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Contents

1.1 libtomcrypt 1.17
1.1.1 Available under license
1.2 lua 5.1.3
1.2.1 Available under license
1.3 csrp 1.0
1.3.1 Available under license
1.4 libtommath 0.42.0
1.4.1 Available under license
1.5 xinetd 2.3.15
1.5.1 Available under license
1.6 pkix-ssh 11.0
1.6.1 Available under license
1.7 lzo 2.10
1.7.1 Available under license
1.8 sqlite 3.27.0
1.9 bzip2 1.0.8
1.10 tcl 8.3.4
1.10.1 Available under license
1.11 sshpass 1.06
1.11.1 Available under license
1.12 lua-cjson 2.1.0
1.12.1 Available under license
1.13 net-tools 2.10
1.13.1 Available under license
1.14 alpine-keys 2.1-r2
1.15 openssl 1.1.1c

1.15.1 Available under license
1.16 hd-parm 9.58
1.17 apk-tools 2.10.4-r3
1.17.1 Available under license
1.18 zlib 1.2.11-r3
1.18.1 Available under license
1.19 libtls-standalone 2.9.1-r0
1.19.1 Available under license
1.20 ndg-httpsclient 0.5.1
1.20.1 Available under license
1.21 readline 7.0-10.el8
1.21.1 Available under license
1.22 attr 2.4.48-3.el8
1.22.1 Available under license
1.23 libmnl 1.0.4-6.el8
1.23.1 Available under license
1.24 pcre 10.32
1.24.1 Available under license
1.25 musl 1.1.24-r0
1.25.1 Available under license
1.26 alpine-baselayout 3.2.0-r3
1.26.1 Available under license
1.27 pax-utils 1.2.4-r0
1.27.1 Available under license
1.28 ca-certificates 20191127-r0
1.28.1 Available under license
1.29 openssl 1.1.1d-r3
1.29.1 Available under license
1.30 busybox 1.31.1-r9
1.30.1 Available under license
1.31 popt 1.16-14.el8
1.31.1 Available under license
1.32 rfc3987 1.3.8
1.32.1 Available under license
1.33 docker-pycreds 0.4.0
1.33.1 Available under license
1.34 godbus 5.0.3
1.34.1 Available under license
1.35 cpio 2.13

1.35.1 Available under license
1.36 netcat 0.7.1
1.36.1 Available under license
1.37 sed 4.8
1.37.1 Available under license
1.38 logrus 1.6.0
1.38.1 Available under license
1.39 urfave-cli 1.22.1
1.39.1 Available under license
1.40 go-md2man 2.0.0-20190314233015-f79a8a8ca69d
1.40.1 Available under license
1.41 tre 0.8.0
1.41.1 Available under license
1.42 bind 9.11.19
1.42.1 Available under license
1.43 libffi 3.1-22.el8
1.43.1 Available under license
1.44 bash 5.0.18
1.44.1 Available under license
1.45 libyaml 0.2.5
1.45.1 Available under license
1.46 cchardet 2.1.7
1.46.1 Available under license
1.47 pyasn1 0.4.8
1.47.1 Available under license
1.48 python-mimeparse 1.6.0
1.48.1 Available under license
1.49 pyparsing 2.4.7
1.49.1 Available under license
1.50 idna-ssl 1.1.0
1.50.1 Available under license
1.51 ip-address 1.0.23
1.51.1 Available under license
1.52 netaddr 0.8.0
1.52.1 Available under license
1.53 strict-rfc3339 0.7
1.53.1 Available under license
1.54 backports-ssl-match-hostname 3.7.0.1
1.54.1 Available under license

1.55 expat 1.95.5
1.55.1 Available under license
1.56 dosfs-tools 4.2
1.56.1 Available under license
1.57 libsodium 1.0.18
1.57.1 Available under license
1.58 tcp-wrappers 7.6-77.el7
1.58.1 Available under license
1.59 libev 4.33
1.59.1 Available under license
1.60 kmod 25-16.el8
1.60.1 Available under license
1.61 go-units 0.4.0
1.61.1 Available under license
1.62 ptyprocess 0.7.0
1.62.1 Available under license
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1.63.1 Available under license
1.64 subwrap 0.1.0
1.64.1 Available under license
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1.66.1 Available under license
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1.67.1 Available under license
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1.68.1 Available under license
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1.69.1 Available under license
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1.70.1 Available under license
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1.71.1 Available under license
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1.72.1 Available under license
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1.73.1 Available under license
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1.75.1 Available under license
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1.76.1 Available under license
1.77 tar 1.34
1.77.1 Available under license
1.78 ws4py 0.5.1
1.78.1 Available under license
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1.79.1 Available under license
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1.80.1 Available under license
1.81 open-ldap 2.4.46-16.el8
1.81.1 Available under license
1.82 erlang-otp 22.3.4.17
1.82.1 Available under license
1.83 backports-functools-lru-cache 1.6.1
1.83.1 Available under license
1.84 inetutils 2:1.8-6
1.84.1 Available under license
1.85 tdb 1.43
1.85.1 Available under license
1.86 helpersdt 0.1.0
1.86.1 Available under license
1.87 luajit 2.1.0.beta3
1.87.1 Available under license
1.88 uwsgi 2.0.20
1.88.1 Available under license
1.89 cyphar-filepath-securejoin 0.2.2
1.89.1 Available under license
1.90 go-capability 0.0.0-20200815063812-42c35b437635
1.90.1 Available under license
1.91 blackfriday 2.0.1
1.91.1 Available under license
1.92 sanitized-anchor-name 1.0.0
1.92.1 Available under license
1.93 x-sys 0.0.0-20200728102440-3e129f6d46b1
1.93.1 Available under license

1.94 opencontainers-runtime-spec 1.0.3-0.20200728170252-4d89ac9fbff6
1.94.1 Available under license
1.95 sys-mountinfo 0.1.3
1.95.1 Available under license
1.96 mnuralp-fileutils 0.0.0-20200520151820-abd8a0e76976
1.96.1 Available under license
1.97 opencontainers-selinux 1.6.0
1.97.1 Available under license
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1.98.1 Available under license
1.99 cilium-ebpf 0.0.0-20200702112145-1c8d4c9ef775
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1.100.1 Available under license
1.101 netns 0.0.0-20191106174202-0a2b9b5464df
1.101.1 Available under license
1.102 grep 3.7
1.102.1 Available under license
1.103 libssh2 1.10.0
1.103.1 Available under license
1.104 ncurses 6.3
1.104.1 Available under license
1.105 simplejson 3.17.6
1.105.1 Available under license
1.106 configargparse 1.5.3
1.106.1 Available under license
1.107 jaraco-functools 3.5.0
1.107.1 Available under license
1.108 cheroot 6.4.0
1.108.1 Available under license
1.109 decorator 5.1.1
1.109.1 Available under license
1.110 pyopenssl 22.0.0
1.110.1 Available under license
1.111 mccabe 0.7.0
1.111.1 Available under license
1.112 libunistring 1.0
1.112.1 Available under license
1.113 markupsafe 2.1.1

1.113.1 Available under license
1.114 expat 2.4.7
1.114.1 Available under license
1.115 itsdangerous 2.1.2
1.115.1 Available under license
1.116 libxslt 1.1.35
1.116.1 Available under license
1.117 goprotobuf 1.4.2
1.117.1 Available under license
1.118 jsonpointer 2.3
1.118.1 Available under license
1.119 bidict 0.22.0
1.119.1 Available under license
1.120 click 8.1.3
1.120.1 Available under license
1.121 jinja2 3.1.2
1.121.1 Available under license
1.122 json-c 0.16
1.122.1 Available under license
1.123 bcrypt 3.2.2
1.123.1 Available under license
1.124 libcap-ng 2.26-4.el8
1.124.1 Available under license
1.125 grpc-go 1.46.0
1.125.1 Available under license
1.126 ncclient 0.6.9
1.126.1 Available under license
1.127 netlink 1.1.0
1.127.1 Available under license
1.128 python3-asn1crypto 1.5.1
1.128.1 Available under license
1.129 pyformance 0.4
1.129.1 Available under license
1.130 libxml2 2.9.14
1.130.1 Available under license
1.131 cryptsetup 2.4.3
1.131.1 Available under license
1.132 libnsl 2.0.0
1.132.1 Available under license

1.133 smartmontools 7.3
1.133.1 Available under license
1.134 libssh 0.8.8
1.134.1 Available under license
1.135 coreutils 9.1
1.135.1 Available under license
1.136 findutils 4.9.0
1.136.1 Available under license
1.137 cffi 1.15.1
1.137.1 Available under license
1.138 typing-extensions 4.3.0
1.138.1 Available under license
1.139 python-setuptools 63.2.0
1.139.1 Available under license
1.140 procps 3.3.15-5.el8
1.140.1 Available under license
1.141 attrs 22.1.0
1.141.1 Available under license
1.142 cmd2 2.4.2
1.142.1 Available under license
1.143 yarl 1.8.1
1.143.1 Available under license
1.144 frozenlist 1.3.1
1.144.1 Available under license
1.145 python-engineio 4.3.4
1.145.1 Available under license
1.146 werkzeug 2.2.2
1.146.1 Available under license
1.147 more-itertools 8.14.0
1.147.1 Available under license
1.148 pyflakes 2.5.0
1.148.1 Available under license
1.149 flask 2.2.2
1.149.1 Available under license
1.150 pytz 2022.2.1
1.150.1 Available under license
1.151 python-setuptools 65.0.2
1.151.1 Available under license
1.152 openssh 9.0p1

1.152.1 Available under license
1.153 inotify-tools 3.22.6.0
1.153.1 Available under license
1.154 packaging 21.3
1.154.1 Available under license
1.155 six 1.16.0
1.155.1 Available under license
1.156 tomli 2.0.1
1.156.1 Available under license
1.157 pysocks 1.7.1
1.157.1 Available under license
1.158 pycparser 2.21
1.158.1 Available under license
1.159 futures 3.3.0
1.159.1 Available under license
1.160 pyrsistent 0.18.1
1.160.1 Available under license
1.161 jsonschema 4.9.1
1.161.1 Available under license
1.162 importlib-metadata 4.12.0
1.162.1 Available under license
1.163 zipp 3.8.1
1.163.1 Available under license
1.164 aiosignal 1.2.0
1.164.1 Available under license
1.165 async-timeout 4.0.2
1.165.1 Available under license
1.166 multidict 6.0.2
1.166.1 Available under license
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1.167.1 Available under license
1.168 psutil 5.9.2
1.168.1 Available under license
1.169 websocket-client 1.4.1
1.169.1 Available under license
1.170 parted 3.5
1.170.1 Available under license
1.171 libnl3 3.7.0
1.171.1 Available under license

1.172 glib 2.72.3
1.172.1 Available under license
1.173 libusb 1.0.26
1.173.1 Available under license
1.174 gdbm 1.23
1.174.1 Available under license
1.175 elfutils 0.187
1.175.1 Available under license
1.176 iptables 1.8.8
1.176.1 Available under license
1.177 prettytable 3.4.1
1.177.1 Available under license
1.178 xz 5.2.6
1.178.1 Available under license
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1.179.1 Available under license
1.180 pyyaml 5.3.1-1
1.180.1 Available under license
1.181 aiohttp 3.8.3
1.181.1 Available under license
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1.182.1 Available under license
1.183 oauthlib 3.2.2
1.183.1 Available under license
1.184 libtirpc 1.3.3
1.184.1 Available under license
1.185 python-lxml 4.9.1
1.185.1 Available under license
1.186 flask-socketio 5.3.1
1.186.1 Available under license
1.187 python-socketio 5.7.2
1.187.1 Available under license
1.188 linux-kernel 5.4.212
1.188.1 Available under license
1.189 strace 5.19
1.189.1 Available under license
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1.194.1 Available under license
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1.196 openssh 9.1
1.196.1 Available under license
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1.197.1 Available under license
1.198 ethtool 5.19
1.198.1 Available under license
1.199 webcolors 1.12
1.199.1 Available under license
1.200 pygobject 3.42.2
1.200.1 Available under license
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1.201.1 Available under license
1.202 chardet 5.0.0
1.202.1 Available under license
1.203 openssh 9.1p1
1.203.1 Available under license
1.204 cherrypy 17.3.0
1.204.1 Available under license
1.205 less 4.1.3
1.205.1 Available under license
1.206 audit 3.0.9
1.206.1 Available under license
1.207 psmisc 23.6-1
1.207.1 Available under license
1.208 safestring 4.1.25
1.208.1 Available under license
1.209 usbutils 1:014-1
1.209.1 Available under license
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1.210.1 Available under license

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1.212.1 Available under license
1.213 mtd-utils 2.1.5
1.213.1 Available under license
1.214 gnutls 3.7.8
1.214.1 Available under license
1.215 systemd 251
1.215.1 Available under license
1.216 gpt-fdisk 1.0.9
1.216.1 Available under license
1.217 libgpg-error 1.45
1.217.1 Available under license
1.218 libgcrypt 1.10.1
1.218.1 Available under license
1.219 lsof 4.95.0
1.219.1 Available under license
1.220 binutils 2.39.0
1.220.1 Available under license
1.221 shadow 4.12.3
1.221.1 Available under license
1.222 diffutils 3.9
1.222.1 Available under license
1.223 slang 2.3.3
1.223.1 Available under license
1.224 squashfs-tools 4.5
1.224.1 Available under license
1.225 gobject-introspection 1.72.0
1.225.1 Available under license
1.226 pathlib 2.3.7
1.226.1 Available under license
1.227 nghttp2 1.49.0
1.227.1 Available under license
1.228 glibc 2.36
1.228.1 Available under license
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1.257.1 Available under license

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1.270.1 Available under license
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1.271.1 Available under license
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1.272.1 Available under license
1.273 networkx 2.8.7
1.273.1 Available under license
1.274 python-pip 22.2.1
1.274.1 Available under license
1.275 python-certifi 2022.09.14
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1.280.1 Available under license
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1.281.1 Available under license
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1.283.1 Available under license
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1.285.1 Available under license
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1.286.1 Available under license
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1.287.1 Available under license
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1.289.1 Available under license
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1.1 libtomcrypt 1.17

1.1.1 Available under license :

```
# /*
#   * SHA-512
#   * Implementation derived from LibTomCrypt (Tom St Denis)
#   *
#   * LibTomCrypt is a library that provides various cryptographic
#   * algorithms in a highly modular and flexible manner.
#   *
#   * The library is free for all purposes without any express
#   * guarantee it works.
#   *
#   * Tom St Denis, tomstdenis@gmail.com, http://libtomcrypt.org
#   */
```

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1.2.1 Available under license :

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1.5 xinetd 2.3.15

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1.6 pkix-ssh 11.0

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1.7 lzo 2.10

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1.11 sshpass 1.06

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1.13 net-tools 2.10

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1.14 alpine-keys 2.1-r2

1.15 openssl 1.1.1c

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1.16 hd-parm 9.58

1.17 apk-tools 2.10.4-r3

1.17.1 Available under license :

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*/
```

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```
/* fetch.c - Alpine Package Keeper (APK)
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```
/* solver.c - Alpine Package Keeper (APK)
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/* implemented as luaL_typerror until lua 5.1, dropped in 5.2
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1.18 zlib 1.2.11-r3

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1.20 ndg-httpsclient 0.5.1

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1.24 pcre 10.32

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Written by: Philip Hazel
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1.25 musl 1.1.24-r0

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1.26 alpine-baselayout 3.2.0-r3

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1.30 busybox 1.31.1-r9

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1.38 logrus 1.6.0

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1.39 urfave-cli 1.22.1

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1.40 go-md2man 2.0.0-20190314233015-f79a8a8ca69d

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1.41 tre 0.8.0

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1.42 bind 9.11.19

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* configure.ac, Makefile.am: The original versions were derived from the
ones in the XML Catalog Manager project, version 2.2.

Author: Julio Merino <jmmv@users.sourceforge.net>

* atf-c/ui.c: The format_paragraph and format_text functions were
derived form the ones in the Monotone project, revision
3a0982da308228d796df35f98d787c5cff2bb5b6.

Author: Julio Merino <jmmv@NetBSD.org>

* atf-c++/detail/io.hpp, atf-c++/detail/io.cpp, atf-c++/detail/io_test.cpp:
These files were derived from the file_handle, systembuf, pipe and pistream
classes and tests found in the Boost.Process library.

Author: Julio Merino <jmmv84@gmail.com>

* admin/check-style.sh,
admin/check-style-common.awk,
admin/check-style-cpp.awk, admin/check-style-shell.awk: These files,
except the first one, were first implemented in the Buildtool project.
They were later adapted to be part of Boost.Process and, during that
process, the shell script was created.

Author: Julio Merino <jmmv84@gmail.com>

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-->

<!-- $Id$ -->

<!-- Generate ISC copyright comments from Docbook copyright metadata. -->

<xsl:stylesheet version="1.0"
 xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
 xmlns:xi="http://www.w3.org/2001/XInclude"
 xmlns:db="http://docbook.org/ns/docbook">
```

```
<xsl:template name="isc.copyright.format">
  <xsl:param name="text"/>
  <xsl:value-of select="$isc.copyright.leader"/>
  <xsl:value-of select="normalize-space(substring-before($text, '&#10;'))"/>
  <xsl:text>&#10;</xsl:text>
  <xsl:variable name="rest" select="substring-after($text, '&#10;')"/>
  <xsl:if test="translate($rest, '&#9;&#32;', '')">
    <xsl:call-template name="isc.copyright.format">
      <xsl:with-param
name="text" select="$rest"/>
    </xsl:call-template>
  </xsl:if>
</xsl:template>

<xsl:variable name="isc.copyright.text">
  <xsl:text>
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  </xsl:text>
</xsl:variable>

<xsl:variable name="isc.copyright">
  <xsl:call-template name="isc.copyright.format">
    <xsl:with-param name="text">
      <xsl:for-each select="book/info/copyright | refentry/docinfo/copyright">
  <xsl:text>Copyright (C) </xsl:text>
  <xsl:call-template name="copyright.years">
    <xsl:with-param name="years" select="year"/>
  </xsl:call-template>
  <xsl:text> </xsl:text>
  <xsl:value-of select="holder"/>
       <xsl:value-of select="$isc.copyright.breakline"/>
  <xsl:text>&#10;</xsl:text>
</xsl:for-each>
<xsl:value-of select="$isc.copyright.text"/>
    </xsl:with-param>
   </xsl:call-template>
</xsl:variable>
</xsl:stylesheet>

<!--
 - Local variables:
 - mode: sgml
 - End:
-->
```

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1.44 bash 5.0.18

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That's all there is to it!

1.47 pyasn1 0.4.8

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Metadata-Version: 1.2
Name: pyasn1
Version: 0.4.8
Summary: ASN.1 types and codecs
Home-page: https://github.com/etingof/pyasn1
Author: Ilya Etingof
Author-email: etingof@gmail.com
Maintainer: Ilya Etingof <etingof@gmail.com>
License: BSD
Description: Pure-Python implementation of ASN.1 types and DER/BER/CER codecs (X.208)
Platform: any
Classifier: Development Status :: 5 - Production/Stable
Classifier: Environment :: Console
Classifier: Intended Audience :: Developers
Classifier: Intended Audience :: Education
Classifier: Intended Audience :: Information Technology
Classifier: Intended Audience :: System Administrators
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Classifier: Programming Language :: Python :: 2.4
Classifier:
Programming Language :: Python :: 2.5
Classifier: Programming Language :: Python :: 2.6
Classifier: Programming Language :: Python :: 2.7
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ASN.1 library for Python

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This is a free and open source implementation of ASN.1 types and codecs
as a Python package. It has been first written to support particular
protocol (SNMP) but then generalized to be suitable for a wide range
of protocols based on
[ASN.1 specification](https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-X.208-198811-W!!PDF-E&type=items).

Features
---

*
Generic implementation of ASN.1 types (X.208)
* Standards compliant BER/CER/DER codecs
* Dumps/loads ASN.1 structures from Python types
* 100% Python, works with Python 2.4 up to Python 3.7
* MT-safe
* Contributed ASN.1 compiler [Asn1ate](https://github.com/kimgr/asn1ate)

Why using pyasn1

ASN.1 solves the data serialisation problem. This solution was
designed long ago by the wise Ancients. Back then, they did not
have the luxury of wasting bits. That is why ASN.1 is designed
to serialise data structures of unbounded complexity into

something compact and efficient when it comes to processing
the data.

That probably explains why many network protocols and file formats
still rely on the 30+ years old technology. Including a number of
high-profile Internet protocols and file formats.

Quite a number of books cover the topic of ASN.1.
[Communication between heterogeneous systems](http://www.oss.com/asn1/dubuisson.html)
by
Olivier Dubuisson is one of those high quality books freely
available on the Internet.

The pyasn1 package is designed to help Python programmers tackling
network protocols and file formats at the comfort of their Python
prompt. The tool struggles to capture all aspects of a rather
complicated ASN.1 system and to represent it on the Python terms.

How to use pyasn1

With pyasn1 you can build Python objects from ASN.1 data structures.
For example, the following ASN.1 data structure:

```bash
Record ::= SEQUENCE {
 id       INTEGER,
 room  [0] INTEGER OPTIONAL,
 house [1] INTEGER DEFAULT 0
}
```

Could be expressed in pyasn1 like this:

```python
class Record(Sequence):
  componentType = NamedTypes(
      NamedType('id', Integer()),
      OptionalNamedType(
          'room', Integer().subtype(
              implicitTag=Tag(tagClassContext, tagFormatSimple, 0)
          )
      ),
      DefaultedNamedType(
          'house',
 Integer(0).subtype(
              implicitTag=Tag(tagClassContext, tagFormatSimple, 1)
          )
```

```
    )
  )
```

It is in the spirit of ASN.1 to take abstract data description
and turn it into a programming language specific form.
Once you have your ASN.1 data structure expressed in Python, you
can use it along the lines of similar Python type (e.g. ASN.1
`SET` is similar to Python `dict`, `SET OF` to `list`):

```python
>>> record = Record()
>>> record['id'] = 123
>>> record['room'] = 321
>>> str(record)
Record:
id=123
room=321
>>>
```

Part of the power of ASN.1 comes from its serialisation features. You
can serialise your data structure and send it over the network.

```python
>>> from pyasn1.codec.der.encoder import encode
>>> substrate = encode(record)
>>> hexdump(substrate)
00000: 30 07 02 01 7B 80 02 01 41
```

Conversely, you can turn serialised ASN.1 content, as received from
network or read from a file, into a Python object which you can
introspect, modify,
 encode and send back.

```python
>>> from pyasn1.codec.der.decoder import decode
>>> received_record, rest_of_substrate = decode(substrate, asn1Spec=Record())
>>>
>>> for field in received_record:
>>>     print('{} is {}'.format(field, received_record[field]))
id is 123
room is 321
house is 0
>>>
>>> record == received_record
True
```

```
>>> received_record.update(room=123)
>>> substrate = encode(received_record)
>>> hexdump(substrate)
00000: 30 06 02 01 7B 80 01 7B
```

The pyasn1 classes struggle to emulate their Python prototypes (e.g. int,
list, dict etc.). But ASN.1 types exhibit more complicated behaviour.
To make life easier for a Pythonista, they can turn their pyasn1
classes into Python built-ins:

```python
>>> from pyasn1.codec.native.encoder import encode
>>> encode(record)
{'id': 123, 'room': 321, 'house': 0}
```

Or vice-versa -- you can initialize an ASN.1 structure from a tree of
Python objects:

```python
>>> from pyasn1.codec.native.decoder import decode
>>> record = decode({'id':
 123, 'room': 321, 'house': 0}, asn1Spec=Record())
>>> str(record)
Record:
id=123
room=321
>>>
```

With ASN.1 design, serialisation codecs are decoupled from data objects,
so you could turn every single ASN.1 object into many different
serialised forms. As of this moment, pyasn1 supports BER, DER, CER and
Python built-ins codecs. The extremely compact PER encoding is expected
to be introduced in the upcoming pyasn1 release.

More information on pyasn1 APIs can be found in the
[documentation](http://snmplabs.com/pyasn1/),
compiled ASN.1 modules for different protocols and file formats
could be found in the pyasn1-modules
[repo](https://github.com/etingof/pyasn1-modules).

How to get pyasn1

The pyasn1 package is distributed under terms and conditions of 2-clause
BSD [license](http://snmplabs.com/pyasn1/license.html). Source code is freely

available as a GitHub [repo](https://github.com/etingof/pyasn1).

You could `pip install pyasn1` or download it from [PyPI](https://pypi.org/project/pyasn1).

If
 something does not work as expected,
[open an issue](https://github.com/etingof/pyasn1/issues) at GitHub or
post your question [on Stack Overflow](https://stackoverflow.com/questions/ask)
or try browsing pyasn1
[mailing list archives](https://sourceforge.net/p/pyasn1/mailman/pyasn1-users/).

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* /opt/cola/permits/1110812511_1607462013.57/0/pyasn1-0-4-8-tar-gz/pyasn1-0.4.8/README.md
No license file was found, but licenses were detected in source scan.

.. _license:

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=======

.. include:: ../../LICENSE.rst

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* /opt/cola/permits/1110812511_1607462013.57/0/pyasn1-0-4-8-tar-gz/pyasn1-0.4.8/docs/source/license.rst
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ASN.1 library for Python
========================

.. toctree::
  :maxdepth: 1

Abstract Syntax Notation One (`ASN.1
<http://en.wikipedia.org/wiki/Abstract_Syntax_Notation_1x>`_) is a
technology for exchanging structured data in a universally understood,
hardware agnostic way. Many industrial, security and telephony
applications heavily rely on ASN.1.

The `pyasn1 <https://pypi.org/project/pyasn1/>`_ library implements
ASN.1 support in pure-Python.

What is ASN.1

ASN.1 is a large, arguably over-engineered and extremely old data modelling and

serialisation tool. It is probably among the first serialisation protocols in
the history of computer science and technology.

ASN.1 started its life over 30 years ago as a serialisation mechanism for the first
electronic mail (known as X.400). Later on if was split off the e-mail application
and become a stand-alone tech still being actively supported by its designers
and
widely used in industry and technology.

Since then ASN.1 is sort of haunted by its relations with the OSI model -- the
first, unsuccessful, version of the Internet. You can read many interesting
`discussions <https://news.ycombinator.com/item?id=8871453>`_ on that topic.

In the following years, generations of software engineers tackled the serialisation
problem many times. We can see that in Google's `ProtoBuffers <https://developers.google.com/protocol-buffers/>`_
or `FlatBuffers <https://google.github.io/flatbuffers/>`_, for example.
Interestingly, many new takes on binary protocol design do not depart
far from ASN.1 from technical perspective. It's more of a matter of striking
a balance between processing overhead, wire format overhead and human
readability.

Looking at what ASN.1 has to offer, it has three loosely coupled parts:

* Data types: the standard introduces a collection of basic data types
(integers, bits, strings, arrays and records) that can be used for describing
arbitrarily complex, nested data structures.

* Serialisation protocols: the above data structures could be converted into a
series of octets for storage or transmission over the wire as well as
recovered back into their structured form. The system is fully agnostic
to hardware architectures differences.

* Schema language: ASN.1 data structures could be described in terms
of a schema language for ASN.1 compiler to turn it into platform-specific
implementation.

ASN.1 applications

Being an old and generally successful standard, ASN.1 is widely
adopted for many uses. To give you an example, these technologies
use ASN.1 for their data exchange needs:

* Signaling standards for the public switched telephone network (SS7 family)
* Network management standards (SNMP, CMIP)
* Directory standards (X.500 family, LDAP)
* Public Key Infrastructure standards (X.509, etc.)

* PBX control (CSTA)
* IP-based Videoconferencing (H.323 family)
* Biometrics (BIP, CBEFF,
 ACBio)
* Intelligent transportation (SAE J2735)
* Cellular telephony (GSM, GPRS/EDGE, UMTS, LTE)

ASN.1 gotchas

Apparently, ASN.1 is hard to implement properly. Quality open-source
ASN.1 tools are rare, but ad-hoc implementations are numerous. Judging from the
`statistics <http://cve.mitre.org/cgi-bin/cvekey.cgi?keyword=ASN.1>`_ on discovered
security vulnerabilities, many people have implemented ASN.1 parsers
and oftentimes fell victim to its edge cases.

On the bright side, ASN.1 has been around for a long time, it is well understood
and security reviewed.

Documentation

.. toctree::
  :maxdepth: 2

  /pyasn1/contents

Use case

.. toctree::
  :maxdepth: 2

  /example-use-case

Download & Install

.. toctree::
  :maxdepth: 2

  /download

Changes

All changes and release history is maintained in changelog. There you
could also download the latest unreleased pyasn1 tarball containing

the latest fixes and improvements.

..
 toctree::
  :maxdepth: 1

  /changelog

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.. toctree::
  :maxdepth: 2

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Getting help

Please, file your `issues <https://github.com/etingof/pyasn1/issues>`_
and `PRs <https://github.com/etingof/pyasn1/pulls>`_ at GitHub.
Alternatively, you could ask for help at
`Stack Overflow <http://stackoverflow.com/questions/tagged/pyasn1>`_
or search
`pyasn1-users <https://lists.sourceforge.net/lists/listinfo/pyasn1-users>`_
mailing list archive.

Books on ASN.1

The pyasn1 implementation is largely based on reading up the following awesome
books:

* `ASN.1 - Communication between heterogeneous systems <http://www.oss.com/asn1/dubuisson.html>`_ by
Olivier Dubuisson
* `ASN.1 Complete <http://www.oss.com/asn1/resources/books-whitepapers-pubs/larmouth-asn1-book.pdf>`_ by
Prof John Larmouth

Here you can get the official standards which is hard to read:

* `ITU standards
 <http://www.itu.int/ITU-T/studygroups/com17/languages/X.680-X.693-0207w.zip>`_

On the other end of the readability spectrum, here is a quick and sweet write up:

* `A Layman's Guide to a Subset of ASN.1, BER, and DER <ftp://ftp.rsasecurity.com/pub/pkcs/ascii/layman.asc>`_

by Burton S. Kaliski

If you are working with ASN.1, we'd highly recommend reading a proper
book on the subject.

Found in path(s):
* /opt/cola/permits/1110812511_1607462013.57/0/pyasn1-0-4-8-tar-gz/pyasn1-0.4.8/docs/source/contents.rst

1.48 python-mimeparse 1.6.0

1.48.1 Available under license :

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1.49 pyparsing 2.4.7

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1.56 dosfs-tools 4.2

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1.60 kmod 25-16.el8

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1.61 go-units 0.4.0

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PLY (Python Lex-Yacc) Version 3.11

[![Build Status](https://travis-ci.org/dabeaz/ply.svg?branch=master)](https://travis-ci.org/dabeaz/ply)

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Introduction
============

PLY is a 100% Python implementation of the common parsing tools lex
and yacc. Here are a few highlights:

- PLY is very closely modeled after traditional lex/yacc.
  If you know how to use these tools in C, you will find PLY

to be similar.

- PLY provides *very* extensive error reporting and diagnostic
  information to assist in parser construction. The original
  implementation was developed for instructional purposes. As
  a result, the system tries to identify the most common types
  of errors made by novice users.

- PLY provides full support for empty productions, error recovery,
  precedence specifiers, and moderately ambiguous grammars.

- Parsing is based on LR-parsing which is fast, memory efficient,
  better suited to large grammars, and which has a number of nice
  properties when dealing with syntax errors and other parsing problems.
  Currently, PLY builds its parsing tables using the LALR(1)
  algorithm used in yacc.

- PLY uses Python introspection features to build lexers and parsers.
  This greatly simplifies the task of parser construction since it reduces
  the number of files and eliminates the need to run a separate lex/yacc
  tool before running your program.

- PLY can be used to build parsers for "real" programming languages.
  Although it is not ultra-fast due to its Python implementation,
  PLY can be used to parse grammars consisting of several hundred
  rules (as might be found for a language like C). The lexer and LR
  parser are also reasonably efficient when parsing typically
  sized programs. People have used PLY to build parsers for
  C, C++, ADA, and other real programming languages.

How to Use
==========

PLY consists of two files : lex.py and yacc.py. These are contained
within the 'ply' directory which may also be used as a Python package.
To use PLY, simply copy the 'ply' directory to your project and import
lex and yacc from the associated 'ply' package. For example:

    import ply.lex as lex
    import ply.yacc as yacc

Alternatively, you can copy just the files lex.py and yacc.py
individually and use them as modules. For example:

    import lex
    import yacc

The file setup.py can be used to install

ply using distutils.

The file doc/ply.html contains complete documentation on how to use
the system.

The example directory contains several different examples including a
PLY specification for ANSI C as given in K&R 2nd Ed.

A simple example is found at the end of this document

Requirements
============
PLY requires the use of Python 2.6 or greater. However, you should
use the latest Python release if possible. It should work on just
about any platform. PLY has been tested with both CPython and Jython.
It also seems to work with IronPython.

Resources
=========
More information about PLY can be obtained on the PLY webpage at:

http://www.dabeaz.com/ply

For a detailed overview of parsing theory, consult the excellent
book "Compilers : Principles, Techniques, and Tools" by Aho, Sethi, and
Ullman. The topics found in "Lex & Yacc" by Levine, Mason, and Brown
may also be useful.

The GitHub page for PLY can be found at:

https://github.com/dabeaz/ply

An old and
relatively inactive discussion group for PLY is found at:

http://groups.google.com/group/ply-hack

Acknowledgments
===============
A special thanks is in order for all of the students in CS326 who
suffered through about 25 different versions of these tools :-).

The CHANGES file acknowledges those who have contributed patches.

Elias Ioup did the first implementation of LALR(1) parsing in PLY-1.x.
Andrew Waters and Markus Schoepflin were instrumental in reporting bugs
and testing a revised LALR(1) implementation for PLY-2.0.

Special Note for PLY-3.0
==========

PLY-3.0 the first PLY release to support Python 3. However, backwards
compatibility with Python 2.6 is still preserved. PLY provides dual
Python 2/3 compatibility by restricting its implementation to a common
subset of basic language features. You should not convert PLY using
2to3--it is not necessary and may in fact break the implementation.

Example
=======

Here is a simple example showing a PLY implementation
 of a calculator
with variables.

```
  # -----------------------------------------------------------------------------
  # calc.py
  #
  # A simple calculator with variables.
  # -----------------------------------------------------------------------------

  tokens = (
     'NAME','NUMBER',
     'PLUS','MINUS','TIMES','DIVIDE','EQUALS',
     'LPAREN','RPAREN',
     )

  # Tokens

  t_PLUS    = r'\+'
  t_MINUS   = r'-'
  t_TIMES   = r'\*'
  t_DIVIDE  = r'/'
  t_EQUALS  = r'='
  t_LPAREN  = r'\('
  t_RPAREN  = r'\)'
  t_NAME    = r'[a-zA-Z_][a-zA-Z0-9_]*'

  def t_NUMBER(t):
     r'\d+'
     t.value = int(t.value)
     return t

  # Ignored characters
  t_ignore = " \t"

  def t_newline(t):
     r'\n+'
```

```
    t.lexer.lineno += t.value.count("\n")

  def t_error(t):
    print("Illegal character '%s'" % t.value[0])
    t.lexer.skip(1)

  # Build the lexer
  import ply.lex as lex
  lex.lex()

  # Precedence
rules for the arithmetic operators
  precedence = (
    ('left','PLUS','MINUS'),
    ('left','TIMES','DIVIDE'),
    ('right','UMINUS'),
    )

  # dictionary of names (for storing variables)
  names = { }

  def p_statement_assign(p):
    'statement : NAME EQUALS expression'
    names[p[1]] = p[3]

  def p_statement_expr(p):
    'statement : expression'
    print(p[1])

  def p_expression_binop(p):
    '''expression : expression PLUS expression
                  | expression MINUS expression
                  | expression TIMES expression
                  | expression DIVIDE expression'''
    if p[2] == '+'  : p[0] = p[1] + p[3]
    elif p[2] == '-': p[0] = p[1] - p[3]
    elif p[2] == '*': p[0] = p[1] * p[3]
    elif p[2] == '/': p[0] = p[1] / p[3]

  def p_expression_uminus(p):
    'expression : MINUS expression %prec UMINUS'
    p[0] = -p[2]

  def p_expression_group(p):
    'expression : LPAREN
expression RPAREN'
    p[0] = p[2]
```

```
  def p_expression_number(p):
      'expression : NUMBER'
      p[0] = p[1]

  def p_expression_name(p):
      'expression : NAME'
      try:
          p[0] = names[p[1]]
      except LookupError:
          print("Undefined name '%s'" % p[1])
          p[0] = 0

  def p_error(p):
      print("Syntax error at '%s'" % p.value)

  import ply.yacc as yacc
  yacc.yacc()

  while True:
      try:
          s = raw_input('calc > ')   # use input() on Python 3
      except EOFError:
          break
      yacc.parse(s)
```

Bug Reports and Patches
==========

My goal with PLY is to simply have a decent lex/yacc implementation for Python. As a general rule, I don't spend huge amounts of time working on it unless I receive very specific bug reports and/or patches to fix problems. I also try to incorporate submitted feature requests and enhancements into each new version. Please visit the PLY github page
at https://github.com/dabeaz/ply to submit issues and pull requests. To contact me about bugs and/or new features, please send email to dave@dabeaz.com.

-- Dave

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* /opt/cola/permits/1160874329_1620411264.5/0/dabeaz-ply-3-11-0-g0f398b7-1-tar-gz/dabeaz-ply-0f398b7/ply/yacc.py
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1.72 pexpect 4.8.0

1.72.1 Available under license :

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1.73 pep8 1.7.1

1.73.1 Available under license :

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Metadata-Version: 1.1
Name: pep8
Version: 1.7.1
Summary: Python style guide checker
Home-page: http://pep8.readthedocs.org/
Author: Ian Lee
Author-email: IanLee1521@gmail.com
License: Expat license
Description-Content-Type: UNKNOWN
Description: pep8 - Python style guide checker
==========

pep8 is a tool to check your Python code against some of the style
conventions in `PEP 8`_.

.. _PEP 8: http://www.python.org/dev/peps/pep-0008/

Features
----

* Plugin architecture: Adding new checks is easy.

* Parseable output: Jump to error location in your editor.

* Small: Just one Python file, requires only stdlib. You can use just
the pep8.py file for this purpose.

* Comes with a comprehensive test suite.

Installation

You can install, upgrade, uninstall pep8.py with these commands::

$ pip install pep8
$ pip install --upgrade pep8
$ pip uninstall pep8

There's also a package for Debian/Ubuntu, but it's not always the
latest version.

Example usage and output

::

```
$ pep8 --first optparse.py
optparse.py:69:11: E401 multiple imports on one line
optparse.py:77:1: E302 expected 2 blank lines, found 1
optparse.py:88:5: E301 expected 1 blank line, found 0
optparse.py:222:34: W602 deprecated form of raising exception
optparse.py:347:31: E211 whitespace before '('
optparse.py:357:17: E201 whitespace after '{'
optparse.py:472:29: E221 multiple spaces before operator
optparse.py:544:21: W601 .has_key() is deprecated, use 'in'
```

You can also make
pep8.py show the source code for each error, and
even the relevant text from PEP 8::

```
$ pep8 --show-source --show-pep8 testsuite/E40.py
testsuite/E40.py:2:10: E401 multiple imports on one line
import os, sys
         ^
    Imports should usually be on separate lines.

    Okay: import os\nimport sys
    E401: import sys, os
```

Or you can display how often each error was found::

```
$ pep8 --statistics -qq Python-2.5/Lib
232     E201 whitespace after '['
599     E202 whitespace before ')'
631     E203 whitespace before ','
842     E211 whitespace before '('
2531    E221 multiple spaces before operator
4473    E301 expected 1 blank line, found 0
4006    E302 expected 2 blank lines, found 1
165     E303 too many blank lines (4)
325     E401 multiple imports on one line
 3615    E501 line too long (82 characters)
612     W601 .has_key() is deprecated, use 'in'
1188    W602 deprecated form of raising exception
```

Links

.. image:: https://api.travis-ci.org/PyCQA/pep8.png?branch=master
  :target: https://travis-ci.org/PyCQA/pep8
  :alt: Build status

.. image:: https://pypip.in/wheel/pep8/badge.png?branch=master
  :target: https://pypi.python.org/pypi/pep8
  :alt: Wheel Status

* `Read the documentation <http://pep8.readthedocs.org/>`_

* `Fork me on GitHub <http://github.com/PyCQA/pep8>`_

Changelog
=========

1.7.1 (2017-10-22)

Changes:

* Prominently note via warning message that the tool is no longer released as
  ``pep8`` and will only be fixed in the ``pycodestyle`` package

1.7.0 (2016-01-12)

Announcements:

* Repository moved to PyCQA Organization on GitHub:
  https://github.com/pycqa/pep8

Changes:

* Reverted the fix in #368, "options passed on command line are only ones
  accepted" feature. This has many unintended consequences in pep8 and flake8
  and needs to be reworked when I have more time.
* Added support for Python 3.5. (Issue #420 & #459)
* Added support for multi-line config_file option parsing. (Issue #429)
* Improved parameter parsing. (Issues #420 & #456)

Bugs:

* Fixed BytesWarning on Python 3. (Issue #459)

1.6.2 (2015-02-15)

Changes:

* Added check for breaking around a binary operator. (Issue #197, Pull #305)

Bugs:

* Restored config_file parameter
in process_options(). (Issue #380)

1.6.1 (2015-02-08)

Changes:

* Assign variables before referenced. (Issue #287)

Bugs:

* Exception thrown due to unassigned ``local_dir`` variable. (Issue #377)

1.6.0 (2015-02-06)

News:

* Ian Lee <ianlee1521@gmail.com> joined the project as a maintainer.

Changes:

* Report E731 for lambda assignment. (Issue #277)

* Report E704 for one-liner def instead of E701.
  Do not report this error in the default configuration. (Issue #277)

* Replace codes E111, E112 and E113 with codes E114, E115 and E116
  for bad indentation of comments. (Issue #274)

* Report E266 instead of E265 when the block comment starts with
  multiple ``#``. (Issue #270)

* Report E402 for import statements not at the top of the file. (Issue #264)

* Do not enforce whitespaces around ``**`` operator. (Issue #292)

* Strip whitespace from around paths during normalization. (Issue #339 / #343)

* Update ``--format`` documentation. (Issue #198 / Pull Request #310)

* Add ``.tox/`` to default excludes. (Issue #335)

* Do not report E121 or E126 in the default configuration. (Issues #256 / #316)

* Allow spaces around the equals sign in an annotated function. (Issue #357)

* Allow trailing backslash if in an inline comment. (Issue #374)

* If ``--config`` is used, only that configuration is processed. Otherwise,
  merge the user and local configurations are merged. (Issue #368 / #369)

Bug fixes:

* Don't crash if Checker.build_tokens_line() returns None. (Issue #306)

* Don't crash if os.path.expanduser() throws an ImportError. (Issue #297)

* Missing space around keyword parameter equal not always reported, E251.
  (Issue #323)

* Fix false positive E711/E712/E713. (Issues #330 and #336)

* Do not skip physical checks if the newline is escaped. (Issue #319)

* Flush sys.stdout to avoid race conditions with printing. See flake8 bug:
  https://gitlab.com/pycqa/flake8/issues/17 for more details. (Issue #363)

1.5.7 (2014-05-29)

Bug fixes:

* Skip the traceback on "Broken pipe" signal. (Issue #275)

* Do not exit when an option in ``setup.cfg`` or ``tox.ini``
  is not recognized.

* Check the last line even if it does not end with a newline. (Issue #286)

* Always open files in universal newlines mode in Python 2. (Issue #288)

1.5.6 (2014-04-14)

Bug fixes:

* Check the last line even if it has no end-of-line. (Issue #273)

1.5.5 (2014-04-10)

Bug fixes:

* Fix regression with E22 checks and inline comments. (Issue #271)

1.5.4 (2014-04-07)

Bug fixes:

* Fix negative offset with E303 before a multi-line docstring.
  (Issue #269)

1.5.3 (2014-04-04)

Bug fixes:

* Fix wrong offset computation when error is on the last char
  of a physical line. (Issue #268)

1.5.2 (2014-04-04)

Changes:

* Distribute a universal wheel file.

Bug fixes:

* Report correct
line number for E303 with comments. (Issue #60)

* Do not allow newline after parameter equal. (Issue #252)

* Fix line number reported for multi-line strings. (Issue #220)

* Fix false positive E121/E126 with multi-line strings. (Issue #265)

* Fix E501 not detected in comments with Python 2.5.

* Fix caret position with ``--show-source`` when line contains tabs.

1.5.1 (2014-03-27)

Bug fixes:

* Fix a crash with E125 on multi-line strings. (Issue #263)

1.5 (2014-03-26)

Changes:

* Report E129 instead of E125 for visually indented line with same
indent as next logical line. (Issue #126)

* Report E265 for space before block comment. (Issue #190)

* Report E713 and E714 when operators ``not in``
and ``is not`` are
recommended. (Issue #236)

* Allow long lines in multiline strings and comments if they cannot
be wrapped. (Issue #224).

* Optionally disable physical line checks inside multiline strings,
using ``# noqa``. (Issue #242)

* Change text for E121 to report "continuation line under-indented
for hanging indent" instead of indentation not being a
multiple of 4.

* Report E131 instead of E121 / E126 if the hanging indent is not

consistent within the same continuation block. It helps when error E121 or E126 is in the ``ignore`` list.

* Report E126 instead of E121 when the continuation line is hanging with extra indentation, even if indentation is not a multiple of 4.

Bug fixes:

* Allow the checkers to report errors on empty files. (Issue #240)

* Fix ignoring too many checks when ``--select`` is used with codes declared in a flake8 extension. (Issue #216)

* Fix regression with multiple brackets. (Issue #214)

* Fix ``StyleGuide`` to parse the local configuration if the keyword argument ``paths`` is specified. (Issue #246)

* Fix a false positive E124 for hanging indent. (Issue #254)

* Fix a false positive E126 with embedded colon. (Issue #144)

* Fix a false positive E126 when indenting with tabs. (Issue #204)

* Fix behaviour when ``exclude`` is in the configuration file and the current directory is not the project directory. (Issue #247)

* The logical checks can return ``None`` instead of an empty iterator. (Issue #250)

* Do not report multiple E101 if only the first indentation starts with a tab. (Issue #237)

* Fix a rare false positive W602. (Issue #34)

1.4.6 (2013-07-02)

Changes:

* Honor ``# noqa`` for errors E711 and E712. (Issue #180)

* When both a ``tox.ini`` and a ``setup.cfg`` are present in the project directory, merge their contents. The ``tox.ini`` file takes precedence (same as before). (Issue #182)

* Give priority to ``--select`` over ``--ignore``. (Issue #188)

* Compare full path when excluding a file. (Issue #186)

* New option ``--hang-closing`` to switch to the alternative style of
  closing bracket indentation for hanging indent. Add error E133 for
  closing bracket which is missing indentation. (Issue #103)

* Accept both styles of closing bracket indentation for hanging indent.
  Do not report error E123 in the default configuration. (Issue #103)

Bug fixes:

* Do not
crash when running AST checks and the document contains null bytes.
  (Issue #184)

* Correctly report other E12 errors when E123 is ignored. (Issue #103)

* Fix false positive E261/E262 when the file contains a BOM. (Issue #193)

* Fix E701, E702 and E703 not detected sometimes. (Issue #196)

* Fix E122 not detected in some cases. (Issue #201 and #208)

* Fix false positive E121 with multiple brackets. (Issue #203)

1.4.5 (2013-03-06)
----

* When no path is specified, do not try to read from stdin. The feature
  was added in 1.4.3, but it is not supported on Windows. Use ``-``
  filename argument to read from stdin. This usage is supported
  since 1.3.4. (Issue #170)

* Do not require ``setuptools`` in setup.py. It works around an issue
  with ``pip`` and Python 3. (Issue #172)

* Add ``__pycache__`` to the ignore list.

* Change misleading message for E251. (Issue #171)

* Do not report false E302 when the source file has a coding cookie or a
  comment on the first line. (Issue #174)

* Reorganize the tests and add tests for the API and for the command line
  usage and options. (Issues #161 and #162)

* Ignore all checks which are not explicitly selected when ``select`` is
  passed to the ``StyleGuide`` constructor.

1.4.4 (2013-02-24)
----

* Report E227 or E228 instead of E225 for whitespace around bitwise, shift
  or modulo operators. (Issue #166)

* Change the message for E226 to make clear that it is about arithmetic
  operators.

* Fix a false positive E128 for continuation line indentation with tabs.

* Fix regression with the
``--diff`` option. (Issue #169)

* Fix the ``TestReport`` class to print the unexpected warnings and
  errors.

1.4.3 (2013-02-22)
----

* Hide the ``--doctest`` and ``--testsuite`` options when installed.

* Fix crash with AST checkers when the syntax is invalid. (Issue #160)

* Read from standard input if no path is specified.

* Initiate a graceful shutdown on ``Control+C``.

* Allow to change the ``checker_class`` for the ``StyleGuide``.

1.4.2 (2013-02-10)
----

* Support AST checkers provided by third-party applications.

* Register new checkers with ``register_check(func_or_cls, codes)``.

* Allow to construct a ``StyleGuide`` with a custom parser.

* Accept visual indentation without parenthesis after the ``if``

statement. (Issue #151)

* Fix UnboundLocalError when using ``# noqa`` with continued lines.
  (Issue #158)

* Re-order the lines for the ``StandardReport``.

* Expand tabs when checking E12 continuation lines. (Issue #155)

* Refactor the testing class ``TestReport`` and the specific test
  functions into a separate test module.

1.4.1 (2013-01-18)
----

* Allow sphinx.ext.autodoc syntax for comments. (Issue #110)

* Report E703 instead of E702 for the trailing semicolon. (Issue #117)

* Honor ``# noqa`` in addition to ``# nopep8``. (Issue #149)

* Expose the ``OptionParser`` factory for better extensibility.

1.4 (2012-12-22)
----

* Report E226 instead of E225 for optional whitespace around common
  operators (``*``, ``**``,
``/``, ``+`` and ``-``). This new error
  code is ignored in the default configuration because PEP 8 recommends
  to "use your own judgement". (Issue #96)

* Lines with a ``# nopep8`` at the end will not issue errors on line
  length E501 or continuation line indentation E12*. (Issue #27)

* Fix AssertionError when the source file contains an invalid line
  ending ```"\r\r\n"```. (Issue #119)

* Read the ``[pep8]`` section of ``tox.ini`` or ``setup.cfg`` if present.
  (Issue #93 and #141)

* Add the Sphinx-based documentation, and publish it
  on http://pep8.readthedocs.org/. (Issue #105)

1.3.4 (2012-12-18)
----

* Fix false positive E124 and E128 with comments. (Issue #100)

* Fix error on stdin when running with bpython. (Issue #101)

* Fix false positive E401. (Issue #104)

* Report E231 for nested dictionary in list. (Issue #142)

* Catch E271 at the beginning of the line. (Issue #133)

* Fix false positive E126 for multi-line comments. (Issue #138)

* Fix false positive E221 when operator is preceded by a comma. (Issue #135)

* Fix ``--diff`` failing on one-line hunk. (Issue #137)

* Fix the ``--exclude`` switch for directory paths. (Issue #111)

* Use ``-`` filename to read from standard input. (Issue #128)

1.3.3 (2012-06-27)
----

* Fix regression with continuation line checker. (Issue #98)

1.3.2 (2012-06-26)
----

* Revert to the previous behaviour for ``--show-pep8``:
  do not imply ``--first``. (Issue #89)

* Add E902 for IO errors. (Issue #87)

* Fix false positive for E121, and
missed E124. (Issue #92)

* Set a sensible default path for config file on Windows. (Issue #95)

* Allow ``verbose`` in the configuration file. (Issue #91)

* Show the enforced ``max-line-length`` in the error message. (Issue #86)

1.3.1 (2012-06-18)
---

* Explain which configuration options are expected. Accept and recommend
  the options names with hyphen instead of underscore. (Issue #82)

* Do not read the user configuration when used as a module
  (except if ``config_file=True`` is passed to the ``StyleGuide`` constructor).

* Fix wrong or missing cases for the E12 series.

* Fix cases where E122 was missed. (Issue #81)

1.3 (2012-06-15)

.. warning::
  The internal API is backwards incompatible.

* Remove global configuration
and refactor the library around
  a ``StyleGuide`` class; add the ability to configure various
  reporters. (Issue #35 and #66)

* Read user configuration from ``~/.config/pep8``
  and local configuration from ``./.pep8``. (Issue #22)

* Fix E502 for backslash embedded in multi-line string. (Issue #68)

* Fix E225 for Python 3 iterable unpacking (PEP 3132). (Issue #72)

* Enable the new checkers from the E12 series in the default
  configuration.

* Suggest less error-prone alternatives for E712 errors.

* Rewrite checkers to run faster (E22, E251, E27).

* Fixed a crash when parsed code is invalid (too many
  closing brackets).

* Fix E127 and E128 for continuation line indentation. (Issue #74)

* New option ``--format`` to customize the error format. (Issue #23)

* New option
``--diff`` to check only modified code. The unified
  diff is read from STDIN. Example: ``hg diff | pep8 --diff``
  (Issue #39)

* Correctly report the count of failures and set the exit code to 1
  when the ``--doctest`` or the ``--testsuite`` fails.

* Correctly detect the encoding in Python 3. (Issue #69)

* Drop support for Python 2.3, 2.4 and 3.0. (Issue #78)

1.2 (2012-06-01)
----

* Add E121 through E128 for continuation line indentation. These
  checks are disabled by default. If you want to force all checks,
  use switch ``--select=E,W``. Patch by Sam Vilain. (Issue #64)

* Add E721 for direct type comparisons. (Issue #47)

* Add E711 and E712 for comparisons to singletons. (Issue #46)

* Fix spurious E225 and E701 for function annotations. (Issue #29)

* Add E502
for explicit line join between brackets.

* Fix E901 when printing source with ``--show-source``.

* Report all errors for each checker, instead of reporting only the
  first occurrence for each line.

* Option ``--show-pep8`` implies ``--first``.

1.1 (2012-05-24)
----

* Add E901 for syntax errors. (Issues #63 and #30)

* Add E271, E272, E273 and E274 for extraneous whitespace around
  keywords. (Issue #57)

* Add ``tox.ini`` configuration file for tests. (Issue #61)

* Add ``.travis.yml`` configuration file for continuous integration.

(Issue #62)

1.0.1 (2012-04-06)
---

* Fix inconsistent version numbers.

1.0 (2012-04-04)
---

* Fix W602 ``raise`` to handle multi-char names.
(Issue #53)

0.7.0 (2012-03-26)
---

* Now ``--first`` prints only the first occurrence of each error.
The ``--repeat`` flag becomes obsolete because it is the default
behaviour. (Issue #6)

* Allow to specify ``--max-line-length``. (Issue #36)

* Make the shebang more flexible. (Issue #26)

* Add testsuite to the bundle. (Issue #25)

* Fixes for Jython. (Issue #49)

* Add PyPI classifiers. (Issue #43)

* Fix the ``--exclude`` option. (Issue #48)

* Fix W602, accept ``raise`` with 3 arguments. (Issue #34)

* Correctly select all tests if ``DEFAULT_IGNORE == ''``.

0.6.1 (2010-10-03)
---

* Fix inconsistent version numbers. (Issue #21)

0.6.0 (2010-09-19)
---

* Test suite reorganized and enhanced in order to check more failures
  with fewer test files. Read the ``run_tests`` docstring for details
  about the syntax.

* Fix E225: accept ``print >>sys.stderr, "..."`` syntax.

* Fix E501 for lines containing multibyte encoded characters. (Issue #7)

* Fix E221, E222, E223, E224 not detected in some cases. (Issue #16)

* Fix E211 to reject ``v = dic['a'] ['b']``. (Issue #17)

* Exit code is always 1 if any error or warning is found. (Issue #10)

* ``--ignore`` checks are now really ignored, especially in
  conjunction with ``--count``. (Issue #8)

* Blank lines with spaces yield W293 instead of W291: some developers
  want to ignore this warning and indent the blank lines to paste their
  code easily in the Python interpreter.

* Fix E301: do not require a blank line before
an indented block. (Issue #14)

* Fix E203 to accept NumPy slice notation ``a[0, :]``. (Issue #13)

* Performance improvements.

* Fix decoding and checking non-UTF8 files in Python 3.

* Fix E225: reject ``True+False`` when running on Python 3.

* Fix an exception when the line starts with an operator.

* Allow a new line before closing ``)``, ``}`` or ``]``. (Issue #5)

0.5.0 (2010-02-17)
----

* Changed the ``--count`` switch to print to sys.stderr and set
  exit code to 1 if any error or warning is found.

* E241 and E242 are removed from the standard checks. If you want to
  include these checks, use switch ``--select=E,W``. (Issue #4)

* Blank line is not mandatory before the first class method or nested
  function definition, even if there's a docstring. (Issue
#1)

* Add the switch ``--version``.

* Fix decoding errors with Python 3. (Issue #13 [1]_)

* Add ``--select`` option which is mirror of ``--ignore``.

* Add checks E261 and E262 for spaces before inline comments.

* New check W604 warns about deprecated usage of backticks.

* New check W603 warns about the deprecated operator ``<>``.

* Performance improvement, due to rewriting of E225.

* E225 now accepts:

  - no whitespace after unary operator or similar. (Issue #9 [1]_)

  - lambda function with argument unpacking or keyword defaults.

* Reserve "2 blank lines" for module-level logical blocks. (E303)

* Allow multi-line comments. (E302, issue #10 [1]_)

0.4.2 (2009-10-22)
----

* Decorators on classes and class methods are OK now.

0.4 (2009-10-20)
----

* Support for all versions of Python from 2.3 to 3.1.

* New and greatly expanded self tests.

* Added ``--count`` option to print the total number of errors and warnings.

* Further improvements to the handling of comments and blank lines.
  (Issue #1 [1]_ and others changes.)

* Check all py files in directory when passed a directory (Issue

#2 [1]_). This also prevents an exception when traversing directories
with non ``*.py`` files.

* E231 should allow commas to be followed by ``)``. (Issue #3 [1]_)

* Spaces are no longer required around the equals sign for keyword
arguments or default parameter values.

.. [1] These issues refer to the `previous issue tracker`__.
.. __: http://github.com/cburroughs/pep8.py/issues

0.3.1 (2009-09-14)
---

* Fixes for comments: do not count them when checking for blank lines between
items.

* Added setup.py for pypi upload and easy_installability.

0.2 (2007-10-16)
---

* Loads of fixes and improvements.

0.1 (2006-10-01)
---

* First release.

Keywords: pep8
Platform: UNKNOWN
Classifier: Development Status :: 5 - Production/Stable
Classifier: Environment :: Console
Classifier: Intended Audience :: Developers
Classifier: License :: OSI Approved :: MIT License
Classifier: Operating System :: OS Independent
Classifier: Programming Language :: Python
Classifier: Programming Language :: Python :: 2
Classifier: Programming Language :: Python :: 3
Classifier: Topic :: Software Development :: Libraries :: Python Modules

Found in path(s):
* /opt/cola/permits/1160881179_1620412741.53/0/pep8-1-7-1-1-tar-gz/pep8-1.7.1/PKG-INFO

*
/opt/cola/permits/1160881179_1620412741.53/0/pep8-1-7-1-1-tar-gz/pep8-1.7.1/pep8.egg-info/PKG-INFO
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* /opt/cola/permits/1160881179_1620412741.53/0/pep8-1-7-1-1-tar-gz/pep8-1.7.1/docs/index.rst

1.74 falcon 2.0.0

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1.75 pyserial 3.5

1.75.1 Available under license :

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1.76 pnp 3.0.0.dev2

1.76.1 Available under license :

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license='Cisco Proprietary',

Found in path(s):
* /opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/setup.py
No license file was found, but licenses were detected in source scan.

[bdist_rpm]
release = 1
packager = Network Plug-n-Play <pnp-dev@cisco.com>
doc_files = README.rst
no-autoreq = 1
post-install = pnp/data/cfg/post_install_rpm.sh
rpm-base = ./rpmbuild
binary-only = 1
description = Plug-n-Play Agent for Cisco Network-PnP
keep-temp = 1

[egg_info]
tag_build =
tag_date = 0

Found in path(s):
* /opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/setup.cfg
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0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/infra/api/capwap.py
* /opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/infra/api/reload.py
* /opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/infra/system/reload.py
* /opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/infra/api/wlc.py
* /opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/infra/api/monitor.py
* /opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/service/services/topology.py
*
/opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/service/services/tag.py
* /opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/infra/system/script_exec.py
* /opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/infra/profile/profile.py
* /opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/infra/api/event.py
* /opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/infra/system/vbond.py
* /opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/infra/api/platform_constants.py
*
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* /opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/discovery/mechanisms/dhcp_discovery.py
* /opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/infra/utils/pnp_utils.py
* /opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/infra/system/clock_sync.py
* /opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/infra/system/interface_info_db.py
* /opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/service/errors.py
* /opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/service/services/interface_info.py
*
/opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/service/action.py
* /opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/discovery/infra/discovery_manager.py
* /opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/infra/system/event.py
* /opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/service/services/device_auth.py

* /opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/infra/xml/xmlparser.py
* /opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/infra/api/vbond.py
*
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* /opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/infra/system/cdp.py
* /opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/service/services/capability.py
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*
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* /opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/discovery/mechanisms/dns_discovery.py
* /opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/service/services/reload.py
* /opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/discovery/mechanisms/sdwan_ztp_discovery.py
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*
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* /opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/service/services/certificate_install.py
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* /opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/infra/utils/pnp_file_paths.py
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* /opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/posix_pnp_nohup.py
* /opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/infra/network/resolve.py
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* /opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/infra/exec_log.py
* /opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/service/api/pnp_service.py
* /opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/service/reasons.py
*
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* /opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/discovery/infra/errors.py
* /opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/infra/utils/pnp_logging.py
* /opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/infra/profile/profile_manager.py
* /opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/agent.py
* /opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/pnp/infra/api/script_exec.py
No license file was found, but licenses were detected in source scan.

Metadata-Version: 1.2
Name: pnp
Version: 3.0.0.dev2
Summary: Plug-n-Play Agent for Cisco Network-PnP
Home-page: https://developer.cisco.com/site/open-plug-n-play/
Author: Network Plug-n-Play
Author-email: pnp-support@cisco.com
License: Cisco Proprietary
Description: UNKNOWN
Keywords: posix pnp agent plug-n-play client
Platform: UNKNOWN
Classifier: Operating System :: POSIX :: Linux
Classifier: Programming Language :: Python :: 3.6
Requires-Python: >=3.6

Found in path(s):
* /opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-

0-dev2-tar-gz/pnp-3.0.0.dev2/pnp.egg-info/PKG-INFO
* /opt/cola/permits/1169156025_1656537926.7187464/0/64c45240b9f81012466f585a1f857d39016ea456-pnp-3-0-0-dev2-tar-gz/pnp-3.0.0.dev2/PKG-INFO

1.77 tar 1.34

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1.82 erlang-otp 22.3.4.17

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[Misc
C library code]

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 */
```

[zlib]

```
/* zlib.h -- interface of
 the 'zlib' general purpose compression library
 version 1.2.3, July 18th, 2005
```

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Jean-loup
Gailly   Mark Adler
jloup@gzip.org   madler@alumni.caltech.edu

The data format used by the zlib library is described by RFCs (Request for
Comments) 1950 to 1952 in the files http://www.ietf.org/rfc/rfc1950.txt
(zlib format), rfc1951.txt (deflate format) and rfc1952.txt (gzip format).
*/

[dialyzer]

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[edoc, syntax_tools]

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1.87 luajit 2.1.0.beta3

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1.89 cyphar-filepath-securejoin 0.2.2

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1.90 go-capability 0.0.0-20200815063812-42c35b437635

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1.92 sanitized-anchor-name 1.0.0

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1.93 x-sys 0.0.0-20200728102440-3e129f6d46b1

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1.95 sys-mountinfo 0.1.3

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1.96 mnuralp-fileutils 0.0.0-20200520151820-abd8a0e76976

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Gocheck - A rich testing framework for Go

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==========

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procfs provides functions to retrieve system, kernel and process metrics from the pseudo-filesystem proc.

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package api

import (
 "io/ioutil"
 "strings"
 "time"
)

type License struct {
 // The unique identifier of the license
 LicenseID string `json:"license_id"`

 // The customer ID associated with the license
 CustomerID string `json:"customer_id"`

 // If set, an identifier that should be used to lock the license to a
 // particular site, cluster, etc.
 InstallationID string `json:"installation_id"`

 // The time at which the license was issued
 IssueTime time.Time `json:"issue_time"`

 // The time at which the license starts being valid
 StartTime time.Time `json:"start_time"`

 // The time after which the license expires
 ExpirationTime time.Time `json:"expiration_time"`

 // The time at which the license ceases to function and can
```

```
 // no longer be used in any capacity
 TerminationTime time.Time `json:"termination_time"`

 // The product the license is valid for
 Product string `json:"product"`

 // License Specific Flags
 Flags map[string]interface{}
 `json:"flags"`

 // List of features enabled by the license
 Features []string `json:"features"`
}

type LicenseReply struct {
 Valid    bool
 License  *License
 Warnings []string
}

func (op *Operator) LicenseGet(q *QueryOptions) (*LicenseReply, error) {
 var reply LicenseReply
 if _, err := op.c.query("/v1/operator/license", &reply, q); err != nil {
  return nil, err
 } else {
  return &reply, nil
 }
}

func (op *Operator) LicenseGetSigned(q *QueryOptions) (string, error) {
 r := op.c.newRequest("GET", "/v1/operator/license")
 r.params.Set("signed", "1")
 r.setQueryOptions(q)
 _, resp, err := requireOK(op.c.doRequest(r))
 if err != nil {
  return "", err
 }
 defer resp.Body.Close()

 data, err := ioutil.ReadAll(resp.Body)
 if err != nil {
  return "", err
 }

 return string(data), nil
}

// LicenseReset will reset the license to the builtin one if it is still valid.
```

```
// If the builtin license is invalid, the current license stays active.
func
 (op *Operator) LicenseReset(opts *WriteOptions) (*LicenseReply, error) {
 var reply LicenseReply
 r := op.c.newRequest("DELETE", "/v1/operator/license")
 r.setWriteOptions(opts)
 _, resp, err := requireOK(op.c.doRequest(r))
 if err != nil {
  return nil, err
 }
 defer resp.Body.Close()

 if err := decodeBody(resp, &reply); err != nil {
  return nil, err
 }

 return &reply, nil
}

func (op *Operator) LicensePut(license string, opts *WriteOptions) (*LicenseReply, error) {
 var reply LicenseReply
 r := op.c.newRequest("PUT", "/v1/operator/license")
 r.setWriteOptions(opts)
 r.body = strings.NewReader(license)
 _, resp, err := requireOK(op.c.doRequest(r))
 if err != nil {
  return nil, err
 }
 defer resp.Body.Close()

 if err := decodeBody(resp, &reply); err != nil {
  return nil, err
 }

 return &reply, nil
}
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```
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package spec

import (
 "encoding/json"

 "github.com/go-openapi/swag"
)

// License information for the exposed API.
//
// For more information: http://goo.gl/8us55a#licenseObject
type License struct {
 LicenseProps
 VendorExtensible
}

// LicenseProps holds the properties of a License object
type LicenseProps struct {
 Name string `json:"name,omitempty"`
 URL  string
 `json:"url,omitempty"`
}

// UnmarshalJSON hydrates License from json
func (l *License) UnmarshalJSON(data []byte) error {
 if err := json.Unmarshal(data, &l.LicenseProps); err != nil {
  return err
 }
 return json.Unmarshal(data, &l.VendorExtensible)
}

// MarshalJSON produces License as json
func (l License) MarshalJSON() ([]byte, error) {
 b1, err := json.Marshal(l.LicenseProps)
 if err != nil {
  return nil, err
 }
 b2, err := json.Marshal(l.VendorExtensible)
 if err != nil {
  return nil, err
 }
 return swag.ConcatJSON(b1, b2), nil
}
Data model artifacts for Prometheus.
Copyright 2012-2015 The Prometheus Authors
```

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* golang.org/x/mod/module - https://github.com/golang/mod

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* gosmith - https://github.com/dvyukov/gosmith

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update-license

This is a small tool that updates the license header for Uber's open source Golang files.

Installation

```
go get go.uber.org/tools/update-license
```

Usage

```
update-license go_files...
```

Further Work

* Support more licenses by name (MIT, Apache 2.0, etc), file path, url (http GET)
* Support custom owner (not just "Uber Technologies, Inc.")
* Support more languages than go (cover go, java, js, py to start, along with LICENSE, LICENSE.txt)
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Protocol Buffers for Go with Gadgets

Go support for Protocol Buffers - Google's data interchange format

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https://github.com/golang/protobuf

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1.100 protobuf 1.23.0

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1.104 ncurses 6.3

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Upstream source https://invisible-island.net/ncurses/ncurses.html
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1.105 simplejson 3.17.6

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1.107 jaraco-functools 3.5.0

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1.108 cheroot 6.4.0

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1.109 decorator 5.1.1

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1.110 pyopenssl 22.0.0

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notices during
execution, include the copyright notice for the Library among
these notices, as well as a reference directing the user to the
copies of the GNU GPL and this license document.

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Library. A suitable mechanism is one that (a) uses at run time
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system, and (b) will operate properly with a modified version
of the Library that is interface-compatible
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Application with a modified version of the Linked Version. (If
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1.113 markupsafe 2.1.1

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Metadata-Version: 2.1
Name: MarkupSafe
Version: 2.1.1
Summary: Safely add untrusted strings to HTML/XML markup.
Home-page: https://palletsprojects.com/p/markupsafe/
Author: Armin Ronacher
Author-email: armin.ronacher@active-4.com
Maintainer: Pallets
Maintainer-email: contact@palletsprojects.com
License: BSD-3-Clause
Project-URL: Donate, https://palletsprojects.com/donate
Project-URL: Documentation, https://markupsafe.palletsprojects.com/
Project-URL: Changes, https://markupsafe.palletsprojects.com/changes/
Project-URL: Source Code, https://github.com/pallets/markupsafe/
Project-URL: Issue Tracker, https://github.com/pallets/markupsafe/issues/
Project-URL: Twitter, https://twitter.com/PalletsTeam
Project-URL: Chat, https://discord.gg/pallets
Platform: UNKNOWN
Classifier: Development Status :: 5 - Production/Stable
Classifier: Environment :: Web Environment
Classifier: Intended Audience :: Developers
Classifier: License
 :: OSI Approved :: BSD License
Classifier: Operating System :: OS Independent
Classifier: Programming Language :: Python
Classifier: Topic :: Internet :: WWW/HTTP :: Dynamic Content
Classifier: Topic :: Text Processing :: Markup :: HTML

Requires-Python: >=3.7
Description-Content-Type: text/x-rst
License-File: LICENSE.rst

MarkupSafe
==========

MarkupSafe implements a text object that escapes characters so it is
safe to use in HTML and XML. Characters that have special meanings are
replaced so that they display as the actual characters. This mitigates
injection attacks, meaning untrusted user input can safely be displayed
on a page.

Installing

Install and update using `pip`_:

.. code-block:: text

  pip install -U MarkupSafe

.. _pip: https://pip.pypa.io/en/stable/getting-started/

Examples

.. code-block:: pycon

  >>> from markupsafe import Markup, escape

  >>> # escape replaces special characters and wraps in Markup
  >>> escape("<script>alert(document.cookie);</script>")
   Markup('<script>alert(document.cookie);</script>')

  >>> # wrap in Markup to mark text "safe" and prevent escaping
  >>> Markup("Hello")
  Markup('hello')

  >>> escape(Markup("Hello"))
  Markup('hello')

  >>> # Markup is a str subclass
  >>> # methods and operators escape their arguments
  >>> template = Markup("Hello {name}")
  >>> template.format(name='"World"')

```
  Markup('Hello <em>&#34;World&#34;</em>')
```

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Links

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- Changes: https://markupsafe.palletsprojects.com/changes/
-
 PyPI Releases: https://pypi.org/project/MarkupSafe/
- Source Code: https://github.com/pallets/markupsafe/
- Issue Tracker: https://github.com/pallets/markupsafe/issues/
- Website: https://palletsprojects.com/p/markupsafe/
- Twitter: https://twitter.com/PalletsTeam
- Chat: https://discord.gg/pallets

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* /opt/cola/permits/1288546271_1649055323.54/0/markupsafe-2-1-1-tar-gz/MarkupSafe-2.1.1/PKG-INFO
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```
[metadata]
name = MarkupSafe
version = attr: markupsafe.__version__
url = https://palletsprojects.com/p/markupsafe/
project_urls =
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 Changes = https://markupsafe.palletsprojects.com/changes/
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 Issue Tracker = https://github.com/pallets/markupsafe/issues/
 Twitter = https://twitter.com/PalletsTeam
 Chat = https://discord.gg/pallets
license = BSD-3-Clause
license_files = LICENSE.rst
author = Armin Ronacher
```

```
author_email = armin.ronacher@active-4.com
maintainer = Pallets
maintainer_email = contact@palletsprojects.com
description = Safely add untrusted strings to HTML/XML markup.
long_description = file: README.rst
long_description_content_type = text/x-rst
classifiers =
 Development Status :: 5 - Production/Stable
 Environment :: Web Environment
 Intended Audience ::
 Developers
 License :: OSI Approved :: BSD License
 Operating System :: OS Independent
 Programming Language :: Python
 Topic :: Internet :: WWW/HTTP :: Dynamic Content
 Topic :: Text Processing :: Markup :: HTML

[options]
packages = find:
package_dir = = src
include_package_data = True
python_requires = >= 3.7

[options.packages.find]
where = src

[tool:pytest]
testpaths = tests
filterwarnings =
 error

[coverage:run]
branch = True
source =
 markupsafe
 tests

[coverage:paths]
source =
 src
 */site-packages

[flake8]
select = B, E, F, W, B9, ISC
ignore =
 E203
 E501
 E722
```

W503
max-line-length = 80

[mypy]
files = src/markupsafe
python_version = 3.7
show_error_codes = True
disallow_subclassing_any = True
disallow_untyped_calls = True
disallow_untyped_defs = True
disallow_incomplete_defs = True
no_implicit_optional = True
local_partial_types = True
no_implicit_reexport = True
strict_equality = True
warn_redundant_casts = True
warn_unused_configs = True
warn_unused_ignores = True
warn_return_any
= True
warn_unreachable = True

[egg_info]
tag_build =
tag_date = 0

Found in path(s):
* /opt/cola/permits/1288546271_1649055323.54/0/markupsafe-2-1-1-tar-gz/MarkupSafe-2.1.1/setup.cfg

1.114 expat 2.4.7

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1.115 itsdangerous 2.1.2

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```
[metadata]
name = itsdangerous
version = attr: itsdangerous.__version__
url = https://palletsprojects.com/p/itsdangerous/
project_urls =
 Donate = https://palletsprojects.com/donate
 Documentation = https://itsdangerous.palletsprojects.com/
 Changes = https://itsdangerous.palletsprojects.com/changes/
 Source Code = https://github.com/pallets/itsdangerous/
 Issue Tracker = https://github.com/pallets/itsdangerous/issues/
 Twitter = https://twitter.com/PalletsTeam
 Chat = https://discord.gg/pallets
license = BSD-3-Clause
license_files = LICENSE.rst
author = Armin Ronacher
author_email = armin.ronacher@active-4.com
maintainer = Pallets
maintainer_email = contact@palletsprojects.com
description = Safely pass data to untrusted environments and back.
long_description = file: README.rst
long_description_content_type = text/x-rst
classifiers =
 Development Status :: 5 - Production/Stable
 Intended Audience :: Developers
 License
 :: OSI Approved :: BSD License
 Operating System :: OS Independent
 Programming Language :: Python

[options]
packages = find:
package_dir = = src
include_package_data = True
python_requires = >= 3.7

[options.packages.find]
where = src

[tool:pytest]
testpaths = tests
filterwarnings =
 error

[coverage:run]
branch = True
source =
 itsdangerous
 tests
```

```
[coverage:paths]
source =
 src
 */site-packages

[flake8]
select = B, E, F, W, B9, ISC
ignore =
 E203
 E501
 E722
 W503
max-line-length = 80
per-file-ignores =
 src/itsdangerous/__init__.py: F401

[mypy]
files = src/itsdangerous
python_version = 3.7
show_error_codes = True
disallow_subclassing_any = True
disallow_untyped_calls = True
disallow_untyped_defs = True
disallow_incomplete_defs = True
no_implicit_optional = True
local_partial_types = True
no_implicit_reexport = True
strict_equality = True
warn_redundant_casts = True
warn_unused_configs = True
warn_unused_ignores = True
warn_return_any = True
warn_unreachable = True

[mypy-itsdangerous.jws]
disallow_untyped_defs
 = False

[egg_info]
tag_build =
tag_date = 0
```

Found in path(s):
* /opt/cola/permits/1294198813_1649055045.06/0/itsdangerous-2-1-2-tar-gz/itsdangerous-2.1.2/setup.cfg
No license file was found, but licenses were detected in source scan.

Metadata-Version: 2.1

Name: itsdangerous
Version: 2.1.2
Summary: Safely pass data to untrusted environments and back.
Home-page: https://palletsprojects.com/p/itsdangerous/
Author: Armin Ronacher
Author-email: armin.ronacher@active-4.com
Maintainer: Pallets
Maintainer-email: contact@palletsprojects.com
License: BSD-3-Clause
Project-URL: Donate, https://palletsprojects.com/donate
Project-URL: Documentation, https://itsdangerous.palletsprojects.com/
Project-URL: Changes, https://itsdangerous.palletsprojects.com/changes/
Project-URL: Source Code, https://github.com/pallets/itsdangerous/
Project-URL: Issue Tracker, https://github.com/pallets/itsdangerous/issues/
Project-URL: Twitter, https://twitter.com/PalletsTeam
Project-URL: Chat, https://discord.gg/pallets
Platform: UNKNOWN
Classifier: Development Status :: 5 - Production/Stable
Classifier: Intended Audience :: Developers
Classifier: License :: OSI Approved :: BSD License
Classifier:
 Operating System :: OS Independent
Classifier: Programming Language :: Python
Requires-Python: >=3.7
Description-Content-Type: text/x-rst
License-File: LICENSE.rst

ItsDangerous
============

... so better sign this

Various helpers to pass data to untrusted environments and to get it
back safe and sound. Data is cryptographically signed to ensure that a
token has not been tampered with.

It's possible to customize how data is serialized. Data is compressed as
needed. A timestamp can be added and verified automatically while
loading a token.

Installing

Install and update using `pip`_:

.. code-block:: text

```
pip install -U itsdangerous
```

.. _pip: https://pip.pypa.io/en/stable/getting-started/

A Simple Example

Here's how you could generate a token for transmitting a user's id and
name between web requests.

.. code-block:: python

```
from itsdangerous import URLSafeSerializer
auth_s = URLSafeSerializer("secret key", "auth")

token = auth_s.dumps({"id": 5, "name": "itsdangerous"})

print(token)
# eyJpZCI6NSwibmFtZSI6Iml0c2Rhbmdlcm91cyJ9.6YP6T0BaO67XP--9UzTrmurXSmg

data = auth_s.loads(token)
print(data["name"])
# itsdangerous
```

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- Source Code: https://github.com/pallets/itsdangerous/
- Issue Tracker: https://github.com/pallets/itsdangerous/issues/
- Website: https://palletsprojects.com/p/itsdangerous/
- Twitter: https://twitter.com/PalletsTeam
- Chat: https://discord.gg/pallets

Found
in path(s):
* /opt/cola/permits/1294198813_1649055045.06/0/itsdangerous-2-1-2-tar-gz/itsdangerous-2.1.2/src/itsdangerous.egg-info/PKG-INFO
* /opt/cola/permits/1294198813_1649055045.06/0/itsdangerous-2-1-2-tar-gz/itsdangerous-2.1.2/PKG-INFO

1.116 libxslt 1.1.35

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1.117 goprotobuf 1.4.2

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1.118 jsonpointer 2.3

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1.119 bidict 0.22.0

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1.120 click 8.1.3

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.. _contrib:

=============
click-contrib
=============

As the userbase of Click grows, more and more major feature requests pop up in
Click's bugtracker. As reasonable as it may be for those features to be bundled
with Click instead of being a standalone project, many of those requested
features are either highly experimental or have unproven practical use, while
potentially being a burden to maintain.

This is why click-contrib_ exists. The GitHub organization is a collection of
possibly experimental third-party packages whose featureset does not belong
into Click, but also a playground for major features that may be added to Click
in the future. It is also meant to coordinate and concentrate effort on writing
third-party extensions for Click, and to ease the effort of searching for such
extensions. In that sense it could be described as a low-maintenance
alternative to extension repositories of other frameworks.

Please
 note that the quality and stability of those packages may be different
than what you expect from Click itself. While published under a common
organization, they are still projects separate from Click.

.. _click-contrib: https://github.com/click-contrib/

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Metadata-Version: 2.1
Name: click
Version: 8.1.3
Summary: Composable command line interface toolkit
Home-page: https://palletsprojects.com/p/click/
Author: Armin Ronacher
Author-email: armin.ronacher@active-4.com
Maintainer: Pallets
Maintainer-email: contact@palletsprojects.com
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Project-URL: Donate, https://palletsprojects.com/donate
Project-URL: Documentation, https://click.palletsprojects.com/
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Platform: UNKNOWN
Classifier: Development Status :: 5 - Production/Stable
Classifier: Intended Audience :: Developers
Classifier: License :: OSI Approved :: BSD License
Classifier: Operating System :: OS Independent
Classifier:
 Programming Language :: Python
Requires-Python: >=3.7
Description-Content-Type: text/x-rst
License-File: LICENSE.rst

\$ click_
==========

Click is a Python package for creating beautiful command line interfaces
in a composable way with as little code as necessary. It's the "Command
Line Interface Creation Kit". It's highly configurable but comes with
sensible defaults out of the box.

It aims to make the process of writing command line tools quick and fun
while also preventing any frustration caused by the inability to
implement an intended CLI API.

Click in three points:

- Arbitrary nesting of commands
- Automatic help page generation
- Supports lazy loading of subcommands at runtime

Installing

Install and update using `pip`_:

.. code-block:: text

  $ pip install -U click

.. _pip: https://pip.pypa.io/en/stable/getting-started/

A Simple Example

.. code-block:: python

  import click

  @click.command()
  @click.option("--count",
 default=1, help="Number of greetings.")
  @click.option("--name", prompt="Your name", help="The person to greet.")
  def hello(count, name):
      """Simple program that greets NAME for a total of COUNT times."""
      for _ in range(count):
          click.echo(f"Hello, {name}!")

  if __name__ == '__main__':
      hello()

.. code-block:: text

  $ python hello.py --count=3
  Your name: Click
  Hello, Click!
  Hello, Click!
  Hello, Click!

Donate

The Pallets organization develops and supports Click and other popular
packages. In order to grow the community of contributors and users, and
allow the maintainers to devote more time to the projects, `please
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Links

- Documentation: https://click.palletsprojects.com/
- Changes: https://click.palletsprojects.com/changes/
- PyPI Releases: https://pypi.org/project/click/
- Source Code: https://github.com/pallets/click
-
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[metadata]
name = click
version = attr: click.__version__
url = https://palletsprojects.com/p/click/
project_urls =
 Donate = https://palletsprojects.com/donate
 Documentation = https://click.palletsprojects.com/
 Changes = https://click.palletsprojects.com/changes/
 Source Code = https://github.com/pallets/click/
 Issue Tracker = https://github.com/pallets/click/issues/
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license = BSD-3-Clause
license_files = LICENSE.rst
author = Armin Ronacher
author_email = armin.ronacher@active-4.com
maintainer = Pallets
maintainer_email = contact@palletsprojects.com
description = Composable command line interface toolkit
long_description = file: README.rst
long_description_content_type = text/x-rst
classifiers =
 Development Status :: 5 - Production/Stable
 Intended Audience :: Developers
 License :: OSI Approved :: BSD License
 Operating System :: OS
 Independent
 Programming Language :: Python

[options]
packages = find:
package_dir = = src
include_package_data = True
python_requires = >= 3.7

[options.packages.find]
where = src

[tool:pytest]
testpaths = tests
filterwarnings =

```
 error

[coverage:run]
branch = True
source =
 click
 tests

[coverage:paths]
source =
 src
 */site-packages

[flake8]
select = B, E, F, W, B9, ISC
ignore =
 E203
 E501
 E722
 W503
max-line-length = 80
per-file-ignores =
 src/click/__init__.py: F401

[mypy]
files = src/click
python_version = 3.7
show_error_codes = True
disallow_subclassing_any = True
disallow_untyped_calls = True
disallow_untyped_defs = True
disallow_incomplete_defs = True
check_untyped_defs = True
no_implicit_optional = True
local_partial_types = True
no_implicit_reexport = True
strict_equality = True
warn_redundant_casts = True
warn_unused_configs = True
warn_unused_ignores = True
warn_return_any = True
warn_unreachable = True

[mypy-colorama.*]
ignore_missing_imports = True

[mypy-importlib_metadata.*]
ignore_missing_imports
```

= True

[egg_info]
tag_build =
tag_date = 0

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1.122 json-c 0.16

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1.123 bcrypt 3.2.2

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1.131 cryptsetup 2.4.3

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If distribution of object code is made by offering access to copy from a designated place, then offering equivalent access to copy the

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When a "work that uses the Library" uses material from a header file that is part of the Library, the object code for the work may be a derivative work of the Library even though the source code is not. Whether this is true is especially significant if the work can be linked without the Library, or if the work is itself a library. The threshold for this to be true is not precisely defined by law.

If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may distribute the object code for the work under the terms of Section 6. Any executables containing that work also fall under Section 6, whether or not they are linked directly with the Library itself.

6. As an exception to the Sections above, you may also combine or link a "work that uses the Library" with the Library to produce a work containing portions of the Library, and distribute that work under terms of your choice, provided that the terms permit modification of the work for the customer's own use and reverse engineering for debugging such modifications.

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1.132 libnsl 2.0.0

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In other cases, permission to use a particular library in non-free programs enables a greater number of people to use a large body of free software. For example, permission to use the GNU C Library in non-free programs enables many more people to use the whole GNU operating system, as well as its variant, the GNU/Linux operating system.

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d) If a facility in the modified Library refers to a function or a
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table, the facility still operates, and performs whatever part of
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(For example, a function in a library to compute square roots has
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application. Therefore, Subsection 2d requires that any
application-supplied function or table used by this function must
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Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Library.

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(For example, a function in a library to compute square roots has a purpose that is entirely well-defined independent of the application. Therefore, Subsection 2d requires that any application-supplied function or table used by this function must be optional: if the application does not supply it, the square root function must still compute square roots.)

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must be distributed
under the terms of Sections 1 and 2 above on a
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If distribution of object code is made by offering access to copy
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If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may distribute the object code for the work under the terms of Section 6. Any executables containing that work also fall under Section 6, whether or not they are linked directly with the Library itself.

6. As an exception to the Sections above, you may also combine or link a "work that uses the Library" with the Library to produce a work containing portions of the Library, and distribute that work under terms of your choice, provided that the terms permit modification of the work for the customer's own use and reverse engineering for debugging such modifications.

You must give prominent notice with each copy of the work that the Library is used in it and that the Library and its use are covered by this License. You must supply a copy of this License. If the work during execution displays copyright notices, you must include the copyright notice for the Library among them, as well as a reference directing the user to the copy of this License. Also, you must do one of these things:

a) Accompany the work with the complete corresponding machine-readable source code for the Library including whatever changes were used in the work (which must be distributed under Sections 1 and 2 above); and, if the work is an executable linked with the Library, with the complete machine-readable "work that uses the Library", as object code and/or source code, so that the user can modify the Library and then relink to produce a modified executable containing the modified Library. (It is understood that the user who changes the contents of definitions files in the Library will not necessarily be able to recompile the application to use the modified definitions.)

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d) If distribution of the work is made by offering access to copy from a designated place, offer equivalent access to copy the above specified materials from the same place.

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1.135 coreutils 9.1

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1.137 cffi 1.15.1

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1.138 typing-extensions 4.3.0

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A. HISTORY OF THE SOFTWARE
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Python was created in the early 1990s by Guido van Rossum at Stichting
Mathematisch Centrum (CWI, see http://www.cwi.nl) in the Netherlands
as a successor of a language called ABC. Guido remains Python's
principal author, although it includes many contributions from others.

In 1995, Guido continued his work on Python at the Corporation for
National Research Initiatives (CNRI, see http://www.cnri.reston.va.us)
in Reston, Virginia where he released several versions of the
software.

In May 2000, Guido and the Python core development team moved to
BeOpen.com to form the BeOpen PythonLabs team. In October of the same
year, the PythonLabs team moved to Digital Creations (now Zope
Corporation, see http://www.zope.com). In 2001, the Python Software
Foundation (PSF, see http://www.python.org/psf/) was formed, a
non-profit organization created specifically to own Python-related
Intellectual Property. Zope Corporation is a sponsoring member

of
the PSF.

All Python releases are Open Source (see http://www.opensource.org for the Open Source Definition). Historically, most, but not all, Python releases have also been GPL-compatible; the table below summarizes the various releases.

Release	Derived from	Year	Owner	GPL-compatible? (1)
0.9.0 thru 1.2		1991-1995	CWI	yes
1.3 thru 1.5.2	1.2	1995-1999	CNRI	yes
1.6	1.5.2	2000	CNRI	no
2.0	1.6	2000	BeOpen.com	no
1.6.1	1.6	2001	CNRI	yes (2)
2.1	2.0+1.6.1	2001	PSF	no
2.0.1	2.0+1.6.1	2001	PSF	yes
2.1.1	2.1+2.0.1	2001	PSF	yes
2.1.2	2.1.1	2002	PSF	yes
2.1.3	2.1.2	2002	PSF	yes
2.2 and above				
2.1.1		2001-now	PSF	yes

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Thanks to the many outside volunteers who have worked under Guido's direction to make these releases possible.

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1.139 python-setuptools 63.2.0

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1.140 procps 3.3.15-5.el8

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1.142 cmd2 2.4.2

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Metadata-Version: 2.1
Name: Flask
Version: 2.2.2
Summary: A simple framework for building complex web applications.
Home-page: https://palletsprojects.com/p/flask
Author: Armin Ronacher
Author-email: armin.ronacher@active-4.com
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Classifier: Topic :: Internet :: WWW/HTTP :: WSGI
Classifier: Topic :: Internet :: WWW/HTTP :: WSGI :: Application
Classifier: Topic :: Software Development :: Libraries :: Application Frameworks
Requires-Python: >=3.7
Description-Content-Type: text/x-rst
Provides-Extra: async
Provides-Extra: dotenv
License-File: LICENSE.rst

Flask
=====

Flask is a lightweight `WSGI`_ web application framework. It is designed
to make getting started quick and easy, with the ability to scale up to
complex applications. It began as a simple wrapper around `Werkzeug`_
and `Jinja`_ and has become one of the most popular Python web
application frameworks.

Flask offers suggestions, but doesn't enforce any dependencies or
project layout. It is up to the developer to choose the tools and
libraries they want to use. There are many extensions
provided by the
community that make adding new functionality easy.

.. _WSGI: https://wsgi.readthedocs.io/
.. _Werkzeug: https://werkzeug.palletsprojects.com/
.. _Jinja: https://jinja.palletsprojects.com/

Installing

Install and update using `pip`_:

.. code-block:: text

  $ pip install -U Flask

.. _pip: https://pip.pypa.io/en/stable/getting-started/

A Simple Example

.. code-block:: python

  # save this as app.py
  from flask import Flask

  app = Flask(__name__)

  @app.route("/")
  def hello():
      return "Hello, World!"

.. code-block:: text

  $ flask run
    * Running on http://127.0.0.1:5000/ (Press CTRL+C to quit)

Contributing

For guidance on setting up a development environment and how to make a
contribution to Flask, see the `contributing guidelines`_.

.. _contributing guidelines: https://github.com/pallets/flask/blob/main/CONTRIBUTING.rst

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- Documentation: https://flask.palletsprojects.com/
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[metadata]
name = Flask
version = attr: flask.__version__
url = https://palletsprojects.com/p/flask
project_urls =
 Donate = https://palletsprojects.com/donate
 Documentation = https://flask.palletsprojects.com/
 Changes = https://flask.palletsprojects.com/changes/
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license = BSD-3-Clause
author = Armin Ronacher
author_email = armin.ronacher@active-4.com
maintainer = Pallets
maintainer_email = contact@palletsprojects.com
description = A simple framework for building complex web applications.
long_description = file: README.rst
long_description_content_type = text/x-rst
classifiers =
 Development Status :: 5 - Production/Stable
 Environment :: Web Environment
 Framework :: Flask
 Intended Audience :: Developers
 License :: OSI Approved
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 Operating System :: OS Independent

```
 Programming Language :: Python
 Topic :: Internet :: WWW/HTTP :: Dynamic Content
 Topic :: Internet :: WWW/HTTP :: WSGI
 Topic :: Internet :: WWW/HTTP :: WSGI :: Application
 Topic :: Software Development :: Libraries :: Application Frameworks

[options]
packages = find:
package_dir = = src
include_package_data = True
python_requires = >= 3.7

[options.packages.find]
where = src

[options.entry_points]
console_scripts =
 flask = flask.cli:main

[tool:pytest]
testpaths = tests
filterwarnings =
 error

[coverage:run]
branch = True
source =
 flask
 tests

[coverage:paths]
source =
 src
 */site-packages

[flake8]
select = B, E, F, W, B9, ISC
ignore =
 E203
 E402
 E501
 E722
 W503
max-line-length = 80
per-file-ignores =
 src/flask/__init__.py: F401

[mypy]
```

```
files = src/flask, tests/typing
python_version = 3.7
show_error_codes = True
allow_redefinition = True
disallow_subclassing_any = True
no_implicit_optional = True
local_partial_types
 = True
strict_equality = True
warn_redundant_casts = True
warn_unused_configs = True
warn_unused_ignores = True

[mypy-asgiref.*]
ignore_missing_imports = True

[mypy-blinker.*]
ignore_missing_imports = True

[mypy-dotenv.*]
ignore_missing_imports = True

[mypy-cryptography.*]
ignore_missing_imports = True

[mypy-importlib_metadata]
ignore_missing_imports = True

[egg_info]
tag_build =
tag_date = 0
```

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```
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```

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```
Flask leverages Jinja2 as its template engine.  You are obviously free to use
```

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.. currentmodule:: flask

Blog Blueprint
==============

You'll use the same techniques you learned about when writing the authentication blueprint to write the blog blueprint. The blog should list all posts, allow logged in users to create posts, and allow the author of a post to edit or delete it.

As you implement each view, keep the development server running. As you save your changes, try going to the URL in your browser and testing them out.

The Blueprint

Define the blueprint and register it in the application factory.

.. code-block:: python
  :caption: ``flaskr/blog.py``

  from flask import (
    Blueprint, flash, g, redirect, render_template, request, url_for
)
  from werkzeug.exceptions import abort

  from flaskr.auth import login_required
  from flaskr.db import get_db

  bp = Blueprint('blog', __name__)

Import and register the blueprint from the factory using :meth:`app.register_blueprint() <Flask.register_blueprint>`. Place the new code at the end of the factory function before returning the app.

.. code-block:: python
  :caption: ``flaskr/__init__.py``

  def create_app():
    app = ...
    # existing code omitted

    from . import blog
    app.register_blueprint(blog.bp)
    app.add_url_rule('/', endpoint='index')

    return app

Unlike the auth blueprint, the blog blueprint does not have a

``url_prefix``. So the ``index`` view will be at ``/``, the ``create`` view at ``/create``, and so on. The blog is the main feature of Flaskr, so it makes sense that the blog index will be the main index.

However, the endpoint for the ``index`` view defined below will be ``blog.index``. Some of the authentication views referred to a plain ``index`` endpoint. :meth:`app.add_url_rule() <Flask.add_url_rule>` associates the endpoint name ``'index'`` with the ``/`` url so that ``url_for('index')`` or ``url_for('blog.index')`` will
 both work,
generating the same ``/`` URL either way.

In another application you might give the blog blueprint a ``url_prefix`` and define a separate ``index`` view in the application factory, similar to the ``hello`` view. Then the ``index`` and ``blog.index`` endpoints and URLs would be different.

Index

The index will show all of the posts, most recent first. A ``JOIN`` is used so that the author information from the ``user`` table is available in the result.

.. code-block:: python
  :caption: ``flaskr/blog.py``

  @bp.route('/')
  def index():
      db = get_db()
      posts = db.execute(
          'SELECT p.id, title, body, created, author_id, username'
          ' FROM post p JOIN user u ON p.author_id = u.id'
          ' ORDER BY created DESC'
).fetchall()
      return render_template('blog/index.html', posts=posts)

.. code-block:: html+jinja
  :caption: ``flaskr/templates/blog/index.html``

  {% extends 'base.html' %}

  {% block header
 %}
    <h1>{% block title %}Posts{% endblock %}</h1>
    {% if g.user %}
      New

```
    {% endif %}
  {% endblock %}

  {% block content %}
    {% for post in posts %}
      <article class="post">
        <header>
          <div>
            <h1>{{ post['title'] }}</h1>
            <div class="about">by {{ post['username'] }} on {{ post['created'].strftime('%Y-%m-%d') }}</div>
          </div>
          {% if g.user['id'] == post['author_id'] %}
            <a class="action" href="{{ url_for('blog.update', id=post['id']) }}">Edit</a>
          {% endif %}
        </header>
        <p class="body">{{ post['body'] }}</p>
      </article>
      {% if not loop.last %}
        <hr>
      {% endif %}
    {% endfor %}
  {% endblock %}
```

When a user is logged in, the ``header`` block adds a link to the
``create`` view. When the user is the author of a post, they'll see an
"Edit" link to the
 ``update`` view for that post. ``loop.last`` is a
special variable available inside `Jinja for loops`_. It's used to
display a line after each post except the last one, to visually separate
them.

.. _Jinja for loops: https://jinja.palletsprojects.com/templates/#for

Create

The ``create`` view works the same as the auth ``register`` view. Either
the form is displayed, or the posted data is validated and the post is
added to the database or an error is shown.

The ``login_required`` decorator you wrote earlier is used on the blog
views. A user must be logged in to visit these views, otherwise they
will be redirected to the login page.

.. code-block:: python
  :caption: ``flaskr/blog.py``

```
  @bp.route('/create', methods=('GET', 'POST'))
  @login_required
  def create():
      if request.method == 'POST':
          title = request.form['title']
          body = request.form['body']
          error = None

          if not title:
              error = 'Title
 is required.'

          if error is not None:
              flash(error)
          else:
              db = get_db()
              db.execute(
                  'INSERT INTO post (title, body, author_id)'
                  ' VALUES (?, ?, ?)',
                  (title, body, g.user['id'])
              )
              db.commit()
              return redirect(url_for('blog.index'))

      return render_template('blog/create.html')
```

```
.. code-block:: html+jinja
  :caption: ``flaskr/templates/blog/create.html``

  {% extends 'base.html' %}

  {% block header %}
    <h1>{% block title %}New Post{% endblock %}</h1>
  {% endblock %}

  {% block content %}
    <form method="post">
      <label for="title">Title</label>
      <input name="title" id="title" value="{{ request.form['title'] }}" required>
      <label for="body">Body</label>
      <textarea name="body" id="body">{{ request.form['body'] }}</textarea>
      <input type="submit" value="Save">
    </form>
  {% endblock %}
```

Update

Both the ``update`` and ``delete`` views will need to fetch a ``post`` by ``id`` and check if the author matches the logged in user. To avoid duplicating code, you can write a function to get the ``post`` and call it from each view.

.. code-block:: python
  :caption: ``flaskr/blog.py``

  def get_post(id, check_author=True):
      post = get_db().execute(
          'SELECT p.id, title, body, created, author_id, username'
          ' FROM post p JOIN user u ON p.author_id = u.id'
          ' WHERE p.id = ?',
          (id,)
).fetchone()

      if post is None:
          abort(404, f"Post id {id} doesn't exist.")

      if check_author and post['author_id'] != g.user['id']:
          abort(403)

      return post

:func:`abort` will raise a special exception that returns an HTTP status code. It takes an optional message to show with the error, otherwise a default message is used. ``404`` means "Not Found", and ``403`` means "Forbidden". (``401`` means "Unauthorized", but you redirect to the login page instead of returning that status.)

The ``check_author`` argument is defined so that the function can be used to get a ``post`` without checking the author. This would be useful if you wrote a view to show an individual post on a page, where the user doesn't matter because they're not modifying the post.

.. code-block:: python
  :caption: ``flaskr/blog.py``

  @bp.route('/<int:id>/update', methods=('GET', 'POST'))
  @login_required
  def update(id):
      post = get_post(id)

      if request.method == 'POST':
          title = request.form['title']
          body = request.form['body']

```
        error = None

        if not title:
            error = 'Title is required.'

        if error is not None:
            flash(error)
        else:
            db = get_db()
            db.execute(
                'UPDATE post SET title = ?,
body = ?'
                ' WHERE id = ?',
                (title, body, id)
            )
            db.commit()
            return redirect(url_for('blog.index'))

    return render_template('blog/update.html', post=post)
```

Unlike the views you've written so far, the ``update`` function takes
an argument, ``id``. That corresponds to the ``<int:id>`` in the route.
A real URL will look like ``/1/update``. Flask will capture the ``1``,
ensure it's an :class:`int`, and pass it as the ``id`` argument. If you
don't specify ``int:`` and instead do ``<id>``, it will be a string.
To generate a URL to the update page, :func:`url_for` needs to be passed
the ``id`` so it knows what to fill in:
``url_for('blog.update', id=post['id'])``. This is also in the
``index.html`` file above.

The ``create`` and ``update`` views look very similar. The main
difference is that the ``update`` view uses a ``post`` object and an
``UPDATE`` query instead of an ``INSERT``. With some clever
 refactoring,
you could use one view and template for both actions, but for the
tutorial it's clearer to keep them separate.

.. code-block:: html+jinja
  :caption: ``flaskr/templates/blog/update.html``

```
  {% extends 'base.html' %}

  {% block header %}
    <h1>{% block title %}Edit "{{ post['title'] }}"{% endblock %}</h1>
  {% endblock %}

  {% block content %}
    <form method="post">
```

```
    <label for="title">Title</label>
    <input name="title" id="title"
      value="{{ request.form['title'] or post['title'] }}" required>
    <label for="body">Body</label>
    <textarea name="body" id="body">{{ request.form['body'] or post['body'] }}</textarea>
    <input type="submit" value="Save">
  </form>
  <hr>
  <form action="{{ url_for('blog.delete', id=post['id']) }}" method="post">
    <input class="danger" type="submit" value="Delete" onclick="return confirm('Are you sure?');">
  </form>
{% endblock %}
```

This template has two forms.
The first posts the edited data to the
current page (``/<id>/update``). The other form contains only a button
and specifies an ``action`` attribute that posts to the delete view
instead. The button uses some JavaScript to show a confirmation dialog
before submitting.

The pattern ``{{ request.form['title'] or post['title'] }}`` is used to
choose what data appears in the form. When the form hasn't been
submitted, the original ``post`` data appears, but if invalid form data
was posted you want to display that so the user can fix the error, so
``request.form`` is used instead. :data:`request` is another variable
that's automatically available in templates.

Delete

The delete view doesn't have its own template, the delete button is part
of ``update.html`` and posts to the ``/<id>/delete`` URL. Since there
is no template, it will only handle the ``POST`` method and then redirect
to the ``index`` view.

.. code-block:: python
  :caption: ``flaskr/blog.py``

```
  @bp.route('/<int:id>/delete',
methods=('POST',))
  @login_required
  def delete(id):
      get_post(id)
      db = get_db()
      db.execute('DELETE FROM post WHERE id = ?', (id,))
      db.commit()
      return redirect(url_for('blog.index'))
```

Congratulations, you've now finished writing your application! Take some
time to try out everything in the browser. However, there's still more
to do before the project is complete.

Continue to :doc:`install`.

Found in path(s):
* /opt/cola/permits/1387358149_1662778327.6442695/0/flask-2-2-2-tar-gz/Flask-2.2.2/docs/tutorial/blog.rst

1.150 pytz 2022.2.1

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1.151 python-setuptools 65.0.2

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1.153 inotify-tools 3.22.6.0

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immerrr again
Alexander Artemenko
Aymeric Augustin
Lee Ball
Ben Bariteau
Ned Batchelder
Wouter Bolsterlee
Brett Cannon
Jason R. Coombs
Julien Danjou
Ben Darnell
Ben Davis
Jon Dufresne
Tim Graham
Thomas Grainger
Max Grender-Jones
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1.162 importlib-metadata 4.12.0

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1.167 wcwidth 0.2.5

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* /opt/cola/permits/1409587106_1679473714.082842/0/libnl3-imports-r8-libnl3-3-7-0-1-el8-tar-gz/libnl3-imports-r8-libnl3-3.7.0-1.el8/SPECS/libnl3.spec

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(For example, a function in a library to compute square roots has a purpose that is entirely well-defined independent of the application. Therefore, Subsection 2d requires that any application-supplied function or table used by this function must be optional: if the application does not supply it, the square root function must still compute square roots.)

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Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Library.

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This option is useful when you wish to copy part of the code of the Library into a program that is not a library.

4. You may copy and distribute the Library (or a portion or derivative of it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange.

If distribution of object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place satisfies the requirement to distribute the source code, even though third parties are not compelled to copy the source along with the object code.

5. A program that contains no derivative of any portion of the Library, but is designed to work with the Library by being compiled or linked with it, is called a "work that uses the Library". Such a work, in isolation, is not a derivative work of the Library, and therefore falls outside the scope of this License.

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that is part of the Library, the object code for the work may be a derivative work of the Library even though the source code is not. Whether this is true is especially significant if the work can be linked without the Library, or if the work is itself a library. The threshold for this to be true is not precisely defined by law.

If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may distribute the object code for the work under the terms of Section 6. Any executables
containing that work also fall under Section 6,
whether or not they are linked directly with the Library itself.

6. As an exception to the Sections above, you may also combine or link a "work that uses the Library" with the Library to produce a work containing portions of the Library, and distribute that work under terms of your choice, provided that the terms permit modification of the work for the customer's own use and reverse engineering for debugging such modifications.

You must give prominent notice with each copy of the work that the Library is used in it and that the Library and its use are covered by this License. You must supply a copy of this License. If the work during execution displays copyright notices, you must include the copyright notice for the Library among them, as well as a reference directing the user to the copy of this License. Also, you must do one of these things:

a) Accompany the work with the complete corresponding machine-readable
source code for the Library including whatever changes were used in the work (which must be distributed under Sections 1 and 2 above); and, if the work is an executable linked with the Library, with the complete machine-readable "work that uses the Library", as object code and/or source code, so that the user can modify the Library and then relink to produce a modified executable containing the modified Library. (It is understood that the user who changes the contents of definitions files in the Library will not necessarily be able to recompile the application to use the modified definitions.)

b) Use a suitable shared library mechanism for linking with the

Library. A suitable mechanism is one that (1) uses at run time a copy of the library already present on the user's computer system, rather than copying library functions into the executable, and (2) will operate properly with a modified version of the library, if the user installs one, as long as the modified version is interface-compatible with the version that the work was made with.

c) Accompany the work with a written offer, valid for at least three years, to give the same user the materials specified in Subsection 6a, above, for a charge no more than the cost of performing this distribution.

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It may happen that this requirement contradicts the license restrictions of other proprietary libraries that do not normally accompany the operating system. Such a contradiction means you cannot use both them and the Library together in an executable that you distribute.

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1.174 gdbm 1.23

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Finally, every program is threatened constantly by software patents. States should not allow patents to restrict development and use of software on general-purpose computers, but in those that do, we wish to avoid the special danger that patents applied to a free program could make it effectively proprietary. To prevent this, the GPL assures that

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The precise terms and conditions for copying, distribution and modification follow.

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0. Definitions.

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The "source code" for a work means the preferred form of the work for making modifications to it. "Object code" means any non-source form of a work.

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than the work as a whole, that (a) is included in the normal form of packaging a Major Component, but which is not part of that Major Component, and (b) serves only to enable use of the work with that Major Component, or to implement a Standard Interface for which an implementation is available to the public in source code form. A "Major Component", in this context, means a major essential component (kernel, window system, and so on) of the specific operating system (if any) on which the executable work runs, or a compiler used to produce the work, or an object code interpreter used to run it.

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b) Convey the object code in, or embodied in, a physical product (including a physical distribution medium), accompanied by a written offer, valid for at least three years and valid for as long as you offer spare parts or
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```
# $FreeBSD: head/etc/pf.os 258865 2013-12-03 04:32:02Z eadler $
# $OpenBSD: pf.os,v 1.27 2016/09/03 17:08:57 sthen Exp $
# passive OS fingerprinting
# -------------------------
#
# SYN signatures. Those signatures work for SYN packets only (duh!).
#
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#
#
# This fingerprint database is adapted from Michal Zalewski's p0f passive
# operating system package.  The last database sync was from a Nov 3 2003
# p0f.fp.
#
#
# Each line in this file specifies a single fingerprint. Please read the
# information below carefully before attempting to append any signatures
# reported as UNKNOWN to this file to avoid mistakes.
#
# We use the following set metrics for fingerprinting:
#
# - Window size (WSS) - a highly OS dependent setting used for TCP/IP
#   performance control (max. amount of data to be sent without ACK).
#   Some systems use a fixed value for initial packets. On other
#   systems, it is a multiple of MSS or MTU (MSS+40). In some rare
#   cases, the value is just arbitrary.
#
#   NEW SIGNATURE: if p0f reported a special value of 'Snn', the number
#   appears to be
 a multiple of MSS (MSS*nn); a special value of 'Tnn'
#   means it is a multiple of MTU ((MSS+40)*nn). Unless you notice the
```

```
#   value of nn is not fixed (unlikely), just copy the Snn or Tnn token
#   literally. If you know this device has a simple stack and a fixed
#   MTU, you can however multiply S value by MSS, or T value by MSS+40,
#   and put it instead of Snn or Tnn.
#
#   If WSS otherwise looks like a fixed value (for example a multiple
#   of two), or if you can confirm the value is fixed, please quote
#   it literally. If there's no apparent pattern in WSS chosen, you
#   should consider wildcarding this value.
#
# - Overall packet size - a function of all IP and TCP options and bugs.
#
#   NEW SIGNATURE: Copy this value literally.
#
# - Initial TTL - We check the actual TTL of a received packet. It can't
#   be higher than the initial TTL, and also shouldn't be dramatically
#   lower (maximum distance is defined as 40 hops).
#
#   NEW SIGNATURE: *Never* copy TTL from a p0f-reported
 signature literally.
#   You need to determine the initial TTL. The best way to do it is to
#   check the documentation for a remote system, or check its settings.
#   A fairly good method is to simply round the observed TTL up to
#   32, 64, 128, or 255, but it should be noted that some obscure devices
#   might not use round TTLs (in particular, some shoddy appliances use
#   "original" initial TTL settings). If not sure, you can see how many
#   hops you're away from the remote party with traceroute or mtr.
#
# - Don't fragment flag (DF) - some modern OSes set this to implement PMTU
#   discovery. Others do not bother.
#
#   NEW SIGNATURE: Copy this value literally.
#
# - Maximum segment size (MSS) - this setting is usually link-dependent. P0f
#   uses it to determine link type of the remote host.
#
#   NEW SIGNATURE: Always wildcard this value, except for rare cases when
#   you have an appliance with a fixed value, know the system supports only
#   a very limited number of
 network interface types, or know the system
#   is using a value it pulled out of nowhere.  Specific unique MSS
#   can be used to tell Google crawlbots from the rest of the population.
#
# - Window scaling (WSCALE) - this feature is used to scale WSS.
#   It extends the size of a TCP/IP window to 32 bits. Some modern
#   systems implement this feature.
#
#   NEW SIGNATURE: Observe several signatures. Initial WSCALE is often set
```

```
#   to zero or other low value. There's usually no need to wildcard this
#   parameter.
#
# - Timestamp - some systems that implement timestamps set them to
#   zero in the initial SYN. This case is detected and handled appropriately.
#
# - Selective ACK permitted - a flag set by systems that implement
#   selective ACK functionality.
#
# - The sequence of TCP all options (MSS, window scaling, selective ACK
#   permitted, timestamp, NOP). Other than the options previously
#   discussed, p0f also checks for timestamp option (a silly
#   extension to broadcast your
 uptime ;-), NOP options (used for
#   header padding) and sackOK option (selective ACK feature).
#
#   NEW SIGNATURE: Copy the sequence literally.
#
# To wildcard any value (except for initial TTL or TCP options), replace
# it with '*'. You can also use a modulo operator to match any values
# that divide by nnn - '%nnn'.
#
# Fingerprint entry format:
#
# wwww:ttt:D:ss:OOO...:OS:Version:Subtype:Details
#
# wwww     - window size (can be *, %nnn, Snn or Tnn).  The special values
#            "S" and "T" which are a multiple of MSS or a multiple of MTU
#            respectively.
# ttt      - initial TTL
# D        - don't fragment bit (0 - not set, 1 - set)
# ss       - overall SYN packet size
# OOO      - option value and order specification (see below)
# OS       - OS genre (Linux, Solaris, Windows)
# Version  - OS Version (2.0.27 on x86, etc)
# Subtype  - OS subtype or patchlevel (SP3, lo0)
# details  - Generic OS details
#
# If OS genre starts with '*', p0f will not show distance,
 link type
# and timestamp data. It is useful for userland TCP/IP stacks of
# network scanners and so on, where many settings are randomized or
# bogus.
#
# If OS genre starts with @, it denotes an approximate hit for a group
# of operating systems (signature reporting still enabled in this case).
# Use this feature at the end of this file to catch cases for which
# you don't have a precise match, but can tell it's Windows or FreeBSD
```

```
# or whatnot by looking at, say, flag layout alone.
#
# Option block description is a list of comma or space separated
# options in the order they appear in the packet:
#
# N    - NOP option
# Wnnn    - window scaling option, value nnn (or * or %nnn)
# Mnnn    - maximum segment size option, value nnn (or * or %nnn)
# S    - selective ACK OK
# T    - timestamp
# T0    - timestamp with a zero value
#
# To denote no TCP options, use a single '.'.
#
# Please report any additions to this file, or any inaccuracies or
# problems spotted, to the maintainers: lcamtuf@coredump.cx,
#
 frantzen@openbsd.org and bugs@openbsd.org with a tcpdump packet
# capture of the relevant SYN packet(s)
#
# A test and submission page is available at
# http://lcamtuf.coredump.cx/p0f-help/
#
#
# WARNING WARNING WARNING
# -----------------------
#
# Do not add a system X as OS Y just because NMAP says so. It is often
# the case that X is a NAT firewall. While nmap is talking to the
# device itself, p0f is fingerprinting the guy behind the firewall
# instead.
#
# When in doubt, use common sense, don't add something that looks like
# a completely different system as Linux or FreeBSD or LinkSys router.
# Check DNS name, establish a connection to the remote host and look
# at SYN+ACK - does it look similar?
#
# Some users tweak their TCP/IP settings - enable or disable RFC1323
# functionality, enable or disable timestamps or selective ACK,
# disable PMTU discovery, change MTU and so on. Always compare a new rule
# to other fingerprints for this system, and verify the system
 isn't
# "customized" before adding it. It is OK to add signature variants
# caused by a commonly used software (personal firewalls, security
# packages, etc), but it makes no sense to try to add every single
# possible /proc/sys/net/ipv4 tweak on Linux or so.
#
# KEEP IN MIND: Some packet firewalls configured to normalize outgoing
```

```
# traffic (OpenBSD pf with "scrub" enabled, for example) will, well,
# normalize packets. Signatures will not correspond to the originating
# system (and probably not quite to the firewall either).
#
# NOTE: Try to keep this file in some reasonable order, from most to
# least likely systems. This will speed up operation. Also keep most
# generic and broad rules near the end.
#

############################
# Standard OS signatures #
############################

# ----------------- AIX ---------------------

# AIX is first because its signatures are close to NetBSD, MacOS X and
# Linux 2.0, but it uses a fairly rare MSSes, at least sometimes...
# This is a shoddy
 hack, though.

45046:64:0:44:M*:  AIX:4.3::AIX 4.3
16384:64:0:44:M512:  AIX:4.3:2-3:AIX 4.3.2 and earlier

16384:64:0:60:M512,N,W%2,N,N,T:  AIX:4.3:3:AIX 4.3.3-5.2
16384:64:0:60:M512,N,W%2,N,N,T:  AIX:5.1-5.2::AIX 4.3.3-5.2
32768:64:0:60:M512,N,W%2,N,N,T:  AIX:4.3:3:AIX 4.3.3-5.2
32768:64:0:60:M512,N,W%2,N,N,T:  AIX:5.1-5.2::AIX 4.3.3-5.2
65535:64:0:60:M512,N,W%2,N,N,T:  AIX:4.3:3:AIX 4.3.3-5.2
65535:64:0:60:M512,N,W%2,N,N,T:  AIX:5.1-5.2::AIX 4.3.3-5.2
65535:64:0:64:M*,N,W1,N,N,T,N,N,S: AIX:5.3:ML1:AIX 5.3 ML1

# ----------------- Linux -------------------

# S1:64:0:44:M*:A:  Linux:1.2::Linux 1.2.x (XXX quirks support)
512:64:0:44:M*:   Linux:2.0:3x:Linux 2.0.3x
16384:64:0:44:M*:  Linux:2.0:3x:Linux 2.0.3x

# Endian snafu! Nelson says "ha-ha":
2:64:0:44:M*:   Linux:2.0:3x:Linux 2.0.3x (MkLinux) on Mac
64:64:0:44:M*:   Linux:2.0:3x:Linux 2.0.3x (MkLinux) on Mac


S4:64:1:60:M1360,S,T,N,W0: Linux:google::Linux (Google crawlbot)

S2:64:1:60:M*,S,T,N,W0:  Linux:2.4::Linux 2.4 (big boy)
S3:64:1:60:M*,S,T,N,W0:  Linux:2.4:.18-21:Linux
 2.4.18 and newer
S4:64:1:60:M*,S,T,N,W0:  Linux:2.4::Linux 2.4/2.6 <= 2.6.7
```

S4:64:1:60:M*,S,T,N,W0: Linux:2.6:.1-7:Linux 2.4/2.6 <= 2.6.7

S4:64:1:60:M*,S,T,N,W5: Linux:2.6::Linux 2.6 (newer, 1)
S4:64:1:60:M*,S,T,N,W6: Linux:2.6::Linux 2.6 (newer, 2)
S4:64:1:60:M*,S,T,N,W7: Linux:2.6::Linux 2.6 (newer, 3)
T4:64:1:60:M*,S,T,N,W7: Linux:2.6::Linux 2.6 (newer, 4)

S10:64:1:60:M*,S,T,N,W4: Linux:3.0::Linux 3.0

S3:64:1:60:M*,S,T,N,W1: Linux:2.5::Linux 2.5 (sometimes 2.4)
S4:64:1:60:M*,S,T,N,W1: Linux:2.5-2.6::Linux 2.5/2.6
S3:64:1:60:M*,S,T,N,W2: Linux:2.5::Linux 2.5 (sometimes 2.4)
S4:64:1:60:M*,S,T,N,W2: Linux:2.5::Linux 2.5 (sometimes 2.4)

S20:64:1:60:M*,S,T,N,W0: Linux:2.2:20-25:Linux 2.2.20 and newer
S22:64:1:60:M*,S,T,N,W0: Linux:2.2::Linux 2.2
S11:64:1:60:M*,S,T,N,W0: Linux:2.2::Linux 2.2

Popular cluster config scripts disable timestamps and
selective ACK:
S4:64:1:48:M1460,N,W0: Linux:2.4:cluster:Linux 2.4 in cluster

#
 This needs to be investigated. On some systems, WSS
is selected as a multiple of MTU instead of MSS. I got
many submissions for this for many late versions of 2.4:
T4:64:1:60:M1412,S,T,N,W0: Linux:2.4::Linux 2.4 (late, uncommon)

This happens only over loopback, but let's make folks happy:
32767:64:1:60:M16396,S,T,N,W0: Linux:2.4:lo0:Linux 2.4 (local)
S8:64:1:60:M3884,S,T,N,W0: Linux:2.2:lo0:Linux 2.2 (local)

Opera visitors:
16384:64:1:60:M*,S,T,N,W0: Linux:2.2:Opera:Linux 2.2 (Opera?)
32767:64:1:60:M*,S,T,N,W0: Linux:2.4:Opera:Linux 2.4 (Opera?)

Some fairly common mods:
S4:64:1:52:M*,N,N,S,N,W0: Linux:2.4:ts:Linux 2.4 w/o timestamps
S22:64:1:52:M*,N,N,S,N,W0: Linux:2.2:ts:Linux 2.2 w/o timestamps

----------------- FreeBSD -----------------

16384:64:1:44:M*: FreeBSD:2.0-2.2::FreeBSD 2.0-4.2
16384:64:1:44:M*: FreeBSD:3.0-3.5::FreeBSD 2.0-4.2
16384:64:1:44:M*: FreeBSD:4.0-4.2::FreeBSD 2.0-4.2
16384:64:1:60:M*,N,W0,N,N,T: FreeBSD:4.4::FreeBSD 4.4

```
1024:64:1:60:M*,N,W0,N,N,T: FreeBSD:4.4::FreeBSD
 4.4

57344:64:1:44:M*:  FreeBSD:4.6-4.8:noRFC1323:FreeBSD 4.6-4.8 (no RFC1323)
57344:64:1:60:M*,N,W0,N,N,T: FreeBSD:4.6-4.9::FreeBSD 4.6-4.9

32768:64:1:60:M*,N,W0,N,N,T: FreeBSD:4.8-4.11::FreeBSD 4.8-5.1 (or MacOS X)
32768:64:1:60:M*,N,W0,N,N,T: FreeBSD:5.0-5.1::FreeBSD 4.8-5.1 (or MacOS X)
65535:64:1:60:M*,N,W0,N,N,T: FreeBSD:4.8-4.11::FreeBSD 4.8-5.2 (or MacOS X)
65535:64:1:60:M*,N,W0,N,N,T: FreeBSD:5.0-5.2::FreeBSD 4.8-5.2 (or MacOS X)
65535:64:1:60:M*,N,W1,N,N,T: FreeBSD:4.7-4.11::FreeBSD 4.7-5.2
65535:64:1:60:M*,N,W1,N,N,T: FreeBSD:5.0-5.2::FreeBSD 4.7-5.2

# XXX need quirks support
# 65535:64:1:60:M*,N,W0,N,N,T:Z:FreeBSD:5.1-5.4::5.1-current (1)
# 65535:64:1:60:M*,N,W1,N,N,T:Z:FreeBSD:5.1-5.4::5.1-current (2)
# 65535:64:1:60:M*,N,W2,N,N,T:Z:FreeBSD:5.1-5.4::5.1-current (3)
# 65535:64:1:44:M*:Z:FreeBSD:5.2::FreeBSD 5.2 (no RFC1323)

# 16384:64:1:60:M*,N,N,N,N,N,N,T:FreeBSD:4.4:noTS:FreeBSD 4.4 (w/o timestamps)

# ----------------- NetBSD ------------------

16384:64:0:60:M*,N,W0,N,N,T: NetBSD:1.3::NetBSD
 1.3
65535:64:0:60:M*,N,W0,N,N,T0: NetBSD:1.6:opera:NetBSD 1.6 (Opera)
16384:64:0:60:M*,N,W0,N,N,T0: NetBSD:1.6::NetBSD 1.6
16384:64:1:60:M*,N,W0,N,N,T0: NetBSD:1.6:df:NetBSD 1.6 (DF)
65535:64:1:60:M*,N,W1,N,N,T0: NetBSD:1.6::NetBSD 1.6W-current (DF)
65535:64:1:60:M*,N,W0,N,N,T0: NetBSD:1.6::NetBSD 1.6X (DF)
32768:64:1:60:M*,N,W0,N,N,T0: NetBSD:1.6:randomization:NetBSD 1.6ZH-current (w/ ip_id randomization)

# ----------------- OpenBSD ------------------

16384:64:0:60:M*,N,W0,N,N,T:  OpenBSD:2.6::NetBSD 1.3 (or OpenBSD 2.6)
16384:64:1:64:M*,N,N,S,N,W0,N,N,T: OpenBSD:3.0-4.8::OpenBSD 3.0-4.8
16384:64:0:64:M*,N,N,S,N,W0,N,N,T: OpenBSD:3.0-4.8:no-df:OpenBSD 3.0-4.8 (scrub no-df)
57344:64:1:64:M*,N,N,S,N,W0,N,N,T: OpenBSD:3.3-4.0::OpenBSD 3.3-4.0
57344:64:0:64:M*,N,N,S,N,W0,N,N,T: OpenBSD:3.3-4.0:no-df:OpenBSD 3.3-4.0 (scrub no-df)

65535:64:1:64:M*,N,N,S,N,W0,N,N,T: OpenBSD:3.0-4.0:opera:OpenBSD 3.0-4.0 (Opera)

16384:64:1:64:M*,N,N,S,N,W3,N,N,T: OpenBSD:4.9::OpenBSD
 4.9
16384:64:0:64:M*,N,N,S,N,W3,N,N,T: OpenBSD:4.9:no-df:OpenBSD 4.9 (scrub no-df)

16384:64:1:64:M*,N,N,S,N,W6,N,N,T:      OpenBSD:6.1::OpenBSD 6.1
16384:64:0:64:M*,N,N,S,N,W6,N,N,T:      OpenBSD:6.1:no-df:OpenBSD 6.1 (scrub no-df)
```

```
# ----------------- DragonFly BSD -----------------

57344:64:1:60:M*,N,W0,N,N,T:  DragonFly:1.0:A:DragonFly 1.0A
57344:64:0:64:M*,N,W0,N,N,S,N,N,T: DragonFly:1.2-1.12::DragonFly 1.2-1.12
5840:64:1:60:M*,S,T,N,W4:   DragonFly:2.0-2.1::DragonFly 2.0-2.1
57344:64:0:64:M*,N,W0,N,N,S,N,N,T: DragonFly:2.2-2.3::DragonFly 2.2-2.3
57344:64:0:64:M*,N,W5,N,N,S,N,N,T: DragonFly:2.4-2.7::DragonFly 2.4-2.7

# ----------------- Solaris -----------------

S17:64:1:64:N,W3,N,N,T0,N,N,S,M*: Solaris:8:RFC1323:Solaris 8 RFC1323
S17:64:1:48:N,N,S,M*:   Solaris:8::Solaris 8
S17:255:1:44:M*:   Solaris:2.5-2.7::Solaris 2.5 to 7

S6:255:1:44:M*:    Solaris:2.6-2.7::Solaris 2.6 to 7
S23:255:1:44:M*:   Solaris:2.5:1:Solaris 2.5.1
S34:64:1:48:M*,N,N,S:   Solaris:2.9::Solaris
 9
S44:255:1:44:M*:   Solaris:2.7::Solaris 7

4096:64:0:44:M1460:   SunOS:4.1::SunOS 4.1.x

S34:64:1:52:M*,N,W0,N,N,S:  Solaris:10:beta:Solaris 10 (beta)
32850:64:1:64:M*,N,N,T,N,W1,N,N,S: Solaris:10::Solaris 10 1203

# ----------------- IRIX --------------------

49152:64:0:44:M*:   IRIX:6.4::IRIX 6.4
61440:64:0:44:M*:   IRIX:6.2-6.5::IRIX 6.2-6.5
49152:64:0:52:M*,N,W2,N,N,S:  IRIX:6.5:RFC1323:IRIX 6.5 (RFC1323)
49152:64:0:52:M*,N,W3,N,N,S:  IRIX:6.5:RFC1323:IRIX 6.5 (RFC1323)

61440:64:0:48:M*,N,N,S:   IRIX:6.5:12-21:IRIX 6.5.12 - 6.5.21
49152:64:0:48:M*,N,N,S:   IRIX:6.5:15-21:IRIX 6.5.15 - 6.5.21

49152:60:0:64:M*,N,W2,N,N,T,N,N,S: IRIX:6.5:IP27:IRIX 6.5 IP27


# ----------------- Tru64 -------------------

32768:64:1:48:M*,N,W0:   Tru64:4.0::Tru64 4.0 (or OS/2 Warp 4)
32768:64:0:48:M*,N,W0:   Tru64:5.0::Tru64 5.0
8192:64:0:44:M1460:   Tru64:5.1:noRFC1323:Tru64 6.1 (no RFC1323) (or QNX 6)
61440:64:0:48:M*,N,W0:   Tru64:5.1a:JP4:Tru64 v5.1a JP4 (or OpenVMS
 7.x on Compaq 5.x stack)

# ----------------- OpenVMS -----------------
```

6144:64:1:60:M*,N,W0,N,N,T: OpenVMS:7.2::OpenVMS 7.2 (Multinet 4.4 stack)

---------- MacOS ----------

XXX Need EOL tcp opt support
S2:255:1:48:M*,W0,E:.:MacOS:8.6 classic

XXX some of these use EOL too
16616:255:1:48:M*,W0:   MacOS:7.3-7.6:OTTCP:MacOS 7.3-8.6 (OTTCP)
16616:255:1:48:M*,W0:   MacOS:8.0-8.6:OTTCP:MacOS 7.3-8.6 (OTTCP)
16616:255:1:48:M*,N,N,N: MacOS:8.1-8.6:OTTCP:MacOS 8.1-8.6 (OTTCP)
32768:255:1:48:M*,W0,N: MacOS:9.0-9.2::MacOS 9.0-9.2
65535:255:1:48:M*,N,N,N,N: MacOS:9.1::MacOS 9.1 (OT 2.7.4)

---------- Windows ----------

Windows TCP/IP stack is a mess. For most recent XP, 2000 and
even 98, the patchlevel, not the actual OS version, is more
relevant to the signature. They share the same code, so it would
seem. Luckily for us, almost all Windows 9x boxes have an
awkward MSS of 536, which I use to tell one from another
in most difficult cases.

8192:32:1:44:M*:   Windows:3.11::Windows
 3.11 (Tucows)
S44:64:1:64:M*,N,W0,N,N,T0,N,N,S: Windows:95::Windows 95
8192:128:1:64:M*,N,W0,N,N,T0,N,N,S: Windows:95:b:Windows 95b

There were so many tweaking tools and so many stack versions for
Windows 98 it is no longer possible to tell them from each other
without some very serious research. Until then, there's an insane
number of signatures, for your amusement:

S44:32:1:48:M*,N,N,S: Windows:98:lowTTL:Windows 98 (low TTL)
8192:32:1:48:M*,N,N,S: Windows:98:lowTTL:Windows 98 (low TTL)
%8192:64:1:48:M536,N,N,S: Windows:98::Windows 98
%8192:128:1:48:M536,N,N,S: Windows:98::Windows 98
S4:64:1:48:M*,N,N,S: Windows:98::Windows 98
S6:64:1:48:M*,N,N,S: Windows:98::Windows 98
S12:64:1:48:M*,N,N,S: Windows:98::Windows 98
T30:64:1:64:M1460,N,W0,N,N,T0,N,N,S: Windows:98::Windows 98
32767:64:1:48:M*,N,N,S: Windows:98::Windows 98
37300:64:1:48:M*,N,N,S: Windows:98::Windows 98
46080:64:1:52:M*,N,W3,N,N,S: Windows:98:RFC1323:Windows
 98 (RFC1323)
65535:64:1:44:M*:   Windows:98:noSack:Windows 98 (no sack)

```
S16:128:1:48:M*,N,N,S:   Windows:98::Windows 98
S16:128:1:64:M*,N,W0,N,N,T0,N,N,S: Windows:98::Windows 98
S26:128:1:48:M*,N,N,S:   Windows:98::Windows 98
T30:128:1:48:M*,N,N,S:   Windows:98::Windows 98
32767:128:1:52:M*,N,W0,N,N,S:  Windows:98::Windows 98
60352:128:1:48:M*,N,N,S:  Windows:98::Windows 98
60352:128:1:64:M*,N,W2,N,N,T0,N,N,S: Windows:98::Windows 98

# What's with 1414 on NT?
T31:128:1:44:M1414:   Windows:NT:4.0:Windows NT 4.0 SP6a
64512:128:1:44:M1414:   Windows:NT:4.0:Windows NT 4.0 SP6a
8192:128:1:44:M*:   Windows:NT:4.0:Windows NT 4.0 (older)

# Windows XP and 2000. Most of the signatures that were
# either dubious or non-specific (no service pack data)
# were deleted and replaced with generics at the end.

65535:128:1:48:M*,N,N,S:  Windows:2000:SP4:Windows 2000 SP4, XP SP1
65535:128:1:48:M*,N,N,S:  Windows:XP:SP1:Windows 2000 SP4, XP SP1
%8192:128:1:48:M*,N,N,S:  Windows:2000:SP2+:Windows
 2000 SP2, XP SP1 (seldom 98 4.10.2222)
%8192:128:1:48:M*,N,N,S:  Windows:XP:SP1:Windows 2000 SP2, XP SP1 (seldom 98 4.10.2222)
S20:128:1:48:M*,N,N,S:   Windows:2000::Windows 2000/XP SP3
S20:128:1:48:M*,N,N,S:   Windows:XP:SP3:Windows 2000/XP SP3
S45:128:1:48:M*,N,N,S:   Windows:2000:SP4:Windows 2000 SP4, XP SP 1
S45:128:1:48:M*,N,N,S:   Windows:XP:SP1:Windows 2000 SP4, XP SP 1
40320:128:1:48:M*,N,N,S:  Windows:2000:SP4:Windows 2000 SP4

S6:128:1:48:M*,N,N,S:   Windows:2000:SP2:Windows XP, 2000 SP2+
S6:128:1:48:M*,N,N,S:   Windows:XP::Windows XP, 2000 SP2+
S12:128:1:48:M*,N,N,S:   Windows:XP:SP1:Windows XP SP1
S44:128:1:48:M*,N,N,S:   Windows:2000:SP3:Windows Pro SP1, 2000 SP3
S44:128:1:48:M*,N,N,S:   Windows:XP:SP1:Windows Pro SP1, 2000 SP3
64512:128:1:48:M*,N,N,S:  Windows:2000:SP3:Windows SP1, 2000 SP3
64512:128:1:48:M*,N,N,S:  Windows:XP:SP1:Windows SP1, 2000 SP3
32767:128:1:48:M*,N,N,S:  Windows:2000:SP4:Windows SP1, 2000 SP4
32767:128:1:48:M*,N,N,S:  Windows:XP:SP1:Windows SP1, 2000
 SP4

8192:128:1:52:M*,N,W2,N,N,S:  Windows:Vista::Windows Vista/7

# Odds, ends, mods:

S52:128:1:48:M1260,N,N,S:  Windows:2000:cisco:Windows XP/2000 via Cisco
S52:128:1:48:M1260,N,N,S:  Windows:XP:cisco:Windows XP/2000 via Cisco
65520:128:1:48:M*,N,N,S:  Windows:XP::Windows XP bare-bone
16384:128:1:52:M536,N,W0,N,N,S:  Windows:2000:ZoneAlarm:Windows 2000 w/ZoneAlarm?
2048:255:0:40:.:   Windows:.NET::Windows .NET Enterprise Server
```

```
44620:64:0:48:M*,N,N,S:   Windows:ME::Windows ME no SP (?)
S6:255:1:48:M536,N,N,S:   Windows:95:winsock2:Windows 95 winsock 2
32768:32:1:52:M1460,N,W0,N,N,S:  Windows:2003:AS:Windows 2003 AS


# No need to be more specific, it passes:
# *:128:1:48:M*,N,N,S:U:-Windows:XP/2000 while downloading (leak!) XXX quirk
# there is an equiv similar generic sig w/o the quirk

# ----------------- HP/UX -------------------

32768:64:1:44:M*:   HP-UX:B.10.20::HP-UX B.10.20
32768:64:0:48:M*,W0,N:   HP-UX:11.0::HP-UX 11.0
32768:64:1:48:M*,W0,N:   HP-UX:11.10::HP-UX 11.0
 or 11.11
32768:64:1:48:M*,W0,N:   HP-UX:11.11::HP-UX 11.0 or 11.11

# Whoa. Hardcore WSS.
0:64:0:48:M*,W0,N:   HP-UX:B.11.00:A:HP-UX B.11.00 A (RFC1323)

# ----------------- RiscOS -------------------

# We don't yet support the ?12 TCP option
#16384:64:1:68:M1460,N,W0,N,N,T,N,N,?12: RISCOS:3.70-4.36::RISC OS 3.70-4.36
12288:32:0:44:M536:    RISC OS:3.70:4.10:RISC OS 3.70 inet 4.10

# XXX quirk
# 4096:64:1:56:M1460,N,N,T:T:   RISC OS:3.70:freenet:RISC OS 3.70 freenet 2.00



# ----------------- BSD/OS -------------------

# Once again, power of two WSS is also shared by MacOS X with DF set
8192:64:1:60:M1460,N,W0,N,N,T:  BSD/OS:3.1::BSD/OS 3.1-4.3 (or MacOS X 10.2 w/DF)
8192:64:1:60:M1460,N,W0,N,N,T:  BSD/OS:4.0-4.3::BSD/OS 3.1-4.3 (or MacOS X 10.2)


# ---------------- NewtonOS ------------------

4096:64:0:44:M1420:  NewtonOS:2.1::NewtonOS 2.1

# ---------------- NeXTSTEP ------------------

S4:64:0:44:M1024:  NeXTSTEP:3.3::NeXTSTEP 3.3
S8:64:0:44:M512:  NeXTSTEP:3.3::NeXTSTEP 3.3
```

```
# ------------------
 BeOS --------------------

1024:255:0:48:M*,N,W0:  BeOS:5.0-5.1::BeOS 5.0-5.1
12288:255:0:44:M1402:  BeOS:5.0::BeOS 5.0.x

# ------------------ OS/400 ------------------

8192:64:1:60:M1440,N,W0,N,N,T: OS/400:VR4::OS/400 VR4/R5
8192:64:1:60:M1440,N,W0,N,N,T: OS/400:VR5::OS/400 VR4/R5
4096:64:1:60:M1440,N,W0,N,N,T: OS/400:V4R5:CF67032:OS/400 V4R5 + CF67032

# XXX quirk
# 28672:64:0:44:M1460:A:OS/390:?

# ------------------ ULTRIX ------------------

16384:64:0:40:.:  ULTRIX:4.5::ULTRIX 4.5

# -------------------- QNX --------------------

S16:64:0:44:M512:  QNX:::QNX demodisk

# ------------------ Novell ------------------

16384:128:1:44:M1460:  Novell:NetWare:5.0:Novel Netware 5.0
6144:128:1:44:M1460:  Novell:IntranetWare:4.11:Novell IntranetWare 4.11
6144:128:1:44:M1368:  Novell:BorderManager::Novell BorderManager ?

6144:128:1:52:M*,W0,N,S,N,N: Novell:Netware:6:Novell Netware 6 SP3


# ------------------ SCO ------------------
S3:64:1:60:M1460,N,W0,N,N,T: SCO:UnixWare:7.1:SCO
 UnixWare 7.1
S17:64:1:60:M1380,N,W0,N,N,T: SCO:UnixWare:7.1:SCO UnixWare 7.1.3 MP3
S23:64:1:44:M1380:  SCO:OpenServer:5.0:SCO OpenServer 5.0

# -------------------- DOS --------------------

2048:255:0:44:M536:  DOS:WATTCP:1.05:DOS Arachne via WATTCP/1.05
T2:255:0:44:M984:  DOS:WATTCP:1.05Arachne:Arachne via WATTCP/1.05 (eepro)

# ------------------ OS/2 --------------------

S56:64:0:44:M512:  OS/2:4::OS/2 4
28672:64:0:44:M1460:  OS/2:4::OS/2 Warp 4.0
```

```
# ----------------- TOPS-20 -----------------

# Another hardcore MSS, one of the ACK leakers hunted down.
# XXX QUIRK 0:64:0:44:M1460:A:TOPS-20:version 7
0:64:0:44:M1460:  TOPS-20:7::TOPS-20 version 7

# ----------------- FreeMiNT ----------------

S44:255:0:44:M536:  FreeMiNT:1:16A:FreeMiNT 1 patch 16A (Atari)

# ------------------ AMIGA ------------------

# XXX TCP option 12
# S32:64:1:56:M*,N,N,S,N,N,?12:.:AMIGA:3.9 BB2 with Miami stack

# ------------------ Plan9 ------------------

65535:255:0:48:M1460,W0,N: Plan9:4::Plan9 edition
 4

# ----------------- AMIGAOS -----------------

16384:64:1:48:M1560,N,N,S: AMIGAOS:3.9::AMIGAOS 3.9 BB2 MiamiDX

##############################################
# Appliance / embedded / other signatures #
##############################################

# ---------- Firewalls / routers ------------

S12:64:1:44:M1460:   @Checkpoint:::Checkpoint (unknown 1)
S12:64:1:48:N,N,S,M1460:  @Checkpoint:::Checkpoint (unknown 2)
4096:32:0:44:M1460:   ExtremeWare:4.x::ExtremeWare 4.x

# XXX TCP option 12
# S32:64:0:68:M512,N,W0,N,N,T,N,N,?12:.:Nokia:IPSO w/Checkpoint NG FP3
# S16:64:0:68:M1024,N,W0,N,N,T,N,N,?12:.:Nokia:IPSO 3.7 build 026

S4:64:1:60:W0,N,S,T,M1460:  FortiNet:FortiGate:50:FortiNet FortiGate 50

8192:64:1:44:M1460:   Eagle:::Eagle Secure Gateway

S52:128:1:48:M1260,N,N,N,N:  LinkSys:WRV54G::LinkSys WRV54G VPN router



# ------- Switches and other stuff ----------
```

4128:255:0:44:M*: Cisco:::Cisco Catalyst 3500, 7500 etc
S8:255:0:44:M*: Cisco:12008::Cisco 12008
60352:128:1:64:M1460,N,W2,N,N,T,N,N,S: Alteon:ACEswitch::Alteon
ACEswitch
64512:128:1:44:M1370: Nortel:Contivity Client::Nortel Conectivity Client

---------- Caches and whatnots ----------

S4:64:1:52:M1460,N,N,S,N,W0: AOL:web cache::AOL web cache

32850:64:1:64:N,W1,N,N,T,N,N,S,M*: NetApp:5.x::NetApp Data OnTap 5.x
16384:64:1:64:M1460,N,N,S,N,W0,N: NetApp:5.3:1:NetApp 5.3.1
65535:64:0:64:M1460,N,N,S,N,W*,N,N,T: NetApp:5.3-5.5::NetApp 5.3-5.5
65535:64:0:60:M1460,N,W0,N,N,T: NetApp:CacheFlow::NetApp CacheFlow
8192:64:1:64:M1460,N,N,S,N,W0,N,N,T: NetApp:5.2:1:NetApp NetCache 5.2.1
20480:64:1:64:M1460,N,N,S,N,W0,N,N,T: NetApp:4.1::NetApp NetCache4.1

65535:64:0:60:M1460,N,W0,N,N,T: CacheFlow:4.1::CacheFlow CacheOS 4.1
8192:64:0:60:M1380,N,N,N,N,N,N,T: CacheFlow:1.1::CacheFlow CacheOS 1.1

S4:64:0:48:M1460,N,N,S: Cisco:Content Engine::Cisco Content Engine

27085:128:0:40:.: Dell:PowerApp cache::Dell PowerApp (Linux-based)

65535:255:1:48:N,W1,M1460: Inktomi:crawler::Inktomi crawler
S1:255:1:60:M1460,S,T,N,W0: LookSmart:ZyBorg::LookSmart
ZyBorg

16384:255:0:40:.: Proxyblocker:::Proxyblocker (what's this?)

65535:255:0:48:M*,N,N,S: Redline:::Redline T|X 2200

32696:128:0:40:M1460: Spirent:Avalanche::Spirent Web Avalanche HTTP benchmarking engine

---------- Embedded systems ----------

S9:255:0:44:M536: PalmOS:Tungsten:C:PalmOS Tungsten C
S5:255:0:44:M536: PalmOS:3::PalmOS 3/4
S5:255:0:44:M536: PalmOS:4::PalmOS 3/4
S4:255:0:44:M536: PalmOS:3:5:PalmOS 3.5
2948:255:0:44:M536: PalmOS:3:5:PalmOS 3.5.3 (Handera)
S29:255:0:44:M536: PalmOS:5::PalmOS 5.0
16384:255:0:44:M1398: PalmOS:5.2:Clie:PalmOS 5.2 (Clie)
S14:255:0:44:M1350: PalmOS:5.2:Treo:PalmOS 5.2.1 (Treo)

S23:64:1:64:N,W1,N,N,T,N,N,S,M1460: SymbianOS:7::SymbianOS 7

8192:255:0:44:M1460: SymbianOS:6048::Symbian OS 6048 (Nokia 7650?)
8192:255:0:44:M536: SymbianOS:9210::Symbian OS (Nokia 9210?)
S22:64:1:56:M1460,T,S: SymbianOS:P800::Symbian OS ? (SE P800?)
S36:64:1:56:M1360,T,S: SymbianOS:6600::Symbian
 OS 60xx (Nokia 6600?)

Perhaps S4?
5840:64:1:60:M1452,S,T,N,W1: Zaurus:3.10::Zaurus 3.10

32768:128:1:64:M1460,N,W0,N,N,T0,N,N,S: PocketPC:2002::PocketPC 2002

S1:255:0:44:M346: Contiki:1.1:rc0:Contiki 1.1-rc0

4096:128:0:44:M1460: Sega:Dreamcast:3.0:Sega Dreamcast Dreamkey 3.0
T5:64:0:44:M536: Sega:Dreamcast:HKT-3020:Sega Dreamcast HKT-3020 (browser disc 51027)
S22:64:1:44:M1460: Sony:PS2::Sony Playstation 2 (SOCOM?)

S12:64:0:44:M1452: AXIS:5600:v5.64:AXIS Printer Server 5600 v5.64

3100:32:1:44:M1460: Windows:CE:2.0:Windows CE 2.0

####################
Fancy signatures
####################

1024:64:0:40:.: *NMAP:syn scan:1:NMAP syn scan (1)
2048:64:0:40:.: *NMAP:syn scan:2:NMAP syn scan (2)
3072:64:0:40:.: *NMAP:syn scan:3:NMAP syn scan (3)
4096:64:0:40:.: *NMAP:syn scan:4:NMAP syn scan (4)

Requires quirks support
1024:64:0:40:.:A:*NMAP:TCP sweep probe (1)
2048:64:0:40:.:A:*NMAP:TCP sweep probe (2)
3072:64:0:40:.:A:*NMAP:TCP sweep
 probe (3)
4096:64:0:40:.:A:*NMAP:TCP sweep probe (4)

1024:64:0:60:W10,N,M265,T: *NMAP:OS:1:NMAP OS detection probe (1)
2048:64:0:60:W10,N,M265,T: *NMAP:OS:2:NMAP OS detection probe (2)
3072:64:0:60:W10,N,M265,T: *NMAP:OS:3:NMAP OS detection probe (3)
4096:64:0:60:W10,N,M265,T: *NMAP:OS:4:NMAP OS detection probe (4)

32767:64:0:40:.: *NAST:::NASTsyn scan

Requires quirks support
12345:255:0:40:.:A:-p0f:sendsyn utility

```
#####################################
# Generic signatures - just in case #
#####################################

#*:64:1:60:M*,N,W*,N,N,T:  @FreeBSD:4.0-4.9::FreeBSD 4.x/5.x
#*:64:1:60:M*,N,W*,N,N,T:  @FreeBSD:5.0-5.1::FreeBSD 4.x/5.x

*:128:1:52:M*,N,W0,N,N,S:  @Windows:XP:RFC1323:Windows XP/2000 (RFC1323 no tstamp)
*:128:1:52:M*,N,W0,N,N,S:  @Windows:2000:RFC1323:Windows XP/2000 (RFC1323 no tstamp)
*:128:1:52:M*,N,W*,N,N,S:  @Windows:XP:RFC1323:Windows XP/2000 (RFC1323 no tstamp)
*:128:1:52:M*,N,W*,N,N,S:  @Windows:2000:RFC1323:Windows XP/2000 (RFC1323
 no tstamp)
*:128:1:64:M*,N,W0,N,N,T0,N,N,S: @Windows:XP:RFC1323:Windows XP/2000 (RFC1323)
*:128:1:64:M*,N,W0,N,N,T0,N,N,S: @Windows:2000:RFC1323:Windows XP/2000 (RFC1323)
*:128:1:64:M*,N,W*,N,N,T0,N,N,S: @Windows:XP:RFC1323:Windows XP (RFC1323, w+)
*:128:1:48:M536,N,N,S:   @Windows:98::Windows 98
*:128:1:48:M*,N,N,S:   @Windows:XP::Windows XP/2000
*:128:1:48:M*,N,N,S:   @Windows:2000::Windows XP/2000

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* /opt/cola/permits/1409587079_1683835556.5462122/0/iptables-1-1-8-3-1-x86-64-pkg-tar-
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* /opt/cola/permits/1409587079_1683835556.5462122/0/iptables-1-1-8-3-1-x86-64-pkg-tar-xz/usr/share/man/man3/ipq-read-3-gz/ipq_read.3
* /opt/cola/permits/1409587079_1683835556.5462122/0/iptables-1-1-8-3-1-x86-64-pkg-tar-xz/usr/share/man/man3/ipq-create-handle-3-gz/ipq_create_handle.3

1.177 prettytable 3.4.1

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1.182 greenlet 1.1.3.post0

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1.183 oauthlib 3.2.2

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1.184 libtirpc 1.3.3

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```
/* nicstar.c  v0.22  Jawaid Bazyar (bazyar@hypermall.com)
* nicstar.c, M. Welsh (matt.welsh@cl.cam.ac.uk)
*
* Hacked October, 1997 by Jawaid Bazyar, Interlink Advertising Services Inc.
*  http://www.hypermall.com/
* 10/1/97 - commented out CFG_PHYIE bit - we don't care when the PHY
* interrupts us (except possibly for removal/insertion of the cable?)
* 10/4/97 - began heavy inline documentation of the code. Corrected typos
* and spelling mistakes.
* 10/5/97 - added code to handle PHY interrupts, disable PHY on
* loss of link, and correctly re-enable PHY when link is
* re-established. (put back CFG_PHYIE)
*
*   Modified to work with the IDT7721 nicstar -- AAL5 (tested) only.
*
* R. D. Rechenmacher <ron@fnal.gov>, Aug. 6, 1997
*
* Linux driver for the IDT77201 NICStAR PCI ATM controller.
* PHY component is expected to be 155 Mbps S/UNI-Lite or IDT 77155;
* see init_nicstar() for PHY initialization to change this. This driver
* expects the Linux ATM stack to support scatter-gather
 lists
* (skb->atm.iovcnt != 0) for Rx skb's passed to vcc->push.
*
* Implementing minimal-copy of received data:
*   IDT always receives data into a small buffer, then large buffers
*     as needed. This means that data must always be copied to create
*     the linear buffer needed by most non-ATM protocol stacks (e.g. IP)
*     Fix is simple: make large buffers large enough to hold entire
*     SDU, and leave <small_buffer_data> bytes empty at the start. Then
*     copy small buffer contents to head of large buffer.
*   Trick is to avoid fragmenting Linux, due to need for a lot of large
*     buffers. This is done by 2 things:
*       1) skb->destructor / skb->atm.recycle_buffer
*           combined, allow nicstar_free_rx_skb to be called to
*           recycle large data buffers
*       2) skb_clone of received buffers
*   See nicstar_free_rx_skb and linearize_buffer for implementation
*     details.
*
*
*
```

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* M. Welsh, 6 July 1996
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*
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1.191 expat 2.5.0

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1.192 charset-normalizer 3.0.0

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1.193 fdisk 2.38.1

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NR START END SECTORS SIZE NAME UUID
1 32 7679 7648 3.7M 8f8378c0-01
2 7680 16383 8704 4.3M 8f8378c0-02
5 7936 12799 4864 2.4M
6 12544 16127 3584 1.8M

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*
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1.201 iproute 5.19.0

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1.203 openssh 9.1p1

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 *
 * Optimised ANSI C code for the Rijndael cipher (now AES)
 *
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 * @author Antoon Bosselaers <antoon.bosselaers@esat.kuleuven.ac.be>
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{"version":3,"file":"less.min.js","sources":["../src/less-browser/utils.js","../src/less-browser/browser.js","../src/less/logger.js","../src/less/environment/environment.js","../src/less/data/colors.js","../src/l

ess/data/unit-
conversions.js","../src/less/data/index.js","../src/less/tree/node.js","../src/less/tree/color.js","../src/less/tree/paren.js","../src/less/tree/combinator.js","../src/less/tree/element.js","../src/less/constants.js","../node_modules/is-what/dist/index.esm.js","../node_modules/copy-anything/dist/index.esm.js","../src/less/utils.js","../src/less/less-error.js","../src/less/tree/selector.js","../src/less/tree/value.js","../src/less/tree/keyword.js","../src/less/tree/anonymous.js","../src/less/tree/declaration.js","../src/less/tree/debug-info.js","../src/less/tree/comment.js","../src/less/contexts.js","../src/less/functions/function-registry.js","../src/less/functions/default.js","../src/less/tree/ruleset.js","../src/less/tree/atrule.js","../src/less/tree/detached-ruleset.js","../src/less/tree/unit.js","../src/less/tree/dimension.js","../src/less/tree/operation.js","../src/less/tree/expression.js","../src/less/functions/function-caller.js","../node_modules/tslib/tslib.es6.js","../src/less/tree/call.js","../src/less/tree/variable.js","../src/less/tree/property.js","../src/less/tree/attribute.js","../src/less/tree/quoted.js","../src/less/tree/url.js","../src/less/tree/media.js","../src/less/tree/import.js","../src/less/tree/js-eval-node.js","../src/less/tree/javascript.js","../src/less/tree/assignment.js","../src/less/tree/condition.js","../src/less/tree/unicode-descriptor.js","../src/less/tree/negative.js","../src/less/tree/extend.js","../src/less/tree/variable-call.js","../src/less/tree/namespace-value.js","../src/less/tree/mixin-definition.js","../src/less/tree/mixin-call.js","../src/less/tree/index.js","../src/less/environment/abstract-file-manager.js","../src/less/environment/abstract-plugin-loader.js","../src/less/visitors/visitor.js","../src/less/visitors/import-sequencer.js","../src/less/visitors/import-visitor.js","../src/less/visitors/set-tree-visibility-visitor.js","../src/less/visitors/extend-visitor.js","../src/less/visitors/join-selector-visitor.js","../src/less/visitors/to-css-visitor.js","../src/less/visitors/index.js","../src/less/parser/parser-input.js","../src/less/parser/chunker.js","../src/less/parser/parser.js","../src/less/functions/boolean.js","../src/less/functions/color.js","../src/less/functions/color-blending.js","../src/less/functions/list.js","../src/less/functions/math-helper.js","../src/less/functions/math.js","../src/less/functions/number.js","../src/less/functions/string.js","../src/less/functions/types.js","../src/less/functions/index.js","../src/less/functions/data-uri.js","../src/less/functions/svg.js","../src/less/transform-tree.js","../src/less/plugin-manager.js","../node_modules/parse-node-version/index.js","../src/less-browser/file-manager.js","../src/less/index.js","../src/less/parse-tree.js","../src/less/source-map-builder.js","../src/less/source-map-output.js","../src/less/import-manager.js","../src/less/render.js","../src/less/parse.js","../src/less-browser/plugin-loader.js","../src/less-browser/error-reporting.js","../src/less-browser/bootstrap.js","../src/less/default-options.js","../src/less-browser/add-default-options.js","../src/less-browser/index.js","../src/less-browser/log-listener.js","../src/less-browser/cache.js","../src/less-browser/image-size.js"],"sourcesContent":["\nexport function extractId(href) {\n return href.replace(/^[a-z-]+:\\/+?[^\\/]+/, '') // Remove protocol & domain\n .replace(/[\\?\\&]livereload=\\w+/, '') // Remove LiveReload cachebuster\n .replace(/^\\//, '') // Remove root /\n .replace(/\\.[a-zA-Z]+$/, '') // Remove simple extension\n .replace(/[^\\.\\w-]+/g, '-') // Replace illegal characters\n .replace(/\\./g, ':'); // Replace dots with colons(for valid id)\n}\n\nexport function addDataAttr(options, tag) {\n if (!tag) {return;} // in case of tag is null or undefined\n for (const opt in tag.dataset) {\n if (tag.dataset.hasOwnProperty(opt)) {\n if (opt === 'env' || opt === 'dumpLineNumbers' || opt === 'rootpath' || opt === 'errorReporting') {\n options[opt] = tag.dataset[opt];\n } else {\n try {\n options[opt] = JSON.parse(tag.dataset[opt]);\n }\n catch (_) {}\n }\n }\n}\n","import * as utils from './utils';\n\nexport default {\n createCSS: function (document, styles, sheet) {\n // Strip the query-string\n const href = sheet.href || '';\n\n // If there is no title set, use the filename, minus the extension\n const id = `less:${sheet.title || utils.extractId(href)}`;\n\n // If this has already been inserted into the DOM, we may need to replace it\n const oldStyleNode = document.getElementById(id);\n let keepOldStyleNode = false;\n\n // Create a new stylesheet node for insertion or (if necessary) replacement\n const styleNode = document.createElement('style');\n

styleNode.setAttribute('type', 'text/css');\n if (sheet.media) {\n styleNode.setAttribute('media', sheet.media);\n }\n styleNode.id = id;\n\n if (!styleNode.styleSheet) {\n styleNode.appendChild(document.createTextNode(styles));\n\n // If new contents match contents of oldStyleNode, don't replace oldStyleNode\n keepOldStyleNode = (oldStyleNode !== null && oldStyleNode.childNodes.length > 0 && styleNode.childNodes.length > 0 &&\n oldStyleNode.firstChild.nodeValue === styleNode.firstChild.nodeValue);\n }\n\n const head = document.getElementsByTagName('head')[0];\n\n

// If there is no oldStyleNode, just append; otherwise, only append if we need\n // to replace oldStyleNode with an updated stylesheet\n if (oldStyleNode === null || keepOldStyleNode === false) {\n const nextEl = sheet && sheet.nextSibling || null;\n if (nextEl) {\n nextEl.parentNode.insertBefore(styleNode, nextEl);\n } else {\n head.appendChild(styleNode);\n }\n }\n if (oldStyleNode && keepOldStyleNode === false) {\n oldStyleNode.parentNode.removeChild(oldStyleNode);\n }\n\n // For IE.\n // This needs to happen *after* the style element is added to the DOM, otherwise IE 7 and 8 may crash.\n // See http://social.msdn.microsoft.com/Forums/en-US/7e081b65-878a-4c22-8e68-c10d39c2ed32/internet-explorer-crashes-appending-style-element-to-head\n if (styleNode.styleSheet) {\n try {\n styleNode.styleSheet.cssText = styles;\n } catch (e) {\n throw new Error('Couldn\\'t reassign styleSheet.cssText.');\n }\n }\n },\n currentScript: function(window) {\n const document = window.document;\n return document.currentScript || (() => {\n const scripts = document.getElementsByTagName('script');\n return scripts[scripts.length - 1];\n })();\n }\n};\n","export default {\n error: function(msg) {\n this._fireEvent('error', msg);\n },\n warn: function(msg) {\n this._fireEvent('warn', msg);\n },\n info: function(msg) {\n this._fireEvent('info', msg);\n },\n debug: function(msg) {\n this._fireEvent('debug', msg);\n },\n addListener: function(listener) {\n this._listeners.push(listener);\n },\n removeListener: function(listener) {\n for (let i = 0; i < this._listeners.length; i++) {\n if (this._listeners[i] === listener) {\n this._listeners.splice(i, 1);\n return;\n }\n }\n },\n _fireEvent: function(type, msg) {\n for (let i = 0; i < this._listeners.length; i++) {\n const logFunction = this._listeners[i][type];\n if (logFunction) {\n logFunction(msg);\n }\n }\n },\n _listeners: []\n};\n","/**\n * @todo Document why this abstraction exists, and the relationship between\n * environment, file managers, and plugin manager\n */\n\nimport logger from '../logger';\n\nclass Environment {\n constructor(externalEnvironment, fileManagers) {\n this.fileManagers = fileManagers || [];\n externalEnvironment = externalEnvironment || {};\n\n const optionalFunctions = ['encodeBase64', 'mimeLookup', 'charsetLookup', 'getSourceMapGenerator'];\n const requiredFunctions = [];\n const functions = requiredFunctions.concat(optionalFunctions);\n\n for (let i = 0; i < functions.length; i++) {\n const propName = functions[i];\n const environmentFunc = externalEnvironment[propName];\n if (environmentFunc) {\n this[propName] = environmentFunc.bind(externalEnvironment);\n } else if (i < requiredFunctions.length) {\n this.warn(`missing required function in environment - ${propName}`);\n }\n }\n\n getFileManager(filename, currentDirectory, options, environment, isSync) {\n\n if (!filename) {\n logger.warn('getFileManager called with no filename.. Please report this issue. continuing.');\n }\n if (currentDirectory == null) {\n logger.warn('getFileManager called with null directory.. Please report this issue. continuing.');\n }\n\n let fileManagers = this.fileManagers;\n if (options.pluginManager) {\n fileManagers = [].concat(fileManagers).concat(options.pluginManager.getFileManagers());\n }\n for (let i = fileManagers.length - 1; i >= 0 ; i--) {\n const fileManager = fileManagers[i];\n if (fileManager[isSync ? 'supportsSync' : 'supports'](filename, currentDirectory, options, environment)) {\n return fileManager;\n }\n }\n return null;\n }\n\n addFileManager(fileManager) {\n this.fileManagers.push(fileManager);\n }\n\n clearFileManagers() {\n this.fileManagers = [];\n }\n}\n\nexport default Environment;\n","export default {\n 'aliceblue':'#f0f8ff',\n 'antiquewhite':'#faebd7',\n 'aqua':'#00ffff',\n 'aquamarine':'#7fffd4',\n 'azure':'#f0ffff',\n 'beige':'#f5f5dc',\n 'bisque':'#ffe4c4',\n

'black':'#000000',\n 'blanchedalmond':'#ffebcd',\n 'blue':'#0000ff',\n 'blueviolet':'#8a2be2',\n 'brown':'#a52a2a',\n 'burlywood':'#deb887',\n 'cadetblue':'#5f9ea0',\n 'chartreuse':'#7fff00',\n 'chocolate':'#d2691e',\n
'coral':'#ff7f50',\n 'cornflowerblue':'#6495ed',\n 'cornsilk':'#fff8dc',\n 'crimson':'#dc143c',\n 'cyan':'#00ffff',\n 'darkblue':'#00008b',\n 'darkcyan':'#008b8b',\n 'darkgoldenrod':'#b8860b',\n 'darkgray':'#a9a9a9',\n 'darkgrey':'#a9a9a9',\n 'darkgreen':'#006400',\n 'darkkhaki':'#bdb76b',\n 'darkmagenta':'#8b008b',\n 'darkolivegreen':'#556b2f',\n 'darkorange':'#ff8c00',\n 'darkorchid':'#9932cc',\n 'darkred':'#8b0000',\n 'darksalmon':'#e9967a',\n 'darkseagreen':'#8fbc8f',\n 'darkslateblue':'#483d8b',\n 'darkslategray':'#2f4f4f',\n 'darkslategrey':'#2f4f4f',\n 'darkturquoise':'#00ced1',\n 'darkviolet':'#9400d3',\n 'deeppink':'#ff1493',\n 'deepskyblue':'#00bfff',\n 'dimgray':'#696969',\n 'dimgrey':'#696969',\n 'dodgerblue':'#1e90ff',\n 'firebrick':'#b22222',\n 'floralwhite':'#fffaf0',\n 'forestgreen':'#228b22',\n 'fuchsia':'#ff00ff',\n 'gainsboro':'#dcdcdc',\n 'ghostwhite':'#f8f8ff',\n
'gold':'#ffd700',\n 'goldenrod':'#daa520',\n 'gray':'#808080',\n 'grey':'#808080',\n 'green':'#008000',\n 'greenyellow':'#adff2f',\n 'honeydew':'#f0fff0',\n 'hotpink':'#ff69b4',\n 'indianred':'#cd5c5c',\n 'indigo':'#4b0082',\n 'ivory':'#fffff0',\n 'khaki':'#f0e68c',\n 'lavender':'#e6e6fa',\n 'lavenderblush':'#fff0f5',\n 'lawngreen':'#7cfc00',\n 'lemonchiffon':'#fffacd',\n 'lightblue':'#add8e6',\n 'lightcoral':'#f08080',\n 'lightcyan':'#e0ffff',\n 'lightgoldenrodyellow':'#fafad2',\n 'lightgray':'#d3d3d3',\n 'lightgrey':'#d3d3d3',\n 'lightgreen':'#90ee90',\n 'lightpink':'#ffb6c1',\n 'lightsalmon':'#ffa07a',\n 'lightseagreen':'#20b2aa',\n 'lightskyblue':'#87cefa',\n 'lightslategray':'#778899',\n 'lightslategrey':'#778899',\n 'lightsteelblue':'#b0c4de',\n 'lightyellow':'#ffffe0',\n 'lime':'#00ff00',\n 'limegreen':'#32cd32',\n 'linen':'#faf0e6',\n 'magenta':'#ff00ff',\n 'maroon':'#800000',\n
'mediumaquamarine':'#66cdaa',\n 'mediumblue':'#0000cd',\n 'mediumorchid':'#ba55d3',\n 'mediumpurple':'#9370d8',\n 'mediumseagreen':'#3cb371',\n 'mediumslateblue':'#7b68ee',\n 'mediumspringgreen':'#00fa9a',\n 'mediumturquoise':'#48d1cc',\n 'mediumvioletred':'#c71585',\n 'midnightblue':'#191970',\n 'mintcream':'#f5fffa',\n 'mistyrose':'#ffe4e1',\n 'moccasin':'#ffe4b5',\n 'navajowhite':'#ffdead',\n 'navy':'#000080',\n 'oldlace':'#fdf5e6',\n 'olive':'#808000',\n 'olivedrab':'#6b8e23',\n 'orange':'#ffa500',\n 'orangered':'#ff4500',\n 'orchid':'#da70d6',\n 'palegoldenrod':'#eee8aa',\n 'palegreen':'#98fb98',\n 'paleturquoise':'#afeeee',\n 'palevioletred':'#d87093',\n 'papayawhip':'#ffefd5',\n 'peachpuff':'#ffdab9',\n 'peru':'#cd853f',\n 'pink':'#ffc0cb',\n 'plum':'#dda0dd',\n 'powderblue':'#b0e0e6',\n 'purple':'#800080',\n 'rebeccapurple':'#663399',\n 'red':'#ff0000',\n 'rosybrown':'#bc8f8f',\n
'royalblue':'#4169e1',\n 'saddlebrown':'#8b4513',\n 'salmon':'#fa8072',\n 'sandybrown':'#f4a460',\n 'seagreen':'#2e8b57',\n 'seashell':'#fff5ee',\n 'sienna':'#a0522d',\n 'silver':'#c0c0c0',\n 'skyblue':'#87ceeb',\n 'slateblue':'#6a5acd',\n 'slategray':'#708090',\n 'slategrey':'#708090',\n 'snow':'#fffafa',\n 'springgreen':'#00ff7f',\n 'steelblue':'#4682b4',\n 'tan':'#d2b48c',\n 'teal':'#008080',\n 'thistle':'#d8bfd8',\n 'tomato':'#ff6347',\n 'turquoise':'#40e0d0',\n 'violet':'#ee82ee',\n 'wheat':'#f5deb3',\n 'white':'#ffffff',\n 'whitesmoke':'#f5f5f5',\n 'yellow':'#ffff00',\n 'yellowgreen':'#9acd32'\n};","export default {\n length: {\n 'm': 1,\n 'cm': 0.01,\n 'mm': 0.001,\n 'in': 0.0254,\n 'px': 0.0254 / 96,\n 'pt': 0.0254 / 72,\n 'pc': 0.0254 / 72 * 12\n },\n duration: {\n 's': 1,\n 'ms': 0.001\n },\n angle: {\n
'rad': 1 / (2 * Math.PI),\n 'deg': 1 / 360,\n 'grad': 1 / 400,\n 'turn': 1\n }\n};","import colors from './colors';\nimport unitConversions from './unit-conversions';\n\nexport default { colors, unitConversions };\n","/**\n * The reason why Node is a class and other nodes simply do not extend\n * from Node (since we're transpiling) is due to this issue:\n * \n * https://github.com/less/less.js/issues/3434\n */\nclass Node {\n constructor() {\n this.parent = null;\n this.visibilityBlocks = undefined;\n this.nodeVisible = undefined;\n this.rootNode = null;\n this.parsed = null;\n }\n\n get currentFileInfo() {\n return this.fileInfo();\n }\n\n get index() {\n return this.getIndex();\n }\n\n setParent(nodes, parent) {\n function set(node) {\n if (node && node instanceof Node) {\n node.parent = parent;\n }\n }\n if (Array.isArray(nodes)) {\n nodes.forEach(set);\n }\n else {\n set(nodes);\n }\n }\n\n getIndex() {\n return this._index || (this.parent && this.parent.getIndex()) || 0;\n }\n\n fileInfo() {\n return this._fileInfo ||

(this.parent && this.parent.fileInfo()) || {};\n }\n\n isRulesetLike() { return false; }\n\n toCSS(context) {\n const strs = [];\n this.genCSS(context, {\n add: function(chunk, fileInfo, index) {\n strs.push(chunk);\n },\n isEmpty: function () {\n return strs.length === 0;\n }\n });\n return strs.join('');\n }\n\n genCSS(context, output) {\n output.add(this.value);\n }\n\n accept(visitor) {\n this.value = visitor.visit(this.value);\n }\n\n eval() { return this; }\n\n _operate(context, op, a, b) {\n switch (op) {\n case '+': return a + b;\n case '-': return a - b;\n case '*': return a * b;\n case '/': return a / b;\n }\n }\n\n fround(context, value) {\n const precision = context && context.numPrecision;\n // add \"epsilon\" to ensure numbers like 1.000000005 (represented as 1.000000004999...) are properly rounded:\n return (precision) ? Number((value + 2e-16).toFixed(precision)) : value;\n }\n\n static compare(a, b) {\n /* returns:\n -1: a < b\n 0: a = b\n 1: a > b\n and *any* other value for a != b (e.g. undefined, NaN, -2 etc.) */\n\n if ((a.compare) &&\n // for \"symmetric results\" force toCSS-based comparison\n // of Quoted or Anonymous if either value is one of those\n !(b.type === 'Quoted' || b.type === 'Anonymous')) {\n return a.compare(b);\n } else if (b.compare) {\n return -b.compare(a);\n } else if (a.type !== b.type) {\n return undefined;\n }\n\n a = a.value;\n b = b.value;\n if (!Array.isArray(a)) {\n return a === b ? 0 : undefined;\n }\n if (a.length !== b.length) {\n return undefined;\n }\n for (let i = 0; i < a.length; i++) {\n if (Node.compare(a[i], b[i]) !== 0) {\n return undefined;\n }\n }\n return 0;\n }\n\n static numericCompare(a, b) {\n return a < b ? -1\n : a === b ? 0\n : a > b ? 1 : undefined;\n }\n\n // Returns true if this node represents root of ast imported by reference\n blocksVisibility() {\n if (this.visibilityBlocks == null) {\n this.visibilityBlocks = 0;\n }\n return this.visibilityBlocks !== 0;\n }\n\n addVisibilityBlock() {\n if (this.visibilityBlocks == null) {\n this.visibilityBlocks = 0;\n }\n this.visibilityBlocks = this.visibilityBlocks + 1;\n }\n\n removeVisibilityBlock() {\n if (this.visibilityBlocks == null) {\n this.visibilityBlocks = 0;\n }\n this.visibilityBlocks = this.visibilityBlocks - 1;\n }\n\n // Turns on node visibility - if called node will be shown in output regardless\n // of whether it comes from import by reference or not\n ensureVisibility() {\n this.nodeVisible = true;\n }\n\n // Turns off node visibility - if called node will NOT be shown in output regardless\n // of whether it comes from import by reference or not\n ensureInvisibility() {\n this.nodeVisible = false;\n }\n\n // return values:\n // false - the node must not be visible\n // true - the node must be visible\n // undefined or null - the node has the same visibility as its parent\n isVisible() {\n return this.nodeVisible;\n }\n\n visibilityInfo() {\n return {\n visibilityBlocks: this.visibilityBlocks,\n nodeVisible:
 this.nodeVisible\n };\n }\n\n copyVisibilityInfo(info) {\n if (!info) {\n return;\n }\n this.visibilityBlocks = info.visibilityBlocks;\n this.nodeVisible = info.nodeVisible;\n }\n}\n\nexport default Node;\n","import Node from './node';\nimport colors from '../data/colors';\n\n//\n// RGB Colors - #ff0014, #eee\n//\nconst Color = function(rgb, a, originalForm) {\n const self = this;\n //\n // The end goal here, is to parse the arguments\n // into an integer triplet, such as `128, 255, 0`\n //\n // This facilitates operations and conversions.\n //\n if (Array.isArray(rgb)) {\n this.rgb = rgb;\n } else if (rgb.length >= 6) {\n this.rgb = [];\n rgb.match(/.{2}/g).map(function (c, i) {\n if (i < 3) {\n self.rgb.push(parseInt(c, 16));\n } else {\n self.alpha = (parseInt(c, 16)) / 255;\n }\n });\n } else {\n this.rgb = [];\n rgb.split('').map(function (c, i) {\n if (i < 3) {\n self.rgb.push(parseInt(c + c, 16));\n } else {\n self.alpha = (parseInt(c + c, 16)) / 255;\n }\n });\n }\n this.alpha = this.alpha || (typeof a === 'number' ? a : 1);\n if (typeof originalForm !== 'undefined') {\n this.value = originalForm;\n }\n}\n\nColor.prototype = Object.assign(new Node(), {\n type: 'Color',\n\n luma() {\n let r = this.rgb[0] / 255, g = this.rgb[1] / 255, b = this.rgb[2] / 255;\n\n r = (r <= 0.03928) ? r / 12.92 : Math.pow(((r + 0.055) / 1.055), 2.4);\n g = (g <= 0.03928) ? g / 12.92 : Math.pow(((g + 0.055) / 1.055), 2.4);\n b = (b <= 0.03928) ? b / 12.92 : Math.pow(((b + 0.055) / 1.055), 2.4);\n\n return 0.2126 * r + 0.7152 * g + 0.0722 * b;\n },\n\n genCSS(context, output) {\n output.add(this.toCSS(context));\n },\n\n toCSS(context, doNotCompress)

{\n const compress = context && context.compress && !doNotCompress;\n let color;\n let alpha;\n let colorFunction;\n let args = [];\n\n // `value` is set if this color was originally\n // converted from a named color string so we need\n // to respect this and try to output named color too.\n alpha = this.fround(context, this.alpha);\n\n if (this.value) {\n if (this.value.indexOf('rgb') === 0) {\n if (alpha < 1) {\n colorFunction = 'rgba';\n }\n } else if (this.value.indexOf('hsl') === 0) {\n if (alpha < 1) {\n colorFunction = 'hsla';\n } else {\n colorFunction = 'hsl';\n }\n } else {\n return this.value;\n }\n } else {\n if (alpha < 1) {\n colorFunction = 'rgba';\n }\n }\n\n switch (colorFunction) {\n case 'rgba':\n args = this.rgb.map(function (c) {\n return clamp(Math.round(c), 255);\n }).concat(clamp(alpha, 1));\n break;\n case 'hsla':\n args.push(clamp(alpha, 1));\n case 'hsl':\n color = this.toHSL();\n args = [\n this.fround(context, color.h),\n `${this.fround(context, color.s * 100)}%`,\n `${this.fround(context, color.l * 100)}%`\n].concat(args);\n }\n\n if (colorFunction) {\n // Values are capped between `0` and `255`, rounded and zero-padded.\n return `${colorFunction}(${args.join(`,${compress ? '' : ' '}`)})`;\n }\n\n color = this.toRGB();\n\n if (compress) {\n const splitcolor = color.split('');\n\n // Convert color to short format\n if (splitcolor[1] === splitcolor[2] && splitcolor[3] === splitcolor[4] && splitcolor[5] === splitcolor[6]) {\n color = `#${splitcolor[1]}${splitcolor[3]}${splitcolor[5]}`;\n }\n }\n\n return color;\n },\n\n //\n // Operations have to be done per-channel, if not,\n // channels will spill onto each other. Once we have\n // our result, in the form of an integer triplet,\n // we create a new Color node to hold the result.\n //\n operate(context, op, other) {\n const rgb = new Array(3);\n const alpha = this.alpha * (1 - other.alpha) + other.alpha;\n for (let c = 0; c < 3; c++) {\n rgb[c] = this._operate(context, op, this.rgb[c], other.rgb[c]);\n }\n return new Color(rgb, alpha);\n },\n\n toRGB() {\n return toHex(this.rgb);\n },\n\n toHSL() {\n const r = this.rgb[0] / 255, g = this.rgb[1] / 255, b = this.rgb[2] / 255, a = this.alpha;\n\n const max = Math.max(r, g, b), min = Math.min(r, g, b);\n let h;\n let s;\n const l = (max + min) / 2;\n const d = max - min;\n\n if (max === min) {\n h = s = 0;\n } else {\n s = l > 0.5 ? d / (2 - max - min) : d / (max + min);\n\n switch (max) {\n case r: h = (g - b) / d + (g < b ? 6 : 0); break;\n case g: h = (b - r) / d + 2; break;\n case b: h = (r - g) / d + 4; break;\n }\n h /= 6;\n }\n return { h: h * 360, s, l, a };\n },\n\n // Adapted from http://mjijackson.com/2008/02/rgb-to-hsl-and-rgb-to-hsv-color-model-conversion-algorithms-in-javascript\n toHSV() {\n const r = this.rgb[0] / 255, g = this.rgb[1] / 255, b = this.rgb[2] / 255, a = this.alpha;\n\n const max = Math.max(r, g, b), min = Math.min(r, g, b);\n let h;\n let s;\n const v = max;\n\n const d = max - min;\n\n if (max === 0) {\n s = 0;\n } else {\n s = d / max;\n }\n\n if (max === min) {\n h = 0;\n } else {\n switch (max) {\n case r: h = (g - b) / d + (g < b ? 6 : 0); break;\n case g: h = (b - r) / d + 2; break;\n case b: h = (r - g) / d + 4; break;\n }\n h /= 6;\n }\n return { h: h * 360, s, v, a };\n },\n\n toARGB() {\n return toHex([this.alpha * 255].concat(this.rgb));\n },\n\n compare(x) {\n return (x.rgb &&\n x.rgb[0] === this.rgb[0] &&\n x.rgb[1] === this.rgb[1] &&\n x.rgb[2] === this.rgb[2] &&\n x.alpha === this.alpha) ? 0 : undefined;\n }\n});\n\nColor.fromKeyword = function(keyword) {\n let c;\n const key = keyword.toLowerCase();\n if (colors.hasOwnProperty(key)) {\n c = new Color(colors[key].slice(1));\n }\n else if (key === 'transparent') {\n c = new Color([0, 0, 0], 0);\n }\n\n if (c) {\n c.value = keyword;\n return c;\n }\n};\n\nfunction clamp(v, max) {\n return Math.min(Math.max(v, 0), max);\n}\n\nfunction toHex(v) {\n return `#${v.map(function (c) {\n c = clamp(Math.round(c), 255);\n return (c < 16 ? '0' : '') + c.toString(16);\n }).join('')}`;\n}\n\nexport default Color;\n","import Node from './node';\n\nconst Paren = function(node) {\n this.value = node;\n};\n\nParen.prototype = Object.assign(new Node(), {\n type: 'Paren',\n\n genCSS(context, output) {\n output.add('(');\n this.value.genCSS(context, output);\n output.add(')');\n },\n\n eval(context) {\n return new Paren(this.value.eval(context));\n }\n});\n\nexport default Paren;\n","import Node from './node';\nconst _noSpaceCombinators = {\n '': true,\n ' ': true,\n '|': true\n};\n\nconst Combinator =

function(value) {\n if (value === ' ')
 {\n this.value = ' ';\n this.emptyOrWhitespace = true;\n } else {\n this.value = value ? value.trim() :
'';\n this.emptyOrWhitespace = this.value === '';\n }\n}\n\nCombinator.prototype = Object.assign(new
Node(), {\n type: 'Combinator',\n\n genCSS(context, output) {\n const spaceOrEmpty = (context.compress ||
_noSpaceCombinators[this.value]) ? '' : ' ';\n output.add(spaceOrEmpty + this.value + spaceOrEmpty);\n
}\n});\n\nexport default Combinator;\n","import Node from './node';\nimport Paren from './paren';\nimport
Combinator from './combinator';\n\nconst Element = function(combinator, value, isVariable, index, currentFileInfo,
visibilityInfo) {\n this.combinator = combinator instanceof Combinator ?\n combinator : new
Combinator(combinator);\n\n if (typeof value === 'string') {\n this.value = value.trim();\n } else if (value)
{\n this.value = value;\n } else {\n this.value = '';\n }\n
  this.isVariable = isVariable;\n this._index = index;\n this._fileInfo = currentFileInfo;\n
this.copyVisibilityInfo(visibilityInfo);\n this.setParent(this.combinator, this);\n}\n\nElement.prototype =
Object.assign(new Node(), {\n type: 'Element',\n\n accept(visitor) {\n const value = this.value;\n
this.combinator = visitor.visit(this.combinator);\n if (typeof value === 'object') {\n this.value =
visitor.visit(value);\n }\n },\n\n eval(context) {\n return new Element(this.combinator,\n
this.value.eval ? this.value.eval(context) : this.value,\n this.isVariable,\n this.getIndex(),\n
this.fileInfo(), this.visibilityInfo());\n },\n\n clone() {\n return new Element(this.combinator,\n
this.value,\n this.isVariable,\n this.getIndex(),\n this.fileInfo(), this.visibilityInfo());\n },\n\n
genCSS(context, output) {\n
  output.add(this.toCSS(context), this.fileInfo(), this.getIndex());\n },\n\n toCSS(context) {\n context =
context || {};\n let value = this.value;\n const firstSelector = context.firstSelector;\n if (value instanceof
Paren) {\n // selector in parens should not be affected by outer selector\n // flags (breaks only
interpolated selectors - see #1973)\n context.firstSelector = true;\n }\n value = value.toCSS ?
value.toCSS(context) : value;\n context.firstSelector = firstSelector;\n if (value === '' &&
this.combinator.value.charAt(0) === '&') {\n return '';\n } else {\n return
this.combinator.toCSS(context) + value;\n }\n }\n});\n\nexport default Element;\n","\nexport const Math = {\n
  ALWAYS: 0,\n PARENS_DIVISION: 1,\n PARENS: 2\n // removed - STRICT_LEGACY: 3\n};\n\nexport
const RewriteUrls = {\n OFF: 0,\n LOCAL: 1,\n ALL: 2\n};","/**\r\n
 * Returns the object type of the given payload\r\n *\r\n * @param {*} payload\r\n * @returns {string}\r\n
*/\r\nfunction getType(payload) {\r\n return Object.prototype.toString.call(payload).slice(8, -1);\r\n}\r\n/**\r\n *
Returns whether the payload is undefined\r\n *\r\n * @param {*} payload\r\n * @returns {payload is undefined}\r\n
*/\r\nfunction isUndefined(payload) {\r\n return getType(payload) === 'Undefined';\r\n}\r\n/**\r\n * Returns
whether the payload is null\r\n *\r\n * @param {*} payload\r\n * @returns {payload is null}\r\n */\r\nfunction
isNull(payload) {\r\n return getType(payload) === 'Null';\r\n}\r\n/**\r\n * Returns whether the payload is a plain
JavaScript object (excluding special classes or objects with other prototypes)\r\n *\r\n * @param {*} payload\r\n *
@returns {payload is Record<string, any>}\r\n */\r\nfunction isPlainObject(payload) {\r\n if (getType(payload)
!== 'Object')\r\n return false;\r\n return payload.constructor === Object &&
 Object.getPrototypeOf(payload) === Object.prototype;\r\n}\r\n/**\r\n * Returns whether the payload is a plain
JavaScript object (excluding special classes or objects with other prototypes)\r\n *\r\n * @param {*} payload\r\n *
@returns {payload is Record<string, any>}\r\n */\r\nfunction isObject(payload) {\r\n return
isPlainObject(payload);\r\n}\r\n/**\r\n * Returns whether the payload is a an empty object (excluding special classes
or objects with other prototypes)\r\n *\r\n * @param {*} payload\r\n * @returns {payload is { [K in any]: never
}}\r\n */\r\nfunction isEmptyObject(payload) {\r\n return isPlainObject(payload) && Object.keys(payload).length
=== 0;\r\n}\r\n/**\r\n * Returns whether the payload is an any kind of object (including special classes or objects
with different prototypes)\r\n *\r\n * @param {*} payload\r\n * @returns {payload is Record<string, any>}\r\n
*/\r\nfunction isAnyObject(payload) {\r\n return getType(payload) === 'Object';\r\n}\r\n/**\r\n * Returns
 whether the payload is an object like a type passed in < >\r\n *\r\n * Usage: isObjectLike<{id: any}>(payload) //
will make sure it's an object and has an `id` prop.\r\n *\r\n * @template T this must be passed in < >\r\n * @param

{*} payload\r\n * @returns {payload is T}\r\n */\r\nfunction isObjectLike(payload) {\r\n return isAnyObject(payload);\r\n}\r\n/**\r\n * Returns whether the payload is a function (regular or async)\r\n *\r\n * @param {*} payload\r\n * @returns {payload is AnyFunction}\r\n */\r\nfunction isFunction(payload) {\r\n return typeof payload === \"function\";\r\n}\r\n/**\r\n * Returns whether the payload is an array\r\n *\r\n * @param {any} payload\r\n * @returns {payload is any[]}\r\n */\r\nfunction isArray(payload) {\r\n return getType(payload) === 'Array';\r\n}\r\n/**\r\n * Returns whether the payload is a an array with at least 1 item\r\n *\r\n * @param {*} payload\r\n * @returns {payload is any[]}\r\n */\r\nfunction isFullArray(payload) {\r\n return isArray(payload) && payload.length > 0;\r\n}\r\n/**\r\n * Returns whether the payload is a an empty array\r\n *\r\n * @param {*} payload\r\n * @returns {payload is []}\r\n */\r\nfunction isEmptyArray(payload) {\r\n return isArray(payload) && payload.length === 0;\r\n}\r\n/**\r\n * Returns whether the payload is a string\r\n *\r\n * @param {*} payload\r\n * @returns {payload is string}\r\n */\r\nfunction isString(payload) {\r\n return getType(payload) === 'String';\r\n}\r\n/**\r\n * Returns whether the payload is a string, BUT returns false for ''\r\n *\r\n * @param {*} payload\r\n * @returns {payload is string}\r\n */\r\nfunction isFullString(payload) {\r\n return isString(payload) && payload !== '';\r\n}\r\n/**\r\n * Returns whether the payload is ''\r\n *\r\n * @param {*} payload\r\n * @returns {payload is string}\r\n */\r\nfunction isEmptyString(payload) {\r\n return payload === '';\r\n}\r\n/**\r\n * Returns whether the payload is a number (but not NaN)\r\n *\r\n * This will return `false` for `NaN`!!\r\n *\r\n * @param {*} payload\r\n * @returns {payload is number}\r\n */\r\nfunction isNumber(payload) {\r\n return getType(payload) === 'Number' && !isNaN(payload);\r\n}\r\n/**\r\n * Returns whether the payload is a boolean\r\n *\r\n * @param {*} payload\r\n * @returns {payload is boolean}\r\n */\r\nfunction isBoolean(payload) {\r\n return getType(payload) === 'Boolean';\r\n}\r\n/**\r\n * Returns whether the payload is a regular expression (RegExp)\r\n *\r\n * @param {*} payload\r\n * @returns {payload is RegExp}\r\n */\r\nfunction isRegExp(payload) {\r\n return getType(payload) === 'RegExp';\r\n}\r\n/**\r\n * Returns whether the payload is a Map\r\n *\r\n * @param {*} payload\r\n * @returns {payload is Map<any, any>}\r\n */\r\nfunction isMap(payload) {\r\n return getType(payload) === 'Map';\r\n}\r\n/**\r\n * Returns whether the payload is a WeakMap\r\n *\r\n * @param {*} payload\r\n * @returns {payload is WeakMap<any, any>}\r\n */\r\nfunction isWeakMap(payload) {\r\n return getType(payload) === 'WeakMap';\r\n}\r\n/**\r\n * Returns whether the payload is a Set\r\n *\r\n * @param {*} payload\r\n * @returns {payload is Set<any>}\r\n */\r\nfunction isSet(payload) {\r\n return getType(payload) === 'Set';\r\n}\r\n/**\r\n * Returns whether the payload is a WeakSet\r\n *\r\n * @param {*} payload\r\n * @returns {payload is WeakSet<any>}\r\n */\r\nfunction isWeakSet(payload) {\r\n return getType(payload) === 'WeakSet';\r\n}\r\n/**\r\n * Returns whether the payload is a Symbol\r\n *\r\n * @param {*} payload\r\n * @returns {payload is symbol}\r\n */\r\nfunction isSymbol(payload) {\r\n return getType(payload) === 'Symbol';\r\n}\r\n/**\r\n * Returns whether the payload is a Date, and that the date is valid\r\n *\r\n * @param {*} payload\r\n * @returns {payload is Date}\r\n */\r\nfunction isDate(payload) {\r\n return getType(payload) === 'Date' && !isNaN(payload);\r\n}\r\n/**\r\n * Returns whether the payload is a Blob\r\n *\r\n * @param {*} payload\r\n * @returns {payload is Blob}\r\n */\r\nfunction isBlob(payload) {\r\n return getType(payload) === 'Blob';\r\n}\r\n/**\r\n * Returns whether the payload is a File\r\n *\r\n * @param {*} payload\r\n * @returns {payload is File}\r\n */\r\nfunction isFile(payload) {\r\n return getType(payload) === 'File';\r\n}\r\n/**\r\n * Returns whether the payload is a Promise\r\n *\r\n * @param {*} payload\r\n * @returns {payload is Promise<any>}\r\n */\r\nfunction isPromise(payload) {\r\n return getType(payload) === 'Promise';\r\n}\r\n/**\r\n * Returns whether the payload is an Error\r\n *\r\n * @param {*} payload\r\n * @returns {payload is Error}\r\n */\r\nfunction isError(payload) {\r\n return getType(payload) === 'Error';\r\n}\r\n/**\r\n * Returns whether the payload is literally the value `NaN` (it's `NaN` and also a `number`)\r\n *\r\n * @param {*} payload\r\n * @returns {payload is typeof NaN}\r\n */\r\nfunction isNaNValue(payload) {\r\n return getType(payload) === 'Number' && isNaN(payload);\r\n}\r\n/**\r\n * Returns whether the payload is a primitive type (eg. Boolean | Null | Undefined | Number | String | Symbol)\r\n *\r\n * @param {*} payload\r\n * @returns {(payload is boolean |

null | undefined | number | string | symbol)}\r\n */\r\nfunction isPrimitive(payload) {\r\n return (isBoolean(payload) ||\r\n isNull(payload) ||\r\n isUndefined(payload) ||\r\n isNumber(payload) ||\r\n isString(payload) ||\r\n isSymbol(payload));\r\n}\r\n/**\r\n * Returns true whether the payload is null or undefined\r\n *\r\n * @param {*} payload\r\n * @returns {(payload is null | undefined)}\r\n */\r\nfunction isNullOrUndefined(payload) {\r\n return isNull(payload) || isUndefined(payload);\r\n}\r\n/**\r\n * Does a generic check to check that the given payload is of a given type.\r\n * In cases like Number, it will return true for NaN as NaN is a Number (thanks javascript!);\r\n * It will, however, differentiate
between object and null\r\n *\r\n * @template T\r\n * @param {*} payload\r\n * @param {T} type\r\n * @throws {TypeError} Will throw type error if type is an invalid type\r\n * @returns {payload is T}\r\n */\r\nfunction isType(payload, type) {\r\n if (!(type instanceof Function)) {\r\n throw new TypeError('Type must be a function');\r\n }\r\n if (!Object.prototype.hasOwnProperty.call(type, 'prototype')) {\r\n throw new TypeError('Type is not a class');\r\n }\r\n // Classes usually have names (as functions usually have names)\r\n var name = type.name;\r\n return getType(payload) === name || Boolean(payload && payload.constructor === type);\r\n}\n\nexport { getType, isAnyObject, isArray, isBlob, isBoolean, isDate, isEmptyArray, isEmptyObject, isEmptyString, isError, isFile, isFullArray, isFullString, isFunction, isMap, isNaNValue, isNull, isNullOrUndefined, isNumber, isObject, isObjectLike, isPlainObject, isPrimitive, isPromise, isRegExp, isSet, isString,
isSymbol, isType, isUndefined, isWeakMap, isWeakSet };\n","import { isArray, isPlainObject } from 'is-what';\n\n/*!
\r\nCopyright (c) Microsoft Corporation. All rights reserved.\r\nLicensed under the Apache License, Version 2.0 (the \"License\"); you may not use\r\nthis file except in compliance with the License. You may obtain a copy of the\r\nLicense at http://www.apache.org/licenses/LICENSE-2.0\r\n\r\nTHIS CODE IS PROVIDED ON AN *AS IS* BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY\r\nKIND, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED\r\nWARRANTIES OR CONDITIONS OF TITLE, FITNESS FOR A PARTICULAR PURPOSE,\r\nMERCHANTABLITY OR NON-INFRINGEMENT.\r\n\r\nSee the Apache Version 2.0 License for specific language governing permissions\r\nand limitations under the License.\r\n */\r\n\r\nfunction __spreadArrays()
{\r\n for (var s = 0, i = 0, il = arguments.length; i < il; i++) s += arguments[i].length;\r\n for (var r = Array(s), k = 0, i = 0; i < il; i++)\r\n for (var a = arguments[i], j = 0, jl = a.length; j < jl; j++, k++)\r\n r[k] = a[j];\r\n return r;\r\n}\n\nfunction assignProp(carry, key, newVal, originalObject, includeNonenumerable) {\r\n var propType = {}.propertyIsEnumerable.call(originalObject, key)\r\n ? 'enumerable'\r\n : 'nonenumerable';\r\n if (propType === 'enumerable')\r\n carry[key] = newVal;\r\n if (includeNonenumerable && propType === 'nonenumerable') {\r\n Object.defineProperty(carry, key, {\r\n value: newVal,\r\n enumerable: false,\r\n writable: true,\r\n configurable: true,\r\n });\r\n }\r\n}\r\n/**\r\n * Copy (clone) an object and all its props recursively to get rid of any prop referenced of the original object. Arrays are also cloned, however objects
inside arrays are still linked.\r\n *\r\n * @export\r\n * @template T\r\n * @param {T} target Target can be anything\r\n * @param {Options} [options={}] Options can be `props` or `nonenumerable`\r\n * @returns {T} the target with replaced values\r\n * @export\r\n */\r\nfunction copy(target, options) {\r\n if (options === void 0) { options = {}; }\r\n if (isArray(target))\r\n return target.map(function (i) { return copy(i, options); });\r\n if (!isPlainObject(target))\r\n return target;\r\n var props = Object.getOwnPropertyNames(target);\r\n var symbols = Object.getOwnPropertySymbols(target);\r\n return __spreadArrays(props, symbols).reduce(function (carry, key) {\r\n if (isArray(options.props) && !options.props.includes(key)) {\r\n return carry;\r\n }\r\n var val = target[key];\r\n var newVal = copy(val, options);\r\n assignProp(carry, key, newVal, target, options.nonenumerable);\r\n return carry;\r\n
}, {});\r\n}\n\nexport { copy };\n","/* jshint proto: true */\nimport * as Constants from './constants';\nimport { copy } from 'copy-anything';\n\nexport function getLocation(index, inputStream) {\n let n = index + 1;\n let line

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= null;\n    let column = -1;\n\n    while (--n >= 0 && inputStream.charAt(n) !== '\\n') {\n        column++;\n    }\n\n    if (typeof index === 'number') {\n        line = (inputStream.slice(0, index).match(/\\n/g) || '').length;\n    }\n\n    return {\n        line,\n        column\n    };\n}\n\nexport function copyArray(arr) {\n    let i;\n    const length = arr.length;\n    const copy = new Array(length);\n\n    for (i = 0; i < length; i++) {\n        copy[i] = arr[i];\n    }\n    return copy;\n}\n\nexport function clone(obj) {\n    const cloned = {};\n    for (const prop in obj) {\n        if (obj.hasOwnProperty(prop)) {\n            cloned[prop] = obj[prop];\n        }\n    }\n    return cloned;\n}\n\nexport function defaults(obj1, obj2) {\n
    let newObj = obj2 || {};\n    if (!obj2._defaults) {\n        newObj = {};\n        const defaults = copy(obj1);\n        newObj._defaults = defaults;\n        const cloned = obj2 ? copy(obj2) : {};\n        Object.assign(newObj, defaults, cloned);\n    }\n    return newObj;\n}\n\nexport function copyOptions(obj1, obj2) {\n    if (obj2 && obj2._defaults) {\n        return obj2;\n    }\n    const opts = defaults(obj1, obj2);\n    if (opts.strictMath) {\n        opts.math = Constants.Math.PARENS;\n    }\n    // Back compat with changed relativeUrls option\n    if (opts.relativeUrls) {\n
    opts.rewriteUrls = Constants.RewriteUrls.ALL;\n    }\n    if (typeof opts.math === 'string') {\n        switch (opts.math.toLowerCase()) {\n            case 'always':\n                opts.math = Constants.Math.ALWAYS;\n                break;\n            case 'parens-division':\n                opts.math = Constants.Math.PARENS_DIVISION;\n                break;\n            case 'strict':\n
        case 'parens':\n                opts.math = Constants.Math.PARENS;\n                break;\n            default:\n                opts.math = Constants.Math.PARENS;\n        }\n    }\n    if (typeof opts.rewriteUrls === 'string') {\n        switch (opts.rewriteUrls.toLowerCase()) {\n            case 'off':\n                opts.rewriteUrls = Constants.RewriteUrls.OFF;\n                break;\n            case 'local':\n                opts.rewriteUrls = Constants.RewriteUrls.LOCAL;\n                break;\n            case 'all':\n                opts.rewriteUrls = Constants.RewriteUrls.ALL;\n                break;\n        }\n    }\n    return opts;\n}\n\nexport function merge(obj1, obj2) {\n    for (const prop in obj2) {\n        if (obj2.hasOwnProperty(prop)) {\n            obj1[prop] = obj2[prop];\n        }\n    }\n    return obj1;\n}\n\nexport function flattenArray(arr, result = []) {\n    for (let i = 0, length = arr.length; i < length; i++) {\n        const value = arr[i];\n
        if (Array.isArray(value)) {\n            flattenArray(value, result);\n        } else {\n            if (value !== undefined) {\n                result.push(value);\n            }\n        }\n    }\n    return result;\n}","import * as utils from './utils';\n\nconst anonymousFunc = /(<anonymous>|Function):(\\d+):(\\d+)/;\n\n/**\n * This is a centralized class of any error that could be thrown internally (mostly by the parser).\n * Besides standard .message it keeps some additional data like a path to the file where the error\n * occurred along with line and column numbers.\n *\n * @class\n * @extends Error\n * @type {module.LessError}\n *\n * @prop {string} type\n * @prop {string} filename\n * @prop {number} index\n * @prop {number} line\n * @prop {number} column\n * @prop {number} callLine\n * @prop {number} callExtract\n * @prop {string[]} extract\n *\n * @param {Object} e - An error object to wrap around or just a descriptive object\n * @param {Object} fileContentMap - An object with file contents in 'contents' property (like importManager) @todo - move to fileManager?\n * @param {string} [currentFilename]\n */\nconst LessError = function(e, fileContentMap, currentFilename) {\n    Error.call(this);\n\n    const filename = e.filename || currentFilename;\n\n    this.message = e.message;\n    this.stack = e.stack;\n\n    if (fileContentMap && filename) {\n        const input = fileContentMap.contents[filename];\n        const loc = utils.getLocation(e.index, input);\n        var line = loc.line;\n        const col  = loc.column;\n        const callLine = e.call && utils.getLocation(e.call, input).line;\n        const lines = input ? input.split('\\n') : '';\n\n        this.type = e.type || 'Syntax';\n        this.filename = filename;\n        this.index = e.index;\n        this.line = typeof line === 'number' ? line + 1 : null;\n        this.column = col;\n\n        if (!this.line && this.stack) {\n            const found = this.stack.match(anonymousFunc);\n\n
            /**\n             * We have to figure out how this environment stringifies anonymous functions\n             * so we can correctly map plugin errors.\n             *\n             * Note, in Node 8, the output of anonymous funcs varied based on parameters\n             * being present or not, so we inject dummy params.\n             */\n            const func = new Function('a', 'throw new Error()');\n            let lineAdjust = 0;\n            try {\n                func();\n            } catch (e) {\n                const match = e.stack.match(anonymousFunc);\n                var line = parseInt(match[2]);\n
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lineAdjust = 1 - line;\n            }\n\n            if (found) {\n                if (found[2]) {\n                    this.line =
parseInt(found[2]) + lineAdjust;\n                }\n                if (found[3]) {\n                    this.column =
parseInt(found[3]);\n                }\n            }\n        }\n\n        this.callLine
 = callLine + 1;\n        this.callExtract = lines[callLine];\n\n        this.extract = [\n            lines[this.line - 2],\n
lines[this.line - 1],\n            lines[this.line]\n        ];\n    }\n\n};\n\nif (typeof Object.create === 'undefined') {\n
const F = function () {};\n    F.prototype = Error.prototype;\n    LessError.prototype = new F();\n} else {\n
LessError.prototype = Object.create(Error.prototype);\n}\n\nLessError.prototype.constructor = LessError;\n\n/**\n *
An overridden version of the default Object.prototype.toString\n * which uses additional information to create a
helpful message.\n *\n * @param {Object} options\n * @returns {string}\n */\nLessError.prototype.toString =
function(options) {\n    options = options || {};\n\n    let message = '';\n    const extract = this.extract || [];\n    let error
= [];\n    let stylize = function (str) { return str; };\n    if (options.stylize) {\n        const type = typeof
options.stylize;\n        if (type
 !== 'function') {\n            throw Error(`options.stylize should be a function, got a ${type}!`);\n        }\n        stylize =
options.stylize;\n    }\n\n    if (this.line !== null) {\n        if (typeof extract[0] === 'string') {\n
error.push(stylize(`${this.line - 1} ${extract[0]}`, 'grey'));\n        }\n\n        if (typeof extract[1] === 'string') {\n
  let errorTxt = `${this.line} `;\n            if (extract[1]) {\n                errorTxt += extract[1].slice(0, this.column) +\n
            stylize(stylize(stylize(extract[1].substr(this.column, 1), 'bold') +\n                    extract[1].slice(this.column
+ 1), 'red'), 'inverse');\n            }\n            error.push(errorTxt);\n        }\n\n        if (typeof extract[2] === 'string') {\n
        error.push(stylize(`${this.line + 1} ${extract[2]}`, 'grey'));\n        }\n        error = `${error.join('\\n') + stylize('',
'reset')}\\n`;\n    }\n\n    message += stylize(`${this.type}Error:
 ${this.message}`, 'red');\n    if (this.filename) {\n        message += stylize(' in ', 'red') + this.filename;\n    }\n    if
(this.line) {\n        message += stylize(` on line ${this.line}, column ${this.column + 1}:`, 'grey');\n    }\n\n
message += `\\n${error}`;\n\n    if (this.callLine) {\n        message += `${stylize('from ', 'red') + (this.filename ||
'')}/n`;\n        message += `${stylize(this.callLine, 'grey')} ${this.callExtract}/n`;\n    }\n\n    return
message;\n};\n\nexport default LessError;","import Node from './node';\nimport Element from './element';\nimport
LessError from '../less-error';\n\nconst Selector = function(elements, extendList, condition, index, currentFileInfo,
visibilityInfo) {\n    this.extendList = extendList;\n    this.condition = condition;\n    this.evaldCondition =
!condition;\n    this._index = index;\n    this._fileInfo = currentFileInfo;\n    this.elements =
this.getElements(elements);\n    this.mixinElements_ = undefined;\n    this.copyVisibilityInfo(visibilityInfo);\n
   this.setParent(this.elements, this);\n};\n\nSelector.prototype = Object.assign(new Node(), {\n    type:
'Selector',\n\n    accept(visitor) {\n        if (this.elements) {\n            this.elements =
visitor.visitArray(this.elements);\n        }\n        if (this.extendList) {\n            this.extendList =
visitor.visitArray(this.extendList);\n        }\n        if (this.condition) {\n            this.condition =
visitor.visit(this.condition);\n        }\n    },\n\n    createDerived(elements, extendList, evaldCondition) {\n
elements = this.getElements(elements);\n        const newSelector = new Selector(elements, extendList ||
this.extendList,\n            null, this.getIndex(), this.fileInfo(), this.visibilityInfo());\n        newSelector.evaldCondition
= (evaldCondition != null) ? evaldCondition : this.evaldCondition;\n        newSelector.mediaEmpty =
this.mediaEmpty;\n        return newSelector;\n    },\n\n    getElements(els) {\n        if
 (!els) {\n            return [new Element('', '&', false, this._index, this._fileInfo)];\n        }\n        if (typeof els ===
'string') {\n            this.parse.parseNode(\n                els, \n                ['selector'],\n                this._index, \n
this._fileInfo, \n                function(err, result) {\n                    if (err) {\n                        throw new LessError({\n
                index: err.index,\n                        message: err.message\n                    }, this.parse.imports,
this._fileInfo.filename);\n                    }\n                    els = result[0].elements;\n                });\n        }\n        return
els;\n    },\n\n    createEmptySelectors() {\n        const el = new Element('', '&', false, this._index, this._fileInfo), sels
= [new Selector([el], null, null, this._index, this._fileInfo)];\n        sels[0].mediaEmpty = true;\n        return sels;\n
},\n\n    match(other) {\n        const elements
 = this.elements;\n        const len = elements.length;\n        let olen;\n        let i;\n\n        other =
other.mixinElements();\n        olen = other.length;\n        if (olen === 0 || len < olen) {\n            return 0;\n        } else
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{\n for (i = 0; i < olen; i++) {\n if (elements[i].value !== other[i]) {\n return 0;\n }\n }\n }\n\n return olen; // return number of matched elements\n },\n\n mixinElements() {\n if (this.mixinElements_) {\n return this.mixinElements_;\n }\n\n let elements = this.elements.map(function(v) {\n return v.combinator.value + (v.value.value || v.value);\n }).join('').match(/[,&#*\\.\\w-]([\\w-]|(\\\\.))*/g);\n\n if (elements) {\n if (elements[0] === '&') {\n elements.shift();\n }\n } else {\n elements = [];\n }\n\n return (this.mixinElements_ = elements);\n },\n\n isJustParentSelector() {\n return !this.mediaEmpty &&\n this.elements.length === 1 &&\n this.elements[0].value === '&' &&\n (this.elements[0].combinator.value === ' ' || this.elements[0].combinator.value === '');\n },\n\n eval(context) {\n const evaldCondition = this.condition && this.condition.eval(context);\n let elements = this.elements;\n let extendList = this.extendList;\n\n elements = elements && elements.map(function (e) { return e.eval(context); });\n extendList = extendList && extendList.map(function(extend) { return extend.eval(context); });\n\n return this.createDerived(elements, extendList, evaldCondition);\n },\n\n genCSS(context, output) {\n let i, element;\n if ((!context || !context.firstSelector) && this.elements[0].combinator.value === '') {\n output.add(' ', this.fileInfo(), this.getIndex());\n }\n for (i = 0; i < this.elements.length; i++) {\n element = this.elements[i];\n element.genCSS(context, output);\n }\n },\n\n getIsOutput() {\n return this.evaldCondition;\n }\n});\n\nexport default Selector;\n","import Node from './node';\n\nconst Value = function(value) {\n if (!value) {\n throw new Error('Value requires an array argument');\n }\n if (!Array.isArray(value)) {\n this.value = [value];\n }\n else {\n this.value = value;\n }\n};\n\nValue.prototype = Object.assign(new Node(), {\n type: 'Value',\n\n accept(visitor) {\n if (this.value) {\n this.value = visitor.visitArray(this.value);\n }\n },\n\n eval(context) {\n if (this.value.length === 1) {\n return this.value[0].eval(context);\n } else {\n return new Value(this.value.map(function (v) {\n return v.eval(context);\n }));\n }\n },\n\n genCSS(context, output) {\n let i;\n for (i = 0; i < this.value.length; i++) {\n this.value[i].genCSS(context, output);\n if (i + 1 < this.value.length) {\n output.add((context && context.compress) ? ',' : ', ');\n }\n }\n }\n});\n\nexport default Value;\n","import Node from './node';\n\nconst Keyword = function(value) {\n this.value = value;\n};\n\nKeyword.prototype = Object.assign(new Node(), {\n type: 'Keyword',\n\n genCSS(context, output) {\n if (this.value === '%') {\n throw { type: 'Syntax', message: 'Invalid % without number' };\n }\n output.add(this.value);\n }\n});\n\nKeyword.True = new Keyword('true');\nKeyword.False = new Keyword('false');\n\nexport default Keyword;\n","import Node from './node';\n\nconst Anonymous = function(value, index, currentFileInfo, mapLines, rulesetLike, visibilityInfo) {\n this.value = value;\n this._index = index;\n this._fileInfo = currentFileInfo;\n this.mapLines = mapLines;\n this.rulesetLike = (typeof rulesetLike === 'undefined') ? false : rulesetLike;\n this.allowRoot = true;\n this.copyVisibilityInfo(visibilityInfo);\n};\n\nAnonymous.prototype = Object.assign(new Node(), {\n type: 'Anonymous',\n eval() {\n return new Anonymous(this.value, this._index, this._fileInfo, this.mapLines, this.rulesetLike, this.visibilityInfo());\n },\n compare(other) {\n return other.toCSS && this.toCSS() === other.toCSS() ? 0 : undefined;\n },\n isRulesetLike() {\n return this.rulesetLike;\n },\n genCSS(context, output) {\n this.nodeVisible = Boolean(this.value);\n if (this.nodeVisible) {\n output.add(this.value, this._fileInfo, this._index, this.mapLines);\n }\n }\n})\n\nexport default Anonymous;\n","import Node from './node';\nimport Value from './value';\nimport Keyword from './keyword';\nimport Anonymous from './anonymous';\nimport * as Constants from '../constants';\n\nconst MATH = Constants.Math;\n\nfunction evalName(context, name) {\n let value = '';\n let i;\n const n = name.length;\n const output = {add: function (s) {value += s;}};\n for (i = 0; i < n; i++) {\n name[i].eval(context).genCSS(context, output);\n }\n return value;\n}\n\nconst Declaration = function(name, value, important, merge, index, currentFileInfo, inline, variable) {\n this.name = name;\n this.value = (value instanceof Node) ? value : new Value([value ? new Anonymous(value) : null]);\n this.important = important ? `${important.trim()}` : '';\n this.merge = merge;\n this._index = index;\n this._fileInfo = currentFileInfo;\n this.inline = inline || false;\n this.variable = (variable !== undefined) ? variable\n : (name.charAt &&

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(name.charAt(0) === '@'));\n    this.allowRoot = true;\n    this.setParent(this.value,
this);\n};\n\nDeclaration.prototype = Object.assign(new Node(), {\n    type: 'Declaration',\n\n
  genCSS(context, output) {\n        output.add(this.name + (context.compress ? ':' : ': '), this.fileInfo(),
this.getIndex());\n        try {\n            this.value.genCSS(context, output);\n        }\n        catch (e) {\n            e.index
= this._index;\n            e.filename = this._fileInfo.filename;\n            throw e;\n        }\n
output.add(this.important + ((this.inline || (context.lastRule && context.compress)) ? '' : ';'), this._fileInfo,
this._index);\n    },\n\n    eval(context) {\n        let mathBypass = false, prevMath, name = this.name, evaldValue,
variable = this.variable;\n        if (typeof name !== 'string') {\n            // expand 'primitive' name directly to get\n
  // things faster (~10% for benchmark.less):\n            name = (name.length === 1) && (name[0] instanceof
Keyword) ?\n                name[0].value : evalName(context, name);\n            variable = false; // never treat expanded
interpolation as new variable name\n
        }\n\n        // @todo remove when parens-division is default\n        if (name === 'font' && context.math ===
MATH.ALWAYS) {\n            mathBypass = true;\n            prevMath = context.math;\n            context.math =
MATH.PARENS_DIVISION;\n        }\n        try {\n            context.importantScope.push({});\n            evaldValue =
this.value.eval(context);\n\n            if (!this.variable && evaldValue.type === 'DetachedRuleset') {\n                throw
{ message: 'Rulesets cannot be evaluated on a property.',\n                    index: this.getIndex(), filename:
this.fileInfo().filename };\n            }\n            let important = this.important;\n            const importantResult =
context.importantScope.pop();\n            if (!important && importantResult.important) {\n                important =
importantResult.important;\n            }\n\n            return new Declaration(name,\n                evaldValue,\n
important,\n                this.merge,\n
                this.getIndex(), this.fileInfo(), this.inline,\n                variable);\n        }\n        catch (e) {\n            if
(typeof e.index !== 'number') {\n                e.index = this.getIndex();\n                e.filename =
this.fileInfo().filename;\n            }\n            throw e;\n        }\n        finally {\n            if (mathBypass) {\n
context.math = prevMath;\n            }\n        }\n    },\n\n    makeImportant() {\n        return new
Declaration(this.name,\n            this.value,\n            '!important',\n            this.merge,\n            this.getIndex(),
this.fileInfo(), this.inline);\n    }\n});\n\nexport default Declaration;","function asComment(ctx) {\n    return `/* line
${ctx.debugInfo.lineNumber}, ${ctx.debugInfo.fileName} */\\n`;\n}\n\nfunction asMediaQuery(ctx) {\n    let
filenameWithProtocol = ctx.debugInfo.fileName;\n    if (!/^[a-z]+:\\/\\//i.test(filenameWithProtocol)) {\n
filenameWithProtocol = `file://${filenameWithProtocol}`;\n
    }\n    return `@media -sass-debug-info{filename{font-family:${filenameWithProtocol.replace(/([.:\\/\\\\])/g,
function (a) {\n        if (a == '\\\\') {\n            a = '\\/';\n        }\n        return `\\\\${a}`;\n    })}}line{font-
family:\\\\00003${ctx.debugInfo.lineNumber}}}\\n`;\n}\n\nfunction debugInfo(context, ctx, lineSeparator) {\n    let
result = '';\n    if (context.dumpLineNumbers && !context.compress) {\n        switch (context.dumpLineNumbers)
{\n            case 'comments':\n                result = asComment(ctx);\n                break;\n            case 'mediaquery':\n
        result = asMediaQuery(ctx);\n                break;\n            case 'all':\n                result = asComment(ctx) +
(lineSeparator || '') + asMediaQuery(ctx);\n                break;\n        }\n    }\n    return result;\n}\n\nexport default
debugInfo;\n\n","import Node from './node';\nimport getDebugInfo from './debug-info';\n\nconst Comment =
function(value,
 isLineComment, index, currentFileInfo) {\n    this.value = value;\n    this.isLineComment = isLineComment;\n
this._index = index;\n    this._fileInfo = currentFileInfo;\n    this.allowRoot = true;\n}\n\nComment.prototype =
Object.assign(new Node(), {\n    type: 'Comment',\n\n    genCSS(context, output) {\n        if (this.debugInfo) {\n
  output.add(getDebugInfo(context, this), this.fileInfo(), this.getIndex());\n        }\n        output.add(this.value);\n
},\n\n    isSilent(context) {\n        const isCompressed = context.compress && this.value[2] !== '!';\n        return
this.isLineComment || isCompressed;\n    }\n});\n\nexport default Comment;\n","const contexts = {};\nexport
default contexts;\nimport * as Constants from './constants';\n\nconst copyFromOriginal = function
copyFromOriginal(original, destination, propertiesToCopy) {\n    if (!original) { return; }\n\n    for (let i = 0; i <
propertiesToCopy.length; i++) {\n        if (original.hasOwnProperty(propertiesToCopy[i]))
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{\n destination[propertiesToCopy[i]] = original[propertiesToCopy[i]];\n }\n }\n};\n\n/*\n parse is used whilst parsing\n */\nconst parseCopyProperties = [\n // options\n 'paths', // option - unmodified - paths to search for imports on\n 'rewriteUrls', // option - whether to adjust URL's to be relative\n 'rootpath', // option - rootpath to append to URL's\n 'strictImports', // option -\n 'insecure', // option - whether to allow imports from insecure ssl hosts\n 'dumpLineNumbers', // option - whether to dump line numbers\n 'compress', // option - whether to compress\n 'syncImport', // option - whether to import synchronously\n 'chunkInput', // option - whether to chunk input. more performant but causes parse issues.\n 'mime', // browser only - mime type for sheet import\n 'useFileCache', // browser only - whether to use the per file session cache\n // context\n 'processImports', // option & context - whether to process imports. if false then imports will not be imported.\n // Used by the import manager to stop multiple import visitors being created.\n 'pluginManager' // Used as the plugin manager for the session\n];\n\ncontexts.Parse = function(options) {\n copyFromOriginal(options, this, parseCopyProperties);\n\n if (typeof this.paths === 'string') { this.paths = [this.paths]; }\n};\n\nconst evalCopyProperties = [\n 'paths', // additional include paths\n 'compress', // whether to compress\n 'math', // whether math has to be within parenthesis\n 'strictUnits', // whether units need to evaluate correctly\n 'sourceMap', // whether to output a source map\n 'importMultiple', // whether we are currently importing multiple copies\n 'urlArgs', // whether to add args into url tokens\n 'javascriptEnabled', // option - whether Inline JavaScript is enabled. if undefined, defaults to false\n 'pluginManager', // Used as the plugin manager for the session\n 'importantScope', // used to bubble up !important statements\n 'rewriteUrls' // option - whether to adjust URL's to be relative\n];\n\ncontexts.Eval = function(options, frames) {\n copyFromOriginal(options, this, evalCopyProperties);\n\n if (typeof this.paths === 'string') { this.paths = [this.paths]; }\n\n this.frames = frames || [];\n this.importantScope = this.importantScope || [];\n};\n\ncontexts.Eval.prototype.enterCalc = function () {\n if (!this.calcStack) {\n this.calcStack = [];\n }\n this.calcStack.push(true);\n this.inCalc = true;\n};\n\ncontexts.Eval.prototype.exitCalc = function () {\n this.calcStack.pop();\n if (!this.calcStack.length) {\n this.inCalc = false;\n }\n};\n\ncontexts.Eval.prototype.inParenthesis = function () {\n if (!this.parensStack) {\n this.parensStack = [];\n }\n this.parensStack.push(true);\n};\n\ncontexts.Eval.prototype.outOfParenthesis = function () {\n this.parensStack.pop();\n};\n\ncontexts.Eval.prototype.inCalc = false;\ncontexts.Eval.prototype.mathOn = true;\ncontexts.Eval.prototype.isMathOn = function (op) {\n if (!this.mathOn) {\n return false;\n }\n if (op === '/' && this.math !== Constants.Math.ALWAYS && (!this.parensStack || !this.parensStack.length)) {\n return false;\n }\n if (this.math > Constants.Math.PARENS_DIVISION) {\n return this.parensStack && this.parensStack.length;\n }\n return true;\n};\n\ncontexts.Eval.prototype.pathRequiresRewrite = function (path) {\n const isRelative = this.rewriteUrls === Constants.RewriteUrls.LOCAL ? isPathLocalRelative : isPathRelative;\n\n return isRelative(path);\n};\n\ncontexts.Eval.prototype.rewritePath = function (path, rootpath) {\n let newPath;\n\n rootpath = rootpath || '';\n newPath = this.normalizePath(rootpath + path);\n\n // If a path was explicit relative and the rootpath was not an absolute path\n // we must ensure that the new path is also explicit relative.\n if (isPathLocalRelative(path) &&\n isPathRelative(rootpath) &&\n isPathLocalRelative(newPath) === false) {\n newPath = `./${newPath}`;\n }\n\n return newPath;\n};\n\ncontexts.Eval.prototype.normalizePath = function (path) {\n const segments = path.split('/').reverse();\n let segment;\n\n path = [];\n while (segments.length !== 0) {\n segment = segments.pop();\n switch (segment) {\n case '.':\n break;\n case '..':\n if ((path.length === 0) || (path[path.length - 1] === '..')) {\n path.push(segment);\n } else {\n path.pop();\n }\n break;\n default:\n path.push(segment);\n break;\n }\n }\n\n return path.join('/');\n};\n\nfunction isPathRelative(path) {\n return !/^(?:[a-z-]+:|\/|#)/i.test(path);\n}\n\nfunction isPathLocalRelative(path) {\n return path.charAt(0) === '.';\n}\n\n// todo - do the same for the toCSS ?\n","function makeRegistry(base) {\n return {\n _data: {},\n add: function(name, func) {\n // precautionary case conversion, as later querying of\n // the registry by

function-caller uses lower case as well.\n name = name.toLowerCase();\n\n if (this._data.hasOwnProperty(name)) {\n // TODO warn\n }\n this._data[name] = func;\n },\n addMultiple: function(functions) {\n Object.keys(functions).forEach(\n name => {\n this.add(name, functions[name]);\n });\n },\n get: function(name) {\n return this._data[name] || (base && base.get(name));\n },\n getLocalFunctions: function() {\n return this._data;\n },\n inherit: function() {\n return makeRegistry(this);\n },\n create: function(base) {\n return makeRegistry(base);\n }\n};\n}\n\nexport default makeRegistry(null);","import Keyword from '../tree/keyword';\n\nconst defaultFunc = {\n eval: function () {\n const v = this.value_;\n const e = this.error_;\n if (e) {\n throw e;\n }\n if (v != null) {\n return v ? Keyword.True : Keyword.False;\n }\n },\n value: function (v) {\n this.value_ = v;\n },\n error: function (e) {\n this.error_ = e;\n },\n reset: function () {\n this.value_ = this.error_ = null;\n }\n};\n\nexport default defaultFunc;\n","import Node from './node';\nimport Declaration from './declaration';\nimport Keyword from './keyword';\nimport Comment from './comment';\nimport Paren from './paren';\nimport Selector from './selector';\nimport Element from './element';\nimport Anonymous from './anonymous';\nimport contexts from '../contexts';\nimport globalFunctionRegistry from '../functions/function-registry';\nimport defaultFunc from '../functions/default';\nimport getDebugInfo from './debug-info';\nimport * as utils from '../utils';\n\nconst Ruleset = function(selectors, rules, strictImports, visibilityInfo) {\n this.selectors = selectors;\n this.rules = rules;\n this._lookups = {};\n this._variables = null;\n this._properties = null;\n this.strictImports = strictImports;\n this.copyVisibilityInfo(visibilityInfo);\n this.allowRoot = true;\n\n this.setParent(this.selectors, this);\n this.setParent(this.rules, this);\n}\n\nRuleset.prototype = Object.assign(new Node(), {\n type: 'Ruleset',\n isRuleset: true,\n\n isRulesetLike() { return true; },\n\n accept(visitor) {\n if (this.paths) {\n this.paths = visitor.visitArray(this.paths, true);\n } else if (this.selectors) {\n this.selectors = visitor.visitArray(this.selectors);\n }\n if (this.rules && this.rules.length) {\n this.rules = visitor.visitArray(this.rules);\n }\n },\n\n eval(context) {\n const that = this;\n let selectors;\n let selCnt;\n let selector;\n let i;\n let hasVariable;\n let hasOnePassingSelector = false;\n\n if (this.selectors && (selCnt = this.selectors.length)) {\n selectors = new Array(selCnt);\n defaultFunc.error({\n type: 'Syntax',\n message: 'it is currently only allowed in parametric mixin guards,'\n });\n\n for (i = 0; i < selCnt; i++) {\n selector = this.selectors[i].eval(context);\n for (var j = 0; j < selector.elements.length; j++) {\n if (selector.elements[j].isVariable) {\n hasVariable = true;\n break;\n }\n }\n selectors[i] = selector;\n if (selector.evaldCondition) {\n hasOnePassingSelector = true;\n }\n }\n\n if (hasVariable) {\n const toParseSelectors = new Array(selCnt);\n for (i = 0; i < selCnt; i++) {\n selector = selectors[i];\n toParseSelectors[i] = selector.toCSS(context);\n }\n this.parse.parseNode(\n toParseSelectors.join(','),\n [\"selectors\"], \n selectors[0].getIndex(), \n selectors[0].fileInfo(), \n function(err, result) {\n if (result) {\n selectors = utils.flattenArray(result);\n }\n });\n }\n\n defaultFunc.reset();\n } else {\n hasOnePassingSelector = true;\n }\n\n let rules = this.rules ? utils.copyArray(this.rules) : null;\n const ruleset = new Ruleset(selectors, rules, this.strictImports, this.visibilityInfo());\n let rule;\n let subRule;\n\n ruleset.originalRuleset = this;\n ruleset.root = this.root;\n ruleset.firstRoot = this.firstRoot;\n ruleset.allowImports = this.allowImports;\n\n if (this.debugInfo) {\n ruleset.debugInfo = this.debugInfo;\n }\n\n if (!hasOnePassingSelector) {\n rules.length = 0;\n }\n\n // inherit a function registry from the frames stack when possible;\n // otherwise from the global registry\n ruleset.functionRegistry = (function (frames) {\n let i = 0;\n const n = frames.length;\n let found;\n for (; i !== n ; ++i) {\n found = frames[i].functionRegistry;\n if (found) { return found; }\n }\n return globalFunctionRegistry;\n }(context.frames)).inherit();\n\n // push the current ruleset to the frames stack\n const ctxFrames = context.frames;\n ctxFrames.unshift(ruleset);\n\n // currrent selectors\n let

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ctxSelectors = context.selectors;\n        if (!ctxSelectors) {\n            context.selectors = ctxSelectors = [];\n        }\n
  ctxSelectors.unshift(this.selectors);\n\n        // Evaluate imports\n        if (ruleset.root || ruleset.allowImports ||
!ruleset.strictImports) {\n            ruleset.evalImports(context);\n        }\n\n        // Store the frames around mixin
definitions,\n        // so they can be evaluated like closures when the time comes.\n        const rsRules =
ruleset.rules;\n        for (i = 0; (rule = rsRules[i]); i++) {\n            if (rule.evalFirst) {\n                rsRules[i] =
rule.eval(context);\n
            }\n        }\n\n        const mediaBlockCount = (context.mediaBlocks && context.mediaBlocks.length) || 0;\n\n
    // Evaluate mixin calls.\n        for (i = 0; (rule = rsRules[i]); i++) {\n            if (rule.type === 'MixinCall') {\n
     /* jshint loopfunc:true */\n                rules = rule.eval(context).filter(function(r) {\n                    if ((r instanceof
Declaration) && r.variable) {\n                        // do not pollute the scope if the variable is\n                        // already
there. consider returning false here\n                        // but we need a way to \"return\" variable from mixins\n
        return !(ruleset.variable(r.name));\n                    }\n                    return true;\n                });\n
rsRules.splice.apply(rsRules, [i, 1].concat(rules));\n                i += rules.length - 1;\n                ruleset.resetCache();\n
        } else if (rule.type ===  'VariableCall')
 {\n                /* jshint loopfunc:true */\n                rules = rule.eval(context).rules.filter(function(r) {\n                    if
((r instanceof Declaration) && r.variable) {\n                        // do not pollute the scope at all\n                        return
false;\n                    }\n                    return true;\n                });\n                rsRules.splice.apply(rsRules, [i,
1].concat(rules));\n                i += rules.length - 1;\n                ruleset.resetCache();\n            }\n        }\n\n        //
Evaluate everything else\n        for (i = 0; (rule = rsRules[i]); i++) {\n            if (!rule.evalFirst) {\n
rsRules[i] = rule = rule.eval ? rule.eval(context) : rule;\n            }\n        }\n\n        // Evaluate everything else\n
for (i = 0; (rule = rsRules[i]); i++) {\n            // for rulesets, check if it is a css guard and can be removed\n            if
(rule instanceof Ruleset && rule.selectors
 && rule.selectors.length === 1) {\n                // check if it can be folded in (e.g. & where)\n                if
(rule.selectors[0] && rule.selectors[0].isJustParentSelector()) {\n                    rsRules.splice(i--, 1);\n\n
for (var j = 0; (subRule = rule.rules[j]); j++) {\n                        if (subRule instanceof Node) {\n
subRule.copyVisibilityInfo(rule.visibilityInfo());\n                            if (!(subRule instanceof Declaration) ||
!subRule.variable) {\n                                rsRules.splice(++i, 0, subRule);\n                            }\n                        }\n
            }\n                }\n            }\n        }\n\n        // Pop the stack\n        ctxFrames.shift();\n
ctxSelectors.shift();\n\n        if (context.mediaBlocks) {\n            for (i = mediaBlockCount; i <
context.mediaBlocks.length; i++) {\n                context.mediaBlocks[i].bubbleSelectors(selectors);\n
    }\n        }\n\n        return ruleset;\n    },\n\n    evalImports(context) {\n        const rules = this.rules;\n        let i;\n
  let importRules;\n        if (!rules) { return; }\n\n        for (i = 0; i < rules.length; i++) {\n            if (rules[i].type ===
'Import') {\n                importRules = rules[i].eval(context);\n                if (importRules && (importRules.length ||
importRules.length === 0)) {\n                    rules.splice.apply(rules, [i, 1].concat(importRules));\n                    i +=
importRules.length - 1;\n                } else {\n                    rules.splice(i, 1, importRules);\n                }\n
this.resetCache();\n            }\n        }\n    },\n\n    makeImportant() {\n        const result = new Ruleset(this.selectors,
this.rules.map(function (r) {\n            if (r.makeImportant) {\n                return r.makeImportant();\n            } else {\n
            return r;\n            }\n        }), this.strictImports,
 this.visibilityInfo());\n\n        return result;\n    },\n\n    matchArgs(args) {\n        return !args || args.length === 0;\n
},\n\n    // lets you call a css selector with a guard\n    matchCondition(args, context) {\n        const lastSelector =
this.selectors[this.selectors.length - 1];\n        if (!lastSelector.evaldCondition) {\n            return false;\n        }\n
if (lastSelector.condition &&\n            !lastSelector.condition.eval(\n                new contexts.Eval(context,\n
    context.frames))) {\n            return false;\n        }\n        return true;\n    },\n\n    resetCache() {\n        this._rulesets
= null;\n        this._variables = null;\n        this._properties = null;\n        this._lookups = {};\n    },\n\n    variables()
{\n        if (!this._variables) {\n            this._variables = !this.rules ? {} : this.rules.reduce(function (hash, r) {\n
    if (r instanceof Declaration && r.variable === true) {\n
                hash[r.name] = r;\n                }\n                // when evaluating variables in an import statement, imports
have not been eval'd\n                // so we need to go inside import statements.\n                // guard against root being a
```

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string (in the case of inlined less)\n            if (r.type === 'Import' && r.root && r.root.variables) {\n
const vars = r.root.variables();\n            for (const name in vars) {\n                if
(vars.hasOwnProperty(name)) {\n                    hash[name] = r.root.variable(name);\n                }\n
    }\n            }\n            return hash;\n        }, {});\n    }\n    return this._variables;\n    },\n\n
properties() {\n    if (!this._properties) {\n        this._properties = !this.rules ? {} : this.rules.reduce(function
(hash, r) {\n            if (r instanceof Declaration && r.variable !== true) {\n
        const name = (r.name.length === 1) && (r.name[0] instanceof Keyword) ?\n                r.name[0].value :
r.name;\n            // Properties don't overwrite as they can merge\n            if (!hash[`$${name}`]) {\n
        hash[`$${name}`] = [ r ];\n            }\n            else {\n                hash[`$${name}`].push(r);\n
        }\n            }\n            return hash;\n        }, {});\n    }\n    return this._properties;\n    },\n\n
variable(name) {\n    const decl = this.variables()[name];\n    if (decl) {\n        return this.parseValue(decl);\n
    }\n    },\n\n    property(name) {\n    const decl = this.properties()[name];\n    if (decl) {\n        return
this.parseValue(decl);\n    }\n    },\n\n    lastDeclaration() {\n    for (let i = this.rules.length; i > 0; i--) {\n
const decl = this.rules[i - 1];\n        if (decl
 instanceof Declaration) {\n            return this.parseValue(decl);\n        }\n    }\n    },\n\n
parseValue(toParse) {\n    const self = this;\n    function transformDeclaration(decl) {\n        if (decl.value
instanceof Anonymous && !decl.parsed) {\n            if (typeof decl.value.value === 'string') {\n
this.parse.parseNode(\n                decl.value.value,\n                ['value', 'important'], \n
decl.value.getIndex(), \n                decl.fileInfo(), \n                function(err, result) {\n                    if
(err) {\n                        decl.parsed = true;\n                    }\n                    if (result) {\n
  decl.value = result[0];\n                        decl.important = result[1] || '';\n                        decl.parsed =
true;\n                    }\n
            });\n        } else {\n            decl.parsed = true;\n        }\n\n        return decl;\n
}\n        else {\n            return decl;\n        }\n    }\n    if (!Array.isArray(toParse)) {\n        return
transformDeclaration.call(self, toParse);\n    }\n    else {\n        const nodes = [];\n
toParse.forEach(function(n) {\n            nodes.push(transformDeclaration.call(self, n));\n        });\n        return
nodes;\n    }\n    },\n\n    rulesets() {\n    if (!this.rules) { return []; }\n\n    const filtRules = [];\n    const
rules = this.rules;\n    let i;\n    let rule;\n\n    for (i = 0; (rule = rules[i]); i++) {\n        if (rule.isRuleset) {\n
        filtRules.push(rule);\n        }\n    }\n\n    return filtRules;\n    },\n\n    prependRule(rule) {\n    const
rules = this.rules;\n    if (rules) {\n
        rules.unshift(rule);\n    } else {\n        this.rules = [ rule ];\n    }\n    this.setParent(rule, this);\n
},\n\n    find(selector, self, filter) {\n    self = self || this;\n    const rules = [];\n    let match;\n    let
foundMixins;\n    const key = selector.toCSS();\n\n    if (key in this._lookups) { return this._lookups[key]; }\n\n
    this.rulesets().forEach(function (rule) {\n        if (rule !== self) {\n            for (let j = 0; j <
rule.selectors.length; j++) {\n                match = selector.match(rule.selectors[j]);\n                if (match) {\n
        if (selector.elements.length > match) {\n                    if (!filter || filter(rule)) {\n
foundMixins = rule.find(new Selector(selector.elements.slice(match)), self, filter);\n                        for (let i =
0; i < foundMixins.length; ++i) {\n
  foundMixins[i].path.push(rule);\n                    }\n                    Array.prototype.push.apply(rules,
foundMixins);\n                }\n            } else {\n                rules.push({ rule, path: []});\n
    }\n                break;\n            }\n        }\n    });\n    this._lookups[key] = rules;\n
   return rules;\n    },\n\n    genCSS(context, output) {\n    let i;\n    let j;\n    const charsetRuleNodes = [];\n
  let ruleNodes = [];\n\n    let // Line number debugging\n        debugInfo;\n\n    let rule;\n    let path;\n\n
 context.tabLevel = (context.tabLevel || 0);\n\n    if (!this.root) {\n        context.tabLevel++;\n    }\n\n
const tabRuleStr = context.compress ? '' : Array(context.tabLevel + 1).join('  ');\n    const tabSetStr =
context.compress ? '' : Array(context.tabLevel).join('
');\n    let sep;\n\n    let charsetNodeIndex = 0;\n    let importNodeIndex = 0;\n    for (i = 0; (rule =
this.rules[i]); i++) {\n        if (rule instanceof Comment) {\n            if (importNodeIndex === i) {\n
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importNodeIndex++;\n            }\n            ruleNodes.push(rule);\n        } else if (rule.isCharset &&
rule.isCharset()) {\n            ruleNodes.splice(charsetNodeIndex, 0, rule);\n            charsetNodeIndex++;\n
    importNodeIndex++;\n        } else if (rule.type === 'Import') {\n            ruleNodes.splice(importNodeIndex,
0, rule);\n            importNodeIndex++;\n        } else {\n            ruleNodes.push(rule);\n        }\n    }\n
ruleNodes = charsetRuleNodes.concat(ruleNodes);\n\n    // If this is the root node, we don't render\n    // a
selector, or {}.\n    if (!this.root) {\n        debugInfo = getDebugInfo(context, this,
 tabSetStr);\n\n        if (debugInfo) {\n            output.add(debugInfo);\n            output.add(tabSetStr);\n
}\n\n        const paths = this.paths;\n        const pathCnt = paths.length;\n        let pathSubCnt;\n\n        sep
= context.compress ? ',' : (`,\\n${tabSetStr}`);\n\n        for (i = 0; i < pathCnt; i++) {\n            path = paths[i];\n
        if (!(pathSubCnt = path.length)) { continue; }\n            if (i > 0) { output.add(sep); }\n\n
context.firstSelector = true;\n            path[0].genCSS(context, output);\n\n            context.firstSelector = false;\n
            for (j = 1; j < pathSubCnt; j++) {\n                path[j].genCSS(context, output);\n            }\n        }\n\n
        output.add((context.compress ? '{' : ' {\\n') + tabRuleStr);\n    }\n\n    // Compile rules and rulesets\n
for (i = 0; (rule = ruleNodes[i]); i++) {\n\n        if
 (i + 1 === ruleNodes.length) {\n            context.lastRule = true;\n        }\n\n        const currentLastRule =
context.lastRule;\n        if (rule.isRulesetLike(rule)) {\n            context.lastRule = false;\n        }\n\n        if
(rule.genCSS) {\n            rule.genCSS(context, output);\n        } else if (rule.value) {\n
output.add(rule.value.toString());\n        }\n\n        context.lastRule = currentLastRule;\n\n        if
(!context.lastRule && rule.isVisible()) {\n            output.add(context.compress ? '' : (`\\n${tabRuleStr}`));\n
} else {\n            context.lastRule = false;\n        }\n    }\n\n    if (!this.root) {\n
output.add((context.compress ? '}' : `\\n${tabSetStr}}`));\n        context.tabLevel--;\n    }\n\n    if
(!output.isEmpty() && !context.compress && this.firstRoot) {\n        output.add('\\n');\n    }\n},\n\n
joinSelectors(paths,
 context, selectors) {\n    for (let s = 0; s < selectors.length; s++) {\n        this.joinSelector(paths, context,
selectors[s]);\n    }\n},\n\njoinSelector(paths, context, selector) {\n\n    function
createParenthesis(elementsToPak, originalElement) {\n        let replacementParen, j;\n        if
(elementsToPak.length === 0) {\n            replacementParen = new Paren(elementsToPak[0]);\n        } else {\n
        const insideParent = new Array(elementsToPak.length);\n            for (j = 0; j < elementsToPak.length; j++)
{\n                insideParent[j] = new Element(\n                    null,\n                    elementsToPak[j],\n
originalElement.isVariable,\n                    originalElement._index,\n                    originalElement._fileInfo\n
                );\n            }\n            replacementParen = new Paren(new Selector(insideParent));\n
}\n        return replacementParen;\n    }\n\n    function createSelector(containedElement, originalElement)
{\n        let element, selector;\n        element = new Element(null, containedElement,
originalElement.isVariable, originalElement._index, originalElement._fileInfo);\n        selector = new
Selector([element]);\n        return selector;\n    }\n\n    // joins selector path from `beginningPath` with
selector path in `addPath`\n    // `replacedElement` contains element that is being replaced by `addPath`\n    //
returns concatenated path\n    function addReplacementIntoPath(beginningPath, addPath, replacedElement,
originalSelector) {\n        let newSelectorPath, lastSelector, newJoinedSelector;\n        // our new selector path\n
        newSelectorPath = [];\n\n        // construct the joined selector - if & is the first thing this will be empty,\n
    // if not newJoinedSelector will be the last set of
 elements in the selector\n        if (beginningPath.length > 0) {\n            newSelectorPath =
utils.copyArray(beginningPath);\n            lastSelector = newSelectorPath.pop();\n            newJoinedSelector =
originalSelector.createDerived(utils.copyArray(lastSelector.elements));\n        }\n        else {\n
newJoinedSelector = originalSelector.createDerived([]);\n        }\n\n        if (addPath.length > 0) {\n            //
/deep/ is a CSS4 selector - (removed, so should deprecate)\n            // that is valid without anything in front of it\n
            // so if the & does not have a combinator that is \"\" or \" \" then\n            // and there is a combinator on
the parent, then grab that.\n            // this also allows + a { & .b { .a & { ... though not sure why you would want
to do that\n            let combinator = replacedElement.combinator;\n\n            const parentEl =
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addPath[0].elements[0];\n
            if (combinator.emptyOrWhitespace && !parentEl.combinator.emptyOrWhitespace) {\n
combinator = parentEl.combinator;\n            }\n            // join the elements so far with the first part of the
parent\n            newJoinedSelector.elements.push(new Element(\n                combinator,\n
parentEl.value,\n                replacedElement.isVariable,\n                replacedElement._index,\n
replacedElement._fileInfo\n            ));\n            newJoinedSelector.elements =
newJoinedSelector.elements.concat(addPath[0].elements.slice(1));\n        }\n\n        // now add the joined
selector - but only if it is not empty\n        if (newJoinedSelector.elements.length !== 0) {\n
newSelectorPath.push(newJoinedSelector);\n        }\n\n        // put together the parent selectors after the join
(e.g. the rest of the parent)\n        if (addPath.length
 > 1) {\n            let restOfPath = addPath.slice(1);\n            restOfPath = restOfPath.map(function (selector) {\n
            return selector.createDerived(selector.elements, []);\n            });\n            newSelectorPath =
newSelectorPath.concat(restOfPath);\n        }\n        return newSelectorPath;\n    }\n\n    // joins selector
path from `beginningPath` with every selector path in `addPaths` array\n    // `replacedElement` contains element
that is being replaced by `addPath`\n    // returns array with all concatenated paths\n    function
addAllReplacementsIntoPath( beginningPath, addPaths, replacedElement, originalSelector, result) {\n        let j;\n
    for (j = 0; j < beginningPath.length; j++) {\n            const newSelectorPath =
addReplacementIntoPath(beginningPath[j], addPaths, replacedElement, originalSelector);\n
result.push(newSelectorPath);\n        }\n        return
 result;\n    }\n\n    function mergeElementsOnToSelectors(elements, selectors) {\n        let i, sel;\n\n        if
(elements.length === 0) {\n            return ;\n        }\n        if (selectors.length === 0) {\n
selectors.push([ new Selector(elements) ]);\n            return;\n        }\n\n        for (i = 0; (sel = selectors[i]);
i++) {\n            // if the previous thing in sel is a parent this needs to join on to it\n            if (sel.length > 0) {\n
            sel[sel.length - 1] = sel[sel.length - 1].createDerived(sel[sel.length - 1].elements.concat(elements));\n
    }\n            else {\n                sel.push(new Selector(elements));\n            }\n        }\n    }\n\n    //
replace all parent selectors inside `inSelector` by content of `context` array\n    // resulting selectors are returned
inside `paths` array\n    // returns true if `inSelector`
 contained at least one parent selector\n    function replaceParentSelector(paths, context, inSelector) {\n        //
The paths are [[Selector]]\n        // The first list is a list of comma separated selectors\n        // The inner list is a
list of inheritance separated selectors\n        // e.g.\n        // .a, .b {\n        //   .c {\n        //   }\n        // }\n
    // == [[.a] [.c]] [[.b] [.c]]\n        //\n        let i, j, k, currentElements, newSelectors, selectorsMultiplied, sel,
el, hadParentSelector = false, length, lastSelector;\n        function findNestedSelector(element) {\n            let
maybeSelector;\n            if (!(element.value instanceof Paren)) {\n                return null;\n            }\n\n
  maybeSelector = element.value.value;\n            if (!(maybeSelector instanceof Selector)) {\n                return
null;\n            }\n\n            return maybeSelector;\n
        }\n\n        // the elements from the current selector so far\n        currentElements = [];\n        // the
current list of new selectors to add to the path.\n        // We will build it up. We initiate it with one empty selector
as we \"multiply\" the new selectors\n        // by the parents\n        newSelectors = [\n            []\n        ];\n\n
    for (i = 0; (el = inSelector.elements[i]); i++) {\n            // non parent reference elements just get added\n
    if (el.value !== '&') {\n                const nestedSelector = findNestedSelector(el);\n                if
(nestedSelector != null) {\n                    // merge the current list of non parent selector elements\n                    //
on to the current list of selectors to add\n                    mergeElementsOnToSelectors(currentElements,
newSelectors);\n\n                    const nestedPaths = [];\n
    let replaced;\n                    const replacedNewSelectors = [];\n                    replaced =
replaceParentSelector(nestedPaths, context, nestedSelector);\n                    hadParentSelector = hadParentSelector
|| replaced;\n                    // the nestedPaths array should have only one member - replaceParentSelector does not
multiply selectors\n                    for (k = 0; k < nestedPaths.length; k++) {\n                        const
replacementSelector = createSelector(createParenthesis(nestedPaths[k], el), el);\n
```

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addAllReplacementsIntoPath(newSelectors, [replacementSelector], el, inSelector, replacedNewSelectors);\n
        }\n                    newSelectors = replacedNewSelectors;\n                    currentElements = [];\n                }
else {\n                    currentElements.push(el);\n                }\n\n            } else {\n
hadParentSelector
 = true;\n                // the new list of selectors to add\n                selectorsMultiplied = [];\n\n                //
merge the current list of non parent selector elements\n                // on to the current list of selectors to add\n
      mergeElementsOnToSelectors(currentElements, newSelectors);\n\n                // loop through our current
selectors\n                for (j = 0; j < newSelectors.length; j++) {\n                    sel = newSelectors[j];\n
   // if we don't have any parent paths, the & might be in a mixin so that it can be used\n                    // whether
there are parents or not\n                    if (context.length === 0) {\n                        // the combinator used on el
should now be applied to the next element instead so that\n                        // it is not lost\n                        if
(sel.length > 0) {\n                            sel[0].elements.push(new
 Element(el.combinator, '', el.isVariable, el._index, el._fileInfo));\n                        }\n
selectorsMultiplied.push(sel);\n                    }\n                    else {\n                        // and the parent
selectors\n                        for (k = 0; k < context.length; k++) {\n                            // We need to put the current
selectors\n                            // then join the last selector's elements on to the parents selectors\n
const newSelectorPath = addReplacementIntoPath(sel, context[k], el, inSelector);\n                            // add that to
our new set of selectors\n                            selectorsMultiplied.push(newSelectorPath);\n                        }\n
            }\n                }\n\n                // our new selectors has been multiplied, so reset the state\n
newSelectors
 = selectorsMultiplied;\n                currentElements = [];\n            }\n        }\n\n        // if we have any
elements left over (e.g. .a& .b == .b)\n        // add them on to all the current selectors\n
mergeElementsOnToSelectors(currentElements, newSelectors);\n\n        for (i = 0; i < newSelectors.length; i++)
{\n            length = newSelectors[i].length;\n            if (length > 0) {\n
paths.push(newSelectors[i]);\n                lastSelector = newSelectors[i][length - 1];\n
newSelectors[i][length - 1] = lastSelector.createDerived(lastSelector.elements, inSelector.extendList);\n
}\n        }\n\n        return hadParentSelector;\n    }\n\n    function deriveSelector(visibilityInfo, deriveFrom)
{\n        const newSelector = deriveFrom.createDerived(deriveFrom.elements, deriveFrom.extendList,
deriveFrom.evaldCondition);\n        newSelector.copyVisibilityInfo(visibilityInfo);\n
        return newSelector;\n    }\n\n    // joinSelector code follows\n    let i, newPaths,
hadParentSelector;\n\n    newPaths = [];\n    hadParentSelector = replaceParentSelector(newPaths, context,
selector);\n\n    if (!hadParentSelector) {\n        if (context.length > 0) {\n            newPaths = [];\n
for (i = 0; i < context.length; i++) {\n\n                const concatenated = context[i].map(deriveSelector.bind(this,
selector.visibilityInfo()));\n\n                concatenated.push(selector);\n
newPaths.push(concatenated);\n            }\n        }\n        else {\n            newPaths = [[selector]];\n
}\n    }\n\n    for (i = 0; i < newPaths.length; i++) {\n        paths.push(newPaths[i]);\n    }\n\n
}\n});\n\nexport default Ruleset;\n","import Node from './node';\nimport Selector from './selector';\nimport Ruleset
from './ruleset';\nimport
 Anonymous from './anonymous';\n\nconst AtRule = function(\n    name,\n    value,\n    rules,\n    index,\n
currentFileInfo,\n    debugInfo,\n    isRooted,\n    visibilityInfo\n) {\n    let i;\n\n    this.name = name;\n    this.value
= (value instanceof Node) ? value : (value ? new Anonymous(value) : value);\n    if (rules) {\n        if
(Array.isArray(rules)) {\n            this.rules = rules;\n        } else {\n            this.rules = [rules];\n
this.rules[0].selectors = (new Selector([], null, null, index, currentFileInfo)).createEmptySelectors();\n        }\n
for (i = 0; i < this.rules.length; i++) {\n            this.rules[i].allowImports = true;\n        }\n
this.setParent(this.rules, this);\n    }\n    this._index = index;\n    this._fileInfo = currentFileInfo;\n    this.debugInfo =
debugInfo;\n    this.isRooted = isRooted || false;\n    this.copyVisibilityInfo(visibilityInfo);\n    this.allowRoot =
true;\n}\n\nAtRule.prototype = Object.assign(new
```

Node(), {\n type: 'AtRule',\n accept(visitor) {\n const value = this.value, rules = this.rules;\n if (rules) {\n this.rules = visitor.visitArray(rules);\n }\n if (value) {\n this.value = visitor.visit(value);\n }\n },\n\n isRulesetLike() {\n return this.rules || !this.isCharset();\n },\n\n isCharset() {\n return '@charset' === this.name;\n },\n\n genCSS(context, output) {\n const value = this.value, rules = this.rules;\n output.add(this.name, this.fileInfo(), this.getIndex());\n if (value) {\n output.add(' ');\n value.genCSS(context, output);\n }\n if (rules) {\n this.outputRuleset(context, output, rules);\n } else {\n output.add(';');\n }\n },\n\n eval(context) {\n let mediaPathBackup, mediaBlocksBackup, value = this.value, rules = this.rules;\n\n // media stored inside other atrule should not bubble over it\n // backpup media bubbling information\n mediaPathBackup = context.mediaPath;\n mediaBlocksBackup = context.mediaBlocks;\n // deleted media bubbling information\n context.mediaPath = [];\n context.mediaBlocks = [];\n\n if (value) {\n value = value.eval(context);\n }\n if (rules) {\n // assuming that there is only one rule at this point - that is how parser constructs the rule\n rules = [rules[0].eval(context)];\n rules[0].root = true;\n }\n // restore media bubbling information\n context.mediaPath = mediaPathBackup;\n context.mediaBlocks = mediaBlocksBackup;\n\n return new AtRule(this.name, value, rules,\n this.getIndex(), this.fileInfo(), this.debugInfo, this.isRooted, this.visibilityInfo());\n },\n\n variable(name) {\n if (this.rules) {\n // assuming that there is only one rule at this point - that is how parser constructs the rule\n return Ruleset.prototype.variable.call(this.rules[0], name);\n }\n },\n\n find() {\n if (this.rules) {\n // assuming that there is only one rule at this point - that is how parser constructs the rule\n return Ruleset.prototype.find.apply(this.rules[0], arguments);\n }\n },\n\n rulesets() {\n if (this.rules) {\n // assuming that there is only one rule at this point - that is how parser constructs the rule\n return Ruleset.prototype.rulesets.apply(this.rules[0]);\n }\n },\n\n outputRuleset(context, output, rules) {\n const ruleCnt = rules.length;\n let i;\n context.tabLevel = (context.tabLevel | 0) + 1;\n\n // Compressed\n if (context.compress) {\n output.add('{');\n for (i = 0; i < ruleCnt; i++) {\n rules[i].genCSS(context, output);\n }\n output.add('}');\n context.tabLevel--;\n return;\n }\n\n // Non-compressed\n const tabSetStr = `\\n${Array(context.tabLevel).join('  ')}`, tabRuleStr = `${tabSetStr}  `;\n if (!ruleCnt) {\n output.add(` {${tabSetStr}}`);\n } else {\n output.add(` {${tabRuleStr}`);\n rules[0].genCSS(context, output);\n for (i = 1; i < ruleCnt; i++) {\n output.add(tabRuleStr);\n rules[i].genCSS(context, output);\n }\n output.add(`${tabSetStr}}`);\n }\n\n context.tabLevel--;\n }\n});\n\nexport default AtRule;\n","import Node from './node';\nimport contexts from '../contexts';\nimport * as utils from '../utils';\n\nconst DetachedRuleset = function(ruleset, frames) {\n this.ruleset = ruleset;\n this.frames = frames;\n this.setParent(this.ruleset, this);\n};\n\nDetachedRuleset.prototype = Object.assign(new Node(),\n {\n type: 'DetachedRuleset',\n evalFirst: true,\n\n accept(visitor) {\n this.ruleset = visitor.visit(this.ruleset);\n },\n\n eval(context) {\n const frames = this.frames || utils.copyArray(context.frames);\n return new DetachedRuleset(this.ruleset, frames);\n },\n\n callEval(context) {\n return this.ruleset.eval(this.frames ? new contexts.Eval(context, this.frames.concat(context.frames)) : context);\n }\n});\n\nexport default DetachedRuleset;\n","import Node from './node';\nimport unitConversions from '../data/unit-conversions';\nimport * as utils from '../utils';\n\nconst Unit = function(numerator, denominator, backupUnit) {\n this.numerator = numerator ? utils.copyArray(numerator).sort() : [];\n this.denominator = denominator ? utils.copyArray(denominator).sort() : [];\n if (backupUnit) {\n this.backupUnit = backupUnit;\n } else if (numerator && numerator.length) {\n this.backupUnit = numerator[0];\n }\n};\n\nUnit.prototype = Object.assign(new Node(), {\n type: 'Unit',\n\n clone() {\n return new Unit(utils.copyArray(this.numerator), utils.copyArray(this.denominator), this.backupUnit);\n },\n\n genCSS(context, output) {\n // Dimension checks the unit is singular and throws an error if in strict math

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mode.\n        const strictUnits = context && context.strictUnits;\n        if (this.numerator.length === 1) {\n
output.add(this.numerator[0]); // the ideal situation\n        } else if (!strictUnits && this.backupUnit) {\n
output.add(this.backupUnit);\n        } else if (!strictUnits && this.denominator.length) {\n
output.add(this.denominator[0]);\n        }\n    },\n\n    toString() {\n        let i, returnStr = this.numerator.join('*');\n
  for (i = 0; i < this.denominator.length; i++) {\n            returnStr += `/${this.denominator[i]}`;\n        }\n        return
returnStr;\n    },\n\n    compare(other) {\n        return
 this.is(other.toString()) ? 0 : undefined;\n    },\n\n    is(unitString) {\n        return this.toString().toUpperCase() ===
unitString.toUpperCase();\n    },\n\n    isLength() {\n        return
RegExp('^(px|em|ex|ch|rem|in|cm|mm|pc|pt|ex|vw|vh|vmin|vmax)$', 'gi').test(this.toCSS());\n    },\n\n    isEmpty() {\n
      return this.numerator.length === 0 && this.denominator.length === 0;\n    },\n\n    isSingular() {\n        return
this.numerator.length <= 1 && this.denominator.length === 0;\n    },\n\n    map(callback) {\n        let i;\n\n        for
(i = 0; i < this.numerator.length; i++) {\n            this.numerator[i] = callback(this.numerator[i], false);\n        }\n\n
 for (i = 0; i < this.denominator.length; i++) {\n            this.denominator[i] = callback(this.denominator[i], true);\n
 }\n    },\n\n    usedUnits() {\n        let group;\n        const result = {};\n        let mapUnit;\n        let groupName;\n\n
   mapUnit = function (atomicUnit) {\n
     /* jshint loopfunc:true */\n            if (group.hasOwnProperty(atomicUnit) && !result[groupName]) {\n
result[groupName] = atomicUnit;\n            }\n\n            return atomicUnit;\n        };\n\n        for (groupName in
unitConversions) {\n            if (unitConversions.hasOwnProperty(groupName)) {\n                group =
unitConversions[groupName];\n\n                this.map(mapUnit);\n            }\n        }\n\n        return result;\n    },\n\n
cancel() {\n        const counter = {};\n        let atomicUnit;\n        let i;\n\n        for (i = 0; i < this.numerator.length;
i++) {\n            atomicUnit = this.numerator[i];\n            counter[atomicUnit] = (counter[atomicUnit] || 0) + 1;\n
}\n\n        for (i = 0; i < this.denominator.length; i++) {\n            atomicUnit = this.denominator[i];\n
counter[atomicUnit] = (counter[atomicUnit] || 0) - 1;\n        }\n\n        this.numerator = [];\n        this.denominator =
[];\n\n
     for (atomicUnit in counter) {\n            if (counter.hasOwnProperty(atomicUnit)) {\n                const count =
counter[atomicUnit];\n\n                if (count > 0) {\n                    for (i = 0; i < count; i++) {\n
this.numerator.push(atomicUnit);\n                    }\n                } else if (count < 0) {\n                    for (i = 0; i < -
count; i++) {\n                        this.denominator.push(atomicUnit);\n                    }\n                }\n            }\n
}\n\n        this.numerator.sort();\n        this.denominator.sort();\n    }\n});\n\nexport default Unit;\n","import Node
from './node';\nimport unitConversions from '../data/unit-conversions';\nimport Unit from './unit';\nimport Color
from './color';\n\n//\n// A number with a unit\n//\nconst Dimension = function(value, unit) {\n    this.value =
parseFloat(value);\n    if (isNaN(this.value)) {\n        throw new Error('Dimension is not a number.');\n    }\n
this.unit
 = (unit && unit instanceof Unit) ? unit :\n        new Unit(unit ? [unit] : undefined);\n    this.setParent(this.unit,
this);\n};\n\nDimension.prototype = Object.assign(new Node(), {\n    type: 'Dimension',\n\n    accept(visitor) {\n
this.unit = visitor.visit(this.unit);\n    },\n\n    eval(context) {\n        return this;\n    },\n\n    toColor() {\n        return
new Color([this.value, this.value, this.value]);\n    },\n\n    genCSS(context, output) {\n        if ((context &&
context.strictUnits) && !this.unit.isSingular()) {\n            throw new Error(`Multiple units in dimension. Correct the
units or use the unit function. Bad unit: ${this.unit.toString()}`);\n        }\n\n        const value = this.fround(context,
this.value);\n        let strValue = String(value);\n\n        if (value !== 0 && value < 0.000001 && value > -0.000001)
{\n            // would be output 1e-6 etc.\n            strValue = value.toFixed(20).replace(/0+$/, '');\n        }\n\n        if
(context
 && context.compress) {\n            // Zero values doesn't need a unit\n            if (value === 0 &&
this.unit.isLength()) {\n                output.add(strValue);\n                return;\n            }\n\n            // Float values
doesn't need a leading zero\n            if (value > 0 && value < 1) {\n                strValue = (strValue).substr(1);\n
 }\n        }\n\n        output.add(strValue);\n        this.unit.genCSS(context, output);\n    },\n\n    // In an operation
between two Dimensions,\n    // we default to the first Dimension's unit,\n    // so `1px + 2` will yield `3px`.\n
operate(context, op, other) {\n        /* jshint noempty:false */\n        let value = this._operate(context, op, this.value,
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other.value);\n let unit = this.unit.clone();\n\n if (op === '+' || op === '-') {\n if (unit.numerator.length === 0 && unit.denominator.length === 0) {\n unit = other.unit.clone();\n if (this.unit.backupUnit)
{\n unit.backupUnit = this.unit.backupUnit;\n }\n } else if (other.unit.numerator.length === 0 && unit.denominator.length === 0) {\n // do nothing\n } else {\n other = other.convertTo(this.unit.usedUnits());\n\n if (context.strictUnits && other.unit.toString() !== unit.toString()) {\n throw new Error(`Incompatible units. Change the units or use the unit function. `\n + `Bad units: '${unit.toString()}' and '${other.unit.toString()}'.`);\n }\n\n value = this._operate(context, op, this.value, other.value);\n }\n } else if (op === '*') {\n unit.numerator = unit.numerator.concat(other.unit.numerator).sort();\n unit.denominator = unit.denominator.concat(other.unit.denominator).sort();\n unit.cancel();\n } else if (op === '/') {\n unit.numerator = unit.numerator.concat(other.unit.denominator).sort();\n unit.denominator = unit.denominator.concat(other.unit.numerator).sort();\n unit.cancel();\n }\n return new Dimension(value, unit);\n },\n\n compare(other) {\n let a, b;\n\n if (!(other instanceof Dimension)) {\n return undefined;\n }\n\n if (this.unit.isEmpty() || other.unit.isEmpty()) {\n a = this;\n b = other;\n } else {\n a = this.unify();\n b = other.unify();\n if (a.unit.compare(b.unit) !== 0) {\n return undefined;\n }\n }\n\n return Node.numericCompare(a.value, b.value);\n },\n\n unify() {\n return this.convertTo({ length: 'px', duration: 's', angle: 'rad' });\n },\n\n convertTo(conversions) {\n let value = this.value;\n const unit = this.unit.clone();\n let i;\n let groupName;\n let group;\n
let targetUnit;\n let derivedConversions = {};\n let applyUnit;\n\n if (typeof conversions === 'string') {\n for (i in unitConversions) {\n if (unitConversions[i].hasOwnProperty(conversions)) {\n derivedConversions = {};\n derivedConversions[i] = conversions;\n }\n }\n conversions = derivedConversions;\n }\n applyUnit = function (atomicUnit, denominator) {\n /* jshint loopfunc:true */\n if (group.hasOwnProperty(atomicUnit)) {\n if (denominator) {\n value = value / (group[atomicUnit] / group[targetUnit]);\n } else {\n value = value * (group[atomicUnit] / group[targetUnit]);\n }\n\n return targetUnit;\n }\n\n return atomicUnit;\n };\n\n for (groupName in conversions) {\n if (conversions.hasOwnProperty(groupName))
{\n targetUnit = conversions[groupName];\n group = unitConversions[groupName];\n\n unit.map(applyUnit);\n }\n }\n\n unit.cancel();\n\n return new Dimension(value, unit);\n }\n});\n\nexport default Dimension;\n","import Node from './node';\nimport Color from './color';\nimport Dimension from './dimension';\nimport * as Constants from '../constants';\nconst MATH = Constants.Math;\n\n\nconst Operation = function(op, operands, isSpaced) {\n this.op = op.trim();\n this.operands = operands;\n this.isSpaced = isSpaced;\n};\n\nOperation.prototype = Object.assign(new Node(), {\n type: 'Operation',\n\n accept(visitor) {\n this.operands = visitor.visitArray(this.operands);\n },\n\n eval(context) {\n let a = this.operands[0].eval(context), b = this.operands[1].eval(context), op;\n\n if (context.isMathOn(this.op)) {\n op = this.op === './'
? '/' : this.op;\n if (a instanceof Dimension && b instanceof Color) {\n a = a.toColor();\n }\n if (b instanceof Dimension && a instanceof Color) {\n b = b.toColor();\n }\n if (!a.operate || !b.operate) {\n if (\n (a instanceof Operation || b instanceof Operation)\n && a.op === '/' && context.math === MATH.PARENS_DIVISION\n) {\n return new Operation(this.op, [a, b], this.isSpaced);\n }\n throw { type: 'Operation',\n message: 'Operation on an invalid type' };\n }\n\n return a.operate(context, op, b);\n } else {\n return new Operation(this.op, [a, b], this.isSpaced);\n }\n },\n\n genCSS(context, output) {\n this.operands[0].genCSS(context, output);\n if (this.isSpaced) {\n output.add(' ');\n }\n output.add(this.op);\n if (this.isSpaced) {\n output.add(' ');\n }\n this.operands[1].genCSS(context, output);\n }\n});\n\nexport default Operation;\n","import Node from

'./node';\nimport Paren from './paren';\nimport Comment from './comment';\nimport Dimension from
'./dimension';\n\nconst Expression = function(value, noSpacing) {\n this.value = value;\n this.noSpacing =
noSpacing;\n if (!value) {\n throw new Error('Expression requires an array parameter');\n
}\n};\n\nExpression.prototype = Object.assign(new Node(), {\n type: 'Expression',\n\n accept(visitor) {\n
this.value = visitor.visitArray(this.value);\n },\n\n eval(context) {\n let returnValue;\n const mathOn =
context.isMathOn();\n const inParenthesis = this.parens;\n\n let doubleParen = false;\n if
(inParenthesis) {\n context.inParenthesis();\n }\n if (this.value.length > 1) {\n
returnValue = new Expression(this.value.map(function (e) {\n if (!e.eval) {\n return e;\n
}\n return e.eval(context);\n }), this.noSpacing);\n } else if (this.value.length === 1)
{\n if (this.value[0].parens && !this.value[0].parensInOp && !context.inCalc) {\n doubleParen =
true;\n }\n returnValue = this.value[0].eval(context);\n } else {\n returnValue = this;\n
}\n if (inParenthesis) {\n context.outOfParenthesis();\n }\n if (this.parens && this.parensInOp
&& !mathOn && !doubleParen \n && (!(returnValue instanceof Dimension))) {\n returnValue = new
Paren(returnValue);\n }\n return returnValue;\n },\n\n genCSS(context, output) {\n for (let i = 0; i <
this.value.length; i++) {\n this.value[i].genCSS(context, output);\n if
(!this.noSpacing && i + 1 < this.value.length) {\n output.add(' ');\n }\n }\n },\n\n
throwAwayComments() {\n this.value = this.value.filter(function(v) {\n return !(v instanceof
Comment);\n });\n }\n});\n\nexport default Expression;\n","import Expression from
'../tree/expression';\n\nclass functionCaller {\n constructor(name, context, index, currentFileInfo) {\n
this.name = name.toLowerCase();\n this.index = index;\n this.context = context;\n this.currentFileInfo
= currentFileInfo;\n\n this.func = context.frames[0].functionRegistry.get(this.name);\n }\n\n isValid() {\n
return Boolean(this.func);\n }\n\n call(args) {\n if (!(Array.isArray(args))) {\n args = [args];\n
}\n const evalArgs = this.func.evalArgs;\n if (evalArgs !== false) {\n args = args.map(a =>
a.eval(this.context));\n }\n const commentFilter
= item => !(item.type === 'Comment');\n\n // This code is terrible and should be replaced as per this issue...\n
// https://github.com/less/less.js/issues/2477\n args = args\n .filter(commentFilter)\n .map(item
=> {\n if (item.type === 'Expression') {\n const subNodes = item.value.filter(commentFilter);\n
if (subNodes.length === 1) {\n // https://github.com/less/less.js/issues/3616\n
if (item.parens && subNodes[0].op === '/') {\n return item;\n }\n
return subNodes[0];\n } else {\n return new Expression(subNodes);\n }\n
}\n return item;\n });\n\n if (evalArgs === false) {\n return this.func(this.context,
...args);\n }\n\n return this.func(...args);\n
}\n}\n\nexport default functionCaller;\n","/*!
***\r\nCopyright (c)
Microsoft Corporation.\r\n\r\nPermission to use, copy, modify, and/or distribute this software for any\r\npurpose
with or without fee is hereby granted.\r\n\r\nTHE SOFTWARE IS PROVIDED \"AS IS\" AND THE AUTHOR
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WARRANTIES OF MERCHANTABILITY\r\nAND FITNESS. IN NO EVENT SHALL THE AUTHOR BE
LIABLE FOR ANY SPECIAL, DIRECT,\r\nINDIRECT, OR CONSEQUENTIAL DAMAGES OR ANY
DAMAGES WHATSOEVER RESULTING FROM\r\nLOSS OF USE, DATA OR PROFITS, WHETHER IN AN
ACTION OF CONTRACT, NEGLIGENCE OR\r\nOTHER TORTIOUS ACTION, ARISING OUT OF OR IN
CONNECTION WITH THE USE OR\r\nPERFORMANCE OF THIS
SOFTWARE.\r\n***
/\r\n/ global Reflect, Promise */\r\n\r\nvar extendStatics = function(d, b) {\r\n extendStatics
= Object.setPrototypeOf ||\r\n ({ __proto__: [] } instanceof Array && function (d, b) { d.__proto__ = b; }) ||\r\n
function (d, b) { for (var p in b) if (Object.prototype.hasOwnProperty.call(b, p)) d[p] = b[p]; };\r\n return
extendStatics(d, b);\r\n};\r\n\r\nexport function __extends(d, b) {\r\n if (typeof b !== \"function\" && b !==
null)\r\n throw new TypeError(\"Class extends value \" + String(b) + \" is not a constructor or null\");\r\n

extendStatics(d, b);\r\n   function __() { this.constructor = d; }\r\n   d.prototype = b === null ? Object.create(b) : (__.prototype = b.prototype, new __());\r\n}\r\n\r\nexport var __assign = function() {\r\n   __assign = Object.assign || function __assign(t) {\r\n   for (var s, i = 1, n = arguments.length; i < n; i++) {\r\n   s = arguments[i];\r\n   for (var p in s) if (Object.prototype.hasOwnProperty.call(s, p)) t[p] = s[p];\r\n   }\r\n   return t;\r\n   }\r\n   return __assign.apply(this, arguments);\r\n}\r\n\r\nexport function __rest(s, e) {\r\n   var t = {};\r\n   for (var p in s) if (Object.prototype.hasOwnProperty.call(s, p) && e.indexOf(p) < 0)\r\n   t[p] = s[p];\r\n   if (s != null && typeof Object.getOwnPropertySymbols === \"function\")\r\n   for (var i = 0, p = Object.getOwnPropertySymbols(s); i < p.length; i++) {\r\n   if (e.indexOf(p[i]) < 0 && Object.prototype.propertyIsEnumerable.call(s, p[i]))\r\n   t[p[i]] = s[p[i]];\r\n   }\r\n   return t;\r\n}\r\n\r\nexport function __decorate(decorators, target, key, desc) {\r\n   var c = arguments.length, r = c < 3 ? target : desc === null ? desc = Object.getOwnPropertyDescriptor(target, key) : desc, d;\r\n   if (typeof Reflect === \"object\" && typeof Reflect.decorate === \"function\") r = Reflect.decorate(decorators, target, key, desc);\r\n   else for (var i = decorators.length - 1; i >= 0; i--) if (d = decorators[i]) r = (c < 3 ? d(r) : c > 3 ? d(target, key, r) : d(target, key)) || r;\r\n   return c > 3 && r && Object.defineProperty(target, key, r), r;\r\n}\r\n\r\nexport function __param(paramIndex, decorator) {\r\n   return function (target, key) { decorator(target, key, paramIndex); }\r\n}\r\n\r\nexport function __metadata(metadataKey, metadataValue) {\r\n   if (typeof Reflect === \"object\" && typeof Reflect.metadata === \"function\") return Reflect.metadata(metadataKey, metadataValue);\r\n}\r\n\r\nexport function __awaiter(thisArg, _arguments, P, generator) {\r\n   function adopt(value) { return value instanceof P ? value : new P(function (resolve) { resolve(value); }); }\r\n   return new (P || (P = Promise))(function (resolve, reject) {\r\n   function fulfilled(value) { try { step(generator.next(value)); } catch (e) { reject(e); } }\r\n   function rejected(value) { try { step(generator[\"throw\"](value)); } catch (e) { reject(e); } }\r\n   function step(result) { result.done ? resolve(result.value) : adopt(result.value).then(fulfilled, rejected); }\r\n   step((generator = generator.apply(thisArg, _arguments || [])).next());\r\n   });\r\n}\r\n\r\nexport function __generator(thisArg, body) {\r\n   var _ = { label: 0, sent: function() { if (t[0] & 1) throw t[1]; return t[1]; }, trys: [], ops: [] }, f, y, t, g;\r\n   return g = { next: verb(0), \"throw\": verb(1), \"return\": verb(2) }, typeof Symbol === \"function\" && (g[Symbol.iterator] = function() { return this; }), g;\r\n   function verb(n) { return function (v) { return step([n, v]); }; }\r\n   function step(op) {\r\n   if (f) throw new TypeError(\"Generator is already executing.\");\r\n   while (_) try {\r\n   if (f = 1, y && (t = op[0] & 2 ? y[\"return\"] : op[0] ? y[\"throw\"] || ((t = y[\"return\"]) && t.call(y), 0) : y.next) && !(t = t.call(y, op[1])).done) return t;\r\n   if (y = 0, t) op = [op[0] & 2, t.value];\r\n   switch (op[0]) {\r\n   case 0: case 1: t = op; break;\r\n   case 4: _.label++; return { value: op[1], done: false };\r\n   case 5: _.label++; y = op[1]; op = [0]; continue;\r\n   case 7: op = _.ops.pop(); _.trys.pop(); continue;\r\n   default:\r\n   if (!(t = _.trys, t = t.length > 0 && t[t.length - 1]) && (op[0] === 6 || op[0] === 2)) { _ = 0; continue; }\r\n   if (op[0] === 3 && (!t || (op[1] > t[0] && op[1] < t[3]))) { _.label = op[1]; break; }\r\n   if (op[0] === 6 && _.label < t[1]) { _.label = t[1]; t = op; break; }\r\n   if (t && _.label < t[2]) { _.label = t[2]; _.ops.push(op); break; }\r\n   if (t[2]) _.ops.pop();\r\n   _.trys.pop(); continue;\r\n   }\r\n   op = body.call(thisArg, _);\r\n   } catch (e) { op = [6, e]; y = 0; } finally { f = t = 0; }\r\n   if (op[0] & 5) throw op[1]; return { value: op[0] ? op[1] : void 0, done: true };\r\n   }\r\n}\r\n\r\nexport var __createBinding = Object.create ? (function(o, m, k, k2) {\r\n   if (k2 === undefined) k2 = k;\r\n   Object.defineProperty(o, k2, { enumerable: true, get: function() { return m[k]; } });\r\n}) : (function(o, m, k, k2) {\r\n   if (k2 === undefined) k2 = k;\r\n   o[k2] = m[k];\r\n});\r\n\r\nexport function __exportStar(m, o) {\r\n   for (var p in m) if (p !== \"default\" && !Object.prototype.hasOwnProperty.call(o, p)) __createBinding(o, m, p);\r\n}\r\n\r\nexport function __values(o) {\r\n   var s = typeof Symbol === \"function\" && Symbol.iterator, m = s && o[s], i = 0;\r\n   if (m) return m.call(o);\r\n   if (o && typeof o.length === \"number\") return {\r\n   next: function () {\r\n   if (o && i >= o.length) o = void 0;\r\n   return { value: o && o[i++], done: !o };\r\n   }\r\n   };\r\n   throw new TypeError(s ? \"Object is not iterable.\" : \"Symbol.iterator is not defined.\");\r\n}\r\n\r\nexport function __read(o, n) {\r\n   var m =

typeof Symbol === \"function\" && o[Symbol.iterator];\r\n   if (!m) return o;\r\n   var i = m.call(o), r, ar = [], e;\r\n   try {\r\n   while ((n === void 0 || n-- > 0) && !(r = i.next()).done) ar.push(r.value);\r\n   }\r\n   catch (error) { e = { error: error }; }\r\n   finally {\r\n   try {\r\n   if (r && !r.done && (m = i[\"return\"])) m.call(i);\r\n   }\r\n   finally { if (e) throw e.error; }\r\n   }\r\n   return ar;\r\n}\r\n\r\n/** @deprecated */\r\nexport function __spread() {\r\n   for (var ar = [], i = 0; i < arguments.length; i++)\r\n   ar = ar.concat(__read(arguments[i]));\r\n   return ar;\r\n}\r\n\r\n/** @deprecated */\r\nexport function __spreadArrays() {\r\n   for (var s = 0, i = 0, il = arguments.length; i < il; i++) s += arguments[i].length;\r\n   for (var r = Array(s), k = 0, i = 0; i < il; i++)\r\n   for (var a = arguments[i], j = 0, jl = a.length; j < jl; j++, k++)\r\n   r[k] = a[j];\r\n   return r;\r\n}\r\n\r\nexport
function __spreadArray(to, from, pack) {\r\n   if (pack || arguments.length === 2) for (var i = 0, l = from.length, ar; i < l; i++) {\r\n   if (ar || !(i in from)) {\r\n   if (!ar) ar = Array.prototype.slice.call(from, 0, i);\r\n   ar[i] = from[i];\r\n   }\r\n   }\r\n   return to.concat(ar || from);\r\n}\r\n\r\nexport function __await(v) {\r\n   return this instanceof __await ? (this.v = v, this) : new __await(v);\r\n}\r\n\r\nexport function __asyncGenerator(thisArg, _arguments, generator) {\r\n   if (!Symbol.asyncIterator) throw new TypeError(\"Symbol.asyncIterator is not defined.\");\r\n   var g = generator.apply(thisArg, _arguments || []), i, q = [];\r\n   return i = {}, verb(\"next\"), verb(\"throw\"), verb(\"return\"), i[Symbol.asyncIterator] = function () { return this; }, i;\r\n   function verb(n) { if (g[n]) i[n] = function (v) { return new Promise(function (a, b) { q.push([n, v, a, b]) > 1 || resume(n, v); }); }; }\r\n   function
resume(n, v) { try { step(g[n](v)); } catch (e) { settle(q[0][3], e); } }\r\n   function step(r) { r.value instanceof __await ? Promise.resolve(r.value.v).then(fulfill, reject) : settle(q[0][2], r); }\r\n   function fulfill(value) { resume(\"next\", value); }\r\n   function reject(value) { resume(\"throw\", value); }\r\n   function settle(f, v) { if (f(v), q.shift(), q.length) resume(q[0][0], q[0][1]); }\r\n}\r\n\r\nexport function __asyncDelegator(o) {\r\n   var i, p;\r\n   return i = {}, verb(\"next\"), verb(\"throw\", function (e) { throw e; }), verb(\"return\"), i[Symbol.iterator] = function () { return this; }, i;\r\n   function verb(n, f) { i[n] = o[n] ? function (v) { return (p = !p) ? { value: __await(o[n](v)), done: n === \"return\" } : f ? f(v) : v; } : f; }\r\n}\r\n\r\nexport function __asyncValues(o) {\r\n   if (!Symbol.asyncIterator) throw new TypeError(\"Symbol.asyncIterator is not defined.\");\r\n   var m = o[Symbol.asyncIterator], i;\r\n   return m ? m.call(o)
: (o = typeof __values === \"function\" ? __values(o) : o[Symbol.iterator](), i = {}, verb(\"next\"), verb(\"throw\"), verb(\"return\"), i[Symbol.asyncIterator] = function () { return this; }, i);\r\n   function verb(n) { i[n] = o[n] && function (v) { return new Promise(function (resolve, reject) { v = o[n](v), settle(resolve, reject, v.done, v.value); }); }; }\r\n   function settle(resolve, reject, d, v) { Promise.resolve(v).then(function(v) { resolve({ value: v, done: d }); }, reject); }\r\n}\r\n\r\nexport function __makeTemplateObject(cooked, raw) {\r\n   if (Object.defineProperty) { Object.defineProperty(cooked, \"raw\", { value: raw }); } else { cooked.raw = raw; }\r\n   return cooked;\r\n};\r\n\r\nvar __setModuleDefault = Object.create ? (function(o, v) {\r\n   Object.defineProperty(o, \"default\", { enumerable: true, value: v });\r\n}) : function(o, v) {\r\n   o[\"default\"] = v;\r\n};\r\n\r\nexport function __importStar(mod) {\r\n   if (mod && mod.__esModule) return mod;\r\n
    var result = {};\r\n   if (mod != null) for (var k in mod) if (k !== \"default\" && Object.prototype.hasOwnProperty.call(mod, k)) __createBinding(result, mod, k);\r\n   __setModuleDefault(result, mod);\r\n   return result;\r\n}\r\n\r\nexport function __importDefault(mod) {\r\n   return (mod && mod.__esModule) ? mod : { default: mod };\r\n}\r\n\r\nexport function __classPrivateFieldGet(receiver, state, kind, f) {\r\n   if (kind === \"a\" && !f) throw new TypeError(\"Private accessor was defined without a getter\");\r\n   if (typeof state === \"function\" ? receiver !== state || !f : !state.has(receiver)) throw new TypeError(\"Cannot read private member from an object whose class did not declare it\");\r\n   return kind === \"m\" ? f : kind === \"a\" ? f.call(receiver) : f ? f.value : state.get(receiver);\r\n}\r\n\r\nexport function __classPrivateFieldSet(receiver, state, value, kind, f) {\r\n   if (kind === \"m\") throw new TypeError(\"Private method is not writable\");\r\n
    if (kind === \"a\" && !f) throw new TypeError(\"Private accessor was defined without a setter\");\r\n   if (typeof state === \"function\" ? receiver !== state || !f : !state.has(receiver)) throw new TypeError(\"Cannot write private member to an object whose class did not declare it\");\r\n   return (kind === \"a\" ? f.call(receiver, value) : f ?

f.value = value : state.set(receiver, value)), value;\r\n}\r\n","import Node from './node';\nimport Anonymous from './anonymous';\nimport FunctionCaller from '../functions/function-caller';\n\n//\n// A function call node.\n//\nconst Call = function(name, args, index, currentFileInfo) {\n this.name = name;\n this.args = args;\n this.calc = name === 'calc';\n this._index = index;\n this._fileInfo = currentFileInfo;\n}\n\nCall.prototype = Object.assign(new Node(), {\n type: 'Call',\n\n accept(visitor) {\n if (this.args) {\n this.args = visitor.visitArray(this.args);\n }\n },\n\n //\n // When evaluating a function call,\n // we either find the function in the functionRegistry,\n // in which case we call it, passing the evaluated arguments,\n // if this returns null or we cannot find the function, we\n // simply print it out as it appeared originally [2].\n //\n // The reason why we evaluate the arguments, is in the case where\n // we try to pass a variable to a function, like: `saturate(@color)`.\n // The function should receive the value, not the variable.\n //\n eval(context) {\n /**\n * Turn off math for calc(), and switch back on for evaluating nested functions\n */\n const currentMathContext = context.mathOn;\n context.mathOn = !this.calc;\n if (this.calc || context.inCalc) {\n context.enterCalc();\n }\n\n const exitCalc = () => {\n if (this.calc || context.inCalc) {\n context.exitCalc();\n }\n context.mathOn = currentMathContext;\n };\n\n let result;\n const funcCaller = new FunctionCaller(this.name, context, this.getIndex(), this.fileInfo());\n\n if (funcCaller.isValid()) {\n try {\n result = funcCaller.call(this.args);\n exitCalc();\n } catch (e) {\n if (e.hasOwnProperty('line') && e.hasOwnProperty('column')) {\n throw e;\n }\n throw { \n type: e.type || 'Runtime',\n message: `Error evaluating function \\`${this.name}\\`${e.message ? `: ${e.message}` : ''}`,\n index: this.getIndex(), \n filename: this.fileInfo().filename,\n line: e.lineNumber,\n column: e.columnNumber\n };\n }\n }\n\n if (result !== null && result !== undefined) {\n // Results that that are not nodes are cast as Anonymous nodes\n // Falsy values or booleans are returned as empty nodes\n if (!(result instanceof Node)) {\n if (!result || result === true) {\n result = new Anonymous(null); \n }\n else {\n result = new Anonymous(result.toString()); \n }\n \n }\n result._index = this._index;\n result._fileInfo = this._fileInfo;\n return result;\n }\n\n const args = this.args.map(a => a.eval(context));\n exitCalc();\n\n return new Call(this.name, args, this.getIndex(), this.fileInfo());\n },\n\n genCSS(context, output) {\n output.add(`${this.name}(`, this.fileInfo(), this.getIndex());\n\n for (let i = 0; i < this.args.length; i++) {\n this.args[i].genCSS(context, output);\n if (i + 1 < this.args.length) {\n output.add(', ');\n }\n }\n\n output.add(')');\n }\n});\n\nexport default Call;\n","import Node from './node';\nimport Call from './call';\n\nconst Variable = function(name, index, currentFileInfo) {\n this.name = name;\n this._index = index;\n this._fileInfo = currentFileInfo;\n};\n\nVariable.prototype = Object.assign(new Node(), {\n type: 'Variable',\n\n eval(context) {\n let variable, name = this.name;\n\n if (name.indexOf('@@') === 0) {\n name = `@${new Variable(name.slice(1), this.getIndex(), this.fileInfo()).eval(context).value}`;\n }\n\n if (this.evaluating) {\n throw { type: 'Name',\n message: `Recursive variable definition for ${name}`,\n filename: this.fileInfo().filename,\n index: this.getIndex() };\n }\n\n this.evaluating = true;\n\n variable = this.find(context.frames, function (frame) {\n const v = frame.variable(name);\n if (v) {\n if (v.important) {\n const importantScope = context.importantScope[context.importantScope.length - 1];\n importantScope.important = v.important;\n }\n // If in calc, wrap vars in a function call to cascade evaluate args first\n if (context.inCalc) {\n return (new Call('_SELF', [v.value])).eval(context);\n }\n else {\n return v.value.eval(context);\n }\n }\n });\n if (variable) {\n this.evaluating = false;\n return variable;\n } else {\n throw { type: 'Name',\n message: `variable ${name} is undefined`,\n filename: this.fileInfo().filename,\n index: this.getIndex() };\n }\n },\n\n find(obj, fun) {\n for (let i = 0, r; i < obj.length; i++) {\n r = fun.call(obj, obj[i]);\n

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if (r) { return r; }\n        }\n        return null;\n    }\n});\n\nexport default Variable;\n","import Node from './node';\nimport Declaration from './declaration';\n\nconst Property = function(name, index, currentFileInfo) {\n this.name = name;\n    this._index = index;\n    this._fileInfo = currentFileInfo;\n};\n\nProperty.prototype = Object.assign(new Node(), {\n    type: 'Property',\n\n    eval(context) {\n        let property;\n        const name = this.name;\n        // TODO: shorten this reference\n        const mergeRules = context.pluginManager.less.visitors.ToCSSVisitor.prototype._mergeRules;\n\n        if (this.evaluating) {\n            throw { type: 'Name',\n                message: `Recursive property reference for ${name}`,\n                filename: this.fileInfo().filename,\n                index: this.getIndex() };\n        }\n\n        this.evaluating = true;\n\n        property = this.find(context.frames, function (frame) {\n            let v;\n            const vArr = frame.property(name);\n            if (vArr) {\n                for (let i = 0; i < vArr.length; i++) {\n                    v = vArr[i];\n\n                    vArr[i] = new Declaration(v.name,\n                        v.value,\n                        v.important,\n                        v.merge,\n                        v.index,\n                        v.currentFileInfo,\n                        v.inline,\n                        v.variable\n                    );\n                }\n                mergeRules(vArr);\n\n                v = vArr[vArr.length - 1];\n                if (v.important) {\n                    const importantScope = context.importantScope[context.importantScope.length - 1];\n                    importantScope.important = v.important;\n                }\n                v = v.value.eval(context);\n                return v;\n            }\n        });\n        if (property) {\n            this.evaluating = false;\n            return property;\n        } else {\n            throw { type: 'Name',\n                message: `Property '${name}' is undefined`,\n                filename: this.currentFileInfo.filename,\n                index: this.index };\n        }\n    },\n\n    find(obj, fun) {\n        for (let i = 0, r; i < obj.length; i++) {\n            r = fun.call(obj, obj[i]);\n            if (r) { return r; }\n        }\n        return null;\n    }\n});\n\nexport default Property;\n","import Node from './node';\n\nconst Attribute = function(key, op, value, cif) {\n    this.key = key;\n    this.op = op;\n    this.value = value;\n    this.cif = cif;\n};\n\nAttribute.prototype = Object.assign(new Node(), {\n    type: 'Attribute',\n\n    eval(context) {\n        return new Attribute(\n            this.key.eval ? this.key.eval(context) : this.key,\n            this.op,\n            (this.value && this.value.eval) ? this.value.eval(context) : this.value,\n            this.cif\n        );\n    },\n\n    genCSS(context, output) {\n        output.add(this.toCSS(context));\n    },\n\n    toCSS(context) {\n        let value = this.key.toCSS ? this.key.toCSS(context) : this.key;\n\n        if (this.op) {\n            value += this.op;\n            value += (this.value.toCSS ? this.value.toCSS(context) : this.value);\n        }\n\n        if (this.cif) {\n            value = value + \" \" + this.cif;\n        }\n\n        return `[${value}]`;\n    }\n});\n\nexport default Attribute;\n","import Node from './node';\nimport Variable from './variable';\nimport Property from './property';\n\n\nconst Quoted = function(str, content, escaped, index, currentFileInfo) {\n    this.escaped = (escaped == null) ? true : escaped;\n    this.value = content || '';\n    this.quote = str.charAt(0);\n    this._index = index;\n    this._fileInfo = currentFileInfo;\n    this.variableRegex = /@\\{([\\w-]+)\\}/g;\n    this.propRegex = /\\$\\{([\\w-]+)\\}/g;\n    this.allowRoot = escaped;\n};\n\nQuoted.prototype = Object.assign(new Node(),\n {\n    type: 'Quoted',\n\n    genCSS(context, output) {\n        if (!this.escaped) {\n            output.add(this.quote, this.fileInfo(), this.getIndex());\n        }\n        output.add(this.value);\n        if (!this.escaped) {\n            output.add(this.quote);\n        }\n    },\n\n    containsVariables() {\n        return this.value.match(this.variableRegex);\n    },\n\n    eval(context) {\n        const that = this;\n        let value = this.value;\n        const variableReplacement = function (_, name) {\n            const v = new Variable(`@${name}`, that.getIndex(), that.fileInfo()).eval(context, true);\n            return (v instanceof Quoted) ? v.value : v.toCSS();\n        };\n        const propertyReplacement = function (_, name) {\n            const v = new Property(`$${name}`, that.getIndex(), that.fileInfo()).eval(context, true);\n            return (v instanceof Quoted) ? v.value : v.toCSS();\n        };\n        function iterativeReplace(value, regexp, replacementFnc)\n {\n            let evaluatedValue = value;\n            do {\n                value = evaluatedValue.toString();\n                evaluatedValue = value.replace(regexp, replacementFnc);\n            } while (value !== evaluatedValue);\n            return evaluatedValue;\n        }\n        value = iterativeReplace(value, this.variableRegex, variableReplacement);\n  value = iterativeReplace(value, this.propRegex, propertyReplacement);\n        return new Quoted(this.quote + value + this.quote, value, this.escaped, this.getIndex(), this.fileInfo());\n    },\n\n    compare(other) {\n        // when
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comparing quoted strings allow the quote to differ\n if (other.type === 'Quoted' && !this.escaped && !other.escaped) {\n return Node.numericCompare(this.value, other.value);\n } else {\n return other.toCSS && this.toCSS() === other.toCSS() ? 0 : undefined;\n }\n }\n});\n\nexport default Quoted;\n","import Node from './node';\n\nfunction escapePath(path) {\n return path.replace(/[\\(\\)'"\\s]/g, function(match) { return `\\\\${match}`; });\n}\n\nconst URL = function(val, index, currentFileInfo, isEvald) {\n this.value = val;\n this._index = index;\n this._fileInfo = currentFileInfo;\n this.isEvald = isEvald;\n};\n\nURL.prototype = Object.assign(new Node(), {\n type: 'Url',\n\n accept(visitor) {\n this.value = visitor.visit(this.value);\n },\n\n genCSS(context, output) {\n output.add('url(');\n this.value.genCSS(context, output);\n output.add(')');\n },\n\n eval(context) {\n const val = this.value.eval(context);\n let rootpath;\n\n if (!this.isEvald) {\n // Add the rootpath if the URL requires a rewrite\n rootpath = this.fileInfo() && this.fileInfo().rootpath;\n if (typeof rootpath === 'string' &&\n typeof val.value === 'string' &&\n context.pathRequiresRewrite(val.value)) {\n if (!val.quote) {\n rootpath = escapePath(rootpath);\n }\n val.value = context.rewritePath(val.value, rootpath);\n } else {\n val.value = context.normalizePath(val.value);\n }\n\n // Add url args if enabled\n if (context.urlArgs) {\n if (!val.value.match(/^\\s*data:/)) {\n const delimiter = val.value.indexOf('?') === -1 ? '?' : '&';\n const urlArgs = delimiter + context.urlArgs;\n if (val.value.indexOf('#') !== -1) {\n val.value = val.value.replace('#', `${urlArgs}#`);\n } else {\n val.value += urlArgs;\n }\n }\n }\n }\n\n return new URL(val, this.getIndex(), this.fileInfo(), true);\n}\n});\n\nexport default URL;\n","import Ruleset from './ruleset';\nimport Value from './value';\nimport Selector from './selector';\nimport Anonymous from './anonymous';\nimport Expression from './expression';\nimport AtRule from './atrule';\nimport * as utils from '../utils';\n\nconst Media = function(value, features, index, currentFileInfo, visibilityInfo) {\n this._index = index;\n this._fileInfo = currentFileInfo;\n\n const selectors = (new Selector([], null, null, this._index, this._fileInfo)).createEmptySelectors();\n\n this.features = new Value(features);\n this.rules = [new Ruleset(selectors, value)];\n this.rules[0].allowImports = true;\n this.copyVisibilityInfo(visibilityInfo);\n this.allowRoot = true;\n this.setParent(selectors, this);\n this.setParent(this.features, this);\n this.setParent(this.rules, this);\n};\n\nMedia.prototype = Object.assign(new AtRule(), {\n type: 'Media',\n\n isRulesetLike() {\n return true;\n },\n\n accept(visitor) {\n if (this.features) {\n this.features = visitor.visit(this.features);\n }\n if (this.rules) {\n this.rules = visitor.visitArray(this.rules);\n }\n },\n\n genCSS(context, output) {\n output.add('@media ', this._fileInfo, this._index);\n this.features.genCSS(context, output);\n this.outputRuleset(context, output, this.rules);\n },\n\n eval(context) {\n if (!context.mediaBlocks) {\n context.mediaBlocks = [];\n context.mediaPath = [];\n }\n\n const media = new Media(null, [], this._index, this._fileInfo, this.visibilityInfo());\n if (this.debugInfo) {\n this.rules[0].debugInfo = this.debugInfo;\n media.debugInfo = this.debugInfo;\n }\n \n media.features = this.features.eval(context);\n\n context.mediaPath.push(media);\n context.mediaBlocks.push(media);\n\n this.rules[0].functionRegistry = context.frames[0].functionRegistry.inherit();\n context.frames.unshift(this.rules[0]);\n media.rules = [this.rules[0].eval(context)];\n context.frames.shift();\n\n context.mediaPath.pop();\n\n return context.mediaPath.length === 0 ? media.evalTop(context) :\n media.evalNested(context);\n },\n\n evalTop(context) {\n let result = this;\n\n // Render all dependent Media blocks.\n if (context.mediaBlocks.length > 1) {\n const selectors = (new Selector([], null, null, this.getIndex(), this.fileInfo())).createEmptySelectors();\n result = new Ruleset(selectors, context.mediaBlocks);\n result.multiMedia = true;\n result.copyVisibilityInfo(this.visibilityInfo());\n this.setParent(result, this);\n }\n\n delete context.mediaBlocks;\n delete context.mediaPath;\n\n return result;\n },\n\n evalNested(context) {\n let i;\n let value;\n const path = context.mediaPath.concat([this]);\n\n

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// Extract the media-query conditions separated with `,` (OR).\n        for (i = 0; i < path.length; i++) {\n value = path[i].features instanceof Value ?\n                path[i].features.value : path[i].features;\n            path[i] = Array.isArray(value) ? value : [value];\n        }\n\n        // Trace all permutations to generate the resulting media-query.\n        //\n        // (a, b and c) with nested (d, e) ->\n        //    a and d\n        //    a and e\n        //    b and c and d\n        //    b and c and e\n        this.features = new Value(this.permute(path).map(path => {\n            path = path.map(fragment => fragment.toCSS ? fragment : new Anonymous(fragment));\n\n            for (i = path.length - 1; i > 0; i--) {\n                path.splice(i, 0, new Anonymous('and'));\n            }\n\n            return new Expression(path);\n        }));\n        this.setParent(this.features, this);\n\n        // Fake a tree-node that doesn't output anything.\n        return new Ruleset([], []);\n    },\n\n    permute(arr) {\n        if (arr.length === 0) {\n            return [];\n        } else if (arr.length === 1) {\n            return arr[0];\n        } else {\n            const result = [];\n            const rest = this.permute(arr.slice(1));\n            for (let i = 0; i < rest.length; i++) {\n                for (let j = 0; j < arr[0].length; j++) {\n                    result.push([arr[0][j]].concat(rest[i]));\n                }\n            }\n            return result;\n        }\n    },\n\n    bubbleSelectors(selectors) {\n        if (!selectors) {\n            return;\n        }\n        this.rules = [new Ruleset(utils.copyArray(selectors), [this.rules[0]])];\n        this.setParent(this.rules, this);\n    }\n});\n\nexport default Media;\n","import Node from './node';\nimport Media from './media';\nimport URL from './url';\nimport Quoted from './quoted';\nimport Ruleset from './ruleset';\nimport Anonymous from './anonymous';\nimport * as utils from '../utils';\nimport LessError from '../less-error';\n\n//\n// CSS @import node\n//\n// The general strategy here is that we don't want to wait\n// for the parsing to be completed, before we start importing\n// the file. That's because in the context of a browser,\n// most of the time will be spent waiting for the server to respond.\n//\n// On creation, we push the import path to our import queue, though\n// `import,push`, we also pass it a callback, which it'll call once\n// the file has been fetched, and parsed.\n//\nconst Import = function(path, features, options, index, currentFileInfo, visibilityInfo) {\n    this.options = options;\n    this._index = index;\n    this._fileInfo = currentFileInfo;\n    this.path = path;\n    this.features = features;\n    this.allowRoot = true;\n\n    if (this.options.less !== undefined || this.options.inline) {\n        this.css = !this.options.less || this.options.inline;\n    } else {\n        const pathValue = this.getPath();\n        if (pathValue && /[#\\.\\&\\?]css([\\?;].*)?$/.test(pathValue)) {\n            this.css = true;\n        }\n    }\n    this.copyVisibilityInfo(visibilityInfo);\n    this.setParent(this.features, this);\n    this.setParent(this.path, this);\n};\n\nImport.prototype = Object.assign(new Node(), {\n    type: 'Import',\n\n    accept(visitor) {\n        if (this.features) {\n            this.features = visitor.visit(this.features);\n        }\n        this.path = visitor.visit(this.path);\n        if (!this.options.isPlugin && !this.options.inline && this.root) {\n            this.root = visitor.visit(this.root);\n        }\n    },\n\n    genCSS(context, output) {\n        if (this.css && this.path._fileInfo.reference === undefined) {\n            output.add('@import ', this._fileInfo, this._index);\n            this.path.genCSS(context, output);\n            if (this.features) {\n                output.add(' ');\n                this.features.genCSS(context, output);\n            }\n            output.add(';');\n        }\n    },\n\n    getPath() {\n        return (this.path instanceof URL) ?\n            this.path.value.value : this.path.value;\n    },\n\n    isVariableImport() {\n        let path = this.path;\n        if (path instanceof URL) {\n            path = path.value;\n        }\n        if (path instanceof Quoted) {\n            return path.containsVariables();\n        }\n\n        return true;\n    },\n\n    evalForImport(context) {\n        let path = this.path;\n\n        if (path instanceof URL) {\n            path = path.value;\n        }\n\n        return new Import(path.eval(context), this.features, this.options, this._index, this._fileInfo, this.visibilityInfo());\n    },\n\n    evalPath(context) {\n        const path = this.path.eval(context);\n        const fileInfo = this._fileInfo;\n\n        if (!(path instanceof URL)) {\n            // Add the rootpath if the URL requires a rewrite\n            const pathValue = path.value;\n            if (fileInfo &&\n                pathValue &&\n                context.pathRequiresRewrite(pathValue)) {\n                path.value = context.rewritePath(pathValue, fileInfo.rootpath);\n            } else {\n                path.value = context.normalizePath(path.value);\n            }\n        }\n\n        return path;\n    },\n\n    eval(context) {\n        const result = this.doEval(context);\n        if (this.options.reference || this.blocksVisibility()) {\n            if (result.length || result.length === 0) {\n                result.forEach(function (node) {\n                    node.addVisibilityBlock();\n                }\n                );\n            } else {\n                result.addVisibilityBlock();\n            }\n        }\n        return result;\n
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},\n\n    doEval(context) {\n        let ruleset;\n        let registry;\n        const features = this.features &&
this.features.eval(context);\n\n        if (this.options.isPlugin) {\n            if (this.root &&
 this.root.eval) {\n                try {\n                    this.root.eval(context);\n                }\n                catch (e) {\n
    e.message = 'Plugin error during evaluation';\n                    throw new LessError(e, this.root.imports,
this.root.filename);\n                }\n            }\n            registry = context.frames[0] &&
context.frames[0].functionRegistry;\n            if ( registry && this.root && this.root.functions ) {\n
registry.addMultiple( this.root.functions );\n            }\n\n            return [];\n        }\n\n        if (this.skip) {\n            if
(typeof this.skip === 'function') {\n                this.skip = this.skip();\n            }\n            if (this.skip) {\n
return [];\n            }\n        }\n        if (this.options.inline) {\n            const contents = new Anonymous(this.root, 0,\n
            {\n                filename: this.importedFilename,\n                reference:
 this.path._fileInfo && this.path._fileInfo.reference\n            }, true, true);\n\n            return this.features ? new
Media([contents], this.features.value) : [contents];\n        } else if (this.css) {\n            const newImport = new
Import(this.evalPath(context), features, this.options, this._index);\n            if (!newImport.css && this.error) {\n
        throw this.error;\n            }\n            return newImport;\n        } else if (this.root) {\n            ruleset = new
Ruleset(null, utils.copyArray(this.root.rules));\n            ruleset.evalImports(context);\n\n            return this.features ?
new Media(ruleset.rules, this.features.value) : ruleset.rules;\n        } else {\n            return [];\n        }\n
}\n});\n\nexport default Import;\n","import Node from './node';\nimport Variable from './variable';\n\nconst
JsEvalNode = function() {};\n\nJsEvalNode.prototype = Object.assign(new Node(), {\n
evaluateJavaScript(expression, context) {\n
        let result;\n        const that = this;\n        const evalContext = {};\n\n        if (!context.javascriptEnabled) {\n
  throw { message: 'Inline JavaScript is not enabled. Is it set in your options?',\n                filename:
this.fileInfo().filename,\n                index: this.getIndex() };\n        }\n\n        expression =
expression.replace(/@\\{([\\w-]+)\\}/g, function (_, name) {\n            return that.jsify(new Variable(`@${name}`,
that.getIndex(), that.fileInfo()).eval(context));\n        });\n\n        try {\n            expression = new Function(`return
(${expression})`);\n        } catch (e) {\n            throw { message: `JavaScript evaluation error: ${e.message} from
\\`${expression}\\`` ,\n                filename: this.fileInfo().filename,\n                index: this.getIndex() };\n        }\n\n
  const variables = context.frames[0].variables();\n        for (const k in variables) {\n            if
(variables.hasOwnProperty(k)) {\n
            /* jshint loopfunc:true */\n                evalContext[k.slice(1)] = {\n                    value: variables[k].value,\n
            toJS: function () {\n                        return this.value.eval(context).toCSS();\n                    }\n                };\n
    }\n        }\n\n        try {\n            result = expression.call(evalContext);\n        } catch (e) {\n            throw {
message: `JavaScript evaluation error: '${e.name}: ${e.message.replace(/[\"]/g, '\\")}'` ,\n                filename:
this.fileInfo().filename,\n                index: this.getIndex() };\n        }\n        return result;\n    },\n\n    jsify(obj) {\n
if (Array.isArray(obj.value) && (obj.value.length > 1)) {\n            return `[${obj.value.map(function (v) { return
v.toCSS(); }).join(', ')}]`;\n        } else {\n            return obj.toCSS();\n        }\n    }\n});\n\nexport default
JsEvalNode;\n","import JsEvalNode from './js-eval-node';\nimport Dimension from './dimension';\nimport
 Quoted from './quoted';\nimport Anonymous from './anonymous';\n\nconst JavaScript = function(string, escaped,
index, currentFileInfo) {\n    this.escaped = escaped;\n    this.expression = string;\n    this._index = index;\n
this._fileInfo = currentFileInfo;\n}\n\nJavaScript.prototype = Object.assign(new JsEvalNode(), {\n    type:
'JavaScript',\n\n    eval(context) {\n        const result = this.evaluateJavaScript(this.expression, context);\n        const
type = typeof result;\n\n        if (type === 'number' && !isNaN(result)) {\n            return new Dimension(result);\n
  } else if (type === 'string') {\n            return new Quoted(`\"${result}\"`, result, this.escaped, this._index);\n        }
else if (Array.isArray(result)) {\n            return new Anonymous(result.join(', '));\n        } else {\n            return new
Anonymous(result);\n        }\n    }\n});\n\nexport default JavaScript;\n","import Node from './node';\n\nconst
Assignment = function(key,
 val) {\n    this.key = key;\n    this.value = val;\n}\n\nAssignment.prototype = Object.assign(new Node(), {\n    type:
'Assignment',\n\n    accept(visitor) {\n        this.value = visitor.visit(this.value);\n    },\n\n    eval(context) {\n        if
(this.value.eval) {\n            return new Assignment(this.key, this.value.eval(context));\n        }\n        return this;\n
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},\n\n genCSS(context, output) {\n output.add(`${this.key}=`);\n if (this.value.genCSS) {\n this.value.genCSS(context, output);\n } else {\n output.add(this.value);\n }\n }\n});\n\nexport default Assignment;\n","import Node from './node';\n\nconst Condition = function(op, l, r, i, negate) {\n this.op = op.trim();\n this.lvalue = l;\n this.rvalue = r;\n this._index = i;\n this.negate = negate;\n};\n\nCondition.prototype = Object.assign(new Node(), {\n type: 'Condition',\n\n accept(visitor) {\n this.lvalue = visitor.visit(this.lvalue);\n this.rvalue = visitor.visit(this.rvalue);\n },\n\n eval(context) {\n const result = (function (op, a, b) {\n switch (op) {\n case 'and': return a && b;\n case 'or': return a || b;\n default:\n switch (Node.compare(a, b)) {\n case -1:\n return op === '<' || op === '=<' || op === '<=';\n case 0:\n return op === '=' || op === '>=' || op === '=<' || op === '<=';\n case 1:\n return op === '>' || op === '>=';\n default:\n return false;\n }\n }\n })(this.op, this.lvalue.eval(context), this.rvalue.eval(context));\n\n return this.negate ? !result : result;\n }\n});\n\nexport default Condition;\n","import Node from './node';\n\nconst UnicodeDescriptor = function(value) {\n this.value = value;\n}\n\nUnicodeDescriptor.prototype = Object.assign(new Node(), {\n type: 'UnicodeDescriptor'\n})\n\nexport default UnicodeDescriptor;\n","import Node from './node';\nimport Operation from './operation';\nimport Dimension from './dimension';\n\nconst Negative = function(node) {\n this.value = node;\n};\n\nNegative.prototype = Object.assign(new Node(), {\n type: 'Negative',\n\n genCSS(context, output) {\n output.add('-');\n this.value.genCSS(context, output);\n },\n\n eval(context) {\n if (context.isMathOn()) {\n return (new Operation('*', [new Dimension(-1), this.value])).eval(context);\n }\n return new Negative(this.value.eval(context));\n }\n});\n\nexport default Negative;\n","import Node from './node';\nimport Selector from './selector';\n\nconst Extend = function(selector, option, index, currentFileInfo, visibilityInfo) {\n this.selector = selector;\n this.option = option;\n this.object_id = Extend.next_id++;\n this.parent_ids = [this.object_id];\n this._index = index;\n this._fileInfo = currentFileInfo;\n this.copyVisibilityInfo(visibilityInfo);\n this.allowRoot = true;\n\n switch (option) {\n case 'all':\n this.allowBefore = true;\n this.allowAfter = true;\n break;\n default:\n this.allowBefore = false;\n this.allowAfter = false;\n break;\n }\n this.setParent(this.selector, this);\n};\n\nExtend.prototype = Object.assign(new Node(), {\n type: 'Extend',\n\n accept(visitor) {\n this.selector = visitor.visit(this.selector);\n },\n\n eval(context) {\n return new Extend(this.selector.eval(context), this.option, this.getIndex(), this.fileInfo(), this.visibilityInfo());\n },\n\n clone(context) {\n return new Extend(this.selector, this.option, this.getIndex(), this.fileInfo(), this.visibilityInfo());\n },\n\n // it concatenates (joins) all selectors in selector array\n findSelfSelectors(selectors) {\n let selfElements = [], i, selectorElements;\n\n for (i = 0; i < selectors.length; i++) {\n selectorElements = selectors[i].elements;\n // duplicate the logic in genCSS function inside the selector node.\n // future TODO - move both logics into the selector joiner visitor\n if (i > 0 && selectorElements.length && selectorElements[0].combinator.value === '') {\n selectorElements[0].combinator.value = ' ';\n }\n selfElements = selfElements.concat(selectors[i].elements);\n }\n\n this.selfSelectors = [new Selector(selfElements)];\n this.selfSelectors[0].copyVisibilityInfo(this.visibilityInfo());\n }\n});\n\nExtend.next_id = 0;\n\nexport default Extend;\n","import Node from './node';\nimport Variable from './variable';\nimport Ruleset from './ruleset';\nimport DetachedRuleset from './detached-ruleset';\nimport LessError from '../less-error';\n\nconst VariableCall = function(variable, index, currentFileInfo) {\n this.variable = variable;\n this._index = index;\n this._fileInfo = currentFileInfo;\n this.allowRoot = true;\n};\n\nVariableCall.prototype = Object.assign(new Node(), {\n type: 'VariableCall',\n\n eval(context) {\n let rules;\n let detachedRuleset = new Variable(this.variable, this.getIndex(), this.fileInfo()).eval(context);\n const error = new LessError({message: `Could not evaluate variable call ${this.variable}`});\n\n if (!detachedRuleset.ruleset) {\n if (detachedRuleset.rules) {\n rules = detachedRuleset;\n }\n else if (Array.isArray(detachedRuleset)) {\n rules = new Ruleset('',

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detachedRuleset);\n            }\n            else if (Array.isArray(detachedRuleset.value)) {\n                rules = new Ruleset('', detachedRuleset.value);\n            }\n            else {\n                throw error;\n            }\n            detachedRuleset = new DetachedRuleset(rules);\n        }\n\n        if (detachedRuleset.ruleset) {\n            return detachedRuleset.callEval(context);\n        }\n        throw error;\n    }\n});\n\nexport default VariableCall;\n","import Node from './node';\nimport Variable from './variable';\nimport Ruleset from './ruleset';\nimport Selector from './selector';\n\nconst NamespaceValue = function(ruleCall, lookups, index, fileInfo) {\n    this.value = ruleCall;\n    this.lookups = lookups;\n    this._index = index;\n    this._fileInfo = fileInfo;\n};\n\nNamespaceValue.prototype = Object.assign(new Node(), {\n    type: 'NamespaceValue',\n\n    eval(context) {\n        let i, j, name, rules = this.value.eval(context);\n        \n        for (i = 0; i < this.lookups.length; i++) {\n            name = this.lookups[i];\n\n            /**\n             * Eval'd DRs return rulesets.\n             * Eval'd mixins return rules, so let's make a ruleset if we need it.\n             * We need to do this because of late parsing of values\n             */\n            if (Array.isArray(rules)) {\n                rules = new Ruleset([new Selector()], rules);\n            }\n\n            if (name === '') {\n                rules = rules.lastDeclaration();\n            }\n            else if (name.charAt(0) === '@') {\n                if (name.charAt(1) === '@') {\n                    name = `@${new Variable(name.substr(1)).eval(context).value}`;\n                }\n                if (rules.variables) {\n                    rules = rules.variable(name);\n                }\n                \n                if (!rules) {\n                    throw { type: 'Name',\n                        message: `variable ${name} not found`,\n                        filename: this.fileInfo().filename,\n                        index: this.getIndex() };\n                }\n            }\n            else\n            {\n                if (name.substring(0, 2) === '$@') {\n                    name = `$${new Variable(name.substr(1)).eval(context).value}`;\n                }\n                else {\n                    name = name.charAt(0) === '$' ? name : `$${name}`;\n                }\n                if (rules.properties) {\n                    rules = rules.property(name);\n                }\n                \n                if (!rules) {\n                    throw { type: 'Name',\n                        message: `property \"${name.substr(1)}\" not found`,\n                        filename: this.fileInfo().filename,\n                        index: this.getIndex() };\n                }\n                // Properties are an array of values, since a ruleset can have multiple props.\n                // We pick the last one (the \"cascaded\" value)\n                rules = rules[rules.length - 1];\n            }\n\n            if (rules.value) {\n                rules = rules.eval(context).value;\n            }\n            if (rules.ruleset) {\n                rules = rules.ruleset.eval(context);\n            }\n        }\n        return rules;\n    }\n});\n\nexport default NamespaceValue;\n","import Selector from './selector';\nimport Element from './element';\nimport Ruleset from './ruleset';\nimport Declaration from './declaration';\nimport DetachedRuleset from './detached-ruleset';\nimport Expression from './expression';\nimport contexts from '../contexts';\nimport * as utils from '../utils';\n\nconst Definition = function(name, params, rules, condition, variadic, frames, visibilityInfo) {\n    this.name = name || 'anonymous mixin';\n    this.selectors = [new Selector([new Element(null, name, false, this._index, this._fileInfo)])];\n    this.params = params;\n    this.condition = condition;\n    this.variadic = variadic;\n    this.arity = params.length;\n    this.rules = rules;\n    this._lookups = {};\n    const optionalParameters = [];\n    this.required = params.reduce(function\n        (count, p) {\n        if (!p.name || (p.name && !p.value)) {\n            return count + 1;\n        }\n        else {\n            optionalParameters.push(p.name);\n            return count;\n        }\n    }, 0);\n    this.optionalParameters = optionalParameters;\n    this.frames = frames;\n    this.copyVisibilityInfo(visibilityInfo);\n    this.allowRoot = true;\n};\n\nDefinition.prototype = Object.assign(new Ruleset(), {\n    type: 'MixinDefinition',\n    evalFirst: true,\n\n    accept(visitor) {\n        if (this.params && this.params.length) {\n            this.params = visitor.visitArray(this.params);\n        }\n        this.rules = visitor.visitArray(this.rules);\n        if (this.condition) {\n            this.condition = visitor.visit(this.condition);\n        }\n    },\n\n    evalParams(context, mixinEnv, args, evaldArguments) {\n        /* jshint boss:true */\n        const frame = new Ruleset(null, null);\n\n        let varargs;\n        let arg;\n        const params\n        = utils.copyArray(this.params);\n        let i;\n        let j;\n        let val;\n        let name;\n        let isNamedFound;\n        let argIndex;\n        let argsLength = 0;\n\n        if (mixinEnv.frames && mixinEnv.frames[0] && mixinEnv.frames[0].functionRegistry) {\n            frame.functionRegistry =
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mixinEnv.frames[0].functionRegistry.inherit();\n        }\n        mixinEnv = new contexts.Eval(mixinEnv,
[frame].concat(mixinEnv.frames));\n\n        if (args) {\n            args = utils.copyArray(args);\n            argsLength =
args.length;\n\n            for (i = 0; i < argsLength; i++) {\n                arg = args[i];\n                if (name = (arg &&
arg.name)) {\n                    isNamedFound = false;\n                    for (j = 0; j < params.length; j++) {\n
if (!evaldArguments[j] && name === params[j].name) {\n                            evaldArguments[j] =
arg.value.eval(context);\n                            frame.prependRule(new Declaration(name,
 arg.value.eval(context)));\n                            isNamedFound = true;\n                            break;\n                        }\n
                    }\n                    if (isNamedFound) {\n                        args.splice(i, 1);\n                        i--;\n
continue;\n                    } else {\n                        throw { type: 'Runtime', message: `Named argument for
${this.name} ${args[i].name} not found` };\n                    }\n                }\n            }\n        }\n        argIndex = 0;\n
 for (i = 0; i < params.length; i++) {\n            if (evaldArguments[i]) { continue; }\n\n            arg = args &&
args[argIndex];\n\n            if (name = params[i].name) {\n                if (params[i].variadic) {\n                    varargs =
[];\n                    for (j = argIndex; j < argsLength; j++) {\n
varargs.push(args[j].value.eval(context));\n                    }\n
                frame.prependRule(new Declaration(name, new Expression(varargs).eval(context)));\n                } else {\n
                  val = arg && arg.value;\n                    if (val) {\n                        // This was a mixin call, pass in a detached
ruleset of it's eval'd rules\n                        if (Array.isArray(val)) {\n                            val = new
DetachedRuleset(new Ruleset('', val));\n                        }\n                        else {\n                            val =
val.eval(context);\n                        }\n                    } else if (params[i].value) {\n                        val =
params[i].value.eval(mixinEnv);\n                        frame.resetCache();\n                    } else {\n                        throw {
type: 'Runtime', message: `wrong number of arguments for ${this.name} (${argsLength} for ${this.arity})` };\n
                }\n\n                frame.prependRule(new Declaration(name, val));\n
            evaldArguments[i] = val;\n                }\n            }\n\n            if (params[i].variadic && args) {\n                for (j =
argIndex; j < argsLength; j++) {\n                    evaldArguments[j] = args[j].value.eval(context);\n                }\n
            }\n            argIndex++;\n        }\n\n        return frame;\n    },\n\n    makeImportant() {\n        const rules = !this.rules ?
this.rules : this.rules.map(function (r) {\n            if (r.makeImportant) {\n                return r.makeImportant(true);\n
        } else {\n                return r;\n            }\n        });\n        const result = new Definition(this.name, this.params,
rules, this.condition, this.variadic, this.frames);\n        return result;\n    },\n\n    eval(context) {\n        return new
Definition(this.name, this.params, this.rules, this.condition, this.variadic, this.frames ||
utils.copyArray(context.frames));\n    },\n\n    evalCall(context, args, important) {\n        const _arguments
 = [];\n        const mixinFrames = this.frames ? this.frames.concat(context.frames) : context.frames;\n        const
frame = this.evalParams(context, new contexts.Eval(context, mixinFrames), args, _arguments);\n        let rules;\n
let ruleset;\n\n        frame.prependRule(new Declaration('@arguments', new
Expression(_arguments).eval(context)));\n\n        rules = utils.copyArray(this.rules);\n\n        ruleset = new
Ruleset(null, rules);\n        ruleset.originalRuleset = this;\n        ruleset = ruleset.eval(new contexts.Eval(context,
[this, frame].concat(mixinFrames)));\n        if (important) {\n            ruleset = ruleset.makeImportant();\n        }\n
return ruleset;\n    },\n\n    matchCondition(args, context) {\n        if (this.condition && !this.condition.eval(\n
new contexts.Eval(context,\n                [this.evalParams(context, /* the parameter variables */\n                    new
contexts.Eval(context, this.frames ? this.frames.concat(context.frames)
 : context.frames), args, [])]\n                    .concat(this.frames || []) // the parent namespace/mixin frames\n
 .concat(context.frames)))) { // the current environment frames\n            return false;\n        }\n        return true;\n
},\n\n    matchArgs(args, context) {\n        const allArgsCnt = (args && args.length) || 0;\n        let len;\n        const
optionalParameters = this.optionalParameters;\n        const requiredArgsCnt = !args ? 0 : args.reduce(function
(count, p) {\n            if (optionalParameters.indexOf(p.name) < 0) {\n                return count + 1;\n            } else {\n
            return count;\n            }\n        }, 0);\n\n        if (!this.variadic) {\n            if (requiredArgsCnt < this.required)
{\n                return false;\n            }\n            if (allArgsCnt > this.params.length) {\n                return false;\n
}\n        } else {\n            if (requiredArgsCnt < (this.required
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- 1)) {\n return false;\n }\n }\n\n // check patterns\n len = Math.min(requiredArgsCnt, this.arity);\n\n for (let i = 0; i < len; i++) {\n if (!this.params[i].name && !this.params[i].variadic) {\n if (args[i].value.eval(context).toCSS() != this.params[i].value.eval(context).toCSS()) {\n return false;\n }\n }\n }\n return true;\n }\n});\n\nexport default Definition;\n","import Node from './node';\nimport Selector from './selector';\nimport MixinDefinition from './mixin-definition';\nimport defaultFunc from '../functions/default';\n\nconst MixinCall = function(elements, args, index, currentFileInfo, important) {\n this.selector = new Selector(elements);\n this.arguments = args || [];\n this._index = index;\n this._fileInfo = currentFileInfo;\n this.important = important;\n this.allowRoot = true;\n this.setParent(this.selector, this);\n};\n\nMixinCall.prototype = Object.assign(new Node(), {\n type: 'MixinCall',\n\n accept(visitor) {\n if (this.selector) {\n this.selector = visitor.visit(this.selector);\n }\n if (this.arguments.length) {\n this.arguments = visitor.visitArray(this.arguments);\n }\n },\n\n eval(context) {\n let mixins;\n let mixin;\n let mixinPath;\n const args = [];\n let arg;\n let argValue;\n const rules = [];\n let match = false;\n let i;\n let m;\n let f;\n let isRecursive;\n let isOneFound;\n const candidates = [];\n let candidate;\n const conditionResult = [];\n let defaultResult;\n const defFalseEitherCase = -1;\n const defNone = 0;\n const defTrue = 1;\n const defFalse = 2;\n let count;\n let originalRuleset;\n let noArgumentsFilter;\n\n this.selector = this.selector.eval(context);\n\n function calcDefGroup(mixin, mixinPath) {\n let f, p, namespace;\n\n for (f = 0; f < 2; f++) {\n conditionResult[f] = true;\n defaultFunc.value(f);\n for (p = 0; p < mixinPath.length && conditionResult[f]; p++) {\n namespace = mixinPath[p];\n if (namespace.matchCondition) {\n conditionResult[f] = conditionResult[f] && namespace.matchCondition(null, context);\n }\n }\n if (mixin.matchCondition) {\n conditionResult[f] = conditionResult[f] && mixin.matchCondition(args, context);\n }\n }\n if (conditionResult[0] || conditionResult[1]) {\n if (conditionResult[0] != conditionResult[1]) {\n return conditionResult[1] ?\n defTrue : defFalse;\n }\n\n return defNone;\n }\n return defFalseEitherCase;\n }\n\n for (i = 0; i < this.arguments.length; i++) {\n arg = this.arguments[i];\n argValue = arg.value.eval(context);\n if (arg.expand && Array.isArray(argValue.value)) {\n argValue = argValue.value;\n for (m = 0; m < argValue.length; m++) {\n args.push({value: argValue[m]});\n }\n } else {\n args.push({name: arg.name, value: argValue});\n }\n }\n\n noArgumentsFilter = function(rule) {return rule.matchArgs(null, context);};\n\n for (i = 0; i < context.frames.length; i++) {\n if ((mixins = context.frames[i].find(this.selector, null, noArgumentsFilter)).length > 0) {\n isOneFound = true;\n\n // To make `default()` function independent of definition order we have two \"subpasses\" here.\n // At first we evaluate each guard *twice* (with `default() == true` and `default() == false`),\n // and build candidate list with corresponding flags. Then, when we know all possible matches,\n // we make a final decision.\n\n for (m = 0; m < mixins.length; m++) {\n mixin = mixins[m].rule;\n mixinPath = mixins[m].path;\n isRecursive = false;\n for (f = 0; f < context.frames.length; f++) {\n if ((!(mixin instanceof MixinDefinition)) && mixin === (context.frames[f].originalRuleset || context.frames[f])) {\n isRecursive = true;\n break;\n }\n }\n if (isRecursive) {\n continue;\n }\n\n if (mixin.matchArgs(args, context)) {\n candidate = {mixin, group: calcDefGroup(mixin, mixinPath)};\n\n if (candidate.group !== defFalseEitherCase) {\n candidates.push(candidate);\n }\n\n match = true;\n }\n }\n\n defaultFunc.reset();\n\n count = [0, 0, 0];\n for (m = 0; m < candidates.length; m++) {\n count[candidates[m].group]++;\n }\n\n if (count[defNone] > 0) {\n defaultResult = defFalse;\n } else {\n defaultResult = defTrue;\n if ((count[defTrue] + count[defFalse]) > 1) {\n throw { type: 'Runtime',\n message: `Ambiguous use of \\`default()\\` found when matching for \\`${this.format(args)}\\``,\n index:

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this.getIndex(), filename: this.fileInfo().filename };\n
  }\n            }\n\n            for (m = 0; m < candidates.length; m++) {\n                candidate =
candidates[m].group;\n                if ((candidate === defNone) || (candidate === defaultResult)) {\n
try {\n                    mixin = candidates[m].mixin;\n                    if (!(mixin instanceof MixinDefinition))
{\n                    originalRuleset = mixin.originalRuleset || mixin;\n                    mixin = new
MixinDefinition('', [], mixin.rules, null, false, null, originalRuleset.visibilityInfo());\n
mixin.originalRuleset = originalRuleset;\n                }\n                const newRules =
mixin.evalCall(context, args, this.important).rules;\n
this._setVisibilityToReplacement(newRules);\n                Array.prototype.push.apply(rules, newRules);\n
            } catch (e) {\n
                throw { message: e.message, index: this.getIndex(), filename: this.fileInfo().filename, stack: e.stack
};\n                }\n            }\n        }\n\n        if (match) {\n            return rules;\n        }\n
    }\n    }\n    if (isOneFound) {\n        throw { type:    'Runtime',\n            message: `No matching
definition was found for \\`${this.format(args)}\\``,\n            index:   this.getIndex(), filename:
this.fileInfo().filename };\n    } else {\n        throw { type:    'Name',\n            message:
`${this.selector.toCSS().trim()} is undefined`,\n            index:   this.getIndex(), filename: this.fileInfo().filename
};\n    }\n},\n\n_setVisibilityToReplacement(replacement) {\n    let i, rule;\n    if (this.blocksVisibility())
{\n        for (i = 0; i < replacement.length; i++) {\n            rule = replacement[i];\n
    rule.addVisibilityBlock();\n        }\n    }\n},\n\nformat(args) {\n    return
`${this.selector.toCSS().trim()}(${args ? args.map(function (a) {\n        let argValue = '';\n        if (a.name) {\n
        argValue += `${a.name}:`;\n        }\n        if (a.value.toCSS) {\n            argValue +=
a.value.toCSS();\n        } else {\n            argValue += '???';\n        }\n        return argValue;\n    }).join(',
') : '')`;\n}\n});\n\nexport default MixinCall;\n","import Node from './node';\nimport Color from './color';\nimport
AtRule from './atrule';\nimport DetachedRuleset from './detached-ruleset';\nimport Operation from
'./operation';\nimport Dimension from './dimension';\nimport Unit from './unit';\nimport Keyword from
'./keyword';\nimport Variable from './variable';\nimport Property from './property';\nimport Ruleset from
'./ruleset';\nimport Element from './element';\nimport Attribute from './attribute';\nimport
 Combinator from './combinator';\nimport Selector from './selector';\nimport Quoted from './quoted';\nimport
Expression from './expression';\nimport Declaration from './declaration';\nimport Call from './call';\nimport URL
from './url';\nimport Import from './import';\nimport Comment from './comment';\nimport Anonymous from
'./anonymous';\nimport Value from './value';\nimport JavaScript from './javascript';\nimport Assignment from
'./assignment';\nimport Condition from './condition';\nimport Paren from './paren';\nimport Media from
'./media';\nimport UnicodeDescriptor from './unicode-descriptor';\nimport Negative from './negative';\nimport
Extend from './extend';\nimport VariableCall from './variable-call';\nimport NamespaceValue from './namespace-
value';\n\n// mixins\nimport MixinCall from './mixin-call';\nimport MixinDefinition from './mixin-
definition';\n\nexport default {\n    Node, Color, AtRule, DetachedRuleset, Operation,\n    Dimension, Unit,
Keyword, Variable, Property,\n
   Ruleset, Element, Attribute, Combinator, Selector,\n    Quoted, Expression, Declaration, Call, URL, Import,\n
Comment, Anonymous, Value, JavaScript, Assignment,\n    Condition, Paren, Media, UnicodeDescriptor,
Negative,\n    Extend, VariableCall, NamespaceValue,\n    mixin: {\n        Call: MixinCall,\n        Definition:
MixinDefinition\n    }\n};","class AbstractFileManager {\n    getPath(filename) {\n        let j =
filename.lastIndexOf('?');\n        if (j > 0) {\n            filename = filename.slice(0, j);\n        }\n        j =
filename.lastIndexOf('/');\n        if (j < 0) {\n            j = filename.lastIndexOf('\\\\');\n        }\n        if (j < 0) {\n
return '';\n        }\n        return filename.slice(0, j + 1);\n    }\n\n    tryAppendExtension(path, ext) {\n        return
/(\\.[a-z]*$)|([\\?;].*)$/.test(path) ? path : path + ext;\n    }\n\n    tryAppendLessExtension(path) {\n        return
this.tryAppendExtension(path, '.less');\n    }\n\n    supportsSync()
 {\n        return false;\n    }\n\n    alwaysMakePathsAbsolute() {\n        return false;\n    }\n\n
isPathAbsolute(filename) {\n        return (/^(?:[a-z-]+:|\\/|\\\\|#)/i).test(filename);\n    }\n\n    // TODO: pull out /
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replace?\n    join(basePath, laterPath) {\n        if (!basePath) {\n            return laterPath;\n        }\n        return basePath + laterPath;\n    }\n\n    pathDiff(url, baseUrl) {\n        // diff between two paths to create a relative path\n\n        const urlParts = this.extractUrlParts(url);\n\n        const baseUrlParts = this.extractUrlParts(baseUrl);\n        let i;\n        let max;\n        let urlDirectories;\n        let baseUrlDirectories;\n        let diff = '';\n        if (urlParts.hostPart !== baseUrlParts.hostPart) {\n            return '';\n        }\n        max = Math.max(baseUrlParts.directories.length, urlParts.directories.length);\n        for (i = 0; i < max; i++) {\n            if (baseUrlParts.directories[i] !== urlParts.directories[i])
 { break; }\n        }\n        baseUrlDirectories = baseUrlParts.directories.slice(i);\n        urlDirectories = urlParts.directories.slice(i);\n        for (i = 0; i < baseUrlDirectories.length - 1; i++) {\n            diff += '../';\n        }\n        for (i = 0; i < urlDirectories.length - 1; i++) {\n            diff += `${urlDirectories[i]}/`;\n        }\n        return diff;\n    }\n\n    // helper function, not part of API\n    extractUrlParts(url, baseUrl) {\n        // urlParts[1] = protocol://hostname/ OR /\n        // urlParts[2] = / if path relative to host base\n        // urlParts[3] = directories\n        // urlParts[4] = filename\n        // urlParts[5] = parameters\n\n        const urlPartsRegex = /^((?:[a-z-]+:)?\/{2}(?:[^\/\?#]*\/)|([\/\\]))?((?:[^\/\\?#]*[\/\\])*)([^\/\\?#]*)([#\?].*)?$/i;\n\n        const urlParts = url.match(urlPartsRegex);\n        const returner = {};\n        let rawDirectories = [];\n        const directories = [];\n        let i;\n        let baseUrlParts;\n\n        if (!urlParts) {\n            throw new Error(`Could not parse sheet href - '${url}'`);\n        }\n\n        // Stylesheets in IE don't always return the full path\n        if (baseUrl && (!urlParts[1] || urlParts[2])) {\n            baseUrlParts = baseUrl.match(urlPartsRegex);\n            if (!baseUrlParts) {\n                throw new Error(`Could not parse page url - '${baseUrl}'`);\n            }\n            urlParts[1] = urlParts[1] || baseUrlParts[1] || '';\n            if (!urlParts[2]) {\n                urlParts[3] = baseUrlParts[3] + urlParts[3];\n            }\n        }\n\n        if (urlParts[3]) {\n            rawDirectories = urlParts[3].replace(/\\\/g, '/').split('/');\n\n            // collapse '..' and skip '.'\n            for (i = 0; i < rawDirectories.length; i++) {\n\n                if (rawDirectories[i] === '..') {\n                    directories.pop();\n                }\n                else
 if (rawDirectories[i] !== '.') {\n                    directories.push(rawDirectories[i]);\n                }\n                \n            }\n        }\n\n        returner.hostPart = urlParts[1];\n        returner.directories = directories;\n        returner.rawPath = (urlParts[1] || '') + rawDirectories.join('/');\n        returner.path = (urlParts[1] || '') + directories.join('/');\n        returner.filename = urlParts[4];\n        returner.fileUrl = returner.path + (urlParts[4] || '');\n        returner.url = returner.fileUrl + (urlParts[5] || '');\n        return returner;\n    }\n}\n\nexport default AbstractFileManager;\n","import functionRegistry from '../functions/function-registry';\nimport LessError from '../less-error';\n\nclass AbstractPluginLoader {\n    constructor() {\n        // Implemented by Node.js plugin loader\n        this.require = function() {\n            return null;\n        }\n    }\n\n    evalPlugin(contents, context, imports, pluginOptions, fileInfo) {\n\n        let loader, registry, pluginObj, localModule, pluginManager, filename, result;\n\n        pluginManager = context.pluginManager;\n\n        if (fileInfo) {\n            if (typeof fileInfo === 'string') {\n                filename = fileInfo;\n            }\n            else {\n                filename = fileInfo.filename;\n            }\n        }\n        const shortname = (new this.less.FileManager()).extractUrlParts(filename).filename;\n\n        if (filename) {\n            pluginObj = pluginManager.get(filename);\n\n            if (pluginObj) {\n                result = this.trySetOptions(pluginObj, filename, shortname, pluginOptions);\n                if (result) {\n                    return result;\n                }\n                try {\n                    if (pluginObj.use) {\n                        pluginObj.use.call(this.context, pluginObj);\n                    }\n                }\n                catch (e) {\n                    e.message = e.message || 'Error during @plugin call';\n                    return new LessError(e, imports, filename);\n                }\n                return pluginObj;\n            }\n        }\n        localModule = {\n            exports: {},\n            pluginManager,\n            fileInfo\n        };\n        registry = functionRegistry.create();\n\n        const registerPlugin = function(obj) {\n            pluginObj = obj;\n        };\n\n        try {\n            loader = new Function('module', 'require', 'registerPlugin', 'functions', 'tree', 'less', 'fileInfo', contents);\n            loader(localModule, this.require(filename), registerPlugin, registry, this.less.tree, this.less, fileInfo);\n        }\n        catch (e) {\n            return new LessError(e, imports, filename);\n        }\n\n        if (!pluginObj) {\n            pluginObj = localModule.exports;\n        }\n        pluginObj = this.validatePlugin(pluginObj, filename, shortname);\n\n        if (pluginObj instanceof LessError) {\n
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return pluginObj;\n }\n\n if (pluginObj) {\n pluginObj.imports = imports;\n pluginObj.filename = filename;\n\n // For < 3.x (or unspecified minVersion) - setOptions() before install()\n if (!pluginObj.minVersion || this.compareVersion('3.0.0', pluginObj.minVersion) < 0) {\n result = this.trySetOptions(pluginObj, filename, shortname, pluginOptions);\n\n if (result) {\n return result;\n }\n }\n\n // Run on first load\n pluginManager.addPlugin(pluginObj, fileInfo.filename, registry);\n pluginObj.functions = registry.getLocalFunctions();\n\n // Need to call setOptions again because the pluginObj might have functions\n result = this.trySetOptions(pluginObj, filename, shortname, pluginOptions);\n if (result) {\n return result;\n }\n\n // Run every @plugin call\n try {\n if (pluginObj.use) {\n pluginObj.use.call(this.context, pluginObj);\n }\n }\n catch (e) {\n e.message = e.message || 'Error during @plugin call';\n return new LessError(e, imports, filename);\n }\n\n }\n else {\n return new LessError({ message: 'Not a valid plugin' }, imports, filename);\n }\n\n return pluginObj;\n\n }\n\n trySetOptions(plugin, filename, name, options) {\n if (options && !plugin.setOptions) {\n return new LessError({\n message: `Options have been provided but the plugin ${name} does not support any options.`\n });\n }\n try {\n plugin.setOptions && plugin.setOptions(options);\n }\n catch (e) {\n return new LessError(e);\n }\n }\n\n validatePlugin(plugin, filename, name) {\n if (plugin) {\n // support plugins being a function\n // so that the plugin can be more usable programmatically\n if (typeof plugin === 'function') {\n plugin = new plugin();\n }\n\n if (plugin.minVersion) {\n if (this.compareVersion(plugin.minVersion, this.less.version) < 0) {\n return new LessError({\n message: `Plugin ${name} requires version ${this.versionToString(plugin.minVersion)}`\n });\n }\n }\n return plugin;\n }\n return null;\n }\n\n compareVersion(aVersion, bVersion) {\n if (typeof aVersion === 'string') {\n aVersion = aVersion.match(/^(\\d+)\\.?(\\d+)?\\.?(\\d+)?/);\n aVersion.shift();\n }\n for (let i = 0; i < aVersion.length; i++) {\n if (aVersion[i] !== bVersion[i]) {\n return parseInt(aVersion[i]) > parseInt(bVersion[i])\n ? -1 : 1;\n }\n }\n return 0;\n }\n\n versionToString(version) {\n let versionString = '';\n for (let i = 0; i < version.length; i++) {\n versionString += (versionString ? '.' : '') + version[i];\n }\n return versionString;\n }\n\n printUsage(plugins) {\n for (let i = 0; i < plugins.length; i++) {\n const plugin = plugins[i];\n if (plugin.printUsage) {\n plugin.printUsage();\n }\n }\n}\n\nexport default AbstractPluginLoader;\n\n","import tree from '../tree';\n\nconst _visitArgs = { visitDeeper: true };\nlet _hasIndexed = false;\n\nfunction _noop(node) {\n return node;\n}\n\nfunction indexNodeTypes(parent, ticker) {\n // add .typeIndex to tree node types for lookup table\n let key, child;\n for (key in parent) { \n /* eslint guard-for-in: 0 */\n child = parent[key];\n switch (typeof child) {\n case 'function':\n // ignore bound functions directly on tree which do not have a prototype\n // or aren't nodes\n if (child.prototype && child.prototype.type) {\n child.prototype.typeIndex = ticker++;\n }\n break;\n case 'object':\n ticker = indexNodeTypes(child, ticker);\n break;\n \n }\n }\n return ticker;\n}\n\nclass Visitor {\n constructor(implementation) {\n this._implementation = implementation;\n this._visitInCache = {};\n this._visitOutCache = {};\n\n if (!_hasIndexed) {\n indexNodeTypes(tree, 1);\n _hasIndexed = true;\n }\n }\n\n visit(node) {\n if (!node) {\n return node;\n }\n\n const nodeTypeIndex = node.typeIndex;\n if (!nodeTypeIndex) {\n // MixinCall args aren't a node type?\n if (node.value && node.value.typeIndex) {\n this.visit(node.value);\n }\n return node;\n }\n\n const impl = this._implementation;\n let func = this._visitInCache[nodeTypeIndex];\n let funcOut = this._visitOutCache[nodeTypeIndex];\n const visitArgs = _visitArgs;\n let fnName;\n\n visitArgs.visitDeeper = true;\n\n if (!func) {\n fnName = `visit${node.type}`;\n func = impl[fnName] || _noop;\n funcOut = impl[`${fnName}Out`] || _noop;\n this._visitInCache[nodeTypeIndex] = func;\n this._visitOutCache[nodeTypeIndex] = funcOut;\n }\n\n
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 if (func !== _noop) {\n            const newNode = func.call(impl, node, visitArgs);\n            if (node &&
impl.isReplacing) {\n                node = newNode;\n            }\n        }\n\n        if (visitArgs.visitDeeper && node) {\n
        if (node.length) {\n                for (let i = 0, cnt =
 node.length; i < cnt; i++) {\n                    if (node[i].accept) {\n                        node[i].accept(this);\n                    }\n
            }\n            } else if (node.accept) {\n                node.accept(this);\n            }\n        }\n\n        if (funcOut !=
_noop) {\n            funcOut.call(impl, node);\n        }\n\n        return node;\n    }\n\n    visitArray(nodes,
nonReplacing) {\n        if (!nodes) {\n            return nodes;\n        }\n\n        const cnt = nodes.length;\n        let i;\n\n
    // Non-replacing\n        if (nonReplacing || !this._implementation.isReplacing) {\n            for (i = 0; i < cnt; i++)
{\n                this.visit(nodes[i]);\n            }\n            return nodes;\n        }\n\n        // Replacing\n        const out =
[];\n        for (i = 0; i < cnt; i++) {\n            const evald = this.visit(nodes[i]);\n            if (evald === undefined) {
continue; }\n            if (!evald.splice) {\n                out.push(evald);\n
            } else if (evald.length) {\n                this.flatten(evald, out);\n            }\n        }\n        return out;\n    }\n\n
flatten(arr, out) {\n        if (!out) {\n            out = [];\n        }\n\n        let cnt, i, item, nestedCnt, j, nestedItem;\n\n
for (i = 0, cnt = arr.length; i < cnt; i++) {\n            item = arr[i];\n            if (item === undefined) {\n
continue;\n            }\n            if (!item.splice) {\n                out.push(item);\n                continue;\n            }\n\n
for (j = 0, nestedCnt = item.length; j < nestedCnt; j++) {\n                nestedItem = item[j];\n                if (nestedItem
=== undefined) {\n                    continue;\n                }\n                if (!nestedItem.splice) {\n
out.push(nestedItem);\n                } else if (nestedItem.length) {\n                    this.flatten(nestedItem, out);\n
 }\n            }\n
    }\n\n        return out;\n    }\n}\n\nexport default Visitor;\n","class ImportSequencer {\n
constructor(onSequencerEmpty) {\n        this.imports = [];\n        this.variableImports = [];\n
this._onSequencerEmpty = onSequencerEmpty;\n        this._currentDepth = 0;\n    }\n\n    addImport(callback) {\n
  const importSequencer = this,\n            importItem = {\n                callback,\n                args: null,\n
isReady: false\n            };\n        this.imports.push(importItem);\n        return function() {\n            importItem.args =
Array.prototype.slice.call(arguments, 0);\n            importItem.isReady = true;\n            importSequencer.tryRun();\n
    };\n    }\n\n    addVariableImport(callback) {\n        this.variableImports.push(callback);\n    }\n\n    tryRun() {\n
   this._currentDepth++;\n        try {\n            while (true) {\n                while (this.imports.length > 0) {\n
const importItem =
 this.imports[0];\n                    if (!importItem.isReady) {\n                        return;\n                    }\n
this.imports = this.imports.slice(1);\n                    importItem.callback.apply(null, importItem.args);\n                }\n
            if (this.variableImports.length === 0) {\n                    break;\n                }\n                const variableImport =
this.variableImports[0];\n                this.variableImports = this.variableImports.slice(1);\n
variableImport();\n            }\n        } finally {\n            this._currentDepth--;\n        }\n        if (this._currentDepth
=== 0 && this._onSequencerEmpty) {\n            this._onSequencerEmpty();\n        }\n    }\n}\n\nexport default
ImportSequencer;\n","import contexts from '../contexts';\nimport Visitor from './visitor';\nimport ImportSequencer
from './import-sequencer';\nimport * as utils from '../utils';\n\nconst ImportVisitor = function(importer, finish)
 {\n\n    this._visitor = new Visitor(this);\n    this._importer = importer;\n    this._finish = finish;\n    this.context =
new contexts.Eval();\n    this.importCount = 0;\n    this.onceFileDetectionMap = {};\n    this.recursionDetector =
{};\n    this._sequencer = new
ImportSequencer(this._onSequencerEmpty.bind(this));\n};\n\nImportVisitor.prototype = {\n    isReplacing: false,\n
run: function (root) {\n        try {\n            // process the contents\n            this._visitor.visit(root);\n        }\n
catch (e) {\n            this.error = e;\n        }\n\n        this.isFinished = true;\n        this._sequencer.tryRun();\n    },\n
_onSequencerEmpty: function() {\n        if (!this.isFinished) {\n            return;\n        }\n
this._finish(this.error);\n    },\n    visitImport: function (importNode, visitArgs) {\n        const inlineCSS =
importNode.options.inline;\n\n        if (!importNode.css || inlineCSS) {\n\n            const context = new
contexts.Eval(this.context,
 utils.copyArray(this.context.frames));\n            const importParent = context.frames[0];\n\n
this.importCount++;\n            if (importNode.isVariableImport()) {\n
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this._sequencer.addVariableImport(this.processImportNode.bind(this, importNode, context, importParent));\n
} else {\n                this.processImportNode(importNode, context, importParent);\n            }\n        }\n
visitArgs.visitDeeper = false;\n    },\n    processImportNode: function(importNode, context, importParent) {\n
let evaldImportNode;\n        const inlineCSS = importNode.options.inline;\n\n        try {\n            evaldImportNode =
importNode.evalForImport(context);\n        } catch (e) {\n            if (!e.filename) { e.index = importNode.getIndex();
e.filename = importNode.fileInfo().filename; }\n            // attempt to eval properly and treat as css\n
importNode.css = true;\n            // if that fails, this error will
 be thrown\n            importNode.error = e;\n        }\n\n        if (evaldImportNode && (!evaldImportNode.css ||
inlineCSS)) {\n\n            if (evaldImportNode.options.multiple) {\n                context.importMultiple = true;\n
}\n\n            // try appending if we haven't determined if it is css or not\n            const tryAppendLessExtension =
evaldImportNode.css === undefined;\n\n            for (let i = 0; i < importParent.rules.length; i++) {\n                if
(importParent.rules[i] === importNode) {\n                    importParent.rules[i] = evaldImportNode;\n
break;\n                }\n            }\n\n            const onImported = this.onImported.bind(this, evaldImportNode, context),
sequencedOnImported = this._sequencer.addImport(onImported);\n\n
this._importer.push(evaldImportNode.getPath(), tryAppendLessExtension, evaldImportNode.fileInfo(),\n
evaldImportNode.options, sequencedOnImported);\n        } else
 {\n            this.importCount--;\n            if (this.isFinished) {\n                this._sequencer.tryRun();\n            }\n
}\n    },\n    onImported: function (importNode, context, e, root, importedAtRoot, fullPath) {\n        if (e) {\n
if (!e.filename) {\n                e.index = importNode.getIndex(); e.filename = importNode.fileInfo().filename;\n
}\n            this.error = e;\n        }\n\n        const importVisitor = this,\n            inlineCSS =
importNode.options.inline,\n            isPlugin = importNode.options.isPlugin,\n            isOptional =
importNode.options.optional,\n            duplicateImport = importedAtRoot || fullPath in
importVisitor.recursionDetector;\n\n        if (!context.importMultiple) {\n            if (duplicateImport) {\n
importNode.skip = true;\n            } else {\n                importNode.skip = function() {\n                    if (fullPath in
importVisitor.onceFileDetectionMap) {\n
                return true;\n                    }\n                    importVisitor.onceFileDetectionMap[fullPath] = true;\n
    return false;\n                };\n            }\n        }\n\n        if (!fullPath && isOptional) {\n            importNode.skip =
true;\n        }\n\n        if (root) {\n            importNode.root = root;\n            importNode.importedFilename =
fullPath;\n\n            if (!inlineCSS && !isPlugin && (context.importMultiple || !duplicateImport)) {\n
importVisitor.recursionDetector[fullPath] = true;\n\n                const oldContext = this.context;\n
this.context = context;\n                try {\n                    this._visitor.visit(root);\n                } catch (e) {\n
this.error = e;\n                }\n                this.context = oldContext;\n            }\n        }\n\n
importVisitor.importCount--;\n\n        if (importVisitor.isFinished) {\n            importVisitor._sequencer.tryRun();\n
        }\n    },\n    visitDeclaration: function (declNode, visitArgs) {\n        if (declNode.value.type ===
'DetachedRuleset') {\n            this.context.frames.unshift(declNode);\n        } else {\n            visitArgs.visitDeeper =
false;\n        }\n    },\n    visitDeclarationOut: function(declNode) {\n        if (declNode.value.type ===
'DetachedRuleset') {\n            this.context.frames.shift();\n        }\n    },\n    visitAtRule: function (atRuleNode,
visitArgs) {\n        this.context.frames.unshift(atRuleNode);\n    },\n    visitAtRuleOut: function (atRuleNode) {\n
 this.context.frames.shift();\n    },\n    visitMixinDefinition: function (mixinDefinitionNode, visitArgs) {\n
this.context.frames.unshift(mixinDefinitionNode);\n    },\n    visitMixinDefinitionOut: function
(mixinDefinitionNode) {\n        this.context.frames.shift();\n    },\n    visitRuleset: function (rulesetNode, visitArgs)
{\n        this.context.frames.unshift(rulesetNode);\n
    },\n    visitRulesetOut: function (rulesetNode) {\n        this.context.frames.shift();\n    },\n    visitMedia: function
(mediaNode, visitArgs) {\n        this.context.frames.unshift(mediaNode.rules[0]);\n    },\n    visitMediaOut: function
(mediaNode) {\n        this.context.frames.shift();\n    }\n};\nexport default ImportVisitor;\n","class
SetTreeVisibilityVisitor {\n    constructor(visible) {\n        this.visible = visible;\n    }\n\n    run(root) {\n
this.visit(root);\n    }\n\n    visitArray(nodes) {\n        if (!nodes) {\n            return nodes;\n        }\n\n        const cnt =
nodes.length;\n        let i;\n        for (i = 0; i < cnt; i++) {\n            this.visit(nodes[i]);\n        }\n        return nodes;\n
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}\n\n    visit(node) {\n        if (!node) {\n            return node;\n        }\n        if (node.constructor === Array) {\n
 return this.visitArray(node);\n        }\n\n        if (!node.blocksVisibility || node.blocksVisibility())
 {\n            return node;\n        }\n        if (this.visible) {\n            node.ensureVisibility();\n        } else {\n
node.ensureInvisibility();\n        }\n\n        node.accept(this);\n        return node;\n    }\n}\n\nexport default
SetTreeVisibilityVisitor;","import tree from '../tree';\nimport Visitor from './visitor';\nimport logger from
'../logger';\nimport * as utils from '../utils';\n\n/* jshint loopfunc:true */\n\nclass ExtendFinderVisitor {\n
constructor() {\n        this._visitor = new Visitor(this);\n        this.contexts = [];\n        this.allExtendsStack = [[]];\n
}\n\n    run(root) {\n        root = this._visitor.visit(root);\n        root.allExtends = this.allExtendsStack[0];\n        return
root;\n    }\n\n    visitDeclaration(declNode, visitArgs) {\n        visitArgs.visitDeeper = false;\n    }\n\n
visitMixinDefinition(mixinDefinitionNode, visitArgs) {\n        visitArgs.visitDeeper = false;\n    }\n\n
visitRuleset(rulesetNode,
 visitArgs) {\n        if (rulesetNode.root) {\n            return;\n        }\n\n        let i;\n        let j;\n        let extend;\n
const allSelectorsExtendList = [];\n        let extendList;\n\n        // get &:extend(.a); rules which apply to all selectors
in this ruleset\n        const rules = rulesetNode.rules, ruleCnt = rules ? rules.length : 0;\n        for (i = 0; i < ruleCnt;
i++) {\n            if (rulesetNode.rules[i] instanceof tree.Extend) {\n                allSelectorsExtendList.push(rules[i]);\n
                rulesetNode.extendOnEveryPath = true;\n            }\n        }\n\n        // now find every selector and apply the
extends that apply to all extends\n        // and the ones which apply to an individual extend\n        const paths =
rulesetNode.paths;\n        for (i = 0; i < paths.length; i++) {\n            const selectorPath = paths[i], selector =
selectorPath[selectorPath.length - 1], selExtendList = selector.extendList;\n\n            extendList = selExtendList
 ? utils.copyArray(selExtendList).concat(allSelectorsExtendList)\n                : allSelectorsExtendList;\n\n            if
(extendList) {\n                extendList = extendList.map(function(allSelectorsExtend) {\n                    return
allSelectorsExtend.clone();\n                });\n            }\n\n            for (j = 0; j < extendList.length; j++) {\n
this.foundExtends = true;\n                extend = extendList[j];\n                extend.findSelfSelectors(selectorPath);\n
        extend.ruleset = rulesetNode;\n                if (j === 0) { extend.firstExtendOnThisSelectorPath = true; }\n
  this.allExtendsStack[this.allExtendsStack.length - 1].push(extend);\n            }\n        }\n\n
this.contexts.push(rulesetNode.selectors);\n    }\n\n    visitRulesetOut(rulesetNode) {\n        if (!rulesetNode.root) {\n
            this.contexts.length = this.contexts.length - 1;\n        }\n    }\n\n    visitMedia(mediaNode, visitArgs)
 {\n        mediaNode.allExtends = [];\n        this.allExtendsStack.push(mediaNode.allExtends);\n    }\n\n
visitMediaOut(mediaNode) {\n        this.allExtendsStack.length = this.allExtendsStack.length - 1;\n    }\n\n
visitAtRule(atRuleNode, visitArgs) {\n        atRuleNode.allExtends = [];\n
this.allExtendsStack.push(atRuleNode.allExtends);\n    }\n\n    visitAtRuleOut(atRuleNode) {\n
this.allExtendsStack.length = this.allExtendsStack.length - 1;\n    }\n}\n\nclass ProcessExtendsVisitor {\n
constructor() {\n        this._visitor = new Visitor(this);\n    }\n\n    run(root) {\n        const extendFinder = new
ExtendFinderVisitor();\n        this.extendIndices = {};\n        extendFinder.run(root);\n        if
(!extendFinder.foundExtends) { return root; }\n        root.allExtends =
root.allExtends.concat(this.doExtendChaining(root.allExtends, root.allExtends));\n        this.allExtendsStack =
[root.allExtends];\n        const newRoot = this._visitor.visit(root);\n
        this.checkExtendsForNonMatched(root.allExtends);\n        return newRoot;\n    }\n\n
checkExtendsForNonMatched(extendList) {\n        const indices = this.extendIndices;\n
extendList.filter(function(extend) {\n            return !extend.hasFoundMatches && extend.parent_ids.length == 1;\n
    }).forEach(function(extend) {\n            let selector = '_unknown_';\n            try {\n                selector =
extend.selector.toCSS({});\n            }\n            catch (_) {}\n\n            if (!indices[`${extend.index} ${selector}`])
{\n                indices[`${extend.index} ${selector}`] = true;\n                logger.warn(`extend '${selector}' has no
matches`);\n            }\n        });\n    }\n\n    doExtendChaining(extendsList, extendsListTarget, iterationCount) {\n
 //\n        // chaining is different from normal extension.. if we extend an extend then we are not just copying,
altering\n        // and pasting the selector we would do normally,
 but we are also adding an extend with the same target selector\n        // this means this new extend can then go and
alter other extends\n        //\n        // this method deals with all the chaining work - without it, extend is flat and
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doesn't work on other extend selectors\n        // this is also the most expensive.. and a match on one selector can cause an extension of a selector we had already\n        // processed if we look at each selector at a time, as is done in visitRuleset\n\n        let extendIndex;\n\n        let targetExtendIndex;\n        let matches;\n        const extendsToAdd = [];\n        let newSelector;\n        const extendVisitor = this;\n        let selectorPath;\n        let extend;\n        let targetExtend;\n        let newExtend;\n\n        iterationCount = iterationCount || 0;\n\n        // loop through comparing every extend with every target extend.\n        // a target extend is the one on the ruleset we are looking at copy/edit/pasting in place\n
        // e.g.  .a:extend(.b) {}  and .b:extend(.c) {} then the first extend extends the second one\n        // and the second is the target.\n        // the separation into two lists allows us to process a subset of chains with a bigger set, as is the\n
    // case when processing media queries\n        for (extendIndex = 0; extendIndex < extendsList.length; extendIndex++) {\n            for (targetExtendIndex = 0; targetExtendIndex < extendsListTarget.length; targetExtendIndex++) {\n\n                extend = extendsList[extendIndex];\n                targetExtend = extendsListTarget[targetExtendIndex];\n\n                // look for circular references\n                if ( extend.parent_ids.indexOf( targetExtend.object_id ) >= 0 ) { continue; }\n\n                // find a match in the target extends self selector (the bit before :extend)\n                selectorPath = [targetExtend.selfSelectors[0]];\n                matches = extendVisitor.findMatch(extend, selectorPath);\n\n
                if (matches.length) {\n                    extend.hasFoundMatches = true;\n\n                    // we found a match, so for each self selector..\n                    extend.selfSelectors.forEach(function(selfSelector) {\n                        const info = targetExtend.visibilityInfo();\n\n                        // process the extend as usual\n                        newSelector = extendVisitor.extendSelector(matches, selectorPath, selfSelector, extend.isVisible());\n\n                        // but now we create a new extend from it\n                        newExtend = new(tree.Extend)(targetExtend.selector, targetExtend.option, 0, targetExtend.fileInfo(), info);\n                        newExtend.selfSelectors = newSelector;\n\n
                        // add the extend onto the list of extends for that selector\n                        newSelector[newSelector.length - 1].extendList = [newExtend];\n\n                        // record that we need to add it.\n
                        extendsToAdd.push(newExtend);\n                        newExtend.ruleset = targetExtend.ruleset;\n\n
                    // remember its parents for circular references\n                        newExtend.parent_ids = newExtend.parent_ids.concat(targetExtend.parent_ids, extend.parent_ids);\n\n                        // only process the selector once.. if we have :extend(.a,.b) then multiple\n                        // extends will look at the same selector path, so when extending\n                        // we know that any others will be duplicates in terms of what is added to the css\n                        if (targetExtend.firstExtendOnThisSelectorPath) {\n                            newExtend.firstExtendOnThisSelectorPath = true;\n                            targetExtend.ruleset.paths.push(newSelector);\n                        }\n                    });\n                }\n            }\n        }\n\n        if (extendsToAdd.length) {\n            // try to detect
 circular references to stop a stack overflow.\n            // may no longer be needed.\n            this.extendChainCount++;\n            if (iterationCount > 100) {\n                let selectorOne = '{unable to calculate}';\n                let selectorTwo = '{unable to calculate}';\n                try {\n                    selectorOne = extendsToAdd[0].selfSelectors[0].toCSS();\n                    selectorTwo = extendsToAdd[0].selector.toCSS();\n                }\n                catch (e) {}\n                throw { message: `extend circular reference detected. One of the circular extends is currently:${selectorOne}:extend(${selectorTwo})`};\n            }\n\n            // now process the new extends on the existing rules so that we can handle a extending b extending c extending\n            // d extending e...\n            return extendsToAdd.concat(extendVisitor.doExtendChaining(extendsToAdd, extendsListTarget, iterationCount + 1));\n        } else {\n            return
 extendsToAdd;\n        }\n    }\n\n    visitDeclaration(ruleNode, visitArgs) {\n        visitArgs.visitDeeper = false;\n    }\n\n    visitMixinDefinition(mixinDefinitionNode, visitArgs) {\n        visitArgs.visitDeeper = false;\n    }\n\n    visitSelector(selectorNode, visitArgs) {\n        visitArgs.visitDeeper = false;\n    }\n\n    visitRuleset(rulesetNode, visitArgs) {\n        if (rulesetNode.root) {\n            return;\n        }\n        let matches;\n        let pathIndex;\n        let extendIndex;\n        const allExtends = this.allExtendsStack[this.allExtendsStack.length - 1];\n        const selectorsToAdd = [];\n        const extendVisitor = this;\n        let selectorPath;\n\n        // look at each selector path in
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the ruleset, find any extend matches and then copy, find and replace\n\n for (extendIndex = 0; extendIndex < allExtends.length; extendIndex++) {\n for (pathIndex = 0; pathIndex < rulesetNode.paths.length; pathIndex++) {\n selectorPath
= rulesetNode.paths[pathIndex];\n\n // extending extends happens initially, before the main pass\n if (rulesetNode.extendOnEveryPath) { continue; }\n const extendList = selectorPath[selectorPath.length - 1].extendList;\n if (extendList && extendList.length) { continue; }\n\n matches = this.findMatch(allExtends[extendIndex], selectorPath);\n\n if (matches.length) {\n allExtends[extendIndex].hasFoundMatches = true;\n\n allExtends[extendIndex].selfSelectors.forEach(function(selfSelector) {\n let extendedSelectors;\n extendedSelectors = extendVisitor.extendSelector(matches, selectorPath, selfSelector, allExtends[extendIndex].isVisible());\n selectorsToAdd.push(extendedSelectors);\n });\n }\n }\n }\n rulesetNode.paths = rulesetNode.paths.concat(selectorsToAdd);\n }\n\n findMatch(extend, haystackSelectorPath) {\n //\n // look through the haystack selector path to try and find the needle - extend.selector\n // returns an array of selector matches that can then be replaced\n //\n let haystackSelectorIndex;\n\n let hackstackSelector;\n let hackstackElementIndex;\n let haystackElement;\n let targetCombinator;\n let i;\n const extendVisitor = this;\n const needleElements = extend.selector.elements;\n const potentialMatches = [];\n let potentialMatch;\n const matches = [];\n\n // loop through the haystack elements\n for (haystackSelectorIndex = 0; haystackSelectorIndex < haystackSelectorPath.length; haystackSelectorIndex++) {\n hackstackSelector = haystackSelectorPath[haystackSelectorIndex];\n\n for (hackstackElementIndex = 0; hackstackElementIndex < hackstackSelector.elements.length;
hackstackElementIndex++) {\n\n haystackElement = hackstackSelector.elements[hackstackElementIndex];\n\n // if we allow elements before our match we can add a potential match every time. otherwise only at the first element.\n if (extend.allowBefore || (haystackSelectorIndex === 0 && hackstackElementIndex === 0)) {\n potentialMatches.push({pathIndex: haystackSelectorIndex, index: hackstackElementIndex, matched: 0,\n initialCombinator: haystackElement.combinator});\n }\n\n for (i = 0; i < potentialMatches.length; i++) {\n potentialMatch = potentialMatches[i];\n\n // selectors add \" \" onto the first element. When we use & it joins the selectors together, but if we don't\n // then each selector in haystackSelectorPath has a space before it added in the toCSS phase. so we need to\n // work out what the resulting combinator will be\n targetCombinator = haystackElement.combinator.value;\n if (targetCombinator === '' && hackstackElementIndex === 0) {\n targetCombinator = ' ';\n }\n\n // if we don't match, null our match to indicate failure\n if (!extendVisitor.isElementValuesEqual(needleElements[potentialMatch.matched].value, haystackElement.value) ||\n (potentialMatch.matched > 0 && needleElements[potentialMatch.matched].combinator.value !== targetCombinator)) {\n potentialMatch = null;\n } else {\n potentialMatch.matched++;\n }\n\n // if we are still valid and have finished, test whether we have elements after and whether these are allowed\n if (potentialMatch) {\n potentialMatch.finished
= potentialMatch.matched === needleElements.length;\n if (potentialMatch.finished &&\n (!extend.allowAfter &&\n (hackstackElementIndex + 1 < hackstackSelector.elements.length || haystackSelectorIndex + 1 < haystackSelectorPath.length))) {\n potentialMatch = null;\n }\n }\n // if null we remove, if not, we are still valid, so either push as a valid match or continue\n if (potentialMatch) {\n if (potentialMatch.finished) {\n potentialMatch.length = needleElements.length;\n potentialMatch.endPathIndex = haystackSelectorIndex;\n potentialMatch.endPathElementIndex = hackstackElementIndex + 1; // index after end of match\n potentialMatches.length = 0; // we don't allow matches to

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 overlap, so start matching again\n                    matches.push(potentialMatch);\n                }\n            }
else {\n                potentialMatches.splice(i, 1);\n                i--;\n            }\n        }\n    }\n
 }\n    return matches;\n}\n\nisElementValuesEqual(elementValue1, elementValue2) {\n    if (typeof
elementValue1 === 'string' || typeof elementValue2 === 'string') {\n        return elementValue1 ===
elementValue2;\n    }\n    if (elementValue1 instanceof tree.Attribute) {\n        if (elementValue1.op !==
elementValue2.op || elementValue1.key !== elementValue2.key) {\n            return false;\n        }\n        if
(!elementValue1.value || !elementValue2.value) {\n            if (elementValue1.value || elementValue2.value) {\n
            return false;\n            }\n            return true;\n        }\n        elementValue1
 = elementValue1.value.value || elementValue1.value;\n        elementValue2 = elementValue2.value.value ||
elementValue2.value;\n        return elementValue1 === elementValue2;\n    }\n    elementValue1 =
elementValue1.value;\n    elementValue2 = elementValue2.value;\n    if (elementValue1 instanceof
tree.Selector) {\n        if (!(elementValue2 instanceof tree.Selector) || elementValue1.elements.length !==
elementValue2.elements.length) {\n            return false;\n        }\n        for (let i = 0; i  <
elementValue1.elements.length; i++) {\n            if (elementValue1.elements[i].combinator.value !==
elementValue2.elements[i].combinator.value) {\n                if (i !== 0 ||
(elementValue1.elements[i].combinator.value || ' ') !== (elementValue2.elements[i].combinator.value || ' ')) {\n
            return false;\n                }\n            }\n            if
(!this.isElementValuesEqual(elementValue1.elements[i].value,
 elementValue2.elements[i].value)) {\n                return false;\n            }\n        }\n        return true;\n
}\n    return false;\n}\n\nextendSelector(matches, selectorPath, replacementSelector, isVisible) {\n\n    //
for a set of matches, replace each match with the replacement selector\n\n    let currentSelectorPathIndex = 0,
currentSelectorPathElementIndex = 0, path = [], matchIndex, selector, firstElement, match, newElements;\n\n
for (matchIndex = 0; matchIndex < matches.length; matchIndex++) {\n        match = matches[matchIndex];\n
  selector = selectorPath[match.pathIndex];\n        firstElement = new tree.Element(\n
match.initialCombinator,\n            replacementSelector.elements[0].value,\n
replacementSelector.elements[0].isVariable,\n            replacementSelector.elements[0].getIndex(),\n
replacementSelector.elements[0].fileInfo()\n
        );\n\n        if (match.pathIndex > currentSelectorPathIndex && currentSelectorPathElementIndex > 0) {\n
        path[path.length - 1].elements = path[path.length - 1]\n
.elements.concat(selectorPath[currentSelectorPathIndex].elements.slice(currentSelectorPathElementIndex));\n
   currentSelectorPathElementIndex = 0;\n            currentSelectorPathIndex++;\n        }\n\n
newElements = selector.elements\n            .slice(currentSelectorPathElementIndex, match.index)\n
.concat([firstElement])\n            .concat(replacementSelector.elements.slice(1));\n\n        if
(currentSelectorPathIndex === match.pathIndex && matchIndex > 0) {\n            path[path.length - 1].elements
=\n            path[path.length - 1].elements.concat(newElements);\n        } else {\n            path =
path.concat(selectorPath.slice(currentSelectorPathIndex, match.pathIndex));\n\n
        path.push(new tree.Selector(\n            newElements\n        ));\n    }\n
currentSelectorPathIndex = match.endPathIndex;\n        currentSelectorPathElementIndex =
match.endPathElementIndex;\n        if (currentSelectorPathElementIndex >=
selectorPath[currentSelectorPathIndex].elements.length) {\n            currentSelectorPathElementIndex = 0;\n
   currentSelectorPathIndex++;\n        }\n    }\n\n    if (currentSelectorPathIndex < selectorPath.length &&
currentSelectorPathElementIndex > 0) {\n        path[path.length - 1].elements = path[path.length - 1]\n
.elements.concat(selectorPath[currentSelectorPathIndex].elements.slice(currentSelectorPathElementIndex));\n
currentSelectorPathIndex++;\n    }\n\n    path = path.concat(selectorPath.slice(currentSelectorPathIndex,
selectorPath.length));\n    path = path.map(function (currentValue) {\n        // we can re-use
 elements here, because the visibility property matters only for selectors\n        const derived =
currentValue.createDerived(currentValue.elements);\n        if (isVisible) {\n            derived.ensureVisibility();\n
        } else {\n            derived.ensureInvisibility();\n        }\n        return derived;\n    });\n    return
```

path;\n   }\n\n   visitMedia(mediaNode, visitArgs) {\n   let newAllExtends = mediaNode.allExtends.concat(this.allExtendsStack[this.allExtendsStack.length - 1]);\n   newAllExtends = newAllExtends.concat(this.doExtendChaining(newAllExtends, mediaNode.allExtends));\n   this.allExtendsStack.push(newAllExtends);\n   }\n\n   visitMediaOut(mediaNode) {\n   const lastIndex = this.allExtendsStack.length - 1;\n   this.allExtendsStack.length = lastIndex;\n   }\n\n   visitAtRule(atRuleNode, visitArgs) {\n   let newAllExtends = atRuleNode.allExtends.concat(this.allExtendsStack[this.allExtendsStack.length - 1]);\n   newAllExtends = newAllExtends.concat(this.doExtendChaining(newAllExtends, atRuleNode.allExtends));\n   this.allExtendsStack.push(newAllExtends);\n   }\n\n   visitAtRuleOut(atRuleNode) {\n   const lastIndex = this.allExtendsStack.length - 1;\n   this.allExtendsStack.length = lastIndex;\n   }\n}\n\nexport default ProcessExtendsVisitor;\n","import Visitor from './visitor';\n\nclass JoinSelectorVisitor {\n   constructor() {\n   this.contexts = [[]];\n   this._visitor = new Visitor(this);\n   }\n\n   run(root) {\n   return this._visitor.visit(root);\n   }\n\n   visitDeclaration(declNode, visitArgs) {\n   visitArgs.visitDeeper = false;\n   }\n\n   visitMixinDefinition(mixinDefinitionNode, visitArgs) {\n   visitArgs.visitDeeper = false;\n   }\n\n   visitRuleset(rulesetNode, visitArgs) {\n   const context = this.contexts[this.contexts.length - 1];\n   const paths = [];\n   let selectors;\n\n   this.contexts.push(paths);\n\n   if (!rulesetNode.root) {\n   selectors = rulesetNode.selectors;\n   if (selectors) {\n   selectors = selectors.filter(function(selector) { return selector.getIsOutput(); });\n   rulesetNode.selectors = selectors.length ? selectors : (selectors = null);\n   if (selectors) { rulesetNode.joinSelectors(paths, context, selectors); }\n   }\n   if (!selectors) { rulesetNode.rules = null; }\n   rulesetNode.paths = paths;\n   }\n   }\n\n   visitRulesetOut(rulesetNode) {\n   this.contexts.length = this.contexts.length - 1;\n   }\n\n   visitMedia(mediaNode, visitArgs) {\n   const context = this.contexts[this.contexts.length - 1];\n   mediaNode.rules[0].root = (context.length === 0 || context[0].multiMedia);\n   }\n\n   visitAtRule(atRuleNode, visitArgs) {\n   const context = this.contexts[this.contexts.length - 1];\n   if (atRuleNode.rules && atRuleNode.rules.length)\n   {\n   atRuleNode.rules[0].root = (atRuleNode.isRooted || context.length === 0 || null);\n   }\n   }\n}\n\nexport default JoinSelectorVisitor;\n","import tree from '../tree';\nimport Visitor from './visitor';\n\nclass CSSVisitorUtils {\n   constructor(context) {\n   this._visitor = new Visitor(this);\n   this._context = context;\n   }\n\n   containsSilentNonBlockedChild(bodyRules) {\n   let rule;\n   if (!bodyRules) {\n   return false;\n   }\n   for (let r = 0; r < bodyRules.length; r++) {\n   rule = bodyRules[r];\n   if (rule.isSilent && rule.isSilent(this._context) && !rule.blocksVisibility()) {\n   // the atrule contains something that was referenced (likely by extend)\n   // therefore it needs to be shown in output too\n   return true;\n   }\n   }\n   return false;\n   }\n\n   keepOnlyVisibleChilds(owner) {\n   if (owner && owner.rules) {\n   owner.rules = owner.rules.filter(thing => thing.isVisible());\n   }\n   }\n\n   isEmpty(owner) {\n   return (owner && owner.rules) \n   ? (owner.rules.length === 0) : true;\n   }\n\n   hasVisibleSelector(rulesetNode) {\n   return (rulesetNode && rulesetNode.paths)\n   ? (rulesetNode.paths.length > 0) : false;\n   }\n\n   resolveVisibility(node, originalRules) {\n   if (!node.blocksVisibility()) {\n   if (this.isEmpty(node) && !this.containsSilentNonBlockedChild(originalRules)) {\n   return ;\n   }\n\n   return node;\n   }\n\n   const compiledRulesBody = node.rules[0];\n   this.keepOnlyVisibleChilds(compiledRulesBody);\n\n   if (this.isEmpty(compiledRulesBody)) {\n   return ;\n   }\n\n   node.ensureVisibility();\n   node.removeVisibilityBlock();\n\n   return node;\n   }\n\n   isVisibleRuleset(rulesetNode) {\n   if (rulesetNode.firstRoot)\n   {\n   return true;\n   }\n\n   if (this.isEmpty(rulesetNode)) {\n   return false;\n   }\n\n   if (!rulesetNode.root && !this.hasVisibleSelector(rulesetNode)) {\n   return false;\n   }\n\n   return true;\n   }\n}\n\nconst ToCSSVisitor = function(context) {\n   this._visitor = new Visitor(this);\n   this._context = context;\n   this.utils = new CSSVisitorUtils(context);\n};\n\nToCSSVisitor.prototype = {\n   isReplacing: true,\n   run: function (root) {\n   return this._visitor.visit(root);\n   },\n\n   visitDeclaration: function (declNode, visitArgs)

```
{\n        if (declNode.blocksVisibility() || declNode.variable) {\n            return;\n        }\n        return declNode;\n    },\n\n    visitMixinDefinition: function (mixinNode, visitArgs) {\n        // mixin definitions do not get eval'd - this means they keep state\n        // so we have to clear that state here so it isn't used if toCSS is called twice\n        mixinNode.frames = [];\n    },\n\n    visitExtend: function (extendNode, visitArgs) {\n    },\n\n    visitComment: function (commentNode, visitArgs) {\n        if (commentNode.blocksVisibility() || commentNode.isSilent(this._context)) {\n            return;\n        }\n        return commentNode;\n    },\n\n    visitMedia: function(mediaNode, visitArgs) {\n        const originalRules = mediaNode.rules[0].rules;\n        mediaNode.accept(this._visitor);\n        visitArgs.visitDeeper = false;\n\n        return this.utils.resolveVisibility(mediaNode, originalRules);\n    },\n\n    visitImport: function (importNode, visitArgs) {\n        if (importNode.blocksVisibility()) {\n            return ;\n        }\n        return importNode;\n    },\n\n    visitAtRule: function(atRuleNode, visitArgs) {\n        if (atRuleNode.rules && atRuleNode.rules.length) {\n            return this.visitAtRuleWithBody(atRuleNode, visitArgs);\n        } else {\n            return this.visitAtRuleWithoutBody(atRuleNode, visitArgs);\n        }\n    },\n\n    visitAnonymous: function(anonymousNode, visitArgs) {\n        if (!anonymousNode.blocksVisibility()) {\n            anonymousNode.accept(this._visitor);\n            return anonymousNode;\n        }\n    },\n\n    visitAtRuleWithBody: function(atRuleNode, visitArgs) {\n        // if there is only one nested ruleset and that one has no path, then it is\n        // just fake ruleset\n        function hasFakeRuleset(atRuleNode) {\n            const bodyRules = atRuleNode.rules;\n            return bodyRules.length === 1 && (!bodyRules[0].paths || bodyRules[0].paths.length === 0);\n        }\n        function getBodyRules(atRuleNode) {\n            const nodeRules = atRuleNode.rules;\n            if (hasFakeRuleset(atRuleNode)) {\n                return nodeRules[0].rules;\n            }\n\n            return nodeRules;\n        }\n        // it is still true that it is only one ruleset in array\n        // this is last such moment\n        // process childs\n        const originalRules = getBodyRules(atRuleNode);\n        atRuleNode.accept(this._visitor);\n        visitArgs.visitDeeper = false;\n\n        if (!this.utils.isEmpty(atRuleNode)) {\n            this._mergeRules(atRuleNode.rules[0].rules);\n        }\n\n        return this.utils.resolveVisibility(atRuleNode, originalRules);\n    },\n\n    visitAtRuleWithoutBody: function(atRuleNode, visitArgs) {\n        if (atRuleNode.blocksVisibility()) {\n            return;\n        }\n\n        if (atRuleNode.name === '@charset') {\n            // Only output the debug info together with subsequent @charset definitions\n            // a comment (or @media statement) before the actual @charset atrule would\n            // be considered illegal css as it has to be on the first line\n            if (this.charset) {\n                if (atRuleNode.debugInfo) {\n                    const comment = new tree.Comment(`/* ${atRuleNode.toCSS(this._context).replace(/\\n/g, '')} */\\n`);\n                    comment.debugInfo = atRuleNode.debugInfo;\n                    return this._visitor.visit(comment);\n                }\n                return;\n            }\n            this.charset = true;\n        }\n\n        return atRuleNode;\n    },\n\n    checkValidNodes: function(rules, isRoot) {\n        if (!rules) {\n            return;\n        }\n\n        for (let i = 0; i < rules.length; i++) {\n            const ruleNode = rules[i];\n            if (isRoot && ruleNode instanceof tree.Declaration && !ruleNode.variable) {\n                throw { message: 'Properties must be inside selector blocks. They cannot be in the root',\n                    index: ruleNode.getIndex(), filename: ruleNode.fileInfo() && ruleNode.fileInfo().filename};\n            }\n            if (ruleNode instanceof tree.Call) {\n                throw { message: `Function '${ruleNode.name}' did not return a root node`,\n                    index: ruleNode.getIndex(), filename:\n                    ruleNode.fileInfo() && ruleNode.fileInfo().filename};\n            }\n            if (ruleNode.type && !ruleNode.allowRoot) {\n                throw { message: `${ruleNode.type} node returned by a function is not valid here`,\n                    index: ruleNode.getIndex(), filename: ruleNode.fileInfo() && ruleNode.fileInfo().filename};\n            }\n        }\n    },\n\n    visitRuleset: function (rulesetNode, visitArgs) {\n        // at this point rulesets are nested into each other\n        let rule;\n\n        const rulesets = [];\n\n        this.checkValidNodes(rulesetNode.rules, rulesetNode.firstRoot);\n\n        if (!rulesetNode.root) {\n            // remove invisible paths\n            this._compileRulesetPaths(rulesetNode);\n\n            // remove rulesets from this ruleset body and compile them separately\n            const nodeRules = rulesetNode.rules;\n\n            let nodeRuleCnt = nodeRules ?
```

nodeRules.length : 0;\n for (let i = 0; i < nodeRuleCnt;
) {\n rule = nodeRules[i];\n if (rule && rule.rules) {\n // visit because we are moving
them out from being a child\n rulesets.push(this._visitor.visit(rule));\n nodeRules.splice(i,
1);\n nodeRuleCnt--;\n continue;\n }\n i++;\n }\n // accept
the visitor to remove rules and refactor itself\n // then we can decide nogw whether we want it or not\n
// compile body\n if (nodeRuleCnt > 0) {\n rulesetNode.accept(this._visitor);\n } else {\n
rulesetNode.rules = null;\n }\n visitArgs.visitDeeper = false;\n } else { // if (!
rulesetNode.root) {\n rulesetNode.accept(this._visitor);\n visitArgs.visitDeeper = false;\n }\n\n
if (rulesetNode.rules) {\n this._mergeRules(rulesetNode.rules);\n
this._removeDuplicateRules(rulesetNode.rules);\n }\n\n // now decide whether we keep the ruleset\n
if (this.utils.isVisibleRuleset(rulesetNode)) {\n rulesetNode.ensureVisibility();\n rulesets.splice(0,
0, rulesetNode);\n }\n\n if (rulesets.length === 1) {\n return rulesets[0];\n }\n return
rulesets;\n },\n\n _compileRulesetPaths: function(rulesetNode) {\n if (rulesetNode.paths) {\n
rulesetNode.paths = rulesetNode.paths\n .filter(p => {\n let i;\n if
(p[0].elements[0].combinator.value === ' ') {\n p[0].elements[0].combinator =
new(tree.Combinator)('');\n }\n for (i = 0; i < p.length; i++) {\n if
(p[i].isVisible() && p[i].getIsOutput()) {\n return true;\n }\n
}\n return false;\n });\n }\n },\n\n _removeDuplicateRules: function(rules) {\n if
(!rules) { return; }\n\n // remove duplicates\n const ruleCache = {};\n\n let ruleList;\n let rule;\n
let i;\n\n for (i = rules.length - 1; i >= 0 ; i--) {\n rule = rules[i];\n if (rule instanceof
tree.Declaration) {\n if (!ruleCache[rule.name]) {\n ruleCache[rule.name] = rule;\n }
else {\n ruleList = ruleCache[rule.name];\n if (ruleList instanceof tree.Declaration) {\n
ruleList = ruleCache[rule.name] = [ruleCache[rule.name].toCSS(this._context)];\n }\n
const ruleCSS = rule.toCSS(this._context);\n if (ruleList.indexOf(ruleCSS) !== -1) {\n
rules.splice(i, 1);\n } else {\n
ruleList.push(ruleCSS);\n }\n }\n }\n },\n\n _mergeRules:
function(rules) {\n if (!rules) {\n return; \n }\n\n const groups = {};\n const groupsArr =
[];\n\n for (let i = 0; i < rules.length; i++) {\n const rule = rules[i];\n if (rule.merge) {\n
const key = rule.name;\n groups[key] ? rules.splice(i--, 1) : \n groupsArr.push(groups[key] =
[]);\n groups[key].push(rule);\n }\n }\n\n groupsArr.forEach(group => {\n if
(group.length > 0) {\n const result = group[0];\n let space = [];\n const comma = [new
tree.Expression(space)];\n group.forEach(rule => {\n if ((rule.merge === '+') && (space.length
> 0)) {\n comma.push(new tree.Expression(space = []));\n
}\n space.push(rule.value);\n result.important = result.important ||
rule.important;\n });\n result.value = new tree.Value(comma);\n }\n });\n
}\n};\n\nexport default ToCSSVisitor;\n","import Visitor from './visitor';\nimport ImportVisitor from './import-
visitor';\nimport MarkVisibleSelectorsVisitor from './set-tree-visibility-visitor';\nimport ExtendVisitor from
'./extend-visitor';\nimport JoinSelectorVisitor from './join-selector-visitor';\nimport ToCSSVisitor from './to-css-
visitor';\n\nexport default {\n Visitor,\n ImportVisitor,\n MarkVisibleSelectorsVisitor,\n ExtendVisitor,\n
JoinSelectorVisitor,\n ToCSSVisitor\n};\n","import chunker from './chunker';\n\nexport default () => {\n let //
Less input string\n input;\n\n let // current chunk\n j;\n\n const // holds state for backtracking\n
saveStack = [];\n\n let // furthest
index the parser has gone to\n furthest;\n\n let // if this is furthest we got to, this is the probably cause\n
furthestPossibleErrorMessage;\n\n let // chunkified input\n chunks;\n\n let // current chunk\n
current;\n\n let // index of current chunk, in `input`\n currentPos;\n\n const parserInput = {};\n const
CHARCODE_SPACE = 32;\n const CHARCODE_TAB = 9;\n const CHARCODE_LF = 10;\n const
CHARCODE_CR = 13;\n const CHARCODE_PLUS = 43;\n const CHARCODE_COMMA = 44;\n const
CHARCODE_FORWARD_SLASH = 47;\n const CHARCODE_9 = 57;\n\n function skipWhitespace(length)

```
{\n        const oldi = parserInput.i;\n        const oldj = j;\n        const curr = parserInput.i - currentPos;\n        const endIndex = parserInput.i + current.length - curr;\n        const mem = (parserInput.i += length);\n        const inp = input;\n        let c;\n        let nextChar;\n        let comment;\n\n        for (; parserInput.i < endIndex; parserInput.i++) {\n            c = inp.charCodeAt(parserInput.i);\n\n            if (parserInput.autoCommentAbsorb && c === CHARCODE_FORWARD_SLASH) {\n                nextChar = inp.charAt(parserInput.i + 1);\n                if (nextChar === '/') {\n                    comment = {index: parserInput.i, isLineComment: true};\n                    let nextNewLine = inp.indexOf('\\n', parserInput.i + 2);\n                    if (nextNewLine < 0) {\n                        nextNewLine = endIndex;\n                    }\n                    parserInput.i = nextNewLine;\n                    comment.text = inp.substr(comment.index, parserInput.i - comment.index);\n                    parserInput.commentStore.push(comment);\n                    continue;\n                } else if (nextChar === '*') {\n                    const nextStarSlash = inp.indexOf('*/', parserInput.i + 2);\n                    if (nextStarSlash >= 0) {\n                        comment = {\n                            index: parserInput.i,\n                            text: inp.substr(parserInput.i, nextStarSlash + 2 - parserInput.i),\n                            isLineComment: false\n                        };\n                        parserInput.i += comment.text.length - 1;\n                        parserInput.commentStore.push(comment);\n                        continue;\n                    }\n                }\n                break;\n            }\n\n            if ((c !== CHARCODE_SPACE) && (c !== CHARCODE_LF) && (c !== CHARCODE_TAB) && (c !== CHARCODE_CR)) {\n                break;\n            }\n        }\n\n        current = current.slice(length + parserInput.i - mem + curr);\n        currentPos = parserInput.i;\n\n        if (!current.length) {\n            if (j < chunks.length - 1) {\n                current = chunks[++j];\n                skipWhitespace(0); // skip space at the beginning of a chunk\n                return true; // things changed\n            }\n            parserInput.finished = true;\n        }\n\n        return oldi !== parserInput.i || oldj !== j;\n    }\n\n    parserInput.save = () => {\n        currentPos = parserInput.i;\n        saveStack.push( { current, i: parserInput.i, j });\n    };\n    parserInput.restore = possibleErrorMessage => {\n\n        if (parserInput.i > furthest || (parserInput.i === furthest && possibleErrorMessage && !furthestPossibleErrorMessage)) {\n            furthest = parserInput.i;\n            furthestPossibleErrorMessage = possibleErrorMessage;\n        }\n        const state = saveStack.pop();\n        current = state.current;\n        currentPos = parserInput.i = state.i;\n        j = state.j;\n    };\n    parserInput.forget = () => {\n        saveStack.pop();\n    };\n    parserInput.isWhitespace = offset => {\n        const pos = parserInput.i + (offset || 0);\n        const code = input.charCodeAt(pos);\n        return (code === CHARCODE_SPACE || code === CHARCODE_CR || code === CHARCODE_TAB || code === CHARCODE_LF);\n    };\n\n    // Specialization of $(tok)\n    parserInput.$re = tok => {\n        if (parserInput.i > currentPos) {\n            current = current.slice(parserInput.i - currentPos);\n            currentPos = parserInput.i;\n        }\n\n        const m = tok.exec(current);\n        if (!m) {\n            return null;\n        }\n\n        skipWhitespace(m[0].length);\n        if (typeof m === 'string') {\n            return m;\n        }\n\n        return m.length === 1 ? m[0] : m;\n    };\n\n    parserInput.$char = tok => {\n        if (input.charAt(parserInput.i) !== tok) {\n            return null;\n        }\n        skipWhitespace(1);\n        return tok;\n    };\n\n    parserInput.$str = tok => {\n        const tokLength = tok.length;\n\n        // https://jsperf.com/string-startswith/21\n        for (let i = 0; i < tokLength; i++) {\n            if (input.charAt(parserInput.i + i) !== tok.charAt(i)) {\n                return null;\n            }\n        }\n\n        skipWhitespace(tokLength);\n        return tok;\n    };\n\n    parserInput.$quoted = loc => {\n        const pos = loc || parserInput.i;\n        const startChar = input.charAt(pos);\n\n        if (startChar !== '\\'' && startChar !== '\"') {\n            return;\n        }\n        const length = input.length;\n        const currentPosition = pos;\n\n        for (let i = 1; i + currentPosition < length; i++) {\n            const nextChar = input.charAt(i + currentPosition);\n            switch (nextChar) {\n                case '\\\\':\n                    i++;\n                    continue;\n                case '\\r':\n                case '\\n':\n                    break;\n                case startChar:\n                    const str = input.substr(currentPosition, i + 1);\n                    if (!loc && loc !== 0) {\n                        skipWhitespace(i + 1);\n                        return str\n                    }\n                    return [startChar, str];\n                default:\n            }\n        }\n        return null;\n    };\n\n    /**\n     * Permissive parsing. Ignores everything except matching {} [] () and quotes\n     * until matching token (outside of blocks)\n     */\n    parserInput.$parseUntil = tok => {\n        let quote = '';\n        let returnVal = null;\n        let inComment = false;\n
```

```
let blockDepth = 0;\n        const blockStack = [];\n        const parseGroups = [];\n        const length = input.length;\n
    const startPos = parserInput.i;\n        let lastPos = parserInput.i;\n        let i = parserInput.i;\n        let loop = true;\n
    let testChar;\n\n        if (typeof tok === 'string') {\n            testChar = char => char === tok\n        } else {\n
testChar = char => tok.test(char)\n        }\n\n        do {\n            let prevChar;\n            let nextChar =
input.charAt(i);\n            if (blockDepth === 0 && testChar(nextChar)) {\n                returnVal =
input.substr(lastPos,
i - lastPos);\n                if (returnVal) {\n                    parseGroups.push(returnVal);\n                }\n                else {\n
                parseGroups.push(' ');\n                }\n                returnVal = parseGroups;\n                skipWhitespace(i -
startPos);\n                loop = false\n            } else {\n                if (inComment) {\n                    if (nextChar === '*'
&& \n                        input.charAt(i + 1) === '/') {\n                        i++;\n                        blockDepth--;\n
 inComment = false;\n                    }\n                    i++;\n                    continue;\n                }\n                switch
(nextChar) {\n                    case '\\\\':\n                        i++;\n                        nextChar = input.charAt(i);\n
 parseGroups.push(input.substr(lastPos, i - lastPos + 1));\n                        lastPos = i + 1;\n
    break;\n                    case '/':\n                        if (input.charAt(i + 1) === '*') {\n                            i++;\n
      inComment = true;\n                            blockDepth++;\n                        }\n                        break;\n
case '\\"':\n                    case '\"':\n                        quote = parserInput.$quoted(i);\n                        if (quote) {\n
            parseGroups.push(input.substr(lastPos, i - lastPos), quote);\n                            i += quote[1].length - 1;\n
                lastPos = i + 1;\n                        }\n                        else {\n                            skipWhitespace(i -
startPos);\n                            returnVal = nextChar;\n                            loop = false;\n                        }\n
break;\n                    case '{':\n                        blockStack.push('}');\n
          blockDepth++;\n                        break;\n                    case '(':\n                        blockStack.push(')');\n
      blockDepth++;\n                        break;\n                    case '[':\n                        blockStack.push(']');\n
  blockDepth++;\n                        break;\n                    case '}':\n                    case ')':\n                    case ']':\n
      const expected = blockStack.pop();\n                        if (nextChar === expected) {\n
blockDepth--;\n                        } else {\n                            // move the parser to the error and return expected\n
            skipWhitespace(i - startPos);\n                            returnVal = expected;\n                            loop = false;\n
            }\n                }\n                i++;\n                if (i > length) {\n                    loop
 = false;\n                }\n            }\n            prevChar = nextChar;\n        } while (loop);\n\n        return returnVal ?
returnVal : null;\n    }\n\n    parserInput.autoCommentAbsorb = true;\n    parserInput.commentStore = [];\n
parserInput.finished = false;\n\n    // Same as $(), but don't change the state of the parser,\n    // just return the
match.\n    parserInput.peek = tok => {\n        if (typeof tok === 'string') {\n            // https://jsperf.com/string-
startswith/21\n            for (let i = 0; i < tok.length; i++) {\n                if (input.charAt(parserInput.i + i) !==
tok.charAt(i)) {\n                    return false;\n                }\n            }\n            return true;\n        } else {\n            return
tok.test(current);\n        }\n    };\n\n    // Specialization of peek()\n    // TODO remove or change some currentChar
calls to peekChar\n    parserInput.peekChar = tok => input.charAt(parserInput.i) === tok;\n\n
parserInput.currentChar
 = () => input.charAt(parserInput.i);\n\n    parserInput.prevChar = () => input.charAt(parserInput.i - 1);\n\n
parserInput.getInput = () => input;\n\n    parserInput.peekNotNumeric = () => {\n        const c =
input.charCodeAt(parserInput.i);\n        // Is the first char of the dimension 0-9, '.', '+' or '-'\n        return (c >
CHARCODE_9 || c < CHARCODE_PLUS) || c === CHARCODE_FORWARD_SLASH || c ===
CHARCODE_COMMA;\n    };\n\n    parserInput.start = (str, chunkInput, failFunction) => {\n        input = str;\n
parserInput.i = j = currentPos = furthest = 0;\n\n        // chunking apparently makes things quicker (but my tests
indicate\n        // it might actually make things slower in node at least)\n        // and it is a non-perfect parse - it can't
recognise\n        // unquoted urls, meaning it can't distinguish comments\n        // meaning comments with quotes or
{}() in them get 'counted'\n        // and then lead to parse errors.\n        // In addition if the chunking
 chunks in the wrong place we might\n        // not be able to parse a parser statement in one go\n        // this is
officially deprecated but can be switched on via an option\n        // in the case it causes too much performance
issues.\n        if (chunkInput) {\n            chunks = chunker(str, failFunction);\n        } else {\n            chunks = [str];\n
```

```
}\n\n    current = chunks[0];\n\n    skipWhitespace(0);\n  };\n\n  parserInput.end = () => {\n    let message;\n    const isFinished = parserInput.i >= input.length;\n\n    if (parserInput.i < furthest) {\n      message = furthestPossibleErrorMessage;\n      parserInput.i = furthest;\n    }\n    return {\n      isFinished,\n      furthest: parserInput.i,\n      furthestPossibleErrorMessage: message,\n      furthestReachedEnd: parserInput.i >= input.length - 1,\n      furthestChar: input[parserInput.i]\n    };\n  };\n\n  return parserInput;\n};\n","//
 Split the input into chunks.\nexport default function (input, fail) {\n  const len = input.length;\n  let level = 0;\n  let parenLevel = 0;\n  let lastOpening;\n  let lastOpeningParen;\n  let lastMultiComment;\n  let lastMultiCommentEndBrace;\n  const chunks = [];\n  let emitFrom = 0;\n  let chunkerCurrentIndex;\n  let currentChunkStartIndex;\n  let cc;\n  let cc2;\n  let matched;\n\n  function emitChunk(force) {\n    const len = chunkerCurrentIndex - emitFrom;\n    if (((len < 512) && !force) || !len) {\n      return;\n    }\n    chunks.push(input.slice(emitFrom, chunkerCurrentIndex + 1));\n    emitFrom = chunkerCurrentIndex + 1;\n  }\n\n  for (chunkerCurrentIndex = 0; chunkerCurrentIndex < len; chunkerCurrentIndex++) {\n    cc = input.charCodeAt(chunkerCurrentIndex);\n    if (((cc >= 97) && (cc <= 122)) || (cc < 34)) {\n      // a-z or whitespace\n      continue;\n    }\n\n    switch
 (cc) {\n      case 40:                  // (\n        parenLevel++;\n        lastOpeningParen = chunkerCurrentIndex;\n        continue;\n      case 41:                  // )\n        if (--parenLevel < 0) {\n          return fail('missing opening `(`', chunkerCurrentIndex);\n        }\n        continue;\n      case 59:                  // ;\n        if (!parenLevel) { emitChunk(); }\n        continue;\n      case 123:                 // {\n        level++;\n        lastOpening = chunkerCurrentIndex;\n        continue;\n      case 125:                 // }\n        if (--level < 0) {\n          return fail('missing opening `{`', chunkerCurrentIndex);\n        }\n        if (!level && !parenLevel) { emitChunk(); }\n        continue;\n      case 92:                  // \\\n
        if (chunkerCurrentIndex < len - 1) { chunkerCurrentIndex++; continue; }\n        return fail('unescaped `\\\\`', chunkerCurrentIndex);\n      case 34:\n      case 39:\n      case 96:                  // \", ' and `\n
        matched = 0;\n        currentChunkStartIndex = chunkerCurrentIndex;\n        for (chunkerCurrentIndex = chunkerCurrentIndex + 1; chunkerCurrentIndex < len; chunkerCurrentIndex++) {\n          cc2 = input.charCodeAt(chunkerCurrentIndex);\n          if (cc2 > 96) { continue; }\n          if (cc2 == cc) { matched = 1; break; }\n          if (cc2 == 92) {        // \\\n            if (chunkerCurrentIndex == len - 1) {\n              return fail('unescaped `\\\\`', chunkerCurrentIndex);\n            }\n            chunkerCurrentIndex++;\n          }\n        }\n        if (matched) { continue;
 }\n        return fail(`unmatched \\`${String.fromCharCode(cc)}\\``, currentChunkStartIndex);\n      case 47:                  // /, check for comment\n        if (parenLevel || (chunkerCurrentIndex == len - 1)) { continue; }\n
        cc2 = input.charCodeAt(chunkerCurrentIndex + 1);\n        if (cc2 == 47) {\n          // //, find lnfeed\n          for (chunkerCurrentIndex = chunkerCurrentIndex + 2; chunkerCurrentIndex < len; chunkerCurrentIndex++) {\n            cc2 = input.charCodeAt(chunkerCurrentIndex);\n            if ((cc2 <= 13) && ((cc2 == 10) || (cc2 == 13))) { break; }\n          }\n        } else if (cc2 == 42) {\n          // /*, find */\n          lastMultiComment = currentChunkStartIndex = chunkerCurrentIndex;\n          for (chunkerCurrentIndex = chunkerCurrentIndex + 2; chunkerCurrentIndex < len - 1; chunkerCurrentIndex++) {\n
            cc2 = input.charCodeAt(chunkerCurrentIndex);\n            if (cc2 == 125) { lastMultiCommentEndBrace = chunkerCurrentIndex; }\n            if (cc2 != 42) { continue; }\n            if (input.charCodeAt(chunkerCurrentIndex + 1) == 47) { break; }\n          }\n          if (chunkerCurrentIndex == len - 1) {\n            return fail('missing closing `*/`', currentChunkStartIndex);\n          }\n          chunkerCurrentIndex++;\n        }\n        continue;\n      case 42:                  // *, check for unmatched */\n        if ((chunkerCurrentIndex < len - 1) && (input.charCodeAt(chunkerCurrentIndex + 1) == 47)) {\n          return fail('unmatched `/*`', chunkerCurrentIndex);\n        }\n        continue;\n    }\n  }\n\n  if (level !== 0) {\n    if ((lastMultiComment > lastOpening) && (lastMultiCommentEndBrace > lastMultiComment))
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{\n return fail('missing closing `}` or `*/`', lastOpening);\n } else {\n return fail('missing closing `}`', lastOpening);\n }\n } else if (parenLevel !== 0) {\n return fail('missing closing `)`', lastOpeningParen);\n }\n\n emitChunk(true);\n return chunks;\n};\n","import LessError from '../less-error';\nimport tree from '../tree';\nimport visitors from '../visitors';\nimport getParserInput from './parser-input';\nimport * as utils from '../utils';\nimport functionRegistry from '../functions/function-registry';\n\n//\n// less.js - parser\n//\n// A relatively straight-forward predictive parser.\n// There is no tokenization/lexing stage, the input is parsed\n// in one sweep.\n//\n// To make the parser fast enough to run in the browser, several\n// optimization had to be made:\n//\n// - Matching and slicing on a huge input is often cause of slowdowns.\n// The solution is to chunkify the input into
smaller strings.\n// The chunks are stored in the `chunks` var,\n// `j` holds the current chunk index, and `currentPos` holds\n// the index of the current chunk in relation to `input`.\n// This gives us an almost 4x speed-up.\n//\n// - In many cases, we don't need to match individual tokens;\n// for example, if a value doesn't hold any variables, operations\n// or dynamic references, the parser can effectively 'skip' it,\n// treating it as a literal.\n// An example would be '1px solid #000' - which evaluates to itself,\n// we don't need to know what the individual components are.\n// The drawback, of course is that you don't get the benefits of\n// syntax-checking on the CSS. This gives us a 50% speed-up in the parser,\n// and a smaller speed-up in the code-gen.\n//\n//\n// Token matching is done with the `$` function, which either takes\n// a terminal string or regexp, or a non-terminal function to call.\n// It
also takes care of moving all the indices forwards.\n//\n\nconst Parser = function Parser(context, imports, fileInfo) {\n let parsers;\n const parserInput = getParserInput();\n\n function error(msg, type) {\n throw new LessError(\n {\n index: parserInput.i,\n filename: fileInfo.filename,\n type: type || 'Syntax',\n message: msg\n },\n imports\n);\n }\n\n function expect(arg, msg) {\n // some older browsers return typeof 'function' for RegExp\n const result = (arg instanceof Function) ? arg.call(parsers) : parserInput.$re(arg);\n if (result) {\n return result;\n }\n \n error(msg || (typeof arg === 'string'\n ? `expected '${arg}' got '${parserInput.currentChar()}'`\n : 'unexpected token'));\n }\n\n // Specialization of expect()\n function expectChar(arg, msg) {\n if (parserInput.$char(arg))
{\n return arg;\n }\n error(msg || `expected '${arg}' got '${parserInput.currentChar()}'`);\n }\n\n function getDebugInfo(index) {\n const filename = fileInfo.filename;\n\n return {\n lineNumber: utils.getLocation(index, parserInput.getInput()).line + 1,\n fileName: filename\n };\n }\n\n /**\n * Used after initial parsing to create nodes on the fly\n *\n * @param {String} str - string to parse \n * @param {Array} parseList - array of parsers to run input through e.g. [\"value\", \"important\"]\n * @param {Number} currentIndex - start number to begin indexing\n * @param {Object} fileInfo - fileInfo to attach to created nodes\n */\n function parseNode(str, parseList, currentIndex, fileInfo, callback) {\n let result;\n const returnNodes = [];\n const parser = parserInput;\n\n try {\n parser.start(str, false,
function fail(msg, index) {\n callback({\n message: msg,\n index: index + currentIndex\n });\n });\n for (let x = 0, p, i; (p = parseList[x]); x++) {\n i = parser.i;\n result = parsers[p]();\n if (result) {\n try {\n result._index = i + currentIndex;\n result._fileInfo = fileInfo;\n } catch (e) {}\n returnNodes.push(result);\n }\n else {\n returnNodes.push(null);\n }\n }\n\n const endInfo = parser.end();\n if (endInfo.isFinished) {\n callback(null, returnNodes);\n }\n else {\n callback(true, null);\n }\n } catch (e) {\n throw new LessError({\n index: e.index
+ currentIndex,\n message: e.message\n }, imports, fileInfo.filename);\n }\n }\n\n //\n // The Parser\n //\n return {\n parserInput,\n imports,\n fileInfo,\n parseNode,\n //\n // Parse an input string into an abstract syntax tree,\n // @param str A string containing 'less' markup\n // @param callback call `callback` when done.\n // @param [additionalData] An optional map which can contains vars - a map (key, value) of variables to apply\n //\n parse: function (str, callback, additionalData) {\n

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let root;\n        let err = null;\n        let globalVars;\n        let modifyVars;\n        let ignored;\n        let preText = '';\n\n        // Optionally disable @plugin parsing\n        if (additionalData && additionalData.disablePluginRule) {\n            parsers.plugin = function() {\n                var dir = parserInput.$re(/^@plugin?\\s+/);\n                if (dir) {\n                    error('@plugin statements are not allowed when disablePluginRule is set to true');\n                }\n            };\n\n        globalVars = (additionalData && additionalData.globalVars) ? `${Parser.serializeVars(additionalData.globalVars)}\\n` : '';\n        modifyVars = (additionalData && additionalData.modifyVars) ? `\\n${Parser.serializeVars(additionalData.modifyVars)}` : '';\n\n        if (context.pluginManager) {\n            const preProcessors = context.pluginManager.getPreProcessors();\n            for (let i = 0; i < preProcessors.length; i++) {\n                str = preProcessors[i].process(str, { context, imports, fileInfo });\n            }\n        }\n\n        if (globalVars || (additionalData && additionalData.banner)) {\n            preText = ((additionalData && additionalData.banner) ? additionalData.banner : '') + globalVars;\n            ignored = imports.contentsIgnoredChars;\n            ignored[fileInfo.filename] = ignored[fileInfo.filename] || 0;\n            ignored[fileInfo.filename] += preText.length;\n        }\n\n        str = str.replace(/\\r\\n?/g, '\\n');\n        // Remove potential UTF Byte Order Mark\n        str = preText + str.replace(/^\\uFEFF/, '') + modifyVars;\n        imports.contents[fileInfo.filename] = str;\n\n        // Start with the primary rule.\n        // The whole syntax tree is held under a Ruleset node,\n        // with the `root` property set to true, so no `{}` are\n        // output. The callback is called when the input is parsed.\n        try {\n            parserInput.start(str, context.chunkInput, function fail(msg, index) {\n                throw new LessError({\n                    index,\n                    type: 'Parse',\n                    message: msg,\n                    filename: fileInfo.filename\n                }, imports);\n            });\n\n            tree.Node.prototype.parse = this;\n            root = new tree.Ruleset(null, this.parsers.primary());\n            tree.Node.prototype.rootNode = root;\n            root.root = true;\n            root.firstRoot = true;\n            root.functionRegistry = functionRegistry.inherit();\n        \n        } catch (e) {\n            return callback(new LessError(e, imports, fileInfo.filename));\n        }\n\n        // If `i` is smaller than the `input.length - 1`,\n        // it means the parser wasn't able to parse the whole\n        // string, so we've got a parsing error.\n        //\n        // We try to extract a \\n delimited string,\n        // showing the line where the parse error occurred.\n        // We split it up into two parts (the part which parsed,\n        // and the part which didn't), so we can color them differently.\n        const endInfo = parserInput.end();\n        if (!endInfo.isFinished) {\n\n            let message = endInfo.furthestPossibleErrorMessage;\n\n            if (!message) {\n                message = 'Unrecognised input';\n                if (endInfo.furthestChar === '}') {\n                    message += '. Possibly missing opening \\'{\\'';\n                } else if (endInfo.furthestChar === ')') {\n                    message += '. Possibly missing opening \\'(\\'';\n                } else if (endInfo.furthestReachedEnd) {\n                    message += '. Possibly missing something';\n                }\n            }\n\n            err = new LessError({\n                type: 'Parse',\n                message,\n                index: endInfo.furthest,\n                filename: fileInfo.filename\n            }, imports);\n        }\n\n        const finish = e => {\n            e = err || e || imports.error;\n\n            if (e) {\n                if (!(e instanceof LessError)) {\n                    e = new LessError(e, imports, fileInfo.filename);\n                }\n\n                return callback(e);\n            }\n            else {\n                return callback(null, root);\n            }\n        };\n\n        if (context.processImports !== false) {\n            new visitors.ImportVisitor(imports, finish)\n                .run(root);\n        } else {\n            return finish();\n        }\n    },\n\n    //\n    // Here in, the parsing rules/functions\n    //\n    // The basic structure of the syntax tree generated is as follows:\n    //\n    //   Ruleset ->  Declaration -> Value -> Expression -> Entity\n    //\n    // Here's some Less code:\n    //\n    //   .class {\n    //     color: #fff;\n    //     border: 1px solid #000;\n    //     width: @w + 4px;\n    //     > .child {...}\n    //   }\n    //\n    // And here's what the parse tree might look like:\n    //\n    //   Ruleset (Selector '.class', [\n    //     Declaration (\"color\",  Value ([Expression [Color #fff]]))\n    //     Declaration (\"border\", Value ([Expression [Dimension 1px][Keyword \"solid\"][Color #000]]))\n    //     Declaration (\"width\",  Value ([Expression [Operation \" + \" [Variable
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\"@w\"][Dimension 4px]]]))\n        //        Ruleset (Selector [Element '>', '.child'], [...])\n        //    ])\n        //\n        // In general, most rules will try to parse a token with the `$re()` function, and if the return\n        //  value is truly, will return a new node, of the relevant type. Sometimes, we need to check\n        //  first, before parsing, that's when we use `peek()`.\n        //\n        parsers: parsers = {\n            //\n            // The `primary` rule is the *entry* and *exit* point of the parser.\n            // The rules here can appear at any level of the parse tree.\n            //\n            // The recursive nature of the grammar is an interplay between the `block`\n            // rule, which represents `{ ... }`, the `ruleset` rule, and this `primary` rule,\n            // as represented by this simplified grammar:\n            //\n            //  primary  (ruleset | declaration)+\n            //  ruleset  selector+ block\n            //  block  '{' primary '}'\n            //\n            // Only at one point is the primary rule not called from the\n            // block rule: at the root level.\n            //\n            primary: function () {\n                const mixin = this.mixin;\n                let root = [];\n                let node;\n\n                while (true) {\n                    while (true) {\n                        node = this.comment();\n                        if (!node) { break; }\n                        root.push(node);\n                    }\n                    // always process comments before deciding if finished\n                    if (parserInput.finished) {\n                        break;\n                    }\n                    if (parserInput.peek('}')) {\n                        break;\n                    }\n\n                    node = this.extendRule();\n                    if (node) {\n                        root = root.concat(node);\n                        continue;\n                    }\n\n                    node = mixin.definition() || this.declaration() || mixin.call(false, false) || \n                        this.ruleset() || this.variableCall() || this.entities.call() || this.atrule();\n                    if (node) {\n                        root.push(node);\n                    } else {\n                        let foundSemiColon = false;\n                        while (parserInput.$char(';')) {\n                            foundSemiColon = true;\n                        }\n                        if (!foundSemiColon) {\n                            break;\n                        }\n                    }\n                }\n\n                return root;\n            },\n\n            // comments are collected by the main parsing mechanism and then assigned to nodes\n            // where the current structure allows it\n            comment: function () {\n                if (parserInput.commentStore.length) {\n                    const comment = parserInput.commentStore.shift();\n                    return new(tree.Comment)(comment.text, comment.isLineComment, comment.index, fileInfo);\n                }\n            },\n\n            //\n            // Entities are tokens which can be found inside an Expression\n            //\n            entities: {\n                mixinLookup: function() {\n                    return parsers.mixin.call(true, true);\n                },\n                //\n                // A string, which supports escaping \" and '\n                //\n                //     \"milky way\" 'he\\'s the one!'\n                //\n                quoted: function (forceEscaped) {\n                    let str;\n                    const index = parserInput.i;\n                    let isEscaped = false;\n\n                    parserInput.save();\n                    if (parserInput.$char('~')) {\n                        isEscaped = true;\n                    } else if (forceEscaped) {\n                        parserInput.restore();\n                        return;\n                    }\n\n                    str = parserInput.$quoted();\n                    if (!str) {\n                        parserInput.restore();\n                        return;\n                    }\n                    parserInput.forget();\n\n                    return new(tree.Quoted)(str.charAt(0), str.substr(1, str.length - 2), isEscaped, index, fileInfo);\n                },\n\n                //\n                // A catch-all word, such as:\n                //\n                //     black border-collapse\n                //\n                keyword: function () {\n                    const k = parserInput.$char('%') || parserInput.$re(/^\\[?(?:[\\w-]|\\\\(?:[A-Fa-f0-9]{1,6} ?|[^A-Fa-f0-9]))+\\]?/);\n                    if (k) {\n                        return tree.Color.fromKeyword(k) || new(tree.Keyword)(k);\n                    }\n                },\n\n                //\n                // A function call\n                //\n                //     rgb(255, 0, 255)\n                //\n                // The arguments are parsed with the `entities.arguments` parser.\n                //\n                call: function () {\n                    let name;\n                    let args;\n                    let func;\n                    const index = parserInput.i;\n\n                    // http://jsperf.com/case-insensitive-regex-vs-strtolower-then-regex/18\n                    if (parserInput.peek(/^url\\(/i)) {\n                        return;\n                    }\n\n                    parserInput.save();\n\n                    name = parserInput.$re(/^([\\w-]+|%|~|progid:[\\w\\.]+)\\(/);\n                    if (!name) {\n                        parserInput.forget(); \n                        return;\n                    }\n\n                    name = name[1];\n                    func = this.customFuncCall(name);\n                    if (func) {\n                        args = func.parse();\n                        if (args && func.stop) {\n                            parserInput.forget();\n                            return args;\n                        }\n                    }\n\n                    args = this.arguments(args);\n\n                    if
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(!parserInput.$char(')')) {\n                parserInput.restore('Could not parse call arguments or missing \\')\\'');\n
            return;\n            }\n\n
              parserInput.forget();\n\n            return new(tree.Call)(name, args, index, fileInfo);\n        },\n
      \n        //\n        // Parsing rules for functions with non-standard args, e.g.:\n        //\n        //
  boolean(not(2 > 1))\n        //\n        //     This is a quick prototype, to be modified/improved when\n
   //     more custom-parsed funcs come (e.g. `selector(...)`)\n        //\n\n        customFuncCall: function
(name) {\n            /* Ideally the table is to be moved out of here for faster perf.,\n            but it's quite
tricky since it relies on all these `parsers`\n            and `expect` available only here */\n            return {\n
              alpha:   f(parsers.ieAlpha, true),\n              boolean: f(condition),\n              'if':
f(condition)\n
    }[name.toLowerCase()];\n\n            function f(parse, stop) {\n                return {\n
parse, // parsing function\n                stop   // when true - stop after parse() and return its result, \n
    // otherwise continue for plain args\n                };\n            }\n        \n        function
condition() {\n            return [expect(parsers.condition, 'expected condition')];\n        }\n
},\n\n        arguments: function (prevArgs) {\n            let argsComma = prevArgs || [];\n            const
argsSemiColon = [];\n            let isSemiColonSeparated;\n            let value;\n\n
parserInput.save();\n\n            while (true) {\n                if (prevArgs) {\n                    prevArgs =
false;\n                } else {\n
                value = parsers.detachedRuleset() || this.assignment() || parsers.expression();\n                if
(!value) {\n                    break;\n                }\n\n                if (value.value &&
value.value.length == 1) {\n                    value = value.value[0];\n                }\n\n
argsComma.push(value);\n                }\n\n                if (parserInput.$char(',')) {\n
continue;\n                }\n\n                if (parserInput.$char(';') || isSemiColonSeparated) {\n
isSemiColonSeparated = true;\n                    value = (argsComma.length < 1) ? argsComma[0]\n
    : new tree.Value(argsComma);\n                    argsSemiColon.push(value);\n                    argsComma =
[];\n                }\n
            }\n\n            parserInput.forget();\n            return isSemiColonSeparated ? argsSemiColon :
argsComma;\n        },\n        literal: function () {\n            return this.dimension() ||\n
this.color() ||\n                this.quoted() ||\n                this.unicodeDescriptor();\n        },\n\n
// Assignments are argument entities for calls.\n        // They are present in ie filter properties as shown below.\n
        //\n        //     filter: progid:DXImageTransform.Microsoft.Alpha( *opacity=50* )\n        //\n\n
    assignment: function () {\n            let key;\n            let value;\n            parserInput.save();\n
     key = parserInput.$re(/^\\w+(?=\\s?=)/i);\n            if (!key) {\n                parserInput.restore();\n

   return;\n            }\n            if (!parserInput.$char('=')) {\n                parserInput.restore();\n
     return;\n            }\n            value = parsers.entity();\n            if (value) {\n
parserInput.forget();\n                return new(tree.Assignment)(key, value);\n            } else {\n
parserInput.restore();\n            }\n        },\n\n        //\n        // Parse url() tokens\n        //\n
      // We use a specific rule for urls, because they don't really behave like\n        // standard function calls. The
difference is that the argument doesn't have\n        // to be enclosed within a string, so it can't be parsed as an
Expression.\n        //\n        url: function () {\n            let value;\n            const index =
parserInput.i;\n\n
            parserInput.autoCommentAbsorb = false;\n\n            if (!parserInput.$str('url(')) {\n
parserInput.autoCommentAbsorb = true;\n                return;\n            }\n\n            value =
this.quoted() || this.variable() || this.property() ||\n                parserInput.$re(/^(?:(?:\\\\[\\(\\)'\"])|[^\\(\\)'\"])+/)
|| '';\n\n            parserInput.autoCommentAbsorb = true;\n\n            expectChar(')');\n\n            return
new(tree.URL)((value.value != null || \n                value instanceof tree.Variable || \n                value
instanceof tree.Property) ?\n                value : new(tree.Anonymous)(value, index), index, fileInfo);\n
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},\n\n            //\n            // A Variable entity, such as `@fink`, in\n            //\n            //     width: @fink +
2px\n            //\n            // We
 use a different parser for variable definitions,\n            // see `parsers.variable`.\n            //\n            variable:
function () {\n                let ch;\n                let name;\n                const index = parserInput.i;\n\n
parserInput.save();\n                if (parserInput.currentChar() === '@' && (name = parserInput.$re(/^@@?[\\w-
]+/))) {\n                    ch = parserInput.currentChar();\n                    if (ch === '(' || ch === '[' &&
!parserInput.prevChar().match(/^\\s/)) {\n                        // this may be a VariableCall lookup\n
const result = parsers.variableCall(name);\n                        if (result) {\n                            parserInput.forget();\n
                            return result;\n                        }\n                    }\n                    parserInput.forget();\n
        return new(tree.Variable)(name,
 index, fileInfo);\n                }\n                parserInput.restore();\n            },\n\n            // A variable entity
using the protective {} e.g. @{var}\n            variableCurly: function () {\n                let curly;\n
const index = parserInput.i;\n\n                if (parserInput.currentChar() === '@' && (curly =
parserInput.$re(/^@\\{([\\w-]+)\\}/))) {\n                    return new(tree.Variable)(`@${curly[1]}`, index,
fileInfo);\n                }\n            },\n            //\n            // A Property accessor, such as `$color`, in\n
//\n            //     background-color: $color\n            //\n            property: function () {\n                let name;\n
            const index = parserInput.i;\n\n                if (parserInput.currentChar() === '$' && (name =
parserInput.$re(/^\\$[\\w-]+/))) {\n                    return new(tree.Property)(name,
 index, fileInfo);\n                }\n            },\n\n            // A property entity useing the protective {} e.g.
${prop}\n            propertyCurly: function () {\n                let curly;\n                const index =
parserInput.i;\n\n                if (parserInput.currentChar() === '$' && (curly = parserInput.$re(/^\\$\\{([\\w-
]+)\\}/))) {\n                    return new(tree.Property)(`$${curly[1]}`, index, fileInfo);\n                }\n            },\n
            //\n            // A Hexadecimal color\n            //\n            //     #4F3C2F\n            //\n            //
`rgb` and `hsl` colors are parsed through the `entities.call` parser.\n            //\n            color: function () {\n
        let rgb;\n                parserInput.save();\n\n                if (parserInput.currentChar() === '#' && (rgb =
parserInput.$re(/^#([A-Fa-f0-9]{8}|[A-Fa-f0-9]{6}|[A-Fa-f0-9]{3,4})([\\w.#\\[])?/)))
 {\n                    if (!rgb[2]) {\n                        parserInput.forget();\n                        return
new(tree.Color)(rgb[1], undefined, rgb[0]);\n                    } \n                }\n                parserInput.restore();\n
        },\n\n            colorKeyword: function () {\n                parserInput.save();\n                const
autoCommentAbsorb = parserInput.autoCommentAbsorb;\n                parserInput.autoCommentAbsorb = false;\n
            const k = parserInput.$re(/^[_A-Za-z-][_A-Za-z0-9-]+/);\n                parserInput.autoCommentAbsorb
= autoCommentAbsorb;\n                if (!k) {\n                    parserInput.forget();\n                    return;\n
    }\n                parserInput.restore();\n                const color = tree.Color.fromKeyword(k);\n                if
(color) {\n
  parserInput.$str(k);\n                    return color;\n                }\n            },\n\n            //\n            // A
Dimension, that is, a number and a unit\n            //\n            //     0.5em 95%\n            //\n            dimension:
function () {\n                if (parserInput.peekNotNumeric()) {\n                    return;\n                }\n\n
  const value = parserInput.$re(/^([+-]?\\d*\\.?\\d+)(%|[a-z_]+)?/i);\n                if (value) {\n                    return
new(tree.Dimension)(value[1], value[2]);\n                }\n            },\n\n            //\n            // A unicode
descriptor, as is used in unicode-range\n            //\n            // U+0??  or U+00A1-00A9\n            //\n
unicodeDescriptor: function () {\n                let ud;\n\n                ud = parserInput.$re(/^U\\+[0-9a-fA-F?]+(\\-
[0-9a-fA-F?]+)?/);\n
                if (ud) {\n                    return new(tree.UnicodeDescriptor)(ud[0]);\n                }\n            },\n\n
        //\n            // JavaScript code to be evaluated\n            //\n            //     `window.location.href`\n
//\n            javascript: function () {\n                let js;\n                const index = parserInput.i;\n\n
parserInput.save();\n\n                const escape = parserInput.$char('~');\n                const jsQuote =
parserInput.$char('`');\n\n                if (!jsQuote) {\n                    parserInput.restore();\n                    return;\n
            }\n\n                js = parserInput.$re(/^[^`]*`/);\n                if (js) {\n
```

```
parserInput.forget();\n                return new(tree.JavaScript)(js.substr(0, js.length - 1), Boolean(escape), index, fileInfo);\n
    }\n                parserInput.restore('invalid javascript definition');\n            }\n        },\n\n        //\n        // The variable part of a variable definition. Used in the `rule` parser\n        //\n        //     @fink:\n        //\n        variable: function () {\n            let name;\n\n            if (parserInput.currentChar() === '@' && (name = parserInput.$re(/^(@[\\w-]+)\\s*:/))) { return name[1]; }\n        },\n\n        //\n        // Call a variable value to retrieve a detached ruleset\n        // or a value from a detached ruleset's rules.\n        //\n        //     @fink();\n        //     @fink;\n        //     color: @fink[@color];\n        //\n        variableCall: function (parsedName) {\n            let lookups;\n            const i = parserInput.i;\n            const inValue = !!parsedName;\n            let name = parsedName;\n\n            parserInput.save();\n\n            if (name || (parserInput.currentChar() === '@'\n                && (name = parserInput.$re(/^(@[\\w-]+)(\\(\\s*\\))?/)))) {\n\n                lookups = this.mixin.ruleLookups();\n\n                if (!lookups && ((inValue && parserInput.$str('()') !== '()') || (name[2] !== '()'))) {\n                    parserInput.restore('Missing \\'[...]\\' lookup in variable call');\n                    return;\n                }\n\n                if (!inValue) {\n                    name = name[1];\n                }\n\n                const call = new tree.VariableCall(name, i, fileInfo);\n                if (!inValue && parsers.end()) {\n                    parserInput.forget();\n                    return call;\n                }\n                else {\n                    parserInput.forget();\n                    return new tree.NamespaceValue(call, lookups, i, fileInfo);\n                }\n            }\n\n            parserInput.restore();\n        },\n\n        //\n        // extend syntax - used to extend selectors\n        //\n        extend: function(isRule) {\n            let elements;\n            let e;\n            const index = parserInput.i;\n            let option;\n            let extendList;\n            let extend;\n\n            if (!parserInput.$str(isRule ? '&:extend(' : ':extend(')) {\n                return;\n            }\n\n            do {\n                option = null;\n                elements = null;\n                while (!(option = parserInput.$re(/^(all)(?=\\s*(\\)|,))/))) {\n                    e = this.element();\n                    if (!e) {\n                        break;\n                    }\n                    if (elements) {\n                        elements.push(e);\n                    } else {\n                        elements = [ e ];\n                    }\n                }\n\n                option = option && option[1];\n                if (!elements) {\n                    error('Missing target selector for :extend().');\n                }\n                extend = new(tree.Extend)(new(tree.Selector)(elements), option, index, fileInfo);\n                if (extendList) {\n                    extendList.push(extend);\n                } else {\n                    extendList = [ extend ];\n                }\n            } while (parserInput.$char(','));\n\n            expect(/^\\)/);\n\n            if (isRule) {\n                expect(/^;/);\n            }\n\n            return extendList;\n        },\n\n        //\n        // extendRule - used in a rule to extend all the parent selectors\n        //\n        extendRule: function() {\n            return this.extend(true);\n        },\n\n        //\n        // Mixins\n        //\n        mixin: {\n            //\n            // A Mixin call, with an optional argument list\n            //\n            //     #mixins > .square(#fff);\n            //     #mixins.square(#fff);\n            //     .rounded(4px, black);\n            //     .button;\n            //\n            // We can lookup / return a value using the lookup syntax:\n            //\n            //     color: #mixin.square(#fff)[@color];\n            //\n            // The `while` loop is there because mixins can be\n            // namespaced, but we only support the child and descendant\n            // selector for now.\n            //\n            call: function (inValue, getLookup) {\n                const s = parserInput.currentChar();\n                let important = false;\n                let lookups;\n                const index = parserInput.i;\n\n                let elements;\n                let args;\n                let hasParens;\n\n                if (s !== '.' && s !== '#') { return; }\n\n                parserInput.save(); // stop us absorbing part of an invalid selector\n\n                elements = this.elements();\n\n                if (elements) {\n                    if (parserInput.$char('(')) {\n                        args = this.args(true).args;\n                        expectChar(')');\n                        hasParens = true;\n                    }\n\n                    if (getLookup !== false) {\n                        lookups = this.ruleLookups();\n                    }\n                    if (getLookup === true && !lookups) {\n                        parserInput.restore();\n                        return;\n                    }\n\n                    if (inValue && !lookups && !hasParens) {\n                        // This isn't
```

```
 a valid in-value mixin call\n                parserInput.restore();\n                return;\n            }\n\n
            if (!inValue && parsers.important()) {\n                important = true;\n            }\n\n
        if (inValue || parsers.end()) {\n                parserInput.forget();\n                const mixin =
new(tree.mixin.Call)(elements, args, index, fileInfo, !lookups && important);\n                if (lookups) {\n
                return new tree.NamespaceValue(mixin, lookups);\n            }\n            else {\n
                return mixin;\n            }\n        }\n    }\n\n
parserInput.restore();\n    },\n    /**\n     * Matching elements for mixins\n     * (Start
with
 . or # and can have > )\n     */\n    elements: function() {\n        let elements;\n        let
e;\n        let c;\n        let elem;\n        let elemIndex;\n        const re = /^[#.](?:[\\w-
]|\\\\(?:[A-Fa-f0-9]{1,6} ?|[^A-Fa-f0-9]))+/;\n        while (true) {\n            elemIndex =
parserInput.i;\n            e = parserInput.$re(re);\n            \n            if (!e) {\n
break;\n            }\n            elem = new(tree.Element)(c, e, false, elemIndex, fileInfo);\n
if (elements) {\n                elements.push(elem);\n            } else {\n                elements = [
elem ];\n            }\n            c = parserInput.$char('>');\n        }\n        return elements;\n
    },\n    args: function (isCall) {\n        const entities = parsers.entities;\n        const
returner = { args:null, variadic: false };\n        let expressions = [];\n        const argsSemiColon = [];\n
        const argsComma = [];\n        let isSemiColonSeparated;\n        let
expressionContainsNamed;\n        let name;\n        let nameLoop;\n        let value;\n
 let arg;\n        let expand;\n        let hasSep = true;\n\n        parserInput.save();\n\n
while (true) {\n            if (isCall) {\n                arg = parsers.detachedRuleset() ||
parsers.expression();\n            } else {\n                parserInput.commentStore.length = 0;\n
    if (parserInput.$str('...')) {\n
                returner.variadic = true;\n                if (parserInput.$char(';') && !isSemiColonSeparated) {\n
                    isSemiColonSeparated = true;\n                }\n
(isSemiColonSeparated ? argsSemiColon : argsComma)\n                    .push({ variadic: true });\n
            break;\n            }\n            arg = entities.variable() || entities.property() || entities.literal()
|| entities.keyword() || this.call(true);\n        }\n\n        if (!arg || !hasSep) {\n
break;\n        }\n\n        nameLoop = null;\n        if (arg.throwAwayComments) {\n
            arg.throwAwayComments();\n        }\n        value = arg;\n        let val =
null;\n\n
        if (isCall) {\n            // Variable\n            if (arg.value && arg.value.length == 1)
{\n                val = arg.value[0];\n            }\n        } else {\n            val =
arg;\n        }\n\n        if (val && (val instanceof tree.Variable || val instanceof tree.Property)) {\n
            if (parserInput.$char(':')) {\n                if (expressions.length > 0) {\n
if (isSemiColonSeparated) {\n                        error('Cannot mix ; and , as delimiter types');\n
    }\n                    expressionContainsNamed = true;\n                }\n\n
value = parsers.detachedRuleset() || parsers.expression();\n\n                if (!value) {\n
                    if (isCall) {\n                        error('could not understand value for named
argument');\n                    } else {\n                        parserInput.restore();\n
 returner.args = [];\n                        return returner;\n                    }\n                }\n
                nameLoop = (name = val.name);\n            } else if (parserInput.$str('...')) {\n
  if (!isCall) {\n                    returner.variadic = true;\n                    if (parserInput.$char(';') &&
!isSemiColonSeparated) {\n                        isSemiColonSeparated = true;\n                    }\n
                (isSemiColonSeparated ? argsSemiColon : argsComma)\n
                .push({ name: arg.name, variadic: true });\n                    break;\n                } else
{\n                    expand = true;\n                }\n            } else if (!isCall) {\n
    name = nameLoop = val.name;\n                value = null;\n            }\n        }\n\n
```

```
            if (value) {\n                expressions.push(value);\n            }\n\n
argsComma.push({ name:nameLoop, value, expand });\n\n            if (parserInput.$char(',')) {\n
  hasSep = true;\n                continue;\n            }\n            hasSep = parserInput.$char(';') ===
';';\n\n            if (hasSep || isSemiColonSeparated) {\n\n                if (expressionContainsNamed)
 {\n                    error('Cannot mix ; and , as delimiter types');\n                }\n\n
isSemiColonSeparated = true;\n\n                if (expressions.length > 1) {\n                    value =
new(tree.Value)(expressions);\n                }\n                argsSemiColon.push({ name, value, expand
});\n\n                name = null;\n                expressions = [];\n
expressionContainsNamed = false;\n            }\n        }\n\n        parserInput.forget();\n
  returner.args = isSemiColonSeparated ? argsSemiColon : argsComma;\n        return returner;\n
},\n        //\n        // A Mixin definition, with a list of parameters\n        //\n        //     .rounded
(@radius: 2px, @color) {\n        //
    ...\n        //     }\n        //\n        // Until we have a finer grained state-machine, we have to\n
 // do a look-ahead, to make sure we don't have a mixin call.\n        // See the `rule` function for more
information.\n        //\n        // We start by matching `.rounded (`, and then proceed on to\n        // the
argument list, which has optional default values.\n        // We store the parameters in `params`, with a `value`
key,\n        // if there is a value, such as in the case of `@radius`.\n        //\n        // Once we've got our
params list, and a closing `)`, we parse\n        // the `{...}` block.\n        //\n        definition: function ()
{\n            let name;\n            let params = [];\n            let match;\n            let ruleset;\n
 let cond;\n            let variadic
 = false;\n            if ((parserInput.currentChar() !== '.' && parserInput.currentChar() !== '#') ||\n
parserInput.peek(/^[^{]*\\}/)) {\n                return;\n            }\n\n            parserInput.save();\n\n
    match = parserInput.$re(/^([#.](?:[\\w-]|\\\\(?:[A-Fa-f0-9]{1,6} ?|[^A-Fa-f0-9]))+)\\s*\\(/);\n            if
(match) {\n                name = match[1];\n\n                const argInfo = this.args(false);\n
params = argInfo.args;\n                variadic = argInfo.variadic;\n\n                // .mixincall(\"@{a}\");\n
        // looks a bit like a mixin definition..\n                // also\n                // .mixincall(@a: {rule:
set;});\n                // so we have to be nice and restore\n                if (!parserInput.$char(')')) {\n
    parserInput.restore('Missing
 closing \\')\\");\n                return;\n            }\n\n            parserInput.commentStore.length =
0;\n\n            if (parserInput.$str('when')) { // Guard\n                cond = expect(parsers.conditions,
'expected condition');\n            }\n\n            ruleset = parsers.block();\n\n            if (ruleset) {\n
                parserInput.forget();\n                return new(tree.mixin.Definition)(name, params, ruleset,
cond, variadic);\n            } else {\n                parserInput.restore();\n            }\n        }
else {\n            parserInput.restore();\n        }\n    },\n    \n    ruleLookups:
function() {\n        let rule;\n        let args;\n        const lookups = [];\n\n
    if (parserInput.currentChar() !== '[') { \n            return;\n        }\n\n        while (true) {\n
        parserInput.save();\n            args = null;\n            rule = this.lookupValue();\n
if (!rule && rule !== '') {\n                parserInput.restore();\n                break;\n            }\n
        lookups.push(rule);\n            parserInput.forget();\n        }\n        if (lookups.length >
0) {\n            return lookups;\n        }\n    },\n    \n    lookupValue: function() {\n
    parserInput.save();\n    \n        if (!parserInput.$char('[')) { \n            parserInput.restore();\n
        return;\n        }\n    \n        const name = parserInput.$re(/^(?:[@$]{0,2})[_a-zA-Z0-9-]*/);\n
    \n        if (!parserInput.$char(']')) {\n            parserInput.restore();\n            return;\n
    } \n\n        if (name || name === '') {\n            parserInput.forget();\n            return name;\n
        }\n    \n        parserInput.restore();\n    }\n    },\n    //\n    // Entities are the
smallest recognized token,\n    // and can be found inside a rule's value.\n    //\n    entity: function ()
{\n        const entities = this.entities;\n\n        return this.comment() || entities.literal() || entities.variable() ||
entities.url() ||\n            entities.property() || entities.call() || entities.keyword() || this.mixin.call(true) ||\n
```

```
    entities.javascript();\n        },\n\n        //\n        // A Declaration terminator.
 Note that we use `peek()` to check for '}',\n        // because the `block` rule will be expecting it, but we still need
to make sure\n        // it's there, if ';' was omitted.\n        //\n        end: function () {\n            return
parserInput.$char(';') || parserInput.peek('}');\n        },\n\n        //\n        // IE's alpha function\n        //\n
//     alpha(opacity=88)\n        //\n        ieAlpha: function () {\n            let value;\n\n            //
http://jsperf.com/case-insensitive-regex-vs-strtolower-then-regex/18\n            if (!parserInput.$re(/^opacity=/i)) {
return; }\n            value = parserInput.$re(/^\\d+/);\n            if (!value) {\n                value =
expect(parsers.entities.variable, 'Could not parse alpha');\n                value = `@{${value.name.slice(1)}}`;\n
    }\n            expectChar(')');\n            return new tree.Quoted('', `alpha(opacity=${value})`);\n
        },\n\n        //\n        // A Selector Element\n        //\n        //     div\n        //     + h1\n        //
#socks\n        //     input[type=\"text\"]\n        //\n        // Elements are the building blocks for Selectors,\n
  // they are made out of a `Combinator` (see combinator rule),\n        // and an element name, such as a tag a class,
or `*`.\n        //\n        element: function () {\n            let e;\n            let c;\n            let v;\n            const
index = parserInput.i;\n\n            c = this.combinator();\n\n            e = parserInput.$re(/^(?:\\d+\\.\\d+|\\d+)%/)
||\n                parserInput.$re(/^(?:[.#]?|:*)(?:[\\w-]|[^\\x00-\\x9f]|\\\\(?:[A-Fa-f0-9]{1,6} ?|[^A-Fa-f0-9]))+/) ||\n
        parserInput.$char('*') || parserInput.$char('&') || this.attribute() ||\n
parserInput.$re(/^\\([^&()@]+\\)/)
 ||  parserInput.$re(/^[\\.#:](?=@)/) ||\n                this.entities.variableCurly();\n\n            if (!e) {\n
parserInput.save();\n                if (parserInput.$char('(')) {\n                    if ((v = this.selector(false)) &&
parserInput.$char(')')) {\n                        e = new(tree.Paren)(v);\n                        parserInput.forget();\n
        } else {\n                        parserInput.restore('Missing closing \\')\\'');\n                    }\n                } else
{\n                    parserInput.forget();\n                }\n            }\n\n            if (e) { return new(tree.Element)(c,
e, e instanceof tree.Variable, index, fileInfo); }\n        },\n\n        //\n        // Combinators combine elements
together, in a Selector.\n        //\n        // Because our parser isn't white-space sensitive, special care\n        //
has to be taken,
 when parsing the descendant combinator, ` `,\n        // as it's an empty space. We have to check the previous
character\n        // in the input, to see if it's a ` ` character. More info on how\n        // we deal with this in
*combinator.js*.\n        //\n        combinator: function () {\n            let c = parserInput.currentChar();\n\n
    if (c === '/') {\n                parserInput.save();\n                const slashedCombinator = parserInput.$re(/^\\/[a-
z]+\\//i);\n                if (slashedCombinator) {\n                    parserInput.forget();\n                    return
new(tree.Combinator)(slashedCombinator);\n                }\n                parserInput.restore();\n            }\n\n
      if (c === '>' || c === '+' || c === '~' || c === '|' || c === '^') {\n                parserInput.i++;\n                if (c ===
'^' && parserInput.currentChar() === '^') {\n
  c = '^^';\n                    parserInput.i++;\n                }\n                while (parserInput.isWhitespace()) {
parserInput.i++; }\n                return new(tree.Combinator)(c);\n            } else if (parserInput.isWhitespace(-1))
{\n                return new(tree.Combinator)(' ');\n            } else {\n                return
new(tree.Combinator)(null);\n            }\n        },\n        //\n        // A CSS Selector\n        // with less
extensions e.g. the ability to extend and guard\n        //\n        //     .class > div + h1\n        //     li a:hover\n
  //\n        // Selectors are made out of one or more Elements, see above.\n        //\n        selector: function
(isLess) {\n            const index = parserInput.i;\n            let elements;\n            let extendList;\n            let
c;\n            let e;\n            let allExtends;\n
    let when;\n            let condition;\n            isLess = isLess !== false;\n            while ((isLess && (extendList
= this.extend())) || (isLess && (when = parserInput.$str('when'))) || (e = this.element())) {\n                if (when) {\n
                    condition = expect(this.conditions, 'expected condition');\n                } else if (condition) {\n
        error('CSS guard can only be used at the end of selector');\n                } else if (extendList) {\n
if (allExtends) {\n                    allExtends = allExtends.concat(extendList);\n                } else {\n
        allExtends = extendList;\n                }\n            } else {\n                if (allExtends) {
error('Extend can only be used at the end of selector'); }\n                c = parserInput.currentChar();\n
```

```
  if (elements) {\n
          elements.push(e);\n                } else {\n                    elements = [ e ];\n                }\n
    e = null;\n                }\n                if (c === '{' || c === '}' || c === ';' || c === ',' || c === ')') {\n
break;\n                }\n            }\n\n            if (elements) { return new(tree.Selector)(elements, allExtends,
condition, index, fileInfo); }\n            if (allExtends) { error('Extend must be used to extend a selector, it cannot be
used on its own'); }\n        },\n        selectors: function () {\n            let s;\n            let selectors;\n
while (true) {\n                s = this.selector();\n                if (!s) {\n                    break;\n                }\n
    if (selectors) {\n                    selectors.push(s);\n                } else {\n                    selectors
= [ s ];\n                }\n                parserInput.commentStore.length = 0;\n                if (s.condition &&
selectors.length > 1) {\n                    error(\"Guards are only currently allowed on a single selector.\");\n
}\n                if (!parserInput.$char(',')) { break; }\n                if (s.condition) {\n                    error(\"Guards
are only currently allowed on a single selector.\");\n                }\n                parserInput.commentStore.length =
0;\n            }\n            return selectors;\n        },\n        attribute: function () {\n            if
(!parserInput.$char('[')) { return; }\n\n            const entities = this.entities;\n            let key;\n            let val;\n
        let op;\n            //\n            // case-insensitive flag\n            // e.g. [attr operator value i]\n            //\n
        let
cif;\n\n            if (!(key = entities.variableCurly())) {\n                key = expect(/^(?:[_A-Za-z0-9-
\\*]*\\|)?(?:[_A-Za-z0-9-]|\\\\.)+/);\n            }\n\n            op = parserInput.$re(/^[|~*$^]?=/);\n            if (op)
{\n                val = entities.quoted() || parserInput.$re(/^[0-9]+%/) || parserInput.$re(/^[\\w-]+/) ||
entities.variableCurly();\n                if (val) {\n                    cif = parserInput.$re(/^[iIsS]/);\n                }\n
    }\n\n            expectChar(']');\n\n            return new(tree.Attribute)(key, op, val, cif);\n        },\n\n
//\n        // The `block` rule is used by `ruleset` and `mixin.definition`.\n        // It's a wrapper around the
`primary` rule, with added `{}`.\n        //\n        block: function () {\n            let content;\n            if
(parserInput.$char('{') && (content = this.primary()) && parserInput.$char('}')) {\n
                return content;\n            }\n        },\n\n        blockRuleset: function() {\n            let block =
this.block();\n\n            if (block) {\n                block = new tree.Ruleset(null, block);\n            }\n
return block;\n        },\n\n        detachedRuleset: function() {\n            let argInfo;\n            let params;\n
        let variadic;\n\n            parserInput.save();\n            if (parserInput.$re(/^[.#]\\(/)) {\n                /**\n
         * DR args currently only implemented for each() function, and not \n                 * yet settable as `@dr:
#(@arg) {}`\n                 * This should be done when DRs are merged with mixins.\n                 * See:
https://github.com/less/less-meta/issues/16\n                 */\n                argInfo = this.mixin.args(false);\n
    params = argInfo.args;\n
    variadic = argInfo.variadic;\n                if (!parserInput.$char(')')) {\n                    parserInput.restore();\n
            return;\n                }\n            }\n            const blockRuleset = this.blockRuleset();\n            if
(blockRuleset) {\n                parserInput.forget();\n                if (params) {\n                    return new
tree.mixin.Definition(null, params, blockRuleset, null, variadic);\n                }\n                return new
tree.DetachedRuleset(blockRuleset);\n            }\n            parserInput.restore();\n        },\n\n        //\n
// div, .class, body > p {...}\n        //\n        ruleset: function () {\n            let selectors;\n            let rules;\n
        let debugInfo;\n\n            parserInput.save();\n\n            if (context.dumpLineNumbers) {\n
debugInfo = getDebugInfo(parserInput.i);\n
            }\n\n            selectors = this.selectors();\n\n            if (selectors && (rules = this.block())) {\n
    parserInput.forget();\n                const ruleset = new(tree.Ruleset)(selectors, rules, context.strictImports);\n
        if (context.dumpLineNumbers) {\n                    ruleset.debugInfo = debugInfo;\n                }\n
return ruleset;\n            } else {\n                parserInput.restore();\n            }\n        },\n        declaration:
function () {\n            let name;\n            let value;\n            const index = parserInput.i;\n            let
hasDR;\n            const c = parserInput.currentChar();\n            let important;\n            let merge;\n
let isVariable;\n\n            if (c === '.' || c === '#' || c === '&' || c === ':') { return; }\n\n
parserInput.save();\n\n
```

```
        name = this.variable() || this.ruleProperty();\n            if (name) {\n                isVariable = typeof name
=== 'string';\n\n                if (isVariable) {\n                    value = this.detachedRuleset();\n                    if
(value) {\n                        hasDR = true;\n                    }\n                }\n\n
parserInput.commentStore.length = 0;\n                if (!value) {\n                    // a name returned by
this.ruleProperty() is always an array of the form:\n                    // [string-1, ..., string-n, \"\"] or [string-1, ...,
string-n, \"+\"]\n                    // where each item is a tree.Keyword or tree.Variable\n                    merge =
!isVariable && name.length > 1 && name.pop().value;\n\n                    // Custom property values get permissive
parsing\n                    if (name[0].value && name[0].value.slice(0, 2) === '--') {\n
value = this.permissiveValue();\n                    }\n                    // Try to store values as anonymous\n
// If we need the value later we'll re-parse it in ruleset.parseValue\n                    else {\n
value = this.anonymousValue();\n                    }\n                    if (value) {\n
parserInput.forget();\n                        // anonymous values absorb the end ';' which is required for them to work\n
return new(tree.Declaration)(name, value, false, merge, index, fileInfo);\n                    }\n\n
if (!value) {\n                        value = this.value();\n                    }\n\n                    if (value) {\n
important = this.important();\n                    } else if (isVariable) {\n                        // As a last resort, try
permissiveValue\n
value = this.permissiveValue();\n                    }\n                }\n\n                if (value &&
(this.end() || hasDR)) {\n                    parserInput.forget();\n                    return new(tree.Declaration)(name,
value, important, merge, index, fileInfo);\n                }\n                else {\n                    parserInput.restore();\n
}\n            } else {\n                parserInput.restore();\n            }\n        },\n
anonymousValue: function () {\n            const index = parserInput.i;\n            const match =
parserInput.$re(/^([^.#@\\$+\\/'\"*`(;{}-]*);/);\n            if (match) {\n                return
new(tree.Anonymous)(match[1], index);\n            }\n        },\n        /**\n         * Used for custom
properties, at-rules, and variables (as fallback)\n         * Parses almost anything inside
of {} [] () \"\" blocks\n         * until it reaches outer-most tokens.\n         * \n         * First, it will try to parse
comments and entities to reach\n         * the end. This is mostly like the Expression parser except no\n         *
math is allowed.\n         */\n        permissiveValue: function (untilTokens) {\n            let i;\n            let e;\n
let done;\n            let value;\n            const tok = untilTokens || ';';\n            const index =
parserInput.i;\n            const result = [];\n\n            function testCurrentChar() {\n                const char =
parserInput.currentChar();\n                if (typeof tok === 'string') {\n                    return char === tok;\n
} else {\n                    return tok.test(char);\n                }\n            }\n            if (testCurrentChar()) {\n
return;\n
}\n            value = [];\n            do {\n                e = this.comment();\n                if (e) {\n
value.push(e);\n                    continue;\n                }\n                e = this.entity();\n                if (e) {\n
value.push(e);\n                }\n            } while (e);\n\n            done = testCurrentChar();\n\n            if
(value.length > 0) {\n                value = new(tree.Expression)(value);\n                if (done) {\n
return value;\n                }\n                else {\n                    result.push(value);\n                }\n                //
Preserve space before $parseUntil as it will not\n                if (parserInput.prevChar() === ' ') {\n
result.push(new tree.Anonymous(' ', index));\n                }\n            }\n            parserInput.save();\n\n
value = parserInput.$parseUntil(tok);\n\n            if (value) {\n                if (typeof value === 'string')
{\n                    error(`Expected '${value}'`, 'Parse');\n                }\n                if (value.length === 1 &&
value[0] === ' ') {\n                    parserInput.forget();\n                    return new tree.Anonymous('', index);\n
}\n                let item;\n                for (i = 0; i < value.length; i++) {\n                    item = value[i];\n
if (Array.isArray(item)) {\n                        // Treat actual quotes as normal quoted values\n
result.push(new tree.Quoted(item[0], item[1], true, index, fileInfo));\n                    }\n                    else {\n
if (i === value.length - 1) {\n                            item = item.trim();\n                        }\n
// Treat like quoted values, but replace vars like unquoted expressions\n                        const
quote = new tree.Quoted('\\', item, true, index, fileInfo);\n                        quote.variableRegex = /@([\\w-]+)/g;\n
```

```
quote.propRegex = /\\$([\\w-]+)/g;\n result.push(quote);\n }\n }\n parserInput.forget();\n return new tree.Expression(result, true);\n }\n parserInput.restore();\n },\n\n //\n // An @import atrule\n //\n // @import \"lib\";\n //\n // Depending on our environment, importing is done differently:\n // In the browser, it's an XHR request, in Node, it would be a\n // file-system operation. The function used for importing is\n // stored in `import`, which we pass
 to the Import constructor.\n //\n 'import': function () {\n let path;\n let features;\n const index = parserInput.i;\n\n const dir = parserInput.$re(/^@import\\s+/);\n\n if (dir) {\n const options = (dir ? this.importOptions() : null) || {};\n\n if ((path = this.entities.quoted() || this.entities.url())) {\n features = this.mediaFeatures();\n\n if (!parserInput.$char(';')) {\n parserInput.i = index;\n error('missing semi-colon or unrecognised media features on import');\n }\n features = features && new(tree.Value)(features);\n return new(tree.Import)(path, features, options, index, fileInfo);\n }\n else {\n parserInput.i =
 index;\n error('malformed import statement');\n }\n }\n },\n\n importOptions: function() {\n let o;\n const options = {};\n let optionName;\n let value;\n\n // list of options, surrounded by parens\n if (!parserInput.$char('(')) { return null; }\n do {\n o = this.importOption();\n if (o) {\n optionName = o;\n value = true;\n switch (optionName) {\n case 'css':\n optionName = 'less';\n value = false;\n break;\n case 'once':\n optionName = 'multiple';\n value = false;\n break;\n }\n options[optionName] = value;\n if (!parserInput.$char(',')) { break; }\n }\n } while (o);\n expectChar(')');\n return options;\n },\n\n importOption: function() {\n const opt = parserInput.$re(/^(less|css|multiple|once|inline|reference|optional)/);\n if (opt) {\n return opt[1];\n }\n },\n\n mediaFeature: function () {\n const entities = this.entities;\n const nodes = [];\n let e;\n let p;\n parserInput.save();\n do {\n e = entities.keyword() || entities.variable() || entities.mixinLookup();\n if (e) {\n nodes.push(e);\n } else if (parserInput.$char('(')) {\n p = this.property();\n e = this.value();\n if (parserInput.$char(')')) {\n if (p && e) {\n nodes.push(new(tree.Paren)(new(tree.Declaration)(p, e, null, null, parserInput.i, fileInfo, true)));\n } else if (e) {\n nodes.push(new(tree.Paren)(e));\n } else {\n error('badly formed media feature definition');\n }\n } else {\n error('Missing closing \\')\\'', 'Parse');\n }\n }\n } while (e);\n\n parserInput.forget();\n if (nodes.length > 0) {\n return new(tree.Expression)(nodes);\n }\n },\n\n mediaFeatures: function () {\n const entities
 = this.entities;\n const features = [];\n let e;\n do {\n e = this.mediaFeature();\n if (e) {\n features.push(e);\n if (!parserInput.$char(',')) { break; }\n } else {\n e = entities.variable() || entities.mixinLookup();\n if (e) {\n features.push(e);\n if (!parserInput.$char(',')) { break; }\n }\n }\n } while (e);\n\n return features.length > 0 ? features : null;\n },\n\n media: function () {\n let features;\n let rules;\n let media;\n let debugInfo;\n const index = parserInput.i;\n\n if (context.dumpLineNumbers) {\n debugInfo = getDebugInfo(index);\n }\n\n parserInput.save();\n\n if (parserInput.$str('@media')) {\n features = this.mediaFeatures();\n\n rules = this.block();\n\n if (!rules) {\n error('media definitions require block statements after any features');\n }\n\n parserInput.forget();\n\n
```

```
media = new(tree.Media)(rules, features, index, fileInfo);\n if (context.dumpLineNumbers) {\n media.debugInfo = debugInfo;\n }\n\n return media;\n }\n\n parserInput.restore();\n },\n\n //\n\n // A @plugin directive, used to import plugins dynamically.\n //\n // @plugin (args) \"lib\";\n //\n plugin: function () {\n let path;\n let args;\n let options;\n const index = parserInput.i;\n const dir = parserInput.$re(/^@plugin\\s+/);\n\n if (dir) {\n args = this.pluginArgs();\n\n if (args) {\n options = {\n pluginArgs: args,\n isPlugin: true\n };\n }\n else {\n options = { isPlugin: true };\n }\n\n if ((path = this.entities.quoted() || this.entities.url())) {\n\n if (!parserInput.$char(';')) {\n parserInput.i = index;\n error('missing semi-colon on @plugin');\n }\n return new(tree.Import)(path, null, options, index, fileInfo);\n }\n else {\n parserInput.i = index;\n error('malformed @plugin statement');\n }\n }\n },\n\n pluginArgs: function() {\n // list of options, surrounded by parens\n parserInput.save();\n if (!parserInput.$char('(')) {\n parserInput.restore();\n return null;\n }\n const args = parserInput.$re(/^\\s*([^\\);]+)\\)\\s*/);\n if (args[1]) {\n parserInput.forget();\n return args[1].trim();\n }\n else { \n parserInput.restore();\n return null;\n }\n },\n\n //\n // A CSS AtRule\n //\n // @charset \"utf-8\";\n //\n atrule: function () {\n const index = parserInput.i;\n let name;\n let value;\n let rules;\n let nonVendorSpecificName;\n let hasIdentifier;\n let hasExpression;\n let hasUnknown;\n let hasBlock = true;\n let isRooted = true;\n\n if (parserInput.currentChar() !== '@') { return; }\n\n value = this['import']() || this.plugin() || this.media();\n if (value) {\n return value;\n }\n\n parserInput.save();\n\n name = parserInput.$re(/^@[a-z-]+/);\n\n if (!name) { return; }\n\n nonVendorSpecificName = name;\n if (name.charAt(1) == '-' && name.indexOf('-', 2) > 0) {\n nonVendorSpecificName = `@${name.slice(name.indexOf('-', 2) + 1)}`;\n }\n\n switch (nonVendorSpecificName) {\n case '@charset':\n hasIdentifier = true;\n hasBlock = false;\n break;\n case '@namespace':\n hasExpression = true;\n hasBlock = false;\n break;\n case '@keyframes':\n case '@counter-style':\n hasIdentifier = true;\n break;\n case '@document':\n case '@supports':\n hasUnknown = true;\n isRooted = false;\n break;\n default:\n hasUnknown = true;\n break;\n }\n\n parserInput.commentStore.length = 0;\n\n if (hasIdentifier) {\n value = this.entity();\n if (!value) {\n error(`expected ${name} identifier`);\n }\n } else if (hasExpression) {\n value = this.expression();\n if (!value) {\n error(`expected ${name} expression`);\n }\n } else if (hasUnknown) {\n value = this.permissiveValue(/^[{;]/);\n hasBlock = (parserInput.currentChar() === '{');\n if (!value) {\n if (!hasBlock && parserInput.currentChar() !== ';') {\n error(`${name} rule is missing block or ending semi-colon`);\n }\n }\n else if (!value.value) {\n value = null;\n }\n }\n\n if (hasBlock) {\n rules = this.blockRuleset();\n }\n\n if (rules || (!hasBlock && value && parserInput.$char(';'))) {\n parserInput.forget();\n return new(tree.AtRule)(name, value, rules, index, fileInfo,\n context.dumpLineNumbers ? getDebugInfo(index) : null,\n isRooted\n );\n }\n\n parserInput.restore('at-rule options not recognised');\n },\n\n //\n // A Value is a comma-delimited list of Expressions\n //\n // font-family: Baskerville, Georgia, serif;\n //\n // In a Rule, a Value represents everything after the `:`,\n // and before the `;`.\n //\n value:
```

```
function () {\n            let e;\n            const expressions = [];\n            const index = parserInput.i;\n\n
do {\n                e = this.expression();\n                if (e) {\n                    expressions.push(e);\n                    if
(!parserInput.$char(',')) { break; }\n
    }\n            } while (e);\n\n            if (expressions.length > 0) {\n                return
new(tree.Value)(expressions, index);\n            }\n        },\n        important: function () {\n            if
(parserInput.currentChar() === '!') {\n                return parserInput.$re(/^! *important/);\n            }\n        },\n
        sub: function () {\n            let a;\n            let e;\n\n            parserInput.save();\n            if
(parserInput.$char('(')) {\n                a = this.addition();\n                if (a && parserInput.$char(')')) {\n
    parserInput.forget();\n                    e = new(tree.Expression)([a]);\n                    e.parens = true;\n
    return e;\n                }\n                parserInput.restore('Expected \\')\\'');\n                return;\n            }\n
        parserInput.restore();\n
    },\n        multiplication: function () {\n            let m;\n            let a;\n            let op;\n            let
operation;\n            let isSpaced;\n            m = this.operand();\n            if (m) {\n                isSpaced =
parserInput.isWhitespace(-1);\n                while (true) {\n                    if (parserInput.peek(/^\\/[*\\/]/)) {\n
            break;\n                    }\n\n                    parserInput.save();\n\n                    op = parserInput.$char('/')
|| parserInput.$char('*') || parserInput.$str('./');\n\n                    if (!op) { parserInput.forget(); break; }\n\n
    a = this.operand();\n\n                    if (!a) { parserInput.restore(); break; }\n
parserInput.forget();\n\n                    m.parensInOp = true;\n                    a.parensInOp = true;\n
operation = new(tree.Operation)(op,
 [operation || m, a], isSpaced);\n                    isSpaced = parserInput.isWhitespace(-1);\n                }\n
 return operation || m;\n            }\n        },\n        addition: function () {\n            let m;\n            let a;\n
        let op;\n            let operation;\n            let isSpaced;\n            m = this.multiplication();\n            if
(m) {\n                isSpaced = parserInput.isWhitespace(-1);\n                while (true) {\n                    op =
parserInput.$re(/^[-+]\\s+/) || (!isSpaced && (parserInput.$char('+') || parserInput.$char('-')));\n                    if
(!op) {\n                        break;\n                    }\n                    a = this.multiplication();\n                    if (!a)
{\n                        break;\n                    }\n\n                    m.parensInOp = true;\n
        a.parensInOp = true;\n                    operation = new(tree.Operation)(op, [operation || m, a], isSpaced);\n
            isSpaced = parserInput.isWhitespace(-1);\n                }\n                return operation || m;\n            }\n
        },\n        conditions: function () {\n            let a;\n            let b;\n            const index = parserInput.i;\n
            let condition;\n\n            a = this.condition(true);\n            if (a) {\n                while (true) {\n
        if (!parserInput.peek(/^,\\s*(not\\s*)?\\(/) || !parserInput.$char(',')) {\n                        break;\n
}\n                    b = this.condition(true);\n                    if (!b) {\n                        break;\n                    }\n
            condition = new(tree.Condition)('or', condition || a, b, index);\n                }\n
        return condition || a;\n            }\n        },\n        condition: function (needsParens) {\n            let
result;\n            let logical;\n            let next;\n            function or() {\n                return
parserInput.$str('or');\n            }\n\n            result = this.conditionAnd(needsParens);\n            if (!result) {\n
            return ;\n            }\n            logical = or();\n            if (logical) {\n                next =
this.condition(needsParens);\n                if (next) {\n                    result = new(tree.Condition)(logical, result,
next);\n                } else {\n                    return ;\n                }\n            }\n            return result;\n
},\n        conditionAnd: function (needsParens) {\n            let result;\n            let logical;\n            let
next;\n            const self
 = this;\n            function insideCondition() {\n                const cond = self.negatedCondition(needsParens) ||
self.parenthesisCondition(needsParens);\n                if (!cond && !needsParens) {\n                    return
self.atomicCondition(needsParens);\n                }\n                return cond;\n            }\n            function
and() {\n                return parserInput.$str('and');\n            }\n\n            result = insideCondition();\n
if (!result) {\n                return ;\n            }\n            logical = and();\n            if (logical) {\n
next = this.conditionAnd(needsParens);\n                if (next) {\n                    result =
new(tree.Condition)(logical, result, next);\n                } else {\n                    return ;\n                }\n
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}\n            return result;\n        },\n        negatedCondition:
 function (needsParens) {\n            if (parserInput.$str('not')) {\n                const result =
this.parenthesisCondition(needsParens);\n                if (result) {\n                    result.negate = !result.negate;\n
        }\n                return result;\n            }\n        },\n        parenthesisCondition: function (needsParens)
{\n            function tryConditionFollowedByParenthesis(me) {\n                let body;\n
parserInput.save();\n                body = me.condition(needsParens);\n                if (!body) {\n
parserInput.restore();\n                    return ;\n                }\n                if (!parserInput.$char(')')) {\n
  parserInput.restore();\n                    return ;\n                }\n                parserInput.forget();\n
return body;\n            }\n\n
            let body;\n            parserInput.save();\n            if (!parserInput.$str('(')) {\n
parserInput.restore();\n                return ;\n            }\n            body =
tryConditionFollowedByParenthesis(this);\n            if (body) {\n                parserInput.forget();\n
return body;\n            }\n\n            body = this.atomicCondition(needsParens);\n            if (!body) {\n
   parserInput.restore();\n                return ;\n            }\n            if (!parserInput.$char(')')) {\n
parserInput.restore(`expected ')' got '${parserInput.currentChar()}'`);\n                return ;\n            }\n
parserInput.forget();\n            return body;\n        },\n        atomicCondition: function (needsParens) {\n
   const entities = this.entities;\n            const index = parserInput.i;\n
            let a;\n            let b;\n            let c;\n            let op;\n\n            function cond() {\n
return this.addition() || entities.keyword() || entities.quoted() || entities.mixinLookup();\n            }\n            cond
= cond.bind(this);\n\n            a = cond();\n            if (a) {\n                if (parserInput.$char('>')) {\n
  if (parserInput.$char('=')) {\n                    op = '>=';\n                } else {\n                    op = '>';\n
            }\n                } else\n                if (parserInput.$char('<')) {\n                    if (parserInput.$char('='))
{\n                    op = '<=';\n                } else {\n                    op = '<';\n                }\n                }
else\n                if (parserInput.$char('=')) {\n                    if (parserInput.$char('>'))
 {\n                    op = '=>';\n                } else if (parserInput.$char('<')) {\n                    op = '=<';\n
            } else {\n                    op = '=';\n                }\n                }\n                if (op) {\n
b = cond();\n                    if (b) {\n                        c = new(tree.Condition)(op, a, b, index, false);\n
} else {\n                        error('expected expression');\n                    }\n                } else {\n                    c =
new(tree.Condition)('=', a, new(tree.Keyword)('true'), index, false);\n                }\n                return c;\n
}\n        },\n\n        //\n        // An operand is anything that can be part of an operation,\n        // such as a
Color, or a Variable\n        //\n        operand: function () {\n
        const entities = this.entities;\n            let negate;\n\n            if (parserInput.peek(/^-[@\\$\\(]/)) {\n
    negate = parserInput.$char('-');\n            }\n\n            let o = this.sub() || entities.dimension() ||\n
entities.color() || entities.variable() ||\n                entities.property() || entities.call() ||\n
entities.quoted(true) || entities.colorKeyword() ||\n                entities.mixinLookup();\n\n            if (negate) {\n
            o.parensInOp = true;\n                o = new(tree.Negative)(o);\n            }\n\n            return o;\n
},\n\n        //\n        // Expressions either represent mathematical operations,\n        // or white-space delimited
Entities.\n        //\n        //     1px solid black\n        //     @var * 2\n        //\n        expression: function ()
{\n
      const entities = [];\n            let e;\n            let delim;\n            const index = parserInput.i;\n\n            do
{\n                e = this.comment();\n                if (e) {\n                    entities.push(e);\n
continue;\n                }\n                e = this.addition() || this.entity();\n\n                if (e instanceof
tree.Comment) {\n                    e = null;\n                }\n\n                if (e) {\n                    entities.push(e);\n
                // operations do not allow keyword \"/\" dimension (e.g. small/20px) so we support that here\n
      if (!parserInput.peek(/^\\/[\\/*]/)) {\n                    delim = parserInput.$char('/');\n                    if
(delim) {\n                        entities.push(new(tree.Anonymous)(delim, index));\n                    }\n
   }\n
```

```
}\n            } while (e);\n            if (entities.length > 0) {\n                return
new(tree.Expression)(entities);\n            }\n        },\n        property: function () {\n            const name =
parserInput.$re(/^(\\*?-?[_a-zA-Z0-9-]+)\\s*:/);\n            if (name) {\n                return name[1];\n            }\n
},\n        ruleProperty: function () {\n            let name = [];\n            const index = [];\n            let s;\n
let k;\n\n            parserInput.save();\n\n            const simpleProperty = parserInput.$re(/^([_a-zA-Z0-9-
]+)\\s*:/);\n            if (simpleProperty) {\n                name = [new(tree.Keyword)(simpleProperty[1])];\n
parserInput.forget();\n                return name;\n            }\n\n            function match(re) {\n
const i = parserInput.i;\n                const
chunk = parserInput.$re(re);\n                if (chunk) {\n                    index.push(i);\n                    return
name.push(chunk[1]);\n                }\n            }\n\n            match(/^(\\*?)/);\n            while (true) {\n
if (!match(/^((?:[\\w-]+)|(?:[@\\$]\\{[\\w-]+\\}))/)) {\n                    break;\n                }\n            }\n\n
if ((name.length > 1) && match(/^((?:\\+_|\\+)?)\\s*:/)) {\n                parserInput.forget();\n\n                // at
last, we have the complete match now. move forward,\n                // convert name particles to tree objects and
return:\n                if (name[0] === '') {\n                    name.shift();\n                    index.shift();\n
}\n                for (k = 0; k < name.length; k++) {\n                    s = name[k];\n                    name[k] =
(s.charAt(0) !== '@' && s.charAt(0)
!== '$') ?\n                        new(tree.Keyword)(s) :\n                        (s.charAt(0) === '@' ?\n
new(tree.Variable)(`@${s.slice(2, -1)}`, index[k], fileInfo) :\n                            new(tree.Property)(`$${s.slice(2, -
1)}`, index[k], fileInfo));\n                }\n                return name;\n            }\n            parserInput.restore();\n
        }\n    }\n};\n};\nParser.serializeVars = vars => {\n    let s = '';\n\n    for (const name in vars) {\n        if
(Object.hasOwnProperty.call(vars, name)) {\n            const value = vars[name];\n            s += `${((name[0] === '@')
? '' : '@') + name}: ${value}${(String(value).slice(-1) === ';') ? '' : ';'}`;\n        }\n    }\n\n    return s;\n};\n\nexport
default Parser;\n","import Anonymous from '../tree/anonymous';\nimport Keyword from
'../tree/keyword';\n\nfunction boolean(condition) {\n    return condition ? Keyword.True :
Keyword.False;\n}\n\n/**\n
 * Functions with evalArgs set to false are sent context\n * as the first argument.\n */\nfunction If(context, condition,
trueValue, falseValue) {\n    return condition.eval(context) ? trueValue.eval(context)\n        : (falseValue ?
falseValue.eval(context) : new Anonymous);\n}\nIf.evalArgs = false;\n\nfunction isdefined(context, variable) {\n
try {\n        variable.eval(context);\n        return Keyword.True;\n    } catch (e) {\n        return Keyword.False;\n
}\n}\n\nisdefined.evalArgs = false;\n\nexport default { isdefined, boolean, 'if': If };\n","import Dimension from
'../tree/dimension';\nimport Color from '../tree/color';\nimport Quoted from '../tree/quoted';\nimport Anonymous
from '../tree/anonymous';\nimport Expression from '../tree/expression';\nimport Operation from
'../tree/operation';\nlet colorFunctions;\n\nfunction clamp(val) {\n    return Math.min(1, Math.max(0,
val));\n}\nfunction hsla(origColor, hsl) {\n    const color = colorFunctions.hsla(hsl.h,
hsl.s, hsl.l, hsl.a);\n    if (color) {\n        if (origColor.value && \n            /^(rgb|hsl)/.test(origColor.value)) {\n
color.value = origColor.value;\n        } else {\n            color.value = 'rgb';\n        }\n        return color;\n
}\n}\nfunction toHSL(color) {\n    if (color.toHSL) {\n        return color.toHSL();\n    } else {\n        throw new
Error('Argument cannot be evaluated to a color');\n    }\n}\n\nfunction toHSV(color) {\n    if (color.toHSV) {\n
return color.toHSV();\n    } else {\n        throw new Error('Argument cannot be evaluated to a color');\n
}\n}\n\nfunction number(n) {\n    if (n instanceof Dimension) {\n        return parseFloat(n.unit.is('%') ? n.value / 100
: n.value);\n    } else if (typeof n === 'number') {\n        return n;\n    } else {\n        throw {\n            type:
'Argument',\n            message: 'color functions take numbers as parameters'\n        };\n    }\n}\nfunction scaled(n,
size) {\n    if (n instanceof
Dimension && n.unit.is('%')) {\n        return parseFloat(n.value * size / 100);\n    } else {\n        return number(n);\n
}\n}\ncolorFunctions = {\n    rgb: function (r, g, b) {\n        let a = 1\n        /**\n         * Comma-less syntax\n         *
e.g. rgb(0 128 255 / 50%)\n         */\n        if (r instanceof Expression) {\n            const val = r.value\n            r =
val[0]\n            g = val[1]\n            b = val[2]\n            /** \n             * @todo - should this be normalized in\n
*   function caller? Or parsed differently?\n             */\n            if (b instanceof Operation) {\n                const op =
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b\n            b = op.operands[0]\n            a = op.operands[1]\n        }\n    }\n    const color = colorFunctions.rgba(r, g, b, a);\n    if (color) {\n        color.value = 'rgb';\n        return color;\n    }\n  },\n  rgba: function (r, g, b, a) {\n    try {\n      if (r instanceof Color) {\n        if (g) {\n          a = number(g);\n        } else {\n          a = r.alpha;\n        }\n        return new Color(r.rgb, a, 'rgba');\n      }\n      const rgb = [r, g, b].map(c => scaled(c, 255));\n      a = number(a);\n      return new Color(rgb, a, 'rgba');\n    }\n    catch (e) {}\n  },\n  hsl: function (h, s, l) {\n    let a = 1\n    if (h instanceof Expression) {\n      const val = h.value\n      h = val[0]\n      s = val[1]\n      l = val[2]\n\n      if (l instanceof Operation) {\n        const op = l\n        l = op.operands[0]\n        a = op.operands[1]\n      }\n    }\n    const color = colorFunctions.hsla(h, s, l, a);\n    if (color) {\n      color.value = 'hsl';\n      return color;\n    }\n  },\n  hsla: function (h, s, l, a) {\n    try {\n      if (h instanceof Color) {\n        if (s) {\n          a = number(s);\n        } else {\n          a = h.alpha;\n        }\n        return new Color(h.rgb, a, 'hsla');\n      }\n\n      let m1;\n      let m2;\n\n      function hue(h) {\n        h = h < 0 ? h + 1 : (h > 1 ? h - 1 : h);\n        if (h * 6 < 1) {\n          return m1 + (m2 - m1) * h * 6;\n        }\n        else if (h * 2 < 1) {\n          return m2;\n        }\n        else if (h * 3 < 2) {\n          return m1 + (m2 - m1) * (2 / 3 - h) * 6;\n        }\n        else {\n          return m1;\n        }\n      }\n\n      h = (number(h) % 360) / 360;\n      s = clamp(number(s));l = clamp(number(l));a = clamp(number(a));\n\n      m2 = l <= 0.5 ? l * (s + 1) : l + s - l * s;\n      m1 = l * 2 - m2;\n\n      const rgb =\n      [\n        hue(h + 1 / 3) * 255,\n        hue(h)       * 255,\n        hue(h - 1 / 3) * 255\n      ];\n      a = number(a);\n      return new Color(rgb, a, 'hsla');\n    }\n    catch (e) {}\n  },\n\n  hsv: function(h, s, v) {\n    return colorFunctions.hsva(h, s, v, 1.0);\n  },\n\n  hsva: function(h, s, v, a) {\n    h = ((number(h) % 360) / 360) * 360;\n    s = number(s);v = number(v);a = number(a);\n\n    let i;\n    let f;\n    i = Math.floor((h / 60) % 6);\n    f = (h / 60) - i;\n\n    const vs = [v,\n      v * (1 - s),\n      v * (1 - f * s),\n      v * (1 - (1 - f) * s)];\n    const perm = [[0, 3, 1],\n      [2, 0, 1],\n      [1, 0, 3],\n      [1, 2, 0],\n      [3, 1, 0],\n      [0, 1, 2]];\n\n    return colorFunctions.rgba(vs[perm[i][0]] * 255,\n      vs[perm[i][1]] * 255,\n      vs[perm[i][2]] * 255,\n      a);\n  },\n\n  hue: function (color) {\n    return new Dimension(toHSL(color).h);\n  },\n  saturation: function (color) {\n    return new Dimension(toHSL(color).s * 100, '%');\n  },\n  lightness: function (color) {\n    return new Dimension(toHSL(color).l * 100, '%');\n  },\n  hsvhue: function(color) {\n    return new Dimension(toHSV(color).h);\n  },\n  hsvsaturation: function (color) {\n    return new Dimension(toHSV(color).s * 100, '%');\n  },\n  hsvvalue: function (color) {\n    return new Dimension(toHSV(color).v * 100, '%');\n  },\n  red: function (color) {\n    return new Dimension(color.rgb[0]);\n  },\n  green: function (color) {\n    return new Dimension(color.rgb[1]);\n  },\n  blue: function (color) {\n    return new Dimension(color.rgb[2]);\n  },\n  alpha: function (color) {\n    return new Dimension(toHSL(color).a);\n  },\n  luma: function (color) {\n    return new Dimension(color.luma() * color.alpha * 100, '%');\n  },\n  luminance: function (color) {\n    const luminance =\n      (0.2126 * color.rgb[0] / 255) +\n      (0.7152 * color.rgb[1] / 255) +\n      (0.0722 * color.rgb[2] / 255);\n\n    return new Dimension(luminance * color.alpha * 100, '%');\n  },\n  saturate: function (color, amount, method) {\n    // filter: saturate(3.2);\n    // should be kept as is, so check for color\n    if (!color.rgb) {\n      return null;\n    }\n    const hsl = toHSL(color);\n\n    if (typeof method !== 'undefined' && method.value === 'relative') {\n      hsl.s +=  hsl.s * amount.value / 100;\n    }\n    else {\n      hsl.s += amount.value / 100;\n    }\n    hsl.s = clamp(hsl.s);\n    return hsla(color, hsl);\n  },\n  desaturate: function (color, amount, method) {\n    const hsl = toHSL(color);\n\n    if (typeof method !== 'undefined' && method.value === 'relative') {\n      hsl.s -=  hsl.s * amount.value / 100;\n    }\n    else {\n      hsl.s -= amount.value / 100;\n    }\n    hsl.s = clamp(hsl.s);\n    return hsla(color, hsl);\n  },\n  lighten: function (color, amount, method) {\n    const hsl = toHSL(color);\n\n    if (typeof method !== 'undefined' && method.value === 'relative') {\n      hsl.l +=
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hsl.l * amount.value / 100;\n        }\n        else {\n            hsl.l += amount.value / 100;\n        }\n        hsl.l = clamp(hsl.l);\n        return hsla(color, hsl);\n    },\n    darken: function (color, amount, method) {\n        const hsl = toHSL(color);\n\n        if (typeof method !== 'undefined' && method.value === 'relative') {\n            hsl.l -=  hsl.l * amount.value / 100;\n        }\n        else {\n            hsl.l -= amount.value / 100;\n        }\n        hsl.l = clamp(hsl.l);\n        return hsla(color, hsl);\n    },\n    fadein: function (color, amount, method) {\n        const hsl = toHSL(color);\n\n        if (typeof method !== 'undefined' && method.value === 'relative') {\n            hsl.a +=  hsl.a * amount.value / 100;\n        }\n        else {\n            hsl.a += amount.value / 100;\n        }\n        hsl.a = clamp(hsl.a);\n        return hsla(color, hsl);\n    },\n    fadeout: function (color, amount, method) {\n        const hsl = toHSL(color);\n\n        if (typeof method !== 'undefined' && method.value === 'relative') {\n            hsl.a -=  hsl.a * amount.value / 100;\n        }\n        else {\n            hsl.a -= amount.value / 100;\n        }\n        hsl.a = clamp(hsl.a);\n        return hsla(color, hsl);\n    },\n    fade: function (color, amount) {\n        const hsl = toHSL(color);\n\n        hsl.a = amount.value / 100;\n        hsl.a = clamp(hsl.a);\n        return hsla(color, hsl);\n    },\n    spin: function (color, amount) {\n        const hsl = toHSL(color);\n        const hue = (hsl.h + amount.value) % 360;\n\n        hsl.h = hue < 0 ?
 360 + hue : hue;\n\n        return hsla(color, hsl);\n    },\n    //\n    // Copyright (c) 2006-2009 Hampton Catlin, Natalie Weizenbaum, and Chris Eppstein\n    // http://sass-lang.com\n    //\n    mix: function (color1, color2, weight) {\n        if (!weight) {\n            weight = new Dimension(50);\n        }\n        const p = weight.value / 100.0;\n        const w = p * 2 - 1;\n        const a = toHSL(color1).a - toHSL(color2).a;\n\n        const w1 = (((w * a == -1) ? w : (w + a) / (1 + w * a)) + 1) / 2.0;\n        const w2 = 1 - w1;\n\n        const rgb = [color1.rgb[0] * w1 + color2.rgb[0] * w2,\n            color1.rgb[1] * w1 + color2.rgb[1] * w2,\n            color1.rgb[2] * w1 + color2.rgb[2] * w2];\n\n        const alpha = color1.alpha * p + color2.alpha * (1 - p);\n\n        return new Color(rgb, alpha);\n    },\n    greyscale: function (color) {\n        return colorFunctions.desaturate(color, new Dimension(100));\n    },\n    contrast: function (color, dark, light, threshold)
 {\n        // filter: contrast(3.2);\n        // should be kept as is, so check for color\n        if (!color.rgb) {\n            return null;\n        }\n        if (typeof light === 'undefined') {\n            light = colorFunctions.rgba(255, 255, 255, 1.0);\n        }\n        if (typeof dark === 'undefined') {\n            dark = colorFunctions.rgba(0, 0, 0, 1.0);\n        }\n        // Figure out which is actually light and dark:\n        if (dark.luma() > light.luma()) {\n            const t = light;\n            light = dark;\n            dark = t;\n        }\n        if (typeof threshold === 'undefined') {\n            threshold = 0.43;\n        } else {\n            threshold = number(threshold);\n        }\n        if (color.luma() < threshold) {\n            return light;\n        } else {\n            return dark;\n        }\n    },\n    // Changes made in 2.7.0 - Reverted in 3.0.0\n    // contrast: function (color, color1, color2, threshold) {\n    //     // Return
 which of `color1` and `color2` has the greatest contrast with `color`\n    //     // according to the standard WCAG contrast ratio calculation.\n    //     // http://www.w3.org/TR/WCAG20/#contrast-ratiodef\n    //     // The threshold param is no longer used, in line with SASS.\n    //     // filter: contrast(3.2);\n    //     // should be kept as is, so check for color\n    //     if (!color.rgb) {\n    //         return null;\n    //     }\n    //     if (typeof color1 === 'undefined') {\n    //         color1 = colorFunctions.rgba(0, 0, 0, 1.0);\n    //     }\n    //     if (typeof color2 === 'undefined') {\n    //         color2 = colorFunctions.rgba(255, 255, 255, 1.0);\n    //     }\n    //     var contrast1, contrast2;\n    //     var luma = color.luma();\n    //     var luma1 = color1.luma();\n    //     var luma2 = color2.luma();\n    //     // Calculate contrast ratios for each color\n    //     if (luma > luma1) {\n    //         contrast1 = (luma + 0.05) / (luma1 + 0.05);\n    //     } else {\n    //         contrast1 = (luma1 + 0.05) / (luma + 0.05);\n    //     }\n    //     if (luma > luma2) {\n    //         contrast2 = (luma + 0.05) / (luma2 + 0.05);\n    //     } else {\n    //         contrast2 = (luma2 + 0.05) / (luma + 0.05);\n    //     }\n    //     if (contrast1 > contrast2) {\n    //         return color1;\n    //     } else {\n    //         return color2;\n    //     }\n    // },\n    argb: function (color) {\n        return new Anonymous(color.toARGB());\n    },\n    color: function(c) {\n        if ((c instanceof Quoted) &&\n            (/^#([A-Fa-f0-9]{8}|[A-Fa-f0-9]{6}|[A-Fa-f0-9]{3,4})$/i.test(c.value))) {\n            const val = c.value.slice(1);\n            return new Color(val, undefined, `#${val}`);\n        }\n        if ((c instanceof Color) || (c = Color.fromKeyword(c.value))) {\n            c.value = undefined;\n            return c;\n        }\n        throw {\n            type:    'Argument',\n            message: 'argument
 must be a color keyword or 3|4|6|8 digit hex e.g. #FFF'\n        };\n    },\n    tint: function(color, amount) {\n        return colorFunctions.mix(colorFunctions.rgb(255, 255, 255), color, amount);\n    },\n    shade: function(color,
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amount) {\n        return colorFunctions.mix(colorFunctions.rgb(0, 0, 0), color, amount);\n    }\n};\n\nexport default colorFunctions;\n","import Color from '../tree/color';\n\n// Color Blending\n// ref: http://www.w3.org/TR/compositing-1\n\nfunction colorBlend(mode, color1, color2) {\n    const ab = color1.alpha;\n    // result\n\n    let // backdrop\n        cb;\n\n    const as = color2.alpha;\n\n    let // source\n        cs;\n\n    let ar;\n\n    let cr;\n    const r = [];\n\n    ar = as + ab * (1 - as);\n    for (let i = 0; i < 3; i++) {\n        cb = color1.rgb[i] / 255;\n        cs = color2.rgb[i] / 255;\n        cr = mode(cb, cs);\n        if (ar) {\n            cr = (as * cs + ab * (cb -\n                as * (cb + cs - cr))) / ar;\n        }\n\n        r[i] = cr * 255;\n    }\n\n    return new Color(r, ar);\n}\n\nconst colorBlendModeFunctions = {\n    multiply: function(cb, cs) {\n        return cb * cs;\n    },\n    screen: function(cb, cs) {\n        return cb + cs - cb * cs;\n    },\n    overlay: function(cb, cs) {\n        cb *= 2;\n        return (cb <= 1) ?\n            colorBlendModeFunctions.multiply(cb, cs) :\n            colorBlendModeFunctions.screen(cb - 1, cs);\n    },\n    softlight: function(cb, cs) {\n        let d = 1;\n        let e = cb;\n        if (cs > 0.5) {\n            e = 1;\n            d = (cb > 0.25) ? Math.sqrt(cb)\n                : ((16 * cb - 12) * cb + 4) * cb;\n        }\n        return cb - (1 - 2 * cs) * e * (d - cb);\n    },\n    hardlight: function(cb, cs) {\n        return colorBlendModeFunctions.overlay(cs, cb);\n    },\n    difference: function(cb, cs) {\n        return Math.abs(cb - cs);\n    },\n    exclusion: function(cb, cs) {\n        return cb + cs - 2 * cb * cs;\n    },\n\n    // non-w3c functions:\n    average: function(cb, cs) {\n        return (cb + cs) / 2;\n    },\n    negation: function(cb, cs) {\n        return 1 - Math.abs(cb + cs - 1);\n    }\n};\n\nfor (const f in colorBlendModeFunctions) {\n    if (colorBlendModeFunctions.hasOwnProperty(f)) {\n        colorBlend[f] = colorBlend.bind(null, colorBlendModeFunctions[f]);\n    }\n}\n\nexport default colorBlend;\n","import Comment from '../tree/comment';\nimport Node from '../tree/node';\nimport Dimension from '../tree/dimension';\nimport Declaration from '../tree/declaration';\nimport Expression from '../tree/expression';\nimport Ruleset from '../tree/ruleset';\nimport Selector from '../tree/selector';\nimport Element from '../tree/element';\nimport Quote from '../tree/quoted';\nimport Value from '../tree/value';\n\nconst getItemsFromNode = node => {\n    // handle non-array values as an array of length 1\n    // return 'undefined' if index is invalid\n    const items = Array.isArray(node.value) ?\n        node.value : Array(node);\n\n    return items;\n};\n\nexport default {\n    _SELF: function(n) {\n        return n;\n    },\n    '~': function(...expr) {\n        if (expr.length === 1) {\n            return expr[0];\n        }\n        return new Value(expr);\n    },\n    extract: function(values, index) {\n        // (1-based index)\n        index = index.value - 1;\n\n        return getItemsFromNode(values)[index];\n    },\n    length: function(values) {\n        return new Dimension(getItemsFromNode(values).length);\n    },\n    /**\n     * Creates a Less list of incremental values.\n     * Modeled after Lodash's range function, also exists natively in PHP\n     *\n     * @param {Dimension} [start=1]\n * @param {Dimension} end  - e.g. 10 or 10px - unit is added to output\n     * @param {Dimension} [step=1]\n */\n    range: function(start, end, step) {\n        let from;\n        let to;\n        let stepValue = 1;\n        const list = [];\n\n    if (end) {\n\n        to = end;\n            from = start.value;\n            if (step) {\n                stepValue = step.value;\n            }\n        }\n        else {\n            from = 1;\n            to = start;\n        }\n\n        for (let i = from; i <= to.value; i += stepValue) {\n            list.push(new Dimension(i, to.unit));\n        }\n\n        return new Expression(list);\n    },\n    each: function(list, rs) {\n        const rules = [];\n        let newRules;\n        let iterator;\n\n        const tryEval = val => {\n            if (val instanceof Node) {\n                return val.eval(this.context);\n            }\n            return val;\n        };\n\n        if (list.value && !(list instanceof Quote)) {\n            if (Array.isArray(list.value)) {\n                iterator = list.value.map(tryEval);\n            } else {\n                iterator = [tryEval(list.value)];\n            }\n        } else if (list.ruleset) {\n            iterator = tryEval(list.ruleset).rules;\n\n        } else if (list.rules) {\n            iterator = list.rules.map(tryEval);\n        } else if (Array.isArray(list)) {\n            iterator = list.map(tryEval);\n        } else {\n            iterator = [tryEval(list)];\n        }\n\n        let valueName = '@value';\n        let keyName = '@key';\n        let indexName = '@index';\n\n        if (rs.params) {\n            valueName = rs.params[0] && rs.params[0].name;\n            keyName = rs.params[1] && rs.params[1].name;\n            indexName = rs.params[2] && rs.params[2].name;\n            rs = rs.rules;\n        } else {\n            rs = rs.ruleset;\n        }\n\n        for (let i = 0; i < iterator.length; i++) {\n            let key;\n            let value;\n            const item = iterator[i];\n            if (item instanceof Declaration) {\n                key = typeof item.name === 'string' ? item.name :
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item.name[0].value;\n value = item.value;\n } else {\n key = new Dimension(i + 1);\n value = item;\n }\n\n if (item instanceof Comment) {\n continue;\n }\n\n newRules = rs.rules.slice(0);\n if (valueName) {\n newRules.push(new Declaration(valueName,\n value,\n false, false, this.index, this.currentFileInfo));\n }\n if (indexName) {\n newRules.push(new Declaration(indexName,\n new Dimension(i + 1),\n false, false, this.index, this.currentFileInfo));\n }\n if (keyName) {\n newRules.push(new Declaration(keyName,\n key,\n false, false, this.index, this.currentFileInfo));\n }\n\n rules.push(new Ruleset([new(Selector)([new Element(\"\", '&')])],\n newRules,\n rs.strictImports,\n rs.visibilityInfo()\n));\n }\n\n return new Ruleset([new(Selector)([new Element(\"\", '&')])],\n rules,\n rs.strictImports,\n rs.visibilityInfo()\n).eval(this.context);\n }\n};\n","import Dimension from '../tree/dimension';\n\nconst MathHelper = (fn, unit, n) => {\n if (!(n instanceof Dimension)) {\n throw { type: 'Argument', message: 'argument must be a number' };\n }\n if (unit == null) {\n unit = n.unit;\n } else {\n n = n.unify();\n }\n return new Dimension(fn(parseFloat(n.value)), unit);\n};\n\nexport default MathHelper;","import mathHelper from './math-helper.js';\n\nconst mathFunctions = {\n // name, unit\n ceil: null,\n floor: null,\n sqrt: null,\n abs: null,\n tan: '',\n sin: '',\n cos: '',\n atan: 'rad',\n asin: 'rad',\n acos: 'rad'\n};\n\nfor (const f in mathFunctions) {\n if (mathFunctions.hasOwnProperty(f)) {\n mathFunctions[f]\n = mathHelper.bind(null, Math[f], mathFunctions[f]);\n }\n}\n\nmathFunctions.round = (n, f) => {\n const fraction = typeof f === 'undefined' ? 0 : f.value;\n return mathHelper(num => num.toFixed(fraction), null, n);\n};\n\nexport default mathFunctions;\n","import Dimension from '../tree/dimension';\nimport Anonymous from '../tree/anonymous';\nimport mathHelper from './math-helper.js';\n\nconst minMax = function (isMin, args) {\n args = Array.prototype.slice.call(args);\n switch (args.length) {\n case 0: throw { type: 'Argument', message: 'one or more arguments required' };\n }\n let i; // key is the unit.toString() for unified Dimension values,\n let j;\n let current;\n let currentUnified;\n let referenceUnified;\n let unit;\n let unitStatic;\n let unitClone;\n\n const // elems only contains original argument values.\n order = [];\n\n const values = {};\n // value is the index into the order array.\n for (i = 0; i < args.length;\n i++) {\n current = args[i];\n if (!(current instanceof Dimension)) {\n if (Array.isArray(args[i].value)) {\n Array.prototype.push.apply(args, Array.prototype.slice.call(args[i].value));\n }\n continue;\n }\n currentUnified = current.unit.toString() === '' && unitClone !== undefined ? new Dimension(current.value, unitClone).unify() : current.unify();\n unit = currentUnified.unit.toString() === '' && unitStatic !== undefined ? unitStatic : currentUnified.unit.toString();\n unitStatic = unit !== '' && unitStatic === undefined || unit !== '' && order[0].unify().unit.toString() === '' ? unit : unitStatic;\n unitClone = unit !== '' && unitClone === undefined ? current.unit.toString() : unitClone;\n j = values[''] !== undefined && unit !== '' && unit === unitStatic ? values[''] : values[unit];\n if (j === undefined) {\n if (unitStatic !== undefined && unit !== unitStatic)\n {\n throw { type: 'Argument', message: 'incompatible types' };\n }\n values[unit] = order.length;\n order.push(current);\n continue;\n }\n referenceUnified = order[j].unit.toString() === '' && unitClone !== undefined ? new Dimension(order[j].value, unitClone).unify() : order[j].unify();\n if (isMin && currentUnified.value < referenceUnified.value ||\n !isMin && currentUnified.value > referenceUnified.value) {\n order[j] = current;\n }\n }\n if (order.length == 1) {\n return order[0];\n }\n args = order.map(function (a) { return a.toCSS(this.context);\n }).join(this.context.compress ? ',' : ', ');\n return new Anonymous(`${isMin ? 'min' : 'max'}(${args})`);\n};\n\nexport default {\n min: function(...args) {\n try {\n return minMax(true, args);\n } catch (e) {}\n },\n max: function(...args) {\n try {\n return minMax(false, args);\n } catch (e) {}\n },\n convert: function (val, unit) {\n return val.convertTo(unit.value);\n },\n pi: function () {\n return new Dimension(Math.PI);\n },\n mod:

function(a, b) {\n return new Dimension(a.value % b.value, a.unit);\n },\n pow: function(x, y) {\n if (typeof x === 'number' && typeof y === 'number') {\n x = new Dimension(x);\n y = new Dimension(y);\n } else if (!(x instanceof Dimension) || !(y instanceof Dimension)) {\n throw { type: 'Argument', message: 'arguments must be numbers' };\n }\n\n return new Dimension(Math.pow(x.value, y.value), x.unit);\n },\n percentage: function (n) {\n const result = mathHelper(num => num * 100, '%', n);\n\n return result;\n }\n};\n","import Quoted from '../tree/quoted';\nimport Anonymous from '../tree/anonymous';\nimport JavaScript from '../tree/javascript';\n\nexport default {\n e: function (str) {\n return new Quoted('\"', str instanceof JavaScript ? str.evaluated : str.value, true);\n },\n escape: function (str) {\n return new Anonymous(\n encodeURI(str.value).replace(/=/g, '%3D').replace(/:/g, '%3A').replace(/#/g, '%23').replace(/;/g, '%3B')\n .replace(/\\(/g, '%28').replace(/\\)/g, '%29'));\n },\n replace: function (string, pattern, replacement, flags) {\n let result = string.value;\n replacement = (replacement.type === 'Quoted') ?\n replacement.value : replacement.toCSS();\n result = result.replace(new RegExp(pattern.value, flags ? flags.value : ''), replacement);\n return new Quoted(string.quote || '', result, string.escaped);\n },\n '%': function (string /* arg, arg, ... */) {\n const args = Array.prototype.slice.call(arguments, 1);\n let result = string.value;\n\n for (let i = 0; i < args.length; i++) {\n /* jshint loopfunc:true\n */\n result = result.replace(/%[sda]/i, token => {\n const value = ((args[i].type === 'Quoted') &&\n token.match(/s/i)) ? args[i].value : args[i].toCSS();\n return token.match(/[A-Z]$/) ? encodeURIComponent(value) : value;\n });\n }\n result = result.replace(/%%/g, '%');\n return new Quoted(string.quote || '', result, string.escaped);\n }\n};\n","import Keyword from '../tree/keyword';\nimport DetachedRuleset from '../tree/detached-ruleset';\nimport Dimension from '../tree/dimension';\nimport Color from '../tree/color';\nimport Quoted from '../tree/quoted';\nimport Anonymous from '../tree/anonymous';\nimport URL from '../tree/url';\nimport Operation from '../tree/operation';\n\nconst isa = (n, Type) => (n instanceof Type) ? Keyword.True : Keyword.False;\nconst isunit = (n, unit) => {\n if (unit === undefined) {\n throw { type: 'Argument', message: 'missing the required second argument to isunit.' };\n }\n unit = typeof unit.value === 'string' ? unit.value : unit;\n if (typeof unit !== 'string') {\n throw { type: 'Argument', message: 'Second argument to isunit should be a unit or a string.' };\n }\n return (n instanceof Dimension) && n.unit.is(unit) ? Keyword.True : Keyword.False;\n};\n\nexport default {\n isruleset: function (n) {\n return isa(n, DetachedRuleset);\n },\n iscolor: function (n) {\n return isa(n, Color);\n },\n isnumber: function (n) {\n return isa(n, Dimension);\n },\n isstring: function (n) {\n return isa(n, Quoted);\n },\n iskeyword: function (n) {\n return isa(n, Keyword);\n },\n isurl: function (n) {\n return isa(n, URL);\n },\n ispixel: function (n) {\n return isunit(n, 'px');\n },\n ispercentage: function (n) {\n return isunit(n, '%');\n },\n isem: function (n) {\n return isunit(n, 'em');\n },\n isunit,\n unit: function (val, unit) {\n if (!(val instanceof Dimension)) {\n throw { type: 'Argument',\n message: `the first argument to unit must be a number${val instanceof Operation ? '. Have you forgotten parenthesis?' : ''}` };\n }\n if (unit) {\n if (unit instanceof Keyword) {\n unit = unit.value;\n } else {\n unit = unit.toCSS();\n }\n } else {\n unit = '';\n }\n return new Dimension(val.value, unit);\n },\n 'get-unit': function (n) {\n return new Anonymous(n.unit);\n }\n};\n","import functionRegistry from './function-registry';\nimport functionCaller from './function-caller';\n\nimport boolean from './boolean';\nimport defaultFunc from './default';\nimport color from './color';\nimport colorBlending from './color-blending';\nimport dataUri from './data-uri';\nimport list from './list';\nimport math from './math';\nimport number from './number';\nimport string from './string';\nimport svg from './svg';\nimport types from './types';\n\nexport default environment => {\n const functions = { functionRegistry, functionCaller };\n\n // register functions\n functionRegistry.addMultiple(boolean);\n functionRegistry.add('default', defaultFunc.eval.bind(defaultFunc));\n functionRegistry.addMultiple(color);\n functionRegistry.addMultiple(colorBlending);\n functionRegistry.addMultiple(dataUri(environment));\n functionRegistry.addMultiple(list);\n functionRegistry.addMultiple(math);\n

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functionRegistry.addMultiple(number);\n    functionRegistry.addMultiple(string);\n
functionRegistry.addMultiple(svg(environment));\n    functionRegistry.addMultiple(types);\n\n    return
functions;\n};\n","import Quoted from '../tree/quoted';\nimport URL from '../tree/url';\nimport * as utils from
'../utils';\nimport logger from '../logger';\n\nexport default environment => {\n    \n    const fallback
 = (functionThis, node) => new URL(node, functionThis.index,
functionThis.currentFileInfo).eval(functionThis.context);    \n\n    return { 'data-uri': function(mimetypeNode,
filePathNode) {\n\n        if (!filePathNode) {\n            filePathNode = mimetypeNode;\n            mimetypeNode =
null;\n        }\n\n        let mimetype = mimetypeNode && mimetypeNode.value;\n        let filePath =
filePathNode.value;\n        const currentFileInfo = this.currentFileInfo;\n        const currentDirectory =
currentFileInfo.rewriteUrls ?\n            currentFileInfo.currentDirectory : currentFileInfo.entryPath;\n\n        const
fragmentStart = filePath.indexOf('#');\n        let fragment = '';\n        if (fragmentStart !== -1) {\n            fragment =
filePath.slice(fragmentStart);\n            filePath = filePath.slice(0, fragmentStart);\n        }\n        const context =
utils.clone(this.context);\n        context.rawBuffer = true;\n\n        const fileManager =
environment.getFileManager(filePath,
 currentDirectory, context, environment, true);\n\n        if (!fileManager) {\n            return fallback(this,
filePathNode);\n        }\n\n        let useBase64 = false;\n\n        // detect the mimetype if not given\n        if
(!mimetypeNode) {\n\n            mimetype = environment.mimeLookup(filePath);\n\n            if (mimetype ===
'image/svg+xml') {\n                useBase64 = false;\n            } else {\n                // use base 64 unless it's an ASCII or
UTF-8 format\n                const charset = environment.charsetLookup(mimetype);\n                useBase64 = ['US-
ASCII', 'UTF-8'].indexOf(charset) < 0;\n            }\n            if (useBase64) { mimetype += ';base64'; }\n        }\n
else {\n            useBase64 = /;base64$/.test(mimetype);\n        }\n\n        const fileSync =
fileManager.loadFileSync(filePath, currentDirectory, context, environment);\n        if (!fileSync.contents) {\n
logger.warn(`Skipped data-uri embedding of
 ${filePath} because file not found`);\n            return fallback(this, filePathNode || mimetypeNode);\n        }\n        let
buf = fileSync.contents;\n        if (useBase64 && !environment.encodeBase64) {\n            return fallback(this,
filePathNode);\n        }\n\n        buf = useBase64 ? environment.encodeBase64(buf) :
encodeURIComponent(buf);\n\n        const uri = `data:${mimetype},${buf}${fragment}`;\n\n        return new
URL(new Quoted(`\"${uri}\"`, uri, false, this.index, this.currentFileInfo), this.index, this.currentFileInfo);\n
}};\n};\n","import Dimension from '../tree/dimension';\nimport Color from '../tree/color';\nimport Expression from
'../tree/expression';\nimport Quoted from '../tree/quoted';\nimport URL from '../tree/url';\n\nexport default
environment => {\n    return { 'svg-gradient': function(direction) {\n        let stops;\n        let gradientDirectionSvg;\n
    let gradientType = 'linear';\n        let rectangleDimension = 'x=\"0\" y=\"0\" width=\"1\"
 height=\"1\"';\n        const renderEnv = {compress: false};\n        let returner;\n        const directionValue =
direction.toCSS(renderEnv);\n        let i;\n        let color;\n        let position;\n        let positionValue;\n        let
alpha;\n\n        function throwArgumentDescriptor() {\n            throw { type: 'Argument',\n                message: 'svg-
gradient expects direction, start_color [start_position], [color position,]...,' +\n                    ' end_color
[end_position] or direction, color list' };\n        }\n\n        if (arguments.length == 2) {\n            if
(arguments[1].value.length < 2) {\n                throwArgumentDescriptor();\n            }\n            stops =
arguments[1].value;\n        } else if (arguments.length < 3) {\n            throwArgumentDescriptor();\n        } else {\n
      stops = Array.prototype.slice.call(arguments, 1);\n        }\n\n        switch (directionValue) {\n            case 'to
bottom':\n
    gradientDirectionSvg = 'x1=\"0%\" y1=\"0%\" x2=\"0%\" y2=\"100%\"';\n                break;\n            case 'to
right':\n                gradientDirectionSvg = 'x1=\"0%\" y1=\"0%\" x2=\"100%\" y2=\"0%\"';\n                break;\n
 case 'to bottom right':\n                gradientDirectionSvg = 'x1=\"0%\" y1=\"0%\" x2=\"100%\" y2=\"100%\"';\n
      break;\n            case 'to top right':\n                gradientDirectionSvg = 'x1=\"0%\" y1=\"100%\" x2=\"100%\"
y2=\"0%\"';\n                break;\n            case 'ellipse':\n            case 'ellipse at center':\n                gradientType =
'radial';\n                gradientDirectionSvg = 'cx=\"50%\" cy=\"50%\" r=\"75%\"';\n                rectangleDimension =
'x=\"-50\" y=\"-50\" width=\"101\" height=\"101\"';\n                break;\n            default:\n                throw { type:
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'Argument', message: 'svg-gradient direction must be \\'to bottom\\', \\'to right\\',' +\n ' \\'to bottom right\\', \\'to top right\\' or \\'ellipse at center\\'' };\n }\n returner = `<svg xmlns=\"http://www.w3.org/2000/svg\" viewBox=\"0 0 1 1\"><${gradientType}Gradient id=\"g\" ${gradientDirectionSvg}>`;\n\n for (i = 0; i < stops.length; i += 1) {\n if (stops[i] instanceof Expression) {\n color = stops[i].value[0];\n position = stops[i].value[1];\n } else {\n color = stops[i];\n position = undefined;\n }\n\n if (!(color instanceof Color) || (!((i === 0 || i + 1 === stops.length) && position === undefined) && !(position instanceof Dimension))) {\n throwArgumentDescriptor();\n }\n positionValue = position ? position.toCSS(renderEnv) : i === 0 ? '0%' : '100%';\n alpha = color.alpha;\n returner += `<stop offset=\"${positionValue}\" stop-color=\"${color.toRGB()}\"${alpha < 1 ? ` stop-opacity=\"${alpha}\"` : ''}/>`;\n }\n returner += `</${gradientType}Gradient><rect ${rectangleDimension} fill=\"url(#g)\" /></svg>`;\n\n returner = encodeURIComponent(returner);\n\n returner = `data:image/svg+xml,${returner}`;\n return new URL(new Quoted(`'${returner}'`, returner, false, this.index, this.currentFileInfo), this.index, this.currentFileInfo);\n }};\n};\n","import contexts from './contexts';\nimport visitor from './visitors';\nimport tree from './tree';\n\nexport default function(root, options) {\n options = options || {};\n let evaldRoot;\n let variables = options.variables;\n const evalEnv = new contexts.Eval(options);\n\n //\n // Allows setting variables with a hash, so:\n //\n // `{ color: new tree.Color('#f01') }` will become:\n //\n // new tree.Declaration('@color',\n // new tree.Value([\n // new tree.Expression([\n // new tree.Color('#f01')\n // ])\n // ])\n // )\n //\n if (typeof variables === 'object' && !Array.isArray(variables)) {\n variables = Object.keys(variables).map(function (k) {\n let value = variables[k];\n\n if (!(value instanceof tree.Value)) {\n if (!(value instanceof tree.Expression)) {\n value = new tree.Expression([value]);\n }\n value = new tree.Value([value]);\n }\n return new tree.Declaration(`@${k}`, value, false, null, 0);\n });\n evalEnv.frames = [new tree.Ruleset(null, variables)];\n }\n\n const visitors = [\n new visitor.JoinSelectorVisitor(),\n new visitor.MarkVisibleSelectorsVisitor(true),\n new visitor.ExtendVisitor(),\n new visitor.ToCSSVisitor({compress: Boolean(options.compress)})\n ];\n\n const preEvalVisitors = [];\n let v;\n let visitorIterator;\n\n /**\n * first() / get() allows visitors to be added while visiting\n * \n * @todo Add scoping for visitors just like functions for @plugin; right now they're global\n */\n if (options.pluginManager) {\n visitorIterator = options.pluginManager.visitor();\n for (var i = 0; i < 2; i++) {\n visitorIterator.first();\n while ((v = visitorIterator.get())) {\n if (v.isPreEvalVisitor) {\n if (i === 0 || preEvalVisitors.indexOf(v) === -1) {\n preEvalVisitors.push(v);\n v.run(root);\n }\n }\n else {\n if (i === 0 || visitors.indexOf(v) === -1) {\n if (v.isPreVisitor) {\n visitors.unshift(v);\n }\n else {\n visitors.push(v);\n }\n }\n }\n }\n }\n\nevaldRoot = root.eval(evalEnv);\n\n for (var i = 0; i < visitors.length; i++) {\n visitors[i].run(evaldRoot);\n }\n\n // Run any remaining visitors added after eval pass\n if (options.pluginManager) {\n visitorIterator.first();\n while ((v = visitorIterator.get())) {\n if (visitors.indexOf(v) === -1 && preEvalVisitors.indexOf(v) === -1) {\n v.run(evaldRoot);\n }\n }\n }\n\n return evaldRoot;\n};\n","/**\n * Plugin Manager\n */\nclass PluginManager {\n constructor(less) {\n this.less = less;\n this.visitors = [];\n this.preProcessors = [];\n this.postProcessors = [];\n this.installedPlugins = [];\n this.fileManagers = [];\n this.iterator = -1;\n this.pluginCache = {};\n this.Loader = new less.PluginLoader(less);\n }\n\n /**\n * Adds all the plugins in the array\n * @param {Array} plugins\n */\n addPlugins(plugins) {\n if (plugins) {\n for (let i = 0; i < plugins.length; i++) {\n this.addPlugin(plugins[i]);\n }\n }\n }\n\n /**\n *\n * @param plugin\n * @param {String} filename\n */\n addPlugin(plugin, filename, functionRegistry) {\n this.installedPlugins.push(plugin);\n if (filename) {\n this.pluginCache[filename] = plugin;\n }\n if (plugin.install) {\n plugin.install(this.less, this, functionRegistry ||
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this.less.functions.functionRegistry);\n }\n }\n\n /**\n *\n * @param filename\n */\n get(filename) {\n return this.pluginCache[filename];\n }\n\n /**\n * Adds a visitor. The visitor object has options on itself to determine\n * when it should run.\n * @param visitor\n */\n addVisitor(visitor) {\n this.visitors.push(visitor);\n }\n\n /**\n * Adds a pre processor object\n * @param {object} preProcessor\n * @param {number} priority
- guidelines 1 = before import, 1000 = import, 2000 = after import\n */\n addPreProcessor(preProcessor, priority) {\n let indexToInsertAt;\n for (indexToInsertAt = 0; indexToInsertAt < this.preProcessors.length; indexToInsertAt++) {\n if (this.preProcessors[indexToInsertAt].priority >= priority) {\n break;\n }\n }\n this.preProcessors.splice(indexToInsertAt, 0, {preProcessor, priority});\n }\n\n /**\n * Adds a post processor object\n * @param {object} postProcessor\n * @param {number} priority - guidelines 1 = before compression, 1000 = compression, 2000 = after compression\n */\n addPostProcessor(postProcessor, priority) {\n let indexToInsertAt;\n for (indexToInsertAt = 0; indexToInsertAt < this.postProcessors.length; indexToInsertAt++) {\n if (this.postProcessors[indexToInsertAt].priority >= priority) {\n break;\n }\n }\n
this.postProcessors.splice(indexToInsertAt, 0, {postProcessor, priority});\n }\n\n /**\n *\n * @param manager\n */\n addFileManager(manager) {\n this.fileManagers.push(manager);\n }\n\n /**\n *\n * @returns {Array}\n * @private\n */\n getPreProcessors() {\n const preProcessors = [];\n for (let i = 0; i < this.preProcessors.length; i++) {\n preProcessors.push(this.preProcessors[i].preProcessor);\n }\n return preProcessors;\n }\n\n /**\n *\n * @returns {Array}\n * @private\n */\n getPostProcessors() {\n const postProcessors = [];\n for (let i = 0; i < this.postProcessors.length; i++) {\n postProcessors.push(this.postProcessors[i].postProcessor);\n }\n return postProcessors;\n }\n\n /**\n *\n * @returns {Array}\n * @private\n */\n getVisitors() {\n return this.visitors;\n }\n\n visitor() {\n
const self = this;\n return {\n first: function() {\n self.iterator = -1;\n return self.visitors[self.iterator];\n },\n get: function() {\n self.iterator += 1;\n return self.visitors[self.iterator];\n }\n };\n }\n\n /**\n *\n * @returns {Array}\n * @private\n */\n getFileManagers() {\n return this.fileManagers;\n }\n}\n\nlet pm;\n\nconst PluginManagerFactory = function(less, newFactory) {\n if (newFactory || !pm) {\n pm = new PluginManager(less);\n }\n return pm;\n};\n\n//\nexport default PluginManagerFactory;\n","'use strict';\n\nfunction parseNodeVersion(version) {\n var match = version.match(/^v(\\d{1,2})\\.(\\d{1,2})\\.(\\d{1,2})(?:-([0-9A-Za-z-.]+))?(?:\\+([0-9A-Za-z-.]+))?$/); // eslint-disable-line max-len\n if (!match) {\n throw new Error('Unable to parse: ' + version);\n }\n\n var res = {\n major:
parseInt(match[1], 10),\n minor: parseInt(match[2], 10),\n patch: parseInt(match[3], 10),\n pre: match[4] || '',\n build: match[5] || '',\n };\n\n return res;\n}\n\nmodule.exports = parseNodeVersion;\n","/* global window, XMLHttpRequest */\n\nimport AbstractFileManager from '../less/environment/abstract-file-manager.js';\n\nlet options;\nlet logger;\nlet fileCache = {};\n\n// TODOS - move log somewhere. pathDiff and doing something similar in node. use pathDiff in the other browser file for the initial load\nconst FileManager = function() {}\nFileManager.prototype = Object.assign(new AbstractFileManager(), {\n alwaysMakePathsAbsolute() {\n return true;\n },\n\n join(basePath, laterPath) {\n if (!basePath) {\n return laterPath;\n }\n return this.extractUrlParts(laterPath, basePath).path;\n },\n\n doXHR(url, type, callback, errback) {\n const xhr = new XMLHttpRequest();\n const async = options.isFileProtocol
? options.fileAsync : true;\n\n if (typeof xhr.overrideMimeType === 'function') {\n xhr.overrideMimeType('text/css');\n }\n logger.debug(`XHR: Getting '${url}'`);\n xhr.open('GET', url, async);\n xhr.setRequestHeader('Accept', type || 'text/x-less, text/css; q=0.9, */*; q=0.5');\n xhr.send(null);\n\n function handleResponse(xhr, callback, errback) {\n if (xhr.status >= 200 && xhr.status < 300) {\n callback(xhr.responseText,\n xhr.getResponseHeader('Last-Modified'));\n } else if (typeof errback === 'function') {\n errback(xhr.status, url);\n }\n }\n\n if (options.isFileProtocol && !options.fileAsync) {\n if (xhr.status === 0 || (xhr.status >= 200 && xhr.status <

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300)) {\n            callback(xhr.responseText);\n        } else {\n            errback(xhr.status, url);\n        }\n    } else if (async) {\n        xhr.onreadystatechange = () => {\n            if (xhr.readyState == 4) {\n                handleResponse(xhr, callback, errback);\n            }\n        };\n    } else {\n        handleResponse(xhr, callback, errback);\n    }\n},\n\n    supports() {\n        return true;\n    },\n\n    clearFileCache() {\n        fileCache = {};\n    },\n\n    loadFile(filename, currentDirectory, options, environment) {\n        // TODO: Add prefix support like less-node?\n        // What about multiple paths?\n\n        if (currentDirectory && !this.isPathAbsolute(filename)) {\n            filename = currentDirectory + filename;\n        }\n\n        filename = options.ext ? this.tryAppendExtension(filename, options.ext) : filename;\n\n        options = options || {};\n\n        // sheet may be set to the stylesheet for the initial load or a collection of properties including\n        // some context variables for imports\n        const hrefParts = this.extractUrlParts(filename, window.location.href);\n        const href      = hrefParts.url;\n        const self      = this;\n        \n        return new Promise((resolve, reject) => {\n            if (options.useFileCache && fileCache[href]) {\n                try {\n                    const lessText = fileCache[href];\n                    return resolve({ contents: lessText, filename: href, webInfo: { lastModified: new Date() }});\n                } catch (e) {\n                    return reject({ filename: href, message: `Error loading file ${href} error was ${e.message}` });\n                }\n            }\n\n            self.doXHR(href, options.mime, function doXHRCallback(data, lastModified) {\n                // per file cache\n                fileCache[href] = data;\n\n                // Use remote copy (re-parse)\n                resolve({ contents: data, filename: href, webInfo: { lastModified }});\n            }, function doXHRError(status, url) {\n                reject({\n                    type: 'File', message: `'${url}' wasn't found (${status})`, href });\n            });\n        });\n    }\n});\n\nexport default (opts, log) => {\n    options = opts;\n    logger = log;\n    return FileManager;\n}\n","import Environment from './environment/environment';\nimport data from './data';\nimport tree from './tree';\nimport AbstractFileManager from './environment/abstract-file-manager';\nimport AbstractPluginLoader from './environment/abstract-plugin-loader';\nimport visitors from './visitors';\nimport Parser from './parser/parser';\nimport functions from './functions';\nimport contexts from './contexts';\nimport LessError from './less-error';\nimport transformTree from './transform-tree';\nimport * as utils from './utils';\nimport PluginManager from './plugin-manager';\nimport logger from './logger';\nimport SourceMapOutput from './source-map-output';\nimport SourceMapBuilder from './source-map-builder';\nimport ParseTree from './parse-tree';\nimport ImportManager from './import-manager';\nimport Parse from './parse';\nimport Render from './render';\nimport { version } from '../../package.json';\nimport parseVersion from 'parse-node-version';\n\nexport default function(environment, fileManagers) {\n    let sourceMapOutput, sourceMapBuilder, parseTree, importManager;\n\n    environment = new Environment(environment, fileManagers);\n    sourceMapOutput = SourceMapOutput(environment);\n    sourceMapBuilder = SourceMapBuilder(sourceMapOutput, environment);\n    parseTree = ParseTree(sourceMapBuilder);\n    importManager = ImportManager(environment);\n\n    const render = Render(environment, parseTree, importManager);\n    const parse = Parse(environment, parseTree, importManager);\n\n    const v = parseVersion(`v${version}`);\n    const initial = {\n        version: [v.major, v.minor, v.patch],\n        data,\n        tree,\n        Environment,\n        AbstractFileManager,\n        AbstractPluginLoader,\n        environment,\n        visitors,\n        Parser,\n        functions: functions(environment),\n        contexts,\n        SourceMapOutput: sourceMapOutput,\n        SourceMapBuilder: sourceMapBuilder,\n        ParseTree: parseTree,\n        ImportManager: importManager,\n        render,\n        parse,\n        LessError,\n        transformTree,\n        utils,\n        PluginManager,\n        logger\n    };\n\n    // Create a public API\n\n    const ctor = function(t) {\n        return function() {\n            const obj = Object.create(t.prototype);\n            t.apply(obj, Array.prototype.slice.call(arguments, 0));\n            return obj;\n        };\n    };\n    let t;\n    const api = Object.create(initial);\n    for (const n in initial.tree) {\n        /* eslint guard-for-in: 0 */\n        t = initial.tree[n];\n        if (typeof t === 'function') {\n            api[n.toLowerCase()] = ctor(t);\n        } else {\n            api[n] = Object.create(null);\n            for (const o in t) {\n                /* eslint guard-for-in: 0 */\n                api[n][o.toLowerCase()] = ctor(t[o]);\n            }\n        }\n    }\n\n    /**\n     * Some of the functions assume a `this` context of the API object,\n     * which causes it to fail when wrapped for ES6
```

```
imports.\n    * \n    * An assumed `this` should be removed in the future.\n    */\n    initial.parse = initial.parse.bind(api);\n    initial.render = initial.render.bind(api);\n\n    return api;\n};\n","import LessError from './less-error';\nimport transformTree from './transform-tree';\nimport logger from './logger';\n\nexport default function(SourceMapBuilder) {\n    class ParseTree {\n        constructor(root, imports) {\n            this.root = root;\n            this.imports = imports;\n        }\n\n        toCSS(options) {\n            let evaldRoot;\n            const result = {};\n            let sourceMapBuilder;\n            try {\n                evaldRoot = transformTree(this.root, options);\n            } catch (e) {\n                throw new LessError(e, this.imports);\n            }\n\n            try {\n                const compress = Boolean(options.compress);\n                if (compress) {\n                    logger.warn('The compress option has been deprecated. ' + \n                        'We recommend you use a dedicated css minifier, for instance see less-plugin-clean-css.');\n                }\n\n                const toCSSOptions = {\n                    compress,\n                    dumpLineNumbers: options.dumpLineNumbers,\n                    strictUnits: Boolean(options.strictUnits),\n                    numPrecision: 8};\n\n                if (options.sourceMap) {\n                    sourceMapBuilder = new SourceMapBuilder(options.sourceMap);\n                    result.css = sourceMapBuilder.toCSS(evaldRoot, toCSSOptions, this.imports);\n                } else {\n                    result.css = evaldRoot.toCSS(toCSSOptions);\n                }\n            } catch (e) {\n                throw new LessError(e, this.imports);\n            }\n\n            if (options.pluginManager) {\n                const postProcessors = options.pluginManager.getPostProcessors();\n                for (let i = 0; i < postProcessors.length; i++) {\n                    result.css = postProcessors[i].process(result.css, { sourceMap: sourceMapBuilder, options, imports: this.imports });\n                }\n            }\n            if (options.sourceMap) {\n                result.map = sourceMapBuilder.getExternalSourceMap();\n            }\n\n            result.imports = [];\n            for (const file in this.imports.files) {\n                if (this.imports.files.hasOwnProperty(file) && file !== this.imports.rootFilename) {\n                    result.imports.push(file);\n                }\n            }\n            return result;\n        }\n    }\n\n    return ParseTree;\n};\n","export default function (SourceMapOutput, environment) {\n    class SourceMapBuilder {\n        constructor(options)\n        {\n            this.options = options;\n        }\n\n        toCSS(rootNode, options, imports) {\n            const sourceMapOutput = new SourceMapOutput(\n                {\n                    contentsIgnoredCharsMap: imports.contentsIgnoredChars,\n                    rootNode,\n                    contentsMap: imports.contents,\n                    sourceMapFilename: this.options.sourceMapFilename,\n                    sourceMapURL: this.options.sourceMapURL,\n                    outputFilename: this.options.sourceMapOutputFilename,\n                    sourceMapBasepath: this.options.sourceMapBasepath,\n                    sourceMapRootpath: this.options.sourceMapRootpath,\n                    outputSourceFiles: this.options.outputSourceFiles,\n                    sourceMapGenerator: this.options.sourceMapGenerator,\n                    sourceMapFileInline: this.options.sourceMapFileInline,    \n                    disableSourcemapAnnotation: this.options.disableSourcemapAnnotation\n                });\n\n            const css = sourceMapOutput.toCSS(options);\n            this.sourceMap = sourceMapOutput.sourceMap;\n            this.sourceMapURL = sourceMapOutput.sourceMapURL;\n            if (this.options.sourceMapInputFilename) {\n                this.sourceMapInputFilename = sourceMapOutput.normalizeFilename(this.options.sourceMapInputFilename);\n            }\n            if (this.options.sourceMapBasepath !== undefined && this.sourceMapURL !== undefined) {\n                this.sourceMapURL = sourceMapOutput.removeBasepath(this.sourceMapURL);\n            }\n            return css + this.getCSSAppendage();\n        }\n\n        getCSSAppendage() {\n\n            let sourceMapURL = this.sourceMapURL;\n            if (this.options.sourceMapFileInline) {\n                if (this.sourceMap === undefined) {\n                    return '';\n                }\n                sourceMapURL = `data:application/jsonbase64,${environment.encodeBase64(this.sourceMap)}`;\n            }\n\n            if (this.options.disableSourcemapAnnotation) {\n                return '';\n            }\n\n            if (sourceMapURL) {\n                return `/*# sourceMappingURL=${sourceMapURL} */`;\n            }\n            return '';\n        }\n\n        getExternalSourceMap() {\n            return this.sourceMap;\n        }\n\n
```

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setExternalSourceMap(sourceMap) {\n        this.sourceMap = sourceMap;\n    }\n\n    isInline() {\n
return this.options.sourceMapFileInline;\n    }\n\n    getSourceMapURL() {\n        return
this.sourceMapURL;\n    }\n\n    getOutputFilename() {\n        return
this.options.sourceMapOutputFilename;\n    }\n\n    getInputFilename() {\n        return
this.sourceMapInputFilename;\n    }\n}\n\n    return SourceMapBuilder;\n};\n","export default function
(environment) {\n    class SourceMapOutput {\n        constructor(options) {\n        this._css
= [];\n        this._rootNode = options.rootNode;\n        this._contentsMap = options.contentsMap;\n
this._contentsIgnoredCharsMap = options.contentsIgnoredCharsMap;\n        if (options.sourceMapFilename) {\n
            this._sourceMapFilename = options.sourceMapFilename.replace(/\\\\/g, '/');\n        }\n
this._outputFilename = options.outputFilename;\n        this.sourceMapURL = options.sourceMapURL;\n        if
(options.sourceMapBasepath) {\n            this._sourceMapBasepath = options.sourceMapBasepath.replace(/\\\\/g,
'/');\n        }\n        if (options.sourceMapRootpath) {\n            this._sourceMapRootpath =
options.sourceMapRootpath.replace(/\\\\/g, '/');\n            if
(this._sourceMapRootpath.charAt(this._sourceMapRootpath.length - 1) !== '/') {\n
this._sourceMapRootpath += '/';\n            }\n        } else {\n            this._sourceMapRootpath = '';\n
    }\n        this._outputSourceFiles = options.outputSourceFiles;\n        this._sourceMapGeneratorConstructor
= environment.getSourceMapGenerator();\n\n        this._lineNumber = 0;\n        this._column = 0;\n    }\n\n
  removeBasepath(path) {\n        if (this._sourceMapBasepath && path.indexOf(this._sourceMapBasepath) ===
0) {\n            path = path.substring(this._sourceMapBasepath.length);\n            if (path.charAt(0) === '\\\\' ||
path.charAt(0) === '/') {\n                path = path.substring(1);\n            }\n        }\n\n        return path;\n
}\n\n    normalizeFilename(filename) {\n        filename = filename.replace(/\\\\/g, '/');\n        filename =
this.removeBasepath(filename);\n        return (this._sourceMapRootpath || '') + filename;\n    }\n\n
add(chunk, fileInfo, index, mapLines) {\n\n        // ignore adding empty strings\n        if (!chunk) {\n
  return;\n        }\n\n        let lines, sourceLines, columns, sourceColumns, i;\n\n        if (fileInfo &&
fileInfo.filename) {\n            let inputSource = this._contentsMap[fileInfo.filename];\n\n            // remove
vars/banner added to the top of the file\n            if (this._contentsIgnoredCharsMap[fileInfo.filename]) {\n
    // adjust the index\n                index -= this._contentsIgnoredCharsMap[fileInfo.filename];\n                if
(index < 0) { index = 0; }\n                // adjust the source\n                inputSource =
inputSource.slice(this._contentsIgnoredCharsMap[fileInfo.filename]);\n            }\n\n            /** \n             *
ignore empty content, or failsafe\n             * if contents map is incorrect\n             */\n            if (inputSource
=== undefined) {\n                this._css.push(chunk);\n                return;\n            }\n\n
    inputSource = inputSource.substring(0, index);\n            sourceLines = inputSource.split('\\n');\n
sourceColumns = sourceLines[sourceLines.length - 1];\n        }\n\n        lines = chunk.split('\\n');\n
columns = lines[lines.length - 1];\n\n        if (fileInfo && fileInfo.filename) {\n            if (!mapLines) {\n
      this._sourceMapGenerator.addMapping({ generated: { line: this._lineNumber + 1, column: this._column},\n
            original: { line: sourceLines.length, column: sourceColumns.length},\n                source:
this.normalizeFilename(fileInfo.filename)});\n            } else {\n                for (i = 0; i < lines.length; i++) {\n
            this._sourceMapGenerator.addMapping({ generated: { line: this._lineNumber + i + 1, column: i === 0 ?
this._column : 0},\n                    original: { line: sourceLines.length + i, column: i === 0 ?
sourceColumns.length
 : 0},\n                    source: this.normalizeFilename(fileInfo.filename)});\n                }\n            }\n
}\n\n        if (lines.length === 1) {\n            this._column += columns.length;\n        } else {\n
this._lineNumber += lines.length - 1;\n            this._column = columns.length;\n        }\n\n
this._css.push(chunk);\n    }\n\n    isEmpty() {\n        return this._css.length === 0;\n    }\n\n
toCSS(context) {\n        this._sourceMapGenerator = new this._sourceMapGeneratorConstructor({ file:
this._outputFilename, sourceRoot: null });\n\n        if (this._outputSourceFiles) {\n            for (const filename in
this._contentsMap) {\n                if (this._contentsMap.hasOwnProperty(filename)) {\n                    let source =
this._contentsMap[filename];\n                    if (this._contentsIgnoredCharsMap[filename]) {\n
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source = source.slice(this._contentsIgnoredCharsMap[filename]);\n }\n this._sourceMapGenerator.setSourceContent(this.normalizeFilename(filename), source);\n }\n }\n }\n\n this._rootNode.genCSS(context, this);\n\n if (this._css.length > 0) {\n let sourceMapURL;\n const sourceMapContent = JSON.stringify(this._sourceMapGenerator.toJSON());\n\n if (this.sourceMapURL) {\n sourceMapURL = this.sourceMapURL;\n } else if (this._sourceMapFilename) {\n sourceMapURL = this._sourceMapFilename;\n }\n this.sourceMapURL = sourceMapURL;\n\n this.sourceMap = sourceMapContent;\n }\n\n return this._css.join('');\n }\n }\n\n return SourceMapOutput;\n};\n","import contexts from './contexts';\nimport Parser from './parser/parser';\nimport LessError from './less-error';\nimport * as utils from './utils';\nimport logger from './logger';\n\nexport default function(environment) {\n // FileInfo = {\n // 'rewriteUrls' - option - whether to adjust URL's to be relative\n // 'filename' - full resolved filename of current file\n // 'rootpath' - path to append to normal URLs for this node\n // 'currentDirectory' - path to the current file, absolute\n // 'rootFilename' - filename of the base file\n // 'entryPath' - absolute path to the entry file\n // 'reference' - whether the file should not be output and only output parts that are referenced\n\n class ImportManager {\n constructor(less, context, rootFileInfo) {\n this.less = less;\n this.rootFilename = rootFileInfo.filename;\n this.paths = context.paths || []; // Search paths, when importing\n this.contents = {}; // map - filename to contents of all the files\n this.contentsIgnoredChars = {}; // map - filename to lines at the beginning of each file to ignore\n this.mime = context.mime;\n this.error = null;\n this.context = context;\n // Deprecated? Unused outside of here, could be useful.\n this.queue = []; // Files which haven't been imported yet\n this.files = {}; // Holds the imported parse trees.\n }\n\n /**\n * Add an import to be imported\n * @param path - the raw path\n * @param tryAppendExtension - whether to try appending a file extension (.less or .js if the path has no extension)\n * @param currentFileInfo - the current file info (used for instance to work out relative paths)\n * @param importOptions - import options\n * @param callback - callback for when it is imported\n */\n push(path, tryAppendExtension, currentFileInfo, importOptions, callback) {\n\n const importManager = this, pluginLoader = this.context.pluginManager.Loader;\n\n this.queue.push(path);\n\n const fileParsedFunc = function (e, root, fullPath) {\n importManager.queue.splice(importManager.queue.indexOf(path), 1); // Remove the path from the queue\n\n const importedEqualsRoot = fullPath === importManager.rootFilename;\n if (importOptions.optional && e) {\n callback(null, {rules:[]}, false, null);\n logger.info(`The file ${fullPath} was skipped because it was not found and the import was marked optional.`);\n }\n else {\n // Inline imports aren't cached here.\n // If we start to cache them, please make sure they won't conflict with non-inline imports of the\n // same name as they used to do before this comment and the condition below have been added.\n if (!importManager.files[fullPath]\n && !importOptions.inline) {\n importManager.files[fullPath] = { root, options: importOptions };\n }\n if (e && !importManager.error) { importManager.error = e; }\n callback(e, root, importedEqualsRoot, fullPath);\n }\n };\n\n const newFileInfo = {\n rewriteUrls: this.context.rewriteUrls,\n entryPath: currentFileInfo.entryPath,\n rootpath: currentFileInfo.rootpath,\n rootFilename: currentFileInfo.rootFilename\n };\n\n const fileManager = environment.getFileManager(path, currentFileInfo.currentDirectory, this.context, environment);\n\n if (!fileManager) {\n fileParsedFunc({ message: `Could not find a file-manager for ${path}` });\n return;\n }\n\n const loadFileCallback = function(loadedFile) {\n let plugin;\n const resolvedFilename = loadedFile.filename;\n const contents = loadedFile.contents.replace(/^\\uFEFF/, '');\n\n // Pass on an updated rootpath if path of imported file is relative and file\n // is in a (sub|sup) directory\n //\n // Examples:\n // - If path of imported file is 'module/nav/nav.less' and rootpath is 'less/',\n // then rootpath should become

'less/module/nav/'\n // - If path of imported file is '../mixins.less' and rootpath is 'less/',\n // then rootpath should become 'less/../'\n newFileInfo.currentDirectory = fileManager.getPath(resolvedFilename);\n if (newFileInfo.rewriteUrls) {\n newFileInfo.rootpath = fileManager.join(\n (importManager.context.rootpath || ''),\n fileManager.pathDiff(newFileInfo.currentDirectory,\n newFileInfo.entryPath));\n\n if (!fileManager.isPathAbsolute(newFileInfo.rootpath) && fileManager.alwaysMakePathsAbsolute()) {\n newFileInfo.rootpath = fileManager.join(newFileInfo.entryPath, newFileInfo.rootpath);\n }\n }\n newFileInfo.filename = resolvedFilename;\n\n const newEnv = new contexts.Parse(importManager.context);\n\n newEnv.processImports = false;\n importManager.contents[resolvedFilename] = contents;\n\n if (currentFileInfo.reference || importOptions.reference) {\n newFileInfo.reference = true;\n }\n\n if (importOptions.isPlugin) {\n plugin = pluginLoader.evalPlugin(contents, newEnv, importManager, importOptions.pluginArgs, newFileInfo);\n if (plugin instanceof LessError) {\n fileParsedFunc(plugin, null,\n resolvedFilename);\n }\n else {\n fileParsedFunc(null, plugin, resolvedFilename);\n }\n } else if (importOptions.inline) {\n fileParsedFunc(null, contents, resolvedFilename);\n } else {\n // import (multiple) parse trees apparently get altered and can't be cached.\n // TODO: investigate why this is\n if (importManager.files[resolvedFilename]\n && !importManager.files[resolvedFilename].options.multiple\n && !importOptions.multiple) {\n\n fileParsedFunc(null, importManager.files[resolvedFilename].root, resolvedFilename);\n }\n else {\n new Parser(newEnv, importManager, newFileInfo).parse(contents, function (e, root) {\n fileParsedFunc(e, root, resolvedFilename);\n });\n }\n }\n };\n let loadedFile;\n let promise;\n const context = utils.clone(this.context);\n\n if (tryAppendExtension) {\n context.ext = importOptions.isPlugin ? '.js' : '.less';\n }\n\n if (importOptions.isPlugin) {\n context.mime = 'application/javascript';\n\n if (context.syncImport) {\n loadedFile = pluginLoader.loadPluginSync(path, currentFileInfo.currentDirectory, context, environment, fileManager);\n } else {\n promise = pluginLoader.loadPlugin(path, currentFileInfo.currentDirectory, context, environment, fileManager);\n }\n }\n else {\n if (context.syncImport) {\n loadedFile = fileManager.loadFileSync(path, currentFileInfo.currentDirectory, context, environment);\n } else {\n promise = fileManager.loadFile(path, currentFileInfo.currentDirectory, context, environment,\n (err, loadedFile) => {\n if (err) {\n fileParsedFunc(err);\n } else {\n loadFileCallback(loadedFile);\n }\n });\n }\n }\n if (loadedFile) {\n if (!loadedFile.filename) {\n fileParsedFunc(loadedFile);\n } else {\n loadFileCallback(loadedFile);\n }\n } else if (promise) {\n promise.then(loadFileCallback, fileParsedFunc);\n }\n }\n }\n\n return ImportManager;\n};\n","import * as utils from './utils';\n\nexport default function(environment, ParseTree, ImportManager) {\n const render = function (input, options, callback) {\n if (typeof options === 'function') {\n callback = options;\n options = utils.copyOptions(this.options, {});\n }\n else {\n options = utils.copyOptions(this.options, options || {});\n }\n\n if (!callback) {\n const self = this;\n return new Promise(function (resolve, reject) {\n render.call(self, input, options, function(err, output) {\n if (err) {\n reject(err);\n } else {\n resolve(output);\n }\n });\n });\n }\n else {\n this.parse(input, options, function(err, root, imports, options) {\n if (err) { return callback(err); }\n\n let result;\n try {\n const parseTree = new ParseTree(root, imports);\n result = parseTree.toCSS(options);\n

}\n catch (err) { return callback(err); }\n\n callback(null, result);\n });\n }\n };\n\n return render;\n};\n","import contexts from './contexts';\nimport Parser from './parser/parser';\nimport PluginManager from './plugin-manager';\nimport LessError from './less-error';\nimport * as utils from './utils';\n\nexport default function(environment, ParseTree, ImportManager) {\n const parse = function (input, options, callback) {\n\n if (typeof options === 'function') {\n callback = options;\n options = utils.copyOptions(this.options, {});\n }\n else {\n options = utils.copyOptions(this.options, options || {});\n }\n\n if (!callback) {\n const self = this;\n return new Promise(function (resolve, reject) {\n parse.call(self, input, options, function(err, output) {\n if (err) {\n reject(err);\n } else {\n resolve(output);\n }\n });\n });\n } else {\n let context;\n let rootFileInfo;\n const pluginManager = new PluginManager(this, !options.reUsePluginManager);\n\n options.pluginManager = pluginManager;\n\n context = new contexts.Parse(options);\n\n if (options.rootFileInfo) {\n rootFileInfo = options.rootFileInfo;\n } else {\n const filename = options.filename || 'input';\n const entryPath = filename.replace(/[^\\/\\\\]*$/, '');\n rootFileInfo = {\n filename,\n rewriteUrls: context.rewriteUrls,\n rootpath: context.rootpath || '',\n currentDirectory: entryPath,\n entryPath,\n rootFilename: filename\n };\n // add in a missing trailing slash\n if (rootFileInfo.rootpath && rootFileInfo.rootpath.slice(-1) !== '/') {\n rootFileInfo.rootpath += '/';\n }\n }\n\n const imports = new ImportManager(this, context, rootFileInfo);\n this.importManager = imports;\n\n // TODO: allow the plugins to be just a list of paths or names\n // Do an async plugin queue like lessc\n\n if (options.plugins) {\n options.plugins.forEach(function(plugin) {\n let evalResult, contents;\n if (plugin.fileContent) {\n contents = plugin.fileContent.replace(/^\\uFEFF/, '');\n evalResult = pluginManager.Loader.evalPlugin(contents, context, imports, plugin.options, plugin.filename);\n if (evalResult instanceof LessError) {\n return callback(evalResult);\n }\n }\n else {\n pluginManager.addPlugin(plugin);\n }\n });\n }\n\n new Parser(context, imports, rootFileInfo)\n .parse(input, function (e, root) {\n if (e) { return callback(e); }\n callback(null, root, imports, options);\n }, options);\n }\n };\n return parse;\n};\n","// TODO: Add tests for browser @plugin\n\n/* global window */\n\nimport AbstractPluginLoader from '../less/environment/abstract-plugin-loader.js';\n\n/**\n * Browser Plugin Loader\n */\nconst PluginLoader = function(less) {\n this.less = less;\n // Should we shim this.require for browser? Probably not?\n};\n\nPluginLoader.prototype = Object.assign(new AbstractPluginLoader(), {\n loadPlugin(filename, basePath, context, environment, fileManager) {\n return new Promise((fulfill, reject) => {\n fileManager.loadFile(filename, basePath, context, environment)\n .then(fulfill).catch(reject);\n });\n }\n});\n\nexport default PluginLoader;\n\n","import * as utils from './utils';\nimport browser from './browser';\n\nexport default (window, less, options) => {\n\n function errorHTML(e, rootHref) {\n const id = `less-error-message:${utils.extractId(rootHref || '')}`;\n const template = ' <label>{line}</label><pre class=\"{class}\">{content}</pre> ';\n const elem = window.document.createElement('div');\n let timer;\n let content;\n const errors = [];\n const filename = e.filename || rootHref;\n const filenameNoPath = filename.match(/([^\\/]+(\\?.*)?)$/)[1];\n\n elem.id = id;\n elem.className = 'less-error-message';\n\n content = `<h3>${e.type || 'Syntax'}Error: ${e.message || 'There is an error in your .less file'}` + \n `</h3><p>in <a href=\"${filename}\">${filenameNoPath}</a> `;\n\n const errorline = (e, i, classname) => {\n if (e.extract[i] !== undefined) {\n errors.push(template.replace(/\\{line\\}/, (parseInt(e.line, 10) || 0) + (i - 1))\n .replace(/\\{class\\}/, classname)\n .replace(/\\{content\\}/, e.extract[i]));\n }\n };\n\n if (e.line) {\n errorline(e, 0, '');\n errorline(e, 1, 'line');\n errorline(e, 2, '');\n content += `on line ${e.line}, column ${e.column + 1}:</p><ul>${errors.join('')}</ul>`;\n }\n if (e.stack && (e.extract || options.logLevel >= 4)) {\n content += `
Stack Trace</br

/>${e.stack.split('\\n').slice(1).join('<br/>')}`;\n }\n elem.innerHTML = content;\n\n // CSS for error messages\n browser.createCSS(window.document, [\n '.less-error-message ul, .less-error-message li {',\n

'list-style-type: none;',\n 'margin-right: 15px;',\n 'padding: 4px 0;',\n 'margin: 0;',\n '}',\n '.less-error-message label {',\n 'font-size: 12px;',\n 'margin-right: 15px;',\n 'padding: 4px 0;',\n 'color: #cc7777;',\n '}',\n '.less-error-message pre {',\n 'color: #dd6666;',\n 'padding: 4px 0;',\n 'margin: 0;',\n 'display: inline-block;',\n '}',\n '.less-error-message pre.line {',\n 'color: #ff0000;',\n '}',\n '.less-error-message h3 {',\n 'font-size: 20px;',\n 'font-weight: bold;',\n 'padding: 15px 0 5px 0;',\n 'margin: 0;',\n '}',\n '.less-error-message a {',\n 'color: #10a',\n '}',\n '.less-error-message .error {',\n 'color: red;',\n 'font-weight:
bold;',\n 'padding-bottom: 2px;',\n 'border-bottom: 1px dashed red;',\n '}'\n].join('\\n'), { title: 'error-message' });\n\n elem.style.cssText = [\n 'font-family: Arial, sans-serif',\n 'border: 1px solid #e00',\n 'background-color: #eee',\n 'border-radius: 5px',\n '-webkit-border-radius: 5px',\n '-moz-border-radius: 5px',\n 'color: #e00',\n 'padding: 15px',\n 'margin-bottom: 15px'\n].join(';');\n\n if (options.env === 'development') {\n timer = setInterval(() => {\n const document = window.document;\n const body = document.body;\n if (body) {\n if (document.getElementById(id)) {\n body.replaceChild(elem, document.getElementById(id));\n } else {\n body.insertBefore(elem, body.firstChild);\n }\n clearInterval(timer);\n }\n }, 10);\n }\n }\n\n function removeErrorHTML(path) {\n const node = window.document.getElementById(`less-error-message:${utils.extractId(path)}`);\n if (node) {\n node.parentNode.removeChild(node);\n }\n }\n\n function removeErrorConsole(path) {\n // no action\n }\n\n function removeError(path) {\n if (!options.errorReporting || options.errorReporting === 'html') {\n removeErrorHTML(path);\n } else if (options.errorReporting === 'console') {\n removeErrorConsole(path);\n } else if (typeof options.errorReporting === 'function') {\n options.errorReporting('remove', path);\n }\n }\n\n function errorConsole(e, rootHref) {\n const template = '{line} {content}';\n const filename = e.filename || rootHref;\n const errors = [];\n let content
= `${e.type || 'Syntax'}Error: ${e.message || 'There is an error in your .less file'} in ${filename}`;\n\n const errorline = (e, i, classname) => {\n if (e.extract[i] !== undefined) {\n errors.push(template.replace(/\\{line\\}/, (parseInt(e.line, 10) || 0) + (i - 1))\n .replace(/\\{class\\}/, classname)\n .replace(/\\{content\\}/, e.extract[i]));\n }\n };\n\n if (e.line) {\n errorline(e, 0, '');\n errorline(e, 1, 'line');\n errorline(e, 2, '');\n content += ` on line ${e.line}, column ${e.column + 1}:\n${errors.join('\\n')}`;\n }\n if (e.stack && (e.extract || options.logLevel >= 4)) {\n content += `\\nStack Trace\\n${e.stack}`;\n }\n less.logger.error(content);\n }\n\n function error(e, rootHref) {\n if (!options.errorReporting || options.errorReporting === 'html') {\n errorHTML(e, rootHref);\n } else if (options.errorReporting === 'console') {\n errorConsole(e, rootHref);\n } else if (typeof options.errorReporting === 'function') {\n options.errorReporting('add', e, rootHref);\n }\n }\n\n return {\n add: error,\n remove: removeError\n };\n};\n","/**\n * Kicks off less and compiles any stylesheets\n * used in the browser distributed version of less\n * to kick-start less using the browser api\n */\n/* global window, document */\n\nimport defaultOptions from '../less/default-options';\nimport addDefaultOptions from './add-default-options';\nimport root from './index';\n\nconst options = defaultOptions();\n\nif (window.less) {\n for (const key in window.less) {\n if (window.less.hasOwnProperty(key)) {\n options[key] = window.less[key];\n }\n }\n}\naddDefaultOptions(window, options);\n\noptions.plugins = options.plugins || [];\n\nif (window.LESS_PLUGINS) {\n options.plugins
= options.plugins.concat(window.LESS_PLUGINS);\n}\n\nconst less = root(window, options);\nexport default less;\n\nwindow.less = less;\n\nlet css;\nlet head;\nlet style;\n\n// Always restore page visibility\nfunction resolveOrReject(data) {\n if (data.filename) {\n console.warn(data);\n }\n if (!options.async) {\n

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head.removeChild(style);\n    }\n}\n\nif (options.onReady) {\n    if (/!watch/.test(window.location.hash)) {\n less.watch();\n    }\n    // Simulate synchronous stylesheet loading by hiding page rendering\n    if (!options.async) {\n        css = 'body { display: none !important }';\n        head = document.head || document.getElementsByTagName('head')[0];\n        style = document.createElement('style');\n\n        style.type = 'text/css';\n        if (style.styleSheet) {\n            style.styleSheet.cssText = css;\n        } else {\n style.appendChild(document.createTextNode(css));\n        }\n\n        head.appendChild(style);\n    }\n    less.registerStylesheetsImmediately();\n    less.pageLoadFinished = less.refresh(less.env === 'development').then(resolveOrReject, resolveOrReject);\n}\n","// Export a new default each time\nexport default function() {\n    return {\n        /* Inline Javascript - @plugin still allowed */\n        javascriptEnabled: false,\n\n        /* Outputs a makefile import dependency list to stdout. */\n        depends: false,\n\n        /* (DEPRECATED) Compress using less built-in compression. \n        * This does an okay job but does not utilise all the tricks of \n        * dedicated css compression. */\n        compress: false,\n\n        /* Runs the less parser and just reports errors without any output. */\n        lint: false,\n\n        /* Sets available include paths.\n        * If the file in an @import rule does not exist at that exact location, \n        * less will look for it at the location(s) passed to this option. \n        * You might use this for instance
 to specify a path to a library which \n        * you want to be referenced simply and relatively in the less files. */\n
 paths: [],\n\n        /* color output in the terminal */\n        color: true,\n\n        /* The strictImports controls whether the compiler will allow an @import inside of either \n        * @media blocks or (a later addition) other selector blocks.\n        * See: https://github.com/less/less.js/issues/656 */\n        strictImports: false,\n\n        /* Allow Imports from Insecure HTTPS Hosts */\n        insecure: false,\n\n        /* Allows you to add a path to every generated import and url in your css. \n        * This does not affect less import statements that are processed, just ones \n        * that are left in the output css. */\n        rootpath: '',\n\n        /* By default URLs are kept as-is, so if you import a file in a sub-directory \n        * that references an image, exactly the same URL will be output in the css. \n        * This option
 allows you to re-write URL's in imported files so that the \n        * URL is always relative to the base imported file */\n        rewriteUrls: false,\n\n        /* How to process math \n        *  0 always               - eagerly try to solve all operations\n        *  1 parens-division      - require parens for division \"/\"\n        *  2 parens | strict      - require parens for all operations\n        *  3 strict-legacy        - legacy strict behavior (super-strict)\n        */\n        math: 1,\n\n        /* Without this option, less attempts to guess at the output unit when it does maths. */\n        strictUnits: false,\n\n        /* Effectively the declaration is put at the top of your base Less file, \n        * meaning it can be used but it also can be overridden if this variable \n        * is defined in the file. */\n        globalVars: null,\n\n        /* As opposed to the global variable option, this puts the declaration at the\n        * end of your base file, meaning
 it will override anything defined in your Less file. */\n        modifyVars: null,\n\n        /* This option allows you to specify a argument to go on to every URL.  */\n        urlArgs: ''\n    };','import {addDataAttr} from './utils';\nimport browser from './browser';\n\nexport default (window, options) => {\n\n    // use options from the current script tag data attribues\n    addDataAttr(options, browser.currentScript(window));\n\n    if (options.isFileProtocol === undefined) {\n        options.isFileProtocol = /^(file|(chrome|safari)(-extension)?|resource|qrc|app):/.test(window.location.protocol);\n    }\n\n    // Load styles asynchronously (default: false)\n    //\n    // This is set to `false` by default, so that the body\n    // doesn't start loading before the stylesheets are parsed.\n    // Setting this to `true` can result in flickering.\n    //\n    options.async = options.async || false;\n    options.fileAsync = options.fileAsync || false;\n\n    // Interval between watch
 polls\n    options.poll = options.poll || (options.isFileProtocol ? 1000 : 1500);\n\n    options.env = options.env || (window.location.hostname == '127.0.0.1' ||\n        window.location.hostname == '0.0.0.0'   ||\n window.location.hostname == 'localhost' ||\n        (window.location.port &&\n            window.location.port.length > 0)  ||\n        options.isFileProtocol                  ? 'development'\n        : 'production');\n\n    const dumpLineNumbers = /!dumpLineNumbers:(comments|mediaquery|all)/.exec(window.location.hash);\n    if (dumpLineNumbers) {\n options.dumpLineNumbers = dumpLineNumbers[1];\n    }\n\n    if (options.useFileCache === undefined) {\n options.useFileCache = true;\n    }\n\n    if (options.onReady === undefined) {\n        options.onReady = true;\n
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}\n\n    if (options.relativeUrls) {\n        options.rewriteUrls = 'all';\n    }\n};\n","//\n// index.js\n// Should expose the additional browser functions on to the less object\n//\nimport {addDataAttr} from './utils';\nimport lessRoot from '../less';\nimport browser from './browser';\nimport FM from './file-manager';\nimport PluginLoader from './plugin-loader';\nimport LogListener from './log-listener';\nimport ErrorReporting from './error-reporting';\nimport Cache from './cache';\nimport ImageSize from './image-size';\n\nexport default (window, options) => {\n    const document = window.document;\n    const less = lessRoot();\n\n    less.options = options;\n    const environment = less.environment;\n    const FileManager = FM(options, less.logger);\n    const fileManager = new FileManager();\n    environment.addFileManager(fileManager);\n    less.FileManager = FileManager;\n    less.PluginLoader = PluginLoader;\n\n    LogListener(less, options);\n    const errors = ErrorReporting(window, less, options);\n    const cache = less.cache = options.cache || Cache(window, options, less.logger);\n    ImageSize(less.environment);\n\n    // Setup user functions - Deprecate?\n    if (options.functions) {\n        less.functions.functionRegistry.addMultiple(options.functions);\n    }\n\n    const typePattern = /^text\\/(x-)?less$/;\n\n    function clone(obj) {\n        const cloned = {};\n        for (const prop in obj) {\n            if (obj.hasOwnProperty(prop)) {\n                cloned[prop] = obj[prop];\n            }\n        }\n        return cloned;\n    }\n\n    // only really needed for phantom\n    function bind(func, thisArg) {\n        const curryArgs = Array.prototype.slice.call(arguments, 2);\n        return function() {\n            const args = curryArgs.concat(Array.prototype.slice.call(arguments, 0));\n            return func.apply(thisArg, args);\n        };\n    }\n\n    function loadStyles(modifyVars) {\n        const styles = document.getElementsByTagName('style');\n        let style;\n\n        for (let i = 0; i < styles.length; i++) {\n            style = styles[i];\n            if (style.type.match(typePattern)) {\n                const instanceOptions = clone(options);\n                instanceOptions.modifyVars = modifyVars;\n                const lessText = style.innerHTML || '';\n                instanceOptions.filename = document.location.href.replace(/#.*$/, '');\n\n                /* jshint loopfunc:true */\n                // use closure to store current style\n                less.render(lessText, instanceOptions,\n                    bind((style, e, result) => {\n                        if (e) {\n                            errors.add(e, 'inline');\n                        } else {\n                            style.type = 'text/css';\n                            if (style.styleSheet) {\n                                style.styleSheet.cssText = result.css;\n                            } else {\n                                style.innerHTML = result.css;\n                            }\n                        }\n                    }, null, style));\n            }\n        }\n    }\n\n    function loadStyleSheet(sheet, callback, reload, remaining, modifyVars) {\n\n        const instanceOptions = clone(options);\n        addDataAttr(instanceOptions, sheet);\n        instanceOptions.mime = sheet.type;\n\n        if (modifyVars) {\n            instanceOptions.modifyVars = modifyVars;\n        }\n\n        function loadInitialFileCallback(loadedFile) {\n            const data = loadedFile.contents;\n            const path = loadedFile.filename;\n            const webInfo = loadedFile.webInfo;\n\n            const newFileInfo = {\n                currentDirectory: fileManager.getPath(path),\n                filename: path,\n                rootFilename: path,\n                rewriteUrls: instanceOptions.rewriteUrls\n            };\n\n            newFileInfo.entryPath = newFileInfo.currentDirectory;\n            newFileInfo.rootpath = instanceOptions.rootpath || newFileInfo.currentDirectory;\n\n            if (webInfo) {\n                webInfo.remaining = remaining;\n\n                const css = cache.getCSS(path, webInfo, instanceOptions.modifyVars);\n                if (!reload && css) {\n                    webInfo.local = true;\n                    callback(null, css, data, sheet, webInfo, path);\n                    return;\n                }\n\n            }\n\n            // TODO add tests around how this behaves when reloading\n            errors.remove(path);\n\n            instanceOptions.rootFileInfo = newFileInfo;\n            less.render(data, instanceOptions, (e, result) => {\n                if (e) {\n                    e.href = path;\n                    callback(e);\n                } else {\n                    cache.setCSS(sheet.href, webInfo.lastModified, instanceOptions.modifyVars, result.css);\n                    callback(null, result.css, data, sheet, webInfo, path);\n                }\n            });\n        }\n\n        fileManager.loadFile(sheet.href, null, instanceOptions, environment)\n            .then(loadedFile => {\n                loadInitialFileCallback(loadedFile);\n            }).catch(err => {\n                console.log(err);\n                callback(err);\n            });\n\n    }\n\n    function loadStyleSheets(callback, reload, modifyVars) {\n        for (let i = 0;
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i < less.sheets.length; i++) {\n            loadStyleSheet(less.sheets[i], callback, reload, less.sheets.length - (i + 1),
modifyVars);\n        }\n    }\n\n    function initRunningMode() {\n        if (less.env === 'development') {\n
less.watchTimer = setInterval(() => {\n                if (less.watchMode) {\n
fileManager.clearFileCache();\n                    loadStyleSheets((e, css, _, sheet, webInfo) => {\n                        if (e)
{\n                            errors.add(e, e.href || sheet.href);\n                        } else if (css) {\n
browser.createCSS(window.document, css, sheet);\n                        }\n                    });\n                }\n
            }, options.poll);\n        }\n    }\n\n    //\n    // Watch mode\n    //\n    less.watch   = function () {\n        if
(!less.watchMode ) {\n            less.env = 'development';\n            initRunningMode();\n        }\n        this.watchMode
= true;\n        return true;\n    };\n\n    less.unwatch = function () {clearInterval(less.watchTimer); this.watchMode =
false; return false; };\n\n    //\n    // Synchronously get all <link> tags with the 'rel' attribute set to\n    //
\"stylesheet/less\".\n    //\n    less.registerStylesheetsImmediately = () => {\n        const links =
document.getElementsByTagName('link');\n        less.sheets = [];\n\n        for (let i = 0; i < links.length; i++) {\n
  if (links[i].rel === 'stylesheet/less' || (links[i].rel.match(/stylesheet/) &&\n
(links[i].type.match(typePattern)))) {\n                less.sheets.push(links[i]);\n            }\n        }\n    };\n\n    //\n    //
Asynchronously get all <link> tags with
 the 'rel' attribute set to\n    // \"stylesheet/less\", returning a Promise.\n    //\n    less.registerStylesheets = () => new
Promise((resolve, reject) => {\n        less.registerStylesheetsImmediately();\n        resolve();\n    });\n\n    //\n    //
With this function, it's possible to alter variables and re-render\n    // CSS without reloading less-files\n    //\n
less.modifyVars = record => less.refresh(true, record, false);\n\n    less.refresh = (reload, modifyVars,
clearFileCache) => {\n        if ((reload || clearFileCache) && clearFileCache !== false) {\n
fileManager.clearFileCache();\n        }\n        return new Promise((resolve, reject) => {\n            let startTime;\n
  let endTime;\n            let totalMilliseconds;\n            let remainingSheets;\n            startTime = endTime = new
Date();\n\n            // Set counter for remaining unprocessed sheets\n            remainingSheets = less.sheets.length;\n\n
            if (remainingSheets ===
 0) {\n\n                endTime = new Date();\n                totalMilliseconds = endTime - startTime;\n
less.logger.info('Less has finished and no sheets were loaded.');\n                resolve({\n                    startTime,\n
            endTime,\n                    totalMilliseconds,\n                    sheets: less.sheets.length\n                });\n\n            }
else {\n                // Relies on less.sheets array, callback seems to be guaranteed to be called for every element of the
array\n                loadStyleSheets((e, css, _, sheet, webInfo) => {\n                    if (e) {\n                        errors.add(e,
e.href || sheet.href);\n                        reject(e);\n                        return;\n                    }\n                    if (webInfo.local)
{\n                        less.logger.info(`Loading ${sheet.href} from cache.`);\n                    } else {\n
less.logger.info(`Rendered ${sheet.href}
 successfully.`);\n                    }\n                    browser.createCSS(window.document, css, sheet);\n
less.logger.info(`CSS for ${sheet.href} generated in ${new Date() - endTime}ms`);\n\n                    // Count
completed sheet\n                    remainingSheets--;\n\n                    // Check if the last remaining sheet was processed
and then call the promise\n                    if (remainingSheets === 0) {\n                        totalMilliseconds = new Date()
- startTime;\n                        less.logger.info(`Less has finished. CSS generated in ${totalMilliseconds}ms`);\n
            resolve({\n                            startTime,\n                            endTime,\n                            totalMilliseconds,\n
                sheets: less.sheets.length\n                        });\n                    }\n                    endTime = new Date();\n
            }, reload, modifyVars);\n            }\n\n
            loadStyles(modifyVars);\n        });\n    };\n\n    less.refreshStyles = loadStyles;\n    return less;\n};\n","export
default (less, options) => {\n    const logLevel_debug = 4;\n    const logLevel_info = 3;\n    const logLevel_warn =
2;\n    const logLevel_error = 1;\n\n    // The amount of logging in the javascript console.\n    // 3 - Debug,
information and errors\n    // 2 - Information and errors\n    // 1 - Errors\n    // 0 - None\n    // Defaults to 2\n
options.logLevel = typeof options.logLevel !== 'undefined' ? options.logLevel : (options.env === 'development' ?
logLevel_info : logLevel_error);\n\n    if (!options.loggers) {\n        options.loggers = [{\n            debug:
function(msg) {\n                if (options.logLevel >= logLevel_debug) {\n                    console.log(msg);\n
}\n            },\n            info: function(msg) {\n                if (options.logLevel >= logLevel_info) {\n
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console.log(msg);\n
}\n },\n warn: function(msg) {\n if (options.logLevel >= logLevel_warn) {\n
console.warn(msg);\n }\n },\n error: function(msg) {\n if (options.logLevel >=
logLevel_error) {\n console.error(msg);\n }\n }\n }];\n }\n for (let i = 0; i <
options.loggers.length; i++) {\n less.logger.addListener(options.loggers[i]);\n }\n};\n","// Cache system is a
bit outdated and could do with work\n\nexport default (window, options, logger) => {\n let cache = null;\n if
(options.env !== 'development') {\n try {\n cache = (typeof window.localStorage === 'undefined') ? null :
window.localStorage;\n } catch (_) {}\n }\n return {\n setCSS: function(path, lastModified,
modifyVars, styles) {\n if (cache) {\n logger.info(`saving ${path} to cache.`);\n
try {\n cache.setItem(path, styles);\n cache.setItem(`${path}:timestamp`, lastModified);\n
if (modifyVars) {\n cache.setItem(`${path}:vars`, JSON.stringify(modifyVars));\n
}\n } catch (e) {\n // TODO - could do with adding more robust error handling\n
logger.error(`failed to save \"${path}\" to local storage for caching.`);\n }\n }\n },\n
getCSS: function(path, webInfo, modifyVars) {\n const css = cache && cache.getItem(path);\n
const timestamp = cache && cache.getItem(`${path}:timestamp`);\n let vars = cache &&
cache.getItem(`${path}:vars`);\n\n modifyVars = modifyVars || {};\n vars = vars || \"{}\"; // if not set,
treat as the JSON representation of an empty object\n\n if (timestamp && webInfo.lastModified &&\n
(new Date(webInfo.lastModified).valueOf() ===\n new Date(timestamp).valueOf()) &&\n
JSON.stringify(modifyVars) === vars) {\n // Use local copy\n return css;\n }\n }\n
};\n};\n","\nimport functionRegistry from './../less/functions/function-registry';\n\nexport default () => {\n function
imageSize() {\n throw {\n type: 'Runtime',\n message: 'Image size functions are not supported in
browser version of less'\n };\n }\n\n const imageFunctions = {\n 'image-size': function(filePathNode)
{\n imageSize(this, filePathNode);\n return -1;\n },\n 'image-width': function(filePathNode)
{\n imageSize(this, filePathNode);\n return -1;\n },\n 'image-height': function(filePathNode)
{\n imageSize(this, filePathNode);\n return -1;\n }\n };\n\n
functionRegistry.addMultiple(imageFunctions);\n};\n"],"names":["extractId","href","replace","addDataAttr","option
s","tag","opt","dataset","hasOwnProperty","JSON","parse","_","document","styles","sheet","id","title","utils.extract
Id","oldStyleNode","getElementById","keepOldStyleNode","styleNode","createElement","setAttribute","media","st
yleSheet","appendChild","createTextNode","childNodes","length","firstChild","nodeValue","head","getElementsBy
TagName","nextEl","nextSibling","parentNode","insertBefore","removeChild","cssText","e","Error","window","scr
ipts","currentScript","error","msg","this","_fireEvent","warn","info","debug","addListener","listener","_listeners","p
ush","removeListener","i","splice","type","logFunction","externalEnvironment","fileManagers","requiredFunctions"
,"functions","concat","propName","environmentFunc","bind","Environment","filename","currentDirectory","enviro
nment","isSync","logger","pluginManager","getFileManagers","fileManager","aliceblue","antiquewhite","aqua","aq
uamarine","azure","beige","bisque","black","blanchedalmond","blue","blueviolet","brown","burlywood","cadetblue
","chartreuse","chocolate","coral","cornflowerblue","cornsilk","crimson","cyan","darkblue","darkcyan","darkgolden
rod","darkgray","darkgrey","darkgreen","darkkhaki","darkmagenta","darkolivegreen","darkorange","darkorchid","d
arkred","darksalmon","darkseagreen","darkslateblue","darkslategray","darkslategrey","darkturquoise","darkviolet","
deeppink","deepskyblue","dimgray","dimgrey","dodgerblue","firebrick","floralwhite","forestgreen","fuchsia","gains
boro","ghostwhite","gold","goldenrod","gray","grey","green","greenyellow","honeydew","hotpink","indianred","ind
igo","ivory","khaki","lavender","lavenderblush","lawngreen","lemonchiffon","lightblue","lightcoral","lightcyan","li
ghtgoldenrodyellow","lightgray","lightgrey","lightgreen","lightpink","lightsalmon","lightseagreen","lightskyblue","l
ightslategray","lightslategrey","lightsteelblue","lightyellow","lime","limegreen","linen","magenta","maroon","medi
umaquamarine","mediumblue","mediumorchid","mediumpurple","mediumseagreen","mediumslateblue","mediumsp
ringgreen","mediumturquoise","mediumvioletred","midnightblue","mintcream","mistyrose","moccasin","navajowhi
te","navy","oldlace","olive","olivedrab","orange","orangered","orchid","palegoldenrod","palegreen","paleturquoise"
,"palevioletred","papayawhip","peachpuff","peru","pink","plum","powderblue","purple","rebeccapurple","red","ros
ybrown","royalblue","saddlebrown","salmon","sandybrown","seagreen","seashell","sienna","silver","skyblue","slate

blue","slategray","slategrey","snow","springgreen","steelblue","tan","teal","thistle","tomato","turquoise","violet","wheat","white","whitesmoke","yellow","yellowgreen","m","cm","mm","in","px","pt","pc","duration","s","ms","angle","rad","Math","PI","deg","grad","turn","colors","unitConversions","parent","visibilityBlocks","undefined","nodeVisible","rootNode","parsed","Object","Node","fileInfo","getIndex","nodes","set","node","Array","isArray","forEach","_index","_fileInfo","context","strs","genCSS","add","chunk","index","isEmpty","join","output","value","visitor","visit","op","a","b","precision","numPrecision","Number","toFixed","compare","Color","rgb","originalForm","self","match","map","c","parseInt","alpha","split","clamp","v","max","min","toHex","round","toString","prototype","assign","luma","r","g","pow","toCSS","doNotCompress","color","colorFunction","compress","args","fround","indexOf","toHSL","h","l","toRGB","splitcolor","operate","other","_operate","d","toHSV","toARGB","x","fromKeyword","keyword","key","toLowerCase","slice","Paren","eval","_noSpaceCombinators","","|","Combinator","emptyOrWhitespace","trim","spaceOrEmpty","Element","combinator","isVariable","currentFileInfo","visibilityInfo","copyVisibilityInfo","setParent","accept","clone","firstSelector","charAt","ALWAYS","PARENS_DIVISION","PARENS","RewriteUrls","getType","payload","call","copy","target","constructor","getPrototypeOf","il","arguments","k","j","jl","__spreadArrays","getOwnPropertyNames","getOwnPropertySymbols","reduce","carry","props","includes","newVal","originalObject","includeNonenumerable","propType","propertyIsEnumerable","defineProperty","enumerable","writable","configurable","assignProp","nonenumerable","getLocation","inputStream","n","line","column","copyArray","arr","obj","cloned","prop","defaults","obj1","obj2","newObj","_defaults","defaults_1","copyOptions","opts","strictMath","math","Constants.Math","relativeUrls","rewriteUrls","Constants.RewriteUrls","flattenArray","result","length_1","anonymousFunc","LessError","fileContentMap","currentFilename","message","stack","input","contents","loc","utils.getLocation","col","callLine","lines","found","func","Function","lineAdjust","callExtract","extract","create","F","stylize","str","errorTxt","substr","Selector","elements","extendList","condition","evaldCondition","getElements","mixinElements_","visitArray","createDerived","newSelector","mediaEmpty","els","parseNode","err","imports","createEmptySelectors","el","sels","olen","len","mixinElements","shift","isJustParentSelector","extend","getIsOutput","Value","Keyword","True","False","Anonymous","mapLines","rulesetLike","allowRoot","isRulesetLike","Boolean","MATH","Declaration","name","important","merge","inline","variable","asComment","ctx","debugInfo","lineNumber","fileName","asMediaQuery","filenameWithProtocol","test","lineSeparator","dumpLineNumbers","lastRule","prevMath","evaldValue","mathBypass","evalName","importantScope","importantResult","pop","makeImportant","Comment","isLineComment","getDebugInfo","isSilent","isCompressed","contexts","copyFromOriginal","original","destination","propertiesToCopy","parseCopyProperties","Parse","paths","evalCopyProperties","isPathRelative","path","isPathLocalRelative","Eval","frames","enterCalc","calcStack","inCalc","exitCalc","inParenthesis","parensStack","outOfParenthesis","mathOn","isMathOn","pathRequiresRewrite","rewritePath","rootpath","newPath","normalizePath","segment","segments","reverse","makeRegistry","base","_data","addMultiple","keys","_this","get","getLocalFunctions","inherit","defaultFunc","value_","error_","reset","Ruleset","selectors","rules","strictImports","_lookups","_variables","_properties","isRuleset","selCnt","selector","hasVariable","hasOnePassingSelector","toParseSelectors","utils.flattenArray","rule","subRule","utils.copyArray","ruleset","originalRuleset","root","firstRoot","allowImports","functionRegistry","globalFunctionRegistry","ctxFrames","unshift","ctxSelectors","evalImports","rsRules","evalFirst","mediaBlockCount","mediaBlocks","filter","apply","resetCache","bubbleSelectors","importRules","matchArgs","matchCondition","lastSelector","_rulesets","variables","hash","vars","name_1","properties","name_2","decl","parseValue","property","lastDeclaration","toParse","transformDeclaration","nodes_1","rulesets","filtRules","prependRule","find","foundMixins","ruleNodes","tabLevel","sep","tabRuleStr","tabSetStr","charsetNodeIndex","importNodeIndex","isCharset","pathCnt","pathSubCnt","currentLastRule","isVisible","joinSelectors","joinSelector","createParenthesis","elementsToPak","originalElement","replacementParen","insideParent","createSelector","containedElement","element","addReplacementIntoPath","beginningPath","addPath","replacedElement","originalSelector","newSelectorPath","newJoinedSelector","parentEl","restOfPath","addAllReplacementsIntoPath","addPaths","mergeElementsOnToSelectors","sel","deriveSelector","deriveFrom","newPaths","replaceParentSelector","inSelector"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Combinator","isElementValuesEqual","finished","endPathIndex","endPathElementIndex","elementValue1","elementValue2","replacementSelector","matchIndex","firstElement","newElements","currentSelectorPathIndex","currentSelectorPathElementIndex","currentValue","derived","newAllExtends","lastIndex","JoinSelectorVisitor","

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height","ImageSize","typePattern","thisArg","curryArgs","loadStyles","instanceOptions","loadStyleSheet","reload","remaining","local","loadInitialFileCallback","loadStyleSheets","sheets","watch","watchMode","watchTimer","unwatch","registerStylesheetsImmediately","links","rel","registerStylesheets","record","refresh","startTime","endTime","totalMilliseconds","remainingSheets","refreshStyles","resolveOrReject","pageLoadFinished"],"mappings":";;;;;;;;;8OACgBA,EAAUC,GACtB,OAAOA,EAAKC,QAAQ,sBAAuB,IACtCA,QAAQ,uBAAwB,IAChCA,QAAQ,MAAAO,IACfA,QAAQ,eAAgB,IACxBA,QAAQ,aAAc,KACtBA,QAAQ,MAAAO,cAGRC,EAAYC,EAASC,GACjC,GAAAKA,EACL,IAAK,IAAMC,KAAAOD,EAAAIE,QAClB,GAAAIF,EAAAIE,QAAAQC,eAAAeF,GAC3B,GAAAY,QAARA,GAAyB,oBAARA,GAAAqC,aAARA,GAA8B,mBAARA,EACpEF,EAAAQE,GAAAOD,EAAAIE,QAAAQD,QAE3B,IACIF,EAAAQE,GAAAOG,KAAAKC,MAAAML,EAAAIE,QAAAQD,IAE1C,MAAAOK,WCjBR,SAAAUC,EAAAUC,EAAAQC,GAEn C,IAAAMb,EAAAOa,EAAAMb,MAAAQ,GAGrBc,EAAAK,SAAAQD,EAAAME,OAAASC,EAAAgBhB,IAG5CiB,EAAAeN,EAASO,eAAeJ,GACzCK,GAAAmB,EAGjBC,EAAAYT,EAASU,cAAAc,SACzCD,EAAAUE,aAAAa,OAAAQ,YAC3BT,EAAAMU,OACNH,EAAAUE,aAAAa,QAAAST,EAAAMU,OAE1CH,EAAAUN,GAAAKA,EAEVM,EAAAUI,aACXJ,EAAAUK,YAAYd,EAASe,eAAed,IAG9CO,EAAAqC,OAAAjBF,GAAAyBA,EAAAaU,WAAAWC,OAAAS,GAAAKR,EAAAUO,WAAAWC,OAAAS,GAC7GX,EAAAaY,WAAAWC,YAAAcV,EAAAUS,WAAAWC,WAGnE,IAAAMC,EAAAOpB,EAAASqB,qBAAAqB,QAAAQ,GAAAInD,GAAAAqB,OAAAjBf,IAA8C,IAArBE,EAA4B,CAACrD,IAAAMc,EAASpB,GAAASA,EAAAMqB,aAAAe,KACzCD,EACACAA,EAAAOE,WAAAWC,aAAAahB,EAAAWa,GAE1CF,EAAAKN,YAAAYL,GAAUzB,GAPIH,IAAAqC,IAArBE,GAChBF,EAAAakB,WAAAWE,YAAAYpB,GAMpCG,EAAAUI,WACV,IACIJ,EAAAUI,WAAAWc,QAAAU1B,EACjC,MAAAO2B,GACL,MAAAM,IAAAIC,MAAAM,6CAIb,SAASC,GACpB,IAEUC,EAFJ/B,EAAAW8B,EAAAO9B,SACxB,OAAAOA,EAAASgC,gBBACND,EAAAU/B,EAASqB,qBAAAqB,WAC/BU,EAAAQd,OAAAS,MC7D7B,CACACXgB,MAAAO,SAASC,GACZC,KAAAKC,WAAAW,QAASF,IAE7BG,KAAAM,SAASH,GACXC,KAAAKC,WAAAW,OAAAQF,IAE5BI,KAAAM,SAASJ,GACXC,KAAAKC,WAAAW,OAAAQF,IAE5BK,MAAAO,SAASL,GACZCZC,KAAAKC,WAAAW,QAASF,IAE7BM,YAAAa,SAASC,GACClBN,KAAAKO,WAAAWC,KAAAKF,IAEzBG,eAAAgB,SAASH,GACCrB,IAAAK,IAAAII,EAAAI,EAAAAGA,EAAAIV,KAAAKO,WAAAWzB,OAAAQ4B,IACxC,GAAAIV,KAAAKO,WAAAWG,KAAAOJ,EAEvB,YADAN,KAAAKO,WAAAWI,OAAAOD,EAAAG,IAKtCT,WAAAY,SAASW,EAAAMb,GACvB,IAAAK,IAAAIW,EAAAI,EAAAAGA,EAAAIV,KAAAKO,WAAAWzB,OAAAQ4B,IAAAK,CAAC7C,IAAAMG,EAAAcb,KAAAKO,WAAAWG,GAAAAGE,GACnCC,GACACAA

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To do so, attach the following notices to the program. It is safest to attach them to the start of each source file to most effectively convey the exclusion of warranty; and each file should have at least the "copyright" line and a pointer to where the full notice is found.

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Gnomovision version 69, Copyright (C) 19yy name of author
Gnomovision comes with ABSOLUTELY NO WARRANTY; for details type `show w'.
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The hypothetical commands
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Ty Coon, President of Vice

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1.208 safestring 4.1.25

1.208.1 Available under license :

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```
/*
 SafeString to Number conversion
 Examples of SafeString to Number conversions and comparing these to the results from String methods

 by Matthew Ford
 Copyright(c)2020 Forward Computing and Control Pty. Ltd.
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 www.forward.com.au/pfod/ArduinoProgramming/SafeString/index.html
*/
```

Found in path(s):
* /opt/cola/permits/1550499841_1675274436.6722012/0/powerbroker2-safestring-4-1-25-0-gfac1370-tar-gz/PowerBroker2-SafeString-fac1370/examples/SafeString_Tests/SafeStringToNum/SafeStringToNum.ino
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```
/*
 SafeString Case changes
 Examples of how to change the case of a SafeString

 by Matthew Ford
 Mods Copyright(c)2020 Forward Computing and Control Pty. Ltd.
 Modified from String Examples by Tom Igoe
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 www.forward.com.au/pfod/ArduinoProgramming/SafeString/index.html
*/
```

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```
/*
 SafeString constructors and assignments
 Examples of how to create SafeStrings and how to assign SafeStrings from other data types
 also see the SafeStringFromCharArray, SafeStringFromCharPtr and SafeStringFromCharPtrWithSize examples
```

by Matthew Ford
Mods Copyright(c)2020 Forward Computing and Control Pty. Ltd.
Modified from String Examples by Tom Igoe
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*/

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No license file was found, but licenses were detected in source scan.

/* SafeStringWithArraysOfCstrings.ino
Example of using SafeString for working with char[][xx]

by Matthew Ford
Copyright(c)2020 Forward Computing and Control Pty. Ltd.
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download and install the SafeString library from Arduino library manager
or from www.forward.com.au/pfod/ArduinoProgramming/SafeString/index.html
*/

Found in path(s):
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/*
SafeString startsWith(), startsWithIgnoreCase(), endsWithCharFrom() and endsWith()

by Matthew Ford
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www.forward.com.au/pfod/ArduinoProgramming/SafeString/index.html
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```
/*
 sfStream.ino

 SafeStringStream Unit test
 Example of using SafeStringStream

 by Matthew Ford
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 https://www.forward.com.au/pfod/ArduinoProgramming/Serial_IO/index.html
*/
```

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No license file was found, but licenses were detected in source scan.

```
/*
 Blink

 Turns an led on for one second, then off for one second, repeatedly.

 Most Arduinos have an on-board led you can control. On the UNO, MEGA and ZERO
 it is attached to digital pin 13, on MKR1000 on pin 6. led is set to
 the correct led pin independent of which board is used.
 If you want to know what pin the on-board led is connected to on your Arduino
 model, check the Technical Specs of your board at:
 https://www.arduino.cc/en/Main/Products

 modified 8 May 2014
 by Scott Fitzgerald
 modified 2 Sep 2016
 by Arturo Guadalupi
 modified 8 Sep 2016
 by Colby Newman

 This example code is in the public domain.

 http://www.arduino.cc/en/Tutorial/Blink
*/
```

Found in path(s):
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```
/*
 SafeString replace()
 Examples of SafeString replace for chars and strings

 by Matthew Ford
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 www.forward.com.au/pfod/ArduinoProgramming/SafeString/index.html
*/
```

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```
/*
 SafeStringReader_Assign.ino

 This example = to SafeStringReader

 by Matthew Ford
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 download and install the SafeString library from Arduino library manager
 or from www.forward.com.au/pfod/ArduinoProgramming/SafeString/index.html
*/
```

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```
/*
 SafeString substring()
 Examples of SafeString substring

 by Matthew Ford
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 www.forward.com.au/pfod/ArduinoProgramming/SafeString/index.html
*/
```

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```
/*
 SafeSting length(), trim()

 by Matthew Ford
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 www.forward.com.au/pfod/ArduinoProgramming/SafeString/index.html
*/
```

Found in path(s):
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```
/*
 SafeString.h static memory SafeString library modified by
 Matthew Ford
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 modified from
 WString.h - String library for Wiring & Arduino
 ...mostly rewritten by Paul Stoffregen...
 Copyright (c) 2009-10 Hernando Barragan.  All right reserved.
 Copyright 2011, Paul Stoffregen, paul@pjrc.com

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 Foundation, Inc., 51 Franklin St, Fifth Floor, Boston, MA  02110-1301  USA
*/
```

Found in path(s):

* /opt/cola/permits/1550499841_1675274436.6722012/0/powerbroker2-safestring-4-1-25-0-gfac1370-tar-gz/PowerBroker2-SafeString-fac1370/src/SafeString.h
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/*
 SafeString from char* with specified size constructor
 Examples of how to create SafeStrings from an existing pointer to a char[]
 also see the SafeString_ConstructorAndDebugging, SafeStringFromCharArray and SafeStringFromCharPtr examples

 by Matthew Ford
 Mods Copyright(c)2020 Forward Computing and Control Pty. Ltd.
 Modified from String Examples by Tom Igoe
 This example code is in the public domain.

 www.forward.com.au/pfod/ArduinoProgramming/SafeString/index.html
*/

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/*
 SafeStringReader_flushInput.ino

 This example flushes any initial input and also starts flushing if "flush" is found in the text stream

 by Matthew Ford
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 download and install the SafeString library from Arduino library manager
 or from www.forward.com.au/pfod/ArduinoProgramming/SafeString/index.html
*/

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/*
 Appending to SafeStrings using the += operator and concat()
 Examples of how to append different data types to SafeStrings
 Also has examples of using hasError() method

 by Matthew Ford

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Modified from String Examples by Tom Igoe
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/*
SafeString charAt() and setCharAt()
Examples of how to get and set characters of a SafeString

by Matthew Ford
Mods Copyright(c)2020 Forward Computing and Control Pty. Ltd.
Modified from String Examples by Tom Igoe
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www.forward.com.au/pfod/ArduinoProgramming/SafeString/index.html
*/

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/*
Comparing SafeStrings
Examples of how to compare SafeStrings using the comparison operators

by Matthew Ford
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www.forward.com.au/pfod/ArduinoProgramming/SafeString/index.html
*/

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No license file was found, but licenses were detected in source scan.

/*
 Tokenizing SafeStrings and converting to numbers
 Examples of how to use the nextToken() and toLong() and toDouble() to parse a CSV line

 by Matthew Ford
 Copyright(c)2020 Forward Computing and Control Pty. Ltd.
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 www.forward.com.au/pfod/ArduinoProgramming/SafeString/index.html
*/

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/*
 OBD_Processor.ino for SafeString V4.0.0+

 Example of using SafeString to process Car OnBoardData

 by Matthew Ford
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 download and install the SafeString library V4.0.0+ from Arduino library manager
 or from www.forward.com.au/pfod/ArduinoProgramming/SafeString/index.html
*/

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/*
 SSring indexOf() and lastIndexOf()

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gz/PowerBroker2-SafeString-fac1370/examples/SafeString_Tests/SafeStringIndexOf/SafeStringIndexOf.ino
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```
/*
 SafeString removeFrom(), removeBefore(), remove(), removeLast(), keepLast()
 Examples of SafeString remove

 by Matthew Ford
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 www.forward.com.au/pfod/ArduinoProgramming/SafeString/index.html
*/
```

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```
/*
 SafeString readUntil, non-blocking until delimiter found
 Example of how to use the non-blocking readUntil() method to parse a CSV line

 by Matthew Ford
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```

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```
/*
 SafeString.cpp V2.0.0 static memory SafeString library modified by
 Matthew Ford
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 extensively modified from

 WString.cpp - SafeString library for Wiring & Arduino
 ...mostly rewritten by Paul Stoffregen...
 Copyright (c) 2009-10 Hernando Barragan.  All rights reserved.
 Copyright 2011, Paul Stoffregen, paul@pjrc.com
```

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Foundation, Inc., 51 Franklin St, Fifth Floor, Boston, MA 02110-1301 USA
*/

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/* SafeStringInClasses_1.ino
   Example of using SafeString for Class char[]s

by Matthew Ford
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download and install the SafeString library from Arduino library manager
or from www.forward.com.au/pfod/ArduinoProgramming/SafeString/index.html
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/*
SafeString from char* constructor
Examples of how to create SafeStrings from an existing pointer to a char[]
also see the SafeString_ConstructorAndDebugging, SafeStringFromCharArray and SafeStringFromCharPtrWithSize examples

by Matthew Ford
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Modified from String Examples by Tom Igoe
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www.forward.com.au/pfod/ArduinoProgramming/SafeString/index.html
*/

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/*
Prefixing to SafeStrings using the -= operator and prefix()
Examples of how to prefix different data types to SafeStrings

by Matthew Ford
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Modified from String Examples by Tom Igoe
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www.forward.com.au/pfod/ArduinoProgramming/SafeString/index.html
*/

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/*
Tokenizing SafeStrings and converting to numbers
Examples of how to use the stoken and toLong() and toDouble() to parse a CSV line

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*/

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/*
Fixed 9 Formatting of double/float/long/ing

by Matthew Ford
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www.forward.com.au/pfod/ArduinoProgramming/SafeString/index.html
*/

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/*
Test Errors for Assignment to SafeStrings using the = operator

by Matthew Ford
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Modified from String Examples by Tom Igoe
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www.forward.com.au/pfod/ArduinoProgramming/SafeString/index.html
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/*
SafeString from char[] constructor
Examples of how to create SafeStrings from an existing char[]
also see the SafeString_ConstructorAndDebugging, SafeStringFromCharPtr and SafeStringFromCharPtrWithSize examples

by Matthew Ford
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Modified from String Examples by Tom Igoe
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/*
SafeStringReader_GPS.ino

This example reads GPS data from a SafeStringStream continuously using a SafeStringReader

by Matthew Ford
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/*
Appending to SafeStrings using print()/println()
Examples of how to use the standard print()/println() to append and format different data types to SafeStrings

by Matthew Ford
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www.forward.com.au/pfod/ArduinoProgramming/SafeString/index.html
*/

Found in path(s):
* /opt/cola/permits/1550499841_1675274436.6722012/0/powerbroker2-safestring-4-1-25-0-gfac1370-tar-gz/PowerBroker2-SafeString-fac1370/examples/SafeString_Tests/SafeStringPrint/SafeStringPrint.ino

1.209 usbutils 1:014-1

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b) Convey the object code in, or embodied in, a physical product (including a physical distribution medium), accompanied by a written offer, valid for at least three years

and valid for as
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c) Convey individual copies of the object code with a copy of the written offer to provide the Corresponding Source. This alternative is allowed only occasionally and noncommercially, and only if you received the object code with such an offer, in accord with subsection 6b.

d) Convey the object code by offering access from a designated place (gratis or for a charge), and offer equivalent access to the Corresponding Source in
the same way through the same place at no
further charge. You need not require recipients to copy the Corresponding Source along with the object code. If the place to copy the object code is a network server, the Corresponding Source may be on a different server (operated by you or a third party) that supports equivalent copying facilities, provided you maintain clear directions next to the object code saying where to find the Corresponding Source. Regardless of what server hosts the Corresponding Source, you remain obligated to ensure that it is available for as long as needed to satisfy these requirements.

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Version 2, June 1991

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[This is the first released version of the library GPL. It is
numbered 2 because it goes with version 2 of the ordinary GPL.]

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========

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and the ordinary General Public License treats it as such.

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such function or table, the facility still operates, and

performs whatever part of its purpose remains meaningful.

(For example, a function in a library to compute square roots
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the source code from the same place satisfies the requirement to
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compelled to copy the source along with the object code.

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uses the library". The executable is therefore covered by this
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executables.

When a "work that uses the Library" uses material from a header
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be a derivative work of the Library even though the source code is
not. Whether this is true is especially significant if the work
can be linked without the Library, or if the work is itself a
library. The threshold for this to be true is not precisely
defined by law.

If such an object file uses only numerical parameters, data
structure layouts and accessors, and small macros and small inline
functions (ten lines or less in length), then the use of the object
file is unrestricted, regardless of whether it is legally a
derivative work. (Executables containing this object code plus
portions of the Library will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may
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6. Any
executables containing that work also fall under Section 6,
whether or not they are linked directly with the Library itself.

6. As an exception to the Sections above, you may also compile or
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b. Accompany the work with a written offer, valid for at least three years, to give the same user the materials specified in Subsection 6a, above, for a charge no more than the cost of

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bzip2/libbzip2 version 1.0.8 of 13 July 2019

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////

[#mpl]
MPL Support, <boost/mp11/mpl.hpp>
:toc:
:toc-title:
:idprefix:

The header `<boost/mp11/mpl.hpp>`, when included, defines the
necessary support infrastructure for `mp_list` and `std::tuple`
to be valid link:../../../../libs/mpl[MPL] sequences.

NOTE: `mpl.hpp` is not included by `<boost/mp11.hpp>`.

It's also possible to only enable support for `mp_list` by
including `<boost/mp11/mpl_list.hpp>`, and for `std::tuple`
by including `<boost/mp11/mpl_tuple.hpp>`. This may be required
because some libraries, such as Boost.Fusion, contain their own MPL
support for `std::tuple`, which conflicts with Mp11's one.

.Converting an existing MPL Sequence into an mp_list
```
using L = mpl::copy<Sequence, mpl::back_inserter<mp11::mp_list<>>>::type;
```
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Roland Schwarz (roland.schwarz -at- chello.at)
Ronald Garcia (garcia -at- cs.indiana.edu) (Email to Andreas Huber, see change log)
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Stefan Seefeld (seefeld -at- sympatico.ca)
Stephen Cleary (scleary -at- jerviswebb.com) (See Boost list message of Tue, 28 Sep 2004 13:11:46 +0100)
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William E. Kempf () (email to Beman Dawes, 9/14/2006 4:18 PM)
Joerg Walter (jhr.walter - at - t-online.de : email to ublas mailing list Mon, 17 Sep 2007 10:17:08 +0200)

Mathias Koch (mkoch - at - idesis.de 7 : email to boost-owner@lists.boost.org Sep 2007 13:20:09 +0200)

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   Copyright Test
  </h3>

   1963, 1964, 1965 Jane Doe

   2018 Joe Blow, John Coe

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  </p>
  <p class="copyright">
    1977, 1985 Someone else
  </p>
 </body>
</html>
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###
Constant-time SSSE3 AES core implementation.
version 0.1
##

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1.219 lsof 4.95.0

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Making and Installing lsof 4

```
**************************************************************************
| The latest release of lsof is always available via anonymous ftp |
| from lsof.itap.purdue.edu.  Look in pub/tools/unix/lsof.         |
**************************************************************************
```

Contents

Pre-built Lsof Binaries
Making Lsof
  Other Configure Script Options
  Environment Variables
  Security
  Run-time Warnings
  Device Access Warnings
  NFS Blocks
  Caches -- Name and Device
  Raw Sockets
  Other Compile-time Definitions
  The AFSConfig Script
  The Inventory Script
  The Customize Script
  Cautions
  Warranty
  License
  Bug Reports
  The 00FAQ File
  The lsof-l Mailing List
  Field Output Example Scripts
  Field Output C Library
Testing Lsof
Dialect Notes
  AFS
  AIX
  Apple Darwin
  Auspex LFS (no longer maintained)

  BSDI BSD/OS
  DEC OSF/1, Digital UNIX, Tru64 UNIX
  FreeBSD
  HP-UX
  IPv6
  Linux
  NetBSD
  NEXTSTEP and OPENSTEP
  OpenBSD
  Pyramid DC/OSx and Reliant UNIX (no longer available)
  Caldera OpenUNIX
  SCO OpenServer

SCO|Caldera UnixWare
Solaris 2.x, 7, 8, 9 and 10
Ultrix (no longer available)
Veritas VxFS and VxVM
User-contributed Dialect Support
Dialects No Longer Supported
Installing Lsof
Setuid-root Lsof Dialects
Setgid Lsof Dialects
Porting lsof 4 to a New UNIX Dialect
Quick Start to Using lsof
Cross-configuring Lsof
Environment Variables Affecting the Configure Script

==========
Pre-built Lsof Binaries
==========

Avoid using pre-built lsof binaries if you can; build your own instead.

I do not support lsof binaries built and packaged by third parties nor lsof binaries built from anything but the latest lsof revision. (See the Bug Reports section for more information on the details of lsof support.)

One important reasone for those support restrictions is that when lsof is built its Configure script tunes lsof to the features available on the building system, often embodied in supporting header files and libraries. If the building system doesn't have support for a particular feature, lsof won't be built to support the feature on any system.

The Veritas VxFS file system is a good example of a feature that requires build-time support.

UNIX dialect version differences -- Solaris 8 versus 9, AIX 4.3.3 vesus 5.2, etc. -- can also render a pre-built lsof binary useless on a different version. So can kernel bit size.

There are so many potential pitfalls to using an lsof binary improperly that I strongly recommend lsof be used only where it is built.

==========

Making Lsof
==========

```
$ cd <lsof source directory>
$ ./Configure <your dialect's abbreviation>
$ make
```

(Consult the 00FAQ and 00XCONFIG files of the lsof distribution
for information about
using make command invocations and environment
variables to override lsof default Makefile strings.)

This lsof distribution can be used with many UNIX dialects. However,
it must be configured specifically for each dialect. Configuration
is done in three ways: 1) by changing definitions in the machine.h
header file of the UNIX dialect of interest; 2) by defining
environment variable values prior to calling Configure (see the
00XCONFIG file, the Environment Variabls and Environment Variables
Affecting the Configure Script sections of this file); and 3) by
running the Configure shell script found in the top level of the
distribution directory.

You may not need to change any machine.h definitions, but you might
want to look at them anyway. Pay particular attention to the
definitions that are discussed in the Security section of this
file. Please read that section.

The Configure script calls three other scripts in the lsof
distribution: AFSConfig; Inventory; and Customize. The
AFSConfig
script is called for selected dialects (AIX, HP-UX, NEXTSTEP, and
Solaris) to locate AFS header files and determine the AFS version.
See The AFSConfig Script section of this file for more information.

The Inventory script checks the completeness of the lsof distribution.
Configure calls Inventory after it has accepted the dialect
abbreviation, but before it configures the top-level directory for
the dialect. See The Inventory Script section of this file for
more information.

Configure calls the Customize script after it has configured the
top-level lsof directory for the declared dialect. Customize helps
you modify some of the important compile-time definitions of
machine.h. See the The Customize Script section.

You should also think about where you will install lsof and its
man page, and whom you will let execute lsof. Please read the
Installing Lsof section of this file for information on installation

considerations.

Once you have inspected the machine.h file for the
dialect for
which you want to build lsof, and made any changes you need, run
the Configure script, supplying it with the abbreviation for the
dialect. (See the following table.) Configure selects the
appropriate options for the dialect and runs the Mksrc shell script
in the dialect sub-directory to construct the appropriate source
files in the top-level distribution directory.

Configure may also run the MkKernOpts script in the dialect
sub-directory to propagate kernel build options to the dialect
Makefile. This is done for only a few dialects -- e.g., DC/OSx,
and Reliant UNIX.

Configure creates a dialect-specific Makefile. You may want to
inspect or edit this Makefile to make it conform to local conventions.
If you want the Makefile to install lsof and its man page, you will
have to create an appropriate install rule.

Lsof may be configured using UNIX dialect abbreviations from the
following table. Alternative abbreviations are indicated by a
separating `|'. For example, for
SCO OpenServer you can use either
the ``osr'' or the ``sco'' abbreviation:

```
$ Configure osr
  or
$ Configure sco
```

Abbreviations	UNIX Dialect
aix	IBM AIX 5.[23] and 5.3-ML1 using IBM's C Compiler
aixgcc	IBM AIX 5.[12] and 5.3-ML1 using gcc
darwin	Apple Darwin 7.x and 8.x for Power Macintosh systems
decosf	DEC OSF/1, Digital UNIX, Tru64 UNIX 4.0 and 5.1
digital_unix	Digital UNIX, DEC OSF/1, Tru64 UNIX 4.0 and 5.1
du	Digital UNIX, DEC OSF/1, Tru64 UNIX 4.0 and 5.1
freebsd	FreeBSD 4.x, 4.1x, 5.x and [67].x
hpux	HP-UX 11.00, 11.11 and 11.23, using HP's C Compiler, both /dev/kmem-based and PSTAT-based
hpuxgcc	HP-UX 11.00, 11.11 and 11.23, using gcc, both /dev/kmem-based and PSTAT-based
linux	Linux 2.1.72 and above for x86-based systems
netbsd	NetBSD 1.[456], 2.x and 3.x
next	NEXTSTEP 3.[13]

nextstep NEXTSTEP 3.[13]
ns NEXTSTEP 3.[13]
nxt NEXTSTEP 3.[13]
openbsd OpenBSD
2.[89] and 3.[0-9]
openstep OPENSTEP 4.x
os OPENSTEP 4.x
osr SCO OpenServer Release 5.0.6, using the C compiler
from the SCO developer's kit
osrgcc SCO OpenServer Release 5.0.6, using gcc
osr6 SCO Openserver 6.0.0, using the SCO C compiler
sco SCO OpenServer Release 5.0.6, using the C compiler
from the SCO developer's kit
scogcc SCO OpenServer Release 5.0.6, using gcc
solaris Solaris 2.x, 7, 8, 9 and 10 using gcc
solariscc Solaris 2.x, 7, 8, 9 and 10 using Sun's cc
tru64 Tru64 UNIX, DEC OSF/1, Digital UNIX 4.0 and 5.1
unixware SCO|Caldera UnixWare 7.1.4
uw SCO|Caldera UnixWare 7.1.4

If you have an earlier version of a dialect not named in the above list, lsof may still work on your system. I have no way of testing that myself. Try configuring for the named dialect -- e.g., if you're using Solaris 2.1, try configuring for Solaris 2.5.1.

After you have configured lsof for your UNIX dialect and have selected options
via the Customize script (See the The Customize Script section.) , use the make command to build lsof -- e.g.,

$ make

Other Configure Script Options
==========

There are three other useful options to the Configure script besides the dialect abbreviation:

-clean may be specified to remove all traces of
a dialect configuration, including the
Makefile, symbolic links, and library files.

-h may be specified to obtain a list of
-help Configure options, including dialect
abbreviations.

-n may be specified to stop the Configure

script from calling the Customize and
Inventory scripts.

Caution: -n also suppresses the AFSConfig
step.

Environment Variables
=====================

Lsof configuration, building, and execution may be affected by
environment variable settings. See the Definitions That Affect
Compilation section in the 00PORTING file, the General Environment
Variables section in the 00XCONFIG
file, the Dialect-Specific
Environment Variables section in the 00XCONFIG file, and the
Environment Variables Affecting the Configure Script section of
this file for more information.

Note in the General Environment Variables section of the 00XCONFIG
file that there are five environment variables that can be used to
pre-define values in lsof's -v output: LSOF_BLDCMT, LSOF_HOST,
LSOF_LOGNAME, LSOF_SYSINFO, and LSOF_USER.

Security
========

If the symbol HASSECURITY is defined, a security mode is enabled,
and lsof will allow only the root user to list all open files.
Non-root users may list only open files whose processes have the
same user ID as the real user ID of the lsof process (the one that
its user logged on with).

However, if HASNOSOCKSECURITY is also defined, anyone may list
anyone else's open socket files, provided their listing is enabled
with the "-i" option.

Lsof is distributed with the security mode disabled -- HASSECURITY
is not defined. (When HASSECURITY is not
defined, the definition
of HASNOSOCKSECURITY has no meaning.) You can enable the security
mode by defining HASSECURITY in the Makefile or in the machine.h
header file for the specific dialect you're using -- e.g.
dialects/aix/machine.h.

The Customize script, run by Configure when it has finished its

work, gives you the opportunity to define HASSECURITY and
HASNOSOCKSECURITY. (See the The Customize Script section.)

The lsof -h output indicates the state HASSECURITY and HASNOSOCKSECURITY
had when lsof was built, reporting:

  "Only root can list all files;"
 if HASSECURITY was defined and HASNOSOCKSECURITY wasn't
 defined;

  "Only root can list all files, but anyone can list socket files."
 if HASSECURITY and HASNOSOCKSECURITY were both defined;

  "Anyone can list all files;"
 if HASSECURITY wasn't defined. (The definition of
 HASNOSOCKSECURITY doesn't matter when HASSECURITY isn't
 defined.)

You should carefully consider the implications of using the default
security mode.
 When lsof is compiled in the absence of the
HASSECURITY definition, anyone who can execute lsof may be able to
see the presence of all open files. This may allow the lsof user
to observe open files -- e.g., log files used to track intrusions
-- whose presence you would rather not disclose.

As distributed, lsof writes a user-readable and user-writable device
cache file in the home directory of the real user ID executing
lsof. There are other options for constructing the device cache file
path, and they each have security implications.

The 00DCACHE file in the lsof distribution discusses device cache
file path construction in great detail. It tells how to disable
the various device cache file path options, or how to disable the
entire device cache file feature by removing the HASDCACHE definition
from the dialect's machine.h file. There is also information on
the device cache file feature in the 00FAQ file. (The 00DCACHE
and 00FAQ files are part of the lsof distribution package.)

The
 Customize script, run by Configure after it has finished its
work, gives you the opportunity to change the compile-time options
related to the device cache file. (See The Customize Script
section.)

Since lsof may need setgid or setuid-root permission (See the Setgid
Lsof Dialects and Setuid-root Lsof Dialects sections.), its security
should always be viewed with skepticism. Lest the setgid and

setuid-root permissions allow lsof to read kernel name list or
memory files, declared with the -k and -m options, that the lsof
user can't normally access, lsof uses access(2) to establish its
real user's authority to read such files when it can't surrender
its power before opening them. This change was added at the
suggestion of Tim Ramsey.

Lsof surrenders setgid permission on most dialects when it has
gained access to the kernel's memory devices. There are exceptions
to this rule, and some lsof implementations need to run setuid-root.
(The Setgid Lsof Dialects and Setuid-root Lsof
 Dialects sections
contains a list of lsof implementations and the permissions
recommended in the distribution's Makefiles.)

The surrendering of setgid permission is controlled by the WILLDROPGID
definition in the dialect machine.h header files.

In the end you must judge for yourself and your installation the
risks that lsof presents and restrict access to it according to
your circumstances and judgement.

Run-time Warnings
==========

Lsof can issue warning messages when it runs -- e.g., about the
state of the device cache file, about an inability to access an
NFS file system, etc. Issuance of warnings are enabled by default
in the lsof distribution.

Issuance or warnings may be disabled by default by defining
WARNINGSTATE in the dialect's machine.h. The Customize script may
also be used to change the default warning message issuance state.
(See The Customize Script section.)

The ``-w" option description of the ``-h" option (help) output
will indicate the default warning
 issuance state. Whatever the
state may be, it can be reversed with ``-w".

Device Access Warnings
==========

When lsof encounters a /dev (or /devices) directory, one of its
sub-directories, or one of their files that it cannot access with
opendir(3) or stat(2), it issues a warning message and continues.

Lsof will be more likely to issue such a warning when it has been
installed with setgid(<some group name>) permission; it won't have
trouble if it has been installed with setuid(root) permission or
is being run under the root login.

The lsof caller can inhibit or enable the warning with the -w
option, depending on the issuance state of run-time warnings. (See
the Run-time Warnings section.)

The warning messages do not appear when lsof obtains device
information from a device cache file that it has built and believes
to be current or when warning message issuance is disabled by
default. (See the "Caches -- Name and Device" section for more
information on the device
cache file.)

The lsof builder can inhibit the warning by disabling the definition
of WARNDEVACCESS in the dialect's machine.h or disable all warnings
by defining WARNINGSTATE. WARNDEVACCESS is defined by default for
most dialects. However, some dialects have some device directory
elements that are private -- e.g., HP-UX -- and it is more convenient
for the lsof user if warning messages about them are inhibited.

Output from lsof's -h option indicates the status of WARNDEVACCESS.
If it was defined when lsof was compiled, this message will appear:

  /dev warnings = enabled

If WARNDEVACCESS was not defined when lsof was compiled, this
message will appear instead:

  /dev warnings = disabled

The Customize script, run by Configure after it has finished its
work, gives you the opportunity to change the WARNDEVACCESS
definition. (See The Customize Script section.)

NFS Blocks
==========

Lsof is susceptible to NFS blocks when it tries to lstat() mounted
file systems and when it does
further processing -- lstat() and
readlink() -- on its optional file and file system arguments.

Lsof tries to avoid being stopped completely by NFS blocks by doing
the lstat() and readlink() functions in a child process, which

returns the function response via a pipe. The lsof parent limits the wait for data to arrive in the pipe with a SIGALRM, and, if the alarm trips, terminates the child process with a SIGINT and a SIGKILL.

This is as reliable and portable a method for breaking NFS deadlocks as I have found, although it still fails under some combinations of NFS version, UNIX dialect, and NFS file system mount options. It generally succeeds when the "intr" or "soft" mount options are used; it generally fails when the "hard" mount option is used.

When lsof cannot kill the child process, a second timeout causes it to stop waiting for the killed child to complete. While the second timeout allows lsof to complete, it may leave behind a hung child process. Unless warnings are inhibited by default or with the -w option, lsof reports the possible hung child.

NFS block handling was updated with suggestions made by Andreas Stolcke. Andreas suggested using the alternate device numbers that appear in the mount tables of some dialects when it is not possible to stat(2) the mount points.

The -b option was added to direct lsof to avoid the stat(2) and readlink(2) calls that might block on NFS mount points and always use the alternate device numbers. If warning message issuance is enabled and you don't want warning messages about what lsof is doing, use the -w option, too.

The -O option directs lsof to avoid doing the potentially blocking operations in child processes. Instead, when -O is specified, lsof does them directly. While this consumes far less system overhead, it can cause lsof to hang, so I advise you to use -O sparingly.

Caches -- Name and Device
==========

Robert Ehrlich suggested that lsof obtain path name components for open files from the kernel's name cache. Where possible, lsof dialect implementations do that. The -C option inhibits kernel name cache examination.

Since AFS apparently does not use the kernel's name cache, where lsof supports AFS it is unable to identify AFS files with path name components.

Robert also suggested that lsof cache the information it obtains via stat(2) for nodes in /dev (or /devices) to reduce subsequent running time. Lsof does that, too.

In the default distribution the device cache file is stored in .lsof_hostname, mode 0600, in the home directory of the login of the user ID that executes lsof. The suffix, hostname, is the first component of the host's name returned by gethostname(2). If lsof is executed by a user ID whose home directory is NFS-mounted from several hosts, the user ID's home directory may collect several device cache files, one for each host from which it was executed.

Lsof senses accidental or malicious damage to the device cache file with extensive integrity
checks, including the use of a 16 bit CRC.
It also tries to sense changes in /dev (or /devices) that indicate the device cache file is out of date.

There are other options for forming the device cache file path. Methods the lsof builder can use to control and employ them are documented in the separate 00DCACHE file of the lsof distribution.

Raw Sockets

==========

On many UNIX systems raw sockets use a separate network control block structure. Display of files for applications using raw sockets -- ping, using ICMP, for example -- need special support for displaying their information. This support is so dialect-specific and information to provide it so difficult to find that not all dialect revisions of lsof handle raw sockets completely.

Other Compile-time Definitions

==========

The machine.h and dlsof.h header files for each dialect contains definitions that affect the compilation of lsof. Check the Definitions That Affect Compilation section of the
00PORTING file
of the lsof distribution for their descriptions. (Also see The Customize Script section.)

The AFSConfig Script

==========

Lsof supports AFS on some combinations of UNIX dialect and AFS version. See the AFS section of this document for a list of supported combinations.

When configuring for dialects where AFS is supported, the Configure script calls the AFSConfig script to determine the location of AFS header files and the AFS version. Configure will not call AFSConfig, even for the selected dialects, unless the file /usr/vice/etc/ThisCell exists.

The AFS header file location is recorded in the AFSHeaders file; version, AFSVersion. Once these values have been recorded, Configure can be told to skip the calling of AFSConfig by specifying its (Configure's) -n option.

The Inventory Script

The lsof distribution contains a script, called Inventory, that checks the distribution for completeness. It uses the file 00MANIFEST in the distribution
as a reference point.

After the Configure script has accepted the dialect abbreviation, it normally calls the Inventory script to make sure the distribution is complete.

After Inventory has run, it creates the file ".ck00MAN" in the top-level directory to record for itself the fact that the inventory has been check. Should Inventory be called again, it senses this file and asks the caller if another check is in order, or if the check should be skipped.

The -n option may be supplied to Configure to make it bypass the calling of the Inventory script. (The option also causes Configure to avoid calling the Customize script.)

The lsof power user may want to define (touch) the file ".neverInv". Configure avoids calling the Inventory script when ".neverInv" exists.

The Customize Script

Normally when the Configure script has finished its work, it calls another shell script in the lsof distribution called Customize.

(You can tell Configure to bypass Customize
with its -n option.)

Customize leads you through the specification of these important
compile-time definitions for the dialect's machine.h header file:

HASDCACHE device cache file control
HASENVDC device cache file environment
variable name
HASPERSDC personal device cache file path
format
HASPERSDCPATH name of environment variable that
provides an additional component
of the personal device cache file
path
HASSYSDC system-wide device cache file path
HASKERNIDCK the build-time to run-time kernel
identity check
HASSECURITY the security option
HASNOSOCKSECURITY the open socket listing option whe
HASSECURITY is defined
WARNDEVACCESS /dev (or /devices) warning message
control
WARNINGSTATE warning message issuance state

The Customize script accompanies its prompting for entry of new
values for these definitions with brief descriptions of each of
them. More information on these definitions may be found in this
file or
in the 00DCACHE and 00FAQ files of the lsof distribution.

You don't need to run Customize after Configure. You can run it
later or you can edit machine.h directly.

The -n option may be supplied to Configure to make it bypass the
calling of the Customize script. (The option also causes Configure
to avoid calling the Inventory script.)

The lsof power user may want to define (touch) the file ".neverCust".
Configure avoids calling the Customize script when ".neverCust"
exists.

Customize CAUTION: the Customize script works best when it is
applied to a newly configured lsof source base -- i.e., the machine.h
header file has not been previously modified by the Customize
script. If you have previously configured lsof, and want to rerun
the Customize script, I recommend you clean out the previous
configuration and create a new one:

$ Configure -clean
$ Configure <dialect_abbreviation>
...
Customize in response to the Customize script prompts.

Cautions
========

Lsof is a tool that
is closely tied to the UNIX operating system
version. It uses header files that describe kernel structures and
reads kernel structures that typically change from OS version to
OS version, and even within a version as vendor patches are applied.

DON'T TRY TO USE AN LSOF BINARY, COMPILED FOR ONE UNIX OS VERSION,
ON ANOTHER. VENDOR PATCHES INFLUENCE THE VERSION IDENTITY.

On some UNIX dialects lsof versions may be even more restricted by
architecture type.

The bottom line is use lsof where you built it. If you intend to
use a common lsof binary on multiple systems, make sure all systems
run exactly the same OS version and have exactly the same patches.

Warranty
========

Lsof is provided as-is without any warranty of any kind, either
expressed or implied, including, but not limited to, the implied
warranties of merchantability and fitness for a particular purpose.
The entire risk as to the quality and performance of lsof is with
you. Should lsof prove defective, you assume the cost
of all
necessary servicing, repair, or correction.

License
=======

Lsof has no license. Its use and distribution are subject to these
terms and conditions, found in each lsof source file. (The copyright
year in or format of the notice may vary slightly.)

```
  /*
   * Copyright 2002 Purdue Research Foundation, West Lafayette,
```

```
 * Indiana 47907.  All rights reserved.
 *
 * Written by Victor A. Abell
 *
 * This software is not subject to any license of the American
 * Telephone and Telegraph Company or the Regents of the
 * University of California.
 *
 * Permission is granted to anyone to use this software for
 * any purpose on any computer system, and to alter it and
 * redistribute it freely, subject to the following
 * restrictions:
 *
 * 1. Neither the authors nor Purdue University are responsible
 *    for any consequences of the use of this software.
 *
 * 2. The origin of this software must not be misrepresented,
 *    either by explicit claim or by omission.  Credit to the
 *    authors and Purdue University must appear in documentation
 *    and sources.
 *
 * 3. Altered versions must be plainly marked as such, and must
 *    not be misrepresented as being the original software.
 *
 * 4. This notice may not be removed or altered.
 */
```

Bug Reports
==========

Now that the obligatory disclaimer is out of the way, let me hasten to add that I accept lsof bug reports and try hard to respond to them. I will also consider and discuss requests for new features, ports to new dialects, or ports to new OS versions.

PLEASE DON'T SEND BUG REPORTS ABOUT LSOF TO THE UNIX DIALECT OR DIALECT OPTION VENDOR.

At worst such bug reports will confuse the vendor; at best, the vendor will forward the bug report to me.

PLEASE DON'T SEND BUG REPORTS ABOUT LSOF BINARIES BUILT OR DISTRIBUTED BY SOMEONE ELSE, BECAUSE I CAN'T SUPPORT THEM.

Before you send me a bug report,
please do these things:

* Make sure you try the latest lsof revision.

  + Download the latest revision from:

  ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof

  + Verify the signatures of what you have downloaded;

  + While connected to lsof.itap.purdue.edu, check for patches:

  ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof/patches

  + If patches exist, install them in the latest revision
  you just downloaded. Then build the latest revision and
  see if it fixes your bug.

* If you're having trouble compiling lsof with gcc, try the
  UNIX dialect vendor's compiler. I don't have access to gcc on
  all test systems, so my support for it is hit-and-miss, and so
  is my ability to respond to gcc compilation problem reports.

* Check the lsof frequently asked questions file, 00FAQ,
  to see if there's a question and answer relevant to your
  problem.

* Make sure you're running the lsof you think you are
by
  checking the path to it with which(1). When in doubt, use an
  absolute path to lsof. Make sure that lsof binary has
  sufficient permissions to do what you ask, including internal
  permissions given it (e.g., restrictions on what files lsof may
  report for whom) during its build.

When you send a bug report, make sure you include output from your
running of lsof's Configure script. If you were able to compile a
running lsof, please also include:

* Output from which(1) that shows the absolute path to the
  lsof binary in question;

* Output from running lsof with its -h and -v options at
  lsof's absolute path;

* Output from "ls -l" directed to lsof's absolute path.

If you weren't able to compile a running lsof, please send me: the
compiler error output; identification of the lsof revision you're using
(contents of the lsof version.c file); identification of your system

(full uname output or output from whatever other tool
identifies the
system); and compiler identification (e.g., gcc -v output).

Either set of output will help me understand how lsof was configured
and what UNIX dialect and lsof revision is involved.

Please send all bug reports, requests, etc. to me via e-mail at
<abe@purdue.edu>. Make sure "lsof" appears in the "Subject:" line so
my e-mail filter won't classify your letter as Spam.

The 00FAQ File
==========

The lsof distribution contains an extensive frequently asked
questions file on lsof features and problems. I recommend you
consult it before sending me e-mail. Use your favorite editor or
pager to search 00FAQ -- e.g., supplying as a search argument some
fixed text from an lsof error message.

The lsof-l Mailing List
==========

Information about lsof, including notices about the availability
of new revisions, may be found in mailings of the lsof-l listserv.
For more information about it, including instructions on how to
subscribe, read the 00LSOF-L file of
the lsof distribution.

Field Output Example Scripts
==========

Example AWK and Perl 4 or 5 scripts for post-processing lsof field
output are locate in the scripts sub-directory of the lsof distribution.
The scripts sub-directory contains a 00README file with information
about the scripts.

Field Output C Library
==========

The lsof test suite (See "Testing Lsof."), checks basic lsof
operations using field output. The test suite has its own library
of C functions for common test program operations, including
processing of field output. The library or selections of its

functions could be adapted for use by C programs that want to process lsof field output. See the library in the file LTlib.c in the tests/ sub-directory

Testing Lsof
============

Lsof has an automated test suite in the tests/ sub-directory that can be used to test some basic lsof features -- once lsof has been configured and made. Tests are arranged in three groups: basic tests that should run on all dialects; standard tests that should run on all dialects; and optional tests that may not run on all dialects or may need special resources to run. See 00TEST for more information.)

CAUTION!!! Before you attempt to use the test suite make sure that the lsof you want to test can access the necessary kernel resources -- e.g., /dev/mem, /dev/kmem, /proc, etc. Usually you want to test the lsof you just built, so this is an important check. (See 00TEST.)

To run the basic and standard tests, using the lsof in the parent directory of tests/, do this:

```
$ cd tests
$ make test
  or $ make std
  or $ make standard
```

The basic and standard tests may be run as silently as possible, using the lsof in the parent directory of tests/, with:

```
$ cd tests
$ make auto
```

This is the "automatic" test mode, designed for use by scripts that build lsof. The caller is expected to test the make exit code to determine if the tests succeeded. The caller should divert standard output and standard error to /dev/null to suppress make's error exit message.

The optional tests may be run, using the lsof in the parent directory of tests/, with:

```
$ cd tests
```

```
 $ make opt
   or $ make optional
```

It's possible to excute individual tests, too. See the 00TEST file
of this distribution for more informaiton on the tests, what they
do, and how to run and possibly customize each test.

It's possible to run the tests, using an lsof other than the one
in the parent directory of /tests, too. See 00TEST for information
about using the LT_LSOF_PATH environment variable to do that.

==========
Dialect Notes
==========

AFS
===

Lsof recognizes AFS files on the following combinations of UNIX
dialect and AFS versions:

```
 AIX 4.1.4 (AFS 3.4a)
 Linux 1.2.13 (AFS 3.3)
 NEXTSTEP 3.2 (AFS 3.3) (untested on recent lsof revisions)
 Solaris 2.6 (AFS 3.4a)
 Ultrix 4.2 RISC (AFS 3.2b) (no longer available)
```

Lsof has not been tested under other combinations -- e.g. HP-UX
10.10 and AFS 3.4a
 -- and probably won't even compile there. Often
when a UNIX dialect version or AFS version changes, the new header
files come into conflict, causing compiler objections.

AIX
===

Specify the aix Configure abbreviation for AIX 4.1.[45], 4.2[.1],
4.3[.123], 5L, and 5.[123].

Specify aixgcc on AIX above 4.1 to use the gcc compiler. (Gcc can't be
used to compile lsof on AIX 4.1 and below because of kernel structure
alignment differences between it and xlc.) Gcc results sometimes
depend on the version of the gcc compiler that is used.

Compilation of lsof with gcc on AIX 4.3[.123], 5L, and 5.[123] has been

sparsely tested with varying degrees of success: it has been reported
to succeed on AIX 4.3.3 and 32 bit Power AIX 5.1; to fail on ia64 AIX
5.1 and 64 bit Power AIX 5.1; and to succeed on 32 and 64 bit Power AIX
5.2. Lsof compilation with gcc hasn't been tested on AIX 5.3.

At revision 4.61 and above lsof is configured and built to match the
bit size of the kernel of Power architecture
 AIX 5.1 systems. Lsof
binaries built for 32 and 64 bit kernels are not interchangeable. See
00FAQ for more information.

The Configure script uses /usr/bin/oslevel to determine the AIX version
for AIX less than 5 and ``uname -rv'' for AIX 5 and higher. If
/usr/bin/oslevel isn't executable on AIX less than 5, the Configure
script issues a warning message and uses ``uname -rv'' to determine the
AIX version.

When Configure must use ``uname -rv'' on AIX less than 5 to determine
the AIX version, the result will lack a correct third component --
e.g., the `4' of ``4.1.4''. If your AIX less than 5 system lacks lacks
an executable oslevel, I suggest you edit the Configure-produced
Makefile and complete the _AIXV definition in the CFGF string.

By default lsof avoids using the kernel's readx() function, causing
it to be unable to report information on some text and library file
references. The ``-X'' option allows the lsof user to ask for the
information readx() supplies.

Lsof avoids
 readx() to avoid the possibility of triggering a kernel
problem, known as the Stale Segment ID kernel bug. Kevin Ruderman
reported this bug to me. The bug shows up when the kernel's
dir_search() function hangs, hanging the application process that
called it so completely that the application process can neither
be killed nor stopped. The hang is the consequence of another
process (perhaps lsof) making legitimate use of the kernel's readx()
function to access the kernel memory that dir_search() is examining.
IBM has indicated they have no plans to fix the bug.

A fuller discussion of this bug may be found in the 00FAQ file of
the lsof distribution. There you will find a description of the
Stale Segment ID bug, the APAR on it, and a discussion of the
sequence of events that exposes it.

I added the ``-X'' function so you can tell lsof to use readx(),
but if you use ``-X'', you should be alert to its possibly serious
side effects. Although readx() is normally disabled, its state

is
controlled with the HASXOPT, HASXOPT_ROOT, and HASXOPT_VALUE
definitions in dialects/aix/machine.h, and you can change its
default state by changing those definitions. You can also change
HASXOPT_ROOT via the Customize script.

You can also compile lsof with readx() use permanently enabled or
disabled -- see the comments about the definitions in the
dialects/aix/machine.h header file. You may want to permanently
disable lsof's use of readx() if you plan to make lsof publicly
executable. You can also restrict -X to processes whose real UID
is root by defining HASXOPT_ROOT.

I have never seen lsof cause the Stale Segment ID bug to occur and
haven't had a report that it has, but I believe there is a possibility
it could.

AFS support for AIX was added with help help from Bob Cook and Jan
Tax who provided test systems.

Henry Grebler and David J. Wilson helped with lsof for AIX 4.2.

Bill Pemberton provided an AIX 4.3 test system. Andrew Kephart
and Tom Weaver provided AIX 4.3 technical
assistance. Niklas
Edmundsson did 4.3.1 testing. Doug Crabill provided an AIX 4.3.2
test system. Jeff W. Stewart provided an AIX 4.3.3 test system.

The SMT file type for AIX 4.1.[45], 4.2[.1], and 4.3[.12] is my
fabrication. See the 00FAQ file more information on it.

Loc Le and Nasser Momtaheni of IBM provided test systems for AIX 5L and
5.1. Lsof for AIX 5L and 5.1 needs setuid-root permission to process
the -X option on systems whose architecture type is ia64.

Dale Talcott of Purdue provided AIX 5.1 and 5.2 test systems. Dale and
John Jackson of Purdue provided an AIX 5.3 test system.

Apple Darwin
==========

The Apple Darwin port was provided by Allan Nathanson for version
1.2. Allan also arranged for access to a test system for maintenance
and regression testing. Dale Talcott provided a test system, too.

Allan supplied patches for updates to 1.4, 5.x, 6.x, 7.x and 8.x.

BSDI BSD/OS
==========

As of lsof revision 4.77 support for BSDI BSD/OS has been
discontinued.
  Lsof revision 4.76 with BSDI BSD/OS support may be found
on lsof.itap.purdue.edu in pub/tools/unix/lsof/src.

DEC OSF/1, Digital UNIX, Tru64 UNIX
===================================

Robert Benites, Dean Brock, Angel Li, Dwight McKay, Berkley Shands,
Ron Young and Steve Wilson have kindly provided test systems.
Jeffrey Mogul has provided technical assistance. Dave Morrison
and Lawrence MacIntyre did Digital UNIX V3.2 testing.

Lsof supports the ADVFS/MSFS layered file system product. Lsof
can locate all the open files of an ADVFS/MSFS file system when
its path is specified, provided the file system is listed in
/etc/fstab with an ``advfs'' type. (This /etc/fstab caveat applies
only to Digital UNIX 2.0.) At Digital UNIX 4.0 and Tru64 UNIX,
using code provided by David Brock, lsof 4.20 and above can locate
ADVFS file paths.

Testing of lsof on DEC OSF/1 and Digital UNIX 4.0 ended with lsof
revision 4.74. Hence, the lsof documentation has dropped the claim
that it works there.
  For a distribution of lsof 4.74 that was tested
on DEC OSF/1 and Digital UNIX 4.0, check pub/tools/unix/lsof/OLD/src
on the lsof ftp home, lsof.itap.purdue.edu.

Lsof revisions past 4.74 have only been tested on Tru64 UNIX 5.1.

FreeBSD
=======

Bill Bormann of Purdue University provided access to several FreeBSD
test systems. Ade Barkah, John Clear, Ralph Forsythe, Michael
Haro, Kurt Jaeger, and William McVey have also provided FreeBSD
test systems.

The FreeBSD distribution header files are augmented by header files
in the dialects/freebsd/include directory.

Larry Rosenman maintains the lsof FreeBSD port package.

HP-UX
=====

Lsof has two HP-UX bases: /dev/kmem for HP-UX 11.0 and earlier;
and PSTAT for HP-UX 11.11 and later. The lsof Configure script
will pick the appropriate base.

To use the CCITT x.25 socket support for HP-UX, you must have the
x.25 header files in /etc/conf/x25

Pasi Kaara helped with the HP-UX port, especially with its CCITT
x.25 socket support.

Richard
Allen provided HP-UX 10.x and 11.x test systems, as did
Mark Bixby, and Elias Halldor Agustsson. Marc Winkler helped test
the 10.20 port. Richard J. Rauenzahn provided a 64 bit HP-UX 11
test system and an HP-UX 11.11 development system.

AFS support for HP-UX was added thanks to help from Chaskiel Moses
Grundman, who provided a test system.

The /dev/kmem-based HP-UX 11.00 support is extremely fragile. It
depends on privately developed kernel structure definitions. (See
.../dialects/hpux/hpux11 for the header files making the definitions.)
Those header files and their definitions will not be updated by
HP-UX 11.00 patches, making it likely that any patch changing a
kernel structure critical to lsof will break lsof in some way.

It's possible to build a 64 bit lsof for 64 bit HP-UX 11.00 with
gcc, but you must have a gcc compiler capable of producing 64 bit
executables. See the 00FAQ file for more information.

The PSTAT-based lsof for HP-UX 11.11 and later is much more solid.
I
am indebted to the vision of HP for providing an lsof kernel API
through the PSTAT implementation. Specifically I appreciate the
help of HP staff members Carl Davidson, Louis Huemiller, Rich
Rauenzahn, and Sailu Yallapragada that made PSTAT-based HP-UX lsof
possible.

IPv6
====

Lsof has IPv6 support that has been tested for these UNIX dialects:

AIX 4.3.x; Apple Darwin 5.[12] and 6.0; the INRIA and KAME FreeBSD IPv6
implementations; PSTAT-based HP-UX; /proc-based Linux; the INRIA and
KAME NetBSD implementations; and Solaris 8 and 9. Lsof has IPv6
support that hasn't been tested for: OpenBSD (KAME); OpenUNIX 8; Tru64
Unix 5.[01]; and UnixWare 7.1.[34].

Please let me know if your UNIX dialect has IPv6 support and I'll
see if it can be supported by lsof.

Linux
=====

Tim Korb, Steve Logue, Joseph J. Nuspl Jr., and Jonathan Sergent
have provided Linux test systems.

Michael Shields helped add and test automatic handling of ELF/COFF
form names in /System.map, Marty Leisner and Keith
 Parks have helped
test many lsof revisions. Marty has provided valuable suggestions,
Linux hints, and code, too.

The 00FAQ file gives some Linux tips, including information on
coping with system map file problems.

To determine the state of the Linux 2.1.x C library lseek() function,
the lsof Configure script runs a test program that must have
permission to read /dev/kmem. The test determines if the lseek()
function properly handles kernel offsets, which appear to be negative
because their high order bit is set. If the lseek() test reveals
a faulty lseek(), Configure activates the use of a private lseek()
function for kernel offset positioning. See the Linux problems
section of the 00FAQ file of the lsof distribution for more
information.

NetBSD
======

Greg Earle and Paul Kranenburg have assisted with the NetBSD ports.
Paul has provided test systems. Ray Phillips provided a NetBSA
Alpha test system. Andrew Brown also provided a test system.

The NetBSD dialect version of lsof
 is compiled using the dialect
sources it shares with OpenBSD in the n+obsd dialect sub-directory.

NEXTSTEP and OPENSTEP
==========

Virtual memory header files that allow lsof to display text references
were derived from the contents of /usr/include/vm of NEXTSTEP 2.0.
NeXT did not ship the virtual memory header files with other NEXTSTEP
or OPENSTEP versions.

You may use the RC_FLAGS environment variable to declare compiler
options outside the Makefile. A common use of this variable is to
define the architecture types to be included in a "fat" executable.
See the comments in dialects/next/Makefile for an example.

OpenBSD
=======

David Mazieres has provided OpenBSD test systems. The OpenBSD
dialect version of lsof is compiled using the dialect sources it
shares with NetBSD in the n+obsd dialect sub-directory.

Kenneth Stailey has provided OpenBSD testing and advice.

John Dzubera (Zube) reports, "lsof 4.33 compiles and runs on OpenBSD
2.3 for the pmax architecture
(decstation 3100)."

I have not tested lsof on OpenBSD 3.8, but David Mazieres reports
revision 4.76 worked on OpenBSD 3.8.

Pyramid DC/OSx and Reliant UNIX
==========

As of lsof revision 4.52 support for all Pyramid dialects has been
discontinued. Lsof revision 4.51 with Pyramid support may be
obtained upon request. Send the request to abe@purdue.edu.

These two UNIX dialects are very similar and share dialect-specific
source files from the pyramid sub-directory.

The Reliant Unix Pyramid C compiler issues warning messages that
I haven't found a convenient way to suppress. You can ignore
warning messages about casts and conversions that lose bits. The
message "warning: undefining __STDC__" is intentionally caused by
the lsof MkKernOpts configuration script to suppress warning messages
about cast and conversion problems in standard system header files,
such as <stdio.h> and <string.h>.

Bruce Beare and Kevin Smith provided test systems.

Caldera OpenUNIX
================

Larry
Rosenman provided an OpenUNIX 8 test system. Matthew Thurmaier
provided technical assistance, along with these people from Caldera:
Jack Craig, Robert Lipe, and Bela Lubkin.

Robert Lipe supplied changes to lsof for OpenUNIX 8.0.1. Those
changes were also incorporated in UnixWare 7.1.3 when it became
the release name for OpenUNIX 8.0.1.

Support for lsof on OpenUNIX ended at lsof revision 4.74. The last
lsof revision, 4.74, tested on OpenUNIX, may be found at the lsof
"home" ftp site, lsof.itap.purdue.edu, in pub/tools/unix/lsof/OLD/src.

SCO OpenServer
==============

Dion Johnson, Bela Lubkin, and Nathan Peterson of SCO gave me copies
of SCO OpenServer and the SCO OpenServer Development System 3.0
and provided technical advice for the lsof port.

Hugh Dickins, Bela Lubkin, Craig B. Olofson, and Nathan Peterson
provided version 5.0 and gave technical advice for porting lsof to
it. Bela provided the 5.0.4 changes. D. Chris Daniels provided
a 5.0.4 test system,
Lee Penn provided one for 5.0.5, and John
Dubois for 5.0.6.

The <netdb.h> header file was accidentally omitted from some SCO
OpenServer Development System releases. The Configure script will
sense its absence and substitute an equivalent from the BSD
distribution. The BSD <netdb.h> and the <sys/cdefs.h> header file
it includes are located in the dialects/os/include sub-directory
tree.

To compile lsof from its distribution sources you must have the
TCP/IP and NSF headers in /usr/include. While those are optional
OpenServer packages, I have access to no system that doesn't have
them, so I'm unable to build lsof for such a configuration. However,
it should be possible to modify the lsof Configure script and
sources so lsof would compile and work without those optional

packages.

If you have an OpenServer system configured without the TCP/IP and
NFS packages, and want to tackle the job of building lsof for it,
contact me via e-mail at <abe@purdue.edu>. I'll identify the
Configure
script, header file, and source file changes you will
need to make. (Caution: this is not a simple task, or I would have
already done it.)

The optional osrgcc and scogcc Configure abbreviations construct
Makefiles for compiling lsof with gcc.

The UnixWare 7.1.4 sources are used for OpenServer Release 6.0.0.
Hence there is a separate Configure abbreviation for it, "osr6".
Richard of SCO provided a test system and technical assistance.

SCO|Caldera UnixWare
==========

D. Chris Daniels, John Hughes, Ken Laing, Andrew Merril, Lee Penn, and
Matthew Thurmaier provided test systems. Bela Lubkin provided
technical assistance. Larry Rosenman provided 7.1.[34] test systems.

Solaris 2.x, 7, 8, 9 and 10
==========

SEE THE CAUTIONS SECTION OF THIS DOCUMENT.

The latest Solaris revision of lsof 4 might work under Solaris
2.[1-4] and 2.5[.1] and 7 but hasn't been tested there. I have no
test systems for those Solaris versions.

Lsof will compile with gcc and the Sun C compiler
under Solaris.
If you want to use the Sun compiler, use the solariscc Configure
abbreviation. If you use a gcc version less than 2.8 on Solaris,
make sure the gcc-specific includes have been updated for your
version of Solaris -- i.e., run the gcc fixincludes script.

Solaris 7, 8, 9 and 10 support for 64 bit kernels depends on a Sun
WorkShop or Forte C compiler version that supports the "-xarch=v9"
flag -- usually 5.0 or greater. Gcc versions 2.95 and above *may*
be configured and built for 64 bit support, but it takes some extra
work, the resulting compiler may be fragile, and the gcc developers
discourage it. I've built 64 bit capable gcc compilers for Solaris

7, 8 and 9 from gcc versions 2.95 through 3.0.1 and produced working lsof executables with them. More information on 64 bit gcc for Solaris may be found in the 00FAQ file.

Solaris 10 ZFS support is questionable, because Sun does not distribute the ZFS kernel structure definition header files. The lsof Configure script
and source code use some risky work-arounds. ZFS file system support was made possible with help from Horst Scheuermann.

Dave Curry and Steve Kirsch provided resources for Solaris 2.x ports. Casper Dik and Gerry Singleton consulted and provided valuable assistance.

Henry Katz, Joseph Kowalski, Charles Stephens, Mike Sullivan, and Mike Tracy provided technical assistance.

AFS support was added to Solaris lsof with help from Curt Freeland, Heidi Hornstein, Michael L. Lewis, Terry McCoy, Phillip Moore, and Sushila R. Subramanian.

Casper Dik provided valuable assistance for the Solaris 8 support.

Sun has graciously provided me access to BETA versions of Solaris 2.5, 2.6, 7, 8, and 9.

John Dzubera provided Solaris 7 and 8 test systems.

Mike Miscevic provided Solaris 10 test systems.

Ultrix
======

As of lsof revision 4.52 support for Ultrix is no longer available, because I no longer have an Ultrix test system.

Terry Friedrichsen, Dwight McKay, and Jeffrey Mogul helped me with
this port.

DECnet support was added to Ultrix lsof with the help of John Beacom, who kindly provided a test system. The Configure script decides that DECnet support is available if /usr/lib/libdnet.a and /usr/include/netdnet/dn.h exist and are readable.

Veritas VxFS and VxVM

==========

Lsof supports some versions of Veritas VxFS and VxVM on some UNIX
dialects. Consult the lsof Configure script for the specific
dialect, and consult the lsof dialect-specific source files for
the UNIX dialect of interest. Veritas support will usually be
found in a source file named dnode[1-9].c.

Since Veritas rarely has a version number that can be extracted
with shell commands, lsof doesn't use it. Instead, when lsof
supports Veritas, the Configure script will form compile-time
definitions starting with HASVXFS. Check the lsof 00PORTING
documentation file for more information.

Lsof Veritas support requires that the supporting Veritas header
files be installed -- e.g., in /usr/include/sys/fs.
 (The location
will depend in the dialect's header file conventions.)

Some information on lsof support for Veritas extensions may be
found in the lsof 00DIST file. (The ChangeLog file points to
00DIST.)

Chris Kordish and Andy Thomas have provided Solaris VxFS test
systems.

================================
User-contributed Dialect Support
================================

There are some user-contributed dialect versions of lsof; more
information on them can be found at:

 ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof/contrib

Check the 00INDEX file there for details.

============================
Dialects No Longer Supported
============================

Because I don't have access to test systems, these UNIX dialects
are no longer supported by lsof:

 CDC EP/IX
 /dev/kmem-based Linux

MIPS RISC/os
Motorola V/88
Pyramid DC/OSx
Pyramid Reliant UNIX
Sequent DYNIX
SGI IRIX
SunOS 4.x
Ultrix
UnixWare below 7.0

Remnants of the support lsof once provided for these
dialects may
be found in:

ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof/OLD/dialects

==========
Installing Lsof
==========

The distributed Makefiles do not have actions that will install lsof. I've come to the conclusion there is no standard for installing lsof or its man page, so I no longer distribute make rules for installing them. You should adjust the Makefile for your local preferences.

The Makefile does have an install rule that will cause lsof to compile by virtue of its dependency clause. Some Makefiles also have a dependency that causes the production of a man page that is ready to install. However, the actions of the install rule will not cause the lsof executable or its man page to be installed in any UNIX system-wide directory.

Instead, after the compilation and optional man page production are completed, the install rule will produce a brief description of what actions you might add to the install rule. The description will suggest the possible
modes, ownerships, permissions, and
destinations your install rule might employ to install the lsof executable and man page.

As you form your install rule, keep in mind that lsof usually needs some type of special permission to do its job. That may be permission to read memory devices such as /dev/kmem, /dev/mem, or /dev/swap, or it may be authorization to read entries in the /proc file system.

Memory device access can usually be provided by setting the modes

of the lsof executable so that it's effective group identifier when it runs is the same as the group that has permission to read the memory devices -- i.e., it is setgid-group. The privileged group is usually kmem, sys, or system.

Don't overlook using ACLs -- e.g., on AIX or Solaris 8 -- to give lsof permission to access memory devices. ACLs, coupled to a separate group like kmem, can be safer than giving lsof setgid authorization to a commonly used system group.

When lsof needs to read /proc file system entries, it must be installed
with modes that make its effective user identifier root when it runs -- i.e., it must be setuid-root. If lsof must be installed setuid-root (only the AIX 5L, PSTAT-based HPUX, and /proc-based Linux, ports need such power.), then access to memory devices is automatic (or not needed in the case of /proc-based Linux).

Your choice of permissions for lsof may also be affected by your desire to allow anyone to use it or your need to restrict its usage to specific individuals. You will have to be guided by local policy and convention in this case.

The next two sections, Setgid Lsof Dialect Versions and Setuid-root Lsof Dialect Versions, list recommended install permissions.

The system directory where you install the lsof executable is also open to choice. A traditional place for a tool like lsof is /usr/local/etc, but recent changes in directory structure organization suggest that somewhere in /opt may be more suitable.

Bear one other factor in mind when choosing a location for the lsof
executable -- it usually is a shared executable, requiring access to shared libraries. Thus, locations like /sbin or /usr/sbin are probably unsuitable.

Once you've chosen a location for the executable you may find that the location for the man page follows -- e.g., if the executable goes in /usr/local/etc, then the man page goes in /usr/local/man. If the executable location doesn't imply a location for the man page, you'll have to let local custom guide you.

Setuid-root Lsof Dialect Versions
==========

These dialect versions should be installed with setuid-root
permission -- i.e., the lsof binary should be owned by root and
its setuid execution bit (04000) should be set.

 AIX 5L and above for full use of the -X option
 Apple Darwin 8.x for Power Macintosh systems
 PSTAT-based HP-UX 11.11 and 11.23
 /proc-based Linux (generally 2.1.72 and above)

Setgid Lsof Dialect Versions
============================

These dialect versions should be installed
 with setgid permission,
owned by the group that can read kernel memory devices such as
/dev/drum, /dev/kmem, /dev/ksyms, /dev/mem, /dev/swap. ACLs may
be another mechanism (e.g., under AIX or Solaris 8) you can use to
grant read permission to the kernel memory devices.

 AIX 4.1.[45], 4.2[.1], and 4.3[.123]
 Apple Darwin 7.x for Power Macintosh systems
 DEC OSF/1, Digital UNIX, Tru64 UNIX 2.0, 3.2, 4.0, and 5.[01]
 FreeBSD 2.1.6, 2.2[.x], 3.x, 4.x, 5.x, [6789].x and 1[012].x
 NetBSD 1.[456], 2.x and 3.x
 NEXTSTEP 3.[13]
 OpenBSD 2.[89] and 3.[0-9]
 OPENSTEP 4.x
 Caldera OpenUNIX 8
 SCO OpenServer 5.0.[46]
 SCO UnixWare 7.0 and 7.1.[0134]
 Solaris 2.6, 8, 9 and 10
 Ultrix 4.2 (no longer available)

===================================
Porting lsof 4 to a New UNIX Dialect
===================================

If you're brave enough to consider this, look at the 00PORTING
file. Please contact me before you start. I might be able to help
you or even do the port myself.

Don't overlook
 the contrib/ directory in pub/tools/unix/lsof on my
ftp server, lsof.itap.purdue.edu. It contains user-contributed ports
of lsof to dialects I don't distribute, because I can't test new
revisions of lsof on them.

==========
Quick Start to Using lsof
==========

For information on how to get started quickly using lsof, consult
the 00QUICKSTART file of the lsof distribution. It cuts past the
formal density of the lsof man page to provide quick examples of
using lsof to solve common open file display problems.

==========
Cross-configuring Lsof
==========

Using environment variables it is possible to Configure (and possibly
build) lsof for one UNIX dialect on a different one -- e.g., you
are running Configure on a Linux 2.3 system and you want to Configure
and build lsof for Linux 2.4.

See the 00XCONFIG file of the lsof distribution for a discussion
of how to do this.

==========
Environment
 Variables Affecting the Configure Script
==========

Configure script actions can be modified by introducing values to
the script via environment variables. In many cases the environment
variable values take the place of test operations the Configure
script makes.

For more information on environment variables that can affect
Configure, consult the 00XCONFIG file of the lsof distribution.
See the General Environment Variables sections for descriptions of
ones that affect all dialects. Consult the Dialect-Specific
Environment Variables section for ones that might affect the dialect
you are trying to configure.

Vic Abell <abe@purdue.edu>
February 14, 2018

Found in path(s):
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/00README

No license file was found, but licenses were detected in source scan.

```
/*
* Copyright 2000 Purdue Research Foundation, West Lafayette, Indiana
* 47907.  All rights reserved.
*
* Written by Victor A. Abell
*
* This software is not subject to any license of the American Telephone
* and Telegraph Company or the Regents of the University of California.
*
* This software has been adapted from snprintf.c in sendmail 8.9.3.  It
* is subject to the sendmail copyright statements listed below, and the
* sendmail licensing terms stated in the sendmail LICENSE file comment
* section of this file.
*
* Permission is granted to anyone to use this software for any purpose on
* any computer system, and to alter it and redistribute it freely, subject
* to the following restrictions:
*
* 1. Neither the authors nor Purdue University are responsible for any
*    consequences of the use of this software.
*
* 2. The origin of this software must not be misrepresented, either by
*    explicit
 claim or by omission.  Credit to the authors and Purdue
*    University must appear in documentation and sources.
*
* 3. Altered versions must be plainly marked as such, and must not be
*    misrepresented as being the original software.
*
* 4. This notice may not be removed or altered.
*/
/* Extended regular expression matching and search library,
  version 0.12.
  (Implements POSIX draft P1003.2/D11.2, except for some of the
  internationalization features.)
  Copyright (C) 1993-1999, 2000 Free Software Foundation, Inc.

  The GNU C Library is free software; you can redistribute it and/or
  modify it under the terms of the GNU Library General Public License as
  published by the Free Software Foundation; either version 2 of the
  License, or (at your option) any later version.

  The GNU C Library is distributed in the hope that it will be useful,
  but WITHOUT ANY WARRANTY; without even the implied warranty of
  MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.
```

See the GNU
Library General Public License for more details.

You should have received a copy of the GNU Library General Public
License along with the GNU C Library; see the file COPYING.LIB. If not,
write to the Free Software Foundation, Inc., 59 Temple Place - Suite 330,
Boston, MA 02111-1307, USA. */

Found in path(s):
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/lib/regex.c
No license file was found, but licenses were detected in source scan.

```
/*
* Copyright (c) 1998 The Santa Cruz Operation, Inc.. All Rights Reserved.
*
*       THIS IS UNPUBLISHED PROPRIETARY SOURCE CODE OF THE
*                SANTA CRUZ OPERATION INC.
*
*   The copyright notice above does not evidence any actual or intended
*   publication of such source code.
*/
```

Found in path(s):
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/uw/uw7/sys/fs/namenode.h
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/uw/uw7/sys/fs/fifonode.h
No license file was found, but licenses were detected in source scan.

```
/*
* Copyright 2003 Purdue Research Foundation, West Lafayette, Indiana
* 47907.  All rights reserved.
*
* Written by Victor A. Abell
*
* This software is not subject to any license of the American Telephone
* and Telegraph Company or the Regents of the University of California.
*
* Permission is granted to anyone to use this software for any purpose on
* any computer system, and to alter it and redistribute it freely, subject
* to the following restrictions:
*
* 1. Neither the authors nor Purdue University are responsible for any
*    consequences of the use of this software.
*
* 2. The origin of this software must not be misrepresented, either by
*    explicit claim or by omission.  Credit to the authors and Purdue
```

* University must appear in documentation and sources.
*
* 3. Altered versions must be plainly marked as such, and must not be
* misrepresented as being the original software.
*
* 4. This notice may not be removed or altered.
*/

Found in path(s):
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/aix/dnode2.c
No license file was found, but licenses were detected in source scan.

Notes for the distribution of lsof version 4

****
| The latest release of lsof is always available from
| https://github.com/lsof-org/lsof/releases
|
| From 4.92.1, git is introduced to manage changes.
| You can consult the details of changes with git.
****

Contents

Dialects Supported
How Lsof Works
Lsof Output
Getting Started Quickly
Limiting, Filtering, and Selecting Lsof Output
Parsing Lsof Output with Another Program
Repeat Mode
Distribution Restrictions
Cautions
Distribution Contents
Warranty
Bug Reports
The lsof-l Mailing List
Version 3 Release Notes
3.0, May 24, 1994
...
3.88, February 17, 1997
What's New in Version 4
Version 4 Release Notes
4.0, February 24, 1997
4.01, March 3, 1997
4.02,

March 21, 1997
4.03, April 7, 1997
4.04, April 17, 1997
4.04 supplement, April 18, 1997
4.05, April 24, 1997
4.06, April 30, 1997
4.07, May 12, 1997
4.08, May 23, 1997
4.09, June 1, 1997
4.10, June 8, 1997
4.11, June 12, 1997
4.12, June 24, 1997
4.13, July 9, 1997
4.14, July 22, 1997
4.15, August 15, 1997
4.16, September 25, 1997
4.17, October 14, 1997
4.18, October 25, 1997
4.19, October 30, 1997
4.20, November 11, 1997
4.21, December 1, 1997
4.22, December 15, 1997
4.23, January 16, 1998
4.24, January 28, 1998
4.25, February 7, 1998
4.26, February 17, 1998
4.27, March 6, 1998
4.28, March 10, 1998
4.29, March 26, 1998
4.30, April 9, 1998
4.31, April 21, 1998
4.32, May 13, 1998
4.33, May 22, 1998
4.34, June 26, 1998
4.35, July 17, 1998
4.36, August 4, 1998
4.37, September 15, 1998
4.38, November 25, 1998
4.39, December 29, 1998
4.40, January 25, 1999
4.41, February 27, 1999
4.42, March 30, 1999
4.43,
May 11, 1999
4.44, June 24, 1999
4.45, July 30, 1999
4.46, October 23, 1999
4.47, November 29, 1999

4.48, January 14, 2000
4.49, April 3, 2000
4.50, June 29, 2000
4.51, August 21, 2000
4.52, November 8, 2000
4.53, December 6, 2000
4.54, January 19, 2001
4.55, February 15, 2001
4.56, May 3, 2001
4.57, July 19, 2001
4.58, September 13, 2001
4.59, October 20, 2001
4.60, November 9, 2001
4.61, January 22, 2002
4.62, March 7, 2002
4.63, April 23, 2002
4.64, June 26, 2002
4.65, October 10, 2002
4.66, December 22, 2002
4.67, March 27, 2003
4.68, June 18, 2003
4.69, October 16, 2003
4.70, January 16, 2004
4.71, March 11, 2004
4.72, July 13, 2004
4.73, October 21, 2004
4.74, January 17, 2005
4.75, May 16, 2005
4.76, August 30, 2005
4.77, April 10, 2006
4.78, April 24, 2007
4.79, April 15, 2008
4.80, May 12, 2008
4.81, October 21, 2008
4.82, March 25, 2009
4.83, January 18, 2010
4.84, July 29, 2010
4.85, September
27, 2011
4.86, April 10, 2012
4.87, January 2, 2013
4.88, October 13, 2014
4.89, July 7, 2015
4.90, February 14, 2018
4.91, March 26, 2018
4.92, May 5, 2018
4.93.0 May 7, 2019
4.93.1 May 7, 2019

4.93.2 May 8, 2019
4.94.0 November 11, 2020

Dialects Supported
==========

Lsof (for LiSt Open Files) lists files opened by processes on
selected Unix systems. Version 4 is a source reorganization of
version 3, itself a major revision of version 2. Version 4 has
been tested on:

Apple Darwin 9 and Mac OS X 10.[567]
FreeBSD 10.3, 11.0, 12.0 and 13.0 for AMD64-based systems
Solaris 9

(The pub/tools/unix/lsof/contrib directory on lsof.itap.purdue.edu
contains information on other ports.)

If your favorite Unix dialect is not in the list, or if your version
of it is more recent than the ones listed, please contact me at
<abe@purdue.edu>.

Version 3 of lsof was tested on:

AIX 3.2.5, 4.1[.[1234]], and 4.2
BSDI BSD/OS 2.0, 2.0.1, and 2.1 for x86-based systems
DC/OSx
1.1 for Pyramid systems
Digital UNIX (DEC OSF/1) 2.0, 3.0, 3.2, and 4.0
EP/IX 2.1.1 for the CDC 4680
FreeBSD 1.1.5.1, 2.0, 2.0.5, 2.1, 2.1.5 for x86-based
systems
HP-UX 8.x, 9.x, 10.01, 10.10, and 10.20
IRIX 5.2, 5.3, 6.0, 6.0.1, and 6.[124]
Linux through 2.0.27 for x86-based systems
NetBSD 1.0, 1.1, and 1.2 for x86 and SPARC-based
systems
NEXTSTEP 2.1 and 3.[0123]
OpenBSD 1.2 and 2.0 for x86-based systems
Reliant UNIX 5.43 for Pyramid systems
RISC/os 4.52 for MIPS R2000-based systems
SCO OpenServer Release 1.1, 3.0, and 5.0.x for x86-based
systems
SCO UnixWare 2.1 and 2.1.1 for x86-based systems
Sequent PTX 2.1.[1569], 4.0.[23], 4.1.[024], 4.2[.1],
and 4.3

Solaris 2.[12345], 2.5.1, and 2.6-Beta
SunOS 4.1.x
Ultrix 4.2, 4.3, 4.4, and 4.5

Version 3 and its predecessor, version 2, may be found at:

ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof/OLD

How Lsof Works
==========

Using available kernel data access methods -- getproc(), getuser(), kvm_*(),
nlist(), pstat(), read(), readx(), /proc -- lsof reads
process table entries, task table entries, user areas and file
pointers to reach the underlying structures that describe files
opened by processes.

Lsof interprets most file node structures -- advfsnodes, autonodes, cnodes, cdrnodes, devnodes, fifonodes, gnodes, hsnodes, inodes, mfsnodes, pcnodes, procnodes, rnodes, snodes, specnodes, s5inodes, tmpnodes. It understands NFS connections. It recognizes FIFOs, multiplexed files, Unix and Internet sockets. It knows about streams. It understands /proc file systems for some dialects. On many dialects it recognizes execution text and library references. It knows about AFS on some Unix dialects.

Lsof Output
==========

The lsof output describes:

* the identification number of the process (PID) that has opened the file;

* the process group identification number (PGID) of the process (optional);

* the process identification number of the parent process (PPID) (optional);

* the command the process is executing;

* the owner of the process;

* for all files in use by the process, including the executing
  text file and the shared libraries it is using:

  * the file descriptor number of the file, if applicable;

  * the file's access mode;

  * the file's lock status;

  * the file's device numbers;

  * the file's inode number;

  * the file's size or offset;

  * the name of the file system containing the file;

  * any available components of the file's path name;

  * the names of the file's stream components;

  * the file's local and remote network addresses;

  * the TLI network (typically UDP) state of the file;

  * the TCP state, read queue length, and write queue length
of the file;

  * the file's TCP window read and write lengths (Solaris
only);

  * other file or dialect-specific values.

Getting Started Quickly
==========

If
 you want to get started using lsof quickly, or see some examples
of how lsof can be used, consult the 00QUICKSTART file of the lsof
distribution.

The 00QUICKSTART file won't help you build or install lsof, but it
will cut through the density of the lsof man page, giving you more
readily an idea of what you can do with lsof.

For information on building and installing lsof, consult the 00README
file of the lsof distribution.

Limiting, Filtering, and Selecting Lsof Output
==========

Lsof accepts options to limit, filter, and select its output.
These are the possible criteria:

* Process ID (PID) number -- to list the open files for a given process;

* Process Group ID (PGID) -- to list the open files for all the processes of a given process group;

* User ID number or login name -- to list the open files for all the processes of a given user;

* Internet address -- to list the open files using a given Internet
address (host name), protocol, or port (number or name); or to list all open Internet files;

* command name;

* file descriptor name or number;

* list all open NFS files;

* list all open Unix domain socket files;

* list all uses of a specific file;

* list all open files on a file system.

Selection options are normally ORed -- i.e., an open file meeting any of the criteria is listed. The selection options may be ANDed so that an open file will be listed only if it meets all the criteria.

In the absence of any selection criteria, lsof lists files open to all processes.

Parsing Lsof Output with Another Program
==========

The lsof -F option directs it to produce "field" output that can easily be parsed by another program. The lsof distribution contains

sample awk, perl 4, and perl 5 scripts in its scripts subdirectory
that show how to post-process field output.

Repeat Mode
==========

Lsof can be directed to produce
output, delay for a specified time,
then repeat the output, cycling until stopped by an interrupt or
quit signal. This mode is useful for monitoring the status of some
file operation -- e.g., an ftp transfer or a tape backup operation.

Repeat mode is more efficient when combined with lsof's selection
options, since they limit lsof overhead.

It's possible to use lsof's field output options to supply repeat
mode output to another process for its manipulation. The scripts
subdirectory of the lsof distribution has sample Perl scripts
showing how to consume lsof repeat mode output from a pipe.

Distribution Restrictions
=========================

Lsof may be used and distributed freely, subject to these limitations:

1. Neither the author nor Purdue University is responsible for
any consequences of the use of this software.

2. The origin of this software must not be misrepresented, either
by explicit claim or by omission. Credit to the author and
Purdue University must appear
in documentation and sources.

3. Altered versions must be plainly marked as such, and must not
be misrepresented as being the original software.

4. This notice may not be removed from or altered in the lsof source
files.

Cautions
========

Lsof is a tool that is closely tied to the Unix operating system
version. It uses header files that describe kernel structures and
reads kernel structures that typically change from OS version to

OS version.

DON'T TRY TO USE AN LSOF BINARY, COMPILED FOR ONE UNIX OS VERSION, ON ANOTHER.

On some Unix dialects, notably SunOS and Solaris, lsof versions may be even more restricted by architecture type. An lsof binary, compiled for SunOS 4.1.3 on a sun4c machine, for example, won't work on a sun4m machine.

AN LSOF BINARY, COMPILED FOR ONE SOLARIS 1.X ARCHITECTURE, ISN'T GUARANTEED TO WORK ON A DIFFERENT SOLARIS 1.X ARCHITECTURE.

Distribution Contents
==========

The lsof distribution is checked for completeness when it is constructed
and by the Inventory script when you run the Configure script. (See The Inventory Script section of the 00README file of this distribution.)

Lsof is organized in these parts:

* The main lsof directory, containing common sources, configuration and setup scripts and three subdirectories: dialects/, lib/, and scripts/.

  Lsof is compiled in the main lsof directory after configuration. The selected dialect sources are copied or linked from the specified subdirectory. (Symbolic linking is the standard method.)

  Common lsof definitions may be found in lsof.h; common function prototypes, proto.h; and common storage, store.c.

* The dialects/ subdirectory contains subdirectories with sources specific to UNIX dialect implementations -- e.g., the dialects/sun/ subdirectory contains sources for the SunOS (Solaris 1.x) and Solaris (2.x) implementations of lsof. The dialects subdirectories also
contain Makefiles
  and scripts for assisting dialect source configuration.

  Dialect configuration definitions may be found in dlsof.h; other dialect definitions, dlsof.h; dialect prototypes, dproto.h; and dialect storage, dstore.c.

* The lib/ subdirectory contains sources for common lsof functions. Not all dialects use the functions -- some have their own versions of them. The lib/ functions are enabled and customized with #define's in the dialect machine.h header files.

* The scripts/ subdirectory contains sample scripts for processing lsof field (-F) output. The scripts are written in AWK, Perl 4, and Perl 5.

The 00PORTING file of the lsof distribution has more information on lsof components, configuration, and construction.

Warranty
========

Lsof is provided as-is without any warranty of any kind, either expressed or implied, including, but not limited to, the implied warranties of merchantability
and fitness for a particular purpose.
The entire risk as to the quality and performance of lsof is with you. Should lsof prove defective, you assume the cost of all necessary servicing, repair, or correction.

Bug Reports
===========

Now that the obligatory disclaimer is out of the way, let me hasten to add that I accept lsof bug reports and try hard to respond to them. I will also consider and discuss requests for new features, ports to new dialects, or ports to new OS versions.

PLEASE DON'T SEND A BUG REPORT ABOUT LSOF TO THE UNIX DIALECT VENDOR.

At worst such a bug report will confuse the vendor; at best, the vendor will forward the bug report to me.

Please send all bug reports, requests, etc. to me via email at <abe@purdue.edu>.

The lsof-l Mailing List
=======================

Information about lsof, including notices about the availability
of new revisions, may be found in mailings of the lsof-l listserv.
For more information about it, including instructions on how
 to
subscribe, read the 00LSOF-L file of the lsof distribution.

Version 3 Release Notes
=======================

See 00DIST in the last lsof 3 revision 3.88, for its complete
set of release notes. Lsof revision 3.88 may be found at:

 ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof/OLD

3.0 May 24, 1994
  This is the first official release of lsof 3.

...

3.88 February 17, 1997

  +=====================================+
  | This is the last version 3 revision. |
  +=====================================+

  Added documentation files -- 00.README.FIRST[_<version>]
  and 00RELEASE.SUMMARY_<version> -- to the distribution.

What's new in Version 4
=======================

The main goal of version 4 was to eliminate the confusing common/
fragment source file technique. Changing the version number also
provided an opportunity to restart the numbering, which at 3.88
had risen to a large value.

The sources that appeared in the dialects/common subdirectory of
version 3 in fragment files
 have been incorporated into the version
4 liblsof.a library as *.c files. This results in significant
changes to many source files, scripts, and Makefiles of all dialect
versions. It allows elimination of some source files -- ddev.c,
dfile.c, dmnt.c -- for dialects now obtaining functions from
liblsof.a that formerly came from making dialect source files by
combining fragment files.

The version 4 liblsof.a sources are stored in the lib/ subdirectory
of the main lsof directory. The liblsof.a functions are activated
and conditioned in their source files by values #define'd in the
dialect dlsof.h and machine.h header files.

Dialects that provide a private version of a library function refrain
from #define'ing the symbol that would activate the library function
code.

Version 4 Release Notes
=======================

4.0 February 24, 1997

 +====================================+
 | This is the first lsof 4 revision. |
 +====================================+

 Reorganized sources:
eliminated code fragment files
 and created a library in their place. Modified or
 deleted many dialect source and header files.
 Changed documentation accordingly.

 Added a warning to sgi/Makefile and 00FAQ that advises
 against using the IRIX C compiler -n32 option when
 compiling lsof. Thanks go to Peter Ilieve
 <peter@memex.co.uk> for bringing this to my attention.

 Dropped IRIX 5.2 in mid-stream, because my 5.2 test
 system was upgraded to 5.3.

4.01 March 3, 1997
 Added TFS support for Pyramid dialects.

 Added test to Configure and to the IRIX dnode.c
 for the different cnode struct that appears in
 <cachefs/cachefs_fs.h> on the 6.2 IMPACT distribution.
 Heddy Boubaker <boubaker@amfou.cenatls.cena.dgac.fr>
 alerted me to the cnode change and helped test this
 lsof adjustment.

 Shut down the lsof child process before doing a -r
 sleep(). A comment from Dan Mercer <dam@mmm.com>
 prompted this.

4.02 March 21, 1997

Based on a report from Pasi Kaara
<Pasi.Kaara@atk.tpo.fi>,
disabled HP-UX CCIT support in lsof for HP-UX
versions 10 and above. Pasi's report also led to
changes in the HP-UX machine.h to support use of
gcc to compile lsof for HP-UX 10.20 and warnings
against using `cc -Aa` or `gcc -ansi` to compile
lsof under HP-UX 10.x.

With help from Richard Allen <ra@hp.is> taught
HP-UX 10.x lsof to name file systems better by
using the virtual file system device number. Elias
Halldor Agustsson <elias@rhi.hi.is> provided a test
system.

Changed NEXTSTEP and UNIXWARE Makefiles to use
safer quoting when generating version.h. The change
was suggested by Bob Farmer <ucs_brf@unx1.shsu.edu>.

Added SHELL=/bin/sh string to all Makefiles.

Added support for Linux 2.1.28 on a test system,
kindly provided by Jonathan Sergent <sergent@purdue.edu>.
Configure tests the Linux 2.1.x's C library lseek()
function for proper handling of kernel offsets.
If lseek() appears suspect, Configure activates
the
use of a private lseek() function. Changed
the private nlist() function to nlist_private()
and taught it to use the query_module() syscall in
place of the deprecated get_kernel_syms() one.
Added rudimentary AX.25 support for Pierfrancesco
Caci <ik5pvx@infogroup.it> who helped test it.
Updated the old get_kernel_syms() code to recognize
and skip module name entries.

Prompted by Marty Leisner <leisner@sdsp.mc.xerox.com>,
eased the requirement that service name lookup for
the -i option be accompanied by a protocol name. The
name is not needed if both TCP and UDP names yield the
same port number.

Added xusers.awk script from Dan Mercer <damercer@mmm.com>
to the distribution scripts/ subdirectory.

Changed Configure script to use LSOF_VERS for all
UNIX dialect version numbers and to pass LSOF_VERS

to the dialect Mksrc functions. Also added the
ability for a dialect stanza to declare a different
dialect Makefile source. Modified dialect Mksrc
files
-- e.g., linux and sun -- accordingly.

Added support for BSD/OS 3.0 with help from Jim
Reid <jim@mpn.cp.philips.com>. Terry Kennedy
<TERRY@spcvxa.spc.edu> kindly provided a test
system. During the port corrected a bug that
prevented proper handling of revoked files.

4.03 April 7, 1997
At the suggestion of Dan Mercer <damercer@mmm.com>,
made HP-UX building of lsof aware of differences
between the HP-UX bundled and unbundled C compilers.

Added the ability for the lsof builder to define the
default warning message issuance state. By default the
issuance of warning messages is disabled; defining
WARNINGSTATE in machine.h disables it. The Customize
script was updated to handle WARNINGSTATE. Dan Mercer
suggested this.

Eliminated compiler complaint about improperly cast
get_Nl_value() argument in ncache_load() in lib/rnch.c.

Corrected zeromem() argument error in SCO dproc.c.
Sped up parent directory cache lookup slightly.

Updated for PTX 4.4,
including additional VxFS (EFS)
file system support.

4.04 April 17, 1997
At the suggestion of Bela Lubkin <belal@sco.COM>
changed device cache handling to be more tolerant
of a device cache file whose [cm]times are older
than the ones on /dev or /devices. The change
required adding information to Solaris device cache
file clone lines, so the first time lsof 4.04 is
run under Solaris it will complain about a bad
cached clone device in a previous device cache
file, then regenerate it.

Added boot file path detection for SCO OSR 5 and
above, based on information supplied by Bela.

Fixed two bugs in DEC OSF/1 lsof -- an error in
reporting locks and a missing continue statement
in readdev() after a failure to open a directory.
Jan Ole Suhr <josuhr@informatik.tu-clausthal.de>
reported the second bug and supplied a fix.

Fixed XFS problems with IRIX 6.2 by abandoning the
idea that SGI will distribute XFS header files and
defining an lsof-private xfs_inode
structure. John
Paul Morrison <John.Paul.Morrison@MultiActive.com>
helped develop and test the 5.3 definition. John
R. Vanderpool <fish@daacdev1.gsfc.nasa.gov> helped
develop and test the 6.2 definition.

Remove obsolete comments about common/*.frag files.

Updated Linux lsof for Linux version 2.1.35.

4.04 April 18, 1997
Supplement Regenerated the 4.04 distribution to correct a non-
device-cache #define misplacement in the Solaris and
SunOS dlsof.h. Alexandre Oliva <oliva@dcc.unicamp.br>
reported the problem.

4.05 April 24, 1997
Corrected an error in 00DCACHE.

Made sure SCO /etc/ps/booted.systems is closed.

Based on an observation by Bela Lubkin <belal@sco.COM>
that the lsof child had needless file descriptors
open, closed all but the open pipes between the
lsof parent and child.

Decommissioned CDC EP/IX support; I no longer have a
test system.

Based on a suggestion from Patrick Connor
<connor@phreak.csd.sgi.com>, added -xansi to
CFLAGS
for IRIX 5.3 and 6.[234].

Also at Patrick's suggestion changed Configure to
propagate exact SunOS 4.1.x version to the main
and library Makefiles. This allowed the sunos413
and sunos413cc Configure abbreviations to be
shortened to sunos and sunoscc.

Updated obsolete argument uses (-H changed to -n)
in count_pf.perl* and watch_a_file.perl scripts.

Adjusted Solaris 2.6 lsof for Beta_Update with tips
from Casper Dik <casper@holland.Sun.COM>.

Fixed a Solaris 2.4 TCP address reporting bug.

4.06 April 30, 1997
Added a step to the Makefile clean rules that does
a make clean in the lib subdirectory; suggested by
Casper Dik <casper@holland.Sun.COM>. (Configure's
-clean argument already did this.)

Fixed an incorrect awk argument in the sunos*)
Configure stanza, reported by Alexandre Oliva
<oliva@dcc.unicamp.br>.

Added CD9660 (aka ISO) file system support to
FreeBSD, NetBSD, and OpenBSD with mods and help
from Kenneth Stailey <kstailey@disclosure.com>.
(BSDI
already had CD9660 support.) While at it,
added file descriptor system support to BSDI and
FreeBSD.

Added /kern file system support to OpenBSD. The
support wasn't extended to BSDI, FreeBSD, or NetBSD,
because it requires Kenneth Stailey's changes to
/sys/miscfs/kernfs/kernfs.h.

Updated IRIX 6.3 support after getting access to
a test system, provided by John Paul Morrison
<John.Paul.Morrison@MultiActive.com>. Improved
the handling of IRIX 5.1 and greater FIFOs.

4.07 May 12, 1997
Based on AIX problem reports from David Capshaw
<David.Capshaw@SEMATECH.Org>, changed the aix*
Configure script stanza to avoid -bnolibpath for
gcc (which the GNU loader doesn't grok) and AIX
below 4.1.4 (where -bnolibpath hasn't been tested
or is known to be unimplemented), and to refuse to
use gcc for compiling lsof in AIX versions below
4.1 (because of possible structure alignment
problems). Updated 00FAQ appropriately.

Added OpenBSD support
for EXT2FS. This support
has yet to be tested.

Tested lsof under OpenBSD 2.1.

Activated /kern file system support for NetBSD when
Configure senses that /sys/miscfs/kernfs/kernfs.h
defines the kern_target structure. This support
has not been tested under NetBSD, although it has
been tested under OpenBSD.

Made some simple changes to the BSDI machine.h,
suggested by Jeffrey C. Honig <jch@bsdi.com>.

Improved handling of alternate dialect Configure
abbreviations -- aix and aixgcc, hpux and hpuxgcc,
solaris and solariscc, and sunos and sunoscc.

4.08 May 23, 1997
Cleaned up dialect Makefile's, staring with a suggestion
from Christopher Schanzle <chris@cam.nist.gov>.

Improved Configure's -clean processing.

Corrected bugs in Solaris lock reporting.

Changed NetBSD Configure stanza to put -I/usr/include
before -I/sys.

4.09 June 1, 1997
Adjusted for latest FreeBSD 3.0 release. This
required adding a new kernel name cache module for
reading
BSD-form hashed kernel name cache entries,
rnmh.c, to the lsof library, and adding a #define
to each machine.h to select it.

Activated rnmh.c for BSDI 2.1, BSDI 3.0, NetBSD
1.2, and OpenBSD 2.1.

4.10 June 8, 1997
Adjusted for Linux 2.1.x (x > 35) kernels with
hashed task structure pointers. Marty Leisner
<leisner@sdsp.mc.xerox.com> and Jonathan Sergent
<sergent@io.com> tested the adjustment.

Replaced readdev() stat() calls with lstat() to

reduce device table and cache entries with the same
device number and inode values. Added code to
remove all remaining duplicates. This fixes a
Linux problem reported by Jonathan Sergent and
makes device node name output predictable.

Corrected a bug in UnixWare stream file handling
that prevented searching for the stream file by
its associated character device name.

Added Pyramid code to determine Reliant UNIX clone
major device number differently from that of DC/OSx.

4.11 June 12, 1997
Changed Configure
to sense that the PTX inp_[fl]addr
members of the inpcb structure of <netinet/in_pcb.h>
have a struct type and set HASINADDRSTR for use in
PTX dnode.c and dsock.c tests.

Changed PTX version 4.1.4 tests to use 4.1.3 instead.
Carson Wilson <carson@mcs.com> reported the need
to do this and tested the change.

Fixed a block device table indexing bug in lib/rdev.c,
reported by Carson Wilson. The same bug was squashed
in pyramid/ddev.c.

Added code to the Pyramid Reliant UNIX kread()
function to compensate for an address boundary
error in the kernel's /dev/kmem driver.

Verified that lsof compiles and works under AIX
4.2.1. Added an AIX test for the presence of NFS
header files, defined HAS_NFS and adjusted AIX
dialect sources accordingly.

Based on a suggestion from Gaylord Holder
<holder@phy.ucsf.EDU>, added DEC OSF/1 code to
auto-detect the booted file, whence kernel symbol
addresses are obtained.

4.12 June 24, 1997
Corrected a device
number sign extension problem
in the reading and writing of device cache file.
The problem was reported by Bela Lubkin <belal@sco.com>
and he suggested a fix.

Fixed an SCO stream device lookup problem. The
report and solution came from Bela Lubkin

Enhanced the Configure script to enable cross-
configuration of lsof, based on suggestions from
Marty Leisner <leisner@sdsp.mc.xerox.com>. A new
documentation file, 00XCONFIG, describes the process.

Made Pyramid OBJFS support conditional on the
presence of supporting header files. Corrected
the Pyramid MkKernOpts script so it generates the
necessary -D's for the Nile/Jolt architecture.
Richard Coley <rcoley@pyra.co.uk> helped.

Added another IRIX xfs_inode variant for 6.2, 32
bits, no XFS rollup patch.

Tested under UnixWare 2.1.2.

4.13 July 9, 1997
Taught Pyramid lsof to grok ttyfs vnodes with help
from Richard Coley <rcoley@pyra.co.uk>. Fixed some
minor bugs in Pyramid FIFO reporting. Eliminated
use
of the Pyramid UCB compatibility library at
Richard's suggestion.

Eliminated reporting of "strange" inode numbers
for SCO OSR 3.2v5.0.x HPPS files with help from
Bela Lubkin <belal@sco.com>

Modified port to service name lookup to use a small
number of getservbyport() calls before reading the
entire map with getservent(). Changed port reporting
to represent a zero as `*' to be consistent with
other prt number reporting tools like netstat.
Casper Dik <casper@holland.Sun.COM> suggested these
changes -- the getserv*() one to improve performance
for large NIS service name maps.

Changed all readdev() functions to make the absence
of block devices a warning instead of a fatal error
after Brian Redman <ber@ms.com> reported his IRIX
6.4 system had no block devices. (It really did
have block devices, but readdev()'s lstat() use
caused it to miss them in a directory symbolically
linked from /dev/dsk->/hw/disk.) Fixed Brian's

real problem by
changing the IRIX readdev() to use
stat() on /dev nodes if a Configure test shows /hw
is readable. Extended the potential to do the same
to all readdev() functions.

For consistency and convenience changed some
Configure abbreviations and dialect subdirectory
names: "decosf" abbreviation and "osf" dialect
subdirectory name to "du"; "netbsd" dialect
subdirectory name to "n+obsd"; "next3" abbreviation
and "next" dialect subdirectory name to "ns"; "sco"
abbreviation and dialect subdirectory name to "osr";
"sgi" dialect subdirectory name to "irix"; and
"unixware" abbreviation and dialect subdirectory
name to "uw".

Added #if/#endif clauses to the AIX rmdupdev()
function to avoid clone processing for AIX versions
less than 4.1.4. The problem was reported by Toralf
Foerster <toralf.foerster@io-warnemuende.de>, who
supplied corrective code.

Added support for new style NetBSD inode with i_ffs
and i_e2fs union members.

Improved Configure and 00FAQ
information on Digital
UNIX configuration subdirectory with suggestions
from Brad Krebs <brad@EECS.Berkeley.EDU>.

4.14 July 22, 1997
Reorganized the Solaris handling of the inode
structure header file, ufs_inode.h, to eliminate
VxFS structure definition conflicts for Solaris
2.4, based on information from Greg Earle
<earle@netbsd4me.jpl.nasa.gov>.

Cleaned up some typos and confusion in Configure's
help output, based on comments from Bela Lubkin
<belal@sco.com>

Added a 00DIALECTS file, containing UNIX dialect
version numbers, that can be used by Configure and
the man page.

4.15 August 15, 1997
Aligned `Configure -help` output better. Removed

Configure's 2.6 Beta test adjustments.

Added improved Solaris VxFS configuration and handling, based on information from Greg Earle <earle@netbsd4me.jpl.nasa.gov>.

Added socket state -- TCO or TPI -- for socket files at the suggestion of Ian Fitchet <I.D.Fitchet@ftel.co.uk>.

4.16 September 25, 1997

Added reporting of TCP/TPI queue lengths and window sizes ala netstat to NAME column. Added -T option to select or de-select TCP/TPI info reporting. (Window sizes are only reported for Solaris.) Fixed anomalies along the way in SIZE/OFF processing for some dialects.

Fixed service name argument processor to allow minus signs as part of the name. Consequently this disallows names with embedded minus signs from being specified as the start of a range.

Added 00FAQ entries explaining why lsof won't find a file being edited with vi, why window sizes aren't reported for all dialects, and what the "no more information" message means.

Forced Pyramid CC to be /usr/ccs/bin/cc to avoid accidental use of the BSD variant in /usr/ucb/cc.

Added support for Linux glibc2, including a Configure test; cross-Configure support (00XCONFIG); and much unfortunate and risky sleight-of-hand in lsof Linux dialect header and source files, forced upon lsof by incompatibilities between Linux kernel and glibc2 header files.

Included in scripts/identd.perl5 a Perl 5 implementation of an identd server, using lsof, provided by Kapil Chowksey <kchowksey@hss.hns.com>.

Updated IRIX 6.4 xfs_inode guess.

4.17 October 14, 1997

Added -V option for verbose search result reporting.

Verbose reports are prepared for failure to locate
file names, command names, Internet addresses or
files, login names, NFS files, PIDs, PGIDs, and UIDs.

Augmented Linux NFS file test to cope with kernels
whose NFS code is in a loadable module. Need for
the test was pointed out by Jonathan Sergent
<sergent@csociety.ecn.purdue.edu>. The change
required that Linux have private dmnt.c source,

Completed a Linux 2.1.57 port on a system provided
by Jonathan Sergent.

4.18 October 25, 1997
Eliminated memory leaks in alloc_lfile(), lkup_port(),
and NEXTSTEP's process_text() function.

Added recognition of OpenBSD 2.2 in Configure,
supplied
by Kenneth Stailey <kstailey@disclosure.com>.

Consolidated print_file() functions to use the one
in lib/prtf.c. Made it configurable and changed
it to size print columns dynamically.

!!! WARNING !!!

WITH DYNAMICALLY SIZED PRINT COLUMNS LSOF 4.18
PRODUCES OUTPUT SIGNIFICANTLY DIFFERENT FROM THAT
OF PREVIOUS REVISIONS. LINES ARE GENERALLY SHORTER
AND THERE IS GENERALLY LESS BLANK SPACE BETWEEN
COLUMNS AND THE ITEMS IN THEM. THERE ARE NO LONGER
ANY SPACES BETWEEN DEVICE NUMBER ELEMENTS, ONLY
COMMAS.

!!! WARNING !!!

Added special types and print specification modifiers
for file size and offset to handle UNIX dialects
with 64 bit sizes and offsets. Paul Eggert
<eggert@twinsun.com> reported the need for this
addition.

With Paul Eggert's help picked lint from the lsof
library, the main level lsof sources, and the Sun
dialect sources.

Added documentation, including the file 00LSOF-L,

about the lsof-l LISTSERV.

Added support for Reliant
UNIX on the RM600. Bob
Passarella <rmpassar@pyramid.com> supplied the
changes. Kevin Smith <kevin@pyramid.com> helped
arrange test systems. While incorporating Bob's
changes, modified lib/rnch.c to handle kernel ncache
structs whose name is accessed via a char *, rather
than in a char array.

Changed #include order of <sys/socketvar.h> for
Solaris 2.x. W. Richard Stevens <rstevens@kohala.com>
pointed out the need to do this.

4.19 October 30, 1997
Changed Pyramid Reliant RM600 proc scan to skip
SSYS (p_flag) processes, since they don't seem to
have a readable u_cdir vnode.

Enabled Pyramid Reliant UNIX kread() work-around
for DC/OSx, too, since its read(/dev/kmem) kernel
driver seems to share the page boundary bug this
work-around circumvents.

Changed SzOffFtm_d and SzOffFtm_dv (new formats at
4.18 to print size and offset) from signed to
unsigned. Setting them signed at 4.18 was an
oversight.

Plugged a memory leak that caused the loss
of 130
bytes per repeat-mode pass. Fixed it with a simple
work-around in main(). Lionel Cons <Lionel.Cons@cern.ch>
reported the leak.

4.20 November 11, 1997
Tested under BSDI 3.1.

Added support for Reliant UNIX Mesh IPC files with
help from Billy Ho <bho@pyramid.com>.

Added support to Digital UNIX lsof that uses the
libmsfs tag_to_path() function (when it exists) to
look up AdvFS path names. The idea and sample code
came from Dean Brock <brock@cs.unca.edu>. Converted
Dean's code into more general purpose support for
private name cache lookups via the HASPRIVNMCACHE

#define in the dialect machine.h file and code
conditional on it in the printname() function.

Taught Digital UNIX lsof to recognize NFS3 file
systems. Corrected Digital UNIX lsof DEVICE column
alignment.

4.21 December 1, 1997
Squashed bug, introduced at revision 4.18, that
resulted in double reporting of each selected PID
when terse mode (-t) was specified.

Corrected minor
bug, also introduced at 4.18, that
might cause an extra print_proc() pass when one
PID has been specified.

Added -R to lsof options in scripts/idrlogin.perl*.
The option should have been there -- it was supposed
to be mandatory for PGID reporting -- but a bug,
corrected in revision 4.18, previously made -R
unnecessary.

Enabled configuring for BSDI BSD/OS 4.0 per a
suggestion from Jeff Honig <jch@bsdi.com>.

Enabled replacement of scoff_t with off64_t (scoff_t
is used to type r_size and r_localsize in the rnode
struct) for IRIX 5.3 systems that have the NFS
kernel rollup patch (1477). This compensates for
SGI's failure to distribute an updated <sys/fs/rnode.h>
with their patch.

Validated under Linux 2.0.3[12], Linux 2.1.64, and
NetBSD 1.3.

Added FreeBSD root directory reporting, courtesy
of Dan Nelson <dnelson@emsphone.com>.

4.22 December 15, 1997
Made adjustments for Linux 2.1.7[02].

Improved NAME information for Linux UNIX domain
sockets.

Added
option +|-M to control the reporting of
portmapper registration information in square

brackets after the TCP or UDP port or service name.
Kenneth Stailey <kstailey@disclosure.com> suggested
the feature and provided sample code from OpenBSD.
Reporting is disabled by default in the distribution
and may be enabled with +M; if lsof is compiled
with HASPMAPENABLED (e.g., from machine.h), reporting
will be enabled by default and can be disabled with
-M.

Changed the -w option to +|-w to match the syntax
of the +|-M option and to eliminate any options
that flip meaning when a symbol is defined at
compile time. For both +|-M and +|-w, specifying
`-' when the default state is disabled or specifying
`+' when the default state is enabled causes no
problems.

!!!WARNING The -w option has changed in lsof 4.22. WARNING!!!

Made the +|- prefix legal for most options, but
didn't document it in the man page or help panel.
Most options that disable
something -- e.g., -b,
-C, -n, -P -- now disable when the prefix is `-'
and enable when it is `+'. Since the states these
options disable are enabled by default, I chose to
avoid documentation complexity and confusion by
not mentioning that they can be used with the `+'
prefix.

Condensed the help panel.

Made sure Digital UNIX Configure stanza puts normal
include path (e.g., /usr/include) before system
include paths.

Added IPX socket information reporting to Linux
with help from Jonathan Sergent <sergent@purdue.edu>.

4.23 January 16, 1998
Fixed conflict arising from the quondam replacement
of the Sun Solaris <netdb.h> with a BIND/BSD version.

With help from Jonathan Sergent <sergent@purdue.edu>
developed a /proc file system based Linux lsof.
It needs some Linux 2.1.x release to work -- I'm
not sure which, but I tested under 2.1.72, 2.1.76,
and 2.1.79. The Configure script selects special

sources for this lsof, so the full lsof distribution
now
contains both /dev/kmem and /proc based sources
for Linux lsof. An optional kernel mod, written
by Jonathan, enhances the /proc-based lsof ability
to recognize IPX socket files. Reorganized and
augmented the Linux sections in 00FAQ to explain
the two types of Linux lsof.

Defined DOSTAT_FUNCTION for dostat() in misc.c to
select the function, stat() or lstat(), it will use.
DOSTAT_FUNCTION is normally undefined, defaults to
lstat(), and is only defined for the /proc-based
Linux lsof in its dlsof.h.

Made conditional on the presence of IRIX 6.4 XFS
rollup patch #6 an XFS node change introduced in
revision 4.16. Identified the patch with help
from John R. Vanderpool <fish@daacdev1.gsfc.nasa.gov>.

Added NFS node compensation for NetBSD 1.3. The
code and suggestion for it was supplied by Jean-Luc
Richier <richier@imag.fr>.

Added diagnostic messages to the /dev/kmem-based
Linux Mksrc script to report errors during the
construction of
the kernel name cache header file,
kncache.h. Added 00FAQ information on kncache.h.

Added a new Linux test host, running 2.0.33 and
GlibC, provided by Steve Logue <stevel@mail.cdsnet.net>.

Ported to PTX 4.1.3 and 4.4.2. Adjusted lib/rnch.c
for 4.4.2 to allow customization f additional ncache
struct element names.

4.24 January 28, 1998
Changed /proc-based Linux lsof offset test to use "/"
instead of "/etc/passwd".

To assist Jim Mintha <jim@geog.ubc.ca> with the
packaging of lsof for Debian Linux, added a
DEBIAN_LINUX_LSOF #define to trigger the activation
of special system map file location code in the
/dev/kmem-based dproc.c.

Applied modification to dialects/bsdi/dlsof.h from

Ingimar Robertson <iar@skyrr.is>, enabling lsof to
compile for BSDI BSD/OS 2.0.

Corrected a documentation error in 00DCACHE, pointed
out by Thomas Anders <anders@hmi.de>. The error was
created when the -V option was added at lsof 4.17.

Made IRIX 5.3 through 6.3 lsof
aware of IRIX SCSI
tape devices (e.g., /dev/tape). Dave Olson of SGI
and Randolph J. Herber of FNAL provided valuable
advice, and Igor Schein <ischein@air-boston.com>
helped test.

Added a machine.h symbol (NEVER_HASDCACHE) that
prevents Customize from offering to change HASDCACHE.
The symbol may appear anywhere in machine.h --
e.g., in a comment. Included the symbol in a
comment of the HASDCACHE section of the /proc-based
Linux lsof machine.h, and accompanied it with
warnings against #define'ing HASDCACHE. Did the
same thing for WARNDEVACCESS (NEVER_WARNDEVACCESS
is the suppressant.)

4.25 February 7, 1998
Corrected an IRIX mis-cast of file offset (position).
Igor Schein <ischein@air-boston.com> reported the
problem. This was offered as a patch to 4.24.
Picked some lint Igor pointed out.

At Igor's suggestion added an optional decimal
digit size argument to the -o option. This argument
specifies how many file offset decimal digits can
follow
"0t" before lsof switches to a "0x..." form.
The argument size specification doesn't count the
two characters of the "0t". A size of 0 means
unlimited. The default is OFFDECDIG (8), preserving
compatibility with existing lsof output; it can be
changed by the lsof builder. When size is specified
with -o it does not force offset display; -o without
a size still must be used to do that.

Added an IRIX 6.2, 32 bit system, XFS node patch,
courtesy of Ulrich Bernhard <rzubu@rzu.unizh.ch>.

For my own convenience enabled Configure to use
/usr/local/bin/gcc for NEXTSTEP. This allows

circumvention of a gcc 2.8.0 ranlib problem on
my test 3.1 `040 cube.

Added flags recommended by the RISC/os and Ultrix
compilers for the updated (and longer) main.c.

Updated FreeBSD cd9660_node.h Configure test.

4.26 February 17, 1998
Added shared process group processing for IRIX 5.3,
and IRIX 6.1 and above, based on investigation of
a bug report from Igor Schein
<ischein@air-boston.com>.
Igor helped test this addition.

Improved handling of file system name arguments.
It's now done in a manner similar to fuser. The
-f argument forces path names to be considered as
simple files, rather than as file system names.
The +f flag forces them to be considered as file
system names. Normally path arguments are considered
file system names when they match a mounted-on
directory in the system's mount table, or when they
match a mounted file system's block device. Igor
Schein helped test this change.

Igor also suggests that the proper compilation of
the IRIX 6.4 proc structure after patch 2536 has
been installed may need -DPIOMEMOPS. So lsof's
MkKernOpts script was updated to propagate that
option from CCOPTS in /var/sysgen/system/irix.sm,
even though patch 2536 doesn't add -DPIOMEMOPS to
it. Added a 00FAQ item on this patch.

Added a fatal warning message about names forced
to be file system names (with +f)
that have no
match in the mount table.

Improved the -V message for files and file systems
for which no open files were found. Added reporting
of /proc file and file system search failures.

Did some code reorganization to combine the multiple
ck_file_arg() functions into one. Moved the new
function from the library to the top level and put
it in arg.c; moved the usage function from arg.c
to a new top-level source file, usage.c, to balance

top-level source file size. The new usage.c depends
on version.h; arg.c no longer does.

Added flag recommended by the DU compiler for the
updated (and longer) main.c.

4.27 March 6, 1998
At the request of Igor Schein <ischein@air-boston.com>
added a conditional repeat mode option, using the
`+' prefix to the `r' option. +r operates as does
-r with the exception that it exits the first time
no open files have been listed during a cycle.
The exit code will be zero when any open files have
been listed; one,
if none were ever listed.

Ported lsof to HP-UX 11.0 with the help of Richard
Allen. This port hasn't been tested on a 64 bit
kernel; I'm sure it won't work there without more
mods. It may not work on PA 2 architectures; I've
only tested it under PA 1 and a separate, busy
tester reported PA 2 problems that I've been unable
to investigate.

In anticipation of getting access to a 64 bit HP-UX
kernel and the pending start of the Solaris 2.7
Beta test (It will have 64 bit kernel addressing.),
started adding support for 64 bit kernel pointers.
This includes: ubiquitous use of the KA_T cast
for kernel pointers; a format to print them,
KA_T_FMT_X; a function to print them, print_kptr();
and modifications to most kernel-related functions
-- e.g., process_file(), process_node(),
process_socket(), readvfs() -- to process kernel
addresses as KA_T types.

Fixed minor bug in handling path name arguments
that end with a `/'.

Removed support for RISC/os;
its test system is no
longer available.

Made modifications to insure that lsof output
doesn't contain non-printable characters. All such
characters are now printed in the printf form
"\x%02x". Several new common functions were
installed in misc.c to support "safe" printing.

This second major modification in 4.27 to common
and dialect code could have introduced bugs not
yet detected.

4.28 March 10, 1998
Refined unprintable format to use \b, \f, \r, \n,
\t, and ^* (for CTRL) forms. Corrected omission
of safestrprt() use for field output command name.
These changes were offered as patches to 4.27.

Made space an unprintable character (\x20) in the
COMMAND column; printable elsewhere, including the
NAME column, field output, and error messages.

Made sure FD column is parseable as a single entity
-- i.e., has no embedded space. Thus, if the access
mode is unknown but there is a known lock mode, (a
very rare case) the access mode will be printed
as
`-'.

Picked lint with gcc 2.8.0 under Solaris 2.6.

With the help of Dave Olson of SGI identified a
proc struct element that should have been added to
<sys/proc.h> by IRIX 6.4 patch 2536. Added a
work-around for it to the lsof Configure script.
Igor Schein <ischein@air-boston.com> identified
that the patch caused a proc structure length
complaint from lsof. Removed an obsolete 00FAQ
item on the patch, installed at lsof 4.26, explaining
that no solution was yet available.

Added a 00FAQ item on how BIND installs its own
header files, including <netdb.h>, which may cause
the rpcent struct definition to vanish. Solaris
has an automatic lsof work-around, but that hasn't
been (and probably can't be) propagated to all
dialects supported by lsof. The 00FAQ item recommends
re-installation of the vendor header files that
BIND has replaced. (Others include <rpcent.h>,
<sys/bitypes.h>, and <sys/ctypes.h>.)

Made AIX AFS fixes.

4.29 March 26,
1998
Corrected bug in Internet address matching. The

matching formerly stopped if the foreign address matched, thus failing to check the local address for a match. That led to a possible false "Internet address not located" warning (i.e., in response to -V) about the local address, when both foreign and local addresses were specified with -i. This correction was offered as a patch to 4.28.

Changed readmnt() usage in an attempt to defer mount readlink() and stat() delays until they are necessary.

Corrected two bugs in the Digital UNIX readdev() function. Made the correction available as a patch to 4.28 and regenerated the 4.28 DU binaries.

Added a missing argument to a print-kptr() call in the HP-UX dsock.c. The missing argument causes a fatal gcc error. The problem was reported by Eyal Shaynis <eyal.shaynis@telrad.co.il>. The fix was offered as a 4.28 patch.

Adjusted for Digital UNIX 4.0D; the spec_node structure is now defined in <sys/specdev.h>. Kris Chandrasekhar <Kris.Chandrasekhar@digital.com> identified the need for the adjustment.

Incorporated a bug fix from Brian McAllister <mcallister@mit.edu> to the DU readmnt() function. This fix was offered as a patch to 4.28.

Added "safe" printing to a SunOS clone device error message.

Corrected bug in tabling of Linux /proc-based lock info.

Corrected bug in handling of SunOS TLI streams. Dan Farmer <zen@trouble.org> reported the problem.

Added a Solaris 2.6 work-around to keep the BIND <sys/bitypes.h> from colliding with the Solaris <sys/int_types.h>.

Strengthened the Configure test for /proc-based Linux lsof, based on a report from Marty Leisner <leisner@sdsp.mc.xerox.com>.

Tested on OpenBSD 2.3.

Made AIX changes that allow use with 3.2.5. The changes were suggested and tested by Brett Hogden <hogden@rge.com>.

Added Solaris 2.6 AFS support. Disabled reporting of some node numbers for Solaris 2.5 and above open AFS
files. The node number computation algorithms used for SunOS 4.1.x and Solaris less than 2.5 no longer always work under Solaris 2.5 and above.

4.30 April 9, 1998

Corrected a pid structure member naming error for UnixWare < 2.1.2. The problem was reported by Richard van Meurs <vanmeurs.anva@atriserv.nl>. He supplied the correction. This was offered as a patch to 4.29.

Had a report from Igor Schein <ischein@air-boston.com> that IRIX 6.4 patch 2839 is another SGI kernel patch, along with 2536, that changes the size of the proc structure in the kernel without changing the proc structure in <sys/proc.h>. Upon further investigation found that the effect of these patches on the proc structure is not consistent. Therefore, dropped the Configure patch test for IRIX 6.4 and made the code in irix/dproc.c slightly more tolerant of proc structure size differences for IRIX 6.4. Igor help test the change.

Corrected Solaris >= 2.5 AFS inode number generation.
Craig Everhart <Craig_Everhart@transarc.com> helped find the cause of the problem. This was offered as a patch to 4.29.

Refined the Linux /dev/kmem-based glibc evasion for the timeval structure to make it work with glibc version 2.0.7. This required defining a new global symbol, TIMEVAL_LSOF, default timeval, that the /dev/kmem-based Linux lsof can set to its private glibc timeval name, distinct from the kernel timeval name.

Added support for Alpha to the /dev/kmem-based

Linux lsof. Alexandre Oliva <oliva@dcc.unicamp.br>
provided a test system. Added an item to 00FAQ
about lsof, the Alpha processor, and Linux.

Added a 00FAQ item about lsof year 2000 compliance.
Basically it says lsof is probably compliant,
because its only date or time computations are done
with time_t values, but I haven't done any specific
Y2K validation. I don't have plans to do any.

Added support for UnixWare 7. Chris Daniels
<chrisd@dlpco.com> provided
a test system and Don
Draper <dond@sco.COM> provided technical information.
Added BFS and SFS file system support to lsof for
UW 2.1.[12] and 7.

Updated Solaris VxFS support for VxFS 3.2.1. Greg
Earle <earle@netbsd4me.jpl.nasa.gov> reported the
need for the update. Greg and Roger Klorese
<rogerk@veritas.com> provided technical information.
Scott McClung <mcclung@primenet.com> tested.

Changed IRIX XFS patch detection in anticipation of
learning there are multiple XFS patches for IRIX 6.4
that require different versions of the lsof-invented
xfs_inode structure.

4.31 April 21, 1998
Added a VxFS #if/#endif wrap to a section of the
HP-UX dnode.c that wasn't properly protected. The
problem was reported by Peter Klosky <PKlosky@bdm.com>.
This was offered as a patch to 4.30.

Added support for Solaris 2.7 (first Beta release).
Mike Sullivan <Mike.Sullivan@Eng.Sun.COM> provided
technical advice and helped test. Charles Stephens
<cfs@jurassic.eng.Sun.COM>
also helped test.

Fixed bug in /proc-based Linux that caused it to
access /proc/mounts excessively. Marty Leisner
<leisner@sdsp.mc.xerox.com> provided a syscall
trace that identified the bug. The fix was offered
as a patch to 4.30.

Adjusted the IRIX 6.4 private structure definition
for the XFS node to accommodate patch 2970. Igor

Schein <ischein@air-boston.com> identified the
patch and the required adjustment.

4.32 May 11, 1998
Corrected Solaris 2.7 code for reporting PCFS
(floppy disk) node numbers. Casper Dik
<casper@holland.sun.com> supplied the fix. The
fix was offered as a patch to 4.31.

Corrected a bug in conditional repeat mode handling
pointed out by Igor Schein <ischein@air-boston.com>.
This was offered as a patch to 4.31.

Improved reporting of AIX open(/dev/memory device)
errors.

Corrected a Solaris < 2.5 KA_T declaration error,
pointed out by Robert Kiessling <robert@easynet.de>.
Changed KA_T from a #define
to a typedef for all
dialects to prevent future problems of this kind.

Changed the sample Perl 5 script big_brother.perl5
to report a four digit year from localtime().

Added support for AIX 4.3[.1]. Bill Pemberton
<wfp5p@tigger.itc.virginia.edu> provided a test
system. Andrew Kephart <akephart@austin.ibm.com>
and Tom Weaver <tvweaver@austin.ibm.com> provided
technical assistance. Niklas Edmundsson
<nikke@ing.umu.se> did 4.3.1 testing.

Added -qmaxmem option to CFLAGs for an AIX compilation
with an xlc version 4.x compiler.

Adjusted Linux socket handling for changes in the
AX25 members of the sock struct. Richard Green
<rtg@tir.com> pointed out the problem. Tested
/dev/kmem-based lsof under Linux 2.0.34.

4.33 May 22, 1998
Added generic IPv6 support to common lsof sources
and specific IPv6 support to AIX sources. Andrew
Kephart <akephart@austin.ibm.com> supplied the
additions and helped with testing. Bill Pemberton
<wfp5p@tigger.itc.virginia.edu>
provided a test
system. The modification affected sources for

every dialect, whether it supports IPv6 or not, by changing the interfaces to the common Internet address function ent_inaddr().

Added support for the NetBSD UVM virtual memory system. Paul Kranenburg <pk@cs.few.eur.nl> supplied technical details.

Bracketed HP-UX 11 use of <sys/spinlock.h> with #if/#endif _KERNEL.

Corrected printing of PCB address in DEVICE column for IRIX.

4.34 June 26, 1998

Updated 00FAQ to discuss TCP and UDP ports private to the AIX kernel and 00README to describe how ACLs can be used to give lsof permission to read the kernel memory devices. Add information to 00FAQ and 00README about other OpenBSD architectures where lsof is reported to compile and run. Added section to 00FAQ discussing how an incorrect loader path environment variable value can prevent lsof from loading correctly.

Improved Solaris namefs and doorfs support so that it
is now possible to search for an open VDOOR file by the path name of its fattached file system object. Igor Schein <igor@txc.com> requested the ability to do such a search. Even with the change, lsof can't always identify path names for open VDOOR files.

Also at Igor's request, improved reporting of information on open Solaris VCHR files that share a common vnode, and Solaris UNIX domain socket files.

Corrected print_kptr() argument error in PTX dnode.c, reported by Mark Price <mprice@sequent.com>. Compensated for ncache element naming differences, introduced at PTX 4.4.2; Kurtis D. Rader <krader@sequent.com> reported the problem.

Changed output column title from INODE to NODE to better reflect the column's contents of node IDs for more than just inodes.

Improved Configuration and processing for Solaris
AFS. Corrected AIX AFS 3.4 afs_rwlock_t simulation.

Corrected a cast problem with two AIX knlist()
calls, thus quieting an AIX 4.2.1 compiler
argument
type warning. Jon Champlin <champlin@us.ibm.com>
reported the problem.

Added support to most dialect versions (exception:
/proc-based Linux) to warn when the identity of
the kernel where lsof was compiled doesn't match
the running identity. The warning can be suppressed
with -w. Note: determining AIX state requires
calling oslevel, a potentially slow operation.
Jon Champlin <champlin@us.ibm.com> suggested this
addition.

!!!! WARNING !!!! !!!! WARNING !!!! !!!! WARNING !!!!

Those using the lsof cross-configuration capability
(see 00XCONFIG), should be aware that the kernel
identity test feature introduces two new basic
cross configuration environment variables, LSOF_ARCH
and LSOF_VSTR.

!!!! WARNING !!!! !!!! WARNING !!!! !!!! WARNING !!!!

Identified a situation where a Solaris UNIX domain
socket name is known and can be searched for by
name; added the necessary code.

4.35 July 17, 1998
Made the kernel identity
check an option with the
HASKERNIDCK #define in machine.h. Enabled altering
of HASKERNIDCK with the Customize script. Added
a clause to the help output that indicates the
build-time HASKERNIDCK status.

Added more information to the NAME column for
Solaris UNIX domain sockets. Made them searchable
by their clone device path name. Igor Schein
<igor@txc.com> requested this.

Completed the HP-UX 11 port with support for its
optional 64 bit kernel. Rich Rauenzahn

<rrauenza@cup.hp.com> provided a test system.
Corrected errors with HP-UX 11 lock reporting and
private kernel structure and type definitions.
Added support for HP-UX NFS3 files.

Limited mount table warnings -- e.g., when -b is
used -- to one set per mount point.

Fixed some mount table scanning and usage bugs,
including one in Solaris, reported by Kjetil Torgrim
Homme <kjetilho@ifi.uio.no>.

4.36 August 4, 1998
Made corrections and additions to IPv6 support and
to AF_ROUTE socket
handling, supplied by Jean-Luc
Richier <Jean-Luc.Richier@imag.fr>. Jean-Luc's
additions provide IPv6 support for the Inria IPv6
implementations on FreeBSD and NetBSD.

Fixed two Solaris 2.5, 2.5.1, 2.6 and 2.7 TCP and
UDP host name or IP address reporting bugs, reported
by James Mathiesen <James-Mathiesen@deshaw.com>.
This fix was offered as a patch to 4.35.

Updated the Customize script to cause ENTER to use
all defaults. Amir J. Katz <amir@ndsoft.com>
suggested this and helped test the changes.

Updated Solaris ICMP and IP stream handling, based
on a report from Igor Schein <igor@txc.com>.

Fixed a bug in the Digital UNIX mount table handling,
reported by Bob Ward <bward@thehartford.com>.
While working on the bug, found and updated some
obsolete AdvFS code. This fix was offered as a
patch to 4.35.

4.37 September 15, 1998
Deactivated SGI IRIX support and archived revision
4.36 sources and binaries in pub/tools/unix/lsof/OLD.

Improved performance
of FD searching. This was
offered as a patch to 4.36.

Amir J. Katz <amir@ndsoft.com> pointed out that
ranlib isn't needed for AIX or Solaris. Made

appropriate Configure script changes.

Fixed a file offset reporting bug for HP-UX VCHR and VBLK device nodes located on a VxFS root. Doug Siebert <douglas-siebert@iowa.edu> reported the bug. The fix was offered as a patch to 4.36.

Resolved an HP-UX root device name reporting bug, partly caused by an out-dated local copy of the <sys/mount.h> mount structure, by generating a local header file with the structure that can be compiled without needing _KERNEL defined. Doug Siebert also reported this bug.

Changed some dialect source code -- Digital UNIX, Solaris, SunOS, and UnixWare -- to make more consistent with ps the user ID lsof reports in the USER column. Added a 00FAQ entry about it. Igor Schein <igor@txc.com> reported the Solaris and SunOS lsof inconsistencies with what ps(1) reports.

Ported
lsof to Pyramid ReliantUNIX 5.44.

Added brackets as comments to case, do, done, else, endif, esac, if, and while statements in Configure to assist in navigating its clauses.

Added more Linux 2.0.x glibc work-arounds.

Added support for UnixWare 7.0.1.

Ralph Forsythe <ralph@contact-paging.com> provided a new FreeBSD test system.

4.38 November 25, 1998
Added support for recent FreeBSD 3.0 distributions. A 3.0 test system was provided by David O'Brien <obrien@NUXI.com>. This was offered as a patch to 4.37.

Updated the scripts/idrlogin.perl* files to look for sshd processes in addition to rlogind and telnetd ones.

Added support for DU 5.0 Beta. Berkley Shands <berkley@cs.wustl.edu> provided a test system.

Added support for OpenBSD 2.4 with changes supplied by Kenneth Stailey <kstailey@disclosure.com>.

Changed the Solaris 2.7 tests and documentation to Solaris 7.

Made some changes to the header files for NEXTSTEP 3.3 and added
support for OPENSTEP 4.x with help from Michael A. Hovan III <mhovan@BLaCKSMITH.com> and Carl Lindberg <Carl_Lindberg@BLaCKSMITH.com>. The combined dialect subdirectory is named n+os. One of Carl's changes propagates RC_CFLAGS to the library Makefile. Timothy J. Luoma <luomat@peak.org> helped test under NEXTSTEP 3.3 and OPENSTEP 4.2.

Made UW 7.x version sensitive to the presence of ptf7038. Added peer PCB address to Unix domain socket Name column, even when a path name has been located. Information for these changes was supplied by Francis Le Bourse <flebourse@intelcom.fr>. Lee Penn <lee@dlpco.com> provided a test system.

Tested lsof under OSR 5.0.5 on a test system also provided by Lee Penn.

Made path name argument processing more tolerant of errors per a suggestion from Julian Gordon <julian@cadence.com>.

Acquired a new UnixWare 2.x test system, generously provided by Computer Classroom, Inc. -- Matthew Thurmaier <matt@compclass.com>,
Ken Laing <ken@compclass.com>, and Andrew Merril <andrew@compclass.com>. Updated Configure to accept a UnixWare version of 2.1.3.

Updated kmem-based lsof for Linux 2.0.36.

Updated NetBSD sources for a change in a UVM virtual mapping header file.

Corrected a cache allocation bug in Sun format kernel name cache handling. The bug only shows up when the kernel name cache is inaccessible.

4.39 December 29, 1998

Corrected problems with large device number handling
for 64 bit Solaris 7. The problems were reported
by Steve Bellenot <bellenot@math.fsu.edu>. Steve
helped test the fixes. The fixes were offered as
two patches to lsof 4.38.

Improved FreeBSD Configure operations for header
files that must be obtained from the kernel source
tree, based on a suggestion from David O'Brien
<obrien@NUXI.com>.

For Bela Lubkin <filbo@deepthought.armory.com> made
optional with +f[cfn] the display of file structure
address, shared use count, and node structure
address.
/proc-based Linux doesn't implement this
feature, because it doesn't read kernel structures
from kernel memory. Modified the PTX -X option to
take advantage of the new file structure display
option. Added shared.perl5 to the scripts/
subdirectory to provide an example of how +f[fn]
might be used to track shared file descriptors and
files.

Added more /dev/kmem-based Linux glibc evasions,
provided by Jeff Johnson <jbj@redhat.com> and Maciej
Lesniewski <nimir@kis.p.lodz.pl>. Jeff helped test
them on various Linux architectures.

Tested on AIX 4.3.2; no changes were required.
Doug Crabill <dgc@purdue.edu> provided a test
system.

Fixed -c option to detect missing command name when
following option begins with `+'.

4.40 January 25, 1999
Added support for using the CDS compiler for Reliant
Unix 5.44 and above. Made Reliant Unix MIPC support
optional, dependent on the presence of <sys/mipc.h>.

Based on a report from Michael Schmitz
<MSchmitz@lbl.gov>
that /dev/kmem-based lsof misbehaves on a Linux
2.0.x m68k kernel without module support, made the
absence of query_module() or get_kernel_syms()
Linux kernel support a fatal error. Updated relevant
sections of 00FAQ to reflect the change.

Added the ability to force the Linux Configure
stanza to use the /proc or /dev/kmem source base
via a LINUX_BASE environment variable specification.
This is a cross-configuration assist.

Added "+D <dir>" and "+d <dir>" options for directory
searching. +D searches the entire tree, starting
at <dir>, including <dir>, its contents, and its
subdirectory branches; +d searches only <dir> and
its contents, but not its subdirectory branches.
Improved lsof's searching of the specified name
list to compensate for anticipated long lists from
+d and +D.

Made an egrep in the Solaris Configure stanza usable
by the standard and XPG4 egrep's. Kenneth Stailey
<kstailey@disclosure.com> pointed out
the improvement.

Fixed bugs in /dev/kmem-based Linux and UnixWare
Unix domain socket name searching.

Changed a Linux Alpha #include to be conditional
on the presence of its named header file, so that
lsof will compile on Red Hat 5.1 and 5.2 (Linux
kernel 2.0.35) where the header file is absent.
The problem was reported by Alexandre Oliva
<oliva@dcc.unicamp.br>.

Fixed an AIX 4.3+ bug in procinfo struct space
allocation, reported by Jeff Stewart <jws@purdue.edu>.
This was offered as a patch to 4.39.

Added an lstatsafely() function to offer the same
isolation for lstat() calls that statsafely() offers
for stat() calls. This made DOSTAT_FUNCTION no
longer necessary, so deleted it.

With help from Laurent P. Montaron <lpm@sequent.com>
ported lsof to PTX 4.4.4. Laurent did a monumental
job of identifying TCP/IP changes by their TCP
version, rather than by their PTX (With mix 'n
match PTX and TCP/IP versions, the PTX version
often has no bearing
on the TCP/IP version.), and
changed the Configure script and pre-processor
#if/#else/#endif blocks to match. He also updated

Unix domain socket handling for PTX TCP/IP versions
4.5 and above.

Updated CLIENT handle acquisition of fill_portmap()
in print.c to use the more modern RPC function
clnt_create() in place of clnttcp_create() where
possible. PTX 4.4.4 requires clnt_create().

4.41 February 27, 1999
Added FreeBSD 3.1 and and 4.0 support with help
from Sheldon Hearn <axl@iafrica.com>, David O'Brien
<obrien@NUXI.com>, and John Polstra <jdp@polstra.com>.

Corrected bungled AIX 4.3+ patch that went into
lsof 4.40.

Reorganized the Configure script to improve Makefile
construction. A specific impetus for this was to
allow FreeBSD system-wide make flags to be propagated
to the lsof Makefiles, but other goals were to make
sure that the DEBUG= make entry can over-ride
standard CFLAGS values, and to better manage the
identification of compilers
and their versions.
Two compiler-related values may now be supplied in
environment variables: 1) the compiler path in
LSOF_CC; and 2) the compiler version in LSOF_CCV.
00XCONFIG documents them.

Added support for Pyramid Reliant Unix bsdsfs,
msockfs, and sockfs file systems.

Added an optional LSOF_CINFO string to Configure,
producing a CINFO string in selected Makefiles,
producing a #define LSOF_CINFO in selected version.h
header files. The purpose of this is to allow
Configure the option to propagate information to
the lsof -v output. It is now used for Linux to
identify the code base, and for HP-UX 10.30 and
11.0 and Solaris 7 to identify the kernel bit size.

Added system information to NEXTSTEP and OPENSTEP
-v output, from the second line of hostinfo's
output.

Fixed a login name buffer overflow problem in the
processing of -u option values. This was offered
as a patch to 4.40. !!!THIS IS A SERIOUS STACK

OVERFLOW BUG; A LINUX EXPLOIT
EXISTS FOR IT THAT
OPENS A BASH SHELL WITH LSOF'S AUTHORITY -- E.G,
SETGID(KMEM) POWER!!!

Improved the Solaris mount table filter so the
volume manager's fake mount point, "/vol", is
ignored and doesn't supplant "/" in NAME column
path assemblies. Igor Schein <igor@txc.com> reported
this bug and provided important help in finding
it. This was offered as a patch to 4.40.

Changed the Linux /dev/kmem-based lock ownership
test to answer a problem reported by Tom Christiansen
<tchrist@jhereg.perl.com>. This was offered as a
patch to 4.40.

Installed an HP-UX 11 patch, suggested by Kevin
Vajk <kvajk@cup.hp.com>, that adjusts a private
lsof kernel header file, derived via Q4, to correspond
to an HP-UX patch bundle.

Made NetBSD 1.3I sockproto structure adjustment.

4.42 March 30, 1999
Fixed a typo in the HP-UX dfile.c that caused +fF
and +fN output controls to swap effect.

Enabled for OpenBSD 2.5 per notice from Kenneth
Stailey <kstailey@kstailey.tzo.com>

Made
more VM accommodations for FreeBSD 4.0.

Improved file system search reporting to include
path name components when they're available, instead
of mindlessly reporting the file system name in
the NAME column. Guy Dallaire <gdallair@geocities.com>
brought the need for this change to my attention.

Updated Solaris 2.6 VxFS for Veritas Oracle Database
Edition 2.0, VxFS version 3.3, and VxVm version
2.5.4, based on a report from Chris Kordish
<chris.kordish@East.Sun.COM>. Chris kindly provided
a test system.

Improved HP-UX ipc_s patch detection in Configure,
response in .../dialects/hpux/hpux11/ipc_s.h, and

documentation in 00FAQ, Kevin Vajk <kvajk@cup.hp.com>
helped test.

Added to Customize the option to suppress HASKERNIDCK
selection for specified dialects. Suppressed it
for /proc-based Linux lsof, and removed its test
and code from there. Tin Le <tin@netimages.com>
alerted me to the need for this update.

Ported to official
Digital UNIX 5.0 release.

Changed DU lsof to use the knlist(3) function when
no kernel file has been specified with -k. This
change was suggested by Erich Wimmer
<Erich.Wimmer@digital.com>.

Updated Configure for latest NetBSD (1.3I?) with
UVM support the default.

4.43 May 11, 1999
Corrected a typo in the Solaris gcc discussion in
00FAQ. Made changes to the Solaris 2.5[.1] private
tcp_s structure. Both changes were done in response
to reports from Igor Schein <igor@txc.com>, who
tested the Solaris 2.5 change.

Made more IPv6 adjustments to lsof for Tru64 UNIX
(Digital UNIX) 5.0, based on information obtained
from Compaq by Berkley Shands <berkley@cs.wustl.edu>.

Corrected HP-UX error message about HP-UX 11 q4 usage.
Amir Katz <amir@ndsoft.com> reported the correction.

Fixed a GlibC 2.1 conflict in /proc-based Linux lsof.

Fixed a man page typo reported by Vlad Harchev
<hvv@hippo.ru>.

Changed some Solaris 2.7 references to Solaris 7
in
Configure and 00XPORTING.

Added a Solaris example to the echo statements that
are the install rule in the SunOS/Solaris Makefile.

Added a field to the file structure output --
FILE-FLAG (file structure open flags, f_flag[s],

and process file flags, typically u_pofile)) --
enabled with +f[gG]. Its field output character
is 'G'.

Figured out another piece of the HP-UX 11 patched
ipc_s structure puzzle with the help of Keith Kalet
<KEITH_KALET@HP-USA-om41.om.hp.com>.

Fixed a PTX real vnode to real inode interpretation
bug.

Added link count to lsof output. Eric Dumazet
<dumazet@risgw.ris.fr> requested and helped test
it. The new +L option enables and filters it.
Its field output character is `k'.

Updated Configure script to recognize NetBSD 1.4.

Updated AFSConfig to handle default answers to
questions.

Incorporated patch from Jonathan Sergent <sergent@io.com>
that enables /proc-based Linux lsof to run on both
32 and 64 bit kernels.

Updated
Configure script with a patch from David
O'Brien <obrien@NUXI.com> that recognizes FreeBSD 3.2.

4.44 June 24, 1999
Corrected use of nlink member of hsnode for SunOS
4.1.x High Sierra File System files. John Dzubera
<zube@tlaloc.stat.colostate.edu> reported the
problem and helped test the fix. Also fixed a
SunOS segmentation fault bug. These fixes were
offered as a patch to 4.43.

Improved handling of /proc-based Linux UNIX PCB
address.

Fixed a NEXTSTEP and OPENSTEP bug that made repeat
option (-r) processing malfunction. This fix was
offered as a patch to 4.43.

Fixed Configure so it doesn't use -O in the Cflags
for the bundled HP-UX C compiler. Jim Ankenbrandt
<jankenbrandt@penton.com> reported the problem.

Corrected output ordering of parent PID and process
group ID when both -R and -g are specified.

Enhanced the pdev.c and pdvn.c library modules for
wider use. These dialect versions use the new
library modules: DEC OSF/1,
Digital UNIX, and Tru64
UNIX; Pyramid DC/OSx and Reliant UNIX; SCO OSR and
UnixWare; and Sequent PTX.

Added basic clone device support to /dev/kmem-based
HP-UX lsof for HP-UX 10.30 and higher.

Added raw socket support to /proc-based Linux lsof.

Changed NODE-ADDR column title to NODE-ID in
anticipation of using more general identification
information in the column.

Ported to UnixWare 7.1, using a test system kindly
provided by Matt Thurmaier <matt@compclass.com>
and Don Draper <dond@sco.com>.

Updated for NetBSD 1.4C VM changes, and a new
current and root working directory structure.

Made minor adjustment for latest Tru64 UNIX 5.0
Beta release.

4.45 July 30, 1999
Fixed quoting problem in DEC OSF/1, Digital Unix,
and Tru64 UNIX Makefile's install rule. The problem
was reported by Berkley Shands <berkley@cs.wustl.edu>.
Fixed bug in Tru64 UNIX 4 lsof that caused FDs to
be skipped. These fixes were offered in a patch
to 4.44.

Fixed a repeat-mode
/proc-based Linux lsof bug,
reported by Sami Farin <sfarin@ratol.fi>. This
was offered as a patch to 4.44.

Picked lint, some reported by Sami Farin.

Corrected a 00DCACHE documentation error in a sample
shell script. The problem was reported by Chad R.
Larson <chad@larsons.org>. Changed commented-out
entries in machine.h files so they require more

thought and work when the comments are removed,
based on a remark by Chad.

Compensated for the practice of Solaris 7 and above
to record the dev= value in /etc/mnttab in 32 bit
mode, even on 64 bit systems. This was offered as
a patch to 4.44.

Added a C library test for /proc-based Linux lsof,
so that the #include files can be adjusted for a
non-GlibC environment. The need for this was
reported by Andrew Hill <andrewh@tirin.openworld.co.uk>.
This was offered as a patch to 4.44.

Added support for Auspex LFS 1.8.1 and 1.9.2 to
SunOS 4.1.4 lsof. The support was requested by
Quentin Fennessy
<quentin@dvorak.amd.com>, who
provided information and did testing.

Enabled IPv6 support code for NetBSD and OpenBSD,
conditional on Configure script tests. Wolfgang
Rupprecht <wolfgang@wsrcc.com> supplied the NetBSD
code and tested it. The OpenBSD code I constructed
has been compiled but not tested.

Updated the identd Perl 5 script, based on a report
from Wendy Lin <af5@taiyang.cc.purdue.edu> that
the space in its response line in front of the user
name violates RFC 1413.

Added IPv6 support to /proc-based Linux lsof.
Jonathan Sergent <sergent@ETLA.NET> and Andrew
Thomas Sydelko <sydelko@ecn.purdue.edu> kindly
provided a test system.

Updated man page description of AIX multiplexed
files to indicate that they might be /dev/ptc or
/dev/pts, depending on the AIX version. The
correction was suggested by Onno van der Linden
<onno@simplex.nl>.

Sylvain Robitaille <syl@alcor.concordia.ca> reports
lsof passes his Y2K tests.

4.46 October
23, 1999
Corrected /proc-based Linux lsof to detect that an

IPv6 address is a mapped IPv4 address. The problem
was reported and analyzed by Arkadiusz Miskiewicz
<misiek@misiek.eu.org>, who also tested the fix.

Added a libc5 library /dev/kmem-based Linux lsof
circumvention, supplied by Jason Lingohr
<lingman@lucid.net.au>.

Corrected a bug in -t (terse) AIX output, reported
by Wendy Lin <af5@taiyang.cc.purdue.edu>. I
introduced the bug at revision 4.43 when adding
FILE_FLAG reporting. This was offered as a patch
to 4.45.

Added a work-around for a problem in the OpenBSD
2.3 <sys/pipe.h> header file. Volker Borchert
<bt@teknon.de> provided and tested it.

Improved description of cross-building lsof for a
64 bit Solaris 7 system on a 32 bit system with
suggestions from Phillip Edwards
<Philip.Edwards@sn.wpafb.af.mil>.

Fixed a gawk POSIX-mode pattern error in the Linux
/dev/kmem-based Mksrc script, based on a tip from
Ambrose C. Li <acli@mingpaoxpress.com>.

Fixed
a bug in the Tru64 UNIX IPv6 handling, courtesy
of a report from Casper Dik <casper@holland.sun.com>.

Enabled support for OpenBSD 2.6.

Enabled support for BSDI BSD/OS 4.1, based on a
report from Jeffrey C Honig <jch@bsdi.com> that
only a Configure script change is necessary.

Enabled Configure script to use gcc for building
lsof for a 64 bit Solaris 7 and 8 kernels, if the
gcc version is 2.95 or above.

Improved -i option handling for systems with IPv6
support so that it will search for a host name in
both IPv4 and IPv6 families, when that is possible.
As a companion modification, changed -V processing
to report a single error when a multiple host name
match is requested. Casper Dik <casper@holland.Sun.COM>
helped test.

Fixed a DEC OSF/1, Digital UNIX, Tru64 UNIX repeat mode bug, reported by Mayer Ilovitz <mayer@cooper.edu>. Mayer helped test the fix. The fix was offered as a patch to 4.45.

Changed Solaris socket file recognition scheme, so it is (nearly) the same through Solaris 8, where the previous clone device scheme no longer works.

With significant assistance from Casper Dik, added support for Solaris 8 Beta and Beta refresh. The IPv6 support in Solaris 8 is still in some flux, so there are temporary compensations for the differences between Beta IPv6 support and Beta refresh IPv6 support. Casper and I hope those differences disappear by FCS.

Improved the delivery of information on Solaris 2.5.1, 2.6, 7, and 8 door files.

Fixed a repeat mode bug that surfaces when /etc/passwd changes between cycles. The bug report and diagnostic help were supplied by Igor Schein <igor@txc.com>. The fix was offered as a patch to 4.45.

Added support for INRIA IPv6 to NetBSD. Jean-Luc Richier <Jean-Luc.Richier@imag.fr> provided patches and a test system on which to verify them.

Added support for AIX 4.3.3. Jeff W. Stewart <jws@anaconda.cc.purdue.edu> provided a test system.

Made adjustments for FreeBSD 4.0-current.

Improved reporting of information for AIX sockets that lack protocol control blocks.

4.47 November 29, 1999

Based on a query from Jean-Pierre Radley <jpr@jpr.com>, changed the lsof top-level Makefile to propagate CFGF to the library Makefile. (DEBUG was already being propagated.) Added osrgcc and scogcc Configure abbreviations (to use gcc) for Jean-Pierre.

In response to a query from Igor Schein <igor@txc.com>,

improved the Configure script test for Solaris 7
and 8 that decides if the compiler can produce 64
bit executables.

Made an ugly hack, based on making a private rnode
structure definition from q4 output, to compensate
for HP-UX 10.20 and lower recent NFS3 patches. HP
didn't supply an updated <nfs/rnode.h> with the
patches. The problem was reported by Will Partain
<partain@mekb2.sps.mot.com>. Elias Halldor Agustsson
<elias@hi.is> helped identify the patches as
PHNE_18173,
PHNE_19426, PHNE_19937, and PHNE_20091,
and provided a test system.

Switched BSDI test system from 2.1 and 3.1 to 4.0.1,
courtesy of Terry Kennedy <terry@tmk.com>.

Added some more dev_t hacks for Alpha FreeBSD 4.0.

Added support for IPv6 on BSD 4.x. The support hasn't
yet been tested, just compiled.

Added support for the mnt file system (mntfs or
/etc/mnttab) on Solaris 8. Tested on Solaris 8
BETA-Refresh.

Made selection of optional fields (e.g., PPID with
-FR) in a field output specification select the
optional field, too, so that the option selector
for the field (e.g., -R) isn't also required. This
change was made in response to an inquiry from John
DuBois <spcecdt@armory.com>. This may require some
revision to scripts that parse all field output;
two scripts in the lsof distribution's scripts/
subdirectory had to be updated.

Corrected handling of Linux IPv4 addresses mapped
in IPv6 addresses.

Tested under OpenBSD 2.6.

4.48 January
14, 2000
Modified -i argument processing of colon-separated
IPv6 addresses to recognize an IPv4 address mapped
in an IPv6 address and handle it as an IPv4 address.
This was offered as a patch to 4.47.

Added a defined symbol (NOWARNBLKDEV) to control
(inhibit) the issuance of a warning when no block
devices are found. This was done anticipating its
need in FreeBSD 4.x, but that dialect version no
longer has any block devices, so HASBLKDEV was
disabled for it instead. NOWARNBLKDEV was left in
place for possible use in the future.

Enabled KAME IPv6 Configure support for FreeBSD
when <netinet6/in6.h> is found.

Disabled use of gcc to compile lsof for 64 bit
HP-UX 11.

Updated Configure to recognized FreeBSD 3.4.

Based on suggestions from Bernt Christandl
<beb@MPA-Garching.MPG.DE> improved AFS configuration
for AIX and Solaris, and updated AIX AFS 3.5 support.
Johannes Tax <tax@bluedog.oit.unc.edu>, Hung T.
Pham <hung_pham@unc.edu>, and Curt
Freeland
<curt@grumpy.cse.nd.edu> provided test systems.

Updated lsof's private rnode definition for AIX
4.3.3, since IBM still doesn't ship the
<oncplus/nfs/rnode.h> header file and the rnode
structure definition in <nfs/rnode.h> doesn't match
what the kernel uses. This was offered as a patch
to 4.47.

Weakened the test in the Linux /proc-based lsof of
the field count of data lines in /proc/net/{tcp,udp}.
It appears that recent 2.3.x Linux kernels have
added untitled fields to these files. The bug
report came from Gabor Liptak <gaborliptak@usa.net>.

Adjusted for a FreeBSD 4.0 change in the definition
of [_]KERNEL. David O'Brien <obrien@NUXI.com> reported
the problem and provided a test system.

Removed the HASPPID bracket from Fppid (the -R
option state variable) so that the field select
table will compile even when HASPPID is not defined.
This problem was introduced at revision 4.47 with
code that causes some field output characters to
set

option states. The problem was reported by
David Bacon <bacon@birch.eecs.lehigh.edu>.

4.49 April 3, 2000
Made clearer in man page that "Lxx" FDs are AIX
loader table references. Also updated the 00FAQ
discussion of the Stale Segment ID bug to include
AIX 4.3.x.

Modified support for NetBSD 1.4Q to include the
<sys/buf.h> header file to cope with an MFS change.

Added support for OpenBSD UVM virtual memory.

Added support for AIX systems with > 2GB of memory.
Chris Sylvain <csylvain@itg.ummc.umaryland.edu>
reported the problem and provided the solution.
Chris also supplied some minor code cleanup. This
was offered as a patch to 4.48.

Based on new information from Igor Schein <igor@txc.com>
made additional compensation in Configure script
for 64 bit Solaris 7 and 8 gcc.

Added some 00FAQ info on the effect ordering of
the +fg and -FG options has on output format.

Improved NetBSD IPv6 configuration, based on a
suggestion from Thomas Klausner
<wiz@danbala.ifoer.tuwien.ac.at>.
Added code to
convert IPv4-mapped-in-IPv6 addresses to IPv4
addresses.

Updated the information in 00FAQ and the HP-UX 11
binary directory README files on the HP-UX 11 ipis_s
patch with new information supplied by Eric McWhorter
<emcwhorter@xsis.xerox.com>.

Added documentation on changes to HASFSTYPE and
HASNCACHE, and the new HASPRIVPRIPP.

Adjusted Configure for FreeBSD 5.0. Made additional,
necessary changes to Configure and the BSDI sources
to eliminate load errors.

Added KAME IPv6 support to FreeBSD at the request
of Ollivier Robert <roberto@eurocontrol.fr>, who

provided a test system.

Corrected the script that generates the CHECKSUMS
files for binaries to correctly name the detached
PGP certificate. The documentation bug was reported
by Michael Hennecke <hennecke@rz.uni-karlsruhe.de>.

4.50 June 29, 2000
Added a NetBSD alpha test host, courtesy of Ray
Phillips <r.phillips@mailbox.uq.edu.au>.
An lsof
4.49 binary, built on Ray's 1.4.1 system was made
available prior to the 3.50 release.

Upgraded the system map file tests in /dev/kmem-based
Linux lsof, making the use of DEBIAN_LINUX_LSOF
unnecessary. Tested the changes on a system made
available by Vincent Kujala <kujala@geog.ubc.ca>
and Jim Mintha <jim@ic.uva.nl>.

Forced AIX to use the large-file-enabled versions
of lstat (lstat64) and stat (stat64) if <sys/stat.h>
contains stat64. This should allow lsof to stat()
AIX files > 2GB even when the builder has not
defined the "large file enabled programming
environment." Configure tests <sys/stat.h> and
puts -DHASSTAT64 in the Makefile's CFLAGS to make
this happen. Fernando A.B. Whitaker
<whitaker@cenapad.unicamp.br> reported the problem.
This was offered as a patch to 4.48.

Enabled Configure script to handle OpenBSD 2.7.
Angelos D. Keromytis <angelos@dsl.cis.upenn.edu>
reported the availability of OpenBSD 2.7 and supplied
the Configure
script patch.

Improved handling of DOOR and fattach()'d files in
Solaris.

Changed message about missing kernel symbol file
from "not yet determined" to "none found".

Updated FreeBSD, NetBSD, NEXTSTEP, OpenBSD, and
OPENSTEP support to report "no PCB" and the values
of the SO_CANTSENDMORE and SO_CANTRCVMORE state
flags when a socket structure has no inpcb pointer.
This modification was made to AIX lsof at revision

4.46. Added an entry to 00FAQ about sockets that
have no inpcb pointer.

Upgraded support for FreeBSD 5.0-CURRENT. Ben
Smithurst <ben@scientia.demon.co.uk> supplied
patches and did testing. David O'Brien <obrien@NUXI.com>
supplied a test system. The update included dropping
the Fctty part of file descriptor file system
support, conditional on a Configure script test.
I propagated those changes to BSDI, NetBSD, and
OpenBSD in anticipation of their having the
modification in the future. David also arranged
with Michael Haro
<mharo@area51.fremont.ca.us> for
a FreeBSD 3.4 test system.

In response to an lsof 3.72 bug report from Jim Mewes
<jim@corp.phone.com>, added more kernel address
filtering to the lsof function, kread(), that reads
Solaris kernel data.

In response to a report from Marc Duponcheel
<marc@offline.be>, added tests to the /proc-based
Linux lsof to ignore file systems of types "autofs"
and "pipfs".

Based on a report and information supplied by Casper
Dik <casper@holland.Sun.COM>, updated the ncache_load()
function in lib/rnch.c with new code that deals
with a post Solaris 8 change in kernel name cache
(DNLC) handling. Casper tested the update, which
should be invisible to Solaris versions without
the new DNLC code.

Added support for Solaris VxFS QIO files, based on
a report from Kieran Broadfoot <kieran.broadfoot@gs.com>.
Kieran help test the support.

Added support for PTX 4.4.6 and 4.5[.1] with help
from the usual cast of good people at Sequent.

Added
support for 64 bit file sizes and offsets on
BSDI, FreeBSD, NetBSD, and OpenBSD, based on a
report from Dan Nelson <dnelson@emsphone.com>.
Dan supplied a patch and did FreeBSD testing.

Added Configure script recognition of NetBSD 1.5,

based on a report from Andrew Brown <atatat@atatdot.net>.
Thomas Klausner <wiz@danbala.ifoer.tuwien.ac.at> updated
the NetBSD port package to use a pre-release of this
addition.

At the last minute saw a notice via deja.com's
UseNet search service that FreeBSD 3.5 had been
released and lsof didn't grok it. Added recognition
of 3.5 to lsof's Configure script, but didn't have
the opportunity to test lsof on 3.5.

4.51 August 21, 2000
Added Configure script support for the upcoming
Solaris 9 release based on suggestions from Casper
Dik <Casper.Dik@holland.sun.com>.

Changed sample Perl scripts to assume that
/usr/local/bin/perl is Perl 5 and Perl 4 may be
found in /usr/local/bin/perl4.

Updated Configure
to recognize FreeBSD 4.1 and made
a FreeBSD pre-release distribution available.

Bela Lubkin <belal@sco.COM> tested lsof on the
upcoming SCO OSR 5.0.6 release and reports that
lsof appears to work properly.

Updated the AIX compiler test in Configure to
recognize its version 5.

Updated AIX 4.3.3 support with automatic recognition
of the proper rnode structure, based on machine
bit width. Also added code to detect when processing
the -X option that lsof has been compiled with the
"other" AIX 4.3.3 user structure and to apply
compensations. When a compensation method works,
it's applied during subsequent -X processing; when
none works, further -X processing is disabled.

Added Tru64 UNIX 5.1 support. Updated Tru64 UNIX
library text file support to recognize new kernel
support for AdvFS library files. Berkley Shands
<berkley@cs.wustl.edu> and Klaus Saggerer USG
[saggerer@zk3.dec.com> helped put me in contact
with Chang Song <song@zk3.dec.com>,
the developer
of 5.1's new kernel name cache and he helped me

develop new code in lsof to access it.

Corrected reporting of PTX fattach()'d address.

Changed Configure and dlsof.h for NetBSD and OpenBSD
to use /usr/include/uvm header files when available.
Andrew Brown <atatat@atatdot.net>, Thomas Klausner
<wiz@danbala.ifoer.tuwien.ac.at>, and Wolfgang
Rupprecht <wolfgang@wsrcc.com> pointed out the need
to do this for NetBSD. Andrew provided access to
a NetBSD 1.5 system for verifying the changes.

Installed snprintf() support, including a private
version in the lsof library for those UNIX dialects
without the function. Changed all sources to use
it instead of sprintf() and strcpy().

Fixed a memory leak in the readvfs() functions of
BSDI, DEC/OSF1, Digital UNIX, FreeBSD, NetBSD,
OpenBSD, and Tru64 UNIX.

Tested on Linux 2.4.

Modified the Pyramid MkKernOpts script to compensate
for `uname -s` configuration alternatives. Robert
Dahlem <Robert.Dahlem@ffm2.siemens.de>
supplied
the modification.

Obtained access to an FCS Solaris 8 64 bit system
and built lsof on it, using Sun Workshop C 5.0 and
gcc 2.96 20000814 (experimental). Both compilers
produce a working lsof.

4.52 November 8, 2000
Completed work on an HP-UX 11.11 port that uses a
pstat(2) interface provided by HP. To distinguish
it from its predecessors for HP-UX, this lsof
version is called PSTAT-based and the predecessor
versions are now called /dev/kmem-based. I am
indebted to the far-sightedness and support of
these good people at HP for making PSTAT-based lsof
possible: Carl Davidson, Louis Huemiller, Rich
Rauenzahn, and Sailu Yallapragada. The PSTAT-based
sources are in lsof_4.52/dialects/hpux/pstat, the
/dev/kmem-based ones in lsof_4.52/dialects/hpux/kmem.

Ported to IBM Monterey for Merced|Itanium, aka AIX
5L. It configures via the Configure script's "aix"
abbreviation and has been tested on AIX 5L Beta 3.
Jay Beck,
Steve Dibbell, Loc Le, Nasser Momtaheni,
and Malcom Zung of IBM provided generous support.
Since AIX 5L is still in Beta testing, this port
can't be considered complete.

Added Configure support for OpenBSD 2.8. David
Mazieres <dm@cs.nyu.edu> provided a test system.

Based on a report from Marc Christensen
<marc@mecworks.com> added sockfs to the mount scan
exemption list for /proc-based Linux lsof.

Added large file, CDFS, and DOSFS for UnixWare 7.x.
Added UnixWare device memory mapping support. All
UnixWare changes were supplied by Eric Dumazet
<edumazet@cosmosbay.com> Eric also supplied some
miscellaneous bug fixes.

Deferred name cache loading until printname() needs
to use the name cache.

Terminated Pyramid, SunOS 4.1.x, and Ultrix support,
because test systems are no longer available.
Final Pyramid and Ultrix source code distributions
for lsof revision 4.51 may be found on lsof.itap.purdue.edu
in pub/tools/unix/lsof/OLD/src. The no
longer
supported SunOS 4.1.x source code is still distributed
with the Solaris source code.

Added code to set Solaris node address to real vnode
address, when applicable.

John Speno <speno@lopan.isc-net.upenn.edu> provided
information that enabled me to update the Tru64
AdvFS (MSFS) node definition for AdvFS version 5.

Added Tru64 5.x CFS support with help from Kris
Chandrasekhar <Kris.Chandrasekhar@compaq.com>,
Diane Lebel <lebel@zk3.dec.com>, and John Speno.
The support only provides information about cached
file attributes.

Installed a Configure patch for HP-UX 11 supplied by

Kenneth Stailey <kstailey@disclosure.com> that adds
another command to q4 input.

Tested on FreeBSD 4.2.

Will Day <willday@rom.oit.gatech.edu> and Frank
Winkler <frank.winkler@germany.sun.com> graciously
supplied Solaris 8 binaries.

Added Solaris 9 text file support, supplied by
Casper Dik <Casper.Dik@holland.sun.com>.

4.53 December 6, 2000
Added the AIX 5L j2_lock.h
to the distribution with
a Configure script step to use it when it's missing
from /usr/include/j2.

Removed SunOS 4.1.x support.

Removed Linux 2.0.x /dev/kmem support.

Fixed VBLK and VCHR special device file reporting
to handle /dev information more accurately.

Added a Apple Darwin / Mac OS X 1.2 port, provided
by Allan Nathanson <ajn@apple.com>. Allan also
arranged for a test system so I can maintain this
port. An additional test system was provided by
Dale Talcott.

Dropped claims of support for all UnixWare versions
except 7.1.0, since that is the only version on
which I can test lsof. Even though lsof 4.53 is
deprecated for UnixWare 2.1.3, installed a patch
for it with testing done by A. Channing Clark
<clark.channing@heb.com>.

Dropped claims of support for all SCO OpenServer
versions except 5.0.5, since that is the only
version on which I can test lsof.

4.54 January 19, 2001
Added compensation for a change that made the
FreeBSD
mount structure invisible. I can only test
back to 3.2 and the compensation works there, so
it's been #ifdef'd for 3.2 and above. David O'Brien

<obrien@FreeBSD.org> provided the necessary clue.

Based on a report from Valdis Kletnieks
<Valdis.Kletnieks@vt.edu>, changed all IPv6 support
to report a TYPE of IPv6 for sockets with IPv4
addresses mapped in IPv6 addresses. The previous
lsof behavior was to report their TYPE as IPv4.

Restored the Linux GlibC test to Configure, removed
at revision 4.53, based on a report from John Dzubera
<zube@cs.colostate.edu>, that RedHat Linux 6.0 still
needs the test.

Made setting of link count for Solaris more selective.

Limited Readlink() recursion to MAXSYMLINKS. The bug
was reported by Jan Dvorak <johnydog@go.cz>.

Dropped the *claim* that lsof runs on Solaris 2.5.1.
It may well do so, but I no longer have access to a
test system.

Fixed an #endif comment typo, reported by Igor Schein.

Fixed a typo
in a cast for a Tru64 UNIX 5.1 function
and updated Configure for Tru64 UNIX 5.0 and 5.1 with
information from Jesse Perry <jesse.perry@compaq.com>.

Corrected non-fatal typos in the AdvFS support in
dnode.c for Tru64 UNIX.

Added msdos file system support for NetBSD and OpenBSD.
Andrew Brown <atatat@atatdot.net> requested and helped
test it.

4.55 February 15, 2001
Based on a report from Bernd Eckenfels <ecki@lina.inka.de>
added support in lsof for files in /proc/<PID>/maps
that have been deleted.

Changed PGRP output title to PGID, conforming to
the most common current abbreviation for Process
Group ID (PGID). While some systems continue to
use *pgrp for internal kernel variable names, most
systems that support the display of PGID via ps(1)
now title it PGID. The lsof -g and -Fg options
operations are unchanged in function; only titles

and descriptions have changed. Also changed internal
variable names from *PGRP and *pgrp to *PGID and
*pgid
where possible.

Dropped the *claim* that lsof runs on HP-UX 9.x.
It may well do so, but I no longer have access to
a test system.

In response to a suggestion from Jeff Howie
<jeff.howie@federated.ca> added support for command
name selection by regular expression. A new form
of the -c option value is use to identify and
specify a regular expression.

Restore the *claim* that lsof works on UnixWare
7.0, since I re-acquired a test system.

4.56 May 3, 2001
Corrected some problems Amir Katz <Amir_Katz@bmc.com>
found with Insure++, one in lib/dvch.c, the rest
in Solaris sources. Amir's report also helped me
find an error in an snpf() call that caused (the
unsupported) Solaris 2.5.1 lsof to crash. Wally
Winzer, Jr. <wally.winzer@ChampUSA.COM> helped test.

Added support for UnixWare 7.1.1 and above in-kernel
UNIX sockets. John Hughes <john@Calva.COM> kindly
provided code and access to a test system. John
also provided a test system and advice
for adding
UnixWare 7.1.1 NonStop Cluster and CFS support.
More help with that effort came from Kurt Gollhardt
(SCO), Barbara Howe (SCO), Bela Lubkin (SCO), and
Dewan Rashid <Dewan.Rashid@ir.com>.

Archived a set of compilation hints (patches) from
Bill Melvin <Bill.Melvin@esc.edu> that make it
possible to compile the old, unsupported lsof 3.08
sources on UnixWare 1.x without NFS or CDFS support.

Installed support supplied by Allan Nathanson
<ajn@apple.com> for the Darwin "Gold Master" release,
Mac OS X 10.0 (aka Darwin 1.3 in its public source
version). Added Allan's CVS repository suggestions
to the script that gets additional header files
from an open source repository.

Tested an HP-UX 11.11 kernel patch from Sailu
Yallapragada that enables reporting of TCP/IP
information for telnetd processes that use the
telnet multiplexor. I don't yet know the kernel
patch ID.

Made the Solaris inclusion of <inet/mi.h> conditional
on the Solaris
version. (It's apparently not needed
at 2.6 and above.) Bill Watson <bill.watson@uk.sun.com>
brought this to my attention.

Added alternate Linux 2.4.x lock extent test, supplied
by Jim Mintha <jim@ic.uva.nl>.

Rearranged the lines and pre-processor tests in
regex.h, lib/regex.c, and lib/snpf.c so that unifdef
can be used to eliminate copyright and GPL statements
when the files aren't being used for a particular
dialect. (USE_LIB_* definitions in a dialect's
machine.h header file determine if one or more of
those three files are to be used.)

Added preliminary support for Solaris 8 with VxFS
3.4. This support will be refined as I get
information from Veritas about how they will
distribute the kernel header files lsof needs.
Those header files were omitted from the standard
VxFS 3.4 distribution. Technical assistance and
testing were provided by Calle Dybedahl <cdy@algonet.se>,
Gary Millen <gary.millen@veritas.com>, Rainer Orth
<ro@TechFak.Uni-Bielefeld.DE>,
Peter C. Vernam
<pvernam@draper.com>, and Donna Yobs
<Donna.Yobs@veritas.com>

Tested on FreeBSD 4.3-STABLE.

Dropped the *claim* that lsof works on UNIX dialects
where I no longer have test systems: BSDI 2.1,
3.[01] and 4.0; DEC OSF/1, Digital UNIX and True
64 UNIX 2.0 and 3.2; FreeBSD 2.1.[67], 2.2[.x],
3.[012345] and 4.[01]; HP-UX 10.20; NetBSD 1.[234];
SCO OpenServer 5.0.5; and SCO UnixWare 7.0

Tested on Solaris 9 BETA, s81_36.

4.57 July 19, 2001

Help (-h) and version (-v) output now have URLs
for the newly created and timeliest lsof FAQ
(00FAQ in the lsof distribution) at:

  ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof/FAQ

and the man page for the current lsof distribution
at:

  ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof/lsof_man

Based on a report from Steve Laubscher
<slaubs@woodward.com>, modified dlsof.h for PTX
4.6[.1] to avoid a temporary dnlc_t definition
needed at PTX 4.5.1.

Corrected test for old Linux
kernels in Configure.
Henri Karrenbeld <ishtar@cal044202.student.utwente.nl>
brought the error to my attention. Limited Linux
claims to 2.1.72 and above in the documentation.

Improved HP-UX 11 Configure stanza and stream socket
handling.

Constructed a work-around for the HP-UX 11 optional
OnlineJFS package. The work-around sadly requires
lsof to have a private version of the vx_inode
structure, since the OnlineJFS package doesn't
update <sys/fs/vx_inode.h>. Troyan Krastev
<Troyan.Krastev@ricoh-usa.com> brought the bug to
my attention and Michael Bracewell
<michael@ra.TSS.PeachNet.EDU> provided a test system
where I developed the work-around.

Added locale support to lsof's isprint() test,
based on a suggestion from Dan Mercer <damercer@mmm.com>.
Lsof will use setlocale(), when that function and
its supporting <locale.h> header file are available.

Added OpenBSD 2.9 support.

Based on a report from Aaron Rhodes <arhodes@psionic.com>
and
with testing help from Aaron, made the lsof
4.56 revision compile and work on OpenBSD 2.6.
While that OpenBSD version is no longer supported,
Aaron's report exposed a Configure script bug

affecting OpenBSD versions lsof does support.

Updated for FreeBSD 5.0-CURRENT. Szilveszter Adam
<sziszi@petra.hos.u-szeged.hu> help test. The lsof
FreeBSD ports packager, David O'Brien <obrien@FreeBSD.org>,
assisted.

Tested on AIX 5.1. Loc Le and Nasser Momtaheni of
IBM provided test systems.

4.58 September 13, 2001
Added options to safestrprt() and safestrprtn() to
surround the string with "" and to suppress the
printing of an ending '\n'. Use of these functions
in device cache file error message reporting answers
a suggestion for better error reporting from John
Jackson <jrj@purdue.edu>.

Fixed a Solaris 2.6 and above problem related to
searching for "large" (O_LARGEFILE) files by name;
lsof was using the wrong version of [l]stat(2).
The bug was reported
by Daniel Trinkle
<trinkle@cs.purdue.edu>.

Added AIX 4.1.4 and above XTI socket support.

Added OSR Xenix Shared Data and Semaphore file type
support with modifications supplied by Bela Lubkin.

Updated OPENSTEP support with modifications from Carl
E. Lindberg <lindberg@clindberg.org>. The changes
enable the correct reporting of executable and
library open files ("txt" type).

Limited claims of OpenServer support to the versions
where I currently test, 5.0.4 and 5.0.6. (Lsof
probably works on 5.0.5.)

Enabled processing of -C option for PSTAT-based HP-UX
lsof.

Enabled and tested on FreeBSD 4.4.

Corrected a file system test example in 00QUICKSTART,
based on a report from Jun Biao WANG <wangjunb@cn.ibm.com>.

Made available for re-distribution a user-contributed

port of lsof 4.51 to Reliant UNIX 5.45. Thomas Mauterer <Thomas.Mauterer@philosys.de> contributed the port.

4.59 October 20, 2001

With the closing of the Sequent Synergy Links Lab by IBM, terminated lsof support for PTX. The last tested PTX lsof revision, 4.58, is available on lsof.itap.purdue.edu in .../lsof/OLD/src.

Adjusted for FreeBSD 5.0-CURRENT NFS header file changes, based on a report from Jos Backus <josb@cncdsl.com>.

Corrected a bug in the way Linux lsof identifies the owner of a process. Lionel Cons <lionel.cons@cern.ch> reported the problem and tested the fix. Added code to avoid stat(2) calls on regular Linux files whenever possible. Lionel reported the need to do this (AFS files) and tested the new code.

Added new output field for raw device number in hex. The field is identified with 'r'. This field is NOT selected when -F or -F0 is specified so that its appearance won't disturb existing scripts that process field output.

Added support for OpenUNIX 8. A test system was provided by Larry Rosenman <ler@lerctr.org>. Matthew Thurmaier <matt@compclass.com> and many people from Caldera provided technical assistance.

Added an additional UVM test to the NetBSD Configure stanza. Andrew Brown <atatat@atatdot.net> supplied the test; it recognizes NetBSD 1.5Y UVM changes to the vnode structure recently committed by Chuck Silvers.

Applied Configure and get-xnu-headers.sh script changes suppled by Allan Nathanson <ajn@apple.com> for Darwin 1.4.

Added for Bela Lubkin <belal@mammoth.ca.caldera.com> OSR-specific environment variables to supply values to the Configure script. The variables are described in 00XCONFIG.

Added an IP version selector to the -i option
parameters.

4.60 November 9, 2001
Added special handling to and corrected bugs in
the matching of IPv4 in IPv6 addresses to -i6:<...>
selectors.

Made 00FAQ corrections and updates, based on
discussions with Igor Schein <igor@txc.com>.

Modified Configure script to detect a 64 bit capable
gcc compiler and permit it to be used to build 64
bit (PA-RISC 2) lsof for HP-UX 11.00. Tested
with
HP's gcc package, which Rich Rauenzahn of HP kindly
installed on a test system at HP. Stefan Marquardt
<stefan.marquardt@hagebau.de> helped test.

Made lsof's method of killing its child process
more robust, based on a suggestion from Bela Lubkin
<belal@caldera.com>.

Modified all dialect Makefile segments to accept
select -v #define's from the environment -- a
builder's comment, host, logname, system information
and user name. This was done for Bela Lubkin, so
he can "tune" the -v output when he packages lsof
in the upcoming Caldera OSR 5.0.7 release.

Changed Perl scripts in scripts/ to put the lsof
path consistently in $LSOF. Also added a fix from
Bela Lubkin to scripts/big_brother.perl5 that allows
it to tolerate SCO OSR "ago" clauses in open UDP
file information. Strengthened emphasis in
scripts/00README that the scripts are examples that
shouldn't be expected to run on all UNIX dialects
without modification.

At Bela Lubkin's
suggestion changed the device
cache file format examples in 00DCACHE and 00FAQ
to avoid "%U%". That's an SCCS escape sequence.

Added support for OpenBSD 3.0.

Added +DAportable to CFLAGS for 32 bit HP-UX 11.

Amir Katz <Amir_Katz@bmc.com> suggested the addition.

4.61 January 22, 2002

Updated field output example Perl scripts in the scripts/ subdirectory to discover the lsof path, starting at .. and proceeding through the PATH environment variable's directories.

Added minor OSR Configure script fixes, provided by Bela Lubkin <belal@caldera.com>.

In response to a report from Joshua Wright <Joshua.Wright@jwu.edu> modified NetBSD and OpenBSD Configure stanzas and sources so that lsof can be built when there is no system source tree (e.g., /usr/src/sys).

In response to a report from Peter Valchev <pvalchev@openbsd.org> improved the UVM test in the OpenBSD Configure stanza.

Updated Configure script to recognize FreeBSD 4.5. Updated for FreeBSD 5.0 procfs and pseudofs changes.

Updated HP-UX stanza to see if the compiler named in the LSOF_CC environment variable is the bundled compiler. If it is, "-O" is omitted from the compiler flags.

Updated Digital UNIX 4.x and Tru64 UNIX error message related to kernel name list failures. Added an FAQ section about how a kloadsrv daemon failure can cause knlist(3) to fail. The condition was reported by Douglas B. Jones <douglas@gpc.peachnet.edu>

Based on a report from Mark W. Eichin <eichin@thok.org> made Linux lsof capable of handling and reporting file sizes greater than 32 bits.

Tested on Solaris 9 BETA-Refresh.

Corrected a bug in the matching of IPv4 addresses, mapped in IPv6 addresses, to an IPv4 parameter to an -i option.

Ported to 64 bit Power AIX 5.1 kernel with advice from David Clissold <cliss@austin.ibm.com> and Marc

Stephenson <marc@austin.ibm.com>, and on a test
system provided by Loc Le <lple@us.ibm.com>.

4.62 March 7, 2002
Updated
00README to reflect the usefulness of gcc
for building AIX lsof. Documented a report from
Brian L. Gentry <BGentry@nationsrent.com> of success
on AIX 4.3.3. I documented my success on 32 bit
Power AIX 5.1 and my lack of success on ia64 AIX
5.1 and 64 bit Power AIX 5.1.

Improved UnixWare >=7.1.1 reporting of UNIX socket
NAME field information for NonStop Cluster systems
with a patch provided by John Hughes <john@Calva.COM>.
Offered John's improvement as a patch to lsof 4.61.

Corrected bugs in handling of open files on block
devices by OSR lsof. The bugs were reported by
Bela Lubkin <filbo@deepthought.armory.com>.

Fixed bug in writing >32 bit device numbers for
block devices to the device cache file.

Added support for reporting block special nodes
not in /dev (or /devices). That required "like
device special" be changed to "like block special"
and "like character special". (00FAQ was updated.)

Based on a report from Peter Valchev
<pvalchev@openbsd.org>
improved the definition of the source for NetBSD
and OpenBSD kernel symbols (the nlist() source
file). NetBSD now defaults to getbootfile(3) if
it is available, /netbsd otherwise. OpenBSD now
defaults to /dev/ksyms if it is available, /bsd
otherwise.

Made possible compilation under BSD/OS (BSDI) 5.0
with changes to Configure, dialects/bsdi/dlsof,
dialects/bsdi/dproc.c and lib/rnmh.c. The changes
were suggested by Steven Hinkle <hinkle@bsdi.com>.
Note that these changes do not substantiate a claim
that lsof works on BSDI 5.0, because I haven't
tested it there.

Updated OpenUNIX private <sys/fs/memfs_mnode.h>,
based on a report from Larry Rosenman <ler@lerctr.org>

that it had been updated by Caldera patch OU800PK3.
Unfortunately the patch only corrects some of the
problems with the header file, so it is still
necessary to distribute a private patched version
of it with the lsof sources.

Applied a man page correction
reported by Frederic
Delanoy <max_ok@yahoo.com>.

Corrected cast bugs related to using the HP-UX
bundled C compiler on HP-UX 11.11.

4.63 April 23, 2002
Added HPUX_BOOTFILE environment variable for use
by the Configure script in determining HP-UX kernel
configuration information -- e.g., the state of
the ipis_s structure in the HP-UX 11 kernel. The
change was suggested by Marc Bejarano <beej@alum.mit.edu>.
Marc also suggested some changes to the HP-UX
section in 00FAQ that discusses Configure's use of
q4 for HP-UX 11.

Fixed a bug in the Solaris lsof file system matching
code. It was not reporting that VCHR files in
/devices were in / when /devices was in /, too.

Corrected bugs in device number, file size, file
offset, and raw device number field output generation.

Added recognition of OpenBSD 3.1 to the Configure
script with a suggestion from Peter Valchev
<pvalchev@sightly.net>. Note that this change does
not constitute a claim that lsof
works on OpenBSD
3.1, because I haven't tested it there.

Built an automated test suite. (See 00TEST and
the tests/ sub-directory of the lsof main directory).
Bela Lubkin requested it. Dale Talcott, John
Hughes, and Larry Rosenman helped me validate it
on their systems.

During the development of the test suite I discovered
the following lsof bugs or missing features, and
corrected or supplied them.

* Corrected the reporting of locks for:

o Digital UNIX 4.0d and Tru64 Unix 5.[01];
o HP-UX 10.30 and 11.00;
o OpenUNIX 8;
o UnixWare 7.1.1.

* Enabled HP-UX 10.30 and 11.00 to report open NFS
file link counts.

* Corrected the reporting of UNIX domain socket
names for Apple Darwin, FreeBSD 4.5 and above,
NetBSD 1.4.1 and above, and for OpenBSD 3.0 and
above.

* Enabled HP-UX 11.11 to stat(2) large files.

* Fixed handling of combination 32 and 64 bit
device numbers in AIX 64 bit architectures.

Updated the AIX 4.3.3 NFS rnode
recognition code,
first installed at revision 4.51. It looks like
some IBM update has restored a single rnode structure
independent of the machine bit width.

Updated the NetBSD and OpenBSD sources so NetBSD
can process DTYPE_PIPE files, as OpenBSD was already
able to do.

Updated Darwin get-xnu-headers.sh script to reflect
information about a recent reorganization of the
Darwin CVS hierarchy, supplied by Allan Nathanson
<ajn@apple.com>.

Added defense against the standard I/O descriptor
attack.

4.64 June 26, 2002
Corrected some FreeBSD pre-processor directives.
David O'Brien <obrien@NUXI.com> pointed them out.

Updated lsof's main() function to: 1) close all
open file descriptors above 2 before starting; and
2) to set a non-interfering umask. Moved GET_MAX_FD
test from misc.c to proto.h, so that main() could
use it. Added multiple-include protection to
proto.h.

Moved FAQ's test suite Q's & A's to a more appropriate

section. Added
a Q&A on HASSECURITY option and
its affect on searching for open files. (That was
already in the man page.)

Updated hpux/kmem/dnode.c for HP-UX < 11 compilation
with information from John Dzubera <Zube@CS.ColoState.EDU>.
While lsof doesn't support HP-UX < 11 any more, I
try to avoid disabling it there when possible, and
a locking fix for HP-UX >= 11 in lsof 4.63
inadvertently disabled compilation of lsof for
HP-UX < 11. Fixed long-standing bug in HP-UX 10.20
lock reporting.

Removed language from the test suite programs that
requires an ANSI-C compiler. This allowed the test
suite to be validated with cc and gcc on the un-
supported HP-UX 10.20.

At the suggestion of Manuel Bouyer <bouyer@antioche.eu.org>
switched NetBSD and OpenBSD lsof from using nlist()
to using kvm_nlist(). Made the same change for
BSDI, Darwin, and FreeBSD.

Validated test suite on OPENSTEP 4.2.

In response to a suggestion from Jeff Stoner
<jstoner@blackboard.com> enhanced
support for the
FD list of the -d option to allow it to be either
an exclusion or inclusion list, using the '^' prefix
to denote exclusions.

Made adjustments for FreeBSD 4.6 and 5.0-CURRENT.
Fixed a FreeBSD /etc/make.conf CFLAGS extraction
bug, reported by Kris Kennaway <kris@obsecurity.org>,
and new a bug in the fix, reported by Eric Cronin
<ecronin@eecs.umich.edu>

Added nullfs support for FreeBSD, NetBSD, and OpenBSD
at the request of Andrew Brown <atatat@atatdot.net>.

Modified all readmnt() functions to ignore mounted-on
directory names that don't begin with '/'.

Tested on NetBSD 1.6A and OpenBSD 3.1.

Upgraded to Solaris 9 FCS with two changes to the

BETA-Refresh support: 1) an adjustment to dnode.c
for a change in the so_so (sonode) structure; and
2) addition of Solaris 9 FCS specific DNLC code.
David Comay <David.Comay@Eng.Sun.COM> sent me the
dnode.c change and Casper Dik <Casper.Dik@sun.com>
helped with the new DNLC support code.

Applied
OpenUNIX changes that permit lsof to compile
and run on the upcoming 8.0.1 release. The changes
were supplied by Robert Lipe <robertl@caldera.com>.
Larry Rosenman <ler@lerctr.org> provided a test
system.

Added Solaris fd file system support.

4.65 October 10, 2002
Adjusted for change in FreeBSD 5.0-CURRENT inode
structure, reported by David O'Brien <obrien@NUXI.com>.
Adjusted for changes in FreeBSD 5.0-CURRENT <sys/vnode.h>.
One change was reported by Anders Nordby
<anders@FreeBSD.org>. Adjusted for FreeBSD 5.0-CURRENT
on sparc64 architecture.

Enhanced the error reporting of Solaris lsof when
it detects a kvm_open() failure, and added a 00FAQ
entry on the cause, based on a report from Peter
J. Bertoncini <pjb@anl.gov>.

Enabled compiling of lsof for NetBSD 1.5 with the
NULL file system, using a patch from Andrew Brown
<atatat@atatdot.net>.

Removed a hack in the LTbigf test program that was
once needed when it was compiled on
Solaris 9 BETA-
Refresh with gcc. The hack isn't needed on Solaris
9 FCS. Janet Hempstead <jan@library.carleton.ca>
brought the need for this change to my attention.

Applied a patch, supplied by Andrew Brown
<atatat@atatdot.net>, that updates lsof for NetBSD
version 1.6F. Corrected handling of the NetBSD
nullfs.

Updated to BSDI BSD/OS 4.3 on a test system kindly
provided by Terry Kennedy <terry@tmk.com>.

Updated to FreeBSD 4.7.

Updated to Apple Darwin 1.5, 5.x and 6.x with
patches supplied by Allan Nathanson <ajn@apple.com>.
The patches include IPv6 support.

Updated Configure to use the -bnolibpath loader
option when building lsof on a PowerPC, running
AIX 5 or greater. Valdis Kletnieks
<Valdis.Kletnieks@vt.edu> informed me this was
needed. Lsof for AIX 5.x was initially developed
on the IA64, where -bnolibpath can't be used and
I didn't think to restore it to PowerPC loads when
AIX 5.x became available for that architecture.

Updated
to UnixWare 7.1.3 on a test system provided
by Larry Rosenman <ler@lerctr.org>. Removed claims
that lsof works on OpenUNIX 8.0.1, because UnixWare
7.1.3 is the release name of OpenUNIX 8.0.1.

Based on a comment that his e-mail address was
wrong in the lsof distribution from Kenneth Stailey
<kstailey@disclosure.com>, removed all e-mail
addresses from lsof documentation files except this
one, 00DIST. The addresses in 00DIST are used to
send revision release notices to those who contributed
to a revision, but the addresses in this file for
previous revisions and in other documentation files
sometimes grow stale and are never validated.

4.66 December 22, 2002
Acquired Solaris 7 and 8 test systems, courtesy of
John Dzubera <Zube@CS.ColoState.EDU>. Updated
00TEST and tests/TestDB accordingly.

Clarified FreeBSD 5.0 architecture claims at the
suggestion of David O'Brien <obrien@NUXI.com>.
Also implemented David's suggestion to change
Intel to x86.

Installed
changes to DNLC handling in OSR lsof in
preparation for handling changes in the OSR 5.0.7
DNLC cache. Information about the changes and
patches to handle them were supplied by Bela Lubkin
<filbo@deepthought.armory.com>.

Upgraded True 64 UNIX support to the 5.1B release
on a test system provided by Berkley Shands
<berkley@cse.wustl.edu> Had to used relaxed ANSI
compilation because of an error in a system header
file and other lsof source usages.

Implemented the HASNOSOCKSECURITY compile-time
option. When it and HASSECURITY are defined, lsof
will be built to list only the user's open files,
but will also list anyone else's open socket files,
provided the "-i" option selects their listing.
Updated the Customize script to ask about setting
HASNOSOCKSECURITY. Left it undefined in all dialect
machine.h header files. This change was requested
by Kenneth Stailey <kstailey@speakeasy.net> for
use with ntop.

Added support for OpenBSD
3.2 and its kernel trace
file.

Improved lsof help (-h) and version (-v) information
reporting.

Fixed a FreeBSD 4.7 and above off-by-two UNIX domain
socket path termination bug, reported by Ken Stailey
<kstailey@speakeasy.net>

4.67 March 27, 2003
Began the transition of the lsof ftp server host
name from vic.cc.purdue.edu to lsof.itap.purdue.edu.
That reflects Purdue organizational changes. This
first step makes the new name an alias to the old
one. The old name, vic.cc.purdue.edu, will remain
usable for an extended period.

Corrected a revision number reference in section
17.17 of 00FAQ on the appearance of Solaris negative
DNLC caching handing.

Updated 00FAQ discussion of compilers for 64 bit
Solaris.

Validated test suite for 64 bit Solaris 8 and gcc.

At the request of Alek O. Komarnitsky <alek@komar.org>
added the "+c <width>" option to enable optional
changing of the COMMAND column output maximum width

from the default to <width>.
The default maximum
width remains CMDL, as defined in lsof.h.

Fixed three AIX kernel bit size detection bugs,
one in the AIX Configure script stanza, the second
and third in the AIX dproc.c get_kernel_access()
function. The bugs were reported by Pierre-Yves
Fontaniere <pyf@cc.in2p3.fr>, who tested the fixes.

Added kernel event queue file support for FreeBSD,
NetBSD and OpenBSD. Andrew Brown <atatat@atatdot.net>
supplied the code.

Updated to AIX 5.2 on a test system provided by
Dale Talcott <dtalcott@purdue.edu>. Had to build
work-arounds for two missing AIX 5.2 header files,
<j2/j2_snapshot> and <proc/proc_public.h>. Corrected
an off-by-one UNIX socket addressing bug. Taught
AIX lsof to handle both jfs and jfs2 files at the
same time. Adjusted for an IBM mistake in the
sizing of the fdsinfo structure in <procinfo.h>
Toshiya Nakamura <TOSHIYAN@jp.ibm.com> helped test,

Updated to FreeBSD 4.8. Corrected another bug in
FreeBSD UNIX domain
socket name handling.

Corrected gcc build problems on HP-UX 11i, reported
by Yuliy Minchev <yuliy@mobiltel.bg>.

Updated BSDI BSD/OS support to 4.3.1.

Augmented a lock ID test on NetBSD to check if the
ID is an LWP pointer.

4.68 June 18, 2003
Enhanced Configure script's cleanup operations.

Added support for OpenBSD 3.3, based on a report
from Peter Valchev <pvalchev@sightly.net>.

Improved the description of the detached PGP
signature certificate file in the main lsof README
file, based on a suggestion from Diana Stockdale
<diana@mpl.ucsd.edu>.

Installed a work-around for FreeBSD 5.0-CURRENT on

Alpha to avoid a compiler register use complaint.

Corrected a 'c' option error message. Gnele
<blaadeleng@yahoo.com> reported the problem.

Upgraded EXT2FS and UFS support for NetBSD and
OpenBSD to handle new inode information, and the
fast UFS1 and UFS2 file systems.

With the help of Andrew Brown <atatat@atatdot.net>
determined the NetBSD snapshot
(1.6F) at which
<sys/mount.h> could be included under _KERNEL, thus
eliminating the lsof netexport.h hack. The same
change applies to OpenBSD versions 3.3 and above.

Applied a patch from Armin Gruner <ag@muc.de> that
corrects the use of the HASPROCFS definition in the
FreeBSD dialect sources.

Corrected spelling errors in 00FAQ and in the
generated 00.README.FIRST_<version> file of the
distribution archive. John Jackson <jrj@purdue.edu>
and Ray Phillips <r.phillips@jkmrc.uq.edu.au>
spotted and reported the errors.

Corrected a spelling error in a comment and incorrect
use of an alarm function in the LTsock test program.

At the suggestion of Stuart Anderson <sba@srl.caltech.edu>
added preliminary (and incomplete) SAM-FS file system
support to Solaris lsof. Completion awaits availability
of SAM-FS internals.

Fixed a Solaris device name printing bug, reported by
Ric Anderson <ric@tick.Telcom.Arizona.EDU>, only
visible when HASDCACHE is
not defined. Ric helped
test the fix.

Fixed an AIX kernel bit size handling bug related
to the NFS node (rnode) structure.

Corrected a print_kptr() function call error in the AIX
AFS code, reported by David Steiner
<david.r.steiner@Dartmouth.EDU>. Upon further reflection
and because I no longer have appropriate AIX AFS test
systems, disabled AIX AFS support in the Configure script

for AIX versions above 4.3.3.0 or AIX AFS versions above 3.5.

Added support for FreeBSD 5.1.

With advice from Allan Nathanson <ajn@apple.com> adjusted
the Darwin get-xnu-headers.sh script to access the kernel
header files needed by lsof from a new form of the Apple
open source repository.

Installed Linux and lsof library bug fixes and
improvements, supplied by Marian Jancar <mjancar@suse.cz>.
One Linux improvement handles mount strings that
have octal escapes in them, eg., \040 for embedded
blanks. Marian tested the changes.

4.69 October 16, 2003

Received and
applied an OpenBSD patch from Peter Valchev
<pvalchev@sightly.net> that replaces a ctob() call with
a sysconf() call. Peter claims sysconf() is needed for
OpenBSD on SPARC. (It is not needed for NetBSD on SPARC.)

With the upgrade of my only Solaris 7 test system
to, Solaris 8, dropped the *claim* that lsof works
on Solaris 7. That doesn't mean it won't work
there, so those who want lsof for Solaris 7 probably
should be able to build it there and it probably
will work there.

Revised lsof's DNLC handling for BSD derivatives,
including: BSDI; Darwin, DEC OSF/1, Digital UNIX
and Tru64 UNIX; FreeBSD; NetBSD; and OpenBSD. The
latest NetBSD distribution's dropping of the vnode
capability ID (v_id) required the revision.

Adjusted to the latest FreeBSD 5.1-CURRENT.

Added NetBSD support for using kvm_getproc2().

Added a patch from Andrew Brown <atatat@atatdot.net>
to handle NetBSD enum conflicts and changes in the
<miscfs/kernfs/kernfs.h> and <miscfs/procfs/procfs.h>
header
files.

Added a "#define _KERNEL" to the AIX dnode2.c source
file for compatibility with a new <j2/j2_inode.h>
AIX 5.2 header file version. The addition was

supplied by Dick Dunbar <Dick.Dunbar@Siebel.com>
and was offered as a patch to lsof 4.68/

Added support for a second type of Solaris SAMFS.
Stuart Anderson <sba@srl.caltech.edu> provided the
support. SAMFS support in lsof SOLARIS remains
scanty, because Sun won't release any details on
its kernel structures.

Dropped the *claim* that lsof works on AIX 4.3.3,
because I was unable to test it there. That doesn't
mean it won't work there, so those who want lsof
for AIX 4.3.3 probably should be able to build it
there and it probably will work there.

Updated for Solaris 10 on test systems provided by
Mike Miscevic <miscevic@hotpop.com>. Casper Dik
<casper@holland.sun.com> provided significant help.
During the Solaris 10 port found and fixed an lofs
handling bug that
prevented reporting of open lofs
file lock status.

Updated the DNLC test, LTdnlc, to provide a possible
explanation about file systems on which the test
might fail.

Modified the procedure for obtaining missing Darwin
XNU kernel header files. The new one requires more
manual intervention, but is the best that can be
done with the way Apple open sources are now
organized. 00FAQ explains the new procedures for
those not used to downloading Apple open source
files.

Added support for Apple Darwin 7.0 (Mac OS X 10.3)
with patches supplied by Allan Nathanson <ajn@apple.com>.
Dropped the *claim* that lsof builds and works on
Apple Darwin below 6.0.

Validated lsof on FreeBSD 4.9, using a test system
provided by Ben Lewis <bl@purdue.edu>.

Validated lsof on FreeBSD 5.1-CURRENT for Amd64.
David O'Brien <obrien@FreeBSD.org> provided a test
system.

Changed the NetBSD Configure stanza to do header

file searches in /usr/include by default. The
LSOF_INCLUDE
and NETBSD_SYS environment variables
may still be used to specify other search paths.
Discussions with Andrew Brown and Wolfgang S.
Rupprecht <wolfgang@wsrcc.com> led to the change.

4.70 January 16, 2004
Improved shell-portability of the linux stanza of
the Configure script with a patch from Paul Jarc
<prj@po.cwru.edu>.

Added a "silent" rule to tests/Makefile for Paul.
Updated, extended and clarified the test suite
documentation in 00FAQ and 00TEST.

Fixed Solaris 10 dlsof.h typo, reported by Mike
Miscevic <miscevic@hotpop.com>. The typo prevents lsof
from loading cleanly in Solaris 10 builds past 40.

Fixed a Solaris HSFS node number reporting bug and
added a structure definition work-around for Solaris
10.

Converted PGP signing to GPG. My previous PGP key can
be used, but the gpg "--allow-non-selfsigned-uid"
option may have to be used when it is imported into a
GPG key ring.

Added bz2 compression.

Updated for OpenBSD 3.4.

Added
a work-around for a missing header file in the
s10_44 Solaris 10 build.

Added support for FreeBSD 5.2-BETA and 5.2-CURRENT.

Updated Linux AX25 support with modifications supplied
by Lutz Poetschulat <dl9cu@db0zwi.de>.

Added raw IPv6 support to Linux lsof.

Improved handling of parameters after "-i@".

Improved file name test in LTdnlc.c.

Added loop count controls to the reading of Solaris lock chains. The change was implemented as a result of a report from Steve Gonczi <steve@relicore.com>.

Based on a report from John Jackson <jrj@purdue.edu>, enabled a Solaris 10 <sys/lgrp.h> work-around for Solaris 9, too. (Patch 112233 installs an lgrp.h on Solaris 9 that needs the work-around.)

With help from Andrew Brown <atatat@atatdot.net> and John Heasley <heas@netbsd.org> added log-structured file system (LFS) support for NetBSD and OpenBSD.

Added AMD64 to the list of FreeBSD 5.x-CURRENT supported architectures. FreeBSD.org provides a test system,
courtesy of (I believe) David O'Brien <obrien@FreeBSD.org>.

Added a cast to lseek() in the HP-UX /dev/kmem-based kread() function to make it work properly with the bundled HP C compiler.

4.71 March 11, 2004
Added text file support to Apple Darwin lsof and enabled the lsof executable portion of the LTbasic test. Added support for Darwin kernel queue, POSIX semaphore and POSIX shared memory files. Tested on Darwin 7.2 (aka Mac OS 10.3.2).

Added process_kqueue() function prototypes for FreeBSD, NetBSD and OpenBSD.

Picked some lint in AIX sources, lib/rnmh.c and tests/LTsock.c.

Added "-x [fl]" cross-over option, which enables +d and +D processing to cross over symbolic links and|or file system mount points. Discussion with Johan Lindquist <johan@smilfinken.net> and Eric Williams (aka The Ghost In The Machine) <ewill3@earthlink.net> on Linux news groups revealed the need for the option.

Updated support for UnixWare 7.1.4.

Added
support for the optional reporting of socket options, socket states and TCP flags for most currently

supported dialects. John Smith <lbalbalba@hotmail.com>
and Tristan Nefzger <tn@bhtrader.com> requested the
information. The dialects and their versions for which
this feature has become available include:

AIX 4.3.2 and 5.[12]
Apple Darwin 7.2
BSDI BSD/OS 4.3.1
Digital UNIX and Tru64 UNIX 4.0
FreeBSD 4.9 and 5.2
HP-UX 11 and 11.11 (aka 11i)
NetBSD 1.6ZH
OpenBSD 3.4
OPENSTEP 4.2
OpenUNIX 8
SCO OpenServer Release 5.0.6
Solaris 2.6, 8, 9 and 10
UnixWare 7.1.[134]

Modified the Configure stanza for HP-UX 11 with better
q4 detection. Steve Bonds <3vhmxxm02@sneakemail.com>
supplied the modification.

Applied a patch from Mike Miscevic <miscevic@hotpop.com>
to enable lsof to compile with the zone support in the
Solaris 10 s10_b51 release. Added information on lsof
zone behavior to 00FAQ.

Added
a "-z [z]" option to Solaris 10 lsof. It enables
the listing of zone name and can also be used to select
the listing of processes and their files from specified
zones.

4.72 July 13, 2004
Corrected Solaris 10 ZONE column title display bug with
a patch from Joep Vesseur <Joep.Vesseur@Sun.COM>. Joep's
fix was offered as a patch to 4.71.

Based on a report from Jean-Pierre Radley <jpr@jpr.com>
about an unexpected GNU uname Configure interaction on
OSR, and working from information received from Bela
Lubkin, changed the OSR Configure stanza to use
/bin/uname instead of uname. Added an FAQ entry about
Configure version detection problems.

Added the +m and "+m m" options in response to a dialog
with Robert T. Brown <rbrown@netmentor.com>. The

options allow the creation of a mount table supplement file which can be used on selected dialects to get device numbers when stat(2) and lstat(2) can't deliver them. (That's generally the result of an inaccessible NFS server.) Currently the new options are supported only on Linux.

Made cpumask_t typedef _KERNEL compensation for FreeBSD 5.2-CURRENT. Refined it for 5.2.1-RELEASE with testing help from Scott Ellentuch <tuc@ttsg.com>.

Added support for FreeBSD 4.10. Larry Rosenman <ler@lerctr.org> kindly provided a test system.

Added support for NetBSD 2.0 with patches supplied by Andrew Brown <atatat@atatdot.net>. Andrew also provided two test systems.

Made handling of Linux maps file more robust, based on a report from Jan Blunck <J.Blunck@tu-harburg.de>. As a side benefit, made handling of generated stat(2) information more flexible.

As a result of a discussion with Jason Fortezzo <fortezza@mechanicalism.net>, adjusted lsof for Solaris to obtain the maximum user name length from ut_name of the utmpx structure, if <utmpx.h> exists.

Tested under OpenBSD 3.5.

Updated 00README information about using gcc (via the Configure aixgcc abbrevisiation) to compile lsof on AIX. Ann Janssen <ajanssen@nebook.com> made me aware the information was out of date.

Added an AIX SIGDANGER handler and some 00FAQ sections on lsof memory usage after a discussion with Tom Qin <tom.qin@citigroup.com> about lsof memory usage.

Added scripts/sort_res.perl5, contributed by Fabian Frederick <fabian.frederick@gmx.fr>. The script displays lsof output sorted by size and path name.

Improved handling of files on Linux NFS mount points that use the root_squash option, based on discussions with Paul Szabo <psz@maths.usyd.edu.au>.

Updated FreeBSD 5.2-CURRENT support, based on a problem report from Filippo Natali <filippo@widestore.net>.

Corrected improper FreeeBSD 5.x-CURRENT #if condition, reported by Kim Culhan <kimc@kim.net>.

Added a Configure script work-around for AIX 5.2 lsof with JFS2, compiled by gcc >= 3.3. The work-around was supplied by Florian M. Weps <fmw@hactrn.ch>.

4.73 October 21, 2004

Added an __XPG4_CHAR_CLASS__ #define before #include'ing <ctype.h> on Solaris to restore lsof's ability to display special characters such as acute-e.

Added wide-character (e.g., UTF-8) support where possible, prompted by a request from Kyungjoon Lee <kjoonlee@gmail.com>. Some older dialects -- e.g., NetBSD 1.4.1 -- don't support wide characters, so the wide character support is enabled by definitions in each dialect's machine.h. Dialects with wide-character support are listed in 00FAQ.

Make a FreeBSD 5.2-CURRENT adjustment for <sys/pipe.h>, supplied by Sergey A. Osokin <osa@FreeBSD.ORG>.

Implemented a Linux feature request made by Jakub Jelinek <jakub@redhat.com> that enhances lsof's ability to locate UNIX domain sockets whose paths are named as arguments. Jakub supplied suggested code.

Dropped *claims* that lsof works on AIX below 5.1, SCO
Dropped *claims* that lsof works on AIX below 5.1, SCO
Openserver 5.0.4, Tru64 UNIX 5.0, and UnixWare below 7.1.4. Lsof will probably build and work on those UNIX dialect versions, but I no longer have any way to test lsof on them.

Added support for FreeBSD 5.3 and 6.0. The FreeBSD 5.3 support hasn't been tested.

Added FD test code that will allow dialect versions to test FD option selections. Used the new code in the PSTAT-based HP-UX lsof to enable it to avoid scanning the mount table when its information is not needed.

The addition was made in response to a query from
Harvey Garner <Harvey.Garner@championusa.com> about
lsof performance in a busy NFS environment.

Upgraded lsof's AIX support level to AIX 5.3, based on
a report from Dick Dunbar <Dick.Dunbar@Siebel.com>. (I
have not tested lsof under AIX 5.3.) Based on Dick's
recommendation and local testing changed the C for AIX
version 6 and higher -qmaxmem option value to -1.

Made LSOF_AR environment variable more useful and
documented it in 00XCONFIG.

Corrected the use of sum(1) to
generate signatures for
the lsof distribution and binaries to match the
documentation that claims it is sum -r output. Jin
Guojun <jin@george.lbl.gov> noticed and reported the
problem.

Tested under OpenBSD 3.6.

Added checksum and GPG certificate files for the bz2,
gz and Z lsof distribution archives. The new files
reside with the distribution archives and supplement
the signature information already inside the archives.

Validated on Solaris 10, i8xpc, build s10_63.

4.74 January 17, 2005
Fixed a Solaris segment fault bug on systems that lack
a /dev/allkmem device. Offered the fix as a patch to
lsof 4.73. The bug was reported by Donald Zoch
<donald.zoch@amd.com>.

Updated lsof for FreeBSD 6.0 and higher for a change in
<sys/vnode.h>, based on a report from Sergey A. Osokin
<osa@FreeBSD.ORG>. Made the update available in a 4.74
'A' edition pre-release.

Filed an HP bug report about missing pstat(2) CWD info
for LOFS on HP-UX 11.11 and higher.
The missing CWD
info was noticed by Ermin Borovac <e.borovac@bom.gov.au>.
Added info to 00FAQ about the problem, which can cause
the lsof test suite's LTbasic test to fail.

Updated the q4-generated tcp_s.h in the lsof

distribution and added socket option support for HP-UX 11.00. Erwin Reyns <ereyns@europarl.eu.int> helped test.

Updated for Solaris 10, build s10_69, with a patch supplied by Mike Miscevic <miscevic@hotpop.com>.

Added v_path support to Solaris 10 lsof. That relieves it of having to read and decode the kernel DNLC, and delivers full paths more reliably.

Added specialized NFS4 support to Solaris 10 lsof.

Applied Solaris 10 patches to lsof supplied by Casper Dik <casper@holland.sun.com>.

Updated lsof for NetBSD 2.99.10 and tested it on a system provided by Andrew Brown <atatat@atatdot.net>.

Added support for the FreeBSD 6.0-CURRENT f_vnode pointer in the file structure.

Added BSDI, FreeBSD, NetBSD and OpenBSD support for the
*effnlink member of the inode structure. This makes the lsof LTnlink test run faster on all modified dialects and correctly on OpenBSD.

Added ptyfs support for NetBSD, using modifications provided by Andrew Brown.

Changed the netbsd Configure stanza to look by default for system header files in both /usr/include and /usr/src. (The NETBSD_SYS environment variable can still be used to select an alternate for /usr/src.)

Corrects two FreeBSD 4.10 RPC/XDR type definitions.

Added an FAQ Q&A about setuid and setgid restrictions in HP-UX 11.11. The information in the answer was supplied by Frank Sanders <frank.sanders@siemens.com>.

Added abbreviations for AXI FCIO and FSNAPSHOT file flags. Holger VanKoll <Holger.VanKoll@swisscom.com> reported the missing FCIO.

Adjusted lsof's private AIX 64 bit rnode structure for 64 bit AIX 5.2 systems. (IBM doesn't distribute a

correct <nfs/rnode.h> for it.)

Corrected a Linux socket inode printing bug
reported by
Igor Schein <igor@txc.com>.

Updated for FreeBSD 4.11. The support compiles but
hasn't been tested.

Back-ported a FreeBSD 6.0-CURRENT fix to FreeBSD
5.3-RELEASE-p1. That was done to solve a compilation
problem reported by Radko Keves <rado@daemon.sk>.

4.75 May 16, 2005
Dropped the *claim* that lsof works on DEC OSF/1 and
Digital UNIX, since my last 4.0 test system has been
removed. The last tested distribution of lsof on DEC OSF/1
and Digital UNIX was revision 4.74. It has been archived
on lsof.itap.purdue.edu in pub/tools/unix/lsof/OLD/src.

Added negation forms to the values in the -g (PGID) and
-p (PID) lists. Negated PGID and PID values, like
negated UID or login name values, are applied without
ORing or ANDing and take effect before any other
selection criteria are applied.

At the request of Marcin Gozdalik <gozdal@gmail.com>
added a -X option for Linux. The option inhibits the
reading of the /proc/net/tcp* and /proc/net/udp*
files.

Based
on a report from David Gutierrez
<davegu1@hotmail.com> changed DEC OSF/1 process table
allocation to request memory in smaller increments.

Based on a report from jayjwa <jayjwa@atr2.ath.cx>
updated the Customize script to use "tail -n 1" where
possible.

Enabled support for FreeBSD 5.4.

Improved the BSDI, FreeBSD, NetBSD, OpenBSD and Solaris
kvm_open() and kvm_openfiles() error messages.

Enabled support for NetBSD 2.99.12.

Improved HP-UX Configure stanza with help from Piet

Starreveld <pstarrev@csc.com>. Picked some lint Piet found.

Enabled IPv6 support for HP-UX > 11. Piet Starreveld helped test it on 11.23, among others.

Updated for HP-UX 11.23 on the ia64 architecture.

Updated to latest FreeBSD 6.0-CURRENT, using a test system provided by Andrzej Tobola <ato@iem.pw.edu.pl>.

Added support for SCO OSR 6.0.0 and UnixWare 7.1.4 with help from Richard at SCO.

Corrected a Linux bug in NFS handling, reported by Karel Zak
<kzak@redhat.com>. Karel supplied a patch.

Improved the code for accessing an AIX 3.2 and higher sockaddr_un structure, thus eliminating a segmentation fault possibility.

Updated for AIX 5.3.

Added preliminary (DEBUG) support for the AIX SANFS file system.

Fixed a bug in the Solaris 10 processing of the vnode's v_path pointer with code supplied by Edward Jajko <ejajko@portal.com>. The fix was offered as a patch to 4.74.

Dropped support for OpenUNIX 8, since a test system is no longer available. Archived an OpenUNIX-only distribution of the last revision (4.74) tested on OpenUNIX in pub/tools/unix/lsof/OLD/src.

Tested under Openbsd 3.7.

Tested under Darwin 7.7.0.

Enabled building on amd64 Solaris 10 with hints from Marc Aurele La France <tsi@ualberta.ca>. Marc provided a test system.

Supplied a missing quote in the FreeBSD Configure stanza. Carl Cook <Info@quantum-sci.com> reported the problem.

Removed "-O" option from
tests/Makefile so that the
HP-UX bundled compiler won't complain.

4.76 August 30, 2005
Corrected an example and spelling errors in man page.

Updated for Apple Darwin 8.x with changes supplied by
Allan Nathanson <ajn@apple.com>. Allan also provided a
test system.

Completed documentation of CLRLFILEADD in all machine.h
files.

At the request of Chris Markle <cmarkle@sendmail.com>
added partial listen queue length to socket options
displayed when -Tf is specified. Partial queue length
is not reported for all dialects. (00FAQ lists the
ones where it is reported.)

Updated for FreeBSD 7.0 with information supplied by
Andrzej Tobola <ato@iem.pw.edu.pl>.

Updated Solaris VxFS support for VxFS versions 4 and
above with technical advice from Craig Harmer
<craig_harmer@symantec.com>, Gary Millen
<gary_millen@symantec.com> and Chuck Silvers
<charles_silvers@symantec.com>. Testing help was
provided by Michael Antlitz <mantlitz@prophasys.com>,
Steve
Ginsberg <steve@dhapdigital.com> and Kenneth
Stailey <kstailey@yahoo.com>.

Fixed a Solaris address space map processing bug.
Janardhan Molumuri <mjanardhan@gmail.com> reported the
bug and help me identify it. Made the fix available as
a patch to 4.75.

Added support for Solaris 10 port and CTFS files. The
CTFS support is imcomplete, because I don't know how
to get inode number, size and link count. (There's
a new 00FAQ entry about that.)

Investigated a report from Christopher J Warweg
<warwegc@GAO.GOV> that the CHECKSUMS for the lsof 4.75
binary for 64 bit Solaris 8 was incorrect. It was my
packaging error. I rebuilt and repackaged the binary.

Enabled support for Linux map file names with embedded
spaces.

4.77 April 10, 2006
Added -X option support for Solaris 10 and above. When
-X is specified lsof will report cached v_node path
names for unlinked files, followed by "(deleted)".
Improved cached vnode path name handling by adding
"(?)"
to the end of path names of questionable accuracy.
Updated 00FAQ to reflect these changes.

Updated for FreeBSD 7.0-CURRENT.

Fixed name addition spacing bug, reported by Stuart
Anderson <anderson@ligo.caltech.edu>. Also updated
Solaris 10 SAMFS support at Stuart's request.

Added missing "break;" and another HASSTATVFS test to
the NetBSD and OpenBSD dnode.c. Bill Behr
<bbehr@networkstoragecorp.com> reported those needs.

Fixed an HP-UX 11 file descriptor "chunk" size problem,
reported by Per Allansson <per@appgate.com>. Per helped
devise the fix and tested it. This fix was offered as
a patch to lsof 4.76.

Updated for FreeBSD 6.0-STABLE and FreeBSD
6.1-PRERELEASE.

Updated scripts/sort_res.perl5 with changes supplied by
Frederick Fabian <fabian.frederick@skynet.be>, the
author of the script.

Corrected +|-M man page documentation error, reported
by Roger Cornelius <rac@tenzing.org>.

Improved FreeBSD user device random seed generation in
response
to a problem report from Danny Braniss
<danny@cs.huji.ac.il>.

Eliminated three syntax error bugs and other compiler
complaints from the PSTAT-based lsof. H. Merijn Brand
<h.m.brand@xs4all.nl> reported the problems and tested
the fixes.

Eliminated compiler complaints in the test suite.

Investigated problems with the building of lsof on
PA-RISC HP-UX 11.23, based on a report from John
Orndorff <John.Orndorff@sungard.com>. Found that
neither the HP bundled C compiler nor gcc would build
lsof, but the the HP unbundled ANSI C compiler would.
Concluded that HP bundled C compiler can't handle
<gssapi/gssapi.h>. Devised a work-around to gcc's
omission of the rpcent structure definition of
<netdb.h> that allows it to compile lsof's print.c, but
the resulting binary doesn't run reliably. Documented
the situation in 00FAQ.

Changed reporting of unknown file types. The number of
an unknown type is now reported as four octets. The
change was
made in response to a Linux lsof bug report
from Karel Zak <kzak@redhat.com>.

Dropped the *claim* that lsof works on BSDI BSD/OS
since my last test system has been removed. The last
tested distribution of lsof for BSDI BSD/OS was
revision 4.76. It has been archived on
lsof.itap.purdue.edu in pub/tools/unix/lsof/OLD/src.

As a result of discussing the lsof source tar's MD5
checksum with Andrew Bell <andrew.bell.ia@gmail.com>,
changed the description of a suitable MD5 tool in the
lsof distribution's documentation to name the openssl
"dgst" command.

Enabled compilation on Solaris 10 1/06 with a fix sent
by Jason Fortezzo <fortezza@mechanicalism.net>. Made
the fix available as a patch to 4.76.

Adjusted to FreeBSD 5.5-PRERELEASE.

Corrected a bug in the lsof library's process_file()
function to enable the locating of AIX XTI sockets by
their TCP/IP address values. The bug was reported by
Michel Dubois <Dubois@sears.ca>.

Based on a bug report
from Karel Zak <kzak@redhat.com>
added command name length checking to as many dialects
as possible (Linux for Karel) for the "-c c" option.

Updated for OpenBSD 3.[89]. Tested the 3.9 update on a system provided by David Mazieres. I have not tested on OpenBSD 3.8, but David reports lsof 4.76 worked there.

Ended regression testing of lsof on 32 bit Solaris 8 with the ending of access to a test system. Lsof continues to be tested on 64 bit Solaris 8.

4.78 April 24, 2007

Added more information to the lsof FAQ about missing link counts and sizes on Linux files.

Simplified Linux stat() and lstat() usage.

Relocated #define's that prevent OpenBSD compilation on systems without a /proc file system. Pieter Bowman <bowman@math.utah.edu> reported the problem.

Added code to avoid processing Linux /proc/<PID>/maps file entries with zero device and node numbers. Some such entries now have names associated with them that are not path names -- e.g., "[heap]", "[stack]" or "[vdso]". Scott Worley <sworley@chkno.net> reported lsof's mishandling of such entries.

Added SELinux security context support, provided by James Antill <james.antill@redhat.com>. I have not tested this, but James and Karel Zak <kzak@redhat.com> have.

Added the #include of <sys/types.h> to Solaris lsof to enabled compilation on Solaris 10 6/06. Peter Harvey Peter.Harvey@Sun.COM diagnosed the problem and supplied a patch.

Added better support for JFS2 on AIX 5.2 and 5.3, based on bug reports and help from Thomas Braunbeck <BRAUNBEC@de.ibm.com> and Tom Whitty <TWHITTY@cerner.com>.

Documented that lsof supports AIX 5.3 only up through maintenance level 1 (ML1).

Enabled Solaris lsof to locate the AFS vnode operation address for OpenAFS 1.4.1. The fix was supplied by Robert Jelinek <Robert.Jelinek@MorganStanley.com>.

Enabled support for Solaris 10 ZFS. If the necessary
ZFS header files aren't found, lsof offers the option
to
drop ZFS support, to use internal, possibly
inaccurate structure definitions, or to supply a path
to the missing header files. Horst Scheuermann
<Horst.Scheuermann@uni-trier.de> provided a development
system and helped test the support.

Corrected a typo in the man page, reported by Eric S.
Raymond <esr@thyrsus.com>.

Changed the spelling of macroes to macros in lsof
source and documentations files, based on a suggestion
from Josh Soref <timeless@gmail.com> and verification
with the OED.

The following dialects are no longer supported: 32 bit
AIX 5.2, HP-UX 11, OpenStep 4.2, Solaris 2.6, Solaris
8, True Unix 64 and UnixWare 7.1.4. Lsof may work on
them, but I no longer have test systems for them.
Support for OpenBSD ends at its version 3.9 for lack of
interest in the port.

4.79 April 15, 2008

********** IMPORTANT NOTE **********
*
* Lsof support has been reduced to the following
*
* dialects: AIX, FreeBSD, Linux and Solaris, and *
* only in selected versions of those dialects. *
* The selected versions are listed in this file *
* and in other lsof documentation. *
*
* I have made this move because of retirement *
* and because I no longer have many test systems *
* available to me. *
*
* Vic Abell *
*
****

Fixed a Solaris VXFS permission problem when accessing
the VXFS inode offsets. The bug was reported by
Gregory A. Ivanov <ivga@mts.ru>. Gregory tested the
fix.

Moved an #include <string.h> later in FreeBSD dlsof.h
to enable compilation on recent FreeBSD releases. The
change was supplied by Roy Marples <uberlord@gentoo.org>.

Improved
Linux /proc file stream reading speed by applying
an expanded version of a patch from Eric Dumazet
<dada1@cosmosbay.com> that allocates a page size buffer
to each stream. Improved TCP, TCP6, UDP and UDP6 hashing
by determining the hash bucket count from the /proc/net
sockstat and sockstat6 files. The improvement was
suggested by Eric and he provided sample code. Eric also
tested both improvements.

Modified Configure script to build lsof on FreeBSD
6.2. Tested it on a system provided by Larry Rosenman
<ler@lerctr.org>.

Fixed a Linux maps file processing bug that prevented path
names from having an embedded colon. James Lingard
<jchl@arastra.com> reported the bug and helped with its
fix.

Based on reports from Eric Dumazet and Samuel Thibault
<samuel.thibault@ens-lyon.org> added support for the
Linux 2.6.22 kernel's /proc/<PID>/fdinfo files -- i.e.,
file offset and flags. Samuel Thibault provided a test
system.

Fixed a Linux UNIX socket
memory leak, reported by
Philip Shin <pshin@xceedium.com>. Phillip supplied the
fix.

With generous assistance from HP added support for an HP-UX
11.23 patch that makes TLI/XTI socket address information
available.

Fixed a header file problem for FreeBSD 6.2 on the Alpha
architecture. The problem was reported by Pekka Honkanen
<phonkane@cc.hut.fi>. Pekka tested the fix.

Based on a report and using suggested fixes from Karel Zak
<kzak@redhat.com>, made these changes to Linux lsof: corrected
a getpidcon() error message; insured that inode numbers are
handled correctly for their unsigned long long type; and
improved SELinux handling. At the request of Alon Bar-Lev
<alonbl@gentoo.org> added the LINUX_HASSELINUX environment

variable to enable or inhibit SElinux support unconditionally.

Updated Configure for FreeBSD 8.0-CURRENT and tested lsof on
AMD64 there.

Added a patch provided by Oles Hnatkevych
<don_oles@able.com.ua> for FreeBSD systems where
the root
file system is on a CD9660 device.

Added compensation for the disappearance of FMARK and FDEFER
from the FreeBSD 8.0-CURRENT <sys/file.h>.

Updated FreeBSD lsof with ZFS support. Larry Rosenman
<ler@lerctr.org>, Erwin Lansing <erwin@FreeBSD.org>, Wesley
Shields <wxs@atarininja.org> and Dmitry Morozovsky
<marck@rinet.ru> provided test systems.

Fixed a socket file identification problem reported by
Pavol Rusnak <stick@gk2.sk>. Pavol also reported the
cause of the problem.

Added the ability to format the repeat mode marker line
with strftime(3), where the dialect supports the
localtime(3) and strftime(3) C library functions. The
addition was suggested by Mike Depot <mdepot@comcast.net>,
who also tested it. The addition required creating a new
main lsof source module, util.c, that contains functions
whose compilation conflicts with the general header file
tree defined by lsof.h and dlsof.h.

Based on reports from Andrei V. Lavreniyuk
<andy.lavr@reactor-xg.kiev.ua>
and Pav Lucistnik
<pav@FreeBSD.org> updated the FreeBSD 7.0 and above
file lock handling to use new locking structures. The
update requires a terrible hack to get a definition for
the lock owner structure from a kernel source module
into a local lsof header file.

4.80 May 12, 2008
Updated for a FreeBSD 7.0 and above byte level locking
change. The problem was reported by Conrad J. Sabatier
<conrads@cox.net>, who helped test the update. Wesley
Shields <wxs@FreeBSD.org> provided an 8.0-CURRENT test
system.

Propagated the FreeBSD 7.0 and above locking changes to

FreeBSD 6.x, based on a report from Edwin Groothuis
<edwin@FreeBSD.org>.

Added warnings for unsupported dialects or versions.

Added Linux support for the UDPLITE protocol. Eric
Dumazet <dada1@cosmosbay.com> supplied a patch.

Added a missing quote to the Configure script's
FreeBSD stanza.

Added a usage.o rule to the HP-UX PSTAT-based
Makefile. I mistakenly
deleted the rule at revision
4.79. The missing rule was reported by Kawaljeet Kaur
<kawaljeet.malviya@gmail.com> who tested the corrected
Makefile.

4.81 October 21, 2008
Updated the Darwin libproc sources with changes from
Allan Nathanson <ajn@apple.com>. Tested them on a iMac
mini, provided by Apple Inc.

Changed dummy declarations in library source files to
eliminate complaints about unused variables and empty
object files. This change may not work on dialects I
can no longer test; it has been tested on some versions
of AIX, Darwin, FreeBSD, Linux and Solaris.

At the request of Hal Brooks <hal@uga.edu> added support
for Linux /proc/net/packet files. Hal tested it.

Added socket file only performance enhancements to Linux
and PSTAT-based HPUX lsof.

Added htonl call around improper usage of INADDR_LOOPBACK;
report from an Apple engineer forwarded by Allan Nathanson
<ajn@apple.com>.

Adjusted for FreeBSD-8.0 change in device number
handling.
The adjustment should work for FreeBSD 5 and above, should
the 8.0 change be propagated downward. The problem was
reported by Pav Lucistnik <pav@FreeBSD.org>. An updated
test system was provided by Erwin Lansing <erwin@FreeBSD.org>.

Reduced AIX support to version 5.3, since test systems with
older versions are no longer available to me.

At the request of Marjo F. Mercado <mmercado@xceedium.com>
and Phil Shin <pshin@xceedium.com> applied some speed
improvements to lsof, particularly when the files of
interest are /Internet files -- i.e., selected with lsof's
"-i" option. Added a two new options to assist the
improvements: 1) "-c^<command>" to tell lsof to exclude the
named command(s); and 2) "-stcp|ud>:[^]state' to tell lsof
to include in its reporting or exclude ('^') from its
reporting Internet files in the named states (e.g., LISTEN,
^CLOSE_WAIT, IDLE, etc.) For the most part these changes
apply only to AIX, Darwin, FreeBSD, PSTAT-based
HP-UX, Linux
and Solaris, since those are the only places I could test
them. They are controlled by the HASTCPUDPSTATE definition
in each dialect's machine.h header file. Marjo and Phil
provided HP-UX 11.23 and 11.31 test systems.

Fixed a stat(2) problem on HP-UX 11.31 while testing the
speed improvements.

Adjusted for kernel header file changes in FreeBSD
8.0-CURRENT. Larry Rosenman <ler@lerctr.org> provided
a test system.

Added a warning for Solaris systems where VxFS node info
can't be obtained from the VxFS utility library. The
warning was requested by Tom Matthews <Tom.MATTHEWS@rbs.com>.

Corrected mishandling of file system path name arguments
that have trailing slashes, except, of course, the root
file system, "/". Allan Nathanson <ajn@apple.com> reported
the bug.

4.82 March 25, 2009
Corrected an over-zealous exclusion test that caused
lsof to report nothing when it was given no arguments
and built with HASSECURITY and HASNOSOCKSECURITY
enabled.
Joshua Kinard <kumba@gentoo.org> reported the bug and
supplied information for reproducing it.

Based on a report from Dan Trinkle <trinkle@cs.purdue.edu>
corrected use of <sys/utsname.h> for 32 bit Solaris 10
and above compilations. Simultaneously eliminated a
casting complaint in arg.c and updated Configure to use
the appropriate 64 bit compilation option (-xarch=v9 or
-m64) with the Solaris Sun C compiler.

Updated for FreeBSD 7.1-PRERELEASE with information
supplied by Larry Rosenman <ler@lerctr.org>.

Updated the Darwin libproc sources with changes from
Allan Nathanson <ajn@apple.com>. Tested them on a iMac
mini, provided by Apple Inc. Allan also provided man
page corrections.

Updated the FreeBSD Makefile to use the ${MAKE} variable
for ZFS dnode2.c module compilation, based on a suggestion
from Alexis Ballier <aballier@gentoo.org>.

Improved the Solaris VxFS library location test, based on a
suggestion from Jason Fortezzo
<fortezza@mechanicalism.net>.
Jason tested the change.

Updated Solaris 10 ZFS support for ZFS version 4 and ZFS
pool version 10, using a test system kindly provided by
Vladislav Nespor <vladislav.nespor@id.ethz.ch>. Renata
Maria Dart <renata@slac.stanford.edu> tested on ZFS
version 4, verifying that the update works there, too.
(ZFS pool version 10 is apparently the ZFS version shipped
with the 10/08 update to Solaris. The original ZFS
support targeted ZFS version 3.)

I still consider ZFS support in Solaris lsof a hack,
because it depends on a znode structure definition that
I developed using dbx. Sun is remiss in not distributing
the ZFS header files used to build the distributed kernel.

Because of the znode structure definition hack, I can't
guarantee that lsof ZFS support will work for any other
versions of ZFS.

Solaris 10: adjusted to a change in the way devices are
stored in the kernel; fixed a problem in zone handling;
and added rudimentary
sharedfs support. Carson Gaspar
<carson@taltos.org> reported the device number problem,
provided a test system, and tested the changes. Peter
Vines <psv2b@eservices.virginia.edu> reported the zone
handling problem and tested the fix.

Adapted to FreeBSD 8.0-CURRENT changes in device number
computation. Problem was reported by Erwin Lansing
<erwin@FreeBSD.org>. Larry Rosenman <ler@lerctr.org>

provided a test system.

Corrected Solaris Configure test for appropriate VxFS
library when using gcc to compile lsof.

Updated for loss of KAME IPv6 FreeBSD accommodations.

Adapted to FreeBSD 7.2. Made Configure script recognized
FreeBSD 6.3.

4.83 January 18, 2010
Converted Solaris 10 and above ZFS support to use the CTF
debugger library, libctf. Code was supplied by Robert
Byrnes <Robert.Byrnes@deshaw.com>.

Corrected a typo in the testing of the LINUX_HASSELINUX
environment variable in the Configure script. The error
was reported by Mike Frysinger
<vapier@gentoo.org>.
At Mike's request made Configure script accept LSOF_RANLIB
(ranlib command), LSOF_CFGF (additional configuration flags)
and LSOF_CFGL (additional library specifications) from the
environment.

Enabled complilation of Solaris 10 lsof after a recent Sun
patch which changed the PC file system's structure. Peter
Vernam <pvernam@draper.com> reported the problem and helped
with the fix.

Made the sort of configuration CFLAGS in the CkTestDB
script impervious to locale settings.

Ported to Solaris 11, using a test system kindly provided
by David Day <dday76@gmail.com>.

Adjusted to the disappearance of <nfs/rpcv2.h> in FreeBSD
8.0-BETA1.

Changed Solaris node type lookup to a hashed method and
added some ability for it to handle duplicate vnodeop names
in /dev/ksyms.

Updated for FreeBSD 9.0-CURRENT. Andrzej Tobola
<ato@iem.pw.edu.pl> provided a test system. Extends the
fix to FreeBSD 6.0 and above via a Configure test and
a
compile-time definition. The need for the extension was
reported by Erik Trulsson <ertr1013@student.uu.se>>

Made corrections to FAQ typographical errors, suggested
by Josh Soref <timeless@gmail.com>.

Added __UCLIBC__ test to Linux dlsof.h so lsof would compile
on an Intel ARM XScale processor. The addition was provided
by Doug Kehn <rdkehn@yahoo.com>.

Added test for <utmpx.h> to FreeBSD configuration. Improved
its use in lsof.h. The changes were supplied by Martin Wilke
<miwi@FreeBSD.org>.

4.84 July 29, 2010
Fixed a man page nroff command error with a correction
supplied by Josh Soref <timeless@gmail.com>.

Made Configure script recognize FreeBSD 7.3. Larry Rosenman
<ler@lerctr.org> provided a test system.

Improved task support, initially for Linux only, with help
provided by Jerome Marchand <jmarchan@redhat.com> and
Miklos Szeredi <mszeredi@suse.cz>. The support includes a
new compile-time definition, HASTASKS, and a new run time
option,
"-K" to select task reporting.

While adding help output support for "-K", reorganized the
printing of help columns to make it much easier to add a new
option description.

Updated the Solaris PC file system structure patch in
revision 4.83 so it will compile with gcc.

Disabled the Solaris lgrp_root work-around in the Solaris
machine.h so it won't cause compilation problems on Solaris
11. It no longer causes compilation problems on my Solaris
9 and 10 test systems, but some older Solaris 9 and 10
versions may still need it, so the work-around was left in
the Sun machine.h and a FAQ entry was created about it.

Updated for Solaris 11 b134, using a test system kindly
provided by Carson Gaspar <carson@taltos.org>. Made
provisions for the next ZFS version. Added info about
the failure of the LTnlink test on ZFS file systems.

Corrected typo in Configure script, reported by Dmitry
Berezin <dmitryb@oit.rutgers.edu>.

4.85 September 27, 2011

John Dzubera <Zube@CS.ColoState.EDU> kindly provided a patched Solaris 9 test system with the lgrp_root conflict and I was able to devise an automatic work-around for the conflict. The special note in .../dialects/sun/machine.h was removed and the 17.28.1 FAQ entry was modified to reflect the update.

Added a Solaris 11 work-around for a typedef problem with <sys/mutex.h>. Carson Gaspar <carson@taltos.org> reported the problem and supplied the work-around.

Added support for FreeBSD 7.4 and 8.2; tested on systems provided by Larry Rosenman <ler@lerctr.org>.

Added support for 32 bit Solaris 11 lsof with mods supplied by Jan Wortelboer <J.H.P.Wortelboer@uva.nl>.

Added Solaris 11 support for using an alternate genunix location. Bill Goodridge <bill@its.brooklyn.cuny.edu> reported the alternate location.

Added further Linux cross configuration support to lsof's Configure script. The additional support was supplied by Grant Erickson <erick205@umn.edu>.
See the descriptions of
the LINUX_* environmen variables in 00XCONFIG for more information. Tested lsof on Linux kernel 2.6.32 and picked some lint that surfaced during the test.

Added fixes and changes for Apple Mac OS X 10.6, provided by Allan Nathanson <ajn@apple.com>. Allan also provided a test system.

Tested on FreeBSD 6.4 i386, using a test system provided by Terry Kennedy <TERRY@tmk.com>. Updated for recent FreeBSD ZFS changes on an 8.2 amd64 test system also provided by Terry.

Changed documentation to indicate FreeBSD 7.x is no longer supported, since I no longer have a test system.

Made some changes to the lsof man page, suggested by Navid <evi1m4chine@googlemail.com>.

Added compensation for Solaris 10 systems that have patch 144488-10. The patch requires that the new header file <sys/socket_proto.h> be included while _KERNEL is defined. Brett Bartick <Brett.bartick@nomura.com> reported the problem

first, followed by Stuart Anderson
<anderson@ligo.caltech.edu>.
Michael Hocke <michael.hocke@nyu.edu> suggested a work-around
which I refined to limit it to the specific Solaris 10 instance
and then tested on a system provided by Charles Stephens
<cfs@cowlabs.com>

Added the +|-e option for Linux. It exempts file systems
named by path from function calls that might block in the
kernel -- i.e., stat(2) and lstat(2), and when the +e form
is used, readlink (2). The new packager of lsof for the
Linux Fedora and RHEL distributions, Peter Schiffer
<pschiffe@redhat.com>, asked for the feature so it could
be used with Clearcase file systems, whose implementation
can block stat(2) calls. I consider this feature very risky
and easy to misuse -- e.g., specifying the file system as
'/' would exempt all file systems. I don't intend to
propagate this option to any other UNIX dialect that lsof
currently supports.

Made FreeBSD 9 adjustment.

Fixed a Linux bug that prevented the display of paths
for
abstact UNIX sockets. Masatake Yamato <yamato@redhat.com>
reported the bug and supplied a patch.

Added compensation for the removal of RPC header files from
GlibC 2.14 for Linux. Marek Behun <kabel@blackhole.sk>
reported the problem and supplied a patch.

Added support for Linux Netlink protocol. Masatake Yamato
requested the support and supplied a patch. Peter Schiffer
<pschiffe@redhat.com> provided a test system.

Corrected Linux UDP6-lite path. The error was reported by
Masatake Yamato and he also supplied a patch.

4.86 April 10, 2012
Lsof for AIX is no longer supported on any versions of that
operating system.

Added information about the clang compiler for FreeBSD to the
FAQ.

Corrected an arg.c bug in the accumulation of +|-e option
values, reported by Peter Schiffer <pschiffe@redhat.com>.
This correction was supplied as a patch to revision 4.85.

Enabled FreeBSD 10 support and tested it there on a system
provided by Larry Rosenman
<ler@lerctr.org>.

Updated for latest Solaris 11 with patches supplied by
Carson Gaspar <carson@taltos.org>. Carson supplied a test
system.

Adjusted Linux file system search method to compensate for
NFS mounts that have duplicate device numbers. The problem
was reported by Peter Schiffer <pschiffe@redhat.com>, who
provided a test system.

At the request of Peter Schiffer <pschiffe@redhat.com>, added
support for Linux SCTP socket files. Peter provided a test
system. Applied a warning patch supplied by Peter.

Added support for Mac OS X 10.7 (Lion), provided by Allan
Nathanson <ajn@apple.com>. Allan also supplied a test
system.

Enabled FreeBSD 8.3 support and tested it there on a system
provided by Larry Rosenman <ler@lerctr.org>.

Corrected the FAQ information on ZFS with Solaris 10 after
Steven Blackmon <stblackm@cisco.com> and Prasad Jampala
<jampalp@cisco.com> pointed out that it was incorrect --
i.e., outdated by the libctf changes at
revision 4.83.

Added code to handle a Linux NFS-mounted root. Jia He
<hejianet@linux.vnet.ibm.com> reported the need for this.

4.87 January 2, 2013
Added an entry to 00FAQ about lsof behavior when the
HASSECURITY and HASNOSOCKSECURITY options are defined.
Carson Gaspar <carson@taltos.org> pointed out the need
for this clarification.

Added a work-around for a missing definition of mach_port_t
in Darwin 9 (Mac OS/X 10.5.8). The work-around was supplied
by Jim Reid <jim@rfc1035.com>.

Added support for Linux anon_inodefs, provided by Masatake
YAMATO <yamato@redhat.com>.

Documented a Solaris 9 and 10 portmap reporting problem

(+M) in 00FAQ. The problem was reported by Clint Roberts <Clint.Roberts@ttius.com>. I have no solution to the problem, but discuss a possible work-around in the answer to this 00FAQ question: "Why doesn't lsof report portmap registrations for some Solaris versions?"

Added FreeBSD support for the oldnfs and newnfs file system types.
Daniel Braniss <danny@cs.huji.ac.il> reported the need for the addition.

Added ICMP socket support for Linux with code provided by Masatake YAMATO <yamato@redhat.com>.

Corrected the reporting of process group ID for libproc versions of Mac OS X with a patch from Jeff Trawick <trawick@gmail.com>. The patch has not been applied to Darwin kmem versions, because of little call for them and inadequate test system access. The patch has been tested on Mac OS X 10.8 (Mountain Lion), courtesy of a test system provided by Allan Nathanson <ajn@apple.com>.

Added thread support to those FreeBSD versions that have ki_numthreads in their kinfo_proc structure. This also activates the -K option for those FreeBSD versions. Jeff Trawick reported problems with FreeBSD lsof when threads are present and this addition solves those problems.

Made changes to 00FAQ and the distribution, suggested by Warren Young <warren@etr-usa.com>. The 00FAQ changes center
on sections that discuss the -s option. The changes to the distribution include a ChangeLog file that is either a pointer to or a copy of 00DIST, the distribution notes.

Added support to FreeBSD for using the clang compiler.

Added Linux support for using the getxattr() call to obtain socket protocol identification when it is can't be obtained from the /proc/net files that lsof examines. Masatake YAMATO <yamato@redhat.com> developed the kernel patch to getxattr() and supplied the lsof patch.

4.88 October 13, 2014

Reduced to 50 the number of open file descriptors lsof attempts to close while trying to protect itself from a file descriptor exec() attack. This limits the overhead lsof incurs on systems that have large file descriptor

limits, yet provides sufficient open descriptors for the
library functions lsof calls.

Updated for changes in FreeBSD 10 with advice from Eygene
Ryabinkin <rea@freebsd.org>. Taught Configure to recognize
FreeBSD
8.4.

Herein am noting that lsof for Solaris 10 or 11 is no longer
supported. I no longer have test systems. Some support is
still available from Casper Dik <Casper.Dik@oracle.com> and a
Solaris 11 patch he provided is included in this revision.

Initialized local variables in the Linux process_id() function.
Jia He <jiakernel@gmail.com> reported the problem.

Added support for FreeBSD 11.

Updated FreeBSD ZFS Configure stanza to supply a dummy
opt_kdtrace.h when needed.

Added tmpfs file system support for FreeBSD.

Since a test system is no longer available, dropped the
claim of FreeBSD 4.9 support.

Added the +|-E options for Linux. -E displays endpoint info;
+E displays endpoint info and endpopint files. Masatake YAMATO
<yamato@redhat.com> requested this support and suggested code
to implement it.

Fixed a Linux bug handling processes whose command includes a
non-printing character, particularly a NEWLINE character, and
clarified printing
of single '\\' characters in command and
file names. Stephane Chazelas <stephane.chazelas@gmail.com>
reported the problem.

Added support for Linux RDMA and CRYPTO protocal names and UNIX
socket type with code from Masatake YAMATO <yamato@redhat.com>.

Fixed field output to insure that the field descriptor field is
always selected, since it identifies the file set. The bug was
reported by Gary Plewa <gary.m.plewa-1@lowes.com>.

4.89 July 7, 2015
Applied correction from Casper Dik <Casper.Dik@oracle.com> to
his patch for Solaris 11 that I applied incorrectly in revision

4.88.

Updated for latest version of FreeBSD 11.0-CURRENT.

Compensated for a missing FreeBSD 10.0 typedef of bool on the i386 architecture. Allen Hewes <rallenh@hotmail.com> provided a test system. Andrey Chernov <ache@freebsd.org> provided useful advice.

Improved tests/Add2TestDB script with a patch from Peter Schiffer <pschiffe@redhat.com>. Added patches from Peter to eliminate
Linux gcc warnings. Updated Lsof.8 with improvements supplied by Bjarni Ingi Gislason <bjarniig@rhi.hi.is>.

Changed FreeBSD global CFLAGS extraction per Terry Kennedy <TERRY@tmk.com>. Also made sure -DNEEDS_BOOL_TYPEDEF is #define'd when the resulting CFLAGS doesn't contain it. Terry reported that need.

Improved Linux test for tcp.h in response to a report from Cato Auestad <cato@cato.ninja>. Cato did the testing.

Fixed Linux UNIX socket search by name bug reported by Stephane Chazelas <stephane.chazelas@gmail.com>.

Added Linux display of UNIX socket endpoint information with code provided by Masatake YAMATO <yamato@redhat.com>. Peter Schiffer <pschiffe@redhat.com> provided a test system.

Insured that type definitions from <vm/vm.h> were again made visible to lsof on FreeBSD 11 after a system header file change hid them.

4.90 February 14, 2018

!!!NOTE!!
!
!
!   It is likely that this is the last lsof revision I   !
!   will issue, unless serious bugs are detected, Stay !
!   tuned to lsof-l for information about future support !
!   of lsof.   !
!   !
!   I thank all the many contributors to lsof over the   !
!   many years (20+?) I have been distributing lsof   !
!   versions 1, 2, 3 and 4.   !
!   !

! Vic Abell <abe@purdue.edu> !
! !
!!!NOTE!!

Taught the Configure script to create a dummy opt_random.h
for FreeBSD systems whose <sys/random.h> includes it.

Added support for the FreeBSD ZFUSE file system.

Corrected the quoting in a Darwin putchar() statement in the
dfile.c
source file. Andrew Janke <floss@apjanke.net> reported
my error.

Added support for the FreeBSD DTYPE_PTS file descriptor and
for unknown descriptors that reference the kernel's badfileops
operation switch. Enabled FreeBSD 12.0 support. Tested the
changes on systems provided by Larry Rosenman <ler@lerctr.org>.

Enhanced -K option with the form "-K i" to direct lsof to
(i)gnore tasks. A query from Rachel Kroll <rkroll@fb.com>
suggested this option. Linux task reports now include both
process and task command names, making lsof's "-c <name>"
option work correctly.

Added a patch to prevent NFS blocking in Linux supplied by
Kristyna Streitova <kstreitova@suse.com>.

Installed a FreeBSD patch that prevents examining a TCP state
structure during a race condition. The patch was supplied by
Bryan Drewery <bdrewery@FreeBSD.org>.

Updated FreeBSD for new UFS inode structure that lacks an i_dev
member in the most recent 12.0-CURRENT. Larry Rosenman
<ler@lerctr.org>
reported the problem and provided a test
system.

Added "#define KLD_MODULE" to dlsof.h and dnode2.c to prevent
<machine/cpuconf.h> from generating an "ARM_NARCH is 0" error.
This is needed so lsof can access kernel structures. Larry
Rosenman supplied the addition.

Added recognition of the FreeBSD 11 file system name "nullfs".
Jamie Landeg-Jones <jamie@catflap.org> supplied the fix.

Added a patch from Larry Rosenman <ler@lerctr.org> that is
needed on FreeBSD 12 so the lsof compilation can obtain the

inpcb and tcpcb structures from their respective header files.

Updated FreeBSD dmnt.c for the ino64 changes.

Inserted a patch for Solaris 12.x to avoid compilation errors from <sys/aio_req.h>, based on information provided by Jorn Clausen <joern.clausen@uni-bielefeld.de>. Jorn tested the patch.

Added performance enhancement that uses the FreeBSD closefrom() and dup2() C library functions when available. The enhancement was supplied by
Conrad Meyer <cem@freebsd.org>.

Corrected FreeBSD lsof's gathering of ZFS file device numbers.

Updated lsof test library for FreeBSD.

Updated socket optons information collection from the socket structure per changes supplied by Gleb Smirnoff <glebius@FreeBSD.org>.

Added patch to dlsof.h that avoids a _KERNEL conflict with bzero. Mateusz Guzik <mjguzik@gmail.com> supplied the patch.

Corrected test library to handle 64 bit FreeBSD device numbers.

Added #defines for FreeBSD 12, src r324225, from Gleb Smirnoff <glebius@FreeBSD.org>.

Incorporated Linux pseudoterminal endpoint processing (+|-E) provided by Masatake YAMATO <yamato@redhat.com> with access to test systems provided by Peter Schiffer <pschiffe@redhat.com>.

Corrected Linux command extraction for commands that include parentheses -- e.g., "(sd-pam)".

4.91 March 26, 2018

A bug has been reported in the PTY endpoint processing of Linux lsof 4.90 by Peter Wu <peter@lekensteyn.nl>, making it necessary
for me to release another revision of lsof.

This revision applies two fixes that correct the Linux PTY endpoint processing bug. Masatake YAMATO <yamato@redhat.com> supplied the fixes.

4.92 July 14, 2018
THIS IS A FREEBSD-ONLY DISTRIBUTION!

Fixes Configure script section that creates the FreeBSD
lockf_owner.h header file; fixes <string.h> conflicts with
FreeBSD kernel header files. Mateusz Gusik supplied part of
the fix.

Released lsof to GitHub with Purdue releases documented in
support/GitHub-release.

Vic Abell <abe@purdue.edu>
July 14, 2018

4.92.1 May 6, 2019

!!!NOTE!!!
! !
! The maintainership is switched from Vic to lsof-org !
! at GitHub team officially. !
! We thank Vic for working on lsof over the years. !
! !
! lsof-org at GitHub
team (https://github.com/lsof-org) !
!!!NOTE!!!

This is just for testing "Release" feature of GitHub.
Many documentations are not updated yet.
URLs in -v output and -h output are updated.

4.93.0 May 7, 2019

[freebsd] Made FreeBSD 13 adjustment.
[darwin] Fix a typo causing a build error.
Fix a potential memory leak.
[linux] use tirpc for rpc if libc doesn't provide rpc.h.
Fix a typo in man page.
[linux] fix memory leaks detected by valgrind about unix
endpoint information.
Update the description about -fg and -fG options on linux.

4.93.1 May 7, 2019

Fix a broken symbolic link.

4.93.2 May 8, 2019

Update the version number embedded in lsof executable.

4.94.0 November 11, 2020

(All changes in this version are ported from
lsof-org/lsof-linux repository at GitHub).

Introduced a new test harness. The harness can run
test cases specific to a dialect. It is designed for
running test cases on CI
environment like Travis-CI.
However, it is runnable locally with following command
line:
$ ./check.sh DIALECT
after making lsof executable.

[linux] Fixed a bug +|-E options output for pipe.
If two processes use the same fd number for a pipe
connecting them, the option didn't print the
information about it.

[linux] Fixed a bug +|-E options output for PTY.
If two processes use the same fd number for a PTY
connecting them, the option didn't print the
information about it.

[linux] Fixed a bug +|-E options output for PTY.
The code for detecting a slave device was incorrect.

[linux] Fixed a potential bug +|-E options output for
PTY. A structure field for the feature was not
initialized.

[linux] Added a code for decoding O_PATH flag in +fg
option.

[linux] Added a code for decoding O_CLOEXEC flag as CX
in +fg option.

[linux] Added a code for decoding O_TMPFILE flag as
TMPF in +fg option.

[linux] Added Linux display of INET socket
endpoint
information with +|-E option. The option handles
INET sockets using IPC.

[linux] Added support for POSIX MQ of Linux
implementation. A POSIX message queue (MQ) is
represented in a fd on Linux. lsof reported it as a
regular file. lsof with this change reports it as a
file with PSXMQ type if mqueue file system is mounted.

[linux] Added Linux display of POSIX message queue
endpoint information with +|-E option. mqueue file system
must be mounted to display the information.

[linux] Added Linux display of INET6 socket endpoint
information with +|-E option. The option handles
INET6 sockets using IPC.

[FreeBSD] update to include <sys/_lock.h> on recent -CURRENT
since it is no longer implicitly included via header pollution.

[linux] Added Linux display of eventfd endpoint information
with +|-E option. The option handles eventfd using IPC.

[FreeBSD] include <stdbool.h> for recent change requiring
refcount(9).

Enhanced -r option.
With `c<N>' specifier, lsof can stop itself
when the number of iterations reaches at <N>.

[linux] Fixed accessing an uninitialized local variable.
Detected by valgrind.

[linux] fix a crash when printing the endpoint for unaccepted
unix socket with +E option.

This closes the github issue #74 reported by @jolmg.

[linux] abort execution when failing in memory allocation for
socket private data.

[linux] decode the name of DCCP socket type.

[linux] decode more netlink protocol numbers (RDMA, CRYPTO, and
SMC).

[linux] print the connection state of unix domain socket
Lsof can print the state of TCP socket like:

```
 nc      22247 yamato    3u  IPv4 471409      0t0       TCP localhost:38802->localhost:9999 (ESTABLISHED)
```

This change exnteds this feature to support unix domain sockets.
LISTEN, UNCONNECTED, CONNECTING, CONNECTED, DISCONNECTING,
and UNKNOWN can be taken as a state.
An example of output:

```
 evince    17333  yamato    1u  unix 0x0000000054183795
   0t0  89141 type=STREAM (CONNECTED)
```

This feature is enabled by default.
To turn off printing state information, use -T option.

Don't display command usage even when a file (or directory) listed
in command line doesn't exist.
This closes the github issue #90 reported by @rowlap.

[FreeBSD] merge all the FreeBSD specific fixes from the FreeBSD sysutils/lsof port

[linux] allow reproducible builds
In a reproducible build all varied information is removed. This
change does so, by checking if the standard SOURCE_DATE_EPOCH
variable is set. If it is, we are attempting a reproducible build
and will strip varying information.
About the standard, see https://reproducible-builds.org/specs/source-date-epoch/
Provided in github pull request #93 by @T4cC0re.

[freebsd] update for r363214
- no user visible changes

Added the way to include (or exclude) all numbered file descriptors
in -d option. "fd" is a pseudo file descriptor name for the
purpose.
See the following output on Linux; lsof doesn't print cwd, rtd, txt,
and mem files.

```
# ./lsof -p $$ -a -d fd
COMMAND    PID USER   FD   TYPE DEVICE SIZE/OFF NODE NAME
bash    866421 root    0u   CHR  136,1      0t0    4 /dev/pts/1
bash    866421 root    1u   CHR  136,1      0t0    4 /dev/pts/1
bash    866421 root    2u   CHR  136,1      0t0    4 /dev/pts/1
bash    866421 root  255u   CHR  136,1      0t0    4 /dev/pts/1
```

docs: fixed minor grammatical error in instructions in Customize file
The change is provided by @hardikpnsp.

man page: improve phrasing and add examples
The change is provided by Martin D Kealey.

man page: improve explanation of -t implying -w
The change is provided by Martin D Kealey.

test cases, [linux]: fix tests for large inode-numbers (i >= 2^32)
The change is provided by Henry Peteet.

[linux] handle ffff:ffff in ipv6 addr correctly
The listen address and port of an AF_INET6 socket were not display
if
the socket listened at an ipv6 address including ffff:ffff.

Here is a command session demonstrating the bug:

```
# ip -6 addr add abcd:ef10:ffff:ffff:ffff:ffff:ffff:ff62 dev lo
# nc -6      -l  abcd:ef10:ffff:ffff:ffff:ffff:ffff:ff62 8888 &
[1] 6762
# ./lsof -p 6762 -a -d fd -P -n
COMMAND  PID   USER   FD   TYPE DEVICE SIZE/OFF    NODE NAME
nc      6762 yamato    0u   CHR  136,6      0t0       9 /dev/pts/6
```

```
nc      6762 yamato    1u   CHR  136,6      0t0       9 /dev/pts/6
nc      6762 yamato    2u   CHR  136,6      0t0       9 /dev/pts/6
nc      6762 yamato    3u  sock    0,9      0t0 5833594 protocol: TCPv6
```

The last line should be:

```
nc      6762 yamato    3u  IPv6 5833594      0t0  TCP [abcd:ef10:ffff:ffff:ffff:ffff:ffff:ff62]:8888 (LISTEN)
```

The original code decoding an ipv6 address uses UINT32_MAX constant
incorrect way.

@zhrf2020 reported this bug in #102.
@zhrf2020 provided the initial version of fix, #109.

man
page,[linux]: enumerate abbreviated flags printed with '+f g' option

Make -Fo option work
-Fo option is for printing file offset. For regular files,
the option didn't work.

Here is a command session demonstrating the fix:

```
# ./lsof -Fo -o0| grep ^o | sort | uniq -c
90586 o0t0
   87 o0t101
   84 o0t103
...
```

@JustAnotherArchivist reported this bug in #118.

man page: fix definition of the `o` field on programmatic output
The change is provided by @JustAnotherArchivist who reported
the original issue in #118.

[linux]: show the pid monitored by a pidfd
With this change, lsof prints pidfd in the following form:

```
[pidfd:%d]
```

where %d represents the pid monitored by the pidfd.

Example output:

```
# ./lsof -p 12573 -p 12710 | grep pidfd
```

```
dbus-brok 12573  jet   11u  a_inode           0,13        0     13312 [pidfd:12575]
dbus-brok 12710  jet   10u  a_inode           0,13        0     13312 [pidfd:12711]
```

fd
11 of pid 12573 monitors pid 12575.
fd 10 of pid 12710 monitors pid 12711.
This change closed #116.

Don't select the file descriptor field by default.
The version 4.88 introduced the change for selecting the file
descriptor field by default. However, the change is not
suitable for users who wants to print only PID field.
@po5857 suggests the use case and the way to improve the man page.

[linux]: enumerate fds monitored by an eventpoll fd
With this change, lsof prints an eventpoll fd in the following form:

```
[eventpoll:<fd0>,<fd1>,...,<fdn>...]
```

Here fdX is a file descriptor monitored by the eventpoll fd.
If an eventpoll fd monitors too many file descriptors, lsof
truncates the list of fds. "..." at the end of list implies
the truncation.

Example output:

```
# sudo ./lsof -p 1 -a -d 10,11,12
COMMAND PID USER   FD      TYPE DEVICE SIZE/OFF  NODE NAME
systemd   1 root   10u  a_inode   0,13        0 11624 [eventpoll:11,12]
systemd
1 root   11r      REG    0,4        0 17680 /proc/1/mountinfo
systemd   1 root   12r  a_inode   0,13        0 11624 inotify
```

systemd monitors fd 11 and fd 12 via eventpoll fd 10.

[linux]: implement "make check"
The target runs check.bash.

4.95.0 April 28, 2022

[n+obsd] fix syntax error
Corrected end of comment.
This change closes #138.
@albert-github reported this issue in #138,
and provided the fix in #140

Don't ignore failures in test/Makefile
Tobias Geerinckx-Rice <me@tobias.gr> provides the fix.

Update perl scripts for the past few decades of progress
Generally, perl is available on base systems - people who are manually
installing perl into /usr/local/bin are the exception rather than the
rule. In addition, Perl 5 was release in 1994, so Perl 4 isn't relevant
any more. We've also standardized on the .pl extension, rather than
.perl5 or whatever.
Provided by @dilinger (Andres Salomon) in #149.
A commit in the pull request includes work
of Nicholas Bamber.

Drop LSOF_CCDATE across all dialects to ensure reproducible builds
Simplify things for reproducible builds by just getting rid of
the embedded date/time string. With LSOF_CCDATE gone, keeping
SOURCE_DATE_EPOCH around doesn't make much sense, so drop that as
well. Folks doing reproducible builds should still override the
LSOF_HOST, LSOF_LOGNAME, LSOF_SYSINFO, and LSOF_USER variables (as
they were previously doing before SOURCE_DATE_EPOCH).
Provided by @dilinger (Andres Salomon) in #150.

[FreeBSD] get the ISO9660 filesystem working again
The ISO9660 filesystem broke starting with FreeBSD 7 due to the header
location changing. Fix the header search path to get it to be detected
again. Fix the header inclusion order. Also add the new way of finding
dev_t on more recent FreeBSD versions.
Provided by Damjan Jovanovic in #151.

[FreeBSD] add support for msdosfs on FreeBSD
Provided by Damjan Jovanovic in #151.

Fix FD field description.
In
811dc78 the output format was changed to not printf the `f`
field by default, however the field description in `lsof_fields.h`,
as seen in `-F?` output still included the `(always selected)` text.
Provided by @algorythmic (Grisha Levit) in #158.

Adjust alignment of buffer passed to stat().

The original code passes char[] buffer to stat(). This can be cause
a SIGBUS. #160 reported an actual crash on armv7a + glibc-2.33 platform.
See also https://sourceware.org/bugzilla/show_bug.cgi?id=27993.
Reported by @10ne1 in #160.

Clean up source code and documentats.
- remove trailing whitespace,
- fix some issues in scripts found through shellcheck, and
- fix spelling
Provided by @a1346054 in #163.

man page: fix hyphen issues
Properly use '-' and '\-' in the man page, ensuring that users
can cut & paste commandline options without issue. Original
patch from Raoul Gunnar Borenius <borenius@dfn.de>, and
submitted/expanded by @dilinger (Andres Salomon)
in #168.

[FreeBSD] update for FreeBSD 13 & 14, and various internal changes
submitted by @DmitryAndric & @emaste.

[FreeBSD] remove various old FreeBSD versions from support
submitted by @emaste

[FreeBSD] configure: suggest variable to set if FreeBSD sys not
found
submitted by @emaste

Fix broken LSOF_CFLAGS_OVERRIDE.
Provided by Fabrice Fontaine in #172.

[linux] Remove sysvlegacy function.
Provided by Fabrice Fontaine in #195.

[linux] use close_range instead of calling close repeatedly
At the starting up, lsof closes its file descriptors greater
than 2 by calling close(2) repeatedly. As reported in #186,
it can take long time. Linux 5.9 introduced close_range(2).
The new system call can close multiple file descriptors faster.
@qianzhangyl reported the original issue (#186).

Add -Q option for adjusting exit status when failed to find a
search item (#129)
In the original code, lsof returned 1 when it failed to find a
search item.
With the new option, lsof returns 0 in the case.

Document -Q option in manpage/00QUICKSTART, and adjust -h
output by @dilinger (Andres Salomon) in #129.

Improve readability of complex adverbial clause by adding a
comma.
Provided by Danny Fowler in #156.

The lsof-org team at GitHub
April 28, 2022

Found in path(s):
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/00DIST
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*
* @(#)netdb.h 5.15 (Berkeley) 4/3/91
*/

Found in path(s):
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/osr/include/netdb.h
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Found in path(s):
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/tests/LTsock.c

* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/tests/LTdnlc.c
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/tests/LTlock.c
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/tests/LTszoff.c
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/tests/LTunix.c
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/tests/LTbigf.c
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/tests/LTnfs.c
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/tests/LTnlink.c
No license file was found, but licenses were detected in source scan.

```
#!/usr/bin/perl
#
# list_fields.pl   -- sample Perl script to list lsof full field output
#       (i.e., -F output without -0)
#
# This script has been tested under perl versions 4.036 and 5.001e.
#
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# Written by Victor A. Abell
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```

```
# Initialize variables.

$fhdr = 0;       # fd hdr. flag
$fdst = 0;       # fd state
$access = $devch = $devn = $fd = $inode = $lock = $name = ""; # | file descr.
$offset = $proto = $size = $state = $stream = $type = ""; # | variables
$pidst = 0;      # process state
$cmd = $login = $pgrp = $pid = $ppid = $uid = "";  # process var.

# Process the ``lsof -F'' output a line at a time, gathering
# the variables for a process together before printing them;
# then gathering the variables for each file descriptor
# together before printing them.

while (<>) {
  chop;
  if (/^p(.*)/) {

# A process set begins with a PID field whose ID character is `p'.

 $tpid = $1;
 if ($pidst) { &list_proc }
 $pidst = 1;
 $pid = $tpid;
 if ($fdst) { &list_fd; $fdst = 0; }
 next;
   }

# Save process-related values.

  if (/^g(.*)/) { $pgrp = $1; next; }
  if (/^c(.*)/) { $cmd = $1; next; }
  if (/^u(.*)/) { $uid = $1; next; }
  if (/^L(.*)/) { $login = $1; next; }
  if (/^R(.*)/) { $ppid = $1; next; }

# A file descriptor set begins with a file descriptor field whose ID
# character is `f'.

  if (/^f(.*)/) {
 $tfd = $1;
 if ($pidst) { &list_proc }
 if ($fdst) { &list_fd }
 $fd = $tfd;
 $fdst = 1;
 next;
  }
```

```
# Save file set information.

  if (/^a(.*)/) { $access = $1; next; }
  if (/^C(.*)/) { next; }
  if (/^d(.*)/) { $devch = $1; next; }
  if (/^D(.*)/) { $devn = $1; next; }
  if (/^F(.*)/) { next; }
  if (/^G(.*)/) { next; }
  if (/^i(.*)/) { $inode = $1; next; }
  if (/^k(.*)/) { next; }
  if (/^l(.*)/) { $lock = $1; next; }
  if (/^N(.*)/) { next; }
  if (/^o(.*)/) { $offset = $1; next; }
  if (/^P(.*)/) { $proto = $1; next; }
  if (/^s(.*)/) { $size = $1; next; }
  if (/^S(.*)/) { $stream = $1; next; }
  if (/^t(.*)/)
 { $type = $1; next; }
  if (/^T(.*)/) {
 if ($state eq "") { $state = "(" . $1; }
 else { $state = $state . " " . $1; }
 next;
  }
  if (/^n(.*)/) { $name = $1; next; }
  print "ERROR: unrecognized: \"$_\"\n";
}

# Flush any stored file or process output.

if ($fdst) { &list_fd }
if ($pidst) { &list_proc }
exit(0);


## list_fd -- list file descriptor information
#       Values are stored inelegantly in global variables.

sub list_fd {
  if ( ! $fhdr) {

  # Print header once.

 print "     FD   TYPE     DEVICE   SIZE/OFF     INODE  NAME\n";
 $fhdr = 1;
  }
  printf "    %4s%1.1s%1.1s %4.4s", $fd, $access, $lock, $type;
  $tmp = $devn; if ($devch ne "") { $tmp = $devch }
  printf "  %10.10s", $tmp;
```

```
  $tmp = $size; if ($offset ne "") { $tmp = $offset }
  printf " %10.10s", $tmp;
  $tmp = $inode; if ($proto ne "") { $tmp = $proto }
  printf " %10.10s", $tmp;
  $tmp = $stream; if ($name ne "") { $tmp = $name }
  print "  ", $tmp;
  if ($state
 ne "") { printf " %s)\n", $state; } else { print "\n"; }

# Clear variables.

  $access = $devch = $devn = $fd = $inode = $lock = $name = "";
  $offset = $proto = $size = $state = $stream = $type = "";
}



# list_proc -- list process information
#       Values are stored inelegantly in global variables.

sub list_proc {
  print "COMMAND      PID    PGRP    PPID  USER\n";
  $tmp = $uid; if ($login ne "") {$tmp = $login }
  printf "%-9.9s  %6d  %6d  %6d  %s\n", $cmd, $pid, $pgrp, $ppid, $tmp;

# Clear variables.

  $cmd = $login = $pgrp = $pid = $uid = "";
  $fhdr = $pidst = 0;
}
```

Found in path(s):
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/scripts/list_fields.pl
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```
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*/

Found in path(s):
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/darwin/libproc/dstore.c
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/darwin/libproc/machine.h
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/darwin/libproc/dproto.h
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/darwin/libproc/ddev.c
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*

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#!/usr/bin/perl
#
list_NULf.pl   -- sample Perl 5 script to list lsof NUL-terminated
full field output (i.e., -F0 output)
#
This script has been tested under perl version 5.001e.
#
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# Initialize variables.

$fhdr = 0;       # fd hdr. flag
$fdst = 0;       # fd state
$access = $devch = $devn = $fd = $inode = $lock = $name = ""; # | file descr.
$offset = $proto = $size = $state = $stream = $type = ""; # | variables
$pidst = 0;       # process state
$cmd = $login = $pgrp = $pid = $ppid = $uid = "";  # process var.

# Process the ``lsof -F'' output a line at a time, gathering
# the variables for a process together before printing them;
# then gathering the variables for each file descriptor
# together before printing them.

while (<>) {
  chop;
  @F = split('\0', $_, 999);
  if ($F[0] =~ /^p/) {

# A process set begins with a PID field whose ID character is `p'.

 if ($pidst) { &list_proc }
 if ($fdst) { &list_fd; $fdst = 0; }
 foreach $i (0 ..
```

```
($#F - 1)) {

    PROC: {
 if ($F[$i] =~ /^c(.*)/) { $cmd = $1; last PROC }
 if ($F[$i] =~ /^g(.*)/) { $pgrp = $1; last PROC }
 if ($F[$i] =~ /^p(.*)/) { $pid = $1; last PROC }
 if ($F[$i] =~ /^u(.*)/) { $uid = $1; last PROC }
 if ($F[$i] =~ /^L(.*)/) { $login = $1; last PROC }
 if ($F[$i] =~ /^R(.*)/) { $ppid = $1; last PROC }
 print "ERROR: unrecognized process field: \"$F[$i]\"\n";
    }
}
$pidst = 1;
next;
  }

# A file descriptor set begins with a file descriptor field whose ID
# character is `f'.

  if ($F[0] =~ /^f/) {
 if ($pidst) { &list_proc }
 if ($fdst) { &list_fd }
 foreach $i (0 .. ($#F - 1)) {

    FD: {
 if ($F[$i] =~ /^a(.*)/) { $access = $1; last FD; }
 if ($F[$i] =~ /^C(.*)/) { last FD; }
 if ($F[$i] =~ /^f(.*)/) { $fd = $1; last FD; }
 if ($F[$i] =~ /^F(.*)/) { last FD; }
 if ($F[$i] =~ /^d(.*)/) { $devch = $1; last FD; }
 if ($F[$i] =~ /^D(.*)/) { $devn = $1; last FD; }
 if ($F[$i] =~ /^G(.*)/) { last FD; }
 if ($F[$i] =~ /^i(.*)/) { $inode
= $1; last FD; }
 if ($F[$i] =~ /^k(.*)/) { last FD; }
 if ($F[$i] =~ /^l(.*)/) { $lock = $1; last FD; }
 if ($F[$i] =~ /^N(.*)/) { last FD; }
 if ($F[$i] =~ /^o(.*)/) { $offset = $1; last FD; }
 if ($F[$i] =~ /^P(.*)/) { $proto = $1; last FD; }
 if ($F[$i] =~ /^s(.*)/) { $size = $1; last FD; }
 if ($F[$i] =~ /^S(.*)/) { $stream = $1; last FD; }
 if ($F[$i] =~ /^t(.*)/) { $type = $1; last FD; }
 if ($F[$i] =~ /^T(.*)/) {
    if ($state eq "") { $state = "(" . $1; }
    else { $state = $state . " " . $1; }
    last FD;
 }
 if ($F[$i] =~ /^n(.*)/) { $name = $1; last FD; }
```

```
  print "ERROR: unrecognized file set field: \"$F[$i]\"\n";
    }
 }
 $fdst = 1;
 next;
  }
  print "ERROR: unrecognized: \"$_\"\n";
}

# Flush any stored file or process output.

if ($fdst) { &list_fd }
if ($pidst) { &list_proc }
exit(0);


## list_fd -- list file descriptor information
#       Values are stored inelegantly in global variables.

sub list_fd {
  if ( ! $fhdr) {

  # Print header
 once.

 print "     FD   TYPE     DEVICE   SIZE/OFF     INODE  NAME\n";
 $fhdr = 1;
  }
  printf "    %4s%1.1s%1.1s %4.4s", $fd, $access, $lock, $type;
  $tmp = $devn; if ($devch ne "") { $tmp = $devch }
  printf "  %10.10s", $tmp;
  $tmp = $size; if ($offset ne "") { $tmp = $offset }
  printf " %10.10s", $tmp;
  $tmp = $inode; if ($proto ne "") { $tmp = $proto }
  printf " %10.10s", $tmp;
  $tmp = $stream; if ($name ne "") { $tmp = $name }
  print "  ", $tmp;
  if ($state ne "") { printf " %s)\n", $state; } else { print "\n"; }

# Clear variables.

  $access = $devch = $devn = $fd = $inode = $lock = "";
  $name = $offset = $proto = $size = $state = $stream = $type = "";
}


# list_proc -- list process information
#       Values are stored inelegantly in global variables.
```

```
sub list_proc {
  print "COMMAND      PID    PGRP    PPID  USER\n";
  $tmp = $uid; if ($login ne "") {$tmp = $login }
  printf "%-9.9s  %6d  %6d  %6d  %s\n", $cmd, $pid, $pgrp,
 $ppid, $tmp;

# Clear variables.

  $cmd = $login = $pgrp = $pid = $uid = "";
  $fhdr = $pidst = 0;
}
```

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* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/freebsd/dproto.h
*
/opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/darwin/kmem/dsock.c
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/sun/dfile.c
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/freebsd/dsock.c
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/darwin/kmem/machine.h
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/freebsd/dlsof.h
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/store.c
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/n+os/machine.h
*
/opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/du/dmnt.c
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/freebsd/dmnt.c
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-

67d8c82/arg.c
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/node.c
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/OLD/proc.c
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/aix/dlsof.h
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/du/dproc.c
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/sun/dsock.c
*
/opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/aix/dproto.h
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/darwin/kmem/dlsof.h
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/n+os/dsock.c
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/n+obsd/dmnt.c
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/aix/dmnt.c
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/aix/dstore.c
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/darwin/kmem/dproc.c
*
/opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/n+os/dproc.c
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/hpux/kmem/dproc.c
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/lsof_fields.h
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/n+os/dproto.h
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/hpux/kmem/dmnt.c
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/n+obsd/dnode.c
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/aix/dfile.c
*
/opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/proto.h
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/sun/ddev.c
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/sun/dproto.h

* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/n+obsd/dproc.c
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/n+obsd/machine.h
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/misc.c
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/du/dlsof.h
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/lsof.h
*
/opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/sun/dstore.c
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/hpux/kmem/dstore.c
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/n+os/dlsof.h
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/n+os/dnode.c
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/n+obsd/dproto.h
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/sun/machine.h
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/freebsd/machine.h
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*/
/* Definitions for data structures and routines for the regular
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*/
/*
* GetOpt() -- Local get option
*
* Liberally adapted from the public domain AT&T getopt() source,
* distributed at the 1985 UNIFORM conference in Dallas
*
* The modifications allow `?' to be an option character and allow
* the caller to decide that an option that may be followed by a
* value doesn't have one -- e.g., has a default instead.
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* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/OLD/main.c
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/OLD/main.c.old
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* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/scripts/list_fields.awk
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/scripts/shared.pl
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*/
/*
* GetOpt() -- Local get option
*
* Borrowed from lsof's main.c source file.
*
* Liberally adapted from the public domain AT&T getopt() source,
* distributed at the 1985 UNIFORM conference in Dallas
*
* The modifications allow `?' to be an option character and allow
* the caller to decide that an option that may be followed by a
* value doesn't have one -- e.g., has a default instead.
*/

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```
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| The latest release of lsof is always available via anonymous ftp |
| from vic.cc.purdue.edu.  Look in pub/tools/unix/lsof.            |
*****************************************************************************
```

Contents

Dialects Supported
How Lsof Works
Lsof Output
Getting Started Quickly
Limiting, Filtering, and Selecting Lsof Output
Parsing Lsof Output with Another Program
Repeat Mode
Distribution Restrictions
Cautions
Distribution Contents
Warranty
Bug Reports
What's new in Version 3
Version 3 Release Notes
3.0, May 24, 1994
3.01, May 27, 1994
3.02, June 2, 1994
3.03, July 8, 1994
3.04, July 15, 1994
3.05, July 26, 1994
3.06, September 2, 1994
3.07, September 8, 1994
3.08, September 23, 1994
3.09, October 18, 1994
3.10,
October 21, 1994
3.11, October 28, 1994
3.12, October 29, 1994
3.13, November 11, 1994
3.14, November 16, 1994
3.15, November 25, 1994
3.16, December 2, 1994
3.17, January 25, 1994
3.18, January 31, 1995
3.19, February 10, 1995
3.20, February 23, 1995

3.21, March 3, 1995
3.22, March 9, 1995
3.23, March 24, 1995
3.24, March 31, 1995
3.25, April 5, 1995
3.26, April 20, 1995
3.27, May 2, 1995
3.28, May 26, 1995
3.29, June 2, 1995
3.30, June 8, 1995
3.31, June 16, 1995
3.32, June 23, 1995
3.33, June 28, 1995
3.34, June 30, 1995
3.35, July 9, 1995
3.36, July 20, 1995
3.37, July 27, 1995
3.38, August 3, 1995
3.39, August 10, 1995
3.40, August 25, 1995
3.41, September 5, 1995
3.42, September 7, 1995
3.43, September 12, 1995
3.44, September 19, 1995
3.45, September 20, 1995
3.46, October 5, 1995
3.47, October 16, 1995
3.48, October 20, 1995
3.49, October 25, 1995
3.50, October 31, 1995
3.51, November 8,
1995
3.52, November 27, 1995
3.53, December 8, 1995
3.54, December 15, 1995
3.55, December 21, 1995
3.56, January 2, 1996
3.57, January 12, 1996
3.58, February 7, 1996
3.59, February 21, 1996
3.60, February 27, 1996
3.61, March 9, 1996
3.62, March 26, 1996
3.63, April 11, 1996
3.64, April 26, 1996
3.65, May 20, 1996
3.66, June 19, 1996
3.67, July 1, 1996

3.68, July 17, 1996
3.69, July 30, 1996
3.70, August 9, 1996
3.71, August 15, 1996
3.72, August 28, 1996
3.73, September 5, 1996
3.74, September 6, 1996
3.75, September 9, 1996
3.76, September 21, 1996
3.77, October 2, 1996
3.78, October 14, 1996
3.79, October 29, 1996
3.80, November 8, 1996
3.81, November 14, 1996
3.82, December 11, 1996
3.83, December 30, 1996
3.84, January 13, 1997
3.85, January 17, 1997
3.86, January 30, 1997
3.87, February 11, 1997
3.88, February 17, 1997

Dialects Supported
==========

Lsof (for LiSt Open Files) lists files opened
by processes on
selected Unix systems. It's a major revision of lsof version 2,
and has been tested on:

AIX 3.2.5, 4.1[.[1234]], the IBM RISC/System 6000
and 4.2
BSDI BSD/OS 2.0, 2.0.1, Intel-based systems
and 2.1
DC/OSx 1.1 Pyramid systems
EP/IX 2.1.1 the CDC 4680
FreeBSD 1.1.5.1, 2.0, Intel-based systems
2.0.5, 2.1, 2.1.5,
2.2, and 3.0
HP-UX 8.x, 9.x, 10.01, HP systems (some combinations)
10.10, and 10.20
IRIX 5.2, 5.3, 6.0, 6.0.1, SGI systems
and 6.[1234]
Linux through 2.0 Intel-based systems
NetBSD 1.0, 1.1, and 1.2 Intel and SPARC-based systems
NEXTSTEP 2.1 and 3.[0123] all NEXTSTEP architectures
OpenBSD 1.2 and 2.0 Intel-based systems

OSF/1 2.0, 3.0, 3.2, and the DEC Alpha
4.0-BETA
Reliant UNIX 5.43 Pyramid systems
RISC/os 4.52 MIPS R2000-based systems
SCO OpenServer 1.1, 3.0, Intel-based systems
and 5.[024]
SCO UnixWare 2.1 and 2.1.1 Intel-based systems
Sequent PTX 2.1.[1569], Sequent systems
4.0.[23],
4.1.[024],
4.2[.1], and 4.3
Solaris 2.[123456], 2.5.1, Sun 4 and i86pc systems
and 2.6-Beta
SunOS 4.1.[1234] Sun 3 and 4
Ultrix 4.2, 4.3, 4.4, DEC RISC and VAX
and 4.5

(The pub/tools/unix/lsof/contrib directory on vic.cc.purdue.edu
contains information on other ports.)

If your favorite Unix dialect is not in the list, or if your version
of it is more recent than the ones listed, please contact me at
<abe@vic.cc.purdue.edu>.

How Lsof Works
==========

Using available kernel data access methods -- getproc(), getuser(),
kvm_*(), nlist(), pstat(), read(), readx(), /proc -- lsof reads
process table entries, user areas and file pointers to reach the
underlying structures that describe files opened by processes.

Lsof interprets most file node structures -- advfsnodes, autonodes,
cnodes, cdrnodes, devnodes, fifonodes, gnodes, hsnodes, inodes,
mfsnodes, pcnodes, procnodes, rnodes, snodes, specnodes, s5inodes,
tmpnodes. It understands NFS connections. It
recognizes FIFOs,
multiplexed files, Unix and Internet sockets. It knows about
streams. It understands /proc file systems for some dialects. On
many dialects it recognizes execution text and library references.
It knows about AFS on some Unix dialects.

Lsof Output
==========

The lsof output describes:

* the identification number of the process (PID) that has opened
  the file;

* the process group identification number (PGRP) of the process
  (optional);

* the process identification number of the parent process (PPID)
  (optional);

* the command the process is executing;

* the owner of the process;

* for all files in use by the process, including the executing
  text file and the shared libraries it is using:

  * the file descriptor number of the file, if applicable;

  * the file's access mode;

  * the file's lock status;

  * the file's device numbers;

  * the file's inode number;

  * the file's size or
offset;

  * the name of the file system containing the file;

  * any available components of the file's path name;

  * the names of the file's stream components;

  * the file's local and remote network addresses;

  * other file or dialect-specific values.

Getting Started Quickly
==========

If you want to get started using lsof quickly, or see some examples
of how lsof can be used, consult the 00QUICKSTART file of the lsof
distribution.

The 00QUICKSTART file won't help you build or install lsof, but it
will cut through the density of the lsof man page, giving you more
readily an idea of what you can do with lsof.

For information on building and installing lsof, consult the 00README
file of the lsof distribution.

Limiting, Filtering, and Selecting Lsof Output
==========

Lsof accepts options to limit, filter, and select its output.
These are the possible criteria:

  * Process ID (PID) number -- to list the
open files for a given
    process;

  * Process Group ID (PGRP) -- to list the open files for all
    the processes of a given process group;

  * User ID number or login name -- to list the open files for
    all the processes of a given user;

  * Internet address -- to list the open files using a given
    Internet address (host name), protocol, or port (number or
    name); or to list all open Internet files;

  * command name;

  * file descriptor name or number;

  * list all open NFS files;

  * list all open Unix domain socket files;

  * list all uses of a specific file;

  * list all open files on a file system.

Selection options are normally ORed -- i.e., an open file meeting
any of the criteria is listed. The selection options may be ANDed
so that an open file will be listed only if it meets all the
criteria.

In the absence of any selection criteria, lsof lists files open to
all processes.

Parsing Lsof Output with Another Program
==

The
 lsof -F option directs it to produce "field" output that can
easily be parsed by another program. The lsof distribution contains
sample awk, perl 4, and perl 5 scripts in its scripts subdirectory
that show how to post-process field output.

Repeat Mode
===========

Lsof can be directed to produce output, delay for a specified time,
then repeat the output, cycling until stopped by an interrupt or
quit signal. This mode is useful for monitoring the status of some
file operation -- e.g., an ftp transfer or a tape backup operation.

Repeat mode is more efficient when combined with lsof's selection
options, since they limit lsof overhead.

It's possible to use lsof's field output options to supply repeat
mode output to another process for its manipulation. The scripts
subdirectory of the lsof distribution has sample Perl scripts
showing how to consume lsof repeat mode output from a pipe.

Distribution Restrictions
=========================

Lsof may
 be used and distributed freely, subject to these limitations:

1. Neither the author nor Purdue University is responsible for
  any consequences of the use of this software.

2. The origin of this software must not be misrepresented, either
  by explicit claim or by omission. Credit to the author and
  Purdue University must appear in documentation and sources.

3. Altered versions must be plainly marked as such, and must not
  be misrepresented as being the original software.

4. This notice may not be removed from or altered in the lsof source
  files.

Cautions
========

Lsof is a tool that is closely tied to the Unix operating system
version. It uses header files that describe kernel structures and
reads kernel structures that typically change from OS version to
OS version.

DON'T TRY TO USE AN LSOF BINARY, COMPILED FOR ONE UNIX OS VERSION,
ON ANOTHER.

On some Unix dialects, notably SunOS and Solaris, lsof versions
may be even more restricted by architecture type. An lsof
 binary,
compiled for SunOS 4.1.3 on a sun4c machine, for example, won't
work on a sun4m machine. Although I have no evidence that they
exist, the potential for similar restrictions exists in Solaris
versions of lsof.

AN LSOF BINARY, COMPILED FOR ONE SOLARIS ARCHITECTURE, ISN'T
GUARANTEED TO WORK ON A DIFFERENT SOLARIS ARCHITECTURE.

Distribution Contents
=====================

The lsof distribution is checked for completeness when it is
constructed and by the Inventory script when you run the Configure
script. (See The Inventory Script section of the 00README file of
this distribution.)

If you're worried you don't have everything, run the Inventory
script. Here's aan approximate picture of what you should have:

lsof_<version>:

```
 00CREDITS    00PORTING     Customize  lsof_fields.h  proc.c
 00DCACHE     00QUICKSTART  Inventory  main.c         proto.h
 00DIST       00README      arg.c      misc.c         scripts/
 00FAQ        AFSConfig     dialects/  node.c         store.c
  00MANIFEST  Configure     lsof.h     print.c        version
```

lsof_<version>/dialects:

```
 aix/       epix/      linux/     osf/       riscos/  sun/
 bsdi/      freebsd/   netbsd/    ptx/       sco/     ultrix/
 common/    hpux/      next/      pyramid/   sgi/     unixware/
```

lsof_<version>/dialects/common:

00Manifest dvch.frag lkud.frag prtf.frag rnam.frag
ckfa.frag fchi.frag pcdn.frag rdev.frag rnch.frag
cvfs.frag isfn.frag prfp.frag rmnt.frag rvfs.frag

Specific dialects sub-directories may differ slightly, depending
on the needs of the dialect, but they should all contain:

lsof_<version>/dialects/next:

Makefile ddev.c dlsof.h dnode.c dproto.h dstore.c
Mksrc* dfile.c dmnt.c dproc.c dsock.c machine.h

lsof_<version>/scripts:

00MANIFEST count_pf.perl* list_fields.awk
00README count_pf.perl5* list_fields.perl*
big_brother.perl5 list_NULf.perl5* watch_a_file.perl*

Warranty
========

Lsof
is provided as-is without any warranty of any kind, either
expressed or implied, including, but not limited to, the implied
warranties of merchantability and fitness for a particular purpose.
The entire risk as to the quality and performance of lsof is with
you. Should lsof prove defective, you assume the cost of all
necessary servicing, repair, or correction.

Bug Reports
===========

Now that the obligatory disclaimer is out of the way, let me hasten
to add that I accept lsof bug reports and try hard to respond to
them. I will also consider and discuss requests for new features,
ports to new dialects, or ports to new OS versions.

PLEASE DON'T SEND A BUG REPORT ABOUT LSOF TO THE UNIX DIALECT
VENDOR.

At worst such a bug report will confuse the vendor; at best, the
vendor will forward the bug report to me.

Please send all bug reports, requests, etc. to me via email at

<abe@purdue.edu>.

What's new in Version 3
==========

I had three goals in mind for version 3:

1. Make it faster.

Lsof 3 defers as many lookup operations -- /dev scan, mount table scan, /etc/services scan -- until they're needed.

I used prof on lsof and used its information to reduce lsof's overhead.

2. Make it easier to maintain and port to other systems, and eliminate complicated nestings of #if/#else/#endif pre-processor statements.

3. Add a few features:

o ANDing of options;

o Sorting of output by Process ID;

o Searching for Unix domain sockets by name -- to a limited extent.

o Process group ID support. (This was a late addition.)

As a result of goal 2, the organization of lsof version 3 differs greatly from version 2. The main directory contains totally common functions, a dialect subdirectory contains subdirectories of code specific to each Unix dialect that is supported. There is also a dialects/common subdirectory that contains code fragments that are used by more than one, but not all dialects.

A top-level Configure script constructs
the complete set of sources
for a given dialect and the Makefile at the top-level. Configure is self-documenting. When it is finished, Configure calls a second script, Customize, that assists with the modification of a few important compile-time options.

Version 3 Release Notes

```
======================
```

3.0 May 24, 1994
  This is the first official release of lsof 3.

3.01 May 27, 1994
  Corrected the #ifdef condition for HASPWSTAYOPEN
  under Sequent Dynix 3.0.12.

  Fixed bug that prevented the display of current
  working and root directory path names under SunOS
  4.1.x, even when the user area contained pointers
  to them.

  Changed the strategy for allocating space to the
  local proc table in EP/IX, NEXTSTEP, Solaris, and
  SunOS.

  Closed the distance between reading the Solaris
  proc structure and its companion pid structure in
  an effort to avoid using a stale pid structure
  pointer. A stale pid structure pointer sometimes
  causes a segmentation violation in
 kvm_read().

  Added code to the SunOS kread() function to filter
  out non-kernel addresses that might lead kvm_read()
  to a segmentation violation. The Configure script
  was updated to create a header file, kernelbase.h,
  with the necessary kernel memory boundary value;
  and to remove the header file when the -clean option
  is specified. The Configure script now passes the
  target name to the Mksrc shell script. It's used
  by sun/Mksrc to determine the source for kernelbase.h.

3.02 June 2, 1994
  Added #if's to of kernelbase.h for Solaris and
  SunOS. This eliminates a redeclaration complaint
  from old versions of SunOS.

  Added code to process_file() in all dialects to
  display "no more information" when f_count in the
  file structure is zero.

3.03 July 8, 1994
  Added support for displaying process group IDs.
  This includes two new options: -j to select PGRP
  display; and -g<list> to specify a list of PGRPs

whose files are to be displayed. (-j was chosen
to
match a similar option in some ps(1)'s.)

Philippe-Andre Prindeville <philipp@res.enst.fr>
suggested this addition.

3.04 July 15, 1994
Corrected handling of port name component of -i
option on systems where htons() is required.

Corrected casting of UID arguments -- needed when
UID is a short and the compiler wants the minimum
argument size to be larger.

3.05 July 26, 1994
Added printing of DECnet socket information for
the Ultrix 4.2 and 4.3 dialects. John Beacom
<beacom@wisnud.physics.wisc.edu> kindly provided
the test system. A new Configure abbreviation,
ultrix42dn, must be used to activate the DECnet
support.

3.06 September 2, 1994
The major news in this revision are the V/88 R32V3
and R40V4.2 ports for Motorola M88K systems. Chance
Neale <cneale@panix.com> kindly provided test systems
and Mike Feldman <feldman@charm.urbana.mcd.mot.com>
provided technical assistance.

Version 3.06 contains other, minor modifications:

* The Configure
script has been isolated from the
environment, thanks to a report of a CC=xlc
problem from Johnny Tolliver <jxt@ca04.cad.ornl.gov>.
Johnny also suggested a better form for the install
commands in the Makefile's install rule. This
change affected all the dialect Mksrc scripts.

A new HP-UX abbreviation (hpuxx25) was added
for systems that have the /etc/conf/x25 include
files. The old HP-UX abbreviation (hpux) no
longer references /etc/conf or defines HPUX_CCITT.

* The command "lsof `tty`" now works most places (maybe
not always for SGI IRIX, but I tried) thanks to a bug
report from Casper Dik <casper@fwi.uva.nl>.

* A mode has been added to disable forking when
debugging. The V/88 R40V4.2 debugger needed that.

* Printing of stream NAMEs was standardized (IRIX
was different) and an attempt was made to avoid
stream NAMEs like /dev/ttyx4->/dev/ttyx4.

* A new documentation file, 00FAQ, accompanies
the
distribution. It contains frequently asked
questions about lsof, and the best answers I can
manage to give.

* I have a new HP-UX test system, courtesy of Dave
Curry <davy@ecn.purdue.edu> and George Goble
<ghg@ecn.purdue.edu> of Purdue's Engineering Computer
Network. I want to thank J. Nelson Howell
<nelson@zeus.mgmt.purdue.edu> of Purdue's School of
Management for his prior support of lsof development
under HP-UX.

3.07 September 8, 1994
This revision contains a small security enhancement.
Tim Ramsey <tar@ksu.ksu.edu> pointed out that lsof's
setgid or setuid power might allow it's user to
read an alternate kernel name list or memory file
via the -c and -k options that the real UID might
not have authority to read. In revision 3.07 lsof
uses access(2) to check the real UID's authority
to read files named with -c and -k.

3.08 September 23, 1994
This revision contains support for Novell's UnixWare,
versions 1.1,
1.1.1, and 1.1.2. Peter Lord
<plord@novell.co.uk> made this possible by providing
a copy of UnixWare and supplying technical advice.
Binaries and sources for this version will be
available from Novell sources. See the Novell
UnixWare section of the distribution's 00README
file for details.

This version adds /proc file system support to the
dialects derived from SYSV R4 (except EP/IX 2.1.1):
FreeBSD, IRIX 5.2, Solaris, UnixWare, and V/88
R40V4.2.

This version compiles under IRIX 4.0.5 again,
correcting a problem introduced at version 3.06 in
the "lsof `tty`" fix.

HP-UX now skips file systems whose mount type is
"ignore". The presence of the -c option is now
controlled by the HASCOPT definition in machine.h.
The HASSWAPPORT option is now documented and
implemented correctly. Hans Petter Christiansen
<hpchr@dxcern.cern.ch> suggested these changes.

3.09 October 18, 1994
This revision recognizes the DEC Alpha OSF/1 V3.0,
IBM AIX 4.1, and
Solaris 2.4 dialects. It has
support for the SunOS 4.1.3 PC file system and two
bug fixes: an IRIX, V/88, and Solaris file argument
processing bug; and a V/88 include error.

Alex Kreis <akreis@us.oracle.com> made the initial
request for DEC OSF/1 V3.0 support and provided
help with testing. Ron Young <ron@screamer.nevada.edu>
graciously provided a test host. James Woodward
<woodward@zk3.dec.com> provided invaluable clues
to V3.0 kernel organization. Others who read the
alpha-osf-managers mailing list made generous offers
of test facilities, and I thank them, too. The
decosf3 abbreviation was added to the Configure
script, and the script was modified to request the
name of the system configuration subdirectory of
/sys where the configuration-specific header files
reside for the decosf1, decosf2, and decosf3
configuration abbreviations.

Mark Peek <mark_peek@taligent.com> provided and
tested the AIX 4.1 changes.

Casper Dik <casper@fwi.uva.nl>
provided and tested
the Solaris 2.4 changes.

Friedel Loinger <friedel@wise.tau.ac.il> suggested
the addition of support for the SunOS 4.1.3 PC file
system ("pcfs").

Andreas Stolcke <stolcke@ICSI.Berkeley.EDU> supplied
a fix to a file argument processing bug that causes
lsof to crash when supplied the path of an NFS

mounted file. The bug affects lsof versions for Motorola V/88 R40V4.2, SGI IRIX 5.2, and Solaris 2.[123].

Corrected an error in the path to include prdata.h in dlsof.h for Motorola V/88 R40V4.2.

3.10 October 21, 1994

This revision adds support for the cache and PC file systems to Solaris. It fixes these bugs: a problem with the display of Motorola V/88 R40V4.2 device numbers; and a failure of Readlink() to resolve symbolic links completely in all cases.

Some major internal restructuring was necessary to be able to display negative inode numbers for SunOS PC file system nodes, while displaying them as unsigned numbers for Solaris, hence all dialect versions were affected.

3.11 October 28, 1994

This revision adds support for Linux version 1.0.9. Tim Korb <jtk@arthur.cs.purdue.edu> kindly provided a development system in the Computer Science Department at Purdue. It is likely that the Linux revision will have to be adjusted for each installation, and it is probable that this revision will not run under later versions of Linux. See the 00FAQ and 00README files for more information on Linux tuning.

3.12 October 29, 1994

This revision supports Linux version 1.1.47 -- the Yggdrasil Plug-and-Play Linux Fall '94 release. Both Linux versions now obtain kernel symbol addresses from the /zSystem.map file.

November 4, 1994

Hendrik G. Seliger <hank@Blimp.automat.uni-essen.de> reports that lsof compiles and seems to work under Linux 1.1.61. He used the linux1147 Configure abbreviation. Marty Leisner <leisner@sdsp.mc.xerox.com> reports that the linux1147 Configure abbreviation produces a working lsof for Linux 1.1.64, too.

3.13 November 11, 1994

This revision contains Pyramid DC/OSx support, provided

by Anthony Shortland <Anthony.Shortland@FMR.com>.

Marty Leisner <leisner@sdsp.mc.xerox.com> reported
a segmentation violation failure in Linux lsof.
In response I changed its task structure access to
use /dev/kmem instead of mmap'ing kernel memory.
This avoids a possible segmentation violation when
bad pointers are obtained from kernel memory. I
also enabled the setting of Linux INET and Unix
select flags so that the -n and -U options work --
I forgot to do that when I did the Linux port.

Marty Leisner reports that the lunix1147 Configure
abbreviation produces a working lsof for Linux
1.1.64, too.

Francois Pindard <pinard@iro.umontreal.ca> provided
a correction to the Linux install rule.

3.14 November 16, 1994
This revision adjusts the Configure script stanzas
for DEC OSF/1, Motorola V/88, Pyramid DC/OSx, and
Ultrix.
It also contains additional support for
DC/OSx and Ultrix.

Bruce Beare <bjb@pyramid.com> and Robert Vernon
<bob@pyramid.com.au> helped me understand Pyramid
nomenclature. Robert Vernon provided DC/OSx support
for the RxFS file system and added machine series
auto-detection to the Configure script. Alex Podlecki
<a.podlecki@att.com> helped test the updated DC/OSx
distribution.

Chris Timmons <skynyrd@tahoma.cwu.edu> provided
information on RISC and VAX Ultrix 4.4 that led to
correct prefixing of nlist() names. I updated the
Configure script to detect Ultrix version, machine
hardware type, and the presence of DECnet support.

I also updated the OSF/1 and V/88 Configure scripts
to determine configuration parameters automatically.

3.15 November 25, 1994
Corrected DEC OSF/1 V2.0 support of the ADVFS file
system.

Bernt Christandl <beb@mpe-garching.mpg.de> and Alex

Kreis <akreis@us.oracle.com> helped test. No OSF/1
V1.x system with ADVFS
was available for testing.

3.16 December 2, 1994
Fixed some device number handling bugs in DEC OSF/1
V2.0 and V3.0 support.

3.17 January 25, 1994
lsof now supports SGI IRIX 5.3, thanks to changes
supplied by Dave Olson <olson@anchor.engr.sgi.com>;
and SCO OpenDesktop or OpenServer releases 1.1 and
3.0, thanks to support from Dion Johnson <dionj@sco.com>,
Bela Lubkin <belal@sco.com>, and Nathan Peterson
<nathanp@sco.com>.

Dave Olson pointed out an IRIX stream handling bug
in sgi/dnode.c. When I investigated it, I found
that it had implications wider than SGI IRIX. The
eventual fix provided the display of inode numbers
for character devices when the inode number must
be obtained from /dev. IRIX, Solaris, and SunOS
benefit from the fix.

I added version detection to the Configure script,
so there is now just one Configure abbreviation
for IRIX versions 4.05, 5.2, and 5.3 -- ``irix".
(The Configure abbreviation for the SCO dialect
``sco".)

Ian
Darrow <ian@sq.com> pointed out that lsof
wouldn't Configure or work properly under Solaris
on an i86pc. Sorting out the difficulties made
clear that the HASSWAPPORT definition should be
removed from every machine.h file and that ntohs()
should be used in every dsock.c on every port
supplied to printinaddr().

Andreas Stolcke <stolcke@ICSI.Berkeley.EDU> pointed
out a method that sometimes allows lsof to report
on files open to a crashed or unavailable remote
NFS server. This led to the addition of code,
where possible, to estimate the device number of
mount points that cannot be stat()'d. The alternate
device number can come from /etc/mtab or /etc/mnttab,
or from the dialect's version of them. On systems
that use /etc/mtab or /etc/mnttab, it is sometimes

possible to add the device number manually to the
mount options field in the form ``dev=xxxx''. Some
internal changes in the way lsof handles device
numbers were necessary to prevent ones
whose dev_t
typedef is a signed short from causing sign extension
when promoted to integers as function arguments.

David Addison <addy@meiko.co.uk> and Robert Ehrlich
<Robert.Ehrlich@inria.fr> pointed out that lsof
errs when reporting device numbers and other node
information for some special Sun files. I rewrote
most of sun/dnode.c to correct the problem; Robert
rewrote it again; and I rewrote it once more.
David and Robert helped me test it under Solaris
2.[34] and SunOs 4.1.[23].

While using code from the Motorola V/88 port for
the SCO port, I found and fixed some NFS bugs in
the V/88 port.

3.18 January 31, 1995
I added the -b and -w options. The -b option causes
lsof to avoid the functions lstat(2), readlink(2),
and stat(2) that might block in the kernel -- e.g.,
when they reference an inaccessible NFS file system.
Instead it uses alternate device numbers obtained
from the mount table, where possible.

The -w option causes lsof to suppress
warning
messages -- e.g., when the -b option has been
specified. The suppression of warning messages
was formerly bundled into the -t option. The -t
option now selects -w.

I figured out how to make alternate AIX 3.2.5 device
numbers from the kernel mount structure. The new
-b option therefore works under AIX 3.2.5.

With the help of Chance Neale <cneale@panix.com>
I fixed bugs in the Motorola V/88 R32V3 NFS support.

I added a solariscc Configure abbreviation for those
who want to use Sun's C compiler.

3.19 February 10, 1995
Robert Ehrlich <Robert.Ehrlich@inria.fr> pointed out

that lsof might be able to gather more complete path
name information from the kernel's name cache. Name
cache access may be inhibited with the new -C option.
Revision 3.19 implements name cache access for:

DEC OSF/1 [23].0
Dynix (Purdue 3.0.12)
EP/IX 2.1.1
FreeBSD 1.1.5.1
HP-UX 9.01
Motorola V/88 R40V4.2
NEXTSTEP 3.1

SGI IRIX 5.3
Solaris 2.[34]
SunOS 4.1.x
Ultrix 2.2 and 4.2

Revision 3.19 does NOT implement name cache access for:
===

AIX The knlist() function won't
return cache addresses --
some IBM wisdom to "protect"
their customers.

Linux My only access is to 1.0.9,
and it doesn't seem to have
a kernel name cache.

Motorola V/88 It doesn't have a unified
R32V3 name cache.

Novell UnixWare I don't have a test system.

Pyramid DC/OSx I don't have a test system.

SCO OpenDesktop It doesn't have a unified
OpenServer name cache.

SGI IRIX 4.0.5H I saw no unified name cache
in the header files before
my 4.05H system was converted
to 5.2.

SGI IRIX 5.2 I don't have a test system.

Another Robert Ehrlich suggestion led to the

establishment of a device cache file feature. The new -D option gives control of it. This feature speeds lsof dramatically on some dialects after lsof has been called once and the cache has been built. (Calling stat(2) on several hundred or thousand /dev nodes can take a long time.) The feature can be disabled or modified in the machine.h header file and the dialects/*/ddev.c source file when lsof is built.

3.20 February 23, 1995

Upgraded Linux socket handling for versions 1.1.75 or greater with help from Marty Leisner <leisner@sdsp.mc.xerox.com> and Linus Torvalds <Linus.Torvalds@cs.Helsinki.FI>. There is now a single Configure script abbreviation for linux.

Updated for Motorola V/88 R40V4.3 with help from Mike Feldman feldman@charm.urbana.mcd.mot.com> and Chance Neale <cneale@panix.com>.

Updated for SGI IRIX 6.0 with help from Przemek Klosowski <przemek@rrdjazz.nist.gov and Dave Olson <olson@anchor.engr.sgi.com>.

Corrected access of device cache file that needs to be updated so that someone other than the file owner can rewrite it. Deleted the chmod() failure warning.

Updated Configure and the Sun Makefile to specify absolute paths to the Sun install program.

3.21 March 3, 1995

Removed BSDI BSD/386 support, because I no longer have a test system, and I needed to have separate sources for two of the three dialects (FreeBSD, and NetBSD) once served by the BSDI BSD/386 sources. FreeBSD sources are now in the freebsd subdirectory; NetBSD, in netbsd.

With the help of Greg Earle <earle@isolar.Tujunga.CA.US> and Paul Kranenburg <pk@cs.few.eur.nl> installed new NetBSD support for versions 1.0 and 1.0A. The NetBSD 0.9 support was removed. The 1.0A support has been tested on Intel and SPARC-based systems.

3.22 March 9, 1995
Fixed a bug in name cache handling that occasionally caused lsof to cause a segmentation violation on FreeBSD. Although the bug didn't do that anywhere else, recreated the binaries of all dialect versions that use the affected code from rnam.frag and rnch.frag.

3.23 March 24, 1995
Removed forgotten HASSWAPPORT reference from HP-UX machine.h and inserted ntohs() calls in the printinaddr() calls of dsock.c for HP-UX and NEXTSTEP.

Added support for NEXTSTEP 3.3, courtesy of Allan Nathanson <ajn@NeXT.com>

3.24 March 31, 1995
Changed Configure script to handle DEC OSF/1 V3.2. Removed leading zero from DEC OSF/1 and ADVFS version values. Added dialects/osf/dec_a/3.2 header file directory, courtesy of Dave Morrison <dmorriso@us.oracle.com>, who also tested the 3.24 DEC/OSF1 V3.2 lsof.

3.25 April 5, 1995
Ported to RISC/os on a R2030 (R2000-based) system, provided by Zdenko Tomasic <zdenko@harvey.cam.rice.edu>.

Tightened security on the device cache file; lsof always tries to change its ownerships to the effective IDs after creating it. This was suggested by Stefan Kelm <kelm@cert.dfn.de>.

Ported to FreeBSD 2.0, starting with work done by Kurt Jaeger <pi@complx.stgt.sub.org> on lsof revision 3.16. Ade Barkah <mbarkah@hemi.com> and William McVey <wam@cs.purdue.edu> provided test systems.

3.26 April 20, 1995
Ported to SCO OpenDesktop or OpenServer 5.0 (aka Everest and 3.2v5.0.0). Hugh Dickins <hughd@sco.COM>, Bela Lubkin <belal@sco.COM>, Craig B. Olofson <craigo@sco.COM>, and Nathan Peterson <nathan@sco.com>, provided me an early-release version of 3.2v5.0.0 and gave technical advice.

Added length checking of the Namech buffer to the printinaddr() function.

3.27 May 2, 1995

Corrected typo in AIX install rule, courtesy of a report from John Colgrave <colgrave@hursley.ibm.com>.

At the suggestion of Greg Earle <earle@isolar.Tujunga.CA.US> added a function to print the name of the unknown protocol (the AF_* symbol), when there is no specific processing for it in dsock.c. This change affected most dialects: exceptions are DC/OSx, Linux, Motorola V/88, and UnixWare.

3.28 May 26, 1995

Added support for Sequent PTX 2 and PTX 4. The PTX 2.1.6 and PTX 4.0.2 test systems and technical advice were provided by Gerrit Huizenga <gerrit@sequent.com>, Peter Jordan <petej@sequent.com>, Kevin Smallwood <kcs@sequent.com>, and Mike Spitzer <mks@sequent.com>. (Thomas A. Endo) <tendo@netcom.com> and (David Putz). <PutzDW@PO1.LMB.unisys.com> tested under PTX 2.1.5. Bob Foertsch <foertsch@uiuc.edu> tested under PTX 4. Kevin Smallwood tested under 2.1.1. Others who helped include Shane Kenney <shane@sequent.com>, Stephan Rossi <rossi@mtu.edu>, Douglas R. Smith <drsmith@us.oracle.com>, and Joel White <jdwhite@netcom.com>.

Changed the local dev structure's name to l_dev to avoid conflicts with the PTX dev structure. Added a common/rdev1.frag -- a variant of rdev.frag. It's used by EP/IX, PTX, RISC/os, and V/88.

Changed printname() to check Namech first and print it if it contains something. This eliminates some hacks in the handling of names for streams, but generates some duplicate device name look-up code in the dnode.c files of some dialects.

3.29 June 2, 1995

Added clone device support to Motorola V/88 R40V4.3.

Added a generic ``-X" option for dialect-specific use. Used it in AIX to allow use of readx(). Lsof

no longer uses readx() by default, because its use
can cause an AIX 3.2.x and 4.1.x kernel error to
appear. Kevin Ruderman <rudi@acs.bu.edu> reported
this bug to me and the possibility that lsof might
trigger it.

The error, known as the Stale Segment ID bug, hangs
the kernel in its dir_search() function, thus
hanging the application process that called it so
tightly that the application process can neither
be killed nor stopped. The bug does not directly
affect lsof, but may cause the hang when the kernel
is searching directories for other processes.
00FAQ and 00README describe the Stale Segment ID
bug in more detail. Consult dialects/aix/machine.h
for options on enabling or disabling readx() by
default, or permanently enabling or disabling
it
with the HASXOPT and HASXOPT_VALUE definitions.

When not using readx(), AIX lsof may not report
fully on all text and loader references. Changes
to the kernel getuser() function in AIX 4.1.1 appear
to have eliminated the text file and loader file
reference information that once led lsof to use
readx(); of course, without that information, lsof
can no longer report on the executing text file or
shared libraries in 4.1.1.

Changed the Configure script to use a single
abbreviation, aix, for AIX. Configure now uses
/usr/bin/oslevel to determine the AIX version; in
the absence of /usr/bin/oslevel, Configure issues
a warning and assumes the version is 3.2.0. Source
code changes were made to dialects/aix/*.[ch] to
accommodate the new form of the _AIXV value.

3.30 June 8, 1995
Added -c to the installation of the man page in
the Ultrix Makefile's install rule. Thanks go to
Jules van Weerden <Jules.vanWeerden@let.ruu.nl>
for noticing this
omission.

Made FreeBSD 2.0 changes: 1) added automatic sensing
of the FreeBSD 2.0 boot file path, using the
getbootfile(3) function (suggested by Ade Barkah);
2) changed kvm_getprocs(3) function call to use

KERN_PROC_ALL symbol from <sys/sysctl.h>, thus
eliminating incorrect use of the <sys/kinfo.h> and
<sys/kinfo_proc.h> header files; and 3) removed
<sys/kinfo.h> and <sys/kinfo_proc.h> header files
from the dialects/freebsd/include/2/sys subdirectory
of distribution.

Tested under AIX 4.1.2.

3.31 June 16, 1995
Added the NOUSAGEONERR definition to allow lsof to
be compiled with the displaying of usage information
after option error messages disabled. Lsof is
distributed without the NOUSAGEONERR definition --
i.e., usage output is displayed after option error
messages.

Worked on documentation in the 00* files and the
man page, adding tables of contents, making usage
more consistent, trying to insure proper dialect
titles, and inserting some
notes about distribution
restrictions (few) and warranty (none).

Fixed Motorola V88 R32V3 bug in handling Internet
files. This bug was introduced some time ago, but
I have only recently been able to test under R32V3
again.

3.32 June 23, 1995
Added the ability to the Linux nlist() function to
automatically detect that the kernel binary is COFF
or ELF form. Also corrected the UID_ARG cast from
int to u_int. These changes were suggested by
Michael Shields <shields@tembel.org>. Joseph J.
Nuspl Jr. <nuspl@nvwls.cc.purdue.edu> provided a
test system.

Updated lsof for HP-UX 10. Richard Allen <ra@rhi.hi.is>
provided a test system. The hpux stanza in the
HP-UX configure script was updated to sense the
HP-UX version automatically, and to sense the
availability of CCITT header files in /etc/conf/x25.

3.33 June 28, 1994
Added options to select "field" output that can be
parsed by a subsequent program. (The -f, -F, and
-0 options form the selection

set.) Provided
sample awk and Perl scripts for parsing and displaying
field output. This feature was suggested by Dan
Bernstein <djb@silverton.berkeley.edu>.

Tested under PTX 4.0.3.

3.34 June 30, 1995
Changed display of file offset to decimal in the
form "0t12345678" if it is less than 100,000,000.
The offset is displayed in hexadecimal in the form
"0x12abcdef" if it is larger than 99,999,999.

Changed inode field output from signed to unsigned
decimal. Updated the list_fields.{awk,perl} and
list_NULf.perl5 scripts.

Documented the truncated inode output form (leading
`*' and 5 digits) for inodes that are too large
for the output field; thanks go to Leonard Sitongia
<sitongia@zia.hao.ucar.edu> for pointing out that
this wasn't documented.

3.35 July 9, 1995
Added loopback file system support to Solaris with
advice from Casper Dik <casper@Holland.Sun.COM>.

Removed the NOUSAGEONERR compile option in favor of
producing a shortened
usage message when option
errors are detected.

Marty Leisner <leisner@sdsp.mc.xerox.com> provided
code to validate the Linux system map file (/System.map
or /zSystem.map). If lsof detects that the system
map file doesn't match the booted kernel, it
complains and quits.

Updated host name cache to include dot forms -- e.g.,
when the host name can't be obtained via gethostbydddr().
This prevents subsequent lookup delays for the same address.

3.36 July 20, 1995
Updated kernel name cache handling to assume a default
size for pointer-linked caches (DEC OSF/1, FreeBSD,
NetBSD, and SGI IRIX 5.3) when the kernel's cache size
variable has a value of zero. A warning is issued,
but lsof proceeds to read and use the name cache.

Folded rdev1.frag into rdev.frag by supporting a
HASDNAMLEN #define for those dialects whose DIRTYPE
structure has a d_namlen definition.

Updated Linux distribution to avoid using d_namlen
from struct dirent if the Linux version
is 1.2.10 or
greater. This avoidance might work on earlier
version of Linux, too, but I have no way of telling.

Added support for FreeBSD 2.0.5. Ade Barkah
<mbarkah@hemi.com> provided a test system.

Added WARNDEVACCESS definition to machine.h control
the default issuance of device directory and
subdirectory access errors.

Changed options:

-m (mount warning) option deleted
-c (core file) option changed to -m
-c option redesignated as command selector
-d (device warning) option deleted
-d option redesignated as file descriptor selector
-O (order) option changed to less-overhead option
-r option added to enable repeat mode

Added a repeat mode in which lsof will display
output, sleep for the number of seconds defined by
the repeat-mode option, -r <seconds>, and then
display output again, doing this repetitively until
it receives an interrupt or quit signal. This
option is much more efficient for monitoring a file
than calling
lsof repeatedly from a shell script,
since it entails only one set of lsof startup
operations.

The CANDOCHILD compile-time option has been removed.
The -O run-time option will do the same thing.

3.37 July 27, 1995
Fixed incorrect setting of low-overhead flag from -O
option.

Marty Leisner reports that d_namlen is not needed
under Linux 1.2.8. Changed the #if test that sets

HASDNAMLEN accordingly.

Made more changes to option processing: combined -f, -F, and -0 into -F (-0 becomes a field identifier value for -F); now allow -F, -g, -r, and -S to have an optional value; made -F? (help) and -F0 (all fields plus NUL terminator) special forms of -F; and added support for --. These option processing changes are handled with a local getopt() function (named GetOpt() to avoid confusion).

Made yet another attempt to create "standard" install and deinstall SunOS/Solaris Makefile rules.

Corrected improper use of examine_lproc() when in repeat
mode.

3.38 August 3, 1995

Modified Linux and PTX to show TCP's "send next" sequence number as the offset for TCP socket files.

Added some version tests for Linux 1.3.0, provided by Roman Gollent <roman@portal.stwing.upenn.edu>.

Added some more PTX tests around code that shouldn't be active when the NFS layered product is unavailable. Mark Vasoll <vasoll@a.cs.okstate.edu> provided them.

3.39 August 10, 1995

Added generic support for dialect-specific elements in the lfile structure. The HASLFILEADD and SETLFILEADD macroes are used in lsof.h to define the elements and in proc.c to preset them. Field identifiers `1' through `9' are allocated to dialect-specific files. The HASFIELDAP<x> strings define the -F? help text for the FieldSel[] table of store.c, and LISTLFILEAP<x> are macroes, used in the print_proc() function of proc.c, to list fields. (<x> is the field identifier.) Other private element and field processing should be done in dialect-specific
modules.

Used {HAS,SET}LFILEADD, HASFIELDAP[12], and LISTLFILEAP[12] to define and list link count and inode address lfile elements under PTX. Used the -X option to control when the values are displayed.

3.40 August 25, 1995

Added support for Solaris 2.5-BETA, including rudimentary support for door files and extensive support for fattach'ed files with the help of Henry Katz <hkatz@panix.com>, Joseph Kowalski <jek3@jurassic.Eng.Sun.COM>, and Mike Tracy <mtrac@jurassic-45.Eng.Sun.COM>.

Changed most dialects to use slightly safer fchown() on the device cache file. Changed dvch.frag to avoid creating a device cache file that is owned by root. Cleared caches when reading of device cache file fails and removed extra NL from device cache error messages.

After receiving yet another complaint about Makefile install rules, I decided to remove all install and deinstall rules from the distribution Makefiles. The Makefiles now contain a set of comments (echo commands) that describe what the install rule might be. The lsof user is now free to construct install and deinstall rules that meet local conventions and preferences.

3.41 September 5, 1995

Changed Linux kernel symbol handling to avoid the stripping of leading `_' characters that was installed in revision 3.32. (Recent Linux kernels have some symbols that are the same except for the leading `_'.)

The Linux kernel loader format is now determined by testing for "_system_utsname" (COFF) and "system_utsname" (ELF) in the symbols returned by the get_kernel_syms() syscall. If neither or both symbols are present, a warning is issued and COFF format is assumed. If the loader format is COFF, then kernel symbols important to lsof are assumed to have a leading `_'.

Because recent Linux releases add a parameter hashing suffix to kernel symbols, lsof removes it before comparing kernel symbol names and addresses to those in /[z]System.map.

Marty

Leisner, Keith Parks <emkxp01@mtcc.demon.co.uk>,
and Michael Shields helped me with the Linux changes.

After much discussion of the security of the device
cache file on the bugtraq mailing list, I adopted
a suggestion from Dave Sill <de5@sws5.CTD.ORNL.GOV>.
His suggestion removes the world-writable device
cache file from /tmp and creates instead a mode
0600 device cache file in the home directory of
the real user ID that is executing lsof. Lsof
issues a warning message when it does this. (The
warning can be suppressed with -w.) The HASDCACHE
definition becomes a relative path. When lsof is
run from root, it will create a device cache file
in root's home directory, e.g., / or /root, but
the file will be readable and writable only by
root. This should make the device cache file much
more secure.

Added support for SGI IRIX 6.1. Dave Olson provided
technical support and Przemek Klosowski supplied
a test system. Since Przemek's
system formerly
supported my testing of lsof for IRIX 6.0, its
update to 6.1 means I have not tested lsof under
IRIX 6.0 since revision 3.39.

Changed name list structure element initialization
for V/88 to make gcc happy. Albert Chin-A-Young
<china@cig.mot.com> suggested this.

3.42 September 7, 1995
Changed device cache file naming process to add a
suffix formed of an underscore, followed by the
first component of the host name returned by
gethostname(2). This allows lsof to create separate
device cache files for each host from which it is
run for the same UID when the UID's home directory
is shared by the hosts via NFS.

3.43 September 12, 1995
Enabled SCO searching for stream files and Release
5.0 Unix domain socket files by name.

Defined HASDOPTPATH for dialects that can supply
a path with -Db, -Dr, and -Du. Defined it for all
but DC/OSx, UnixWare, and V/88. Used it in the
ctrl_dcache() function of arg.c to enable and

disable -Db,
-Dr, and -Du.

Used is_readable() in dvch.frag when opening the
device cache file for reading.

3.44 September 19, 1995
Added test for setuid-root state so that some
security-sensitive code now disabled by #define's
can by dynamically disabled.

Enhanced, extended, improved, secured, and documented
formation and use of the device cache file path.
More options, more carefully controlled are now
available. A separate documentation file, 00DCACHE,
accompanies the distribution to explain the device
cache file path handling.

Where possible, lsof now drops setgid permission
as soon as possible. Two exceptions are the Solaris
and SunOS versions of lsof which need to close and
re-open kvm access. Setuid-root lsof implementations
must retain that permission to access files in /proc.

Improved the README.lsof_<revision> file that
appears in the lsof wrapper tar file with help from
Jon A. Tankersley <tank@amoco.com>.

Added Veritas file system support
to the HP-UX
dialect port.

Albert Chin-A-Young tested lsof under Motorola V/88
R40V4.1 and provided #if/#else/#endif changes.

3.45 September 20, 1995
Enabled setgid permission surrender for Solaris
and SunOS dialects.

3.46 October 5, 1995
Added more conversions to HASPERSDC, based on
suggestions from John Gardiner Myers <jgm+@CMU.EDU>.
They make it possible to locate the personal device
cache file in /tmp, for example. A new -D function,
`?', reports device cache file name formation
information.

Gained access to AIX 4.1.3, compiled lsof there, and found that it seems to work.

Tested lsof under FreeBSD 2.1.0-950726-SNAP. John Clear <jac@dragonfly.vet.purdue.edu> kindly provided a test system.

Added a Customize script that helps with the job of modifying some important (e.g., security-related) compile-time options. Configure calls Customize, but can be told not to with the -n|-nocust options.

Fixed over-sensitivity to unexpected kernel file structure pointer values in HP-UX version that led to premature exit. Lionel Cons <cons@dxcern.cern.ch> pointed out the problem.

With the help of Leif Hedstrom <leif@infoseek.com> identified a pair of conflicting Solaris 2.4 patches that prevent lsof from working. A work-around is described in section 00FAQ.

3.47 October 16, 1995

Enabled suppression of an HP-UX pstat() warning message. Added big_brother.perl5 to field output scripts/ subdirectory. Both changes are courtesy of Lionel Cons <Lionel.Cons@cern.ch>.

Added a test for automount detritus in the SCO mount table.

Added kernel name cache support to SCO dialect. Modified most name cache support to report full path names without the intervening `` -- '' when possible.

Added an Inventory script to check the contents of the distribution, using a new file, 00MANIFEST. The Configure script normally calls Inventory. Changed the -n option to Configure to avoid calling the Customize and Inventory scripts and dropped the -nocust option. The presence of .neverCust suppresses the calling of Customize; .neverInv, Inventory. The Inventory script creates .ck00MAN when it completes, so that subsequent calls to Inventory won't check the inventory again -- although

the caller is given the opportunity to have the
inventory rechecked.

Added PTX 4.1.0 support, courtesy of a test system
supplied by Kevin Smallwood <kcs@sequent.com>.

Picked lint for gcc in the V/88 dproc.c from hints
provided by Albert Chin-A-Young <chinay@cig.mot.com>.

3.48 October 20, 1995
Improved root directory detection during name cache
lookup.

Remove the Novell UnixWare and Pyramid DC/OSx ports
from the distribution, because I have not been able
to test them for 40 or more revisions. Their pieces
may now be found on vic.cc.purdue.edu in
pub/tools/unix/lsof/OLD/{binaries,dialects}.

Corrected an error in Customize that caused it to
incorrectly redefine
HASSYSDC to HASSYSDCPATH. This
was reported by Michael Beirne <beirne@dcdsv0.fnal.gov>.

Made sure that lsof will compile when HASDCACHE is
undefined. A problem with a reference to the DChelp
symbol was reported by Vasco Pedro <vp@fct.unl.pt>
and resolved by always defining DChelp.

Corrected handling of -c and -m options.

Corrected the reading of the SCO /etc/mnttab. Bela
Lubkin <belal@sco.com> helped me understand its
special multi-line format. The "nothing/nowhere"
lines are continuations of the file system directory
and device names when either are > 31 characters.

Corrected SCO version list in Configure help output.

Update special SCO name cache code to make it more
robust.

Add support for IRIX 6.0.1 with the help of Eberhard
Mater <system@grzap1.rz.go.dlr.de>.

3.49 October 25, 1995
Removed need for dialects/sgi/irix601hdr subdirectory,
replacing it with one created by dialects/sgi/Mksrc

and composed of symbolic links to dialects/sgi/irix6hdr.
Eberhard
Mater did the testing.

Added file system inode number to the local file
structures of the DEC OSF/1, DYNIX, EP/IX, HP-UX,
NeXT, PTX, RISCos, SGI, Sun, and V/88 dialects.
Added code to name cache, node, and VFS functions
to set the file system inode number and use it for
faster recognition of files on the file system
mount point.

Added kernel name cache support to Linux. This
has been tested only under release 1.2.13.

3.50 October 31, 1995
Updated 00FAQ: reorganized and renumbered sections;
added some DEC OSF/1 sections; section about the
Solaris and SunOS Sun KERNELBASE.

Added an alternative readdir() function, called
ReadDir(), to dialects/osf/ddev.c This function
was supplied by Duncan McEwan <duncan@comp.vuw.ac.nz>,
who discovered that the getdirentries() function
in DEC OSF/1 versions 3.[02] returns an incorrect
length for the /dev/fd directory when it is a file
system mount point. Modified the Configure script
to
define USELOCALREADDIR for 3.[02] to enable
using this local function.

Modified the Solaris/SunOS Mksrc to create a dummy
(empty) kernelbase.h for Solaris 2.5 (5.5).

3.51 November 8, 1995
Modified the Configure script to declare the kernel
state definitions appropriate to IRIX 6.1 on IP21
and IP26 platforms. News of the need for this came
from Kate Fissell <Kate.Fissell@IUS4.IUS.CS.CMU.EDU>
and Dave Olson <olson@anchor.engr.sgi.com>.

Modified the SGI IRIX dproc.c to provide more
information when the kernel's idea of the size of
a proc structure doesn't match sizeof(struct proc).
This mismatch can occur if the wrong kernel state
definitions are used to condition the header files
(e.g., <sys/proc.h>) included when compiling dproc.c.

Made the -i option with no arguments equivalent to
the -n option -- i.e., they both select the listing
of all open Internet files.

Supplied a missing "you" in the Customize script
introduction. John Jackson <jrj@cc.purdue.edu>
noticed
the omission.

Modified the Customize script to put long messages
in here documents rather than echo statements, so
that changing and reformatting them is easier.
John Jackson offered this helpful suggestion.

Fixed a port number cast bug in Solaris 2.[45],
courtesy of information and code supplied by Allan
Black <allan@scotnet.co.uk>.

Automated the detection of Solaris 2.4 patches
101945-32 and 102303-02 that cause the installed
kernel's user structure to differ from the one
defined by <sys/user.h> because of a patch to
<sys/auxv.h> that wasn't applied when the kernel
was built. The Configure script invokes an alternate
auxv.h file and warns that it is doing so.

Fixed a problem with Inventory script that shows up
on systems where echo is not an sh built-in. The
bug was reported by Scott Ballew <smb@cc.purdue.edu>.

3.52 November 27, 1995
Added support for Linux versions 1.3.22 and above,
courtesy of changes supplied
by Keith Parks
<emkxp01@mtcc.demon.co.uk>.

Changed -d option processing to allow specification
of a comma-separated list of file descriptors.

Modified SCO support to allow NFS code to be optional
at the request of Dave Gilbert
<agere!dgilbert%peapod.com@zool.interaccess.com>.

Enabled HP-UX 10.x version to display device and
inode numbers for FIFOs. The problem was reported
by Jeff Earickson <jaearick@colby.edu>.

3.53 December 8, 1995

Enhanced NeXTSTEP FIFO reporting.

Fixed a formatting problem in the man page, reported
by Angel Li <angel@flipper.rsmas.miami.edu>.

Added support for DEC OSF/1 4.0-BETA. Angel Li
provided the test system.

Added a -v option to display lsof version information.
Marty Leisner <leisner@sdsp.mc.xerox.com> suggested
this.

Replaced touch with echo in Inventory script to avoid
DEC OSF/1 4.0 complaint.

Tested under PTX 4.1.2.

3.54 December 15, 1995
Added support for IRIX 6.2-BETA. The support for
older IRIX
versions changed considerably in the
process. Revision 3.54 has been tested under these
older IRIX versions: 5.3 and 6.1. Angel Li
<angel@flipper.rsmas.miami.edu> provided a test
system and Jim Brown <jim@guanabana.rsmas.miami.edu>
helped.

Tested under AIX 4.1.4.

Decommissioned the DYNIX port -- I no longer have
access to a test system.

Added the HASXOPT_ROOT define to allow the lsof
builder to restrict the use of the dialect-specific
X option (AIX and PTX currently) to processes whose
real user ID is root. Updated the Customize script
to provide an easy mechanism to change HASXOPT_ROOT.
AIX uses HASXOPT_ROOT; PTX does not. This change
was suggested by R. Lindsay Todd <toddr@rpi.edu>.

3.55 December 22, 1995
Eliminated need for modified DEC OSF/1 headers by
using #undef and #define statements. Chip Stettler
<STETTLERC@wlmpo1.wilm.ge.com> helped test.

Added quick start documentation file, 00QUICKSTART,
containing examples and explanations

of lsof use.

Verified that lsof works under the released Solaris
2.5.

3.56 January 2, 1996
Corrected lock reporting for Solaris 2.[345].

Corrected Linux malloc() kernel symbol handling bug,
reported by Keith Parks <emkxp01@mtcc.demon.co.uk>.

Corrected AIX loader text file selection bug; it
caused all process IDs to be listed when the -t
option and one file system name was specified.
The bug was reported by Christopher C. Evert
<cevert@waii.com>.

Made sure Solaris Kb variable is zeroed before
first use.

3.57 January 12, 1996
Updated SunOS port to obtain lock information from
v_filocks and the lock_list struct to which it
points.

Changed -H to -n. The function formerly performed
by -n can be done by using -i with no address.

Updated Linux FIFO support so that the display for FIFOs
contains device number, inode number, and NAME. Johannes
Kroeger <jkroeger@squirrel.owl.de> reported the lack of
these items in the Linux FIFO display.

Added
RCS identification to header files, Makefiles,
and common fragments.

Added BSDI BSD/OS support for 2.0, 2.0.1, and 2.1-BETA.
Terry Kennedy <terry@spcvxa.spc.edu> kindly provided a
2.1-BETA test system and did the 2.0.1 testing.

Modified the Inventory script to compensate for dialects
that have an expr that doesn't set its exit code when
string matches fail.

Converted internal representations of file offset and
size to unsigned long.

Corrected bug in NetBSD lock handling.

Corrected bug in FreeBSD file system type name handling.

Keith Parks <emkxp01@mtcc.demon.co.uk> reports lsof 3.57 compiles and runs under Linux 1.3.56.

3.58 February 7, 1996

Changed Solaris 2.3 configuration to pass the level of patch 101318 to the source code. This allows a Solaris 2.3 lock handling difference to be accommodated.

Updated 00QUICKSTART to reflect -n and -H changes made in revision 3.57. (Ooops!)

Changed Configure script to compile lsof for SCO versions beyond 3.2v5.0.0 as it is compiled for 3.2v5.0.0. Bill Campbell <bill@celestial.com> reported he has done this successfully.

Added information to 00FAQ about a Linux kernel symbol problem (section 3.7.6) and included a <linux/random.h> patch to work around it. The patch was supplied by Keith Parks <emkxp01@mtcc.demon.co.uk>.

3.59 February 21, 1996

In response to a query from Louis Rayman <lou@asahi.ps.quotron.com>, added special support for Solaris "sockmod" streams, used for Unix domain sockets, that allows their file system device type and inode number to be displayed. It also allows lsof to search for them by name or type (-U).

Added range handling to -d argument.

Added the display of CDFS file size to DEC OSF/1 output.

Added an include of <rpc/xdr.h> to keep gcc on HP-UX 10 happy. Blair Zajac <blair@olympia.gps.caltech.edu> suggested it.

Added Ultrix 4.5 to support list, courtesy of a notification from Gregory Neil Shapiro <gshapiro@WPI.EDU>.

Added AFS support for Solaris 2.4 at the request

of Michael L. Lewis <mlewis@morgan.com> and Phillip Moore <wpm@morgan.com>. Phillip helped me locate a test host, generously provided by Heidi Hornstein <heidi@cmf.nrl.navy.mil> with support from Chaskiel Moses Grundman <cg2v+@andrew.cmu.edu> and Sushila R. Subramanian <sushi@cmf.nrl.navy.mil>. Lsof is configured for AFS with a new script, AFSConfig.

Used a SunOS 4.1.4 test system, provided by Chaskiel, to extend Solaris AFS support to cover SunOS. Used another test system, provided by Chaskiel, to extend AFS support to NEXTSTEP 3.2.

Tested lsof under AFS on yet another Chaskiel-provided system, running Linux 1.2.13 and AFS 3.3, and found that lsof needed no changes to recognize its AFS files.

Used a test system, provided by Curt Freeland <curt@grumpy.cse.nd.edu> and Terry McCoy <terry@anubis.cc.nd.edu> to extend Solaris AFS support to Solaris 2.5 with AFS 3.4-Alpha.

Added
the [-A A] option for specifying the name list file that contains dynamic kernel module addresses. This is defined for the NEXTSTEP, SunOS, and Solaris implementations.

Added stty isig handling (where appropriate) to the Customize and Inventory scripts.

Added support to Solaris for the nfs3 file system type. Its absence was reported by Patrick D. Sullivan <pds@snt.bellsouth.com>.

In response to a report from Tigran Aivazian <bs_s641@ceres.king.ac.uk)> corrected bug in Linux local nlist() function and based the default kernel loader format on a Configure test for CONFIG_KERNEL_ELF in /usr/src/linux/include/linux/autoconf.h.

Fixed a bug in name cache exploration for BSD-derived dialects -- e.g., FreeBSD.

Updated for NetBSD 1.1.

3.60 February 27, 1996
Improved Unix domain socket reporting for Solaris.

Louis Rayman <lou@asahi.ps.quotron.com> helped test.

Added warning messages about absence of Linux CONFIG_MODULES definition in autoconf.h, leading to lack of get_kernel_syms() support. Tigran Aivazian <bs_s641@ceres.king.ac.uk)> supplied the information.

3.61 March 8, 1996

Added AFS support for AIX and HP-UX and verified that the lsof Ultrix version needs no additions for AFS. Chaskiel Moses Grundman <cg2v+@andrew.cmu.edu> provided the HP-UX and Ultrix test systems. Jan Tax <jan_tax@unc.edu> provided an AIX 4.1.4 test system. Bob Cook <bobcook@SLAC.Stanford.EDU> provided 3.2.5 and 4.1.4 test systems.

Fixed minor problems and made improvements to NEXTSTEP, Solaris, and SunOS AFS support. Changed the AFSConfig script to ask for AFS version.

During the Hp-UX AFS work, added the hpuxgcc abbreviation to the Configure script for configuring lsof to be compiled with gcc under lsof.

Fixed a NetBSD mount structure array referencing bug, reported by Peter Svensson <petersv@df.lth.se>.

Dropped support for Motorola V/88, because I no longer have access to test systems.

Added rudimentary support for the IRIX XFS file system type, pending more information.

3.61 March 12, 1996

Corrected misuse of the LSOF_DINC shell variable in the Configure script for HP-UX and Solaris. Larry Rogers <lrr@cert.org> pointed out this problem. Also removed an obsolete irix52 abbreviation from Configure.

I didn't consider this change sufficient to warrant a new version number, but just rebuilt the 3.61 distribution.

3.62 March 26, 1996

Updated AFS comments in 00README.

Supplied missing break statement in a N_VXFS case
clause in the HP-UX dnode.c.

Added Veritas file support to PTX, courtesy of code
supplied by Laurent Montaron <lpm@sequent.com> and
help from Kevin Smallwood <kcs@sequent.com>.
Created two new source modules (dnode[12].c) to
separate PTX header file node definitions and thus
eliminate symbol conflicts. Laurent did most of
the testing.

Added tests to BSDI, FreeBSD, HP-UX, IRIX, NetBSD,
NEXTSTEP, PTX, Solaris and SunOS lsof
versions that
allow them to report on unknown file system types.

Added IRIX 6.0.1 #if/#else/#endif support in response
to a report and suggested modifications from Scott
Presnell <srp@zgi.com>.

With the help of Dave Olson <olson@anchor.engr.sgi.com>
improved the IRIX 6.2-BETA XFS support.

3.62 March 27, 1996
Corrected SunOS incompatibility with last-minute
addition of Solaris MVFS support. The problem was
reported by Larry W. Virden <lvirden@cas.org>.

I didn't consider this change sufficient to warrant
a new version number, but just rebuilt the 3.62
distribution.

3.63 April 11, 1996
Upgraded Solaris MVFS support. In the process,
enlarged Solaris and SunOS DEVICE output column.

Changed SunOS 4.1.x Configure to make -DNOCONST
Makefile definition dependent on SC version.

At the suggestion of John DiMarco <jdd@cdf.toronto.edu>
suppressed two warning messages: the device cache
file creation warning when -Db has been specified;
and the one
issued when -D? is used with a non-writable
system-wide device cache file and there is no other
writable path. Also at John's suggestion redid

the manner in which child processes are used to
avoid kernel calls that might block; the net effect
of the change is that normally one child process
is required, rather than one per kernel call.

Refined the NetBSD test for <nfs/nfsproto.h> with
a Configure script change.

Modified Configure script to compute AIX version
with ``uname -rv'' when /usr/bin/oslevel can't be
executed. Stephen C. Woods <scw@seas.ucla.edu>
suggested this.

Disabled conflicting prototype definitions in the
local netdb.h used when the SCO 3.0 netdb.h is
missing. Disabled #include of <strings.h> unless
the SCO version is 5.0 or above. Don Kirouac
<dkirouac@minicom.com> pointed out these problems.

3.63 April 15, 1996
Improved Configure's SunOS 4.1.x CC test for compiler
support of the const keyword and avoided Configure's
``test
-f {Customize,Inventory}'' (because the
Ultrix test doesn't grok -x) in response to a report
from Larry Schwimmer <rosebud@cyclone.Stanford.EDU>.

I didn't consider this change sufficient to warrant
a new version number, but just rebuilt the 3.63
distribution.

3.64 April 26, 1996
Added a negate option for entries of the -u list.
Kurt Hillig <khillig@Chem.LSA.umich.edu> suggested
it.

Added a check for legal protocols in the -i option.

Adjusted the Configure and SGI MkKernOpts scripts
to handle more IRIX situations per instructions
from Dave Olson <olson@anchor.engr.sgi.com>.

Added support for HP-UX 10.10, courtesy of a test
system provided by Mark Bixby <markb@cccd.edu>.

3.65 May 20, 1995
Corrected errors, reported by Arne H. Juul
<arnej@pvv.unit.no>, in use of IRIX stat structure.

Added support for the IRIX 6.2 cachefs, following
a report from Peter Van Epp <vanepp@sfu.ca>.

Added clone support for AIX 4.1.4 and above.

Adjusted the
IRIX configuration to work properly
for 64 bit IRIX 6.2 systems. Richard Chycoski
<richard@sfu.ca> and Peter Van Epp <vanepp@sfu.ca>
provided a test system.

3.66 June 19, 1996
Improved the HP-UX VXFS test in the Configure
script, based on a report from Robert Hall
<rjh6810@misty.ca.boeing.com>.

Added SCO information to 00FAQ. Added information
about lsof slowness and nameserver.

Added an untested Configure abbreviation for Solaris
2.5.1.

Ambrose Li <ambrose@www.mingpaoxpress.com> supplied
a Linux change that avoids a conflict with the
d_namlen definition in versions 1.99.8 and above.

Added compiler version identification to the
Configure script for AIX and Solaris cc.

Added support for FreeBSD 2.2-960612-SNAP. Ade
Barkah <mbarkah@hemi.com> provided a test system.

3.67 Jult 1, 1996
Made miscellanous documentation corrections.

Added support for gcc under AIX 4.1 and above,
including an aixgcc Configure abbreviation, and a
work-around
for an long long alignment problem.
Stuart D. Gathman <stuart@bmsi.com> and Waldemar
Zurowski <bilbo@pwr.wroc.pl> helped me to understand
the gcc problem and devise the work-around.

3.68 July 17, 1996
Malgorzata Roos <groos@rzusun.unizh.ch>: pointed
out the AIX lsof didn't report the inode number
for named pipes (FIFOs) and wouldn't locate them

by name; _and_ supplied a fix. (Now _that's_ the
kind of bug report I like. :-)

Update Configure script to clean out aix41*
subdirectories created by the AIX gcc work-around.

Taught IRIX lsof how to report the correct device
number, inode number, and size for named NFS pipes.

Taught HP-UX 9.x lsof how to report size/offset
and inode number for named NFS pipes. (HP-UX 10.x
already knows.)

Taught DEC OSF/1 (errr, Digital Unix) lsof to report
device and inode numbers correctly for named pipes.
Because stat(2) under DEC OSF/1 V3.2 doesn't report
the device number correctly for named pipes, lsof
can't
locate them by name, but it can do that under
DEC OSF/1 V2.0.

Taught EP/IX 2.1.1 lsof to report device and inode
numbers correctly for named pipes.

Taught versions of lsof for PTX 2.1.6 and 4.1.2 to
report device and inode numbers correctly for named
pipes.

Taught RISC/os 4.52 lsof to report device and inode
numbers correctly for named pipes.

Taught versions of lsof for Ultrix 4.2 and above
to report inode numbers and file systems names
correctly for named pipes (FIFOs).

Added safety check when trying to get a sockaddr_un
structure from a BSDI, FreeBSD, or NetBSD mbuf.

Improved documentation on install permissions in
00README at the suggestion of Paul Wickman
<Paul.Wickman@amd.com>.

Installed support for the DTYPE_PIPE file structure
in FreeBSD 2.2. Changed the FreeBSD version symbol
from _FREEBSDV to FREEBSDV.

Added support for NetBSD 1.2.

3.69 July 30, 1996
Added block device name caching and reporting for all dialects.

Improved (I think) IRIX 6.2 64 bit configuration.

Eliminated C name space pollution by removing the leading `_' from all dialect version symbols that had it: _AIXV, _BSDIV, _OSF1V, _ADVFSV, _EPIXV, _HPUXV, _IRIXV, _PTXV, _RISCOSV, and _SCOV.

Changed decosf stanza in Configure script to automatically detect the subdirectory of /sys (or /usr/sys) that contain's the configuration header files for the machine. Added a 00FAQ entry about this.

3.70 August 9, 1996
Set the execute bits on scripts/big_brother.perl5. Changed -H in scripts/watch_a_file.perl to -n. Retained all the command name characters that are available in the proc or user struct for field output. Improved sample install rules for BSDI and HP-UX. Strengthened HP-UX CCITT test in the Configure script. Gildas Perrot <perrot@francenet.fr> suggested these changes.

Improved Solaris local TCP address reporting, based on a bug report from John Caruso <jcaruso@csg.com>.

Improved HP-UX VFS handling, and corrected a bug in VFS handling, based on bug reports from David Capshaw <David.Capshaw@SEMATECH.Org>.

Added support to -i argument handling to allow port lists and ranges, and service name lists to be specified. John DuBois <spcecdt@armory.com> suggested this.

Dropped support for IRIX 4.0.5H. Revived support for IRIX 5.2, courtesy of a test system from Dan Trinkle <trinkle@cs.purdue.edu>.

3.71 August 15, 1996
Improved handling of port ranges specified with the -i option. Improved performance when the only

option is -i.

3.72 August 28, 1996

Fixed bugs and typos in SCO mount table handling.

Added support for OpenBSD (only the i386 architecture type has been tested), using the NetBSD dialect sources. David Mazieres <dm@amsterdam.lcs.mit.edu> provided a test system.

Added fdesc file system support to FreeBSD, NetBSD and OpenBSD. Changed the way proc file system support is activated with additions to the Configure script and
changes to the dialect machine.h files.
Dropped the distribution of the Freebsd <procfs/procfs.h> header file.

Added support for PTX 4.1.4.

3.73 September 5, 1996

Added information to 00FAQ for missing CCITT HP-UX header file x25L3.h. Pasi Kaara <ppk@atk.tpo.fi> provided the information.

Changed AIX header file #include pattern to prevent gcc's loader from complaining about multiply defined etherbroadcastaddr[], fddi_broadcastaddr[], and ie5_broadcastaddr[] CONST u_char arrays from <net/net_globals.h>. (The AIX loader doesn't complain.) David Capshaw <David.Capshaw@SEMATECH.Org> reported this problem.

Removed the HASPWSTAYOPEN definition; it was only used for two dialects that are no longer supported.

Corrected a bug in UID cacheing that appeared during long repeat-mode (-r) operations. The bug was reported by Peter Van Epp <vanepp@sfu.ca>. When in repeat mode the UID cache will be cleared when /etc/passwd changes.

Fixed a bug in
FreeBSD support that causes a segmentation fault on VBAD vnodes.

Deleted ultrix22 from Configure and RHF from Ultrix source files. Dropped 2.2 from support list.

3.74 September 6, 1996
Corrected a bug in FreeBSD's proc table handling,
reported by David O'Brien <obrien@Nuxi.cs.ucdavis.edu>.

3.75 September 9, 1996
Added FreeBSD proc table handling fix from revision
3.74 to BSDI, NetBSD, and OpenBSD dialects.

Improved Solaris VFS handling.

Added pipe handling to OpenBSD. Changed Configure
script to define OPENBSDV for OpenBSD and used that
definition to include the pipe support in the NetBSD
sources. The Configure script defines NETBSDV for
NetBSD. So far neither dialect has any #if/#else/#endif
blocks that depend on version number.

Added support for AIX 4.2.

3.76 September 21, 1996
Plugged a memory leak in command handling, introduced
in revision 3.70. The bug was reported by Peter
Van Epp <vanepp@sfu.ca>.

Fixed a bug in the reporting
of size for IRIX 5.3
EFS files, introduced in revision 3.69 by the name
space pollution abatement. The _IRIXV definition
was used in the IRIX 5.x private efs_inode.h header
file to configure the inode stricture for IRIX 5.3,
so I changed the tests to use IRIXV.

Changed information on the AIX Stale Segment ID bug
to reflect the fact that IBM now says they won't
fix it. They have closed the APAR.

Disabled the AIX gcc long long alignment hack under
AIX 4.2, because it doesn't work there. Installed
a fatal error message in Configure that gcc can't
be used to compile lsof under AIX 4.2 until a work-
around can be developed.

Upgraded BSDI, FreeBSD (2.0 and above), NetBSD
(1.1B and above), and OpenBSD lock reporting.
David Mazieres <dm@amsterdam.lcs.mit.edu> reported
the need for the upgrade.

Made similar lock reporting upgrades to (versions tested are in parentheses): AIX (4.1.4 and 4.2); DEC OSF/1 (2.0 and 3.2d); EP/IX (2.1.1); HP-UX (9.x and 10.10); IRIX (5.2, 5.3, and 6.2); Linux; NEXTSTEP (3.1); PTX (2.1.6 and 4.2); RISCos; SCO (releases 3.0 and 5.0); Solaris (2.5); SunOS (4.1.3); and Ultrix (4.2).

Updated man page and 00FAQ with more information on lock reporting.

Updated PTX lsof for 4.2. Upgraded HP-UX lsof for 10.20. Used a test system, provided by Richard Allen <ra@rhi.hi.is>, and received testing assistance from Marc Winkler <marc@healthchex.com>.

Changed handling of Internet addresses to avoid DNS lookup operations when the address has clearly not been selected. John DuBois <johnd@sco.COM> suggested this.

3.77 October 2, 1996

Changed SCO Configure stanza to call nm by its full path, thus avoiding possible confusion. The change was suggested by Jean-Pierre Radley <jpr@jpr.com>.

Added changes to allow lsof to be compiled by gcc under AIX 4.2 -- enabled some gcc-specific typedef's in the AIX machine.h and disabled the Configure script's rejection of aixgcc for AIX 4.2. The typdef's were supplied by Henry Grebler <henryg@optimation.com.au>.

Based on information supplied by Henry and David J. Wilson <davidw@optimation.com.au>, invented a description and processing for an unknown file struct that is established by AIX 4.2 (at least) for X processes when DISPLAY=:0.0. For convenience I gave its type the DTYPE_PIPE definition, but that may be incorrect.

Fixed some Solaris 2.[34] errors in locking code, added at 3.76, that I couldn't test. Rainer Orth <ro@TechFak.Uni-Bielefeld.DE> reported the problem and supplied the fixes.

Made Configure script supply NeXTSTEP 3.x version
in Makefile so that the shadow vnode locking code,
introduced in 3.76, would be disabled for NeXTSTEP
3.0. Rainer Orth discovered this problem, too.

Added reporting of UNIX domain socket inode numbers
for Linux version 2.0 and above. The addition was
supplied by Matthew Burt <BurtM@poole.siemens.co.uk>.

Enhanced file searching to
report all instances of
references to automounted file systems, even when
they're direct mounts not yet realized. Enhanced
Solaris 2.5 lsof to grok autofs nodes. Victoria
H. Lau <vlau@msmail2.hac.com> pointed out the need
for these enhancements and helped test them.

Changed AIX lock length test so it will work with
gcc under AIX 4.2.

Changed PTX HAS_VXFS symbol, indicating presence
of VxFS, to HASVXFS for consistency with the HP-UX
form of the symbol.

3.78 October 14, 1996
Changed strtol() call in private Linux nlist()
function to strtoul(). Linux kernel addresses at
2.1.0 have their top bit set and appear to be
negative to strtol(). This information was provided
by Marty Leisner <leisner@sdsp.mc.xerox.com>.
Marty also notes that other, unknown-as-of-yet
problems prevent lsof from working under 2.1. He
is investigating, since I don't have access to a
2.1 system.

Added definitions to machine.h for a private file
struct type (HASPRIVFILETYPE
and PRIVFILETYPE) that
can be accommodated without changing prfp.frag,
much as HASPIPEFN works for PIPE file struct types.

Used the new private file struct type support to
support the AIX f_type=0xf that DISPLAY=:0.0 causes.
Changed its output TYPE from PIPE to SMT; displayed
file size as buffer size less free bytes in buffer;
enabled recognizion under AIX 4.1.4. Mike Feldman
<feldman@charm.urbana.mcd.mot.com> and others helped
me identify this file as a Shared Memory Transport

(SMT) socket.

Corrected a function prototype in the HP-UX dnode.c for HP-UX 10 and greater; gcc objected; HP's cc did not. Christian Krackowizer <kra1@technodat.co.at> reported the problem.

Made AFSConfig script more capable of locating the cell's root directory. Updated AFS documentation in 00FAQ and 00README. Both were suggested by Timothy Miller <tsm@cs.brown.edu>.

Installed update to big_brother.perl5 script from Lionel Cons <Lionel.Cons@cern.ch>.

3.79 October 29, 1996

Added support for IRIX 6.4, courtesy of a test system provided by Angel Li <angel@rrsl.rsmas.miami.edu>. Fixed FIFO and NFS3 bugs in IRIX 6.2 lsof in the process. Lsof has not been tested under IRIX 6.3, but the Configure script has a stanza for it.

Changed device functions to use stat() instead of lstat(). Used WARNDEVACCESS to suppress stat(2) failure messages.

Tested under OpenBSD 2.0.

3.80 November 8, 1996

Corrected comments in 00README about using the sunos413 and sunos413cc Configure abbreviations.

Made some Configure and Customize script changes, suggested by Bruce Jerrick <bruce@cse.ogi.edu>.

Added missing elements to definition of local Solaris 2.3 lock_descriptor structure so that dnode.c will compile and work properly under it. Corrected a bug in Solaris 2.[34] lock descriptor handling.

3.81 November 14, 1996

Corrected error in the "invented" HP-UX 10.20 proc struct. The erroneous struct definition named the set-UID member as the UID member, resulting in occasional incorrect UID attributions in lsof

output.

At the suggestion of Larry Schwimmer <schwim@cyclone.stanford.edu>, changed AFSConfig to use awk to get the cell name from /usr/etc/vice/ThisCell, thus avoiding a problem when the cell name line has more than one word.

Added -DSWASH to IRIX 6.2 options propagated from the kernel build CCOPTS to lsof's Makefile. Randolph J. Herber <herber@dcdrjh.fnal.gov> did the detective work that revealed the need for this. IRIX 6.2 patch 1488 added -DSWASH and its effects.

3.82 December 11, 1996

Updated Configure script for FreeBSD 3.0 and SCO OpenServer 5.0.[24]. FreeBSD Configure script change was supplied by David E. O'Brien <obrien@NUXI.com> and SCO Configure script change was supplied by Bela Lubkin <belal@sco.COM>.

Tested lsof under FreeBSD 3.0, courtesy of a test system provided by Ade Barkah <mbarkah@hemi.com>.

Added changes to support SCO OpenServer 5.0.4 (Comet), supplied by Bela Lubkin <belal@sco.COM>.

Added support for UnixWare 2.1. D. Chris Daniels <chrisd@dlpco.com> provided a test system and Bela Lubkin provided technical assistance.

Added support for Pyramid DC/OSx 1.1 and Reliant UNIX 5.43. Bruce Beare <bjb@pyramid.com> and Kevin Smith <kevin@pyramid.com> provided test systems and technical assistance. This dialect version must run setuid-root, since it accesses proc and user structures vic the /proc file system.

Tested under PTX 2.1.9 and added support for PTX 4.2.1.

At Bela Lubkin's suggestion added a commercial to the lsof man page, -h option, and -v option output, telling where to get the latest revision. This entailed large scale rearrangement of the -h output to keep it as short as possible. It also involved shortening the -X explanation for PTX.

Made sure that address segment access errors didn't
incorrectly force the listing of a process. This
fix was needed
by the Sun, Pyramid, and UnixWare
ports.

Corrected bug in the way the local device table is
sorted.

3.83 December 30, 1996
Added support for Solaris 2.6 (Beta) with help from
Casper Dik <casper@holland.Sun.COM>, May Jackson
<methalya.jackson@eng.sun.com>, Joseph Kowalski
<jek3@Eng.Sun.COM>, and the Solaris 2.6 Beta test
program.

Fixed an inode file system type processing bug in
SCO OpenServ 5.0 and greater, reported by Robert
Lipe <robertl@arnet.com>.

Fixed bugs in SCO kernel name cache probing, courtesy
of code and suggestions from Bela Lubkin <belal@sco.COM>.

Revised kernel name list handling to remove the need
for changing two files (dlsof.h and dstore.c) when
altering, removing, or adding name list symbols.
All dialects were affected.

Added support for SCO OpenServer event "clones."
Robert Lipe need for their support and Bela Lubkin
provided technical assistance in identifying them.

Added display of bound name to Solaris UNIX
domain
socket file handling.

Correct bug in SunOS address space ("txt" file)
handling.

Tested under UnixWare 2.1.1.

Changed SGI IRIX lsof to use the kernel's proc
struct size when striding through its proc table
(IRIX versions below 6.4). The proc struct size
difference warning is still issued, and lsof still
uses the proc struct size and proc struct from
<sys/proc.h> to read and process proc table

information. Added a note to 00FAQ about this.

Deferred Internet host and port name lookups to
print time, thus avoiding lookups for files that
are not listed.

3.84 January 13, 1997
Updated the Pyramid private configuration script,
MkKernOpts, to propagate the R4000 definition for
DC/OSx systems so equipped. Anthony Shortland
<anthony.shortland@FMR.COM> pointed out the need
for this and Kevin Smith <kevin@pyramid.com> provided
access to a test system.

Added information to 00FAQ about UDP ports for
which lsof can't find users, because the
ports are
reserved to the kernel and aren't associated with
open files.

3.85 January 17, 1987
The DEC OSF/1 kernel name cache can be processed
as a simple table, rather than a linked list, so
changed the interface to rnam.frag accordingly.

Added a new optional output field, parent process
ID (PPID). The -R option (for paRent) selects it,
and the `R' field identifier labels it. Updated
some scripts to handle it and developed two new
scripts, idrlogin.perl and idrlogin.perl5, to
use it in locating nework (rlogind and telnetd)
source addresses for shell processes. Added some
information about the new scripts to 00QUICKSTART.

3.86 January 30, 1997
Add explanation of why device warning messages
disappear when the device cache file is used.

Changed Linux Configure stanza to check more
places for the [z]System.map file and warn if
the one located differs in date from /vmlinuz.
Bjorn S. Nilsson <NILSSON@nbivms.nbi.dk> suggested
this for easier configuration
at Linux 2.0.28.

Changed Linux Confifgure stanza to check for the
presence of fl_fd, fl_file, and fl_whence in the
file_lock structure of <linux.fs.h> and define

symbols appropriately.

Changed Linux lock testing to test task structure
pointer (fl_owner) from file_lock struct as well
as (possibly) the file struct pointer (fl_file) or
file decriptor number (fl_fd) to identify the lock
owner, depending on what HAS_FL_* symbols were
defined by Configure's file_lock structure examination.
Added section to Linux Problems in 00FAQ about this.

Corrected 00FAQ reference in Configure's Solaris
2.4 stanza.

3.87 February 11, 1997
Corrected setting of VxFS device number for HP-UX
and PTX.

Added VM map flag test #if/#else/#endif for recent
versions of FreeBSD 3.0, supplied by Chris Timmons
<skynyrd@opus.cts.cwu.edu>.

Added a #define that removes a conflict between a
signal() prototype in the IRIX 6.4 <sys/systm.h>
and one in its <sys/signal.h>,
exposed when cachefs
support is enabled. Wolfgang Hecht
<hecht@zedat.fu-berlin.de> identified the need for
this addition and helped test it. Refined IRIX
proc struct size test, warning, and use.

Revised Linux system map file handling (yet again)
to search for the file at execution time, rather
than in the Configure script. Marty Leisner
<leisner@sdsp.mc.xerox.com> suggested this.

Added VxFS support to Solaris lsof with help from
Peter Radig <radig@DresdnerBank.de>. Philip Kizer
<pckizer@tamu.edu> helped test.

Added support for PTX 4.3, thanks to access provided
by Peter Jordan <petej@sequent.com>.

3.87 February 11, 1997
supplement Updated FreeBSD kernel name list handling.

3.88 February 17, 1997
Added documentation files -- 00.README.FIRST[_<version>]
and 00RELEASE.SUMMARY_<version> -- to the distribution.

Vic Abell <abe@purdue.edu>
Purdue University Computing Center
February 17, 1997

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* $Id: pfsnode.h,v 1.1 1993/12/12 12:26:39 davidg Exp $
*/
```

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* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/osr/dsock.c
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*
 /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/osr/machine.h
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* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/n+obsd/dnode1.c
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/*
     * If this is a regular file with a non-numeric FD, it may be the
     * executable.
     */
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From: Sandel, Ken L. <sandel@purdue.edu>
Sent: Tuesday, July 10, 2018 14:28
To: Victor Abell
Subject: RE: One more question regarding GitHub release

Vic,

For clarity I approved the release.

Ken

Ken L. Sandel
Senior Director, Sponsored Program Services
Senior Intellectual Property Officer
Purdue University
610 Purdue Mall
Hovde Hall Room 328
West Lafayette, IN 47907
sandel@purdue.edu
(765) 494-1063 (office)
(765) 426-2530 (cell)

From: Kasper, Joseph R. <JRKasper@prf.org>
Sent: Tuesday, July 10, 2018 11:23 AM
To: Victor Abell <vabell@lsof.comcastbiz.net>
Cc: Sandel, Ken L. <sandel@purdue.edu>
Subject: RE: One more question regarding GitHub release

Hi Vic,

My apologies for not following up. Mr. Sandel approves the release on GitHub under the copyright notice text currently in use.

Best,
Joe

Joseph R. Kasper, Ph.D.
Senior Business Development Manager & Director of Marketing
Office of Technology Commercialization
765-588-3486
jrkasper@prf.org
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From: Victor Abell <vabell@lsof.comcastbiz.net>
Sent: Monday, July 9, 2018 8:26 PM
To: Kasper, Joseph R. <JRKasper@prf.org>
Subject: RE: One more question regarding GitHub release

Joe,

Has there been any word from Ken about the release
of lsof to GitHub?

Vic

From: Kasper, Joseph R. [mailto:JRKasper@prf.org]
Sent: Thursday, June 28, 2018 1:15 PM
To: Victor Abell
Subject: RE: One more question regarding GitHub release

Hi
Vic,

One more request. Ken would like a copy of the email from Gerry. If for any reason you arent comfortable sending it to me, please contact Ken directly (765-494-1063, sandel@purdue.edu).

If this last piece of information is satisfactory to Ken, I expect to get his approval.

Thanks for your cooperation throughout this process.

Best,
Joe

From: Victor Abell <vabell@lsof.comcastbiz.net>
Sent: Thursday, June 28, 2018 7:43 AM
To: Kasper, Joseph R. <JRKasper@prf.org>
Subject: RE: One more question regarding GitHub release

Joe,

I sent e-mail to Gerry McCartney and in his answer he
says he has no objection.

Vic

From: Kasper, Joseph R. [mailto:JRKasper@prf.org]
Sent: Tuesday, June 26, 2018 4:03 PM
To: Victor Abell

Subject: RE: One more question regarding GitHub release

Hi Vic,

Thanks for the extra detail. I think it would put Kens mind at ease if you have Gerrys blessing. Let me know if youll reach out to him.

Best,
Joe

From: Victor Abell <vabell@lsof.comcastbiz.net>
Sent:
Tuesday, June 26, 2018 3:57 PM
To: Kasper, Joseph R. <JRKasper@prf.org>
Subject: RE: One more question regarding GitHub release

Joe,

I have had no communication with ITaP about the move to GitHub.
The extent of their involvement with lsof has been minimal the
Visiting Scholar appointment and the maintenance of a distribution
system.

I know Gerry McCartney well. Would it be helpful if I contacted
him about the GitHub move?

Vic

From: Kasper, Joseph R. [mailto:JRKasper@prf.org]
Sent: Tuesday, June 26, 2018 3:44 PM
To: Vic Abell; Victor Abell
Subject: One more question regarding GitHub release

Hi Vic,

Ken Sandel, Senior IP Officer, just got back to me. He wants to know if the leadership of ITaP supports the contribution to Github. Please let me know. If you have any communication to this effect that you can forward to me, it would be helpful.

Best,
Joe

Joseph R. Kasper, Ph.D.
Business Development Manager
Purdue Research Foundation
Office of Technology Commercialization
765-588-3486
jrkasper@prf.org

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* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/lib/fino.c
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/lib/pdvn.c
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* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/linux/dproc.c
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* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/lib/rnch.c
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* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/linux/dlsof.h

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* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/sun/dnode1.c
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/uw/dnode2.c
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/uw/machine.h
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/aix/dnode1.c
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* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/hpux/kmem/dnode2.c
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 /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/uw/dlsof.h
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/n+os/dnode1.c

* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/uw/dproto.h
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* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/uw/dnode1.c
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* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/freebsd/dzfs.h
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/util.c

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* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/dialects/darwin/libproc/dfile.c
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Frequently Asked Questions about lsof

```
************************************************************************
| The latest release of lsof is always available via anonymous ftp   |
| from lsof.itap.purdue.edu.  Look in pub/lsof.README for its       |
| location.                                   |
************************************************************************
```

This file contains frequently asked questions about lsof and answers
to them.

Vic Abell <abe@purdue.edu>
October 13, 2014

Table of Contents:

1.0 General Concepts
1.1 Lsof -- what is it?
1.2 Where do I get lsof?
1.2.1 Are there mirror sites?
1.2.2 Are lsof executables available?
1.2.3 How do I check the validity of an lsof distribution?
1.2.4 Why can't I get the sum(1) result reported in
README.lsof_<revision>?
1.2.5 Why
won't gpg accept the lsof-signing PGP public key?
1.3 Where can I get more lsof documentation?
1.4 How do I report an lsof bug?
1.5 Where can I get the lsof FAQ?
1.5.1 How timely is the on-line FAQ?
1.6 Is there a test suite?
1.7 Is lsof vulnerable to the standard I/O descriptor attack?
1.8 Can I alter lsof's make(1) behavior?
1.9 Is there an lsof license?
1.10 Language locale support
1.10.1 Does lsof support language locales? How do I use the support?
1.10.2 Does lsof support wide characters in language locales?
1.11 Are any files in the lsof distribution copyrighted?
1.12 Are there other lsof-related resources?
1.13 What does the "WARNING: unsupported dialect or version" mean?

2.0 Lsof Ports
2.1 What ports exist?
2.2 What about a new port?
2.2.1 User-contributed Ports
2.3 Why isn't there an AT&T SVR4 port?
2.4 Why isn't there an SGI IRIX port?
2.5 Why does lsof's Configure script report "WARNING: unsupported
dialect or version"?

3.0 Lsof Problems
3.1 Configuration
Problems
3.1.1 Why can't Configure determine the UNIX dialect version?

3.2 Compilation Problems
3.2.1 Why does the compiler complain about missing header files?
3.2.2 Why does gcc complain about the contents of header files distributed by the system's vendor?
3.2.3 Other header file problems
3.3 Why doesn't lsof report full path names?
3.3.1 Why do lsof -r reports show different path names?
3.3.2 Why does lsof report the wrong path names?
3.3.3 Why doesn't lsof report path names for unlinked (rm'd) files?
3.3.4 Why doesn't lsof report the "correct" hard linked file path name?
3.3.5 When will lsof report path names for deleted files?
3.4 Why is lsof so slow?
3.5 Why doesn't lsof's setgid or setuid permission work?
3.6 Does lsof have security problems?
3.7 Will lsof show remote hosts using files via NFS?
3.8 Why doesn't lsof report locks held on NFS files?
3.8.1 Why does lsof report a one byte lock on byte zero as a full file lock?
3.9 Why does lsof report different values for open files on the same file system (the automounter phenomenon)?
3.10 Why don't lsof and netstat output match?
3.10.1 Why can't lsof find accesses to some TCP and UDP ports?
3.11 Why does lsof update the device cache file?
3.12 Why doesn't lsof report state for UDP socket files?
3.13 I am editing a file with vi; why doesn't lsof find the file?
3.14 Why doesn't lsof report TCP/TPI window and queue sizes for my dialect?
3.14.1 Why doesn't lsof report socket options, socket states, and TCP flags and values for my dialect?
3.14.2 Why doesn't lsof report the partial listen queue connection count for my dialect?
3.15 What does "no more information" in the NAME column mean?
3.16 Why doesn't lsof find a process that ps finds?
3.17 Why doesn't -V report a search failure?
3.18 Portmap problems
3.18.1 Why isn't a name displayed for the portmap registration?
3.18.2 How can I display only portmap registrations?
3.18.3 Why doesn't lsof report portmap registrations for some ports?
3.18.4 Why doesn't lsof report portmap registrations for some Solaris versions?
3.19 Why is `lsof | wc` bigger than my system's open file limit?
3.20 Why doesn't lsof report file offset (position)?
3.20.1 What does lsof report for size when the file doesn't really have one?
3.21 Problems with path name arguments

3.21.1 How do I ask lsof to search a file system?
3.21.2 Why doesn't lsof find all the open files in a file system?
3.21.3 Why does the lsof exit code report it didn't find open files
when some files were listed?
3.21.4 Why won't lsof find all the open files in a directory?
3.21.5 Why are the +D and +d options so slow?
3.21.6 Why do the +D and +d options produce warning messages?
3.22 Why can't my C compiler find the rpcent structure definition?
3.23 Why doesn't lsof report fully on file "foo" on UNIX dialect
"bar?"
3.24 Why do I get a complaint when I execute lsof that some library
file can't be found?
3.25 Why does lsof complain it can't open files?
3.26 Why does lsof warn
"compiled for x ... y; this is z."?
3.27 How can I disable the kernel identity check?
3.28 Why don't ps(1) and lsof agree on the owner of a process?
3.29 Why doesn't lsof find an open socket file whose connection
state is past CLOSE_WAIT?
3.30 Why don't machine.h definitions work when the surrounding
comments are removed?
3.31 What do "can't read inpcb at 0x...", "no protocol control
block", "no PCB, CANTSENDMORE, CANTRCVMORE", etc. mean?
3.32 What do the "unknown file system type" warnings mean?
3.33 Installation
3.33.1 How do I install lsof?
3.33.2 How do I install a common lsof when I have machines that
need differently constructed lsof binaries?
3.34 Why do lsof 4.53 and above reject device cache files built
by earlier lsof revisions?
3.35 What do "like block special" and "like character special" mean
in the NAME column?
3.36 Why does an lsof make fail because of undefined symbols?
3.37 Command Regular Expressions (REs)
3.37.1 What are basic and extended regular expressions?
3.37.2 Why
can't I put a slash in a command regular expression?
3.37.3 Why does lsof say my command regular expression wasn't found?
3.38 Why doesn't lsof report on shared memory segments?
3.39 Why does lsof report two instances of itself?
3.40 Why does lsof report '\n' in device cache file error messages?
3.41 Kernel Symbol and Address Problems
3.41.1 What does "lsof: WARNING: name cache hash size length error: 0"
mean?
3.41.2 Why does lsof produce "garbage" output?
3.42 Why does lsof report open files when run as super user that
it doesn't report when run with lesser privileges?
3.43 Test Suite Problems

3.43.1 Errors all tests can report:
3.43.1.1 Why do tests complain "ERROR!!! can't execute ../lsof"?
3.43.1.2 Why do tests complain "ERROR!!! can't find ..." a file?
3.43.1.3 Why do some tests fail to compile?
3.43.1.4 Why do some tests always fail?
3.43.1.5 Why does the test suite say it hasn't been validated on
my dialect?
3.43.1.6 Why do the tests complain they can't stat()
or open()
/dev/mem or /dev/kmem?
3.43.2 LTbigf test issues
3.43.2.1 Why does the LTbigf test say that the dialect doesn't
support large files?
3.43.2.2 Why does LTbigf complain about operations on its config.LTbigf*
file?
3.43.2.3 Why does LTbigf warn that lsof doesn't return file offsets?
3.43.3 Why does the LTbasic test complain "ERROR!!! lsof this ..."
and "ERROR!!! lsof that ..."?
3.43.4 LTnfs test issues
3.43.4.1 Why does the LTnfs test complain "couldn't find NFS file ..."?
3.43.5 LTnlink test issues
3.43.5.1 Why does the LTnlink test complain that its test file is on
an NFS file system?
3.43.5.2 Why does LTnlink delay and report "waiting for link count
update: ..."?
3.43.5.3 Why does LTnlink fail because of an unlink error?
3.43.6 LTdnlc test issues
3.43.6.1 Why won't the LTdnlc test run?
3.43.6.2 What does the LTdnlc test mean by "... <path> found: 100.00%"?
3.43.6.3 Why does the DNLC test fail?
3.43.7 Why hasn't the test suite been qualified for 64 bit HP-UX
11
when lsof is compiled with gcc?
3.43.8 LTszoff test issues
3.43.8.1 Why does LTszoff warn that lsof doesn't return file offsets?
3.43.9 LTlock test issues
3.44 File descriptor list (the ``-d'' option) problems
3.44.1 Why does lsof reject a ``-d'' FD list?
3.44.2 Why are file descriptors other than those in my FD list
reported?
3.45 How can I supply device numbers for inaccessible NFS file
systems?
3.46 Why won't lsof find open files on over-mounted file systems?
3.47 What can be done when lsof reports no more space?
3.48 What if the lsof build encounters ar and ld problems?
3.49 Why does lsof -i report an open socket file for a process, but
lsof -p on that process' ID report nothing?

4.0 AIX Problems
4.1 What is the Stale Segment ID bug and why is -X needed?
4.1.1 Stale Segment ID APAR
4.2 Gcc Work-around for AIX 4.1x
4.3 Gcc and AIX 4.2
4.4 Why won't lsof's Configure allow the use of gcc for AIX
below 4.1?
4.5 What is an AIX SMT file type?
4.6 Why does AIX lsof start so slowly?
4.7 Why
does exec complain it can't find libc.a[shr.o]?
4.8 What does lsof mean when it says, "TCP no PCB, CANTSENDMORE,
CANTRCVMORE" in a socket file's NAME column?
4.9 When the -X option is used on AIX 4.3.3, why does lsof disable
it, saying "WARNING: user struct mismatch; -X option disabled?"
4.10 Why doesn't the -X option work on my AIX 5L or 5.[123] system?
4.11 Why doesn't /usr/bin/oslevel report the correct AIX version?
4.11.1 Why doesn't /usr/bin/oslevel report the correct AIX version
on AIX 5.1?
4.12 Why does lsof for AIX 5.1 or above Power architecture
complain about kernel bit size?
4.13 What can't gcc be used to compile lsof on the ia64 architecture
for AIX 5 and above?
4.14 Why does lsof get a segmentation fault when compiled with gcc
for a 64 bit Power architecture AIX 5.1 kernel?
4.15 Why does lsof ignore AFS on my AIX system?
4.16 Why does lsof report "system paging space is low" and exit?
4.17 Why does lsof have compilation and execution problems on AIX
5.3
above maintenance level 1?

5.0 Apple Darwin Problems
5.1 What do /dev/kmem-based and libproc-based mean?
5.2 /dev/kmem-based Apple Darwin Questions
5.2.1 Why does Configure ask for a path to the Darwin XNU kernel
header files?
5.2.1.1 Why does Configure complain that Darwin XNU kernel header
files are missing?
5.2.2 Why doesn't Apple Darwin lsof report text file information?
5.2.3 Why doesn't Apple Darwin lsof support IPv6?
5.2.4 Why does lsof complain about a mismatch between the release
for which lsof was compiled and the booted Mac OS X release?
5.2.5 Why does lsof for Apple Darwin 8 and higher report
"stat(...): ..." in the NAME column?
5.2.6 What are the limitations of Apple Darwin lsof link count
reporting?
5.2.7 Why does Apple Darwin report process group IDs incorrectly?"ayy
5.3 Libproc-based Apple Darwin Questions

6.0 BSD/OS BSDI Problems
6.0.5 Statement of deprecation

7.0 DEC OSF/1, Digital UNIX, and Tru64 UNIX Problems
7.1 Why does lsof complain about non-existent /dev/fd
entries?
7.2 Why does the Digital UNIX V3.2 ld complain about Ots* symbols?
7.3 Why can't lsof locate named pipes (FIFOs) under V3.2?
7.4 Why does lsof use the wrong configuration header files?
For example, why can't the lsof compilation find cpus.h?
7.5 Why does lsof indicate incomplete paths with " -- " for Tru64
UNIX 5.1 files?
7.6 Why doesn't lsof report link count, node number, and size
for some Tru64 5.x CFS files?
7.7 Why does lsof say it can't read the kernel name list or
proc table on Digital UNIX 4.x or Tru64 UNIX?

8.0 FreeBSD Problems
8.1 Why doesn't lsof report on open kernfs files?
8.2 Why doesn't lsof work on my FreeBSD system?
8.3 Why doesn't lsof work on the RELEASE version of CURRENT?
8.4 Why can't kvm_open() can't find some file?
8.5 FreeBSD ZFS Problems
8.5.1 Why does FreeBSD lsof report "WARNING: no ZFS support has been
8.6 Why can't Configure create lsof_owner.h for FreeBSD 6 and above?
8.6.1 Why are there lockf structure compiler errors for FreeBSD
6.0
and higher lsof?
8.6.2 Why don't /usr/src/sys/sys/lockf.h and /usr/include/sys/lockf.h
match?
8.7 FreeBSD and clang
8.7.1 Why does clang complain about VOP_FSYNC?

9.0 HP-UX Problems
9.1 What do /dev/kmem-based and PSTAT-based mean?
9.2 /dev/kmem-based HP-UX lsof Questions
9.2.1 Why doesn't a /dev/kmem-based HP-UX lsof compilation use -O?
9.2.2 Why doesn't the /dev/kmem-based CCITT support work under 10.x?
9.2.3 Why can't /dev/kmem-based lsof be compiled with `cc -Aa` or
`gcc -ansi` under HP-UX 10.x?
9.2.4 Why does /dev/kmem-based lsof complain about no C compiler?
9.2.5 Why does Configure complain about q4 for /dev/kmem-based lsof
for HP-UX 11?
9.2.6 When compiling /dev/kmem-based lsof for HP-UX 11 what do the
"aCC runtime: ERROR..." messages mean?
9.2.7 Why doesn't /dev/kmem-based lsof for HP-UX 11 report VxFS file
link counts, node numbers, and sizes correctly?

9.2.8 Why can't /dev/kmem-based lsof be built with gcc for 64 bit
HP-UX 11?
9.2.8.1 How can I acquire a gcc for
building lsof for 64 bit HP-UX 11?
9.2.9 Why does /dev/kmem-based lsof for HP-UX 11 report "unknown file
system type" for VxFS files?
9.2.10 Why does the ANSI-C compiler complain about comments in HP-UX
11 header files?
9.2.11 Why does dnode1.c cause the HP-UX 11 compiler to complain that
<sys/fs/vx_inode.h> is missing or incorrect?
9.3 PSTAT-based HP-UX lsof Questions
9.3.1 Why does PSTAT-based lsof complain about pst_static and
other PSTAT structures?
9.3.2 Why does PSTAT-based lsof complain it can't read pst_*
structures?
9.3.3 Why does PSTAT-based lsof rebuild the device cache file
after each reboot?
9.3.4 Why doesn't PSTAT-based lsof report TCP addresses for
telnetd's open socket files?
9.3.5 Why does PSTAT-based lsof cause an HP-UX 11.11 kernel panic?
9.3.6 Why doesn't PSTAT-based lsof report a CWD that is on a loopback
(LOFS) file system?
9.3.7 Why do some swinstall packages for PSTAT-based HP-UX 11.11
packages complain about setgid and setuid bits?
9.3.8 Why won't
the bundled C compiler build PSTAT-based lsof for
PA-RISC HP-UX 11.23?
9.3.9 Why won't gcc build PSTAT-based lsof for PA-RISC HP-UX 11.23?
9.3.10 Why does PSTAT-based lsof complain, "FATAL: pst_stream_size
should be: 672; is 72" on HP-UX 11.11 and above?
9.4 Why won't the HP-UX depot install?

10.0 Linux Problems
10.1 What do /dev/kmem-based and /proc-based lsof mean?
10.2 /proc-based Linux lsof Questions
10.2.1 Why doesn't /proc-based lsof report file offsets (positions)?
10.2.2 Why does /proc-based lsof report "can't identify protocol" for
some socket files?
10.2.3 Why does /proc-based lsof warn about unsupported formats?
10.2.4 Why does /proc-based lsof report "(deleted)" after a path name?
10.2.5 Why doesn't /proc-based lsof report full open file information
for all processes?
10.2.6 Why won't Customize offer to change HASDCACHE or WARNDEVACCESS
for /proc-based lsof?
10.2.7 /proc-based lsof Linux NFS questions
10.2.7.1 Why can't lsof find files on an accessible NFS file system?
10.2.7.2

Why can't lsof find files on an inaccessible NFS file system?
10.2.8 Why doesn't /proc-based Linux lsof report socket options and values, socket state flags, and TCP options and values?
10.2.9 Does /proc-based Linux lsof use a device cache?
10.2.10 Why doesn't /proc-based Linux lsof report any or all file structure values for its +fcfgGn option?
10.3 Special Linux file types
10.3.1 Why is ``DEL'' reported as a Linux file type?
10.3.2 Why is ``unknown'' reported as a Linux file type?
10.4 Linux ``mem'' Entry Problems
10.4.1 What do ``path dev=xxx'' and ``path inode=yyy'' mean in the NAME column of Linux ``mem'' file types?
10.4.2 Why is neither link count nor size reported for some Linux ``DEL'' and ``mem'' file types?
10.5 Special Linux NAME column messages
10.5.1 What does ``(stat: xxx)'' mean in the NAME column of Linux files?
10.5.2 What does ``(readlink: xxx)'' mean in the NAME column of Linux files?
10.6 Why is ``NOFD'' reported as a Linux file type?
10.7
Why does Linux lsof report a NAME column value that begins with ``/proc''?
10.8 Linux /proc/net/tcp* and /proc/net/udp* issues
10.8.1 Why use the Linux -X option?
10.8.2 Why does lsof say ``-i is useless when -X is specified''?
10.8.3 Why does lsof say ``can't identify protocol (-X specified)''?

11.0 NetBSD Problems
11.1 Why doesn't lsof report on open kernfs files?
11.2 Why doesn't lsof report on open files on: file descriptor file systems; /proc file systems; 9660 (CD-ROM) file systems; MS-DOS (floppy disk) file systems; or kernel file systems?
11.3 Why does lsof produce confusing results for nullfs file systems?
11.4 NetBSD header file problems
11.4.1 Why can't the compiler find some NetBSD header files?
11.4.2 Why does NetBSD lsof produce incorrect output?
11.5 Why isn't lsof feature xxx enabled for NetBSD?

12.0 NEXTSTEP and OPENSTEP Problems
12.1 Why can't lsof report on 3.1 lockf() or fcntl(F_SETLK) locks?
12.2 Why doesn't lsof compile for NEXTSTEP with AFS?

13.0 OpenBSD Problems
13.1 Why doesn't lsof support kernfs on my OpenBSD system?

13.2 Will lsof work on OpenBSD on non-x86-based architectures?
13.3 <sys/pipe.h> problems
13.3.1 Why does the compiler claim nbpg isn't defined?
13.3.2 What value should I assign to nbpg?
13.4 Why doesn't lsof report on open MS-DOS file system (floppy
disk) files?
13.5 Why isn't lsof feature xxx enabled for OpenBSD?

14.0 Output problems
14.1 Why do the lsof column sizes change?
14.2 Why does the offset have ``0t' and ``0x" prefixes?
14.3 What are the values printed in the FILE_FLAG column
and why is 0x<value> sometimes included?
14.3.1 Why doesn't lsof display FILE_FLAG values for my dialect?
14.4 Network Addresses
14.4.1 Why does lsof's -n option cause IPv4 addresses, mapped to
IPv6, to be displayed in IPv6 notation?
14.5 Why does lsof output \x, ^x, or \xnn for characters
sometimes?
14.5.1 Why is space considered a non-printable character in command
names?
14.6 Why doesn't lsof print all the characters of
a command name?
14.7 Why does lsof reject some -c command names, saying their lengths
are "> what system provides (nn)"?
14.8 Why does lsof sometimes print TYPE numbers instead of names?
14.9 Marker line format problems
14.9.1 Why won't lsof accept a marker line format?
14.9.2 Why does lsof reject the NL (%n) marker line format?
14.10 How are protocol state name exclusion and inclusion used?
14.10.1 Why doesn't my dialect support state name exclusion and inclusion?

15.0 Pyramid Version Problems
15.0.5 Statement of deprecation

16.0 SCO Problems
16.1 SCO OpenServer Problems
16.1.1 How can I avoid segmentation faults when compiling lsof?
16.1.2 Where is libsocket.a?
16.1.3 Why do I get "warning C4200" messages when I compile lsof?
16.2 SCO|Caldera UnixWare Problems
16.2.1 Why doesn't lsof compile on my UnixWare 7.1.1 or above
system?
16.2.2 Why does lsof complain about node_self() on my UnixWare
7.1.1 or above system?
16.2.3 Why does UnixWare 7.1.1 or above complain about -lcluster,
node_self(),

or libcluster.so?
16.2.4 Why does UnixWare 7.1.1 or above lsof complain it can't read the kernel name list?
16.2.5 Why doesn't lsof report link count, node number, and size for some UnixWare 7.1.1 or above CFS files?
16.2.6 Why doesn't lsof report open files on all UnixWare 7.1.1 NonStop Cluster (NSC) nodes?
16.2.7 Why doesn't lsof report the UnixWare 7.1.1 NonStop Cluster (NSC) node a process is using?
16.2.8 Why does the compiler complain about missing UnixWare 2.1[.x] header files?

17.0 Sun Problems
17.0.5 Statement of deprecation
17.1 My Sun gcc-compiled lsof doesn't work -- why?
17.2 How can I make lsof compile with gcc under Solaris 2.[456], 2.5.1, 7, 8 or 9?
17.3 Why does Solaris Sun C complain about system header files?
17.4 Why doesn't lsof work under my Solaris 2.4 system?
17.5 Where are the Solaris header files?
17.6 Where is the Solaris /usr/src/uts/<architecture>/sys/machparam.h?
17.7 Why does Solaris lsof say ``can't read proc table''?
17.8 Why does Solaris lsof complain about a bad cached clone device?
17.9 Why doesn't Solaris make generate .o files?
17.10 Why does lsof report some Solaris 2.3 and 2.4 lock types as `N'?
17.11 Why does lsof Configure say "WARNING: no cc in ..."?
17.12 Solaris 7, 8 and 9 Problems
17.12.1 Why does lsof say the compiler isn't adequate for Solaris 7, 8 or 9?
17.12.2 Why does Solaris 7, 8 or 9 lsof say "FATAL: lsof was compiled for..."?
17.12.3 How do I build lsof for a 64 bit Solaris kernel under a 32 bit Solaris kernel?
17.12.4 How do I install lsof for Solaris 7, 8 or 9?
17.12.5 Why does my Solaris 7, 8 or 9 system say it cannot execute lsof?
17.12.6 What gcc will produce 64 bit Solaris 7, 8 and 9 executables?
17.12.7 Why does lsof on my Solaris 7, 8 or 9 system say, "can't read namelist from /dev/ksyms?"
17.13 Solaris and COMMON
17.13.1 What does COMMON mean in the NAME column for a Solaris VCHR file?
17.13.2 Why does a COMMON Solaris VCHR file sometimes seem to have an incorrect minor device number?
17.14 Why don't lsof and Solaris pfiles reports always match?
17.15 Why does lsof say, "kvm_open(namelist=default, core=default):

Permission denied?"
17.16 Why is lsof slow on my busy Solaris UFS file system?
17.17 Why is lsof so slow on my Solaris 8 or 9 system?
17.18 Solaris and VxFS
17.18.1 Why doesn't lsof support VxFS 3.4 on Solaris 2.6, and above?
17.18.2 Why does lsof report "vx_inode: vxfsu_get_ioffsets error"
for open Solaris 2.6 and above VxFS 3.4 and above files?
17.18.3 Why does Solaris Configure claim there is no VxFS library?
17.18.4 Why doesn't Solaris lsof report VxFS path name components?
17.18.5 Why does Solaris 10 lsof report scrambled VxFS paths?
17.19 Large file problems
17.19.1 Why does lsof complain it can't stat(2) a Solaris 2.5.1
large file?
17.20 Why does lsof get a segmentation fault on 64 bit Solaris
8 using NIS+?
17.21 Will lsof crash the Solaris kernel?
17.22 Why does lsof on Solaris 7, 8, or 9 report a kvm_open()
failure?
17.23 Solaris
and SAM-FS
17.23.1 Why does Solaris lsof report "(limited SAM-FS info)"?
17.23.2 Why can't lsof locate named SAM-FS files?
17.24 Lsof and Solaris 10 zones
17.24.1 How can I make lsof list the Solaris zone?
17.24.2 Why doesn't lsof work in a Solaris 10 zone?
17.24.3 Why does lsof complain it can't stat() Solaris 10 zone file
systems?
17.25 Solaris 10 problems
17.25.1 Why does Solaris 10 lsof sometimes report the wrong path name?
17.25.2 Why does Solaris 10 lsof sometimes report only the mounted-on
directory and device?
17.25.3 What does "(deleted)" mean in the NAME column of a Solaris 10
open file?
17.25.4 What does "(?)" mean in the NAME column of a Solaris 10 open
file?
17.26 Solaris contract file problems
17.26.1 Why doesn't lsof report size, link count and node number for
Solaris 10 contract files?
17.26.2 Why can't lsof locate a Solaris 10 contract file by path name?
17.27 Solaris 10 and above ZFS probblems
17.27.1 Why does Configure warn that ZFS support is not enabled?
17.28 Problems
with Solaris 9 and above
17.28.1 Why does the compiler complain about lgrp_root on Solaris 9
and above?

18.0 Lsof Features
18.1 Why doesn't lsof doesn't report on /proc entries on my

system?
18.2 How do I disable the device cache file feature or alter
it's behavior?
18.2.1 What's the risk with a perverted device cache file?
18.2.2 How do I put the full host name in a personal device cache file
path?
18.2.3 How do I put the personal device cache file in /tmp?
18.3 Why doesn't lsof know about AFS files on my favorite dialect?
18.3.1 Why doesn't lsof report node numbers for all AFS volume files,
or how do I reveal dynamic module addresses to lsof?

1.0 General Concepts

1.1 Lsof -- what is it?

Lsof is a UNIX-specific tool. Its name stands for LiSt Open Files, and it does just that. It lists information about files that are open by the processes running on a UNIX system.

See the lsof man page, the 00DIST file, the 00QUICKSTART file, and the 00README file of the lsof distribution for more information.

1.2 Where do I get lsof?

Lsof is available via anonymous ftp from lsof.itap.purdue.edu. Look in the pub/tools/unix/lsof sub-directory.

ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof

Bzip2'd, compressed and gzip'd tar files with GPG certificates are available.

1.2.1 Are there mirror sites?

On March 21, 2013 these sites appeared to have the lastest lsof revision:

ftp://ftp.fu-berlin.de/pub/unix/tools/lsof
ftp://sunsite.ualberta.ca/pub/Mirror/lsof
http://www.mirrorservice.org/sites/lsof.itap.purdue.edu/pub/tools/unix/lsof/
ftp://ftp.mirrorservice.org/sites/lsof.itap.purdue.edu/pub/tools/unix/lsof/
rsync://rsync.mirrorservice.org/lsof.itap.purdue.edu/pub/tools/unix/lsof/

1.2.2 Are lsof executables available?

Some lsof executables are available in the subdirectory tree pub/tools/unix/lsof/binaries These are neither guaranteed to be current nor cover every dialect and machine architecture.

I don't recommend you use pre-compiled lsof binaries; I recommend you obtain the sources and build your own binary. Even if you're a Sun user without a Sun C compiler, you can use gcc to compile lsof.

If you must use a binary file, please be conscious of the security and configuration implications in using an executable of unknown or different origin. The lsof binaries are accompanied by GPG certificates. Please use them!

Three additional cautions apply to executables:

1. Don't try to use an lsof executable, compiled for one version of a UNIX dialect, on another. Patches can make the dialect version different.

2. If you want to use an lsof binary on multiple systems, they must be running the same dialect OS version and have the same patches and feature support.

1.2.3 How do I check the validity of an lsof distribution?

There are two ways to check the validity of an lsof distribution:

1. Follow the instructions in the CHECKSUMS_<revision> file found with the lsof distribution.

   Checking with GPG is the best method.

2. Follow the instructions in the "Security" section of the README.lsof_<revision> file found inside the lsof distribution.

   Again, checking with GPG is the best method.

1.2.4 Why can't I get the sum(1) result reported in README.lsof_<revision>?

The "Security" section of the README.lsof_<revision> file found

inside the lsof distribution gives md5, sum, and GPG certificate information.

The simplest, the sum(1) signature, seems to be the trickiest. That's because there are different sum(1) methods, BSD systems usually have cksum(1) instead of sum(1), and different systems compute the block size value differently.

First, the lsof sum results are computed with the old, "alternate" algorithm. On newer systems, you can use sum's "-r" option to get that computation result.

Second, on BSD systems you usually must use cksum(1) instead of
sum(1), because they have no sum(1). To tell cksum(1) to use the old, "alternate" algorithm, use its "-o1" option.

Third, the second value that sum reports, the block count, may be computed differently on different systems -- usually block size is considered to be 512 or 1,024. The lsof block counts were computed on a system with a sum(1) option that considers block size to be 512. The BSD system cksum(1) -o1 option considers block size to be 1,024. If your sum(1) or cksum(1) doesn't report a block count that matches the sum(1) signature given in README.lsof_<revision>, check its man page to see what block size it uses, then adjust its reported block count appropriately.

1.2.5 Why won't gpg accept the lsof-signing PGP public key?

An older PGP key that once signed lsof distributions is included in lsof revisions prior to 4.70. The PGP key is indeed my key, but is incompatible with GPG. It was created about ten years ago and is still acceptable to PGP versions 2.6.2
through 6.5.2.

Lsof revisions 4.70 and above are signed with a copy of my PGP key that has been made acceptable for use with GPG by importing it under GPG's "--allow-non-selfsigned-uid" option.

You can find my GPG compatible key in lsof revisions 4.70 and above and at:

ftp://lsof.itap.purdue.edu/pub/Victor_A_Abell.gpg

If you have an older lsof revision with my PGP key, there are two possible ways to use it:

* Use it with a PGP version from 2.6.2 through 6.5.2.

* Use GPG's "--allow-non-selfsigned-uid" option when you
  import my PGP key into your GPG key ring.

  $ gpg --allow-non-selfsigned-uid --import Victor_A_Abell.pgp

1.3 Where can I get more lsof documentation?

A significant set of documentation may be found in the lsof distribution (See "Where can I get lsof?). There is a manual page, copious documentation in files whose names begin with 00, and a copy of this FAQ in the file 00FAQ (perhaps slightly less recent than this file if you're reading
it via a web browser.)

Two URLs provide some documentation that appears in the lsof distribution:

FAQ: ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof/FAQ

man page: ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof/lsof_man

1.4 How do I report an lsof bug?

If you believe you have discovered a bug in lsof, you can report it via e-mail to <abe@purdue.edu>. Do NOT report lsof bugs to the UNIX dialect vendor. Make sure "lsof" appears in the "Subject:" line so my e-mail filter won't classify your letter as Spam.

Before you send me a bug report, please read the "Bug Reports" section of the 00README file of the lsof distribution. It lists the steps you should take before and when reporting a suspected bug.

1.5 Where can I get the lsof FAQ?

This lsof FAQ is available in the file 00FAQ in the lsof distribution and at the URL:

    ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof/FAQ

1.5.1 How timely is the on-line FAQ?

The on-line FAQ is sometimes too timely. :-)

I
update it as soon as new information is available. That may include information about support that won't appear in the lsof source distribution until the next revision. If you encounter something like that, please send me e-mail at <abe@purdue.edu>. I may be able to point you at a pre-release distribution that contains the support of interest. Make sure "lsof" appears in the "Subject:" line so my e-mail filter won't classify your letter as Spam.

1.6 Is there a test suite?

Yes, as of lsof revision 4.63 there's an automated lsof test suite in the tests/ sub-directory of the lsof top-level directory.

More information on using the test suite, what it does, how to use it and how to configure it may be found in the 00TEST file of the lsof distribution. That file also explains where the test suite has been tested.

Frequently asked questions about the test suite will be asked and answered here in the FAQ. (See "Test Suite Problems.")

After lsof has been configured
with the Configure script,
lsof can be made and tested with:

```
$ make
$ cd tests
$ make
```

Under normal conditions -- i.e., unless the lsof tree has been cleaned or purged severely -- all tests or individual tests may be run by:

```
$ cd test
$ make
```
or
```
$ <run a single test> (See 00TEST.)
```

1.7 Is lsof vulnerable to the standard I/O descriptor attack?

Lsof revisions 4.63 and above are not vulnerable.

Lsof revisions 4.62 and below are vulnerable, but no damage scenarios have so far been demonstrated.

The standard I/O descriptor attack is a local programmed assault on setuid and setgid programs that tricks them into opening a sensitive file with write access on a standard descriptor, usually stderr (2), and writing error messages to stderr. If the attacker can control the content of the error message, the attacker may gain elevated privileges.

The attack was first described in Pine Internet Advisory PINE-CERT-20020401, available at:

http://www.pine.nl/advisories/pine-cert-20020401.txt

If you are using an lsof revision below 4.63, you should remove any setuid or setgid permissions you might have given its executable. Then you should upgrade to lsof revision 4.63.

1.8 Can I alter lsof's make(1) behavior?

Yes. There are at least two ways to do that.

You can put replacements for lsof Makefile strings in your environment. If you specify the -e make option, make will give environment variable values precedence over strings from the Makefile. For example, to change the compiler string CC from the environment, you might do this with the Bourne shell:

```
$ CC=foobar; export CC
$ make -e
```

You can also replace lsof Makefile strings in the make command invocation. Here's the previous example done that way:

```
$ make CC=foobar
```

Changing the CFGF, CFGL, and DEBUG strings used in lsof Makefiles, either from the environment or from the make invocation, can significantly alter lsof make(1) behavior.
I
commonly use DEBUG to change the -O option to -g so I can build an lsof executable for debugging -- e.g.,

```
$ make DEBUG=-g
```

(Look for DEBUG in this FAQ for other examples of its use.)

Consult the Makefiles to see what CFGL, CFGL, and other
lsof Makefile strings contain, and to see what influence
their alteration might have on lsof make(1) behavior.

1.9 Is there an lsof license?

No.

The only restriction on the use or redistribution of lsof
is contained in this copyright statement, found in every
lsof source file. (The copyright year in or format of the
notice may vary slightly.)

```
/*
 * Copyright 2002 Purdue Research Foundation, West Lafayette,
 * Indiana 47907.  All rights reserved.
 *
 * Written by Victor A. Abell
 *
 * This software is not subject to any license of the American
 * Telephone and Telegraph Company or the Regents of the
 * University of California.
 *
 * Permission is granted to anyone to use this software for
 * any purpose on any
computer system, and to alter it and
 * redistribute it freely, subject to the following
 * restrictions:
 *
 * 1. Neither the authors nor Purdue University are responsible
 *    for any consequences of the use of this software.
 *
 * 2. The origin of this software must not be misrepresented,
 *    either by explicit claim or by omission.  Credit to the
 *    authors and Purdue University must appear in documentation
 *    and sources.
 *
 * 3. Altered versions must be plainly marked as such, and must
 *    not be misrepresented as being the original software.
 *
 * 4. This notice may not be removed or altered.
 */
```

1.10 Language locale support

1.10.1 Does lsof support language locales? How do I use the support?

Most UNIX dialect versions of lsof support 8 bit language
locale characters -- e.g., the ability to print 8 bit
characters that have accents and other marks over them.

See the answer to the "Does lsof support wide characters in
language locales?" question
for information on when lsof's
language locale support covers characters wider than 8 bits.

To see if lsof supports language locales for your dialect, look
in the dialect's machine.h header file for the HASSETLOCALE
definition. If it is present and not disabled, then lsof has
language locale support for the dialect.

To enable lsof's language locale support, you must specify in a
locale environment variable (e.g., LANG) a language locale
known to your system that supports the printing of marked
characters -- e.g, en_US. (On some dialects locale(1) may be
used to list the known language locales.)

Note that LANG=C and LANG=POSIX are NOT language locales that
support the printing of marked characters.

If the language locale doesn't support the printing of marked
characters, lsof's OUTPUT of them follows the rules for
non-printable characters described in the OUTPUT section of
lsof(8).

Consult your dialect's setlocale(3) man page for the names of
environment variables
other than LANG -- e.g., LC_ALL,
LC_TYPE, etc. -- which may be used to define language locales.

1.10.2 Does lsof support wide characters in language locales?

When lsof's language locale support is enabled with the
HASSETLOCALE definition, for selected dialects lsof will also
print wide characters (e.g., from UTF-8) when iswprint(3)
reports them to be printable.

Wide character support is available when HASWIDECHAR is defined
in a dialect's machine.h header file. As of this writing on
July 22, 2004, the following dialect versions have wide character
support:

AIX >= 4.3.2
Apple Darwin >= 7.3.0

FreeBSD >= 5.2
HP-UX >= 11.00
/proc-based Linux
NetBSD >= 1.6
SCO OpenServer >= 5.0.6
Solaris >= 2.6
Tru64 UNIX 5.1

1.11 Are any files in the lsof distribution copyrighted?

Yes. Most files carry the copyright of the Purdue Research Foundation and may be redistributed under the terms that accompany the copyright notice. Those terms may also be found in the answer to the question, "Is there an lsof license?")

A few files carry other copyright notices. Some are BSD notices and they explain the terms under which they are included in the lsof distribution.

Those that carry vendor copyright notices have been reproduced in their original or modified forms with permission from the copyright owners. That permission is indicated in the README files that accompany the files.

1.12 Are there other lsof-related resources?

There are other resources available, connected to lsof. Among them are FreeBSD and Linux packages whose products use lsof and two particularly interesting resources.

The two interesting resources are a Gnome Tool Kit (GTK) GUI for lsof and a Perl wrapper module.

The GTK GUI is called Glsof and was developed by Gnele. It can be found at:

http://www.sourceforge.net

The Perl wrapper module by Marc Beyer can be found at:

http://search.cpan.org/dist/Unix-Lsof/

1.13 What does the "WARNING: unsupported dialect or version" mean?

The lsof configure script issues that message for UNIX dialects or their versions where I have been unable to test the current

revision of lsof. The message doesn't mean that lsof won't work, just that I have no direct evidence that it will.

If the COnfigure script succeeds, except for the warning, try compiling) lsof. If that succeeds, try the lsof test suite.

2.0 Lsof Ports

2.1 What ports exist?

The pub/lsof.README file carries the latest port information:

AIX 5.[23] and 5.3
FreeBSD 4.9 and 6.4 for x86-based systems
FreeBSD 8.[234], 9.0, 10.0 and 11.0 for AMD64-based systems
Linux 2.1.72 and above for x86-based systems
Solaris 9, 10 and 11

In the above list the only UNIX dialects present are ones for which I test the current lsof revision. Lsof may still support unlisted dialect versions -- e.g., HP-UX 10.20, Solaris 7, etc. -- but I don't have access to systems where I could test lsof
on them, so I can't claim lsof works on them. If your dialect isn't in the list, you should try building lsof on it anyway.

Lsof version 4 predecessors, versions 2 and 3, may support older version of some dialects. Contact me via e-mail at <abe@purdue.edu> if you're interested in their distributions. Make sure "lsof" appears in the "Subject:" line so my e-mail filter won't classify your letter as Spam.

2.2 What about a new port?

The 00PORTING file in the distribution gives hints on doing a port. I will consider doing a port in exchange for permanent access to a test host. I require permanent access so I can test new lsof revisions, because I will not offer distributions of dialect ports I cannot upgrade and test.

2.2.1 User-contributed Ports

Sometimes I receive contributions of ports of lsof to systems where I can't test future revisions of lsof. Hence, I don't incorporate these contributions into my lsof distribution.

However, I do make descriptions

of these contributions
available. You can find them in the 00INDEX and README
files at:

ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof/contrib

Consult the 00INDEX file in the contrib/ directory for a
list of the available contributions and consult README
there for information on how to obtain them.

2.3 Why isn't there an AT&T SVR4 port?

I haven't produced an AT&T SVR4 port because I haven't seen
a UNIX dialect that is strictly limited to the AT&T System
V, Release 4 source code. Every one I have seen is a
derivative with vendor additions.

The vendor additions are significant to lsof because they
affect the internal kernel structures with which lsof does
business. While some vendor derivatives of SVR4 are similar,
each one I have encounted so far has been different enough
from its siblings to require special source code.

If you're interested in an SVR4 version of lsof, here are
some existing ports you might consider:

DC/OSx (This obsolete port is only
available upon
special request.)
Reliant UNIX (This obsolete port is only available
upon special request.)
SCO|Caldera UnixWare (This is the most likely choice.)
Solaris

2.4 Why isn't there an SGI IRIX port?

Lsof support for IRIX was terminated at lsof revision 4.36,
because it had become increasingly difficult for me to
obtain information on the IRIX kernel structures lsof needs
to access.

At IRIX 6.5 I decided the obstacles were too large for me
to overcome, and I stopped supporting lsof on IRIX. I have
sources to the last revision of lsof (4.36) for IRIX, but
that version of lsof does not work on IRIX 6.5 and is
vulnerable to the standard I/O descriptor attack. (See
the "Is lsof vulnerable to the standard I/O descriptor
attack?" Q&A for more information.) Contact me to discuss

obtaining those sources.

If you wish to pursue the issue, don't contact me, contact
SGI. This case was opened with SGI on the subject:

Case ID: 0982584

Category: Unix
Priority: 30-Moderate Impact

Problem Summary:
kernel structure header files needed for continued lsof
support

Problem Description:
Email In 07/17/98 19:09:23

2.5 Why does lsof's Configure script report "WARNING: unsupported dialect or version"?

Lsof's Configure script issues this message when it encounters a dialect or its version that lsof once supported, but no longer does. Usually I drop support for a dialect or version when I can no longer test lsof on it.

However, it's worth trying to compile and use lsof. Be sure to run the test suite. (See the answer to the "Is there a test suite? question for information on the test suite.)

If you have problems with an unsupported dialect or version, contact me via e-mail at <abe@purdue.edu> and I may be able to help. Make sure "lsof" appears in the "Subject:" line so my e-mail filter won't classify your letter as Spam.

3.0 Lsof Problems

3.1 Configuration Problems

3.1.1 Why can't Configure determine the UNIX dialect version?

The lsof Configure script uses UNIX shell commands, often in a command pipeline, to determine the UNIX dialect version. (Consult the dialect stanza in Configure to determine which commands are used.) If Configure can't determine the dialect version, probably one of the commands is not behaving as Configure expects.

Symptoms of the failure include Configure warning messages and incorrect version definitions in the Makefile CFLAGS.

If you suspect that the lsof Configure script is failing to determine the dialect version correctly, try running the commands from Configure stanza one at a time. That will usually reveal the source of the problem. Be particularly mindful that the PATH environment variable can cause commands to be executed from non-standard directories.

If you can't determine the source of the problem, there is a work-around. You can supply the UNIX dialect version in the LSOF_VSTR environment variable.
Use Configure as a guide to forming what it expects in LSOF_VSTR. There is also some information on LSOF_VSTR in the 00XCONFIG documentation file of the lsof distribution.

3.2 Compilation Problems

3.2.1 Why does the compiler complain about missing header files?

When you use make to build lsof, the compiler may complain that it can't find header files -- e.g.,

```
$ make
(cd lib; make DEBUG="-O" CFGF="-DAIXA=0 -DAIXV=4330 \
-DLSOF_VSTR=\"4.3.3.0\"")
gcc  -DAIXA=0 -DAIXV=4330 -DLSOF_VSTR="4.3.3.0" -O \
-c ckkv.c
In file included from ckkv.c:33: ../machine.h:70: \
sys/types.h: A file or directory in the path name \
does not exist. \
```

That type of complaint doesn't represent an lsof problem. It represents a problem with a missing system header file that probably should be found in /usr/include or in the system source tree.

As a first step try using find(1) to locate the problem header file. If it's a system header file and can't be found, here are some possible causes:

1. The file set, RPM or package containing the header files has not been installed. Instructions for doing that are specific to the UNIX dialect and beyond the scope

of this document.

2. If the compiler is gcc, the private gcc header files:

* May not have been installed;

* May have been installed incorrectly;

* May not have been updated properly after the last
compiler or system update;

* Ones from a previous installation may not have been
removed.

A path leading to the gcc private header files can be
found with `gcc -v`. Consult the gcc documentation for
instructions on proper installation of the private gcc
header files.

3. On some dialects -- e.g., FreeBSD, NetBSD, OpenBSD --
lsof may need to use header files that are located in
the system source tree -- /sys or /usr/src/sys, for
example. Make sure the system source tree
has been
installed.

3.2.2 Why does gcc complain about the contents of header files
distributed by the system's vendor?

When you use make to build lsof and gcc to compile it, gcc
may complain that it finds errors in system header files
-- e.g.,

```
$ make
(cd lib; make DEBUG="-O" CFGF="-Dsolaris=80000 \
 -DHASPR_GWINDOWS -m64 -DHASIPv6 -DHAS_VSOCK \
 -DLSOF_VSTR=\"5.8\"")
 gcc -Dsolaris=80000  -DHASPR_GWINDOWS -m64 -DHASIPv6 \
 -DHAS_VSOCK -DLSOF_VSTR="5.8"  -O  -c  dvch.c
In file included from /usr/include/sys/proc.h:31, \
      from /homes/abe/gnu/gcc-3.2.1/lib/gcc-lib/sparcv9-sun-solaris2/ \
 3.2.1/include/sys/user.h:267, from /usr/include/kvm.h:13, \
 from ../dlsof.h:53, from ../lsof.h:172, from dvch.c:43: \
 /homes/abe/gnu/gcc-3.2.1/lib/gcc-lib/sparcv9-sun-solaris2/\
  3.2.1/include/sys/task.h:59: parse error before "uint_t"
```

Errors like the above are most likely not problems in the
system's header files,

but in the private copies of them
that were created when gcc was made or installed. Note
the presense of
".../gcc-3.2.1/lib/gcc-lib/sparcv9-sun-solaris2/3.2.1/include/..."
in the paths for user.h and task.h. It indicates both
header files are gcc-specific.

To solve errors like this requires comparing the header
files in the vendor's /usr/include tree to the gcc-specific
ones in gcc's private gcc-lib/.../include tree. It may be
necessary to regenerate gcc-specific header files, correct
them or remove them. See the gcc distribution for the
appropriate tools.

A possible temporary work-around is to direct gcc to use
the vendor's header files instead of its temporary ones by
declaring -I/usr/include in the compilation flags.

3.2.3 Other header file problems

Don't overlook any vendor tools that might validate the
vendor header files installed on the system -- e.g., the
Solaris pkgchk tool can be used to check the header files
that were installed from the SUNWhea package.

For
other header file problems contact me at <abe@purdue.edu>.
Please follow the reporting guidelines in the "How do I
report an lsof bug?" section of this FAQ.

3.3 Why doesn't lsof report full path names?

Lsof reports the full path name when it is specified as a
search argument for open files that match the argument.
However, if the argument is a file system mounted-on
directory, and lsof finds additional path name components
from the kernel name cache, it will report them.

Lsof reports path name for file system types that have path
name lookup features -- e.g., some versions of AdvFS for
Digital and Tru64 UNIX. The Linux /proc-based lsof reports
full path names, because the Linux /proc file system provides
them. Lsof on recent builds of Solaris 10 also report full
path names, because those Solaris kernels record the full path
name in the vnode structure.

Otherwise, lsof uses the kernel name cache, where it exists
and can be accessed, and reports some or

all path name
components (e.g., the sys and proc.h components of
/usr/include/sys/proc.h) for these dialects:

 Apple Darwin
 DC/OSx
 FreeBSD
 HP-UX, /dev/kmem and PSTAT based
 Linux, /dev/kmem-based
 NetBSD
 NEXTSTEP
 OpenBSD
 OPENSTEP
 Reliant UNIX
 SCO OpenServer
 SCO|Caldera UnixWare
 Solaris 2.x, 7, 8 and 9 (except for some VxFS versions;
    see the "Why doesn't Solaris
    lsof report VxFS path name
    components?" section for more
    information)
 Solaris 10 (early builds) Tru64 UNIX

As far as I can determine, AFS path lookups don't share in
kernel name cache operations, so lsof can't identify open AFS
path name components. Apparently Solaris VxFS versions 4 and
above don't share in kernel name cache operations, either, so
lsof can't display path name components for those open files.

Since the size of the kernel name cache is limited and the
cache is in constant flux, it does not always contain the names
of all components in an open file's
path; sometimes it contains
none of them.

Lsof reports the file system directory name and whatever
components of the file's path it finds in the cache, starting
with the last component and working backwards through the
directories that contain it. If lsof finds no path
components, lsof reports the file system device name instead.

When lsof does report some path components in the NAME
column, it prefixes them with the file system directory
name, followed by " -- ", followed by the components --
e.g., /usr -- sys/path.h for /usr/include/sys/path.h. The
" -- " is omitted when lsof finds all the path name components
of a file's name.

The PSTAT-based HP-UX lsof relies on kernel name cache contents, too, even though its information comes to lsof via pstat() function calls. Consequently, PSTAT-based HP-UX lsof won't always report full paths, but may use the " -- " partial path name notation, or may occasionally report no path name at all but just the file system mounted-on directory
and device names.

Lsof can't obtain path name components from the kernel name caches of the following dialects:

AIX

Only the Linux kernel records full path names in the structures it maintains about open files; instead, most kernels convert path names to device and node number doublets and use them for subsequent file references once files have been opened.

To convert the device and node number doublet into a complete path name, lsof would have to start at the root node (root directory) of the file system on which the node resides, and search every branch for the node, building possible path names along the way. That would be a time consuming operation and require access to the raw disk device (usually implying setuid-root permission).

If the prospect of all that local disk activity doesn't concern you, think about the cost when the device is NFS-mounted.

Try using the file system mount point and node number lsof reports as parameters to find
-- e.g.,

$ find <mount_point> -inum <node_number> -print

and you may get an appreciation of what a file system directory tree search would cost.

3.3.1 Why do lsof -r reports show different path names?

When you run lsof with its repeat (``-r'') option, you may notice that the extent to which it reports path names for the same files may vary from cycle to cycle. That happens because other processes are making kernel calls affecting the cache and causing entries to be removed from and added

to it.

3.3.2 Why does lsof report the wrong path names?

Under some circumstances lsof may report an incorrect path name component, especially for files in a rapidly changing directory like /tmp.

In a rapidly changing directory, like /tmp, if the kernel doesn't clear the cache entry when it removes a file, a new file may be given the same keys and lead lsof to believe that the old cache entry with the same keys belongs to the new file.

Lsof tries to avoid this error by purging duplicate entries from its copy of the kernel name cache when they have the same device and inode number, but different names.

This error is less likely to occur in UNIX dialects where the keys to the name cache are node address and possibly a capability ID. The Apple Darwin, Digital UNIX, FreeBSD, HP-UX, NEXTSTEP, OPENSTEP, Solaris, Tru64 UNIX, and UnixWare dialects use node address. Apple Darwin, FreeBSD, NetBSD, OpenBSD, Tru64 UNIX, and also use a capability ID to further identify name cache entries.

3.3.3 Why doesn't lsof report path names for unlinked (rm'd) files?

When lsof gets path name components from the kernel's name cache, it does not report the path names of a file that has been unlinked from its parent directory -- e.g., deleted via rm, or the unlink() system call -- even when some process may still hold the file open; lsof reports only the file system's mounted-on directory and device. That's because path name components are removed from the kernel name cache when the file is unlinked.

Unlinked open files are sometimes used by applications for temporary, but invisible storage (i.e., ls won't show them, and no other process can open them.) However, they may occasionally consume disk space to excess and cause concern for a system administrator, who will be unable to locate them with find, ls, du, or other tools that rely on finding files by examining the directory tree.

By using lsof's +L option you can see the link count of

open files -- in the NLINK column. An unlinked file will have an NLINK value of zero. By using the option +L1 you can tell lsof to display only files whose link count is less than one (i.e., zero).

There are some UNIX dialect-specific exceptions to lsof's inability to report unlinked path names. They are described in the answer to the "When will lsof report path names for deleted files?" question.

3.3.4 Why doesn't lsof report the "correct" hard linked file path name?

When lsof reports a rightmost path name component for a file with hard links, the component may come from the kernel's name cache. Since the key which connects an open file to the kernel name cache may be the same for each differently named hard link, lsof may report only one name for all open hard-linked files. Sometimes that will be "correct" in the eye of the beholder; sometimes it will not. Remember, the file identification keys significant to the kernel are the device and node numbers, and they're the same for all the hard linked names.

3.3.5 When will lsof report path names for deleted files?

Lsof will report path names for deleted files for two dialects: Linux and later builds of Solaris 10.

Deleted Linux path names are reported by default and have "(deleted)" at their ends.

The display of Solaris 10 deleted path names may be selected with the -X option. When selected they are also reported with "(deleted)" at their ends.

3.4 Why is lsof so slow?

Lsof may appear to be slow if network address to host name resolution is slow. This can happen, for example, when the name server is unreachable, or when a Solaris PPP cache daemon is malfunctioning.

To see if name lookup is causing lsof to be slow, turn it off with the ``-n" option.

Port service name lookup or portmap registration lookup may
also be causes of slow-down. To suppress port service name
lookup, specify the ``-P'' option.

Lsof doesn't usually make direct portmap calls -- only when +M
is specified, or when HASPMAPENABLED is defined during lsof
construction. (The lsof help panel, produced with `lsof -h`
will display the default portmap registration reporting
state.) The quickest first step in checking if lsof is slow
because of the portmapper is to use lsof's ``-M'' option.

Lsof may be slow if UID to login name lookups are slow.
Suppress them with ``-l''.

On dialects where lsof uses the kernel name cache, try
disabling its use with ``-C''. (You can tell if
lsof uses the
kernel name cache by looking for ``-C'' in lsof's ``-h''
output.) Of course, disabling kernel name cache use will mean
that lsof won't report full or partial path names, just file
system and character device names.

If you're just interested in the open files of one process, try
using the ``-p <Process-ID>'' option to limit lsof to that
process. (The ``-p'' option may also be followed with a list
of Process-IDs.)

If you're interested in including or excluding certain
commands, try lsof's "-c[^]cmd" option.

If you're interested in certain Internet TCP and UDP states
(e.g., ESTABLISHED) or in excluding some (e.g., CLOSE_WAIT),
try lsof's "-s p:s" option, available where shown on the lsof
help output, obtained with -h or -?. More information on it
may be found in the answer to the "How are protocol state name
exclusion and inclusion used?" question.

Your UNIX dialect may not support "-s p:s" and its associated
performance improvments to Internet-only
file processing. You
can find more information on those topics in the answer to the
"Why doesn't my dialect support state name exclusion and
inclusion?" question.

Older AIX lsof may be slow to start because of its oslevel
identity comparison. (Newer AIX lsof uses uname(2).) See the
"Why does AIX lsof start so slowly?" and "Why does lsof warn
"compiled for x ... y; this is z.?" sections for more

information.

3.5 Why doesn't lsof's setgid or setuid permission work?

If you install lsof on an NFS file system that has been
mounted with the nosuid option, lsof may not be able to
use the setgid or setuid permission you give it, complaining
it can't open the kernel memory device -- e.g., /dev/kmem.

The only solution is to install lsof on a file system that
doesn't inhibit setgid or setuid permission.

3.6 Does lsof have security problems?

I don't think so. However, lsof does usually start with
setgid permission, and sometimes with setuid-root permission.
Any program
that has setgid or setuid-root permission,
should always be regarded with suspicion.

Lsof drops setgid power, holding it only while it opens
access to kernel memory devices (e.g., /dev/kmem, /dev/mem,
/dev/swap). That allows lsof to bypass the weaker security
of access(2) in favor of the stronger checks the kernel
makes when it examines the right of the lsof process to
open files declared with -k and -m. Lsof also restricts
some device cache file naming options when it senses the
process has setuid-root power.

On a few dialects lsof requires setuid-root permission
during its full execution in order to access files in the
/proc file system. These dialects include:

   DC/OSx 1.1 for Pyramid systems
   Reliant UNIX 5.4[34] for Pyramid systems

When lsof runs with setuid-root permission it severely
restricts all file accesses it might be asked to make with
its options.

The device cache file (typically .lsof_hostname in the home
directory of the real user ID that
executes lsof) has 0600
modes. (The suffix, hostname, is the first component of
the host's name returned by gethostname(2).) However, even
when lsof runs setuid-root, it makes sure the file's
ownerships are changed to that of the real user and group.
In addition, lsof checks the file carefully before using

it (See the question "How do I disable the device cache file feature or alter it's behavior?" for a description of the checks.); discards the file if it fails the scrutiny; complains about the condition of the file; then rebuilds the file.

See the 00DCACHE file of the lsof distribution for more information about device cache file handling and the risks associated with the file.

3.7 Will lsof show remote hosts using files via NFS?

No. Remember, lsof displays open files for the processes of the host on which it runs. If the host on which lsof is running is an NFS server, the remote NFS client processes that are accessing files on the server leave no process records
on the server for lsof to examine.

3.8 Why doesn't lsof report locks held on NFS files?

Generally lock information held by local processes on remote NFS files is not recorded by the UNIX dialect kernel. Hence, lsof can't report it.

One exception is some patch levels of Solaris 2.3, and all versions of Solaris 2.4 and above. Lsof for those dialects does report on locks held by local processes on remotely mounted NFS files.

3.8.1 Why does lsof report a one byte lock on byte zero as a full file lock?

When a process has a lock of length one, starting at byte zero, lsof can't distinguish it from a full file lock.
That's because most UNIX dialects represent both locks the same way in their file lock (flock or eflock) structures.

3.9 Why does lsof report different values for open files on the same file system (the automounter phenomenon)?

On UNIX dialects where file systems may be mounted by an automounter with the ``direct" type, lsof may sometimes report difference
DEVICE, SIZE/OFF, INODE and NAME values
when asked to report files open on the file system.

This happens because some files open on the file system --

e.g., the current directory of a shell that changed its directory to the file system as the file system's first reference -- may be characterized in the kernel with temporary automounter node information. The cd doesn't cause the file system to be mounted.

A subsequent reference to the file system -- e.g., an ls of any place in it -- will cause the file system to be mounted. Processes with files open to the mounted file system are characterized in the kernel with data that reflects the mounted file system's parameters.

Unfortunately some kernels (e.g., some versions of Solaris 2.x) don't revisit the process that did only a change-directory for the purpose of updating the data associated with the open directory file. The file continues to be characterized with temporary automounter information until it does another
directory change, even a trivial ``cd .".

Lsof will report on both reference types, when supplied the file system name as an argument, but the data lsof reports will reflect what it finds in the kernel. For the different types lsof will display different data, including different major and minor device numbers in the DEVICE column, different lengths in the SIZE/OFF column, different node numbers in the INODE column, and slightly different file system names in the NAME column.

In contrast, fuser, where available, can only report on one reference type when supplied the file system name as an argument. Usually it will report on the one that is associated with the mounted file system information. If the only reference type is the temporary automounter one, fuser will often be silent about it.

3.10 Why don't lsof and netstat output match?

Lsof and netstat output don't match because lsof reports the network information it finds in open file system objects
--
e.g., socket files -- while netstat often gets its information from separate kernel tables.

The information available to netstat may describe network activities never or no longer associated with open files, but necessary for proper network state machine operation.

For example, a TCP connection in the FIN_WAIT_[12] state
may no longer have an associated open file, because the
connection has been closed at the application layer and is
now being closed at the TCP/IP protocol layer.

3.10.1 Why can't lsof find accesses to some TCP and UDP ports?

Lsof stands for LiSt Open Files. If there is no open file
connected to a TCP or UDP port, lsof won't find it. That's
the most common reason why lsof doesn't find a port netstat
might report open.

One reason I've found on some UNIX dialects is that their
kernels set aside TCP and UDP ports for communicating with
support activities, running in application layer servers
-- the automounter daemons, and the NFS biod and nfsd
daemons
are examples. Netstat may report the ports are in
use, but lsof doesn't.

Another reason is that netstat may also be able to report
a port is open on a particular dialect, because it uses a
source of data different from what lsof uses -- e.g.,
netstat might examine kernel tables or use streams messages
to MIB2, while lsof relies on the information it finds in
open file structures and their descendants.

Sometimes it's possible to search the data netstat and lsof
use. For example, on Linux /proc/tcp and /proc/udp can be
examined. There might an entry there for a particular
protocol and port, but if the line on which the port appears
doesn't have an inode number that matches an inode number
of an open file, lsof won't be able to identify the process
using the port.

This is a tough question to which there is no easy answer.

3.11 Why does lsof update the device cache file?

At the end of the lsof output you may see the message:

```
    lsof: WARNING: /Homes/abe/.lsof_vic
was updated.
```

In this message /Homes/abe/.lsof_vic is the path to the
private device cache file for login abe. (See 00DCACHE.)

Lsof issues this message when it finds it necessary to

recheck the system device directory (e.g., /dev or /devices)
and rebuild the device cache file during the open file
scan. Lsof may need to do these things it finds that a
device directory node has changed, or if it cannot find a
device in the cache.

3.12 Why doesn't lsof report state for UDP socket files?

Lsof reports UDP TPI connection state -- TS_IDLE (Idle),
TS_BOUND (Bound), etc. -- for some, but not all dialects.
TPI state is stream-based TCP/IP information that isn't
available in many dialects.

A fairly weak general rule is if netstat(1) reports UDP
TPI state, lsof may be able to report it, too. But don't
be surprised if lsof fails to report UDP TPI state for your
dialect. Other factors influence lsof's ability to report
UDP TPI state, including the availability of state
number
data in kernel structures, and state number to state name
conversion data.

3.13 I am editing a file with vi; why doesn't lsof find the file?

Classic implementations of vi usually don't keep open the file
being edited. (Newer ones may do so in order to maintain an
advisory lock.) Instead classic vi opens the file, makes a
temporary copy (usually in /tmp or /usr/tmp), and does its work
in that file. When you save the file being edited from a
classic vi implementation, it reopens and rewrites the file.

During a classic vi session, except for the brief periods when
vi is reading or rewriting the file, lsof won't find an open
reference to the file from the vi process, because there is
none.

3.14 Why doesn't lsof report TCP/TPI window and queue sizes for my
dialect?

Lsof only reports TCP/TPI window sizes for Solaris, because
only its netstat reports them. The intent of providing
TCP/TPI information in lsof NAME column output is to make
it easier to match netstat
output to lsof output.

In general lsof only reports queue sizes for both TCP and
UDP (TPI) connections on BSD-derived UNIX dialects, where
both sets of values appear in kernel socket queue structures.

SYSV-derived UNIX dialects whose TCP/IP implementations are based on streams generally provide only TCP queue sizes, not UDP (TPI) ones.

While you may find that netstat on some SYSV-derived UNIX dialects with streams TCP/IP may report UDP (TPI) queue sizes, you will probably also find that the sizes are always zero -- netstat supplies a constant zero for UDP (TPI) queue sizes to make its headers align the same for TCP and UDP (TPI) connections. Solaris seems to get it right -- i.e., its netstat does not report UDP (TPI) queue sizes.

When in doubt, I chose to avoid reporting UDP (TPI) queue sizes for UNIX dialects whose netstat-reported values I knew to be a constant zero or whose origin I couldn't determine. OSR is a dialect in this category.

3.14.1 Why doesn't
lsof report socket options, socket states, and TCP
flags and values for my dialect?

The lsof -T argument, 'f', that selects the reporting of socket options, socket states and TCP flags was implemented at lsof revision 4.71 for the following UNIX dialects, providing the indicated information:

AIX 4.3.2 and 5.1 and above
All socket options and values, socket states, and TCP flags and values described in lsof(8) are reported.

Apple Darwin 7.2 and above
All socket options and values, socket states, and TCP flags and values described in lsof(8) are reported.

Digital UNIX and Tru64 UNIX 4.0
All socket options and values, socket states, and TCP flags and values described in lsof(8) are reported.

FreeBSD 4.9 and above
All socket options and values, socket states, and TCP flags and values described in lsof(8) are reported.

HP-UX 11.00 (/dev/kmem-based lsof)
All socket options and values are reported. No socket states are reported. Only the
TF_NODELAY TCP flag and
the TF_MSS value are reported.

HP-UX 11.11 and iiiv2 (PSTAT-based lsof)
All socket options and values, and socket states are reported. No TCP flags or values are reported.

Linux
No socket options and values, socket states, or TCP

flags and values are reported. The support for "-Tf" could not be added to Linux, because socket options, socket states, and TCP flags and values are not available via the /proc file system.

NetBSD 1.6G and above

All socket options and values, socket states, and TCP flags and values described in lsof(8) are reported.

OpenBSD 3.4 and above

All socket options and values, socket states, and TCP flags and values described in lsof(8) are reported.

OPENSTEP 4.2

All socket options and values, socket states, and TCP flags and values described in lsof(8) are reported.

OpenUNIX 8

All socket options and values, socket states, and TCP flags and values described in lsof(8) are reported.

SCO OpenServer Release 5.0.6

All socket options and values, socket states, and TCP flags and values described in lsof(8) are reported.

Solaris 2.6, 8 and above

The socket option display is limited to BROADCAST, DEBUG, DGRAM_ERRIND, DONTROUTE and OOBINLINE. Socket values are limited to KEEPALIVE and LINGER. No socket states are reported. The TCP DELACK, NODELAY and SENTFIN flags are reported. The TCP MSS value is reported.

UnixWare 7.1.[134]

All socket options and values, socket states, and TCP flags and values described in lsof(8) are reported.

3.14.2 Why doesn't lsof report the partial listen queue connection count for my dialect?

The reporting of partial listen queue connections was added to -Tf processing at lsof revision 4.76. Currently it is reported for these dialects:

AIX 4.3.2

This dialect is no longer supported, so no attempt was made to add partial listen queue length support for it.

AIX 5.1 and above

Partial listen queue information is available.

Apple Darwin 7.2 and above

Partial listen queue information is available.

Digital UNIX 4.0

This dialect is no longer supported, so no attempt
was made to add partial listen queue length support
for it.
  FreeBSD 4.9 and above
Partial listen queue information is available.
  HP-UX 11.00 (/dev/kmem-based lsof)
No partial listen queue information is available.
  HP-UX 11.11 and iiiv2 (PSTAT-based lsof)
No partial listen queue information is available.
  Linux
No partial listen queue information is available.
  NetBSD 1.6G and above
Partial listen queue information is available.
  OpenBSD 3.4 and above
Partial listen queue information is available.
  OPENSTEP 4.2
Partial listen queue information is available.
  OpenUNIX 8
This dialect is no longer supported, so no attempt
was made to add partial listen queue length support
for it.
  SCO OpenServer Release 5.0.6
No partial listen queue information
is available.
  Solaris 2.6, 8 and above
Partial listen queue information is available.
  Tru64 UNIX 5.0
This dialect is no longer supported, so no attempt
was made to add partial listen queue length support
for it.
  Tru64 UNIX 5.1
Partial listen queue information is available.
  UnixWare 7.1.[134]
Partial listen queue information is available.

3.15 What does "no more information" in the NAME column mean?

When lsof can find no successor structures -- a gnode,
inode, socket, or vnode -- connected to the file structure
of an open descriptor of a process, it reports "no more
information" in the NAME column. The TYPE, DEVICE, SIZE/OFF,
and INODE columns will be blank.

Because the file structure is supposed to contain a pointer
to the next structure of a file's processing support, if
the pointer is NUL, lsof can go no further.

Some UNIX dialects have file structures for system processes -- e.g., the sched process -- that have no successor structure
pointers. The "no more information" NAME will commonly appear for these processes in lsof output.

It may also be the case that lsof has read the file structure while it is being assembled and before a successor structure pointer value has been set. The "no more information" NAME will again result.

Unless lsof output is filled with "no more information" NAME column messages, the appearance of a few should be no cause for alarm.

3.16 Why doesn't lsof find a process that ps finds?

If lsof fails to display open files for a process that ps indicates exists, there may be several reasons for the difference.

The process may be a "zombie" for which ps displays the "(defunct)" state. In that case, the process has exited and has no open file information lsof can display. It does still have a process structure, sufficient for the needs of ps.

Another possible explanation is that kernel tables and structures may have been changing when lsof looked for the process,
making lsof unable to find all relevant process structures. Try repeating the lsof request.

3.17 Why doesn't -V report a search failure?

The usual reason that -V won't report a search failure is that lsof located the search item, but was prevented from listing it by an option that doesn't participate in search failure reporting.

For example, this lsof invocation:

```
$ lsof -V -i TCP@foobar -a -d 999
```

won't report it can't find the Internet address TCP@foobar, even if there is an open file connected to that address, unless the open file also has a file descriptor number of 999 (the ``-a -d 999'' options).

Compile-time options can also affect -V results in much the same way. For example, if HASSECURITY and HASNOSOCKSECURITY are defined at compile time, this lsof invocation, run by a non-root user:

```
$ lsof -V -c inetd
```

won't report that it can't find the inetd command, even if there is a process running the inetd command, because the HASSECURITY and HASNOSOCKSECURITY options prevent the listing of all but the socket files of another user, and no socket file selector (e.g., "-i") was specified.

3.18 Portmap problems

3.18.1 Why isn't a name displayed for the portmap registration?

When portmap registration reporting is enabled, any time there is a registration for a local TCP or UDP port, lsof displays it in square brackets, following the port number or service name -- e.g., ``:1234[name]'' or ``:name[100083]''.

The TCP or UDP port number or service number (what follows the `:') is displayed under the control of the lsof -P option. The registration identity is held by the portmapper and may be a name or a number, depending on how the registration's owner declared it. Lsof reports what the port map holds and cannot derive a registration name from a registration number.

Lsof can be compiled with registration reporting enabled or disabled by default, under the control of the HASPMAPENABLED #define (usually in machine.h).
The lsof help panel (`lsof -h`) will show the default. Lsof is distributed with reporting disabled by default.

3.18.2 How can I display only portmap registrations?

Lsof doesn't have an option that will display only TCP or UDP ports with portmap registrations. The +M option only enables the reporting of registration information when Internet socket files are displayed; +M doesn't select the displaying of Internet socket files -- the -i option does that.

This simple lsof pipe to grep will do the job:

```
 $ lsof -i +M | grep "\["
```

This works because -i selects Internet socket files, +M enables portmap registration reporting, and only output lines with opening square brackets will have registrations.

When portmap registration reporting is enabled by default, because the lsof builder constructed it that way, +M is not necessary. (The lsof help panel, produced with `lsof -h` will display the default portmapper registration reporting state.) However, specifying
+M when reporting
is already enabled is acceptable, as is specifying -M when reporting is already disabled.

Digression: lsof will accept `+' or `-' as a prefix to most options. (That isn't documented in the man page or help panel to reduce confusion and complexity.) The -i option is as acceptable as +i, so the above example could be written a little more tersely as:

```
 $ lsof +Mi | grep "\["
```

But be careful to use the ``Mi'' ordering, since ``iM'' implies M is an address argument to `i'.

3.18.3 Why doesn't lsof report portmap registrations for some ports?

Lsof reports portmap registrations for local TCP and UDP ports only. It identifies local ports this way:

* The port appears in the local address section of the kernel structure that contains it.

* The port appears in the foreign address section of a kernel structure whose local and foreign Internet addresses are the same.

* The port appears in the foreign address section of a kernel address structure
whose Internet address is
INADDR_LOOPBACK (127.0.0.1).

Following these rules, lsof ignores foreign portmapped ports. That's done for reasons of efficiency and possible

security prohibitions. Contacting all remote portmappers could take a long time and be blocked by network difficulties (i.e., be inefficient). Many firewalls block portmapper access for security reasons.

Lsof may occasionally ignore portmap registration information for a legitimate local port by virtue of its local port rules. This can happen when a port appears in the foreign part of its kernel structure and the local and foreign Internet addresses don't match (perhaps because they're on different interfaces), and the foreign Internet address isn't INADDR_LOOPBACK (127.0.0.1).

3.18.4 Why doesn't lsof report portmap registrations for some Solaris versions?

In some versions of Solaris -- 9 and 10 are known to exhibit this problem -- lsof is unable to display portmap registrations.

This
portmap registration reporting failure occurs when the Solaris netconfig field (in /etc or etc/inet) has its first two non-comment lines enabling tcp6 and udp6. When netconfig is configured in that fashion, lsof's attempt to read the portmap via an RPC function fails.

I don't have an explanation for the failure, but this comment in the netconfig(4) man page appears to have some bearing on the problem:

```
# The following two entries starting with udp6 and tcp6 are
# meant to be used for IPv6. If you have Ipv6 enabled on your
# machine then you can uncomment these two lines to enable
# RPC and NFS to use the Ipv6 stack.
...
#udp6  tpi_clts      v  inet6  udp  /dev/udp6  -
#tcp6  tpi_cots_ord  v  inet6  tcp  /dev/tcp6  - "
```

My interpretation of that comment is that there is a different RPC interface to the portmap when IPv6 is enabled. However, I can't find any documentation on it in the RPC man pages. If anyone has information on it, please
send it to me at
<abe@purdue> and put "lsof Solaris portmap" in the subject line.

A work-around may be to move the ucp6 and tcp6 lines after the udp and tcxp lines in netconfig. I don't know if that change

has any unacceptable consequences, but it works for me on my Solaris 9 test system, and I have a report that it also works on Solaris 10.

3.19 Why is `lsof | wc` bigger than my system's open file limit?

There is a strong temptation to count open files by piping lsof output to wc. If your purpose is to compare the number you get to some Unix system parameter that defines the number of open files your system can have, resist the temptation.

One reason is that lsof reports a number of "files" that don't occupy Unix file table space -- current working directories, root directories, jail directories, text files, library files, memory mapped files are some. Another reason is that lsof can report a file shared by more than one process that itself occupies only
one file table slot.

If you want to know the number of open files that occupy file table slots, use the +ff option and process the lsof output's FILE_ADDR column information with standard Unix tools like cut, grep, sed, and sort.

You might also consider using use lsof's field output with +ff, selecting the file struct address with -FF, and processing the output with an AWK or Perl script. See the list_fields.awk, list_fields.perl, and shared.perl5 scripts in the scripts/ subdirectory of the lsof distribution for hints on file struct post-processing filters.

3.20 Why doesn't lsof report file offset (position)?

Lsof won't report a file offset (position) value if the -s option (without parameters) has been specified, or if the dialect doesn't support the displaying of file offset (position). (Note that on selected dialects the help output, obtained with -h or -?, may show that the -s option can also be supplied the "p:s" parameters; for more information on that addition,
see the answer to the "How are protocol state name exclusion and inclusion used?" question.)

That lsof is reporting only file size is indicated by the fact that the appropriate column header says SIZE instead of SIZE/OFF.

If lsof doesn't support the displaying of file offset (position) -- e.g., for Linux /proc-based lsof -- the -h or -? output panel won't list the -o option.

Sometimes the availability of file offset information depends on the dialect's kernel. This is particularly true for socket file offsets.

Maintenance of offsets for pseudo-terminal devices varies by UNIX dialect and is related to how the dialect kernel implements pseudo-terminal support. Kernels like AIX, for example, that short-circuit the transfer of data between socket and pseudo devices to reduce TCP/IP daemon interrupt rates won't advance offsets in the TCP/IP daemon socket files. Instead they will advance offsets in the open standard I/O files of the shell child precess where the pseudo-terminal
devices are used.

When in doubt about the behavior of lsof in reporting file offset information, do some carefully measured experiments, consult the lsof sources, or contact me at <abe@purdue.edu> to discuss the matter. Please follow the reporting guidelines in the "How do I report an lsof bug?" section of this FAQ.

3.20.1 What does lsof report for size when the file doesn't really have one?

When a file has no true size -- e.g., it's a socket, a FIFO, or a pipe -- lsof tries to report the information it finds in the kernel that describes the contents of associated kernel buffers.

Thus, for example, size for most TCP/IP files is socket buffer size. The size of the socket read buffer is reported for read-only files; the size of the write buffer for write-only files; and the sum of the buffers sizes for read-write files.

3.21 Problems with path name arguments

3.21.1 How do I ask lsof to search a file system?

You can ask lsof to search for all open files on a file
system by specifying its mounted path name as an lsof argument -- e.g.,

```
$ lsof /
```

Output of the mount command will show file system mounted
path names. It will also show the mounted-on device path
for the file system.

If the mounted-on device is a block device (the permission
field in output of `ls -l <device>` starts with a `b/),
you can specify it's name, too -- e.g.,

```
$ lsof /dev/sd0a
```

If the mounted-on device isn't a block device -- for example,
some UNIX dialects call a CD-ROM device a character device
(ls output starts with a `c') -- you can force lsof to
assume that the specified device names a file system with
the +f option -- e.g.,

```
$ lsof +f -- /dev/sd0a
```

(Note: you must use ``--" after +f or -f if a file name
follows immediately, because +f and -f can be followed by
characters that specify flag output selections.)

When you use +f and lsof can't match the device to a file
system, lsof will issue a complaint.

The +f option
may be used in some dialects to ask lsof to
search for an NFS file system by its server name and server
mount point. If the mount application reports an NFS file
system mounted-on value that way, then this sample lsof
request should work.

```
$ lsof +f -- fleet:/home/fleet/u5
```

Finally, you can use -f if you don't want a mounted file
system path name to be considered a request to report all
open files on the file system. This is useful when you
want to know if anyone is using the file system's mounted
path name. This example directs lsof to report on open
access to the `/' directory, including when it's being used
as a current working or root directory.

```
$ lsof -f -- /
```

The lsof -f option performs the same function as -f does

in some fuser implementations. However, since the lsof -c
option was chosen for another purpose before the `f' option
was added to lsof, +f was selected as the analogue to the
fuser -c option. (Sorry for the potential confusion.)

3.21.2 Why
doesn't lsof find all the open files in a file system?

Lsof may not find all the open files in a file system for
several reasons.

First, some processes with files open on the file system
may have been changing status when lsof examined the process
table, and lsof "missed" them. Remember, the kernel changes
much faster than lsof can respond to the changes.

Second, be sure you have specified the file system correctly.
Perhaps you specified a file instead. You can use lsof's
-V option to have lsof report in detail on what it couldn't
find. Make sure the report for the file system you specified
says "file system." Here's some -V output:

```
$ /lsof -V /tmp ./lsof.h ./lsof
COMMAND  PID USER   FD   TYPE DEVICE SIZE/OFF  INODE NAME
lsof    2688  abe  txt   VREG 18,1,7  1428583 226641 ./lsof
lsof    2689  abe  txt   VREG 18,1,7  1428583 226641 ./lsof
lsof: no file use located: ./lsof.h
```

You can also use lsof's +f option to force it to consider
a
path name as a file system. If lsof can't find a file
system by the specified name, it will issue a complaint --
e.g.,

```
$ lsof +f -- /usr
lsof: not a file system: /usr
```

(/usr is a directory in the / file system.)

3.21.3 Why does the lsof exit code report it didn't find open files
when some files were listed?

Sometimes lsof will list some open files, yet return a
non-zero exit code, suggesting it hasn't found all the
specified files.

The first thing you should when you suspect lsof is incorrect
is to repeat the request, adding the -V option. In the

resulting report you may find that your file system
specification really wasn't a file system specification,
just a file specification.

Finally, if you specify two files or two file systems twice,
lsof will credit all matches to the first of the two and
believe that there were no matches for the second. It's
possible to specify a single file system twice with different
path names by using both its mounted
directory path name
and mounted-one device name.

```
$ lsof +f -V spcuna:/sysprog /sysprog
COMMAND   PID USER   FD   TYPE DEVICE SIZE/OFF  INODE NAME
ksh     11092  abe  cwd   VDIR 39,0,1     1536 226562 /sysprog
(spcuna:/sysprog)
...
lsof: no file system use located: spcuna:/sysprog
```

All matches were credited to /sysprog; none to spcuna:/sysprog.

3.21.4 Why won't lsof find all the open files in a directory?

When you give lsof a simple directory path name argument
(not a file system mounted-on name), you are asking it to
search for processes that have the directory open as a
file, or as a process-specific directory -- e.g., root or
current working directory.

If you want to list instances of open files inside the
directory, you need to specify the individual path names
of those files, or use the lsof +D and +d options.

See the answer to the question "Why are the +D and +d
options so slow?" before you use +D or +d casually.

See the answer to
the question "Why do the +D and +d options
produce warning messages?" for an explanation of some
process authority limitations of +D and +d.

3.21.5 Why are the +D and +d options so slow?

The +D and +d options cause lsof to build a path name search
list for a specified directory. +D causes lsof to descend
the directory to its furthest subdirectory, while +d
restricts it to the top level. In both cases, the specified
directory itself is included in the search list. In both

symbolic links are ignored.

Building such a search list can take considerable time,
especially when the specified directory contains many files
and subdirectories -- lsof must call the system readlink()
and stat() functions for each file and directory. Storing
the search list can cause lsof to use more than its normal
amount of dynamic memory -- each file recorded in the search
list consumes dynamic memory for its path name, characteristics,
and search linkages. Using the list means lsof must search
it
for every open file in the system.

Building the search list for a directory specified on some
file systems can be slow -- e.g., for an NFS directory with
many files. Some file systems have special logging features
that can introduce additional delays to the building of
the search list -- e.g., NFS logging, or logging on a
Solaris UFS file system. The bottom line is that slow
search list construction may not be so much an lsof problem
as a file system problem. (Hint: if you're using Solaris
UFS logging, consider specifying the "logging,noatime"
option pair to reduce the number of atime writes to the
UFS logging queue and disk.)

A somewhat risky way to speed up lsof's building of the
search list is to use lsof's ``-O" option. It forces lsof
to do all system calls needed to build the search list
directly, rather than in a child process. While direct
system calls are much faster, they can block in the kernel
-- e.g., when an NFS server stops responding --
stopping
lsof until the kernel operation unblocks.

As an example of the load +D can impose, consider that an
`lsof +D /` on a lightly loaded NeXT '040 cube with a 1GB
root file system disk took 4+ minutes of real time. It
also generated several hundred error messages about files
and directories the lsof process didn't have permission to
access with stat(2).

The bottom line is that +D and +d should be used cautiously.
+D is more costly than +d for deeply nested directory trees,
because of the full directory descent it causes. So use
+d where possible. And you might need to consider the
performance of the file system that holds the directory
you name with +d or +D.

In view of these warnings, when is it appropriate to use
+D or +d? Probably the most appropriate time is when you
would specify the directory's contents to lsof with a shell
globbing construct -- e.g., `lsof *`. If that's what you
need to do, `lsof +d .` is probably more efficient than
having the shell
produce a directory list, form it into an
argument vector, and pass the vector to lsof for it to
unravel.

See the answer to the question "Why do the +D and +d options
produce warning messages?" for an explanation of some
process authority limitations of +D and +d.

3.21.6 Why do the +D and +d options produce warning messages?

+D and +d option processing is limited by the authority of
the lsof process -- i.e., lsof can only examine (with
lstat(2) and stat(2)) files the owner of the process can
access.

If the ownership, group membership, or permissions of the
specified directory, file within it, or directory within
it prevents the owner of the lsof process from using lstat(2)
or stat(2) on it, lsof will issue a warning message, naming
the path and giving the system's (lstat(2's or stat(2)'s)
reason (errno explanation text) for refusing access.

As an example, assume user abc has a subdirectory in /tmp,
owned by abc and readable, writable and searchable by only
its
owner. If user def asks lsof to search for all /tmp
references with +D or +d, lsof will be unable to lstat(2)
or stat(2) anything in abc's private subdirectory, and will
issue an appropriate warning.

Lsof warnings can usually be suppressed with the -w option.
However, using -w with +D or +d means that there will be
no indication why lsof couldn't find an open reference to
a restricted directory or something contained in it.

Hint: if you need to use +D or +d and avoid authority
warnings, and if you have super-user power, su and use lsof
with +D or +d as root.

3.22 Why can't my C compiler find the rpcent structure definition?

When you try to compile lsof your compiler may complain

that the rpcent structure is undefined. The complaints
may look like this:

>print.c: In function `fill_portmap':
>print.c:213: dereferencing pointer to incomplete type
>...

The most likely cause is that someone has allowed a BIND
installation to update /usr/include/netdb.h
(or perhaps
/usr/include/rpc/netdb.h), removing the rpcent structure
definition that lsof expects to find there.

Only Solaris has an automatic work-around. (See dlsof.h
in dialects/sun.). The Solaris work-around succeeds because
there is another header file, <rpc/rpcent.h>, with the rpcent
structure definition, and there is a Solaris C pre-processor
test that can tell when the BIND <netdb.h> is in place and
hence <rpc/rpcent.h> must be included.

Doubtlessly there are similar work-arounds possible in
other UNIX dialects whose header files have been "touched"
by BIND, but in general I recommend restoration of the
vendor's <netdb.h> and any other header files BIND might
have replaced. (I think BIND replaces <resolv.h>,
<sys/bitypes.h>, <sys/cdefs.h> -- and maybe others.)

3.23 Why doesn't lsof report fully on file "foo" on UNIX dialect
"bar?"

Lsof sometimes won't report much information on a given
file, or may even report an error message in its NAME
column. That's
usually because the file is of a special
type -- e.g., in a file system specific to the UNIX dialect
-- and I haven't used a system where the file appeared
during my testing.

If you encounter such a situation, send me e-mail at
<abe@purdue.edu> and we may be able to devise an addition to
lsof that will report on the file in question. Please follow
the reporting guidelines in the "How do I report an lsof bug?"
section of this FAQ. Make sure "lsof" appears in the
"Subject:" line so my e-mail filter won't classify your letter
as Spam.

3.24 Why do I get a complaint when I execute lsof that some library
file can't be found?

On systems where the LIBPATH (or the equivalent) environment
variable is used to record the library search path in
executable files when they are built, an incorrect value
may make it impossible for the system to find the shared
libraries needed to load lsof for execution.

This may be particularly true on systems like AIX >= 4.1.4,
where the lsof
Makefile takes the precautionary step of
using the -bnolibpath loader flag to insure that the path
to the private static lsof library is not recorded in the
lsof binary. Should LIBPATH be invalid when lsof is built,
it will be recorded in the lsof binary as the default
library path search order and lead to an inability to find
libraries when lsof is executed.

So, if you get missing library complaints when you try to
execute lsof, check LIBPATH, or whatever environment variable
is used on your system to define library search order in
executable files. Use the tools at your disposal to look
at the library paths recorded in the lsof binary -- e.g.,
chatr on HP-UX, dump on AIX, ldd on Solaris.

Make sure, too, that when the correct library search path
has been recorded in the executable file, the required
library files exist at one or more of the search paths.

3.25 Why does lsof complain it can't open files?

When lsof begins execution, unless it has been asked to
report
only help or version information, typically it will
attempt to access kernel memory and symbol files -- e.g.,
/unix, /dev/kmem. Even though lsof needs only permission
to open these files for reading, read access to them might
be restricted by ownerships and permission modes.

So the first step to diagnosing lsof problems with opening
files is to use ls(1) to examine the ownerships and permission
modes of the files that lsof wants to open. You may find
that lsof needs to be installed with some type of special
ownership or permission modes to enable it to open the
necessary files for reading. See the "Installing Lsof"
section of 00README for more information.

3.26 Why does lsof warn "compiled for x ... y; this is z."?

Unless warnings are suppressed (with -w) or the kernel identity check symbol (HASKERNIDCK) definition has been deleted, all but one lsof dialect version (exception: /proc-based Linux lsof) compare the identity of the running kernel to that of the
one for which lsof was constructed.
If the identities don't match, lsof issues a warning like this:

lsof: WARNING: compiled for Solaris release 5.7; this is 5.6.

Two kernel identity differences can generate this warning -- the version number and the release number.

Build and running identity differences are usually significant, because they usually indicate kernels whose structures are different -- kernel structures commonly change at dialect version releases. Since lsof reads data from the kernel in the form of structures, it is sensitive to changes in them. The general rule is that an lsof compiled for one UNIX dialect version will not work correctly when run on a different version.

There are three work-arounds: 1) use -w to suppress the warning -- and risk missing other warnings; 2) permanently disable the identity check by deleting the definition of HASKERNIDCK in the dialect's machine.h header file -- with the same risk; or 3) rebuild lsof on the system
where it
is to be run. (Deleting HASKERNIDCK can be done with the Customize script or by editing machine.h.)

Generally checking kernel identity is a quick operation for lsof. However, it is potentially slow under AIX, where lsof must run /usr/bin/oslevel. To speed up lsof, use -w to suppress the /usr/bin/oslevel test. See "Why does AIX lsof start so slowly?" for more information.

3.27 How can I disable the kernel identity check?

The kernel identity check is controlled by the HASKERNIDCK definition. When it is defined, most dialects (exclusion: /proc-based Linux lsof) will compare the build-time kernel identity with the run-time one.

To disable the kernel identity check, disable the HASKERNIDCK definition in the dialect's machine.h header file. The

Customize script can be used to do that in its section
about the kernel identity check.

Caution: while disabling the kernel identity check may
result in smaller lsof startup overhead, it comes with the
risk of
executing an lsof that may produce warning messages,
error messages, incorrect output, or no output at all.

3.28 Why don't ps(1) and lsof agree on the owner of a process?

Generally the user ID lsof reports in its USER column is
the process effective user ID, as found in the process
structure. Sometimes that may not agree with what ps(1)
reports for the same process.

There are sundry reasons for the difference. Sometimes
ps(1) uses a different source for process information,
e.g., the /proc file system or the psinfo structure.
Sometimes the kernel is lax or confused (e.g., Solaris
2.5.1) about what ID to report as the effective user ID.
Sometimes the system carries only one user ID in its process
structure (some BSD derivatives), leaving lsof no choice.

The differences between lsof and ps(1) user identifications
should be small and normally it will be apparent that the
confusion is over a process whose application has changed
to an effective user ID different from
the real one.

3.29 Why doesn't lsof find an open socket file whose connection
state is past CLOSE_WAIT?

TCP/IP connections in states past CLOSE_WAIT -- e.g.,
FIN_WAIT_1, CLOSING, LAST_ACK, FIN_WAIT_2, and TIME_WAIT
-- don't always have open files associated with them. When
they don't, lsof can't identify them. When the connection
state advances from CLOSE_WAIT, sometimes the open file
associated with the connection is deleted.

3.30 Why don't machine.h definitions work when the surrounding
comments are removed?

The machine.h header files in dialect subdirectories have
some commented-out definitions like:

```
/* #define HASSYSDC "/your/choice/of/path */
```

You can't simply remove the comments and expect the definition
to work. That's intended to make you think about what
value you are assigning to the symbol. The assigned value
might have a system-specific convention. HASSYSDC, for
example, might be /var/db/lsof.dc for FreeBSD, but it might
be /var/adm/lsof.dc for
Solaris.

Symbols defined in the lsof documentation are described in
00PORTING, other machine.h comments, and other lsof
documentation files. HASSYSDC, for example, is discussed
in 00DCACHE. When comments and documentation don't suffice,
consult the source code for hints on how the symbol is
used.

3.31 What do "can't read inpcb at 0x...", "no protocol control
block", "no PCB, CANTSENDMORE, CANTRCVMORE", etc. mean?

Sometimes lsof will report "can't read inpcb at 0x00000000",
"no protocol control block", "no PCB, CANTSENDMORE,
CANTRCVMORE" or a similar message in the NAME column for
open TCP socket files. These messages mean the file's socket
structure lacks a pointer to the INternet Protocol Control
Block (inpcb) where lsof expects to find connection addresses
-- local and foreign ports, local and foreign IP addresses.
The socket file has probably been submitted to the shutdown(2)
function for processing.

In some implementations lsof issues the "no PCB, CANTSENDMORE,
CANTRCVMORE"
message, which tries to explain the absence
of a protocol control block by showing the socket state
settings that have been made by the shutdown(2) function.

If a non-zero address follows the "0x" in the "can't read
inpcb" message, it means lsof couldn't read inpcb contents
from the indicated address in kernel memory.

3.32 What do the "unknown file system type" warnings mean?

Lsof may report a message similar to"

    unknown file system type, v_op: 0x10472f10

in the NAME column for some files.

This means that lsof has encountered a vnode for the file
whose operation switch address (from v_op) references a

file system type for which there is no support in lsof.
After lsof identifies the file system type, it uses
pre-compiled code to locate the file system specific node
for the file where lsof finds information like file size,
device number, node number, etc.

To get some idea of what the file system type might be,
use nm on your kernel symbol file
to locate the symbol name
that corresponds to the v_op address -- e.g., on Solaris
do:

```
$ nm -x /dev/ksyms | grep 0x10472f10
0x10472f10 ... |file_system_name_vnodeops
```

Where "file_system_name" is the clue to the unsupported
file system.

Lsof doesn't use the v_op address to identify file system
types on all dialects. Sometimes it uses an index number
it finds in the vnode. It will translate that symbol to
a short name in the warning message -- e.g., "nfs3" -- if
possible.

3.33 Installation

3.33.1 How do I install lsof?

There is no "standard" way to install lsof. Too much
depends on local conditions for me to be able to provide
working install rules in the lsof make files. (The skeleton
install rules you will find just give "hints.") See the
"Installing Lsof" section of 00README for a fuller explanation.

To install lsof you will need to consider these questions:

* Who should be able to use lsof? (See HASSECURITY and
  HASNOSOCKSECURITY in the
"Security" section of 00README.)

* Where should lsof be installed? This is a decision
  mostly dictated by local conditions. Somewhere in
  /usr/local -- etc/ or sbin/ -- is a common choice.

* What permissions should I give the lsof executable?
  The answer to this varies by dialect. The make files
  have install rules that give hints. The "Installing
  Lsof" section of 00README gives information, too.

* What if I want to install lsof in a shared file system
  for machines that require different lsof configurations?
  See the next question and answer, "How do I install a
  common lsof when I have machines that need differently
  constructed lsof binaries?"

3.33.2 How do I install a common lsof when I have machines that need differently constructed lsof binaries?

A dilemma that faces some system administrators when they install lsof in a shared file system -- e.g., NFS -- is that they must have different lsof executables for different systems.

The answer is to build an lsof wrapper script that is executed in place of lsof. The script can use system commands to determine which lsof binary should be executed.

Consider this example. You have HP-UX machines with 32 and 64 bit kernels that share the /usr/local/sbin directory where you want to install lsof. Consequently, on each system you must use a different lsof executable, built for the system's bit size. (That's because lsof reads kernel structures, sized by the kernel's bit size.)

One answer is to install three things in /usr/local/sbin: 1) a 32 bit lsof as lsof32; 2) a 64 bit lsof as lsof64; and 3) an lsof script. The script might look like this one, based on work by Amir J. Katz:

```
  #!/bin/sh
  x=`/usr/bin/getconf KERNEL_BITS`  # returns 32 or 64
  if /usr/bin/test "X$x" = "X32"
  then
    lsof32 $*
  else
    if /usr/bin/test "X$x" = "X64"
    then
lsof64 $*
    else
echo "Can't determine which lsof executable to use;"
echo
"getconf KERNEL_BITS says: $x"
exit 1
    fi
  fi
```

Solaris users should consult "How do I install lsof for
Solaris 7, 8 or 9?" for information on a similar trick
using the Solaris isaexec command.

Users of other dialects might be able to use a command like
uname(1) that can identify a distinguishing feature of the
system to be incorporated in pre-installed lsof executable
names. For example, use `uname -r` and install binaries
with suffixes that match `uname -r` output.

3.34 Why do lsof 4.53 and above reject device cache files built
by earlier lsof revisions?

When lsof revisions 4.53 run and encounter a device cache
file built by an earlier revision, it will reject the file
and build a new one. The rejection will be advertised with
these messages:

```
lsof: WARNING: no /dev device in <name>: 2 sections
...
lsof: WARNING: created device cache file: <name>
```

This happens because the header line of the device cache
file was changed at revision 4.53
to contain the number of
the device on which the device directory resides. The old
device cache file header line -- the "2 sections" line in
the above warning message, node reads "2 sections, dev=600".

This is not a serious problem, since lsof automatically
rebuilds the device cache file with the correct header
line.

3.35 What do "like block special" and "like character special" mean
in the NAME column?

When lsof comes across an open block or character file
whose device, raw device and inode place it somewhere other
than /dev (or /devices), lsof doesn't report the /dev (or
/devices) name in the NAME column. Instead lsof reports
the file system name and device or path name in the NAME
column and parenthetically adds "like block special <path>"
or "like character special <path>".

The value for <path> will point to a block or character
device in /dev (or /devices) whose raw device number matches
that of the open file being reported, but whose device

number or node
number (or both) don't match.

Such an open file is connected to a device node that has
been created in a directory other than /dev (or /devices.)
See mknod(8) for information on how such nodes are created.
(Generally one needs root power to create device nodes with
mknod.)

3.36 Why does an lsof make fail because of undefined symbols?

When lsof is compiled via the `make` step and the final
load step fails because of missing symbols, the problem
may not be lsof. The problem may be that ld, called by
the compiler as part of the `make` step, can't find some
library that lsof needs.

First check the last compiler line of the make operation
-- e.g., the last line with cc or gcc in it before the
undefined symbol report -- for loader arguments, i.e.,
ones beginning with "-l". Except for "-llsof" the rest
name system libraries. ("-L./lib" precedes "-llsof" to
tell the loader its location.)

Check that all the named system libraries exist. Look in
/lib and /usr/lib as a
start, but that may not be the only
place system libraries live. Consult your dialect's
documentation, e.g., the compiler and loader man pages,
for other possible locations.

If some system library doesn't exist, that may mean it was
never installed or was removed. You'll have to re-install
the missing library.

You may find that all the system libraries lsof uses exist.
Your next step might be to use nm and grep to see if any
of them contain the undefined symbols.

```
$ nm library | grep symbol
```

If the undefined symbol exists in some library named by
the lsof make step, then you might have a problem with some
environment variable that controls the load step. The most
common is LD_LIBRARY_PATH. It may have a setting that
causes ld to ignore a directory containing a library lsof
names. If this is the case, try unsetting LD_LIBRARY_PATH
in the environment of the ld process -- e.g., do:

```
   $ unset LD_LIBRARY_PATH
or
   % unsetenv LD_LIBRARY_PATH

Consult your
ld man page for other environment variables
that might affect library searching -- e.g., LIBPATH, LPATH,
SHLIB_PATH, etc.

If the undefined function doesn't exist in any libraries
lsof names, check other libraries.  See if the function
has a man page that names its library.  If the latter is
true, please let me know, because that is an lsof problem
I need to fix.

If none of these solutions work for you, send me some
documentation via e-mail at <abe@purdue.edu>.  Include `uname
-a` output, the output of the lsof `Configure ...` and `make`
steps, and the contents of the environment in force when the
`make` step was executed -- e.g., `env` or `printenv` output.
If you've located the libraries lsof names, send me that
information, too.  Make sure "lsof" appears in the "Subject:"
line so my e-mail filter won't classify your letter as Spam.
```

3.37 Command Regular Expressions (REs)

3.37.1 What are basic and extended regular expressions?

```
Lsof's ``-c'' option allows the specification
of regular
expressions (REs), enclosed in two slash ('/') characters and
followed by these modifiers:

   b the RE is a basic RE.
   i ignore case.
   x the RE is an extended RE (the default).

Note: the characters of the regular expression may need to
be quoted to prevent their expansion by the shell.

Example: this RE is an extended RE that matches exactly
four characters, whose third may be an upper ('O') or lower
case ('o') oh:

   -c /^..o.$/i

For simplicity's sake, an RE that is acceptable to egrep(1)
```

is usually called an extended RE.

REs suitable for the old line editor, ed(1), are often
called basic REs (and sometimes also called obsolete).

These are some ways basic REs usually differ from extended
REs. (There are other differences.)

* `|', `+', `?', '{', and '}' are ordinary characters.

* `^' is an ordinary character except at the beginning of
  the RE.

* `$' is an ordinary character except at the end of the
  RE.

* `*' is an
ordinary character if it appears at the
  beginning of the RE.

For more information on REs and the distinction between
basic and extended REs, consult your dialect's man pages
for ed(1), egrep(1), sed(1), and possibly regex(5) or
regex(7).

3.37.2 Why can't I put a slash in a command regular expression?

Since a UNIX command name is the last part of a path to
the command's executable, the lsof command regular expression
(RE) syntax uses slash ('/') to mark the beginning and end
of an RE. Slash may not appear in the RE and the `\'
back-slash escape is ineffective for "hiding" it.

More likely than not, if you try to put a slash in an lsof
command RE, you'll get this response:

```
$ lsof -s/.\// ...
lsof: invalid regexp modifier: /
```

Lsof is complaining the the first character it found after
the second slash isn't an lsof command RE modifier -- 'b',
'i', or 'x'.

3.37.3 Why does lsof say my command regular expression wasn't found?

When you use both forms of lsof's
-c option --
``-c <command>" and ``-c /RE/[m]" -- and ask that lsof

do a verbose search (``-V''), you may be surprised that
lsof will say that the regular expression wasn't found.

This can happen if the ``-c <command>'' form matches first,
because then the ``-c/RE/[m]'' test will never have been
applied. For example:

```
$ ./lsof -clsof -c/^..o.$/ -V -adcwd
COMMAND  PID USER   FD   TYPE DEVICE SIZE/OFF  NODE NAME
lsof    7850  abe  cwd   VDIR    6,0     2048 96442 / (/dev/sd0a)
lsof: no command found for regex: ^..o.$
```

The ``-clsof'' option matched first, so the ``-c/^..o.$/
option wasn't tested.

3.38 Why doesn't lsof report on shared memory segments?

Lsof reports on shared memory segments only if they're
associated with an open file. That's consistent with lsof's
mission -- to LiSt Open Files. Shared memory segments with
no file associations aren't open files.

That's not to say that a report on shared memory segments
and their associated processes
wouldn't be useful. But it
calls for a new tool, not more baggage for lsof.

3.39 Why does lsof report two instances of itself?

When you ask lsof to report all open files and it has
permission to do so, you may see two lsof processes in the
output. The processes are connected via pipes -- e.g.,
here's an HP-UX 11 example.

```
COMMAND     PID USER   FD   TYPE     DEVICE ...
...
lsof      29450  abe    7w  PIPE 0x48732408 ...
lsof      29450  abe    8r  PIPE 0x48970808 ...
...
lsof      29451  abe    6r  PIPE 0x48732408 ...
lsof      29451  abe    9w  PIPE 0x48970808 ...
```

The first process will usually be the lsof you initiated;
the second, an lsof child process that is used to isolate
its parent process from kernel functions that can block --
e.g., readlink() or stat().

Information to and from the kernel functions is exchanged

via the two pipes. When the parent process detects that
the child process has become blocked, it attempts to
kill
the child. Depending on the UNIX dialect that may succeed
or fail, but the parent won't be blocked in any event.

See the "BLOCKS AND TIMEOUTS" and "AVOIDING KERNEL BLOCKS"
sections of the lsof man page for more information on why
the child process is used and how you can specify lsof
options to avoid it. (Caution: that may be risky.)

3.40 Why does lsof report '\n' in device cache file error messages?

Lsof revisions prior to 4.58 may report '\n' in error
messages it delivers about problems in the device cache
file -- e.g.,

    lsof: WARNING: no ...: 4 sections\n

That's deliberately done to show the exact contents of the
device cache file line about which lsof is complaining,
including its terminating NL (New Line) '\n' character.
In the above example the line in the device cache file
causing the lsof complaint contains "4 sections" and ends
with a '\n'.

At revision 4.58 and above, device cache error messages
like the one in the above example have been changed
to
read:

    lsof: WARNING: no ...: line "4 sections"

The terminal '\n' is no longer reported, the line contents
are enclosed in double quote marks (""), and the word
"line" has been added as a prefix to denote that what
follows is a line from the device cache file.

3.41 Kernel Symbol and Address Problems

3.41.1 What does "lsof: WARNING: name cache hash size length error: 0"
mean?

When run on some systems, lsof may issue this warning:

    lsof: WARNING: name cache hash size length error: 0

That is an example from a FreeBSD system where lsof reads

the kernel's _nchash variable and finds its value is zero.

Similar warnings include:

```
WARNING: kernel name cache size:
WARNING: can't read kernel's name cache:
WARNING: no name cache address
WARNING: name cache hash size length error:
WARNING: unusable name cache size:
```

These warnings are issued when lsof is attempting to read the kernel's name cache information. They are usually the result
of a mis-match between the addresses for kernel symbols lsof gets via nlist(2) and the addresses in use by the kernel.

Lsof usually gets kernel symbol addresses from what it believes to be the kernel boot file. In FreeBSD, for example, that's the path returned by getbootfile(3), usually /kernel. The boot file can have other names in other UNIX dialects -- /unix, /vmunix, /bsd, /netbsd, /mach, /stand/vmunix, etc.

Lsof will get incorrect (mismatched) addresses from the boot file if it has been replaced by a newer one which hasn't yet been booted -- e.g., if this is done in FreeBSD:

```
# mv /kernel /kernel.OLD
# mv /kernel.NEW /kernel
```

Until the FreeBSD system is rebooted, the booted kernel is /kernel.OLD, but getbootfile() says it is /kernel. If symbol addresses important to lsof in /kernel.OLD and /kernel don't match, the lsof WARNING messages result.

3.41.2 Why does lsof produce "garbage" output?

Kernel name cache warnings may not be the only sign that lsof
is using incorrect symbol addresses to read kernel values. If there's no reasonable test lsof can make on what it reads from the kernel, it may issue other warnings or even report nonsensical results.

The warnings may appear on STDERR, such as:

```
lsof: can't read proc table info
```

Or the warnings may appear in the NAME column as messages
saying lsof can't read or interpret some kernel structure --
e.g.,

```
... NAME
... can't read file struct from 0x12345
```

One possible work-around is to point lsof's kernel symbol
address gathering at the proper boot file. That can be
done with lsof's -k option -- e.g.,

```
$ lsof -k /kernel.OLD
```

The best work-around is to make sure the standard boot file
is properly sited -- e.g., if you've moved a new /kernel
in place, boot it.

3.42 Why does lsof report open files when run as super user that
it doesn't report when run with lesser privileges?

The most likely cause is that the HASSECURITY option was
selected when
the lsof executable was built.

If HASSECURITY is defined when lsof is built, and lsof is
run with the privileges of a non-ROOT user, it will only
list open files belonging to the user. The same lsof
executable, when run with root user privileges, will list
all open files.

However, if HASSECURITY and HASNOSOCKSECURITY are both
defined when lsof is built, lsof will list open files
belonging to the user and will also list anyone else's open
socket files, provided their listing is selected with the
"-i" option.

So first ask yourself if the process whose open files lsof
won't list belong to a user other than the one under which
you're running lsof, and are not open socket files. If
either is true, use lsof's help (-h or -?) option and look
for a line near the bottom of the help panel that says:

```
"... can list all files..."
```

If the leading "..." says "Only root" then HASSECURITY was
defined when lsof was built. If the trailing "..." says
", but anyone can list

socket files" then HASNOSOCKSECURITY
was also defined.

Should you want an lsof not built with HASSECURITY defined,
rerun the lsof Configure script. If you let Configure do
customization, make sure you answer 'n' when it asks if
you want to enable HASSECURITY and HASNOSOCKSECURITY. If
you don't need to do customization, you can rebuild lsof
with the "-n" option to Configure. Here's an example of
such a rebuild sequence:

```
$ Configure -clean
$ Configure -n <dialect-abbreviation>
$ make
```

More information on the HASSECURITY and HASNOSOCKSECURITY
options may be found in the "Security" section of the
00README file of the lsof distribution.

3.43 Test Suite Problems

3.43.1 Errors all tests can report:

3.43.1.1 Why do tests complain "ERROR!!! can't execute ../lsof"?

All tests in the test suite expect an executable lsof file
to exist in the tests parent directory, ../lsof.

If there's none there, the tests/Makefile has a rule to
make it, but there are probably
circumstances where that
rule may fail.

The work-around is to re-Configure and re-make lsof, then
run the test suite.

3.43.1.2 Why do tests complain "ERROR!!! can't find ..." a file?

Many tests create (or use from a supplied environment
variable path) a test file and use lsof to find it. When
lsof can't file the file, the tests report the error with
messages of the form:

```
ERROR!!! can't find ... : <some file path>
```
or
```
ERROR!!! lsof couldn't find ...
```

These type of error messages mean that the lsof field output

delivered to the test didn't contain a file that the test could identify as the one it intended lsof to find. It might also mean that the process information -- command name, PID or parent PID -- didn't match what the test expected.

This could imply a bug in the test or a bug in lsof. Try using lsof to find a known file that is open. For example, while in the tests sub-directory, do this:

```
$ sleep 30 < Makefile
$ ../lsof Makefile
```

If
lsof doesn't report that Makefile is open, then the fault may be with lsof. If lsof reports the file is open, search further in the test code for the failure cause.

3.43.1.3 Why do some tests fail to compile?

If a test suite program fails to compile, it may be because I've never had an opportunity to compile the test on the particular UNIX version you are using.

See Appendix B in 00TEST for a list of the UNIX dialects where the test suite has been validate.

3.43.1.4 Why do some tests always fail?

There are several tests in the optional group that have conflicting or special requirements:

LTbigf needs a dialect and file system that support large files.

LTlock won't work if the tests/ sub-directory is on an NFS file system.

LTnfs won't work if the tests/ sub-directory is not on an NFS file system.

So for two tests in particular, LTlock and LTnfs, one will generally fail.

Some failing tests can be run successfully by supplying to
them a path to the appropriate type of file system with the -p option.

3.43.1.5 Why does the test suite say it hasn't been validated on my dialect?

When you use the default rule of the test suite's Makefile, it may issue this complaint:

```
$ cd tests
$ make
!!!WARNING!!!

This dialect or its particular version may not have
been validated with the lsof test suite.  Consequently
some tests may fail or may not even compile.

!!!WARNING!!!
```

You are then given the opportunity to answer 'y' to have the test suite operation continue.

This message means that the tests/TestDB file in the tests sub-directory doesn't show that the test suite has been run with the combination of compiler flags found in tests/config.cflags. The tests might nor run; they may encounter compiler failures.

See 00TEST for more information on the UNIX dialects where the test suite has been validated and on the workings of TestDB and its supporting scripts.

When the tests/Makefile "auto" rule is used, the message is more terse and the condition is fatal.

```
This suite has not been validated on:

<dialect_description>
```

No opportunity to continue is offered.

The tests/Makefile "silent" rule will skip checking for the validation footprint.

3.43.1.6 Why do the tests complain they can't stat() or open() /dev/mem or /dev/kmem?

When the tests detect that lsof for the dialect reads its information from kernel memory (i.e., the LT_KMEM definition

is present in tests/config.cflags), and when the lsof
executable path is ../lsof, the tests make sure they can
stat() and open() for read access the relevant kernel memory
devices, /dev/kmem and possibly /dev/mem.

If those stat() or open() operations fail, the tests issue
an error message and quit. The message explains why the
system rejected the operation in terms of system "errno"
symbols and messages. More often than not the explanation
will be that the process lacks permission
to access the
indicated device node.

One work-around is to give the lsof executable being tested
the necessary permission -- e.g., via chgrp, chmod, etc.
-- and set its path in the LT_LSOF_PATH environment variable.
(See 00TEST.)

Another work-around is to make sure the process that runs
the tests has the necessary permissions -- e.g., run it as
root, or enable the process login to access the resources.
For example, I can run the tests on my personal work-station
because /dev/kmem and /dev/mem are readable by the "kmem"
group and my login is in that group.

3.43.2 LTbigf test issues

3.43.2.1 Why does the LTbigf test say that the dialect doesn't support large files?

Large file support is defined dialect by dialect in the
lsof source files and Configure script. If large file
support isn't defined there, it isn't defined in the LTbigf
test.

If you think that's wrong for a particular dialect, contact me
via e-mail at <abe@purdue.edu>. Make sure "lsof" appears
in the
"Subject:" line so my e-mail filter won't classify your letter
as Spam.

3.43.2.2 Why does LTbigf complain about operations on its config.LTbigf* file?

The LTbigf must be able to write a large file test (size
> 32 bits) and seek within it and the process file ulimit
size must permit the operation. If the default location

for the test file, tests/, isn't on a file system enabled
for large file operations or if the process ulimit file
block size is too small, lsof will get file operation
errors, particularly when seeking

There may be a work-around. Specify the path to a file
LTbigf can write in a file system enabled for large file
operations a the -poption. Make sure that the ulimit file
block size permits writing a large file. For example,
presuming /scratch23 is large-file-enabled, and presuming
you have permission to raise the ulimit file block size,
this shell commands will allow the LTbigf test to run on
AIX:

```
$ ./LTbigf -p /scratch23/abe/bigfile
```

(Note:
syntax for the ulimit command varies by dialect and
by shell. Discovering the proper variant is left to the
reader.)

More information on this subject can be found in the LTbigf
description in the 00TEST file. If course, the LTbigf.c
source file in tests/ is the ultimate source of information,

3.43.2.3 Why does LTbigf warn that lsof doesn't return file offsets?

On some dialects (e.g., Linux) lsof can't report file
offsets, because the data access method underlying lsof
doesn't provide them. If LTbigf knows that lsof can't
report file offsets for the dialect, it issues this warning:

```
LTbigf ... WARNING!!! lsof can't return file offsets
for this dialect, so offset tests have
been disabled.
```

LTbigf then performs the size test and skips the offset
tests.

For more information see 00TEST and the "Why doesn't
/proc-based lsof report file offsets (positions)?" Q&A of
this file.

3.43.3 Why does the LTbasic test complain "ERROR!!! lsof this ..."
and "ERROR!!!
lsof that ..."?

The LTbasic test program uses lsof to examine a running

lsof process. It looks for the lsof current working directory, executable (if possible), and kernel memory file (if applicable).

Failures to find those things result in the LTbasic error messages. More information on how LTbasic produces the error messages may be found in the LTbasic.c source file.

On HP-UX 11.11 and higher, for example, if the test's current working directory is on a loopback (LOFS) file system, LTbasic won't be able to find the current working directory of the lsof process because of a bug in the HP-UX kernel.

The solution for that HP-UX problem is to install an HP-UX patch. See the answer to the "Why doesn't PSTAT-based lsof report a CWD that is on a loopback (LOFS) file system?" question for more information on the patch.

3.43.4 NFS test issues

3.43.4.1 Why does the LTnfs test complain "couldn't find NFS file ..."?

The LTnfs test must work with an NFS test file. After it opens the file it asks lsof to find it on an NFS file system. If the file isn't on an NFS file system, lsof won't find it, and the NFS test script complains and fails.

The work-around is to use -p option to supply a path to a regular NFS file (not a directory) that is on an NFS file system that LTnfs can read. Presuming /share/bin/file is such a file and can be opened for reading by the LTnfs test, this sample shell command could be used to run the LTnfs test successfully:

```
$ ./LTnfs -p /share/bin/file
```

(If the NFS file system is enabled for large files, the NFS test will produce the error message described in the following Q&A.)

3.43.5 LTnlink test issues

3.43.5.1 Why does the LTnlink test complain that its test file is on an NFS file system?

The LTnlink test may complain:

LTnlink ... WARNING!!! test file <path> is NFS mounted.

and then issue an explanation and a hint about using the
-p option.

The LTnlist test does this because of the
way NFS file
links are managed when an NFS file is unlinked and the
unlinking process still has the file open. Unlike with
files on a local file system, when an NFS file that is
still open is unlinked, its link count is not reduced.

The file name is changed to a name of the form .nfsxxxx
and the link count is left unchanged until the process
holding the file open closes it. That's done by NFS so it
can keep proper track of the file on NFS clients and servers.

Since the link count isn't reduced when the LTnlink test
program closes the NFS test file it still has open, lsof
won't find it for LTnlink with a link count of zero.
Consequently, LTnlink disables that test section and issues
its warning.

The warning suggests that the unlink test section can be
run by giving LTnlink a path to a test file with the -p
option. That path must name a file LTnlink can write and
unlink. Presuming /scratch23/abe/nlinkfile is on a local
file system and the LTnlink test can write
to it and unlink
it, this sample shell command can be used to run the complete
LTnlink test successfully:

$ LTnlink -p /scratch23/abe/nlinkfile

3.43.5.2 Why does LTnlink delay and report "waiting for link count update: ..."?

On some UNIX dialects and file system combinations the
updating of link count after a file has been unlinked can
be delayed. Consequently, lsof won't be able to report
the updated link count to LTnlink for a while.

When lsof doesn't report the proper link count to LTnlink,
it sleeps and repeats the lsof call, using the "waiting
for link count update: ..." message as a signal that it is
waiting for the expected lsof response. The wait cycle
duration is limited to approximately one minute.

3.43.5.3 Why does LTnlink fail because of an unlink error?

LTnlink may fail with an error similar to:

    LTnlink ... ERROR!! unlink(<name>) failed: (Permission denied).

That message will be followed by a short explanation.

The error means that the
kernel support for the file system on
which the file <name> resides does not allow a process to
unlink a file while it has the file open. (When LTnlink is run
without the "-p path" option, it creates a <name> that begins
with "./config.LTnlink" and ends with the LTnlink process ID
number.)

An unlink failure of this type runs counter to original UNIX
file system behavior, but it has been observed on some file
system types, especially on the ZFS file system.

The work-around is to run LTnlink on a file system that allows
a process to unlink a file it has open. Usually /tmp has that
support. So, try running LTnlink this way:

    $ ./LTnlink -p /tmp/<name>

where <name> is a unique name in /tmp of your choosing. To
be safe, create a subdirectory in /tmp, named by your login:

    $ rm -f /tmp/<login>
    $ mkdir /tmp/<login>
    $ ./LTnlink -p /tmp/<login>/<name>

3.43.6 LTdnlc test issues

3.43.6.1 Why won't the LTdnlc test run?

Lsof is unable to access the DNLC
cache on AIX, because the
kernel symbols for the DNLC aren't exported. Contact IBM
to learn why that decision was made.

The LTdnlc test won't work on Apple Darwin because lsof
can't obtain reliable DNLC information.

The LTdnlc test may fail on other dialects. Failure causes
include: a busy system with a DNLC that is changing rapidly;
path name components too large for the DNLC; a file system

-- e.g., NFS, /tmp, loopback -- which doesn't fully
participate in the DNLC; or DNLC limitations (Many DNLC
implementations will only store path name components if
they are 31 characters or less.)

If you suspect the file system doesn't fully participate
in kernel DNLC processing, as a work-around rebuild and
test lsof on one that does.

3.43.6.2 What does the LTdnlc test mean by "... <path> found: 100.00%"?

Even when it succeeds the LTdnlc test will report:

LTdnlc ... /export/home/abe/src/lsof4/tests found: 100.00%

This message means that the LTdnlc test asked lsof to find
the
file at the indicated path five times and lsof found
the full path name in the indicated percentage of calls.
The LTdnlc test considers it a failure if the percentage
falls below 50.0%

3.43.6.3 Why does the DNLC test fail?

The DNLC test may fail when some component of the lsof
tests/ sub-directory can't be cached by the kernel DNLC.
Some kernels have a limit on the length of individual
components (typically) 32.

3.43.7 Why hasn't the test suite been qualified for 64 bit HP-UX
11 when lsof is compiled with gcc?

When I attempted to qualify lsof for HP-UX 11, compiled
with gcc 3.0, the LTsock test failed. I traced the failure
to a gcc compilation error. Because LTsock is an important
test, I didn't feel that the test suite was qualified if
it failed.

LTsock compiles and runs correctly on 64 bit HP-UX 11 when
compiled with HP's ANSI-C.

3.43.8 LTszoff test issues

3.43.8.1 Why does LTszoff warn that lsof doesn't return file offsets?

On some dialects (e.g., Linux)
lsof can't report file
offsets, because the data access method underlying lsof

doesn't provide them. If LTszoff knows that lsof can't
report file offsets for the dialect, it issues this warning:

    LTszoff ... WARNING!!! lsof can't return file offsets
    for this dialect, so offset tests have
    been disabled.

LTszoff then performs the size test and skips the offset
tests.

For more information see 00TEST and the "Why doesn't
/proc-based lsof report file offsets (positions)?" Q&A of
this file.

3.43.9 LTlock test issues

3.44 File descriptor list (the ``-d'' option) problems

3.44.1 Why does lsof reject a ``-d'' FD list?

Lsof rejects ``-d'' FD lists that contain both exclusions
and inclusions with messages like:

    lsof: exclude in an include list: ^1
    lsof: include in an exclude list: 2

That's because ``-d'' FD lists are processed as ORed lists,
so it makes no sense for them to contain both exclusions
and inclusions.

I.e.,, if a ``-d'' FD list were
to contain ``^cwd,1'', the
``^cwd'' member is useless, because the ``1'' member
dominates by saying "include only FD 1". That effectively
excludes ``cwd'' FD.

Note that lists may have multiple members of the same type,
exclude or include. They are processed as an ORed set.
If an FD isn't excluded by any member of an exclude list,
it is selected. If an FD is included by any member of an
include list, it is selected.

3.44.2 Why are file descriptors other than those in my FD list
reported?

The FD list that follows ``-d'' excludes or includes file
descriptors, but unless the ``-a'' (AND) option is specified,
the FD list selections are ORed to the other selections.

For example, the following lsof command will cause all file descriptors to be listed for the lsof command, and all but the cwd descriptor for all other commands, probably not what was intended.

```
$ lsof -clsof -d^cwd
```

Hint: use ``-a" -- e.g.,

```
$ lsof -clsof -a -d^cwd
```

3.45 How can I supply device numbers for inaccessible NFS file systems?

When lsof can't get device numbers for inaccessible NFS file systems via stat(2) or lstat(2), it attempts to get them from the mount table's dev=xxx options. Successes are reported with a warning message that indicates the source of the device number and that output might be incomplete as a consequence of the warnings.

Some system mount tables -- e.g., Linux /proc/mounts -- don't have a dev=xxx option. In that case, and provided lsof for the dialect supports them, you can use the +m option to create a mount table supplement file and the "+m m" option to use it.

First check the lsof -h (help) output to see if the +m and "+m m" options are supported. If they are, use +m to create a mount table supplement file when all mounted file systems are accessible. Use "+m m" later to make the supplement available when some mounted file systems might not be available.

Here's an example that creates a mount supplement file in $HOME/mnt-sup
and later makes it available to lsof.

```
$ rm -f $HOME/mnt-sup
$ lsof +m > $HOME/mnt-sup
...
$ lsof +m $HOME/mnt-sup <other lsof options>
```

If lsof has to get the device number from the supplement, it will issue an informative warning message. The warning can be suppressed with lsof's -w option.

Caution! Since the mount table supplement file is static, it

is its supplier's responsibility to update it as file system
mounts change.

For more information, consult the lsof man page. The
"ALTERNATE DEVICE NUMBERS" section has useful information on
how lsof acquires device numbers when stat(2) or lstat(2)
fail.

3.46 Why won't lsof find open files on over-mounted file systems?

When a file system, /xyz for example, is mounted on the same
mount point as another file system, /abc for example, running
lsof with an argument of the path of the first file system's
mount point -- the over-mounted one, /abc -- probably will not
reveal any files open
on /abc.

That's because lsof looks for open files on a file system by
looking for files with the file system's device number. The
two file systems usually have different device numbers and lsof
determines the device number search key from the supplied name
of the second file system.

A general work-around exists only for Linux. On that UNIX
dialect, when you know the over-mounted file system's mount
point path, you can ask lsof to report on all open files and
grep that output for the path of the over-mounted file system
mount point.

3.47 What can be done when lsof reports no more space?

Many lsof methods cache information in memory, using the
dialects malloc() library function. When malloc() can't
allocate the requested amount of memory, lsof exits with
warning messages similar to this AIX message:

    lsof: no more dev-ch space at pid 2257750: 0x82a8e600

Lsof then exits immediately and produces no more output.

A possible work-around is to increase the memory
foot print
of the shell that runs lsof. That is often done with the
ulimit(1) shell command.

3.48 What if the lsof build encounters ar and ld problems?

The lsof main and library Makefiles use the library archiver,

ar, and the system loader, ld, applications. Improperly
located, installed or configured versions of them may cause the
lsof build to encounter errors with them.

The application producing the error should identify itself in
its error messages.

The first thing to check the path of the application that is
being used. Try `which ar` or `which ld` to see if perhaps the
PATH used during the build might be causing the wrong archiver
or loader to be used.

If the problem is with the use of the wrong archiver, and it's
not possible to correct the PATH to it, try using the LSOF_AR
environment variable to specify the path to and arguments for
the correct archiver. See 00XCONFIG for more information and
note that LSOF_AR must specify the path to the archive
application
and the arguments for it, less the terminating
library and module name arguments.

If the problem is with the loader, there is no lsof work-
around. That's because lsof calls the loader via the C
compiler, so the problem must be fixed at the compiler (system)
level.

3.49 Why does lsof -i report an open socket file for a process, but
lsof -p on that process' ID report nothing?

The lsof in use was probably built with the HASSECURITY and
HASNOSOCKSECURITY options and the process in question does not
belong to the user of lsof.

The HASSECURITY option limits lsof output to processes owned
by the user invoking lsof and the HASNOSOCKSECURITY option
weakens that slightly to allow output of open socket file
information for all processes.

For example, if process PID 12345 is owned by some user other
than the one invoking lsof, and lsof has been compiled with the
HASSECURITY and HASNOSOCKSECURITY options, the following lsof
command will display the open socket files
of process 12345:

```
$ lsof -p 12345 -a -i
```

This security restriction is described in the lsof(8) manual
page.

4.0 AIX Problems

4.1 What is the Stale Segment ID bug and why is -X needed?

Kevin Ruderman reports that he has been informed by IBM
that processes using the AIX 3.2.x, 4.1[.12345]], 4.2[.1],
and 4.3.x kernel's readx() function can cause other AIX
processes to hang because of what appears to be file system
corruption.

This failure, known as the Stale Segment ID bug, is caused
by an error in the AIX kernel's journaled segment memory
handler that causes the kernel's dir_search() function
erroneously to believe directory entries contain zeroes.
The process using the readx() call need not be doing anything
wrong. Usually the system must be under such heavy load
that the segment ID being used in the readx() call has been
freed and then reallocated to another process since it was
obtained from kernel memory.

Lsof uses the readx() function to access library entry
structures,
based on the segment ID it finds in the proc
structure of a process. Since IBM probably will never fix
the kernel bug, I've added an AIX-specific option to lsof
that controls its use of the readx() function.

By default lsof readx() use is disabled; specifying the
``-X'' option enables readx() use.

If you want to change the default readx() behavior of AIX
lsof, change the HASXOPT, HASXOPT_ROOT, and HASXOPT_VALUE
definitions in dialects/aix/machine.h. You can also use
these definitions to enable or disable readx() -- consult
the comments in machine.h. You may want to disable readx()
use permanently if you plan to make lsof publicly executable.

When HASXOPT_ROOT is defined, lsof will restrict use of
the -X option to processes whose real UID is root; if
HASXOPT_ROOT isn't defined, any user may specify the -X
option. The Customize script offers the option to change
HASXOPT_ROOT when HASXOPT is defined and HASXOPT_ROOT is
named in any dialect's machine.h
header file.

I have never seen lsof cause a problem with its use of

readx(), but I believe there is some chance it could, given the right circumstances.

4.1.1 Stale Segment ID APAR

Here are the details of the Stale Segment ID bug and IBM's response, provided by Kevin Ruderman.

AIX V3
APAR=ix49183
user process hangs forever in kernel due to file system corruption
STAT=closed prs TID=tx2527 ISEV=2 SEV=2
(A "closed prs" is one closed with a Permanent ReStriction.)
RCOMP=575603001 aix v3 for rs/6 RREL=r320

AIX V4 (internal defect, no apar #)
prefix p
name 175671
abstract KERMP: loop for ever in dir_search()

Problem description:

1. Some user application -- e.g., lsof -- gets the segment ID (SID) for the process private segment of a target process from the process table.

2. The target process exits, deleting the process private segment.

3. The SID is reallocated for use as a persistent segment.

4. The user application runs again and tries to read the user area structure from /dev/mem, using the SID it read from the process table.

5. The loads done by the driver for /dev/mem cause faults in the directory; new blocks are allocated; the size changed; and zero pages created.

6. The next application that looks for a file in the affected directory hangs in the kernel's dir_search() function because of the zero pages. This occurs because the kernel's dir_search() function loops through the variable length entries one at a time, moving from one to the next by adding the length of the current entry to its

address to get the address of the next entry. This
process should end when the current pointer passes the
end of the known directory length.

However, while the directory length has increased, the
entry length data has not, so when dir_search() reaches
the zero pages, it loops forever, adding a length of

zero to the current pointer, never passing the end of
the directory length. The application process is hung;
it can't be killed or stopped.

IBM closed the problem with a PRS code (Permanent ReStriction)
under AIX Version 3 and had targeted a fix for AIX 4.2. They
have recently (I became aware of it September 10, 1996)
cancelled the defect report altogether and have indicated they
are not going to fix the defect.

4.2 Gcc Work-around for AIX 4.1x

When gcc is used to compile lsof for AIX 4.1x, it doesn't
align one element of the user structure correctly. Xlc
sees the U_irss element as a type "long long" and aligns
it on an 8 byte boundary. That's because the default mode
of xlc is -qlonglong; when -qlonglong is enabled, the
_LONG_LONG symbol is also defined.

Gcc sees U_irss as a two element array of type long, because
_LONG_LONG isn't defined. Hence gcc aligns the U_irss
element array on a 4 byte boundary, rather than an 8 byte
one, making the gcc incantation
of the user structure 4
bytes shorter than xlc's.

When the length of gcc's user structure is supplied as
argument 4 to the undocumented getuser() function of the
AIX kernel, getuser() rejects it as an incorrect size and
returns EINVAL.

Lsof has a work-around for this problem. It involves a
special test in the Configure script when the "aixgcc"
Configure abbreviation is used -- e.g.,

$ Configure -n aixgcc

The test is to compile a small program with gcc and check
the alignment of U_irss. If it's not aligned on an 8 byte
boundary, the Configure script makes a special copy of

<sys/user.h> in ./dialects/aix/aix<AIX_version> whose
U_irss will align properly, and generates compile time
options to use it.

While I have tested this work-around only with 4.1.4, it
should work with earlier versions of AIX 4.1. It does not
work for AIX 4.2; a different work-around is employed there.
(See the next section.)

If you want to use this technique to compile other AIX
4.1x
programs with gcc for using getuser(), check the
Configure script.

Stuart D. Gathman identified this gcc AIX alignment problem.

4.3 Gcc and AIX 4.2[.1]

Alignment problems with gcc and AIX 4.2[.1] inside the user
structure are more severe, because there are some new 64
bit types in AIX that gcc doesn't yet (as of 2.7.x) support.
The <sys/user.h> U_irss element problem, discussed in 4.3
above, doesn't exist in 4.2[.1].

The AIX lsof machine.h header file has a work-around,
provided by Henry Grebler, that bypasses gcc alignment
problems. Later versions of gcc (e.g., 2.8.x) will probably
bypass the problems as well.

4.4 Why won't lsof's Configure allow the use of gcc for AIX
below 4.1?

Gcc can't reliably be used to compile lsof for AIX versions
below AIX 4.1 because of possible kernel structure element
alignment differences between it and xlc.

4.5 What is an AIX SMT file type?

When you run AIX X clients with the DISPLAY environment
variable set to ``:0.0'' they communicate
with the AIX X
server via files whose kernel file structure has an undefined
type (f_type == 0xf) -- at least there's no definition for
it in <sys/file.h>.

These are Shared Memory Transport (SMT) sockets, an artifact
of AIXWindows, designed for more efficient data transfers
between the X server and its clients.

Henry Grebler and David J. Wilson alerted me to the existence of these files. Mike Feldman and others helped me identify them as SMT sockets.

The curious reader can find more about SMT sockets in /usr/lpp/X11/README.SMT.

4.6 Why does AIX lsof start so slowly?

When AIX lsof starts it compares the running kernel's identity to the one for which it was built, using /usr/bin/oslevel. That comparison can sometimes take a long time to complete, depending on the system's maintenance level and how recently it was examined with oslevel.

AIX revisions 4.67 and above for AIX 5 and above don't use oslevel to determine the kernel identity. They use uname(2) instead,
and it is much faster.

You can skip the oslevel test by suppressing warning messages with lsof's -w option. Doing that carries with it the risk of missing other warning messages, however.

You can also disable the kernel identity check by disabling the definition of the HASKERNIDCK symbol by editing AIX machine.h header file or by using the Customize script to disable it.

See the "Why does lsof warn "compiled for x ... y; this is z.?" section for more information.

4.7 Why does exec complain it can't find libc.a[shr.o]?

When you try to execute lsof you may get this complaint:

```
exec(): 0509-036 Cannot load program ./lsof because of
    the following errors:
 0509-022 Cannot load library libc.a[shr.o].
 0509-026 System error: A file or directory in
the path name does not exist.
```

This is probably the result of making lsof when the LIBPATH environment variable contained a directory path that doesn't contain libc.a. You can see what LIBPATH
contained when
lsof was made by using the dump application on lsof. For

example, if LIBPATH contained /foo/bar when lsof was made,
you will see this (partial) dump output:

```
   $ dump -H lsof
   ...
 ***Import File Strings***
   INDEX  PATH                    BASE        ...
   0      /foo/bar
```

To correct the problem, revisit the lsof source directory
and remake lsof this way:

```
   $ unset LIBPATH; make  (sh or ksh)
or
   % unsetenv LIBPATH; make  (csh or tcsh)
```

4.8 What does lsof mean when it says, "no PCB, CANTSENDMORE,
CANTRCVMORE" in a socket file's NAME column?

When an AIX application calls shutdown(2) on an open socket
file, but hasn't called close(2) on the file, the file will
remain visible to lsof as an open socket file without any
extended protocol information.

Lsof reports that state in the NAME column by saying that
there is "no PCB" (Protocol Control Block) for the protocol
(e.g., TCP in the NODE column). If the open socket file
has
the state variables SO_CANTSENDMORE and SO_CANTRCVMORE
set -- i.e., from the shutdown(2) call -- lsof reports them
with the CANTSENDMORE and CANTRCVMORE notes in the NAME
column.

4.9 When the -X option is used on AIX 4.3.3, why does lsof disable
it, saying "WARNING: user struct mismatch; -X option disabled?"

The -X option causes lsof to read the loader information
of the user structure from virtual memory via the readx()
system call. It does that with the user structure definition
from <sys/user.h> that was compiled into the lsof executable.

On AIX 4.3.3 there are two different user structure
definitions in two separate <sys/user.h> header files,
distributed at different times by IBM. If lsof was compiled
with one and the kernel on which lsof is being run was
compiled with the other, lsof normally won't get correct
loader information when it calls readx().

In an attempt to compensate for that difference, lsof makes
an independent check of the loader information
by getting
the user structure's open file count via readx() and
comparing it to the open file count obtained independently
via getprocs(). When the two counts don't match, lsof
tries to read the count (and re-read the loader information)
with two offsets, based on observed differences between
the two user structures.

When one of the three attempts produces a correct open file
count, lsof uses its corresponding offset on subsequent
readings of the loader information.

When none of the three attempts produces a correct open
file count, lsof issues the WARNING message and disables
-X processing.

To eliminate this problem, obtain an lsof binary that
matches the kernel of the AIX 4.3.3 system where you want
to run lsof. Compiling lsof on the target system is the
preferred way to get a matching binary.

4.10 Why doesn't the -X option work on my AIX 5L or 5.[123] system?

If your AIX 5L or 5.[123] system uses the ia64 architecture,
lsof needs setuid-root permission to be
able to do the
processing that -X requires.

Check the output of `uname -a` to determine the architecture
type.

The work-around is to give lsof setuid-root permission.

4.11 Why doesn't /usr/bin/oslevel report the correct AIX version?

The oslevel man page says, "The oslevel command reports
the level of the operating system using a subset of all
filesets installed on your system."

You can see which fileset is below the expected level with
oslevel's -l option. For example, if you believe your
system is at AIX level 4.3.3, but oslevel reports 4.3.2,
use this oslevel command to find the filesets below 4.3.3:

```
$ /usr/bin/oslevel -l 4.3.3.0
```

If you don't know what level argument to supply to oslevel's
-l option, use oslevel's -q option first.

4.11.1 Why doesn't /usr/bin/oslevel report the correct AIX version
on AIX 5.1?

The subset list for oslevel on AIX 5.1 seems to include at
least two filesets, xlsmp.msg.en_US.rte and xlsmp.rte, that
do not install from AIX 5.1
media with a 5.1.0.0 level.
Hence, oslevel reports 5.0.0.0 instead of the expected
5.1.0.0.

If either xlsmp.msg.en_US.rte or xlsmp.rte is installed,
lsof's Configure script and run-time tests will identify
the AIX version incorrectly. The run-time test will
issue a complaint message of this form:

    lsof: WARNING: compiled for AIX version xxx; this is yyy.

You can correct the Configure test by pre-defining the
oslevel value, setting the correct value in the LSOF_VSTR
environment variable before running the Configure script
-- e.g., to pre-define AIX 5.1 when using ksh, do this:

    $ LSOF_VSTR=5.1.0.0 Configure -n aix

You can't affect oslevel output without uninstalling
xlsmp.msg.en_US.rte and xlsmp.rte. If you can't do that,
you'll have to put up with the run-time complaint.

4.12 Why does lsof for AIX 5.1 or above Power architecture
complain about kernel bit size?

When you run an lsof binary on an AIX 5.1 or above Power
system, it might complain:

```
 lsof: FATAL: compiled for a 32 bit kernel.
   The bit size of this kernel is 64.
or
    exec: 0509-036 Cannot load program ./lsof because of
     the following errors:
         0509-032 Cannot run a 64-bit program on a 32-bit
     machine.
```

Starting at lsof revision 4.61, lsof binaries for Power
architecture systems running AIX 5.1 or above are closely

tied to the kernel bit size. Lsof must do that so it can
read and understand kernel structures.

Lsof's Configure script tunes the lsof configuration so
that the binary built in the make(1) step is adjusted to
the kernel bit size.

An lsof binary knows the bit size for which it was constructed,
tests the bit size of the kernel under which it is running,
and objects if the two sizes don't match. To see the bit
size for which lsof was constructed, run it with its -v
option and look for these lines in the output:

    configuration info: 32 bit kernel
 or
    configuration info: 64 bit kernel

(Note: these lines will
appear only in -v output for AIX
5.1 and above lsof binaries, built for Power architecture.)

You can see the kernel bit size test method in the aix
stanza of the lsof Configure script and in the get_kernel_access()
function of the lsof .../dialects/aix/dproc.c source file.

There is more information on pre-defining the kernel bit
size when building lsof in Configure, 00PORTING, and
00XCONFIG.

The only work-around is to use an lsof binary built to
match the running kernel bit size.

4.13 What can't gcc be used to compile lsof on the ia64 architecture
for AIX 5 and above?

Gcc can't be used to compile lsof on the ia64 architecture
for AIX 5 and above because I haven't had access to a system
that has a working gcc compiler. The gcc compiler on my
one and only ia64 AIX 5.1 test system, provided by IBM,
didn't work at all.

4.14 Why does lsof get a segmentation fault when compiled with gcc
for a 64 bit Power architecture AIX 5.1 kernel?

When lsof is configured with the
lsof "aixgcc" Configure
abbreviation, the resulting lsof executable may cause a
segmentation violation when it is run. I've observed this

with gcc version 2.9-aix43-010414-7.

As far as I have been able to tell, the segmentation fault
is the result of a gcc compilation, loading, or library
error. Watching lsof run with gcc's companion debugger,
gdb, shows no error in the lsof source code that might
explain the fault.

The only work-around I know is to use the IBM C compiler
in place of gcc -- i.e., use the "aix" lsof Configure
abbreviation.

4.15 Why does lsof ignore AFS on my AIX system?

The lsof Configure script quits on AIX when AFS is present,
the AIX version is greater than 4.3.3.0 or the AFS version
is greater than 3.5. That's because I have no test systems
available for those AIX and AFS version combinations.

When the lsof Configure script detects an AIX and AFS
version combination that is unsupported, it will report:

```
 !!!FATAL: Lsof does not support
AFS on this combination of
    AIX and AFS versions.  To disable AFS, set the
    value of the AIX_HAS_AFS environment variable to
    "no".
```

The only work-around is to set the AIX_HAS_AFS environment
variable as explained in the error message:

```
   $ AIX_HAS_NSF=no; export AIX_HAS_NFS
   $ ./Configure -n aix
```

4.16 Why does lsof report "system paging space is low" and exit?

When AIX paging space runs low, the AIX kernel sends a SIGDANGER
signal to processes, warning them that they should reduce their
memory usage.

When lsof receives that signal, it issues the following fatal
error message and exits:

```
   lsof: FATAL: system paging space is low.
```

A possible work-around is to limit the amount of information
lsof must cache in its process memory with the "-c", "-g", "-l"
and "-p" options.

Also see the answer to the "What can be done when lsof reports no more space?" question.

4.17 Why does lsof have a compilation problem on AIX 5.3 above maintenance level 1?

On some AIX 5.3 systems with maintenance levels 2 and higher installed, lsof 4.77 and below may not compile properly. The compiler complains the snapshotObject structure definition, needed by <j2/j2_inode.h>, is missing.

That problem is fixed in the 4.78 revision.

5.0 Apple Darwin Problems

5.1 What do /dev/kmem-based and libproc-based mean?

Lsof for Apple Darwin currently uses /dev/kmem to read kernel data structures from which it gathers and reports open file information. That version of lsof is called /dev/kmem-based lsof.

At an upcoming release lsof will use a library called libproc to obtain information about open files. That version of lsof wil be called libproc-based lsof.

The /dev/kmem-based lsof sources may be found in the kmem subdirectory of the dialects/darwin branch of the lsof source tree. When the supporting version of Apple Darwin is released, the libproc-based lsof sources will be found in .../dialects/darwin/libproc.

5.2 /dev/kmem-based Apple Darwin Questions

5.2.1 Why does Configure ask for a path to the Darwin XNU kernel header files?

When lsof was ported to Apple Darwin by Allan Nathanson at revision 4.53, some kernel header files needed by lsof weren't being exported by the developers. (That's still true at lsof revision 4.76.)

At first a shell script that Allan provided would get the missing header files by checking them out from the CVS

root. Although the script was updated from time to time,
eventually the re-organization of Darwin sources has made
it impossible to update the script to do an automatic
download of the missing header files.

At lsof revision 4.69 and above it is necessary for the Darwin
lsof builder to download the Darwin XNU kernel headers before
attempting to build lsof. The download my be done via a web
browser, starting at this URL:

    http://www.opensource.apple.com/darwinsource/index.html

Once there, select the link to the Mac OS X version that
matches the one on the
system where lsof is to be built.

Follow that link's "[Source]" link. Once there, select the
tar.gz link of the xnu* entry near the bottom of the page.
That entry should have a name that matches the xnu* name shown
by `uname -a` -- e.g., if uname reports:

    $ uname -a
    ... root:xnu/xnu-517.7.21 ...

Then the appropriate xnu* entry is xnu-517.7.21. Clicking
its link should lead to an "Apple Open Source" page requesting
an Apple ID and password.

Enter them if they're available. If an Apple ID and password
are not available, get them by following the instructions on
the page -- i.e., follow the signin.apple.com link.

Once a valid Apple ID and its password have been entered,
the download will begin. Select the saving of the downloaded
xnu*.tar.gz file in an appropriate place on the Mac OS X
system.

Once the download completes, install it. Use gunzip to
decompress the download and tar to extract the archive -- e.g.,

    $ gunzip -c xnu-517.7.21.tar.gz
| tar xf -

Remember the absolute path to the extracted archive. That is
its installed place. E.g., if the xnu-517.7.21.tar archive was
extracted to the lsof builder's home directory, its full
installation path will be something like:

~/xnu-517.7.21

Now run the lsof Configure script. When it asks for the path to the installed Darwin XNU kernel header files, supply the path to the gunzip'd and extracted xnu* archive -- e.g., ~/xnu-517.7.21.

The path to the Darwin XNU kernel headers may also be supplied to the Configure script in the DARWIN_XNUDIR environment variable, eliminating the need to enter it interactively -- e.g.,

$ DARWIN_XNUDIR=~/xnu-344.49 ./Configure -n darwin

5.2.1.1 Why does Configure complain that Darwin XNU kernel header files are missing?

These are some reasons why the lsof Configure script might claim that Darwin XNU header files are missing:

* The wrong path to them was specified.

* The files and directories in the path are not readable and searchable -- i.e., check the modes and ownerships.

* The downloaded archive doesn't match the Mac OS X version of the system.

If in doubt, revisit the Darwin XNU kernel header file download instructions in the answer to the question "Why does Configure ask for a path to the Darwin XNU kernel header files?"

If Configure still can't find Darwin XNU kernel header files, contact me via e-mail at <abe@purdue.edu> for help. Make sure "lsof" appears in the "Subject:" line so my e-mail filter won't classify your letter as Spam.

5.2.2 Why doesn't Apple Darwin lsof report text file information?

At the first port of lsof to Apple Darwin, revision 4.53, insufficient information was available -- logic and header files -- to permit the installation of VM space scanning for text files. As of lsof 4.70 it is sill not available.

Text file support will be added to Apple Darwin lsof after the necessary information becomes available.

5.2.3 Why
doesn't Apple Darwin lsof support IPv6?

At the first port of lsof to Apple Darwin, revision 4.53,
Apple Darwin lacked IPv6 support. IPv6 became available
in Apple Darwin version 1.5 and support for it was added
to lsof then.

5.2.4 Why does lsof complain about a mismatch between the release
for which lsof was compiled and the booted Mac OS X release?

When lsof is started on the "Gold Master" Darwin release
(aka Mac OS X), it complains:

    lsof: compiled for 1.0 release; this is 1.3.2.

This happens because the lsof binary released with Mac OS
X was built on a system whose release number (1.0) doesn't
match that of the released system -- usually 1.3.x Lsof
makes this check because UNIX dialect OS changes are often
accompanied by header file changes that affect lsof.

In this specific case, this error can be ignored. If you
don't want to do that, get the lsof distribution and build
lsof so its built-on and running-on Mac OS X release numbers
match.

5.2.5 Why does
lsof for Apple Darwin 8 and higher report
"stat(...): ..." in the NAME column?

Lsof for Apple Darwin 8 may report messages like these in the
NAME column:

    stat(/private/var/run/asl_prune): No such file or directory
 or
    stat(/private/var/db/netinfo/local.nidb/Config): Permission denied

Those messages indicate that lsof was unable to collect open
file information for the paths enclosed in "stat(...)" with the
stat(2) function, because the function encountered the reported
error.

A work-around for the "Permission denied" error is to run lsof
with elevated privileges -- e.g., when logged on as the super
user.

If the stat(2) error message is "No such file or directory", the file probably has been unlinked (removed) and there is no lsof work-around.

5.2.6 What are the limitations of Apple Darwin lsof link count reporting?

Lsof for Apple Darwin cannot report link count information reliably.

For Apple Darwin below 8 link count information is not always available
in the kernel node structures available to lsof.
When link count information is available, however, it includes link counts of zero. Thus, using lsof's +L1 option may result in the finding of some files whose link counts are zero.

Lsof can report only some link count information for Apple Darwin 8 and above. Link count information is only available for files where lsof can assemble the full file path and has permission to apply stat(2) to it. (See the answer to the "Why does lsof for Apple Darwin 8 and higher report "stat(...): ..." in the NAME column?" question for more information on stat(2) failures.)

Apple Darwin 8 and above files that have been unlinked and thus have a link count of zero cannot be found by stat(2) -- i.e., stat(2) returns a "No such file or directory" error. As a result lsof never displays link counts of zero and the use of lsof's +L1 option to find them always fails.

5.2.7 Why does Apple Darwin report process group IDs incorrectly?"

The
kmem version of lsof for Apple Darwin does not report process group IDs correctly when requested to do so with its ``-g" option. This is a bug that surfaced after the libproc version was released and access to kmem test systems has prevented patching the bug.

If you are using the kmem version and would like a fix for this problem, please send e-mail to me <abe@purdue.edu>. Make sure "lsof" appears in the "Subject:" line so my e-mail filter won't classify your letter as Spam.

5.3 Libproc-based Apple Darwin Questions

6.0 BSD/OS BSDI Problems

6.0.5 Statement of deprecation

As of lsof revision 4.76 support for BSDI BSD/OS has been dropped. The 4.76 distribution of lsof for BSDI BSD/OS may be found on lsof.itap.purdue.edu in pub/tools/unix/lsof/OLD/src.

7.0 DEC OSF/1, Digital UNIX, and Tru64 UNIX Problems

7.1 Why does lsof complain about non-existent /dev/fd entries?

When you run lsof for Digital UNIX 3.2, lsof may complain:

```
   lsof: can't lstat /dev/fd/xxx:
No such file or directory
   lsof: can't lstat /dev/fd/yyy: No such file or directory
```

(Or it may warn about other missing /dev/fd paths.) When you do an ``ls /dev/fd" none of the missing paths are listed.

This is caused by a bug in the DEC library function getdirentries(). For some reason, when /dev/fd is a file system mount point, getdirentries() returns an incorrect size for it to readdir(). (Lsof calls readdir() in its ddev.c readdev() function.) Because of the incorrect size, readdir() goes past the end of the /dev/fd directory buffer, encounters random paths and returns them to lsof. Lsof then attempts to lstat(2) the random paths, gets error replies from lstat(2), and complains about the paths.

Duncan McEwan discovered this error and has reported it to DEC. Duncan also supplied an alternate readdir() function as a work-around. I've incorporated his readdir() in dialects/osf/ddev.c (as the static ReadDir() function) with some slight modifications, and enabled its use when the USELOCALREADDIR symbol is defined.

The Configure script defines USELOCALREADDIR for Digital UNIX version and 3.2. If you don't want to use Duncan's local readdir() function, edit the Makefile and remove -DUSELOCALREADDIR from the CFGF string. When DEC releases a corrected getdirentries() function, I'll modify the Configure script to stop defining USELOCALREADDIR.

7.2 Why does the Digital UNIX V3.2 ld complain about Ots* symbols?

When you compile lsof on your Digital UNIX V3.2 system, ld may complain:

```
ld:
Unresolved:
knlist
_OtsRemainder32Unsigned
_OtsDivide64Unsigned
_OtsRemainder64Unsigned
_OtsDivide32Unsigned
_OtsMove
_OtsDivide32
_OtsRemainder32
*** Exit 1
```

Chris Eleveld reports this happens on Digital UNIX V3.2 systems after the Fortran compiler has been installed.

The best work-around seems to be to remove -lmld from the CFGL string in the Makefile produced by Configure -- i.e., change:

```
CFGL=    -lmld
```

to

```
CFGL=
```

According to the V3.2 man page for nlist(3), this shouldn't work, but my testing shows that it does. Although I haven't been able to test this second work-around, you might try adding -lots to CFGL, rather than removing -lmld -- i.e., change:

```
CFGL=    -lmld
```

to

```
CFGL=    -lmld -lots
```

WARNING: my testing also shows that the V2.0 nlist(3) man page means what it says when it calls for -lmld -- lsof loaded without -mld under V2.0 can't locate the proc (process) table address.

DON'T REMOVE -lmld FROM THE DIGITAL UNIX V2.0 MAKEFILE.

If you run into this problem, please let me know what problem you encountered and how you solved it.

7.3 Why can't lsof locate named pipes (FIFOs) under V3.2?

While lsof for V3.2 can report on named pipes (FIFOs), it can't find them by name. That appears to happen because of the way the V3.2 kernel lstat(2) function reports named pipe device numbers.

The V3.2 kernel reports the device number as 0xffffffff, while the kernel structures for named pipes that lsof examines contain the device number of the file system on which the named pipe resides.

Consequently, lsof can't match the device and inode number pair it receives from applying lstat(2) to the named pipe with any device and inode number pair it finds when scanning kernel structures.

I don't have a work-around. You can, of course, ask for full lsof output and use a post-processing filer (e.g., grep) to locate the named pipe of interest.

This problem doesn't exist under V2.0.

7.4 Why does lsof use the wrong configuration header files? For example, why can't the lsof compilation find cpus.h?

DEC OSF/1, Digital UNIX, and Tru64 UNIX configuration header files describe the hardware and software environment for which your kernel boot file was constructed. For example, /sys/<name>/cpus.h defines the number of CPUs in its NCPUS #define.

Lsof searches for the configuration header file subdirectory in /sys (/usr/sys for Digital UNIX version 4.0 and Tru64 UNIX) by converting the first host name component to capital letters -- e.g., TOMIS is derived from tomis.bio.purdue.edu. If that subdirectory exists, lsof uses header files from it. (Configure reports what subdirectory is being used.)

If Configure doesn't find a host-name derived subdirectory, it prompts you for the entry of a subdirectory name. If you can't find one, quit Configure and run the kernel generation process to create a proper configuration sub-directory. If you don't identify a proper configuration subdirectory and you try to compile lsof, the compiler will complain about missing header files -- e.g., a missing

cpus.h.

Once you have located or generated a proper configuration subdirectory, rerun Configure. If you have generated a configuration subdirectory whose name is derived from the host name, Configure will find and use it. If not, you will have to specify its name to Configure.

7.5 Why does lsof indicate incomplete paths with " -- " for Tru64 UNIX 5.1 files?

When lsof can't find a component of a path in the kernel's name cache (aka DNLC), or can't determine that the left-most component has as its parent the file system root, it uses an "incomplete path" notation. That notation begins with the file system root name, followed by " -- ", followed by the consecutive path name components lsof was able to find in the DNLC -- e.g., "/ -- init".

Because the DNLC was significantly redesigned in Tru64 UNIX 5.1, lsof's handling of the cache had to be completely redone. As part of the DNLC redesign a name cache entry parameter lsof formerly used to locate the file system root of a path was removed. With help from Chang Song I've been able to implement an alternate method for detecting the root of these file system types: AdvFS (MSFS), CDFS, DVDFS, FDFS, NFS, NFS3, and UFS.

When lsof doesn't know how to identify the root for a file system type, it will resort to the " -- " incomplete path notation.

7.6 Why doesn't lsof report link count, node number, and size for some Tru64 5.x CFS files?

Lsof reports link count, node number, and size for open CFS files as recorded in their kernel node structure's cached attributes. Sometimes not all attributes are cached on the system where lsof runs, so lsof cannot report them.

7.7 Why does lsof say it can't read the kernel name list or proc table on Digital UNIX 4.x or Tru64 UNIX?

By default on Digital UNIX 4 and Tru64 UNIX lsof reads the addresses for kernel symbols with the knlist(3) function. That function can fail, for example, when the kloadsrv

daemon isn't running or is malfunctioning. When that happens, lsof may abort with one of these error messages:

```
  lsof: can't read kernel name list from knlist(3): ...
or
  lsof: can't read proc table info
```

The first message suggests a complete knlist(3) or kloadsrv failure; the second, a partial one.

If you know the name of the file from which the running system was booted, e.g., /vmunix, you can use lsof's -k option to direct it to read kernel symbol addresses from the name list of that file --

```
  $ lsof -k /vmunix ...
```

If that works, then knlist(3) is malfunctioning and you need to fix it.

8.0 FreeBSD Problems

8.1 Why doesn't lsof report on open kernfs files?

Lsof doesn't report on open FreeBSD kernfs files because the structures lsof needs aren't defined in the kernfs.h header file in /sys/misc/kernfs.

8.2 Why doesn't lsof work on my FreeBSD system?

If lsof doesn't work on your FreeBSD system, first make sure you have the latest lsof revision. See the answer to the "Where do I get lsof?" question for information on how to get the latest lsof revision.

Once you have gotten the latest lsof revision, Configure and make it. If Configure fails -- e.g., it complains about an unknown FreeBSD version -- then lsof probably hasn't been ported to your FreeBSD version yet, and there's no need to go any further. Follow the answer to the "How do I report an lsof bug" to report the Configure complaint to me.

If you are able to Configure and make lsof, run its test suite. (See the answer to the "Is there a test suite?"

question for more information on how to use lsof's test
suite.)

If lsof still fails, make sure your kernel sources, kernel
header files, kernel boot file, standard header files and
libraries are synchronized. They should all be built from the
same CVS refresh. (Don't forget to do a "make buildworld"
followed by a "make installworld".) If they aren't, then the
KVM library or lsof may be using kernel structure definitions
that don't match the booted kernel; or lsof may fail to compile
properly because of header files in /usr/src/sys/sys and
/usr/include/sys that don't match.

If you have synchronized your kernel, header files and
libraries, and still can't get lsof to work, follow the
steps in the answer to the "How do
I report an lsof bug"
question to report the problem to me.

8.3 Why doesn't lsof work on the RELEASE version of CURRENT?

Lsof tracks the CURRENT release of the current leading edge
FreeBSD version, because my access to leading edge FreeBSD is
limited to FreeBDSD.org reference systems, all running the
CURRENT release.

Sometimes that tracking leads to changes in lsof that won't
work on an earlier RELEASE version of the current leading edge
version.

When that happens, please send e-mail to me <abe@purdue.edu>.
Make sure "lsof" appears in the "Subject:" line so my e-mail
filter won't classify your letter as Spam.

8.4 Why does kvm_open() complain it can't find some file?

If lsof issues this complaint:

```
lsof: kvm_open(execfile=/boot/kernel/kernel,
corefile=/dev/mem: No such file or directory
```

Your FreeBSD system might not have a /dev/mem device. If
not, create one -- e.g., as root do:

```
# mknod /dev/mem c <major> 0
# chmod 440 /dev/mem
# chgrp kmem
```

/dev/mem

For <major> use /dev/kmem's major device number.

You may have to run kldload, too -- again as root do:

```
# kldload mem
```

8.5 FreeBSD ZFS Problems

8.5.1 Why does FreeBSD lsof report "WARNING: no ZFS support has been defined."?

Lsof issues that message when it detects a file on a ZFS file system, but has not been built with support for ZFS. Lsof's Configure script detects support can be added for ZFS when it finds this file:

/usr/src/sys/contrib/opensolaris/uts/common/fs/zfs/sys/zfs_znode.h

That header file and others in the OpenSolaris files in /usr/src enable lsof to extract information about ZFS files from the kernel structures associated with them.

8.6 Why can't Configure create lsof_owner.h for FreeBSD 6 and above?

Lsof may report:

```
   Creating ./lockf_owner.h from /usr/src/sys/kern/kern_lockf.c
   FATAL ERROR: can't read /usr/src/sys/kern/kern_lockf.c
   FATAL ERROR: ./lockf_owner.h creation failed (see 00FAQ)
or
   Creating ./lockf_owner.h
from /usr/src/sys/kern/kern_lockf.c
   FATAL ERROR: ./lockf_owner.h creation failed (see 00FAQ)
```

Those messages mean that lsof's Configure script failed to create a local header file, ./lockf_owner.h, needed to use the new kernel file locking code of some versions of FreeBSD 6 and above.

The changes that implement that new locking code alter the lockf structure in <sys/lockf.h> and introduce a new structure, lockf_entry, to that header file. When Configure detects the presence of the lockf_entry definition in <sys/lockf.h>, it tries to construct the local header file, ./lockf_owner.h.

Configure has to do that because an unfortunate side effect of

the new kernel file locking code is that <sys/lockf.h> doesn't
contain the lockf_owner structure definition referenced in its
own lockf structure. Lsof needs to access elements of that
lockf_owner structure to determine if a lock belongs to the
process that has a file open.

The missing lockf_owner structure definition
is in the kernel
source file, typically /usr/src/sys/kern/kern_lockf.c.
Configure tries to extract the lockf_owner structure definition
from kern_lockf.c into lsof's local header file, ./lockf_owner.h.
If Configure can't do that, it reports:

    FATAL ERROR: ./lockf_owner.h creation failed

If Configure can't even read kern_lockf.c, it first reports:

    FATAL ERROR: can't read /usr/src/sys/kern/kern_lockf.c

The work-around for this problem is to update the FreeBSD
kernel /usr/src tree (e.g., do a CVSup or csup) on the system
where lsof is to be built and then do a "make buildworld"
followed by a "make installworld".

8.6.1 Why are there lockf structure compiler errors for FreeBSD 6.0
and higher lsof?

If, when compiling lsof, the compiler complains with error
messages like:

    dnode.c: In function 'get_lock_state':
    dnode.c:113: error: 'struct lockf' has no member named 'lf_flags'
    dnode.c:115: error: 'struct lockf' has no member named 'lf_id'
    ...

Then
lsof is being built on a system that has new kernel file
locking code and lsof's Configure script failed to build a
local lockf_owner.h header file with a structure definition
lsof needs.

See the "Why can't Configure create lsof_owner.h for FreeBSD 6
and above?" section for more information and a work-around.

8.6.2 Why don't /usr/src/sys/sys/lockf.h and /usr/include/sys/lockf.h
match?

This mismatch can cause the errors explained in the answer to

the "Why are there lockf structure compiler errors for FreeBSD 6.0 and higher lsof?" question.

If /usr/src/sys/sys/lockf.h has been updated with a CVSup or csup, the new lockf.h won't be propagated to /usr/include/sys until the "make buildworld" and "make installworld" steps have been completed.

8.7 FreeBSD and clang

As of lsof revision 4.87, lsof may be compiled with clang.

8.7.1 Why does clang complain about VOP_FSYNC?

There is an error in the Solaris ZFS compatibility vnode.h header file with use of VOP_FSYNC before it is defined. No work-around is possible that will eliminate the clang compile-time warning message about the invalid declaration of the VOP_FSYNC function.

9.0 HP-UX Problems

9.1 What do /dev/kmem-based and PSTAT-based mean?

Lsof for HP-UX 11.0 and below uses /dev/kmem to read kernel data structures from which it gathers and reports open file information. That version of lsof is called /dev/kmem-based lsof.

Starting with HP-UX 10.10, finding definitions for the necessary kernel structures became more difficult as HP no longer distributed header files in /usr/include that defined all kernel structures. So I started "inventing" structure definitions by using Q4 to display them.

By HP-UX 11, the process of invention became extremely intensive to support. Following a patch to the ipc_s structure in early 1999, my invented definition of that structure became incorrect. Although I was able to devise a work-around test for the patch with Q4, it was clear that my inventions were bound to cause more problems.

Discussion with HP about the patch led to my proposing that an lsof API in the HP-UX kernel was the proper solution. Much to my surprise, HP agreed. I believe Carl Davidson

was the prime mover behind that decision, but I know others
participated, among them Louis Huemiller, Rich Rauenzahn,
and Sailu Yallapragada. I am indebted to these folks and
HP for their willingness to do this work.

The API was added to the PSTAT interface in a project named
PEGL, Pstat Enhancements for Glance and Lsof. Louis and
Sailu did the bulk of the design and implementation work
and testing began in March, 2000

HP-UX 11.11 is the first version that provides PSTAT support
for lsof. HP-UX versions in between 11.0 and 11.11 -- all
Beta versions as far as I can determine -- have no lsof
support.

See the "PSTAT-based HP-UX lsof Questions" section for
questions and answers specific to PSTAT-based HP-UX lsof.
The next section, "Why doesn't
a /dev/kmem-based HP-UX lsof
compilation use -O?" covers /dev/kmem-based HP-UX lsof.

The /dev/kmem-based lsof sources may be found in the kmem
subdirectory of the dialects/hpux branch of the lsof source
tree. The PSTAT-based lsof sources may be found in
.../dialects/hpux/pstat.

9.2 /dev/kmem-based HP-UX lsof Questions

The sources for /dev/kmem-based lsof for HP-UX may be found
in lsof_<revision>/dialects/hpux/kmem.

Lsof's Configure shell script decides to use these sources
when it finds that the /usr/include/sys/pstat subdirectory
doesn't exist.

Lsof can be forced to use the /dev/kmem sources by setting
"/dev/kmem" in the HPUX_BASE environment variable. Consult
the Configure shell script and 00XPORTING for more information.

9.2.1 Why doesn't a /dev/kmem-based HP-UX lsof compilation use -O?

If you only have the standard (bundled) HP-UX C compiler
and haven't purchased and installed the optional one, then
you can't use cc's -O option. The HP-UX cc(1) man page
says
this:

"Options

Note that in the following list, the cc and c89 options
-A , -G , -g , -O , -p , -v , -y , +z , and +Z are
not supported by the C compiler provided as part of
the standard HP-UX operating system. They are supported
by the C compiler sold as an optional separate product."

Lsof's Configure script tries to detect what C compiler
product you have installed by examining your compiler. If
that examination reveals a standard (bundled) compiler,
lsof avoids using -O.

If the Configure compiler test fails, the C compiler will
complain that it doesn't support -O. You can suppress that
complaint with this make invocation:

```
$ make DEBUG=""
```

9.2.2 Why doesn't the /dev/kmem-based CCITT support work under 10.x?

Pasi Kaara, who originally provided the HP-UX CCITT support,
reports that it no longer works under HP-UX 10.x.
Consequently, at lsof revision 4.02 it has been disabled.

9.2.3 Why can't /dev/kmem-based lsof be compiled with
`cc -Aa` or
`gcc -ansi` under HP-UX 10.x?

Some HP-UX 10.x header files, needed by lsof, can't be
compiled properly in ANSI_C mode; structure element definition
and alignment problems result. The f_offset member of the
file structure, for example, is incorrect.

This ANSI-C obstacle extends to using the -Aa option of
the HP C compiler and the -ansi option of gcc.

9.2.4 Why does /dev/kmem-based lsof complain about no C compiler?

Lsof's Configure script looks in /bin and /usr/ccs/bin for
an HP C compiler, because it needs to know if the compiler
is the standard (bundled) one or the optional separate
product. If it finds no compiler in either place, Configure
quits after complaining:

```
No executable cc in /bin or /usr/ccs/bin
```

If you don't have a C compiler in either of these standard
places, you should consider installing it. If you have
gcc installed, you can use it by declaring the ``hpuxgcc''

abbreviation to lsof's Configure script.

If you have a C compiler
in a non-standard location, you
can use the HPUX_CCDIR[12] environment variables to name
the path to it. Consult the 00XCONFIG file of the lsof
distribution for more information.

9.2.5 Why does Configure complain about q4 for /dev/kmem-based lsof for HP-UX 11?

When you run Configure on an HP-UX 11 system, it may complain:

```
!!!ERROR!!!  !!!ERROR!!!  !!!ERROR!!!  !!!ERROR!!!
Configure can't use /usr/contrib/bin/q4 to examine the ipis_s
structure.  You must do that yourself, report the result in
the HPUX_IPC_S_PATCH environment variable, then repeat the
Configure step.  Consult the Configure script's use of
/usr/contrib/bin/q4 and the 00XCONFIG file for information
on ipis_s testing and the setting of HPUX_IPC_S_PATCH.
!!!ERROR!!!  !!!ERROR!!!  !!!ERROR!!!  !!!ERROR!!!
```

This message states that Configure cannot use q4 from
/usr/contrib/bin to examine the kernel's boot image for
the ipis_s structure. Maybe q4 hasn't been installed,
or
perhaps Configure can't execute it.

Lsof needs to gather information about ipis_s to determine
if the ipis_s structure is defined in the kernel boot image,
if the ipis_s structure of the kernel boot image has an
ipis_msgsqueued member, and if the ipc_s structure of the
kernel boot image uses has an ipc_ipis member.

The ipis_s structure isn't described in any header file
HP-UX releases with HP-UX 11. It appears in the private
lsof header file .../dialects/hpux/kmem/hpux11/ipc_s.h.
Lsof gets local and remote connection addresses (IP and
port numbers) from ipc_s, so an incorrect ipc_s definition
may cause incorrect reporting of TCP/IP connection addresses.
It definitely will cause incorrect reporting on 32 bit
kernels. In any case lsof should be compiled with a correct
ipc_s definition no matter the kernel bit size, so the
Configure script always tests for it when the HP-UX version
is 11.

For lsof's Configure script to gather the necessary ipis_s
information q4

needs to be installed in /usr/contrib/bin
and the kernel boot image, /stand/vmunix, needs to have
been processed with pxdb. If either is untrue, lsof issues
the above error message, perhaps preceded by q4 messages.
(Note: lsof's use of q4 may also fail if q4 can't execute
nm -- e.g., it can't find /usr/bin/nm, or there is a
conflicting, private version of nm earlier in the path.)

If /stand/vmunix hasn't been processed by pxdb, the q4
messages will include:

```
   q4: (error) vmunix not pxdb'd
or
   q4: (warning) /stand/vmunix has not been processed by pxdb.
```

It's possible to make a suitable private copy of /stand/vmunix
for configuring lsof. That requires /opt/langtools/bin/pxdb
or the q4 version of pxdb from /usr/contrib/bin/q4pxdb.
The path to the result is supplied to the lsof Configure
script in the HPUX_BOOTFILE environment variable. Configure
still requires /usr/contrib/bin/q4.

The following sample Bourne shell commands make a private
copy of /stand/vmunix
in /tmp, process it with pxdb or
q4pxdb, and supply its path to lsof's Configure script in
HPUX_BOOTFILE.

```
   $ cp /stand/vmunix /tmp/vmunix.lsof

   $ /opt/langtools/bin/pxdb /tmp/vmunix.lsof
 or
   $ /usr/contrib/bin/q4pxdb /tmp/vmunix.lsof

   ... pxdb messages ...
   $ HPUX_BOOTFILE=/tmp/vmunix.lsof Configure -n hpux
```

It may also be necessary to use q4 outside the lsof Configure
script. In that case q4 can be to determine the state of
ipis_s and ipc_s with these q4 commands:

```
   $ /usr/contrib/bin/q4 /stand/vmunix
   ...
   q4> fields -c struct ipc_s
   ...
   q4> fields -c struct ipis_s
```

Look in the q4 output for the ipc_ipis member of the ipc_s

structure, and look in the q4 output for the ipis_s structure
for the ipis_msgsqueued member. If ipc_s has ipc_ipis but
ipis_s lacks ipis_msgsqueued, set HPUX_IPC_S_PATCH environment
variable to "1". If ipc_s has ipc_ipis and ipis_s has
ipis_msgsqueued, set HPUX_IPC_S_PATCH to "2" -- e.g.,

```
   $ HPUX_IPC_S_PATCH=1
Configure -n hpux
  or
   $ HPUX_IPC_S_PATCH=2 Configure -n hpux
```

If ipc_s has no ipc_ipis member, set HPUX_IPC_S_PATCH to
"N" -- e.g., use this Configure step:

```
   $ HPUX_IPC_S_PATCH=N Configure -n hpux
```

9.2.6 When compiling /dev/kmem-based lsof for HP-UX 11 what do the
"aCC runtime: ERROR..." messages mean?

When the lsof Makefile asks the HP-UX unbundled compiler
to load lsof, it may complain:

```
   /bin/cc -o lsof  -DHPUXV=1100 -DHASVXFS -DHPUXKERNBITS=64 \
-I/home/abe/src/lsof4/dialects/hpux/kmem/hpux11 +DD64 \
-DHAS_IPC_S_PATCH=2 -I/home/abe/src/lsof4/dialects/hpux/kmem \
-DLSOF_VSTR=\"B.11.00\"  -g dfile.o dmnt.o dnode.o dnode1.o \
dnode2.o dproc.o dsock.o  dstore.o  arg.o main.o misc.o \
node.o print.o proc.o store.o usage.o -L./lib -llsof  -lelf \
-lnsl
   aCC runtime: ERROR: Unexpected use of shared libraries
   aCC runtime: ERROR: Read aCC manpage, +A option
   /usr/lib/nls/loc/locales.1//is_IS.iso88591
```

This is a bug in the HP-UX national
language support.
(Notice the last message with "locales" in it?) Complain
to HP -- then use this work-around before executing make:

```
   $ unset LANG
   $ make
```

9.2.7 Why doesn't /dev/kmem-based lsof for HP-UX 11 report VxFS file
link counts, node numbers, and sizes correctly?

This is usually the result of running an lsof binary whose
revision number is less than 4.57 on a system that has
OnlineJFS support installed. It can also happen with lsof
4.57 binaries when the OnlineJFS support with which they

were built doesn't match the OnlineJFS status of the system
on which they are run.

The OnlineJFS status of lsof 4.57 and higher binaries can
be determined by running:

```
$ lsof -v 2>&1 | grep HASONLINEJFS
```

If that shell pipe produces output, lsof was compiled with
OnlineJFS support enabled; no output, disabled.

If OnlineJFS is installed on an HP-UX 11 system the
/sbin/fs/vxfs/subtype executable exists and outputs "vxfs3.3"
when run.

The problem occurs
because the optional OnlineJFS support
installation doesn't update <sys/fs/vx_inode.h>. Consequently
lsof can be compiled with an incorrect definition of the
vx_inode structure and look for for link counts, node
numbers, and sizes in the wrong places in the structure.

The current response I have gotten from HP is that no
<sys/fs/vx_inode.h> update will be provided for OnlineJFS.

I've addressed this problem temporarily with a work-around
(hack) in lsof revision 4.57.

9.2.8 Why can't /dev/kmem-based lsof be built with gcc for 64 bit
HP-UX 11?

When Configure is given the "hpuxgcc" abbreviation, the
HP-UX version is 11, and the kernel bit size is 64, the
lsof Configure script may abort with the messages:

```
!!!!!!!!!!!!!!!! FATAL ERROR !!!!!!!!!!!!!!!!!!

APPARENTLY GCC CANNOT BUILD 64 BIT EXECUTABLES.
A COMPILER MUST BE USED THAT CAN.  SEE 00FAQ
FOR MORE INFORMATION.
```

(This is the "more information" in 00FAQ.)

This means the Configure script compiled
a test program
with gcc the result wasn't an ELF-64 binary. Lsof tries
two gcc modes, one with no options and another with the
-mlp64 option, before it concludes gcc can't be used.

See the "How can I acquire a gcc for building lsof for 64
bit HP-UX 11?" answer for information on where you might
be able to get a gcc for HP-UX 11 that can produce ELF-64
executables.

9.2.8.1 How can I acquire a gcc for building lsof for 64 bit HP-UX 11?

Check this HP URL:

http://h21007.www2.hp.com/dspp/tech/tech_TechSoftwareDetailPage_IDX/1,1703,547,00.html

(That's one very long link; be careful you cut 'n paste it
all.)

In November 2001 that URL led to a web page whose title
was "gcc for hp-ux 11." The page offered a link for
downloading a 64 bit gcc 3.0 compiler for HP-UX 11.0 and
11i. Rich Rauenzahn of HP installed that compiler on an
HP test system he allows me to use and I successfully built
a 64 bit lsof with it.

The HP package may install the 64 bit capable gcc in
/usr/local/pa20_64/bin/gcc,
so you may have to adjust your
path or set the LSOF_CC environment variable to compensate.

9.2.9 Why does /dev/kmem-based lsof for HP-UX 11 report "unknown file
system type" for some open files?

The lsof binary being used probably doesn't have support for
the VxFS file system.

To confirm that, check `lsof -v` output for "-DHASVXFS". If
it's not present, lsof doesn't have VxFS support.

You also need to establish that lsof really is complaining
about VxFS files by checking the kernel boot file for the
symbol associated with the hexadecimal address reported in the
"unknown file system type" message -- e.g., "v_op: 0x8711c8."
Use nm(1) to do that:

```
$ nm -x /stand/vmunix | grep 8711c8
```

If nm reports the symbol associated with the address is
vx_vnodeops, then lsof is complaining about an open VxFS file.

The solution in that case is to build lsof yourself (The

bundled C compiler will do it.), making sure that lsof's
Configure script detects
the presence of VxFS. Configure does
that by finding these two header files:

```
   /usr/include/sys/fs/vx_hpux.h
   /usr/include/sys/fs/vx_inode.h
```

If the system where you are building lsof doesn't have those
header files, but does have VxFS, you might be able to install
the header files by installing the HP JournalFS package from
the CoreOS CD -- in particular the file set JournalFS.VXFS-PRG
and its associated patch, PHKL_18543. (My thanks to Steve
Bonds for that information.)

Finally, if you find that lsof isn't complaining about VxFS
when it complains about an unknown file system type, send
e-mail to me <abe@purdue.edu> for further assistance. Make
sure "lsof" appears in the "Subject:" line so my e-mail filter
won't classify your letter as Spam.

9.2.10 Why does the ANSI-C compiler complain about comments in HP-UX
11 header files?

When compiling lsof on HP-UX 11, the HP ANSI-C compiler's
pre-processor, cpp, may complain about comments in HP-UX header
files
-- e.g.,

```
   cpp: "/usr/include/sys/cdfs.h", line 232: warning 2028:
 Found comment inside comment started on line 232.
   cpp: "/usr/include/sys/cdnode.h", line 196: warning 2028:
 Found comment inside comment started on line 196.
   cpp: "/usr/include/nfs/snode.h", line 30: warning 2028:
 Found comment inside comment started on line 30
```

This is not a problem with lsof. It is a problem with the
HP-UX header files; they have non-compliant ANSI-C comment
sequences in them -- e.g.,

```
   <sys/cdfs.h>: 232
 /* struct  cdfs *cdfs_link;  /* linked list of file systems */
```

The initial "/*" is not terminated by an ending "*/" before the
appearance of a second "/*".

9.2.11 Why does dnode1.c cause the HP-UX 11 compiler to complain that
<sys/fs/vx_inode.h> is missing or incorrect?

If CFLAGS in the lsof Makefile for an HP-UX 11 compilation includes HASONLINEJFS, indicating the system has OnlineJFS support, lsof needs the <sys/fs/vx_inode.h> header file. Sometimes it is missing
from /usr/include/sys/fs.

<sys/fs/vx_inode.h> is a header file that must be obtained from Veritas. If that proves impossible, please contact me via e-mail at <abe@purdue.edu>. Make sure "lsof" appears in the "Subject:" line so my e-mail filter won't classify your letter as Spam.

9.3 PSTAT-based HP-UX lsof Questions

The sources for PSTAT-based lsof for HP-UX may be found in lsof_<revision>/dialects/hpux/pstat.

Lsof's Configure shell script decides to use these sources when it finds that the /usr/include/sys/pstat subdirectory exists.

Lsof can be forced to use the PSTAT-based sources by setting "pstat" in the HPUX_BASE environment variable. Consult the Configure shell script and 00XPORTING for more information.

9.3.1 Why does PSTAT-based lsof complain about pst_static and other PSTAT structures?

When lsof starts it may issue one of these fatal error messages:

```
lsof: FATAL: can't determine PSTAT static size
lsof: FATAL: can't read <n> bytes of pst_static

lsof: FATAL: pst_static doesn't contain <name>_size
lsof: FATAL: <name>_size should be <n>
```

These messages indicate that lsof's tests for the proper level of PSTAT support have failed. The structure names, given in <name>, and sizes, given in <n>, identify the support deficiency more precisely.

You may need to upgrade the PSTAT support in your kernel to be able to use PSTAT-based lsof.

9.3.2 Why does PSTAT-based lsof complain it can't read pst_*

structures?

Lsof may put messages like the following in the NAME column of its output.

```
can't read cwd pst_filedetails: Permission denied
can't read mem pst_filedetails: Permission denied
can't read rtd pst_filedetails: Permission denied
can't read txt pst_filedetails: Permission denied
can't read pst_filedetails: Permission denied
can't read 3 stream structures: Permission denied
can't read pst_socket: Permission denied
```

These messages indicate that the lsof binary lacks the authority to read the name structures for processes other than ones belonging to the UID under which lsof is running. Authority to read the structures of other processes is limited to root processes -- i.e., lsof must have setuid-root permission if it is to list open files for arbitrary processes.

If you want to eliminate these errors, you must run lsof as root or install it with setuid-root permission.

9.3.3 Why does PSTAT-based lsof rebuild the device cache file after each reboot?

After each HP-UX rebuild, the first time a user runs lsof it will report:

```
lsof: WARNING: device cache mismatch: /dev/tun...
lsof: WARNING: created device cache file: /<user_path>
```

This happens because the device numbers on /dev/tun* device nodes are recalculated at each reboot. When lsof detects a change in the device number of a /dev/tun* file, it rebuilds its local device cache file.

9.3.4 Why doesn't PSTAT-based lsof report TCP addresses for telnetd's open socket files?

When lsof can't report TCP addresses for telnetd's open socket files it is because an unpatched PSTAT kernel interface doesn't report the addresses to lsof.

This has been addressed in PSTAT kernel patch PHKL_24047.

It is available from the HP IT Resource Center at:

http://itrc.hp.com

In the page's "maintenance / support" box select the "individual patches" link. Once at its page, select the "hp-ux" link. On that page select the "Series 800" or "Series 700" radio button and select "11.11" from the pull-down list to the right of the button. Under "search or browse the path list" select "Search by Patch IDs" from the pull down list, enter PHKL_24047 in the following text box, and select search. That should lead to information about PHKL_24047 and a link for downloading it. (You may have to log in first and you may have to create a login identity by registering before you can log in.)

Some time in March 2006 the PHKL_24047 patch was "lost" by the HP-UX networking lab. It has been "found" again in August 2006 and will be re-released as a GRO patch "some time." I don't yet know when that will be. You must contact HP to learn about the availability of the GRO patch.

9.3.5 Why does PSTAT-based lsof cause an HP-UX 11.11 kernel panic?

When PSTAT-based lsof runs on some HP-UX 11.11 kernels, the kernel may panic. Symptoms include:

Console message:
0xFBE000301100EF00 00000000 0000EF00 -
type 31 = legacy PA HEX chassis-code

/var/adm/syslog:
... vmunix: Trap Type 15 (Data page fault)
... vmunix: Instruction Address (pcsq.pcoq) = 0x...

The panic is caused by a bug in the way PSTAT's pstat_getstream() function obtains module names from streams managed by the otsam stream driver (part of OSI Transport Services). Lsof calls pstat_getstream() when it encounters an open otsam stream file. An HP-UX 11.11 system uses otsam if otsam appears in /stand/system.

HP-UX 11.11 patch PHKL_24507 (available some time after July 15, 2001) fixes the pstat_getstream() bug. See the information in the answer to the "Why doesn't PSTAT-based

lsof report TCP addresses for telnetd's open socket files?"
question for information on how to obtain the patch.

9.3.6 Why doesn't PSTAT-based lsof report a CWD that is on a loopback (LOFS) file system?

When PSTAT-based lsof reports on processes whose current working directory (CWD) is on a loopback file system, lsof can't report the open CWD file. The reason is that the HP-UX 11.11 and above kernel's loopback file system code is not passing the CWD file ID to the kernel's pstat(2) code. Hence lsof is given no information on the lofs CWD.

The problem was first reported to me by Ermin Borovac and an internal bug report was filed with the HP-UX file system group on October 26, 2004. That report has now been answered by the patch PHKL_33200 -- s700_800 11.11 lofs cumulative patch. The HP IT Resource Center (http://itrc.hp.com) is a source for the patch.

9.3.7 Why
do some swinstall packages for PSTAT-based HP-UX 11.11 packages complain about setgid and setuid bits?

First, let me explain that I do not provide lsof swinstall packages for lsof. Others provide them and they should be contacted about problems with their packages.

However, I have become aware of a problem with one package about which I have some information I can share. The problem shows up in these swinstall messages:

```
ERROR:   Unknown owner and/or group for file
  "/usr/local/bin/lsof". SUID and/or SGID bit was
  not set.
ERROR:   Failed installing fileset "lsof.lsof-RUN,r=4.73".
  Check the above output for details.
```

The swpackage SUID/SGID functionality was restricted by changes for POSIX compliance, breaking backward compatibility. The patch PHCO_27671 allows SUID/SGID for uid/gid of 0 only, as a compromise between backward compatibility and POSIX conformance.

If the setuid bit is to be set on the executable, the UID
and
GID of the executable must be 0 (zero).

9.3.8 Why won't the bundled C compiler build PSTAT-based lsof for

PA-RISC HP-UX 11.23?

A PA-RISC HP-UX 11.23 bundled C compiler dated May 2005 or later will not build PSTAT-based lsof. It will deliver error messages related to the system's <gssapi/gssapi.h> header file.

There is nothing wrong with that header file or lsof. The problem is that the bundled C compiler can't cope with the gssapi.h header file.

The work-around is to use the HP ANSI C compiler. Using gcc is not a satisfactory work-around. See the answer to the "Why won't gcc build PSTAT-based lsof for PA-RISC HP-UX 11.23?" question for more information.

9.3.9 Why won't gcc build PSTAT-based lsof for PA-RISC HP-UX 11.23?

Gcc will not even compile PSTAT-based lsof revisions below 4.77 for PA-RISC HP-UX 11.23 dated May 2005 or later. It reports errors in lsof's print.c fill_portmap() function about missing members of the rpcent structure. That happens because gcc defines _XOPEN_SOURCE_EXTENDED which disables the definition of the rpcent structure in <netdb.h>.

Using the HP bundled C compiler is not a viable work-around. That is explained in the answer to the "Why won't the bundled C compiler build PSTAT-based lsof for PA-RISC HP-UX 11.23?"

While an lsof revision 4.77 or higher can be compiled with gcc, the results are unreliable. Lsof will compile, but it occasionally produces segment faults when it runs. I have not been able to reproduce the failure reliably or locate a debugger that will work with the gcc-compiled lsof.

The only reliable work-around is to use the HP ANSI C compiler.

9.3.10 Why does PSTAT-based lsof complain, "FATAL: pst_stream_size should be: 672; is 72" on HP-UX 11.11 and above?

This message indicates a mismatch between the PSTAT header files used to build lsof (<sys/pstat.h> and those in the /usr/include/sys/pstat subdirectory), and those that built the running kernel.

Unfortunately the June

2008 patch set for HP-UX 11.23 creates
this inconsistency, because it does not contain all the patches
needed to match the kernel with the PSTAT header files. Even
more serious is that the missing patches update the kernel's
PSTAT support to provide TCP/UDP endpoint information to lsof
from TCP/TLI streams.

The patch inconsistency comes about because, while the following
patch is installed,

PHKL_36577 1.0 PM-PSTAT section 2 manpage changes

other kernel patches are not.

The PHKL_36577 patch updates the PSTAT header files and manual
pages to match kernel changes that other patches with the
following numbers (or patches that contain or supersede them)
contain:

PHNE_36575 1.0 Cumulative STREAMS Patch
PHNE_37670 1.0 cumulative ARPA Transport patch
PHNE_37851 1.0 NFS cumulative patch

Those patches implement the kernel changes that support the
delivery of information promised in patch PHKL_36577.

The work-around is to install the missing patches.

9.4 Why
won't the HP-UX depot install?

I don't distribute lsof depots, so I can't support them.

From time to time depots prepared by various sites -- e.g.,
usually HP-UX software collection sites -- will contain errors
that cause installation of the depot to fail.

Do not contact me when this happens. Instead, contact the
administrator of the site that prepared the depot.

As should be clear from the bulk of the lsof documentation, I
do not recommend you use pre-built lsof binaries in any form.
Instead, I recommend you obtain the lsof source distribution
and build lsof yourself.

10.0 Linux

10.1 What do /dev/kmem-based and /proc-based lsof mean?

At approximately Linux 2.1.72 and exactly at lsof revision
4.23 support for Linux forks. The first fork, containing
the oldest lsof form is based on access to kernel memory
structures, and is called /dev/kmem-based lsof. A
/dev/kmem-based lsof is heavily intertwined with the Linux
kernel version, its header files,
and its system map file.
Typically a /dev/kmem-based lsof needs only setgid permission
to local all open file information.

After approximately Linux 2.1.72 and at revision 4.23 lsof
obtains all its information from the /proc file system.
That lsof is called the /proc-based lsof. A /proc-based
lsof does not read kernel memory, needs neither kernel
header files nor the system map file, and is less likely
to be affected by Linux kernel changes. However, it does
require setuid-root permission to list all open files, and
it can't report file offsets (positions).

After revision 4.52 the /dev/kmem-based Linux sources for
lsof are no longer distributed. Information about them
may be found in the 00INDEX and README files at:

ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof/OLD/src

10.2 /proc-based Linux lsof Questions

10.2.1 Why doesn't /proc-based lsof report file offsets (positions)?

/proc-based lsof revisions 4.79 and above can only report file
offsets (positions)
for the files of Linux kernels 2.6.22 and
above.

During its initialization /proc-based lsof tests to see if
offset information can be obtained. If it cannot, lsof
disables offset reporting. If the -o option was selected, lsof
also issues this warning:

lsof: WARNING: can't report offset; disregarding -o.

10.2.2 Why does /proc-based lsof report "can't identify protocol" for
some socket files?

/proc-based lsof may report:

```
COMMAND PID ... TYPE ... NODE NAME
pump    226 ... sock ...  309 can't identify protocol
```

This means that it can't identify the protocol (i.e., the AF_* designation) being used by the open socket file. Lsof identifies protocols by matching the node number associated with the /proc/<PID>/fd entry to the node numbers found in selected files of the /proc/net sub-directory. Currently /proc-based lsof examines these protocol files:

```
/proc/net/ax25  (untested)
/proc/net/icmp
/proc/net/ipx  (needs kernel patch)
/proc/net/netlink

/proc/net/packet
/proc/net/raw
/proc/net/raw6
/proc/net/sctp/assocs
/proc/net/sctp/eps
/proc/net/sockstat
/proc/net/sockstat6
/proc/net/tcp
/proc/net/tcp6
/proc/net/udp
/proc/net/udp6
/proc/net/udplite
/proc/net/udplite6
/proc/net/unix
```

If /proc-based lsof says it can't identify the protocol for an open socket file, you may be able to identify the protocol yourself by using grep to look for the specific node number in the files of /proc/net -- e.g.,

```
$ grep <node_number> /proc/net/*
```

You may not be able to find the desired node number, because not all kernel protocol modules fully support /proc/net information.

If you find a matching node number in a /proc/net file that is not currently being processed by lsof, contact me via e-mail at <abe@purdue.edu>. I'll discuss adding support to /proc-based lsof for the protocol of the /proc/net file with you. Make sure "lsof" appears in the "Subject:"

line so my e-mail filter
won't classify your letter as Spam.

The code that matches node numbers of open IPX protocol
socket files to those in /proc/net/ipx requires Jonathan
Sergent's Linux 2.1.79 patch to /usr/src/linux/net/ipx/af_ipx.c.
The patch, suitable for input to Larry Wall's patch program,
may be found in the lsof distribution file:

.../dialects/linux/proc/patches/net_ipx_af_ipx.c.patch

10.2.3 Why does /proc-based lsof warn about unsupported formats?

Lsof may issue the following warning:

lsof: WARNING: unsupported format: /proc/net/<file>

if the header line of the indicated <file> in /proc/net --
ax25, ipx, raw, tcp, udp, or unix -- doesn't match what
lsof expects to find.

When the header line of a /proc/net file isn't what lsof
expects, lsof probably can't parse the rest of the file
correctly and doesn't try. As a result, lsof can't report
any NAME column information (e.g., local and remote addresses)
for socket files bound to the indicated
network protocol.

If you get this warning, please send me e-mail at <abe@purdue.edu>.
Include the contents of the file lsof claims has an unsupported
format. Make sure "lsof" appears in the "Subject:" line so my
e-mail filter won't classify your letter as Spam.

10.2.4 Why does /proc-based lsof report "(deleted)" after a path name?

The "(deleted)" notation following a path name in /proc-based
lsof's NAME column comes from the /proc/<PID>/fd/<FD> entry
for the open file. It's the Linux kernel's way of indicating
the file is open but has been unlinked (rm'd).

10.2.5 Why doesn't /proc-based lsof report full open file information
for all processes?

/proc-based lsof can only report on processes whose /proc
files it has permission to read. /proc normally grants
permission to read all its files only to root or to the
owning user ID.

Without permission to read most /proc files, lsof can only
report full information for processes belonging to the user
who is running
lsof. /proc-based lsof may be able to report
some information for all processes, depending on the
permissions of their associated /proc files, but usually
/proc-based lsof won't be able to access the files in
/proc/<PID>/fd/ that describe regular open files.

If you want /proc-based lsof to report on all processes, you
must install it with setuid-root permission.

10.2.6 Why won't Customize offer to change HASDCACHE or WARNDEVACCESS
for /proc-based lsof?

/proc-based lsof doesn't read device information from /dev
or the device cache file, so it makes no sense to change
the state of device cache processing or /dev node accessibility
warnings.

10.2.7 /proc-based lsof Linux NFS questions

10.2.7.1 Why can't lsof find files on an accessible NFS file system?

On occasion lsof may be unable to identify that an open
file is on an NFS file system. This is most likely the
result of a bug in the way the Linux kernel supplies
information to the reader of /proc/mounts (lsof) --
sometimes
that pseudo-file is truncated by the kernel.

One way to see if this is the case is to search for the
NFS file system in /proc/mounts -- e.g.,

    $ grep <NFS_file_system_mount_point> /proc/mounts

If you get no output or the third word of the output isn't
"nfs", then lsof won't consider the file system an NFS file
system.

A second test is to look at the end of /proc/mounts --
e.g.,

    $ tail /proc/mounts

If tail reports "# truncated" then /proc/mounts is incomplete
because of a Linux kernel bug. The bug is documented at:

http://www.xss.co.at/sysinfo/mounts.html

The bug is fixed in Linux kernel 2.4.18, and possibly in some earlier Linux kernel versions.

10.2.7.2 Why can't lsof find files on an inaccessible NFS file system?

If lsof issues this message about a Linux file system, mounted from an NFS server:

lsof: WARNING: can't stat() nfs file system /xxx/yyy

Then lsof won't be able to find any open files on the file system.

That's because of an inadequacy in the Linux /proc file system. Its /proc/mounts file doesn't give the device doublet (major and minor numbers) of the file system as do many UNIX systems (e.g., Solaris). The only way lsof can get the device doublet for a Linux file system is to call stat(2) on the file system path, which fails if the NFS server isn't accessible.

When lsof doesn't know the device doublet of a file system, it can't find open files on the inaccessible file system, because it can't match the doublets of open files to the doublet of the inaccessible file system.

This topic is covered extensively in lsof(8) it its ALTERNATE DEVICE NUMBERS and BLOCKS AND TIMEOUTS sections.

10.2.8 Why doesn't /proc-based Linux lsof report socket options and values, socket state flags, and TCP options and values?

The Linux /proc file system doesn't report socket options and values, socket states, and TCP options and values to lsof.

10.2.9 Does /proc-based Linux lsof use a device cache?

No.
The Linux /proc/<PID>/fd/* entries provide device names to lsof via readlink(2). It is not necessary to enable device cache processing for /proc-based Linux lsof via the Customize script or modifications to the Linux machine.h header file.

10.2.10 Why doesn't /proc-based Linux lsof report any or all file structure

values for its +fcfgGn option?

/proc-based lsof revisions 4.79 and above can only report some
file structure values for Linux kernels below 2.6.22.

When running on Linux kernels at 2.6.22 and above lsof 4.79 can
report some file flag values -- i.e., in response to the +fg or
+fG options. The flag values are obtained from the
/proc/<PID>/fdinfo/ files introduced at Linux kernel 2.6.22.

/proc-based Linux lsof tests its availability to obtain file
flag values at initialization. If values are not available,
lsof disables file flag reporting. If the flags were requested
with +fg or +fG, lsof displays this warning:

    lsof: WARNING: can't report
file flags; disregarding +f.

As a special note, when Linux lsof can report flag bits, it
will not report 'R' for a read-only file. There is no
read-only flag bit O_* symbol in <fcntl.h> (or <bits/fcntl.h>)
and lsof reports only bits that are set. The absence of O_RDWR
and O_WRONLY flag bits implies the file is read-only.

10.3 Special Linux file types

10.3.1 Why is ``DEL'' reported as a Linux file type?

Lsof usually reports entries from the Linux /proc/<PID>/maps
file with ``mem'' in the TYPE column. However, when lsof can't
stat(2) a path in the process' ``maps'' file and the ``maps''
file entry contains ``(deleted)'', indicating the file was
deleted after it had been opened, lsof reports the file type as
``DEL''.

10.3.2 Why is ``unknown'' reported as a Linux file type?

Lsof may report a Linux file's type as ``unknown'' in the TYPE
column when lsof can't obtain complete stat(2) results for the
file.

Usually the NAME column will contain a ``(stat: xxx)'' error
message,
but that could have been suppressed with the lsof
``-w'' option.

10.4 Linux ``mem'' Entry Problems

10.4.1 What do ``path dev=xxx'' and ``path inode=yyy'' mean in the NAME column of Linux ``mem'' file types?

When the device or inode number in the process' ``maps'' file entry doesn't match the stat(2) results from the file path, lsof reports the inconsistent information from the stat(2) of the path parenthetically after the path in the NAME column in one of these forms:

(path dev=xxx) only the device number, ``xxx'', from a stat(2) of the ``maps'' file entry path differs from the ``maps'' file entry value reported in the DEVICE column.

(path inode=yyy) only the inode number, ``yyy'', from a stat(2) of the ``maps'' file entry path differs from the ``maps'' file entry value reported in the NODE column.

(path dev=xxx inode=yyy) Both device and inode numbers differ.

Lsof reports the ``maps'' file device number in the DEVICE column and the inode number in the NODE column.

When device and inode mismatches occur, lsof suppresses the reporting of link count and size. See the answer to the "Why is neither link count nor size reported for some Linux ``DEL'' and ``mem'' file types?" question for more information.

Device and inode inconsistencies can occur when a file at a ``maps'' path is replaced after the process has started, or when a different file system with similar path names is mounted on top of the original file system.

The device inconsistency parenthetical messages can be suppressed with lsof's ``-w'' option.

10.4.2 Why is neither link count nor size reported for some Linux ``DEL'' and ``mem'' file types?

Link count and size are not reported for some entries from the process' ``maps'' file because a stat(2) of the entry file path

failed or stat(2) delivered device or inode numbers that don't match the ones in the ``maps'' entry.

When the stat(2) device or inode numbers don't match those in the ``maps'' file entry, it is likely that the stat(2) results don't apply to the file that was originally mapped by the process and whose path appears in the ``maps'' file entry, so lsof tries to avoid reporting possibly incorrect information.

See the answer to the "What do ``path dev=xxx'' and ``path inode=yyy'' mean in the NAME column of Linux ``mem'' file types?" for more information on how mismatched stat(2) device and inode numbers are reported.

10.5 Special Linux NAME column messages

10.5.1 What does ``(stat: xxx)'' mean in the NAME column of Linux files?

When lsof tried to stat(2) the path in the NAME column, the stat(2) system call failed and produced an error message of ``xxx''.

This situation usually occurs if the lsof process lacks permission to stat(2) the path -- e.g., the lsof executable lacks root permission, or lsof is attempting to stat(2) a path on an NFS device mounted with the root_squash option.

The message can be suppressed with lsof's ``-w'' option.

10.5.2 What does ``(readlink: xxx)'' mean in the NAME column of Linux files?

When lsof tried to convert the /proc/<PID>/fd path, reported in the NAME column, to its full and more meaningful path, the readlink(2) system call used to do the conversion failed. The readlink(2) failure message is ``xxx''.

This situation usually occurs if the lsof process lacks permission to readlink(2) some part of the path -- e.g., the lsof executable lacks root permission, or lsof is attempting to stat(2) a path on an NFS device mounted with the root_squash option.

The message can be suppressed with lsof's ``-w'' option.

10.6 Why is ``NOFD'' reported as a Linux file type?

When lsof lacks permission to use opendir() on the fd/
subdirectory of a process' /proc/<PID> directory, it reports a
single file of the type ``NOFD'' (for no file descriptors).

Lsof reports the the /proc/<PID>/path in the NAME column,
followed
by "(opendir: xxx)", where ``xxx'' is the error
message returned by opendir().

The ``NOFD'' entry can be suppressed with lsof's ``-w'' option.

10.7 Why does Linux lsof report a NAME column value that begins with ``/proc''?

When lsof has problems processing a ``/proc/<PID>'' entry --
e.g., it can't convert the entry to a full and more meaningful
path name, or it can't access the /proc/<PID>/fd subdirectory
with opendir() -- it will report the /proc/<PID> path in the
NAME column.

10.8 Linux /proc/net/tcp* and /proc/net/udp* issues

10.8.1 Why use the Linux -X option?

If you're not interested in TCP/IP socket information for a
particular use of lsof, adding the -X option will make lsof run
more quickly, because -X inhibits the reading of the
/proc/net/tcp* and /proc/net/udp* files. For example, you may
only be interested in knowing what process has a particular
file open.

When the Linux system has a large number of open TCP/IP socket
files, the time savings provided
by -X can be significant.

10.8.2 Why does lsof say ``-i is useless when -X is specified''?

If -X is specified, lsof can't report much information on open
TCP/IP socket files. However, lsof's -i option requests that
information. Hence, the two options conflict and can't be used
together.

10.8.3 Why does lsof say ``can't identify protocol (-X specified)''?

If the Linux lsof -X option is specified and an open socket
file can't be identified without accessing the /proc/net/tcp*

and /proc/net/udp* files, lsof will report that it can't identify the socket's protocol and that the failure may be caused by the -X specification

11.0 NetBSD Problems

11.1 Why doesn't lsof report on open kernfs files?

Lsof doesn't report on open NetBSD kernfs files because the structures lsof needs aren't defined in the kernfs.h header file in /sys/misc/kernfs.

11.2 Why doesn't lsof report on open files on: file descriptor file systems; /proc file systems; 9660 (CD-ROM) file systems; MS-DOS (floppy disk) file systems; or kernel file systems?

Lsof is not able to report on open files on certain file system if /usr/src/sys/msdosfs didn't exist when the lsof Configure script ran and lsof was made. /usr/src/sys/msdosfs contains header files lsof needs for collecting data on certain file system files.

You can tell if an lsof executable above) lacks support for a file system if the following test of `lsof -v` produces nothing:

```
$ lsof -v 2>&1 | grep <support_enabled_definition>
```

The <support-enabled_definition> will be:

File System Type	Definition	Note
File descriptor	HASFDESCFS	
/proc	HASPROCFS	
9660	HAS9660FS	
MS-DOS	HASMSDOSFS	(lsof 4.61 and above)
Kernel	HASKERNFS	

The work-around is to install /usr/src/sys, rerun the lsof Configure script, and remake lsof.

11.3 Why does lsof produce confusing results for nullfs file systems?

Consider this report from /sbin/mount:

/usr/home
on /home type null (local)

(According to /sbin/mount /usr/home is the mounted-on device
and /home is the mounted-on directory.)

When lsof is asked to report on open files on /home, it
will report them as files on /usr/home instead. That's an
artifact of the NetBSD kernel's dynamic name lookup cache
(DNLC) and the way the kernel handles nullfs mounted-on
directories.

While lsof will report all open files on /home when given
/home as a file system directory argument, even though
reporting them as located on /usr/home, lsof will not find
the same files when asked to report on all open files on
/usr/home when given /usr/home as a file system device
argument. That's because from the mount perspective
/usr/home is equivalent to a device, but from the device
perspective it is still a directory.

So, what this lsof command reports:

```
$ lsof /home
... NAME
... /usr/home/...
```

Won't be duplicated by this lsof command:

```
$ lsof /usr/home
```

Another way
to look at this confusing /home and /usr/home
example is to consider what stat(2) reports. For /home
stat(2) reports a device doublet that matches what lsof
finds in open file node structures, while the device doublet
stat(2) reports for /usr/home won't match what lsof finds.
Nor does the mode reported by stat(2) indicate a block
devices, as is the expected case.

There is no simple answer to this confusion, nor is there
even a simple explanation. Simply be aware that when
supplying file system arguments to lsof on NetBSD, use the
mounted-on directory name for a nullfs as the lsof argument,
and don't be surprised when the NAME column reports the
mounted-on device name.

11.4 NetBSD header file problems

11.4.1 Why can't the compiler find some NetBSD header files?

If the compiler's pre-processor complains it can't find some header files when it compiles lsof source files, /usr/include and /usr/src may not have all the header files lsof needs.

As a work-around use the
NETBSD_SYS environment variable
to specify to lsof the location of the additional header files -- e.g.,

```
% setenv NETBSD_SYS /my_source
% ./Configure -n netbsd
```

or

```
$ NETBSD_SYS=/mys_source ./Configure -n netbsd
```

Caution: using this work-around may cause the lsof Configure script to activate or omit different features, depending on where it finds the header files that determine the state of the features.

11.4.2 Why does NetBSD lsof produce incorrect output?

If the NetBSD system's kernel was built from header files that don't match those in /usr/include -- e.g., //usr/src has the ones from which the kernel was built -- lsof may build, but won't produce correct output.

As a possible work-around, try directing the C compiler to select header files from /usr/src before it selects them from /usr/include. That can be done with the DEBUG make string -- e.g.,

```
$ make DEBUG="-I/usr/src -I/usr/include"
```

If that work-around fails, try using the LSOF_INCLUDE
and
NETBSD_SYS environment variables to swap /usr/include and /usr/src when running the Configure script, then use the make DEBUG string when running make -- e.g.,

```
$ LSOF_INCLUDE=/usr/src; export LSOF_INCLUDE
$ NETBSD_SYS=/usr/include; export NETBSD_SYS
$ ./Configure -n netbsd
$ make DEBUG="-I/usr/src -I/usr/include"
```

11.5 Why isn't lsof feature xxx enabled for NetBSD?

Lsof's Configure script enables NetBSD features by locating
and examining header files associated with the features,
and based on what it finds, setting compile-time definitions
in Makefiles. (See 00PORTING for a list of the definitions.)

When Configure doesn't find header files or doesn't find
appropriate values in header files, that may mean the header
file tree lsof is searching is incomplete or out of date.

Lsof normally looks for NetBSD header files in /usr/include.
It can also be directed to look in other directories --
e.g., /sys -- if told to do so with the contents of the
LSOF_INCLUDE
and NETBSD_SYS environment variables.

To determine what header file enables a missing feature,
check the NetBSD stanza in the Configure script. Then
check the locations it checks for the indicated header
files and contents.

See 00XCONFIG for more information on LSOF_INCLUDE and
and NETBSD_SYS.

12.0 NEXTSTEP and OPENSTEP Problems

12.1 Why can't lsof report on 3.1 lockf() or fcntl(F_SETLK)
locks?

Lsof has code to test for locks defined with lockf() or
fcntl(F_SETLK) under NEXTSTEP 3.1, but that code has never
been tested. I couldn't test it, because my NEXTSTEP 3.1
lockf() and fcntl(F_SETLK) functions return "Invalid
argument" every way I have tried to invoke them.

If your NEXTSTEP 3.1 system does allow you to use lockf()
and fcntl(F_SETLK) and lsof doesn't report locks set with
them, then the code in .../dialects/next/dnode.c probably
isn't correct. Please contact me via e-mail at <abe@purdue.edu>
and tell me how you got your lockf() and fcntl(F_SETLK)
system
calls to work. Make sure "lsof" appears in the "Subject:" line
so my e-mail filter won't classify your letter as Spam.

12.2 Why doesn't lsof compile for NEXTSTEP with AFS?

I no longer have a NEXTSTEP test system that has AFS.
Changes to lsof since I once had a test system have caused
me to change the AFS code in NEXTSTEP without being able
to test the changes.

If you need AFS support for NEXTSTEP and can't get it to
compile, please contact me. Perhaps we can jointly fix
the problems.

13.0 OpenBSD Problems

13.1 Why doesn't lsof support kernfs on my OpenBSD system?

Lsof supports the kernel file system on OpenBSD versions
whose /sys/miscfs/kernfs/kernfs.h (or <miscfs/kernfs/kernfs.h>
header file correctly defines the kern_target structure.
The lsof Configure script's openbsd stanza checks for the
presence of the structure's kt_name element and activates
kernfs support for the CFLAGS -DHASKERNFS definition only
when it finds kt_name.

The kernfs.h header
file is scheduled to be updated in the
OpenBSD 2.1 release, according to Kenneth Stailey, who
authored its changes.

13.2 Will lsof work on OpenBSD on non-x86-based architectures?

I've not tested lsof on an OpenBSD system that uses a
non-x86-based architecture, but I've had one report that
lsof 4.33 compiles and works on OpenBSD for the pmax
architecture (decstation 3100).

13.3 <sys/pipe.h> problems

13.3.1 Why does the compiler claim nbpg isn't defined?

When compiling lsof on some (older) OpenBSD SPARC versions,
the compiler may complain:

```
In file included from ../dlsof.h:191,
     from ../lsof.h:166,
     from fino.c:52:
/usr/include/sys/pipe.h:83: `nbpg' undeclared here
(not in a function)
/usr/include/sys/pipe.h:83: size of array `ms' has
non-integer type
```

This happens because <sys/pipe.h> uses NBPG from
<machine/param.h> to size the `ms' array, and some OpenBSD
systems define NBPG in terms of a kernel integer variable,
nbpg.

Lsof
revisions 4.46 and above have a hack to dlsof.h,
developed by Volker Borchert that avoids the compiler
problem for SPARC OpenBSD 2.3. The hack might work for
other OpenBSD SPARC versions, but hasn't been tested there.

If you want to enable the hack for your OpenBSD SPARC
version, modify this code in .../dialects/n+obsd/dlsof.h:

```
# if    defined(OPENBSDV)
#  if   OPENBSDV==2030 && defined(__sparc__)
#   if  defined(nbpg)
#undef  nbpg
#   endif       /* defined(nbpg) */
#define nbpg    4096            /* WARNING!!!  ... */
#  endif       /* OPENBSDV==2030 && defined(__sparc__) */
#include <sys/pipe.h>
#endif  /* defined(OPENBSDV) */
```

You will probably want to change the second #if test to
match your OpenBSD version. You may also want to change
what value is assigned to nbpg. See the next section,
"What value should I assign to nbpg?"

13.3.2 What value should I assign to nbpg?

If you need to enable the nbpg hack, described
in "Why does
the compiler claim nbpg isn't defined?", you may also need
to assign a value other than 4096 to nbpg. 4096 works for
the sun4c processor and should work for sun4m, but 8192
may be needed for sun4.

Check <machine/param.h> and other OpenBSD documentation to
determine the correct nbpg assignment.

13.4 Why doesn't lsof report on open MS-DOS file system (floppy
disk) files?

Lsof is not able to report on open MS-DOS file system files
if /usr/src/sys/msdosfs didn't exist when the lsof Configure
script ran and lsof was made. /usr/src/sys/msdosfs contains

header files lsof needs for collecting data on MS-DOS file system files.

You can tell if an lsof executable (revisions 4.61 and above) lacks MS-DOS file system support if the following command reports nothing:

```
$ lsof -v 2>&1 | grep HASMSDOSFS
```

The work-around is to install /usr/src/sys, rerun the lsof Configure script, and remake lsof.

13.5 Why isn't lsof feature xxx enabled for OpenBSD?

Lsof's Configure script enables OpenBSD features by locating and examining header files associated with the features, and based on what if finds, setting compile-time definitions in Makefiles. (See 00PORTING for a list of the definitions.)

When Configure doesn't find header files or doesn't find appropriate values in header files, that may mean the header file tree lsof is searching is incomplete or out of date.

Lsof normally looks for OpenBSD header files in /usr/include and /sys. It can also be directed to look in other directories if told to do so with the contents of the LSOF_INCLUDE and NETBSD_SYS environment variables.

To determine what header file enables a missing feature, check the OpenBSD stanza in the Configure script. Then check the locations it checks for the indicated header files and contents.

See 00XCONFIG for more information on LSOF_INCLUDE and and NETBSD_SYS.

14.0 Output Problems

14.1 Why do the lsof column sizes change?

Lsof dynamically sizes its output columns each time it runs to make sure that each column takes the minimum space. Column parsing -- e.g., with awk -- is possible, because each column is guaranteed to be separated from the preceding one by at lease one space, and no column except the last

(NAME) contains embedded spaces.

14.2 Why does the offset have ``0t' and ``0x" prefixes?

The offset value that appears in the SIZE/OFF column has ``0t' and ``0x" prefixes to distinguish it from size values that may appear in the same column.

Normally if the offset value is less than 100,000,000 (8 digits), it appears in decimal with a ``0t' prefix; over 99,999,999, in hexadecimal with a ``0x" prefix.

A decimal offset is handy, for example, when tracking the progress of an outbound ftp transfer. When lsof reports on the ftp process, it will report the size of the file being sent with its open descriptor; it will report the progress of the transfer via the offset of the outbound open ftp data socket descriptor.

The
``-o [n]" option may be used to specify the maximum number of decimal digits to be printed after ``0t" before lsof switches to the hexadecimal digits after `0x". As already noted, the default decimal digit count is 8.

14.3 What are the values printed in the FILE_FLAG column and why is 0x<value> sometimes included?

The two comma separated lists, separated by a semicolon, printed in the FILE-FLAG column (when the "+fg" option is specified), are short-hand names or hexadecimal values for the bits lsof finds in the f_flag or f_flags member of file structures for files (the first list, the one before the semicolon), and process open files flags found in various kernel structures, often named "pofile" (the second list, the one after the semicolon).

Lsof determines the short-hand names from symbols in the <fcntl.h>, <linux/fs.h>, <sys/fcntl.h>, <sys/fcntlcom.h>, o<sys/file.h>, and <sys/user.h> header files.

See the discussion of FILE-FLAG in the OUTPUT section
of
the lsof man page, and the FF_* and POF_* symbols in lsof.h for a list of the names.

Bits with no names defined for them are represented by an 0x<value> member of the comma-separated list -- a hexadecimal

integer. When "+fG" is specified (instead of "+fg"), lsof
will list all flag values as two hexadecimal integers,
separated by a semicolon.

When "-FG" is specified to get the flags in an output field,
the format defaults to hexadecimal. You can get names
instead by following "-FG" with "+fg" -- e.g.,

```
$ lsof -FG +fg ...
```

However, when you precede "-FG" with "+fg" -- e.g.,

```
$ lsof +fg -FG
```

the format will be hexadecimal; order is important.

14.3.1 Why doesn't lsof display FILE_FLAG values for my dialect?

All versions of lsof except the /proc-based Linux lsof
report FILE-FLAG values. Lsof can't obtain FILE-FLAG
information from the Linux /proc interface.

14.4 Network Addresses

14.4.1 Why does lsof's -n option cause IPv4 addresses, mapped to
IPv6,
to be displayed in IPv6 notation?

When you use the -n option to tell lsof to display numeric
network addresses, and an IPv4 address has been mapped to
IPv6, lsof displays the address in IPv6 format and puts
"ipv4" in the TYPE column. That combination indicates the
IPv4 address has been mapped to IPv6.

For example, the IPv4 address 1.2.3.4, when mapped to an
IPv6 address, will be displayed by lsof as:

```
[::ffff:1.2.3.4]
```

The enclosing brackets are lsof's signal that this is an
IPv6 address. Inside the brackets is a standard IPv6
address, reported by inet_ntop(). The first two colons,
signifying zeroes in the first 64 bits of the IPv6 address,
and the hexadecimal ffff in the next 32 bits, indicate that
the last 32 bits contains a mapped IPv4 address, which is
then displayed in IPv4 dot notation.

14.5 Why does lsof output \x, ^x, or \xnn for characters

sometimes?

Lsof displays only printable ASCII characters. Lsof considers a character printable if isprint(3) says it is. If isprint(3) says a character isn't printable, the lsof may page explains:

"... Non-printable characters are printed in one of three forms: the C ``\[bfrnt]" form; the control character `^' form (e.g., ``^@"); or hexadecimal leading ``\x" form (e.g., ``\xab"). Space is non-printable in the COMMAND column (``\x20") and printable elsewhere."

14.5.1 Why is space considered a non-printable character in command names?

Space is considered an unprintable character in command names because it is sometimes possible to hide the full command name from scripts that parse ps(1) output by embedding a space in the name.

14.6 Why doesn't lsof print all the characters of a command name?

By default lsof prints the first nine characters of the names of commands associated with processes. If more characters are required, the "w" value of the "+c w" option may be used to specify a larger width.

If "w" is zero ('0') lsof will print all characters of all command names up to the limit of the number of characters supplied by the particular UNIX dialect. When reporting command names, lsof replaces non-printable characters as discussed in the answer to " Why does lsof output \x, ^x, or \xnn for characters sometimes?"

See the answer to the "Why is space considered a non-printable character in command names?" question for an explanation of why spaces are replaced by the ``\x20" representation in command names.

The number of command name characters supplied to lsof by UNIX dialects in files and structures varies by dialect. For example, Linux 2.4.27 supplies lsof the first 15 characters of command names and Solaris 9 supplies 16. Thus, even if "w" is zero ('0'), lsof can't report more characters for command names

on those two UNIX dialects than they provide lsof.

14.7 Why does lsof reject some -c command names, saying their lengths are "> what system provides (nn)"?

The command name length that a specific system provides varies from dialect to dialect. As noted in the answer to the "Why doesn't lsof print all the characters of a command name?" question, Linux and Solaris provide a limited number of command name characters.

When more characters are specified in the parameter to the -c option, lsof considers it an error and issues a fatal error message -- e.g.,

```
lsof: "-c xxxxyyyy" length (8) > what system provides (7)
```

The only work-around is to specify no more characters to -c that the system provides to lsof.

14.8 Why does lsof sometimes print TYPE numbers instead of names?

When lsof can't convert a type number to a name for printing in the TYPE column, it will report the number as four octets.

14.9 Marker line format problems

14.9.1 Why won't lsof accept a marker line format?

Lsof's Configure script must find the localtime(3) and strftime(3) functions in the dialect's C library in order to enable support for marker line formats.

Check the output of lsof's -v option for the presence of -DHAS_STRFTIME in the compiler flags. If it isn't there, Configure didn't find the necessary two C library functions.

If you think lsof should have found the functions, make a copy of the C test program in the Configure script that it uses to find the functions. Then use the copy, or a more informative modification of it, to learn why Configure can't find the functions. You can find that program by searching for strftime.

14.9.2 Why does lsof reject the NL (%n) marker line format?

When repeat mode and field output (with -F) have both been specified, lsof won't allow new line (NL) formats to be specified with ``%n''. That's because the marker line is always guaranteed to be a single line.

There is no work-around to this restriction.

14.10 How are protocol state name exclusion and inclusion used?

Protocol state name inclusion and exclusion with the ``-s p:s'' option and its arguments have some issues to consider. Note: the ``-s p:s'' option is only available when the help output, obtained with -h or -?, shows it; it was a recent addition to lsof and is supported only on dialects where it could be tested.

First, there is the problem of determining what state names, if any, the dialect produces. Try running this lsof command to find them:

```
$ lsof -i
```

Knowing the state names of interest, the next problem is to decide on the lsof options and their parameters that will produce the desired output. Here some examples are probably the most useful.

To list only TCP socket files in LISTEN and CLOSE_WAIT states, use:

```
$ lsof -itcp -stcp:listen,close_wait
```

or

```
$ lsof -iTCP -sTCP:LISTEN,CLOSE_WAIT
```

Case isn't important to lsof in protocol and state names.

To exclude TCP socket files in CLOSE_WAIT state, use:

```
$ lsof -itcp -stcp:^close_wait
```

Note the `^' preceding close_wait; it selects exclusion. You can mix included and excluded names in a comma separated list, but you may not include and exclude the same name for the same protocol.

To list TCP files in LISTEN state and UDP files in Idle state,

use:

```
$ lsof -i -stcp:listen -sudp:idle
```

Note: if you don't accompany the ``-s p:s'' list option and
argguments with the -i option, lsof will list all other regular
files, while applying the specified inclusion and exclusion
specifications to network files. Generally, then, you want to
use -i with -s.

14.10.1 Why doesn't my dialect support state name exclusion and inclusion?

When state name inclusion and exclusion was added, I had access
to test systems for AIX, Darwin, FreeBSD, Linux, PSTAT-based
HP-UX and Solaris.

Therefore, I was unable to add and test the support to any other
UNIX dialects.

If a dialect has the support, then the HASTCPUDPSTATE definition
in its machine.h header file will be active; if not, it will be
absent or commented out.

If your dialect doesn't have the support and you want it added,
you will have to provide me Internet
access to a test host, where
I can compile lsof and have the credentials to test the changes
the support requires. If that's possible for you, please contact
me via e-mail at <abe@purdue.edu>. Make sure "lsof" appears in
the "Subject:" line so my e-mail filter won't classify your letter
as Spam.

15.0 Pyramid Version Problems

15.0.5 Statement of deprecation

As of lsof revision 4.52 support for all Pyramid versions has
been dropped. Contact me via e-mail at <abe@purdue.edu> if you
are interested in obtaining the last lsof Pyramid distribution.
Make sure "lsof" appears in the "Subject:" line so my e-mail
filter won't classify your letter as Spam.

16.0 SCO Problems

16.1 SCO OpenServer Problems

16.1.1 How can I avoid segmentation faults when compiling lsof?

If you have an older SCO OpenServer compiler, it may get a segmentation fault when compiling some lsof modules. That appears to happen because of the -Ox optimization action requested in the lsof Makefile.

Try changing -Ox to -O with this make invocation:

```
$ make DEBUG=-O
```

Bela Lubkin supplied this tip and Steve Williams verified it.

16.1.2 Where is libsocket.a?

If you compile lsof and the loader says it can't find the socket library, libsocket.a, called by the -lsocket option in the lsof compile flags, you probably are running an SCO OpenServer release earlier than 5.0 and don't have the TCP/IP Development System package installed.

You may have the necessary header files, because you have the TCP/IP run-time package installed, but if you don't have the TCP/IP Development System package installed, you won't have libsocket.a.

Your choices are to install the TCP/IP Development System package or upgrade to OpenServer Release 5.0. You will find libsocket.a in 5.0 -- you'll find all the libraries and header files there, in fact -- and you can use gcc to compile lsof if you don't want to install the 5.0 Development System package.

16.1.3 Why do I get "warning C4200" messages when I compile lsof?

When you compile lsof under OSR 3.2v4.2 (and perhaps under earlier versions as well), you may get many compiler warning messages of the form:

```
node.c(183) : warning C4200: previous declarator is not
compatible with default argument promotion
```

In my opinion this is a bug in the OSR compiler. Because the compiler cannot handle full ANSI-C prototypes, it assumes default types for function parameters as it encounters

untyped in a function prototype -- e.g., in this function
declaration from node.c,

```
   readrnode(ra, r)
 KA_T ra;
 struct rnode *r;
   {
   ...
```

the compiler assigns default int types to the ra and r
arguments.

Then, when the compiler encounters the fully typed parameters
after the function skeleton and sees parameters with types
that don't match the assumptions it previously made, it
whines about its own assumptions.

You can ignore these messages.

16.2 SCO|Caldera UnixWare Problems

16.2.1 Why doesn't lsof compile on my UnixWare 7.1.1 or above system?

When you Configure lsof with the "uw" abbreviation and try
to compile it for UnixWare 7.1.1, you may get compiler
error messages like this:

```
   UX:acomp: ERROR: "dproc.c", line 98:
 undefined struct/union member: p_pgidp
```

This suggest that you probably have a non-stop cluster
UnixWare 7.1.1 system. Its <sys/proc.h> header file differs
from the one on the system where I did the lsof port to
UnixWare 7.1.1. I currently don't have access to a non-stop
cluster system to be able to develop changes to lsof that
would make it compile and work there.

If you have a non-stop cluster UnixWare 7.1.1 system, want lsof
for it, and can offer me a test account on the system, please
contact me via e-mail at <abe@purdue.edu>. Make sure "lsof"
appears in the "Subject:" line so my e-mail filter won't
classify your letter as Spam.

If you have a system with nsc_cfs and can offer me a test
account on it, please contact me via e-mail

at <abe@purdue.edu>.
Make sure "lsof" appears in the "Subject:" line so my e-mail
filter won't classify your letter as Spam.

16.2.2 Why does lsof complain about node_self() on my UnixWare 7.1.1 or above system?

If lsof exits immediately after issuing this message:

```
can't identify process NSC node; node_self(): <message>
```

It means that lsof has been built to run on a NonStop Cluster (NSC) UnixWare 7.1.1 or higher system and can't get the number of the node on which it is running. Lsof uses the node number to determine the path to the kernel boot file.

You can tell if lsof has been built for NSC by looking for "-DHAS_UW_NSC" in lsof's "-v" option output.

If the system on which you're trying to run lsof isn't running an NSC kernel, you will need to build a non-NSC lsof.

16.2.3 Why does UnixWare 7.1.1 or above complain about -lcluster, node_self(), or libcluster.so?

When you build, compile, and load lsof for UnixWare 7.1.1 and above, ld may complain that it can't
find the -lcluster
library or that the node_self symbol is undefined. When you try to run an existing lsof binary it may complain that libcluster.so can't be found.

These messages mean the tests made by Configure on your system led it to believe your system is running a NonStop Cluster (NSC) kernel, or the lsof binary you're trying to use was built on a NonStop Cluster system. If an lsof binary was built for NSC, this shell command produces output:

```
$ strings <lsof_binary> | grep HAS_UW_NSC
```

If that's not the case, and you can rebuild lsof, set the UW_HAS_NSC environment variable to "N" and do this:

```
$ Configure -n clean
$ UW_HAS_NSC=N
```

```
$ export UW_HAS_NSC
$ Configure -n uw
$ make
```

You can also edit Makefile and lib/Makefile. Remove -DHAS_UW_NSC from the CFGF strings. Remove -lcluster from the CFGL strings. Then run make again.

If you have an existing NSC lsof binary and you want one for a non-NSC system, you will have to build lsof yourself on the system where you want to use it. (That's always a good idea anyway.)

16.2.4 Why does UnixWare 7.1.1 or above lsof complain it can't read the kernel name list?

If lsof complains:

```
can't read kernel name list from <path>
```

It means that lsof can't find the booted kernel image file at <path>. On NonStop Cluster (NSC) UnixWare 7.1.1 or higher systems lsof determines the booted file path by examining this file:

```
/stand/`node_self`/boot
```

If examining that file doesn't lead to an NSC path, lsof uses:

```
/stand/1/unix
```

On non-NSC systems lsof expects the booted kernel image to be in /stand/unix.

If your booted kernel image is in a different place, use lsof's "-k <path>" option to specify its path.

16.2.5 Why doesn't lsof report link count, node number, and size for some UnixWare 7.1.1 or above CFS files?

Lsof reports link count, node number, and size for open CFS files as recorded in their kernel node structure's cached attributes. Sometimes not all attributes are cached on the node where lsof runs, so lsof cannot report them.

16.2.6 Why doesn't lsof report open files on all UnixWare 7.1.1 NonStop Cluster (NSC) nodes?

Lsof can only report on files open on the node on which it runs, because the information lsof reports comes from the private kernel memory of the node. This may mean that asking lsof to find a specific open file, or use of a specific Internet address or port, may not report all open instances on nodes other than the one used to run lsof.

You can use the NSC onnode(1) command to run lsof on specific nodes, or the onall(1) command to run lsof on all nodes -- e.g.,

```
  $ onall lsof [options] 2>&1 | less
or
  $ onnode node-number lsof [options] 2>&1 | less
```

Note that, when lsof is run all nodes, the path name component assembly results it reports in its NAME column may vary, because the dynamic name cache from which lsof gets the components is private to the kernel of each node.

Also note the use of shell redirection in the examples to merge the standard error file information from onnode and onall with lsof's standard output file output. That will put the onnode and onall node announcements in proper sequence with lsof's output.

16.2.7 Why doesn't lsof report the UnixWare 7.1.1 NonStop Cluster (NSC) node a process is using?

To induce lsof to report the node on which a process runs would be a significant, non-standard modification to lsof. It has much wider implications than merely the printing of a number in an output column. I'm not currently (April 2001) prepared to undertake such a modification.

If you want node-specific NSC information about open files, run lsof under the control of onall(1) or onnode(1).

```
  $ onall lsof [options] 2>&1 | less
or
  $ onnode node-number lsof [options] 2>&1 | less
```

16.2.8 Why does the compiler complain about missing UnixWare 2.1[.x]

header files?

SCO|Caldera didn't ship the following header files
with
UnixWare 2.1 through 2.1.3:

<fs/proc/prdata.h>
<fs/procfs/prdata.h>
<sys/fs/fifonode.h>
<sys/fs/namenode.h>

Lsof needs those header files for its compilation. Contact
SCO|Caldera to get copies of those header files.

If you can't get the header files from SCO|Caldera, please
contact me via e-mail at <abe@purdue.edu>. Make sure "lsof"
appears in the "Subject:" line so my e-mail filter won't
classify your letter as Spam.

17.0 Sun Problems

17.0.5 Statement of deprecation

Lsof support for SunOS 4.1.x was last tested at revision 4.51.
Contact me via e-mail at <abe@purdue.edu> if you're interested in
obtaining it. Make sure "lsof" appears in the "Subject:" line so
my e-mail filter won't classify your letter as Spam.

17.1 My Sun gcc-compiled lsof doesn't work -- why?

Gcc can be used to build lsof successfully. However, an
improperly installed Sun gcc compiler will usually not
produce a working lsof.

If your Sun gcc-compiled lsof doesn't report
anything, or
reports ``can't read proc table,'' or gcc refuses to compile
lsof without error, check that the gcc step that "fixes"
Sun header files was run on the system where you're using
gcc to compile lsof. As an alternative, if you have the
SunPro C 5.0 compiler or later available, use it to compile
lsof -- e.g., use the solariscc Configure abbreviations.

17.2 How can I make lsof compile with gcc under Solaris 2.[456], 2.5.1, 7, 8 or 9?

Presuming your gcc-specific header files are wrong for

Solaris, edit the lsof Configure-generated Makefile and
lib/Makefile and make this change:

 CFGF=   -Dsolaris=20400 ...
to
 CFGF=   -Dsolaris=20400 -D__STDC__=0 -I/usr/include ...

or change:

 CFGF=   -Dsolaris=20500 ...
to
 CFGF=   -Dsolaris=20500 -D__STDC__=0 -I/usr/include ...

or change:

 CFGF=   -Dsolaris=20501 ...
to
 CFGF=   -Dsolaris=20501 -D__STDC__=0 -I/usr/include ...

This is only a temporary work-around. You really should
instruct gcc to to update your
gcc-specific header files
or install a recent gcc (e.g., 3.2), which has no need for
private copies of Solaris include files.

17.3 Why does Solaris Sun C complain about system header files?

You're probably trying to use /usr/ucb/cc if you get compiler
complaints like:

    cc -O -Dsun -Dsolaris=20300 ...
    "/usr/include/sys/machsig.h", line 81: macro BUS_OBJERR
    redefines previous macro at "/usr/ucbinclude/sys/signal.h",
    line 444

Note the reference to "/usr/ucbinclude/sys/signal.h". It
reveals that the BSD Compatibility Package C compiler is
in use. Lsof requires the ANSI C version of the Solaris
C compiler, usually found in /usr/opt/bin/cc or
/opt/SUNWspro/bin/cc.

Try adding a CC string to the lsof Makefile that points to
the Sun ANSI C version of the Sun C compiler -- e.g.,

    CC= /usr/opt/bin/cc
or
    CC= /opt/SUNWspro/bin/cc.

17.4 Why doesn't lsof work under my Solaris 2.4 system?

If lsof doesn't work under your Solaris 2.4 system -- e.g.,
it
produces no output, little output, or the output is
missing command names or file descriptors -- you may have
a pair of conflicting Sun patches installed.

Solaris patch 101945-32 installs a kernel that was built
with a <sys/auxv.h> header file whose NUM_*_VECTORS
definitions don't match the ones in the <sys/auxv.h> updated
by Solaris patch 102303-02.

NUM_*_VECTORS in the kernel of patch 101945-32 are smaller
than the ones in the <sys/auxv.h> of patch 102303-02. The
consequence is that when lsof is compiled with the <sys/auxv.h>
whose NUM_*_VECTORS definitions are larger than the ones
used to compile the patched kernel, lsof's user structure
does not align with the one that the kernel employs.

If you have these two patches installed, contact Sun and
complain about the mis-match.

You may be able to work around the problem by editing
/usr/include/sys/auxv.h to have the following NUM_*_VECTORS
definitions:

```
    #define NUM_GEN_VECTORS 4
    #define NUM_SUN_VECTORS
8
```

The Configure script issues a prominent WARNING that you should
try the work-around.

I thank Leif Hedstrom for identifying the offending patches.

17.5 Where are the Solaris header files?

If you try to compile lsof under Solaris and get a compiler
complaint that it can't find system header files, perhaps
you forgot to add the header file package, SUNWhea.

17.6 Where is the Solaris /usr/src/uts/<architecture>/sys/machparam.h?

When you try to Configure lsof for Solaris 2.[23456], 2.5.1,
and 7 -- e.g., on a `uname -m` == sun4m system -- Configure
complains:

grep: /usr/src/uts/sun4m/sys/machparam.h:
No such file or directory
grep: /usr/src/uts/sun4m/sys/machparam.h:
No such file or directory

And when you try to compile the configured lsof, cc or gcc complains:

dproc.c:530: `KERNELBASE' undeclared (first use this function)

The explanation is that somehow your Solaris system doesn't have the header files in /usr/src/uts it should have. Perhaps someone
removed the directory to save space. Perhaps you're using a gcc installation, copied from another system. In any event, you will have to load the header files from the SUNWhea package of your Solaris distribution.

KERNELBASE is an important symbol to lsof -- it keeps lsof from sending an illegal kernel value to kvm_read() where a segmentation violation might result (a bug in the kvm library). Lsof can get illegal kernel values because it reads kernel values slowly with kvm_read() calls that the kernel is changing rapidly.

Lsof doesn't need KERNELBASE at Solaris 2.5 and above, because it has a KERNELBASE value whose address lsof can find with /dev/ksyms and whose value it can read with kvm_read(). Under Solaris 2.5 /usr/src/uts has moved to /usr/platform.

17.7 Why does Solaris lsof say ``can't read proc table''?

When lsof collects data on processes, using the kvm_*() functions to scan the kernel's proc structure table, it checks to make sure it has
identified a reasonable number
of them -- a minimum of three. When lsof can't identify three processes during a scan, it repeats the scan.

When five scans fail to yield three processes, lsof issues the fatal message:

lsof: can't read proc table

and exits.

Usually lsof fails to identify three processes during a

scan because its idea of the form of the proc structure
differs from that being used by the kernel. Since the proc
structure is defined in <sys/proc.h> and other /usr/include
header files, the root cause of a proc structure discrepancy
usually can be found in the composition of /usr/include.

One common way that /usr/include header files can be
incorrect is that gcc was used to compile lsof, gcc used
its special (i.e., "fixed") header files instead of the
ones in /usr/include, and the special gcc header files
weren't updated when Solaris was. Answers to these questions:

My Sun gcc-compiled lsof doesn't work -- why?

How can I make lsof compile
with gcc under Solaris 2.[456],
2.5.1, 7, 8 or 9?

Why does Solaris Sun C complain about system header files?

discuss the gcc header file problem and offer suggestions
on how to fix it or work around it.

It may also be that you are trying to run a version of lsof
that was compiled on an older version of Solaris. For
example, an lsof executable, compiled for Solaris 2.4, will
produce the ``can't read proc table'' message if you try
to run it under Solaris 2.5. If you have compiled lsof
under Solaris 2.5 and it still won't work, see if the header
files in /usr/include have been updated to 2.5, or still
represent a previous version of Solaris.

Another source of header file discrepancies to consider is
the Solaris patch level and whether a binary kernel patch
was not matched with a corresponding header file update.
See the "Why doesn't lsof work under my Solaris 2.4 system?"
question for an example of one in Solaris 2.4 -- there may
be other such patch conflicts
I don't know about.

17.8 Why does Solaris lsof complain about a bad cached clone device?

When lsof revisions below 4.04 have been run on a Solaris
system and have been allowed to create a device cache file,
the running of revisions 4.04 and above on the same systems
may produce this complaint:

lsof: bad cached clone device: ...

lsof: WARNING: created device cache file: ...

This is the result of a change in the device cache file
that took place at lsof revision 4.04. The change introduced
a node number into the clone device lines of the device
cache file and was done in such a way that lsof could detect
device cache files whose clone lines don't have node numbers
(lines created by previous lsof revisions) and recognize
the need to regenerate the device cache file.

17.9 Why doesn't Solaris make generate .o files?

Solaris /usr/ccs/bin/make won't generate .o files from .c
files if /usr/share/lib/make/make.rules is missing. It
may be found in and installed
from the SUNWsport package.

17.10 Why does lsof report some Solaris 2.3 and 2.4 lock types as `N'?

For Solaris 2.3 with patch P101318 installed at level 45
or above, and for all versions of Solaris 2.4, NFS locks
are represented by a NFS-specific kernel lock structure
that sometimes lacks a read or write lock type indicator.
When lsof encounters such a lock structure, it reports the
lock type as `N'.

17.11 Why does lsof Configure say "WARNING: no cc in ..."?

When lsof's Configure script is executed with the solariscc
abbreviation it tries to make sure it's using the Sun C
compiler and not the UCB substitute from /usr/ucb/cc.
Thus, it looks for cc in the "standard" Sun compiler
location, /opt/SUNWspro/bin.

If Configure can't find cc there, it issues the warning:

lsof: WARNING: no cc in /opt/SUNWspro/bin;
using cc without path.

and uses cc for the compiler name, letting the shell find
cc with its PATH environment variable.

You can tell Configure where
to find your cc with the
SOLARIS_CCDIR cross-configuration environment variable.
(See 00XCONFIG for more information on SOLARIS_CCDIR).
For example, use this Configure shell command:

SOLARIS_CCDIR=/usr/special/bin Configure -n solariscc

(SOLARIS_CCDIR should be the full path to the directory
containing your cc.)

17.12 Solaris 7, 8 and 9 Problems

17.12.1 Why does lsof say the compiler isn't adequate for Solaris 7, 8 or 9?

Solaris 7, 8 and 9 kernels come in two flavors, 32 and 64 bit. 64 bit kernels run on machines that support the SPARC v9 instruction set architecture. Separate executables for some programs, -- e.g., ones using libkvm like lsof -- must be built for 32 and 64 bit kernels.

Previous Sun (e.g., SC4.0) and earlier gcc compilers will build lsof for 32 bit kernels, but they won't build it for 64 bit kernels. Compilers that will build lsof for 64 bit Solaris 7, 8 and 9 kernels are the Sun WorkShop Compilers C 5.0 and above, and recent gcc versions, e.g., 3.2.

When given the ``-xarch=v9'' flag, the C 5.0 compiler and above, and associated loader and 64 bit libraries will build a 64 bit lsof executable; when given the "-m64" or "-mcpu=v9" (deprecated) flags, an appropriate gcc compiler will build a 64 bit lsof executable.

When the lsof Configure script detects a 64 bit kernel is in use (e.g., by executing `/bin/isainfo -kv`), and when it finds that the specified compiler is inappropriate, it complains with these messages:

For gcc:

```
"!!!WARNING!!!=========!!!WARNING!!!=========!!!WARNING!!!"
"!                                             !"
"! LSOF NEEDS TO BE CONFIGURED FOR A 64 BIT KERNEL, BUT  !"
"! THIS GCC DOESN'T SUPPORT THE BUILDING OF 64 BIT       !"
"! SOLARIS EXECUTABLES.  LSOF WILL BE CONFIGURED FOR A   !"
"! 32 BIT echo KERNEL.                                   !"
"!                                             !"
"!!!WARNING!!!=========!!!WARNING!!!=========!!!WARNING!!!"
```

For
Sun C:

```
 !!!WARNING!!!==========!!!WARNING!!!==========!!!WARNING!!!
 !                                    !
 ! LSOF NEEDS TO BE CONFIGURED FOR A 64 BIT KERNEL, BUT    |
 ! THE VERSION OF SUN C AVAILABLE DOESN'T SUPPORT THE      !
 ! -xarch=v9 FLAG.  LSOF WILL BE CONFIGURED FOR A 32 BIT   !
 ! KERNEL.                                  !
 !                                    !
 !!!WARNING!!!==========!!!WARNING!!!==========!!!WARNING!!!
```

17.12.2 Why does Solaris 7, 8 or 9 lsof say "FATAL: lsof was compiled for..."?

Solaris 7, 8 or 9 lsof may say:

```
   lsof: FATAL: lsof was compiled for a xx bit kernel,
   but this machine has booted a yy bit kernel.

   Where: xx = 32 or 64
   yy = 64 or 32

   (xx and yy won't match.)
```

This message indicates that lsof was compiled for one size kernel and is being asked to execute on a different size one. That's not possible for programs like lsof that use libkvm.

Depending on the instruction sets for which you need Solaris 7, 8 or 9 lsof, you may need two or more versions of lsof, compiled for each kernel size, installed for use with /usr/lib/isaexec. See the "How do I install lsof for Solaris 7, 8 or 9?" section of this document for more information on that.

17.12.3 How do I build lsof for a 64 bit Solaris kernel under a 32 bit Solaris kernel?

If your Solaris system has an appropriate compiler (e.g., WorkShop Compilers C 5.0 and above, or a recent gcc like 3.2) and the 64 bit libraries have been installed, you can force lsof's Configure script to build a 64 bit version of lsof with:

```
   $ SOLARIS_KERNBITS=64 Configure -n solariscc
```

The SOLARIS_KERNBITS environment variable is part of the lsof cross-configuration support, described in the 00XCONFIG

file of the lsof distribution.

17.12.4 How do I install lsof for Solaris 7, 8 or 9?

If you are installing lsof where it will be used only under the
bit size kernel for which it was built, no special
installation is required.

If, however, you are installing different versions of lsof
for different bit sizes -- e.g., for use on a 64 bit NFS
server and from its 32 bit clients -- you should read the
man page for isaexec(3C) and install lsof according to its
instructions.

The executable at the directory where lsof is to be found
should be a hard link to /usr/lib/isaexec or a copy of it.
In the directory there must be instruction architecture
subdirectories -- e.g., .../sparc/ and .../sparcv9/. The
lsof for 64 bit size kernels is installed in the .../sparcv9/
subdirectory; the one for 32 bit size kernels, in .../sparc/.

For example, if you're installing 32 and 64 bit lsof
executables in /usr/local/etc, you would:

```
 # cd /usr/local/etc
 # ln /usr/lib/isaexec lsof
 # mkdir sparc sparcv9
 # install the 32 bit lsof as sparc/lsof
 # install the 64 bit lsof as sparcv9/lsof
 # chmod, chown, and chgrp sparc/lsof and

 sparcv9/lsof appropriately
```

Lsof permissions and ownerships are the same whether one
or more lsof executables are being installed, with or
without the /usr/lib/isaexec hard link.

17.12.5 Why does my Solaris 7, 8 or 9 system say it cannot execute
lsof?

When you attempt to execute lsof, your Solaris 7, 8 or 9
shell may complain:

```
    ksh: ./lsof: cannot execute
```

If the lsof executable exists and has the proper execution
permissions, this error may be the result of trying to

execute an lsof, built for a 64 bit kernel, on a 32 bit kernel.

This will tell you about the lsof executable:

```
$ file lsof
lsof: ELF 64-bit MSB executable SPARCV9 Version 1,
dynamically linked, not stripped
```

The "64-bit" notation indicates the binary was built for a 64 bit kernel. To see the running kernel bit size, use this command:

```
$ isainfo -kv
32-bit sparc kernel modules
```

The "32-bit" notation indicates a 32 bit kernel has been booted.

The only work-around is to obtain, or Configure and make, an lsof for the appropriate kernel bit size. If you Configure and make lsof on the kernel where you wish to run it the proper compiler, the lsof Configure step will generate Makefiles that can be used with make to build an appropriate lsof executable.

To compile a 64 bit lsof, you must have an appropriate compiler -- i.e., Sun WorkShop Compilers C 5.0 or higher or a recent gcc like 3.2.

17.12.6 What gcc will produce 64 bit Solaris 7, 8 and 9 executables?
8 and 9 executables?

Properly built and installed recent gcc versions -- e.g., 3.2 -- will build lsof for 64 bit Solaris kernels.

If you update your gcc version to 3.2 or later, make sure the private gcc header files become current -- i.e., clear out any private header files from a previous gcc or Solaris installation before installing the new ones, or build to a new --prefix root and replace the old root with it after the build and installation are complete.

17.12.7 Why does lsof on my Solaris 7, 8 or 9 system say, "can't read namelist from /dev/ksyms?"

You're probably trying to use an lsof executable built for
an earlier Solaris release on a 64 bit Solaris 7, 8 or 9
kernel. The output from `lsof -v` will tell you the build
environment of your lsof executable. You should also have
gotten a warning message that lsof is compiled for a
different Solaris version than the one under which it is
running -- something like this:

lsof: WARNING: compiled for Solaris release X; this is Y

You need to build lsof on the system where you want to use
it. For 64 bit Solaris 7, 8 and 9 you need a compiler that
can generate 64 bit Solaris executables -- e.g., the Sun
Workshop 5 C compiler or later, or a recent gcc version
like 3.2. See the "Why does lsof say the compiler isn't
adequate for Solaris 7, 8 or 9?" section and the ones
following it for a discussion of building lsof for 64 bit
Solaris 7, 8 or 9.

17.13 Solaris and COMMON

17.13.1 What does COMMON mean in the NAME column for a Solaris VCHR file?

When lsof puts COMMON or (COMMON) in the NAME column of a
Solaris VCHR file, it means that the file is handled by
the special file system functions of the kernel through a
common vnode.

17.13.2 Why does a COMMON Solaris VCHR file sometimes seem to have an incorrect minor device number?

When lsof reports on an open file in a Solaris special file
system that uses a COMMON vnode, and the file is a VCHR
file, lsof tries to locate the associated device node by
looking for matches on the major and minor device numbers
first.

If no major and minor match results, lsof then looks for
a match on pseudo and clone device files. (See /devices/pseudo.)
Those device nodes are matched specially by either their
major or minor device numbers, but not both. Hence, when
lsof finds a match under those special conditions, it may
report a value in its output DEVICE column that differs
from one of the major and minor numbers of the device
node.

Here's an example from a sun4m Solaris 7 system:

```
$ ls -li /devices/pseudo/pm@0:pm
151261 crw-rw-rw-   1 root     sys      117,  0 ...
$ lsof /devices/pseudo/pm@0:pm
COMMAND ... DEVICE ...   NODE NAME
powerd       117,1 ... 151261 /devices/pseudo/pm@0:pm (COMMON)
Xsun     ...  117,0 ... 151261 /devices/pseudo/pm@0:pm
```

Note that the DEVICE value for the file with (COMMON) in its name field has a different minor device number (1) from what ls reports (0), while the DEVICE value for the file without (COMMON) matches the ls output exactly. Both match on the major device number, 117. The minor device number mis-match is a result of the way the Solaris kernel handles special file system common vnodes, and it's the reason lsof puts (COMMON) after the name to signal that a mis-match is possible.

17.14 Why don't lsof and Solaris pfiles reports always match?

/usr/proc/bin/pfiles for Solaris 2.6, 7, 8, and 9 also reports information on open files for processes. Sometimes the information it reports differs from what lsof reports.

There are several reasons why this might be true. First, because pfiles is a Sun product, based on Sun kernel features, its developers have a better chance of knowing exactly how open file information is organized. I sometimes have to guess at how kernel file structure linkages are constructed by gleaning hints from header files.

Second, lsof is aimed at providing information, specifically device and node numbers, that can be used to identify named file system objects -- i.e., path names. Thus, lsof tries to make sure its device and node numbers match those reported by stat(2). Pfiles doesn't always report numbers that match stat(2) -- e.g., for files using clone and pseudo devices via common vnodes like the nlist() /dev/ksyms usage.

Here's the Solaris 7 COMMON VCHR example again with additional pfiles output:

```
$ ls -li /devices/pseudo/pm@0:pm
151261 crw-rw-rw-
 1 root     sys      117,  0 ...
$ lsof /devices/pseudo/pm@0:pm
```

```
vic1: 10 = lsof /dev/pm
COMMAND ... DEVICE ...   NODE NAME
powerd  ...  117,1 ... 151261 /devices/pseudo/pm@0:pm (COMMON)
Xsun    ...  117,0 ... 151261 /devices/pseudo/pm@0:pm
$ pfiles ...
0: S_IFCHR ... dev:32,24 ino:61945 ... rdev:117,1
...
14: S_IFCHR ... dev:32,24 ino:151261 ... rdev:117,0
```

Note that the NODE number, reported by lsof, matches what ls(1) and stat(2) report, while the ino value pfiles reports doesn't. Lsof also indicates with the (COMMON) notation that the DEVICE number is a pseudo one, derived from the character device's value. The lsof DEVICE value matches the pfiles rdev value, correct behavior for a character device, but pfiles gives no sign that it's not possible to find that character device number in /devices with ls(1) or stat(2).

17.15 Why does lsof say, "kvm_open(namelist=default, core=default): Permission denied?"

Lsof needs permission to read from the /dev/kmem and /dev/mem memory devices. Access to them is opened via a call to the kvm_open() library function and it reports the indicated message.

You must give lsof permission to read the memory devices. The super user can almost always do that, but other lsof users can do it if some group -- e.g., sys -- has permission to read the memory devices, and the lsof binary is installed with the group's ownership and with the setgid permission bit enabled.

17.16 Why is lsof slow on my busy Solaris UFS file system?

Lsof may be slow on a busy Solaris UFS file system when UFS logging has been enabled with the "logging" mount option. That option can significantly increase disk operations under certain conditions -- e.g., when a lot of files are accessed quickly.

When only the "logging" option is specified to mount, all file accesses (atime updates) are logged to the UFS logging queue. Each atime update requires two writes to the disk to complete it.

If
you want to do UFS logging -- and there are reliability
advantages to it -- consider using the "logging,noatime"
mount options instead. That will shift atime updates from
the logging queue to fewer and independent asynchronous
operations, consequently making the UFS logging queue a
smaller bottleneck.

Consult mount_ufs(1M) for more information on the logging
and noatime options.

(My thanks to Casper Dik for this tip on improving the
performance of UFS logging.)

17.17 Why is lsof so slow on my Solaris 8 or 9 system?

Solaris 8 has a post-release feature upgrade modifying
kernel name cache (DNLC) handling that can slow lsof
throughput dramatically. The feature, sometimes called
negative DNLC caching, is standard in Solaris 9.

As best I can tell, when you install the Solaris 8 MU1
package, you get negative DNLC caching. If this pipe
produces any output, your system has negative DNLC caching.

```
$ nm /dev/ksyms | grep negative_cache_vnode
```

The reason negative
DNLC caching perturbs lsof is that a
single vnode address (found in the negative_cache_vnode
kernel variable) is used to mark entries in the DNLC that
are not (the negative part) found on disk.

Since a single vnode address (the DNLC key lsof uses) can
represent many (I've seen upwards of 30,000.) DNLC entries,
their presence overloads lsof's internal DNLC hashing
function. An overloaded hash function is a slow hash
function, and lsof's slows to a crawl when it encounters
thousands of keys that produce the same value when the lsof
DNLC hash function is applied to them.

The solution is simple -- ignore negative DNLC cache keys.
They don't represent path name components lsof can use.
Lsof revisions 4.50 and above have an addition that ignores
them and the performance of those lsof revisions improves
significantly when presented with negative DNLC cache keys.

If you don't have an lsof revision at 4.51 or later, there's

a work-around. Use lsof's ``-C'' option. It disables
lsof's
DNLC caching. Of course, that also inhibits the
reporting of any path name components from the kernel DNLC.
When ``-c'' is used, lsof will continue to report file
system and character device paths.

17.18 Solaris and VxFS

17.18.1 Why doesn't lsof support VxFS 3.4 on Solaris 2.6, and above?

Lsof will not support VxFS version 3.4 on Solaris 2.6 and above
unless some files from VxFS Update 2 have been installed. VxFS
3.4 FCS and VxFS 3.4 update 1 lack the header files lsof
normally uses to obtain information from the VxFS 3.4 kernel
node structure, vx_inode. VxFS 3.4 Update 2 provides a method
whereby lsof can obtain the necessary vx_inode information from
the vxfsu_get_ioffsets() function in Veritas utility
libraries.

The utility libraries (32 bit and 64 bit versions) may be
found in /opt/VRTSvxfs/lib. An ancillary header file may
be found in /opt/VRTSvxfs/include/sys/fs/vx_libutil.h.
Documentation of the vxfsu_get_ioffsets(3) function may be
found in
/opt/VRTS/man/man3/vxfsu_get_ioffsets.3.

Those files of VxFS 3.4 Update 2 may be downloaded from:

    ftp://ftp.veritas.com/pub/support/vxfs_34.i64243.tar

The vxfs_34.i64243.tar archive will unpack into an i64243
directory containing these files:

```
$ ls i64243
README
libvxfsutil.sol26.sums
libvxfsutil.sol26.tar.Z
libvxfsutil.sol27.sums
libvxfsutil.sol27.tar.Z
libvxfsutil.sol28.sums
libvxfsutil.sol28.tar.Z
```

Read README. Select the *.tar.Z file appropriate for your
Solaris version. Its contents will unpack into /opt/VRTS
and /opt/VRTSvxfs, so you will need sufficient permission
-- e.g., do it as root -- to unpack the uncompressed archive.
Once you've done that, it's a good idea to compare the

checksums of the archive you unpacked with the ones recorded
in the appropriate *.sums file. Use `sum -r` to verify
the checksums.

For example, if you want the Solaris 8 version, uncompress
and unpack libvxfsutil.sol28.tar.Z -- e.g.,

```
$ su
  ...
  # cd i6423
  # zcat libvxfsutil.sol28.tar.Z | tar xf -
```

That should create these new files and subdirectories with
the indicated checksums:

```
  File or subdirectory   sum -r

  /opt/VRTSvxfs/include/vxfsutil.h  03938
  /opt/VRTSvxfs/lib/libvxfsutil.a  51794
  /opt/VRTSvxfs/lib/sparcv9/
  /opt/VRTSvxfs/lib/sparcv9/libvxfsutil.a 07420
  /opt/VRTS/man/man3/
  /opt/VRTS/man/man3/vxfsu_get_ioffsets.3 62480
```

Once these files are in place, run lsof's Configure script
for the solaris or solariscc abbreviation. Configure will
locate the appropriate VxFS 3.4 Update 2 files and set up
for the making of an lsof that will properly display open
VxFS 3.4 file information.

17.18.2 Why does lsof report "vx_inode: vxfsu_get_ioffsets error"
for open Solaris 2.6 and above VxFS 3.4 and above files?

Even when lsof supports VxFS 3.4 and above on Solaris 2.6 and
above, it may report "vx_inode: vxfsu_get_ioffsets error" in
the NAME column for all VxFS files.

The
usual cause is that lsof doesn't have permission to
read the file at the end of the /dev/vxportal symbolic
link. If, for example, lsof has been installed setgid(sys),
then the /dev/vxportal symbolic link destination should be
owned by the sys group and readable by it.

Update 2 for VxFS 3.4 sets the modes of the /dev/vxportal
symbolic link destination to 0640 and the group ownership
to sys. But I have had a report that the modes are wrong

in a VxFS 4.0 installation.

Another cause may be that the system has more than one version
of VxFS installed (Only one can be active.), and lsof's
Configure script did not choose the header files and libraries
for the active VxFS version. Configure opts for VxFS 4.0 and
above header files and libraries (in /opt/VRTS) in preference
to those for VxFS below 4.0 (in /opt/VRTSvxfs).

Look for the directories /opt/VRTS and /opt/VRTSvxfs. If you
have /opt/VRTS, make sure its header and library symbolic links
point to those of
the active VxFS version.

If you have both directories, look at the CFLAGS that Configure
constructed for making lsof and see which directory path
follows a -I option. If that doesn't match the directory path
of the active VxFS version, try pointing Configure at the
correct directory with the SOLARIS_VXFSINCL environment
variable -- e.g.,

```
$ SOLARIS_VXFSINCL=/opt/.../include ./Configure -n solaris
```

17.18.3 Why does Solaris Configure claim there is no VxFS library?

The lsof Configure script, when configuring for Solaris, may
report:

```
FATAL: no VxFS .../libvxfsutil.a
```

That fatal error message indicates lsof has found the VxFS
utility library's header files, but can't find the library
itself in the expected location adjacent to the header files.

One possible cause is an incorrect symbolic link from
/opt/VRTS/lib/sparcv9/libvxfsutil.a to the library's real
location. (Some VxFS distributions declared the link
incorrectly.) Use `ls -lL` on that path to see if
it exists.
If it doesn't exist, the link may be missing an additional
leading "../" component.

If the problem is a missing "../" from the library's link, you
can correct the link or check with Veritas/Symantec for the
patch that corrects it.

If the problem is not a missing "../", and you know the
libvxfsutil.a location, you can define its path in the

SOLARIS_VXFSLIB environment variable before running the lsof
Configure script. (See 00XCONFIG for information about using
the SOLARIS_VXFSLIB environment variable.)

If you have no libvxfsutil.a, you must obtain it from
Veritas/Symantec or find it in your VxFS installation package.

17.18.4 Why doesn't Solaris lsof report VxFS path name components?

Solaris lsof will report path name components for VxFS versions
that use the common Solaris Dynamic Name Lookup Cache (DNLC) or
on some file systems of VxFS versions that support the VxFS
Reverse Name Lookup (RNL) facility.

VxFS versions 3.3 (approximately) and below use the
common
Solaris DNLC. (I haven't been able to determine exactly when
VxFS stopped using the DNLC.) For versions above that boundary,
but below 4.0, lsof can't report path name components.

At VxFS 4.0 and above, lsof can be compiled to use the VxFS RNL
facility for reporting path names. If "-DHASVXFSRNL" appears
in the compiler flags section of lsof "-v" option output, then
the lsof Configure script detected the VxFS RNL facility and
lsof has been compiled to use it.

Lsof's use of the RNL facility can fail when the VxFS file
system disk layout version is below 6. In that case, lsof can
report no path name components. For more information, see the
vxfs_inotopath(3) manual page. any of the following commands
will show the disk layout version for a VxFS file system, when
supplied the block device or mount point on which the file
system is mounted.

```
   fstyp -v <block_device>
 or
   mkfs -m <block_device>
 or
   vxupgrade <mount_point>
```

You must have permission
to read the block device -- e.g., be
the root user.

You may also be able to upgrade an older disk layout to one
that will work with the RNL. See the vxupgrade(1M) man page
for more information on that.

When lsof can't report VxFS path name components, it reports the file system mount point and the path name of device on which it is mounted. The device path name is enclosed in parentheses.

17.18.5 Why does Solaris 10 lsof report scrambled VxFS paths?

Solaris 10 lsof may report a bogus, scrambled path for an open VxFS file, when lsof obtains the path from a vnode's cached path. Veritas/Symantec reports that their Solaris 10 implementation has bugs in the way it handles the Solaris 10 vnode cached path and those bugs will be fixed in an upcoming patch some time after August 15, 2005.

When Solaris 10 lsof reports a path for an open VxFs file obtained via the VxFS Reverse Name Lookup facility, the path will be correct.

Also see the answers to the questions "Why does Solaris 10 lsof sometimes report the wrong path name?" and "Why doesn't Solaris lsof report VxFS path name components?"

17.19 Large file problems

17.19.1 Why does lsof complain it can't stat(2) a Solaris 2.5.1 large file?

When given an argument that is the path to a Solaris 2.5.1 file, enable for large file operations with the O_LARGEFILE open(2) option, lsof complains that it can't stat(2) the file. That's because lsof isn't using a stat(2) call and associated structure enabled for large files.

This error has been fixed, starting at lsof revision 4.58 for Solaris 2.6 and above. That fix won't work on Solaris 2.5.1 and I no longer have access to a Solaris 2.5.1 test system to develop a separate fix.

The work-around is to avoid specifying a O_LARGEFILE path as an argument to lsof on Solaris 2.5.1. Instead use a combination of lsof and grep to achieve the same results, albeit more clumsily.

17.20 Why does lsof get a segmentation fault on 64 bit Solaris 8 using NIS+?

I have received a report from Gary Craig that lsof produces a segmentation fault on his 64 bit Solaris 8 system using NIS+. Via an independent test program we have exonerated lsof and tracked the fault to the NIS+ __nis_server_name() function in the C name server library, -lnsl.

Lsof causes the __nis_server_name() NIS+ function to be called by calling getservent() to read entries of the port number to service name map.

The only Sun bug ID that appears to describe the problem is 4304244, although its text is unclear enough to leave room for doubt.

Until Sun eliminates the __nis_server_name() segmentation fault cause, a work-around for lsof is to use its "-P" option, causing lsof to avoid port to service name lookups.

17.21 Will lsof crash the Solaris kernel?

I've received and investigated one report that it has when the Sun hardware (a QME interface) was faulty. Today (May 23, 2002) I've learned that Sun has reports of kernel crashes caused by adb,
lsof, and mdb.

The Sun investigation pinpointed a problem in the /dev/kmem kernel driver and there is a Sun bug report, 4344513, about the problem. There is a fix in Solaris 9, and patches for Solaris 7 and 8 (SPARC and x86).

To see if your Solaris system is fixed, look for a /devices/pseudo/*allkmem node.

Extensive address filtering was added to lsof revision 4.50 to forestall what I then (July 2001) believed to be only the possibility that lsof might crash Solaris. However, the filtering isn't perfect, since a filtered address might become invalid after lsof has filtered it but before lsof has delivered it to /dev/kmem. That filtering work is described in .../dialects/sun/solaris_kaddr_filters, also available at:

ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof/solaris_kaddr_filters

The best and safest work-around is to upgrade to Solaris 9 or install an appropriate patch or its equivalent from this list:

Solaris SPARC x86
Version Patch Patch

======= ===== =====
7 106541-20 106542-20
8 108528-14 108529-14

17.22 Why does lsof on Solaris 7, 8, or 9 report a kvm_open() failure?

When lsof is started on some Solaris 7, 8, and 9 systems it may report:

lsof: kvm_open(namelist=default, corefile=default): \
No such file or directory

Lsof revisions 4.65 and later will first report:

lsof: cannot stat /dev/allkmem

The second message, not delivered in lsof revisions below 4.65, explains the cause of the kvm_open() failure; it can't find /dev/allkmem.

/dev/allkmem is a device added to Solaris 7 and 8 in patches and in the Solaris 9 FCS. See the preceding "Will lsof crash the Solaris kernel?" section for more information on /dev/allkmem and the patches.

The kvm_open(3KVM) function in the KVM library of patched Solaris 7 and 8 systems and in Solaris 9 expects to find /dev/allkmem and exits on error when it does not.

If you have installed the patch that updated your KVM library to
a version that expects /dev/allkmem to be present
and it is not, you may need to reconfigure your system's devices with devfsadm(1M) or enter "boot -r" to the OpenBoot monitor's prompt (usually "ok").

17.23 Solaris and SAM-FS

17.23.1 Why does Solaris lsof report "(limited SAM-FS info)"?

Lsof 4.68 and above report "(limited SAM-FS info)" on Solaris in the NAME column after the path or file system name for all files it finds on SAM-FS file systems.

That's because no more information is known about the composition of the nodes that follow SAM-FS vnodes. If you can provide that information, please contact me via e-mail at <abe@purdue.edu>. Make sure "lsof" appears in the "Subject:" line so my e-mail filter won't classify your letter as Spam.

17.23.2 Why can't lsof locate named SAM-GS files?

Solaris lsof 4.68 and above can't locate files on SAM-FS file systems when the files are named as lsof arguments because lsof doesn't know how to locate open SAM-FS file device
and node number information. (See also 'Why does Solaris lsof report "(limited SAM-FS info)?')

17.24 Lsof and Solaris 10 zones

17.24.1 How can I make lsof list the Solaris zone?

Use the lsof "-z [z]" option.

17.24.2 Why doesn't lsof work in a Solaris 10 zone?

When run from within a Solaris 10 zone, lsof will usually report:

```
lsof: can't stat(/devices): No such file or directory
```

That's because a Solaris zone usually has no /devices subdirectory, a restriction of the zone implementation intended to limit the ability of zone processes to control global system resources, including physical devices.

While a zone may have a /dev subdirectory, that subdirectory usually lacks the /dev/allkmem, /dev/mem and /dev/kmem devices lsof and the KVM library it uses require.

The work-around is to run lsof in the global zone. When it is run in a global zone lsof will be able to report on processes running in any zone, including the global zone.

17.24.3 Why does lsof complain it can't stat() Solaris 10 zone file systems?

When run from the global zone on Solaris 10 lsof may complain:

```
lsof: WARNING: can't stat() 15 zone file systems;
 using dev= options
```

The warning message means lsof found the reported number of file system entries in the mount table for which it didn't have permission to get stat(2) results, but which had "zone=" and "dev=" mount table options.

That is a normal restriction of Solaris 10 zones. Since the lsof warning message indicates it was able to find "dev=" options for the file systems, lsof will probably work correctly.

One work-around is to relax the restrictions on zone mount points, so that lsof can stat() them. While that may be possible by changing directory modes or group ownerships, it is probably not a good idea, because it weakens the restrictions zones are intended to provide.

Another work-around is to suppress the warning message with lsof's "-w" option. The down side of that is that it causes the suppression of all warning messages, leading to the possibility that some non-stat() warning messages will be suppressed.

17.25 Solaris 10 problems

17.25.1 Why does Solaris 10 lsof sometimes report the wrong path name?

When a path name component is renamed -- e.g., with mv(1) -- Solaris 10 lsof may report the old component for an open file that used the component in its path before the rename. That's because Solaris 10 lsof reports the path name cached in the open file's vnode and the Solaris 10 kernel doesn't update the open vnode's cached path name when a component of it is changed.

When an open file is deleted -- e.g., with rm(1) -- the path name by which it was opened remains cached in the vnode. Lsof can be instructed to display that path name with the -X option. The path name might be incorrect because of the rename problem described above. See the answer to the 'What does "(deleted)" mean in the NAME column of a Solaris 10 open file?' question for more information.

Lsof is sometimes able to detect that cached path name is

incorrect. In that case lsof may report only the mounted-on directory and device of the file system or it may report that the path name is of questionable accuracy by appending a trailing "(?)" to it in the NAME column.

See the answer to the "Why does Solaris 10 lsof sometimes report only the mounted-on directory and device?" and 'What does "(?)" mean in the NAME column of a Solaris 10 open file?' questions for more information.

17.25.2 Why does Solaris 10 lsof sometimes report only the mounted-on directory and device?

For some regular open files lsof may report only the mounted-on directory and device of the file system on which the file resides. That's because lsof was able to determine that the path name cached in the open file's vnode is incorrect.

Lsof detects the cached path name is incorrect by applying stat(2) to it, provided that no error was detected when stat(2) was applied to
the file system mounted-on directory during lsof
setup. If a mounted-on directory stat(2) error was detected during setup, lsof does no cached path name analysis and simply reports it.

When the application of stat(2) to the cached path name returns a no-entry reply (the ENOENT error number), lsof concludes the path no longer exists (i.e., has been unlinked) and reports the mounted-on directory and device of the file system. That behavior can be modified with the -X option in lsof revisions 4.77 and above. See the answer to the 'What does "(deleted)" mean in the NAME column of a Solaris 10 open file?' for more information.

When the application of stat(2) to the cached path name returns a permission error reply (the EACCES or EPERM error numbers), lsof reports the cached path name and adds a trailing "(?)" to indicate the reported path name is of questionable accuracy. See the answer to the question 'What does "(?)" mean in the NAME column of a Solaris 10 open file?'
for more information.

If the application of stat(2) to the cached path name yields any other error reply, lsof reports the mounted-on directory and device of the file system.

When the application of stat(2) to the cached path name

succeeds, lsof compares the reported device and node numbers to what it has obtained for the open file from kernel structures. If they match, lsof reports the cached path name. If they don't match, lsof instead reports the mounted-on directory and device of the file system.

A work-around that allows lsof to apply stat(2) successfully to cached path names is to give lsof sufficient permission to do it -- i.e., run lsof as the root user.

17.25.3 What does "(deleted)" mean in the NAME column of a Solaris 10 open file?

When the -X option is specified to Solaris 10 lsof, it will report in its NAME column the path name cached for a deleted file in its vnode. The path name will be followed by "(deleted)".

Note that the path name cached in a file's vnode is the path name by which the file was opened. It is not updated by the Solaris kernel when any path name component is changed. Hence, it may not represent the final path name the open file had.

See the answer to the "Why does Solaris 10 lsof sometimes report the wrong path name?" question for more information on how changing a path name component affects the correctness of a what lsof reports.

17.25.4 What does "(?)" mean in the NAME column of a Solaris 10 open file?

When lsof encounters a path name cached in the open file's vnode that stat(2) reports lsof lacks permission to access, lsof adds "(?)" to the path name reported in the NAME column to indicate the path name is of questionable accuracy.

See the answers to the "Why does Solaris 10 lsof sometimes report the wrong path name?" and "Why does Solaris 10 lsof sometimes report only the mounted-on directory and device?" questions for more information on why lsof may report a path name of questionable accuracy.

A work-around that allows lsof to apply stat(2) successfully to cached path names is to give lsof sufficient permission to do it -- i.e., run lsof as the root user.

17.26 Solaris contract file problems

17.26.1 Why doesn't lsof report size, link count and node number for Solaris 10 contract files?

Lsof doesn't report size, link count or node number for Solaris 10 contract files because I don't know how to obtain them from contract file kernel structures.

17.26.2 Why can't lsof locate a Solaris 10 contract file by path name?

Because lsof can't find the node number of Solaris contract files, it can't match the device and node numbers it gets from applying stat(2) to the contract file path name with what it finds in kernel data.

17.27 Solaris 10 and above ZFS probblems

17.27.1 Why does Configure warn that ZFS support is not enabled?

To provide ZFS support it is necessary that lsof have access to the definitions of ZFS structures used by the kernel. Those definitions are made available to lsof when it runs by the libctl library.

If lsof's Configure script finds that ZFS is indicated by the presence of the <sys/fs/zfs.h> header file, but the libctl library is not indicated via the <libctl.h> header file, the script concludes that ZFS support is not possible and issues the following warning:

WARNING: ZFS support not enabled; libctf.h missing.

Install libctf support to remedy this problem.

17.28 Problems with Solaris 9 and above

17.28.1 Why does the compiler complain about lgrp_root on Solaris 9 and above?

When compiling lsof 4.84 on later Solaris 9 and 10 systems, the compiler may report the following error:

/usr/include/sys/lgrp.h", line ...: identifier redeclared: lgrp_root

This error results from a conflict between usage of lgrp_root

in both <sys/lgrp.h> and <sys/lgrp_user.h> when _KMEMUSER or
_KERNEL is #define'd before <sys/lgrp.h> is #include'd. This
problem is noted in Sunsolve bug ID 5064229.

The
work-around is to use lsof revision 4.85 sources.

18.0 Lsof Features

18.1 Why doesn't lsof doesn't report on /proc entries on my system?

/proc file system support is generally available only for
BSD, SYSV R4 dialects, and Tru64 UNIX (Digital UNIX, DEC
OSF/1). It's also available for Linux, and Pyramid DC/OSx
and Reliant UNIX.

Even on some SYSV R4 dialects I encountered many problems
while trying to incorporate /proc file system support.
The chief problem is that some vendors don't distribute
the header file that describes the /proc file system node
-- usually called prdata.h.

18.2 How do I disable the device cache file feature or alter it's behavior?

To disable the device cache file feature for a dialect,
remove the HASDCACHE definition from the machine.h file of
the dialect's machine.h header file. You can also use
HASDCACHE to change the default prefix (``.lsof'') of the
device cache file.

Be sure you consider disabling the device cache file feature
carefully.
Having a device cache file significantly reduces
lsof startup overhead by eliminating a full scan of /dev
(or /devices) once the device cache file has been created.
That full scan also overloads the kernel's name cache with
the names of the /dev (or /devices) nodes, reducing the
opportunity for lsof to find path name components of open
files.

If you're worried about the presence of mode 0600 device
cache files in the home directories of the real user IDs
that execute lsof, consider these checks that lsof makes
on the file before using it:

1. To read the device cache file, lsof must gain permission from access(2).

2. The device cache file's modes must be 0600 (0644 if lsof is reading a system-wide device cache file) and its size non-zero.

3. There must be a correctly formatted section count line at the beginning of the file.

4. Each section must have a header line with a count that properly numbers the lines in the section. Legal sections are device, clone, pseudo-device, and CRC.

5. The lines of a section must have the proper format.

6. All lines are included in a 16 bit CRC, and it is recorded in a non-checksummed section line at the end of the file.

7. The checksum computed when the file is read must match the checksum recorded when the file was written.

8. The checksum section line must be followed by end-of-information.

9. Lsof must be able to get matching results from stat(2) on a randomly chosen entry of the device section.

For more information on the device cache file, read the 00DCACHE file of the lsof distribution.

18.2.1 What's the risk with a perverted device cache file?

Even with the checks that lsof makes on the device cache file, it's conceivable that an intruder could modify it so it would pass lsof's tests.

The only serious consequence I know of this change is the removal of a file whose major device number identifies a socket from some user ID's device cache file. When such a device has been removed from the device cache file, and when lsof doesn't detect the removal, lsof may not be able

to identify socket files when executed by the affected user
ID. Only certain dialects are at risk to this attack --
e.g., SCO OpenServer and Solaris 2.x, 7, 8, and 9.

If you're tracking a network intruder with lsof, that could
be important to you. If you suspect that someone has
corrupted the device cache file you're using, I recommend
you use lsof's -Di option to tell it to ignore it and use
the contents of /dev (or /devices) instead; or remove the
device cache file (usually .lsof_hostname, where hostname
is the first component of the host's name returned by
gethostname(2)) from the user ID's home directory and let
lsof create a new one for you.

18.2.2 How do I put the full host name in a personal device cache file path?

Lsof constructs the personal device cache file path name
from a format
specified in the HASPERSDC #define in the
dialect's machine.h header file. As distributed HASPERSDC
declares the path to be ``.lsof_" plus the first component
of the host name with the format ``.lsof_%L".

If you want to change the way lsof constructs the personal
device cache file path name, you can change the HASPERSDC
#define and recompile lsof. If, for example, you #define
HASPERSDC to be ``.lsof_%l" (note the lower case `l'),
Configure and remake lsof, then the personal device cache
file path will be ``.lsof_" plus the host name returned
by gethostname(2).

See the 00DCACHE file of the lsof distribution for more
information on the formation of the personal device cache
file path and the use of the HASPERSDC #define.

18.2.3 How do I put the personal device cache file in /tmp?

Change the HASPERSDC definition in your dialect's machine.h
header file.

When you redefine HASPERSDC, make sure you put at least
one user identification conversion in it to keep separate
the
device cache files for each user of lsof. Also give
some thought to including the ``%0" conversion to define
an alternate path for setuid-root and root processes.

Here's a definition that puts a personal device cache file
in /tmp with the name ``.lsof_login_hostname_pers".

```
#define HASPERSDC "/tmp/.lsof_%u_%l_pers"
```

Thus the /tmp personal device cache file path for login
"abe" on host "lsof.itap.purdue.edu" would be:

```
/tmp/.lsof_abe_lsof.itap.purdue.edu_pers
```

You can add the User ID (UID) with the "%U" conversion and
the first host name component with the ``%L" conversion.

CAUTION: be careful using absolute paths like /tmp lest
lsof processes that are setuid-root or whose real UID is
root be used to exploit some security weakness via /tmp.
Elect instead to add an alternate path for those processes
with the ``%0" conversion. Here's an extension of the
previous HASPERSDC format for /tmp that declares an alternate
path:

```
#define HASPERSDC "/tmp/.lsof_%u_%l_pers%0%h/.lsof_%L"
```

When
the lsof process is setuid-root or its real UID is
root, presuming root's home directory is `/' and the host's
name is ``lsof.itap.purdue.edu", the extended format yields:

```
/.lsof_vic
```

18.3 Why doesn't lsof know about AFS files on my favorite dialect?

Lsof currently supports AFS for these dialects:

```
AIX 4.1.4 (AFS 3.4a)
Linux 1.2.13 (AFS 3.3)
NEXTSTEP 3.2 (AFS 3.3)
Solaris 2.[56] (AFS 3.4a)
```

It may recognize AFS files on other versions of these
dialects, but I have no way to test that. Lsof may report
correct information for AFS files on other dialects, but
I can't test that either.

AFS support must be custom crafted for each UNIX dialect
and then tested. If lsof supports your favorite dialect,
but doesn't recognize its AFS files, probably I don't have
access to a test system. If you want AFS support badly

for your dialect, consider helping me do the development
and testing.

18.3.1 Why doesn't lsof report
node numbers for all AFS volume files,
or how do I reveal dynamic module addresses to lsof?

When AFS is implemented via dynamic kernel modules -- e.g.,
in NEXTSTEP -- lsof can't obtain the addresses of AFS
variables in the kernel that it uses to identify AFS vnodes.
It can guess that a vnode is assigned to an AFS file and
it can obtain other information about AFS files, but it
has trouble computing AFS volume node numbers.

To determine node numbers for AFS volumes other than the
root volume, /afs, lsof needs access to a hashed volume
structure pointer table. When it can't find the address
of that table, because AFS support is implemented via
dynamic kernel modules, lsof will return blanks in the
INODE column for AFS volume files. Lsof can identify the
root volume's node number (0), and can compute the node
numbers for all other AFS files.

If you have a name list file that contains the addresses
of the AFS dynamic modules -- e.g., you saved module symbols
when
you created a loadable module kernel with modload(8)
by specifying -sym -- lsof may be able to find the kernel
addresses it needs in that file.

Lsof looks up AFS dynamic kernel addresses for these dialects
at these default paths:

NEXTSTEP 3.2 /usr/vice/etc/afs_loadable

A different path to a name list file with AFS dynamic kernel
addresses may be specified with the -A option, when the -A
option description appears in lsof's -h or -? (help) output.

If any addresses appear in the -A name list file that also
appear in the regular kernel name list file -- e.g., /vmunix
-- they must match, or lsof will silently ignore the -A
addresses on the presumption that they are out of date.

Found in path(s):
* /opt/cola/permits/1682050831_1684512792.1459703/0/lsof-org-lsof-4-95-0-0-g67d8c82-tar-gz/lsof-org-lsof-67d8c82/00FAQ

1.220 binutils 2.39.0

1.220.1 Available under license :

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Public License permits more lax criteria for linking other code with the library.

We call this license the "Lesser" General Public License because it does Less to protect the user's freedom than the ordinary General Public License. It also provides other free software developers Less of an advantage over competing non-free programs. These disadvantages are the reason we use the ordinary General Public License for many libraries. However, the Lesser license provides advantages in certain special circumstances.

For example, on rare occasions, there may be a special need to encourage the widest possible use of a certain library, so that it becomes a de-facto standard. To achieve this, non-free programs must be allowed to use the library. A more frequent case is that a free library does the same job as widely used non-free libraries. In this case, there is little to gain by limiting the free library to free software only, so we
use the Lesser General Public License.

In other cases, permission to use a particular library in non-free programs enables a greater number of people to use a large body of free software. For example, permission to use the GNU C Library in non-free programs enables many more people to use the whole GNU operating system, as well as its variant, the GNU/Linux operating system.

Although the Lesser General Public License is Less protective of the users' freedom, it does ensure that the user of a program that is linked with the Library has the freedom and the wherewithal to run that program using a modified version of the Library.

The precise terms and conditions for copying, distribution and modification follow. Pay close attention to the difference between a

"work based on the library" and a "work that uses the library". The former contains code derived from the library, whereas the latter must be combined with the library in order to run.

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0. This License Agreement applies to any software library or other program which contains a notice placed by the copyright holder or other authorized party saying it may be distributed under the terms of this Lesser General Public License (also called "this License"). Each licensee is addressed as "you".

A "library" means a collection of software functions and/or data prepared so as to be conveniently linked with application programs (which use some of those functions and data) to form executables.

The "Library", below, refers to any such software library or work which has been distributed under these terms. A "work based on the Library" means either the Library or any derivative work under copyright law: that is to say, a work containing the Library or a portion of it, either verbatim or with modifications and/or translated straightforwardly into another language. (Hereinafter, translation is included without
limitation in the term "modification".)

"Source code" for a work means the preferred form of the work for making modifications to it. For a library, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the library.

Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running a program using the Library is not restricted, and output from such a program is covered only if its contents constitute a work based on the Library (independent of the use of the Library in a tool for writing it). Whether that is true depends on what the Library does and what the program that uses the Library does.

1. You may copy and distribute verbatim copies of the Library's complete source code as you receive it, in any medium, provided that you conspicuously and appropriately publish
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appropriate copyright notice and disclaimer of warranty; keep intact all the notices that refer to this License and to the absence of any warranty; and distribute a copy of this License along with the Library.

You may charge a fee for the physical act of transferring a copy, and you may at your option offer warranty protection in exchange for a fee.

2. You may modify your copy or copies of the Library or any portion of it, thus forming a work based on the Library, and copy and distribute such modifications or work under the terms of Section 1 above, provided that you also meet all of these conditions:

a) The modified work must itself be a software library.

b) You must cause the files modified to carry prominent notices stating that you changed the files and the date of any change.

c) You must cause the whole of the work to be licensed at no charge to all third parties under the terms of this License.

d) If a facility in the modified Library refers to a function or a table of data to be supplied by an application program that uses the facility, other than as an argument passed when the facility is invoked, then you must make a good faith effort to ensure that, in the event an application does not supply such function or table, the facility still operates, and performs whatever part of its purpose remains meaningful.

(For example, a function in a library to compute square roots has a purpose that is entirely well-defined independent of the application. Therefore, Subsection 2d requires that any application-supplied function or table used by this function must be optional: if the application does not supply it, the square root function must still compute square roots.)

These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Library, and can be reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works. But when you distribute the same sections as part of a whole which is a work based on the Library, the distribution of the whole must be on the terms of this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to

exercise the right to control the distribution of derivative or
collective works based on the Library.

In addition, mere aggregation of another work not based on the Library
with the Library (or with a work based on the Library) on a volume of
a storage or distribution medium does not bring the other work under
the scope of this License.

3. You may opt to apply the terms of the ordinary GNU General Public
License instead of this License
to a given copy of the Library. To do
this, you must alter all the notices that refer to this License, so
that they refer to the ordinary GNU General Public License, version 2,
instead of to this License. (If a newer version than version 2 of the
ordinary GNU General Public License has appeared, then you can specify
that version instead if you wish.) Do not make any other change in
these notices.

Once this change is made in a given copy, it is irreversible for
that copy, so the ordinary GNU General Public License applies to all
subsequent copies and derivative works made from that copy.

This option is useful when you wish to copy part of the code of
the Library into a program that is not a library.

4. You may copy and distribute the Library (or a portion or
derivative of it, under Section 2) in object code or executable form
under the terms of Sections 1 and 2 above provided that you accompany
it with the complete corresponding machine-readable source code, which
must be
distributed under the terms of Sections 1 and 2 above on a
medium customarily used for software interchange.

If distribution of object code is made by offering access to copy
from a designated place, then offering equivalent access to copy the
source code from the same place satisfies the requirement to
distribute the source code, even though third parties are not
compelled to copy the source along with the object code.

5. A program that contains no derivative of any portion of the
Library, but is designed to work with the Library by being compiled or
linked with it, is called a "work that uses the Library". Such a
work, in isolation, is not a derivative work of the Library, and
therefore falls outside the scope of this License.

However, linking a "work that uses the Library" with the Library
creates an executable that is a derivative of the Library (because it
contains portions of the Library), rather than a "work that uses the

library". The executable is therefore covered
by this License.
Section 6 states terms for distribution of such executables.

When a "work that uses the Library" uses material from a header file that is part of the Library, the object code for the work may be a derivative work of the Library even though the source code is not. Whether this is true is especially significant if the work can be linked without the Library, or if the work is itself a library. The threshold for this to be true is not precisely defined by law.

If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may distribute the object code for the work under the terms of Section 6. Any
executables containing that work also fall under Section 6, whether or not they are linked directly with the Library itself.

6. As an exception to the Sections above, you may also combine or link a "work that uses the Library" with the Library to produce a work containing portions of the Library, and distribute that work under terms of your choice, provided that the terms permit modification of the work for the customer's own use and reverse engineering for debugging such modifications.

You must give prominent notice with each copy of the work that the Library is used in it and that the Library and its use are covered by this License. You must supply a copy of this License. If the work during execution displays copyright notices, you must include the copyright notice for the Library among them, as well as a reference directing the user to the copy of this License. Also, you must do one of these things:

a) Accompany the work with the complete corresponding machine-readable
source code for the Library including whatever
changes were used in the work (which must be distributed under Sections 1 and 2 above); and, if the work is an executable linked with the Library, with the complete machine-readable "work that uses the Library", as object code and/or source code, so that the user can modify the Library and then relink to produce a modified executable containing the modified Library. (It is understood

that the user who changes the contents of definitions files in the Library will not necessarily be able to recompile the application to use the modified definitions.)

b) Use a suitable shared library mechanism for linking with the Library. A suitable mechanism is one that (1) uses at run time a copy of the library already present on the user's computer system, rather than copying library functions into the executable, and (2) will operate properly with a modified version of the library, if the
user installs one, as long as the modified version is interface-compatible with the version that the work was made with.

c) Accompany the work with a written offer, valid for at least three years, to give the same user the materials specified in Subsection 6a, above, for a charge no more than the cost of performing this distribution.

d) If distribution of the work is made by offering access to copy from a designated place, offer equivalent access to copy the above specified materials from the same place.

e) Verify that the user has already received a copy of these materials or that you have already sent this user a copy.

For an executable, the required form of the "work that uses the Library" must include any data and utility programs needed for reproducing the executable from it. However, as a special exception, the materials to be distributed need not include anything that is normally distributed (in either source or binary form) with the major
components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

It may happen that this requirement contradicts the license restrictions of other proprietary libraries that do not normally accompany the operating system. Such a contradiction means you cannot use both them and the Library together in an executable that you distribute.

7. You may place library facilities that are a work based on the Library side-by-side in a single library together with other library facilities not covered by this License, and distribute such a combined library, provided that the separate distribution of the work based on the Library and of the other library facilities is otherwise permitted, and provided that you do these two things:

a) Accompany the combined library with a copy of the same work based on the Library, uncombined with any other library facilities. This must be distributed under the terms of the Sections above.

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[This is the first released version of the library GPL. It is
numbered 2 because it goes with version 2 of the ordinary GPL.]

Preamble

The licenses for most software are designed to take away your
freedom to share and change it. By contrast, the GNU General Public
Licenses are intended to guarantee your freedom to share and change
free software--to make sure the software is free for all its users.

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if you want it, that you can change the software or use pieces of it
in new free programs; and that you know you can do these things.

To protect your rights, we need to make restrictions that forbid
anyone to deny you these rights or to ask you to surrender the rights.
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you distribute copies of the library, or if you modify it.

For example, if you distribute copies of the library, whether gratis
or for a fee, you must give the recipients all the rights that we gave
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code. If you link a program with the library, you must provide
complete object files to the recipients so that they can relink them
with the library, after making
changes to the library and recompiling
it. And you must show them these terms so they know their rights.

Our method of protecting your rights has two steps: (1) copyright
the library, and (2) offer you this license which gives you legal
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Also, for each distributor's protection, we want to make certain
that everyone understands that there is no warranty for this free
library. If the library is modified by someone else and passed on, we
want its recipients to know that what they have is not the original
version, so that any problems introduced by others will not reflect on
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Finally, any free program is threatened constantly by software
patents. We wish to avoid the danger that companies distributing free
software will individually obtain patent licenses, thus in effect
transforming the program into proprietary software. To prevent this,
we have made it clear that any patent must be licensed
for everyone's
free use or not licensed at all.

Most GNU software, including some libraries, is covered by the ordinary
GNU General Public License, which was designed for utility programs. This
license, the GNU Library General Public License, applies to certain
designated libraries. This license is quite different from the ordinary

one; be sure to read it in full, and don't assume that anything in it is
the same as in the ordinary license.

The reason we have a separate public license for some libraries is that
they blur the distinction we usually make between modifying or adding to a
program and simply using it. Linking a program with a library, without
changing the library, is in some sense simply using the library, and is
analogous to running a utility program or application program. However, in
a textual and legal sense, the linked executable is a combined work, a
derivative of the original library, and the ordinary General Public License
treats it as such.

Because
of this blurred distinction, using the ordinary General
Public License for libraries did not effectively promote software
sharing, because most developers did not use the libraries. We
concluded that weaker conditions might promote sharing better.

However, unrestricted linking of non-free programs would deprive the
users of those programs of all benefit from the free status of the
libraries themselves. This Library General Public License is intended to
permit developers of non-free programs to use free libraries, while
preserving your freedom as a user of such programs to change the free
libraries that are incorporated in them. (We have not seen how to achieve
this as regards changes in header files, but we have achieved it as regards
changes in the actual functions of the Library.) The hope is that this
will lead to faster development of free libraries.

The precise terms and conditions for copying, distribution and
modification follow. Pay close attention to the difference
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"work based on the library" and a "work that uses the library". The
former contains code derived from the library, while the latter only
works together with the library.

Note that it is possible for a library to be covered by the ordinary
General Public License rather than by this special one.

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A "library" means a collection of software functions and/or data

prepared so as to be conveniently linked with application programs (which use some of those functions and data) to form executables.

The "Library", below, refers to any such software library or work which has been distributed under these terms. A "work based on the Library" means either the Library or any derivative work under copyright law: that is to say, a work containing the Library or a portion of it, either verbatim or with modifications and/or translated straightforwardly into another language. (Hereinafter, translation is included without limitation in the term "modification".)

"Source code" for a work means the preferred form of the work for making modifications to it. For a library, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the library.

Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running a program using the Library is not restricted, and output from such a program is covered only if its contents constitute a work based on the Library (independent of the use of the Library in a tool for writing it). Whether that is true depends on what the Library does and what the program that uses the Library does.

1. You may copy and distribute verbatim copies of the Library's complete source code as you receive it, in any medium, provided that you conspicuously and appropriately publish on each copy an appropriate copyright notice and disclaimer of warranty; keep intact all the notices that refer to this License and to the absence of any warranty; and distribute a copy of this License along with the Library.

You may charge a fee for the physical act of transferring a copy, and you may at your option offer warranty protection in exchange for a fee.

2. You may modify your copy or copies of the Library or any portion of it, thus forming a work based on the Library, and copy and distribute such modifications or work under the terms of Section 1 above, provided that you also meet all of these conditions:

a) The modified work must itself be a software library.

b) You must cause the files modified to carry prominent notices

stating that you changed the files and the date of any change.

c) You must cause the whole of the work to be licensed at no charge to all third parties under the terms of this License.

d) If a facility in the modified Library refers to a function or a table of data to be supplied by an application program that uses the facility, other than as an argument passed when the facility is invoked, then you must make a good faith effort to ensure that, in the event an application does not supply such function or table, the facility still operates, and performs whatever part of its purpose remains meaningful.

(For example, a function in a library to compute square roots has a purpose that is entirely well-defined independent of the application. Therefore, Subsection 2d requires that any application-supplied function or table used by this function must be optional: if the application does not supply it, the square root function must still compute square roots.)

These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Library, and can be reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works. But when you distribute the same sections as part of a whole which is a work based on the Library, the distribution of the whole must be on the terms of this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Library.

In addition, mere aggregation of another work not based on the Library with the Library (or with a work based on the Library) on a volume of a storage or distribution medium does not bring the other work under the scope of this License.

3. You may opt to apply the terms of the ordinary GNU General Public License instead of this License to a given copy of the Library. To do this, you must alter all the notices that refer to this License, so that they refer to the ordinary GNU General Public License, version 2, instead of to this License. (If a newer version than version 2 of the

ordinary GNU General Public License has appeared, then you can specify that version instead if you wish.) Do not make any other change in these notices.

Once this change is made in a given copy, it is irreversible for that copy, so the ordinary GNU General Public License applies to all subsequent copies and derivative works made from that copy.

This option is useful when you wish to copy part of the code of the
Library into a program that is not a library.

4. You may copy and distribute the Library (or a portion or derivative of it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange.

If distribution of object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place satisfies the requirement to distribute the source code, even though third parties are not compelled to copy the source along with the object code.

5. A program that contains no derivative of any portion of the Library, but is designed to work with the Library by being compiled or linked with it, is called a "work that uses the Library". Such a work, in isolation, is not a derivative
work of the Library, and
therefore falls outside the scope of this License.

However, linking a "work that uses the Library" with the Library creates an executable that is a derivative of the Library (because it contains portions of the Library), rather than a "work that uses the library". The executable is therefore covered by this License. Section 6 states terms for distribution of such executables.

When a "work that uses the Library" uses material from a header file that is part of the Library, the object code for the work may be a derivative work of the Library even though the source code is not. Whether this is true is especially significant if the work can be linked without the Library, or if the work is itself a library. The threshold for this to be true is not precisely defined by law.

If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of

the object
file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may distribute the object code for the work under the terms of Section 6. Any executables containing that work also fall under Section 6, whether or not they are linked directly with the Library itself.

6. As an exception to the Sections above, you may also compile or link a "work that uses the Library" with the Library to produce a work containing portions of the Library, and distribute that work under terms of your choice, provided that the terms permit modification of the work for the customer's own use and reverse engineering for debugging such modifications.

You must give prominent notice with each copy of the work that the Library is used in it and that the Library and its use are covered by this License. You must supply
a copy of this License. If the work
during execution displays copyright notices, you must include the copyright notice for the Library among them, as well as a reference directing the user to the copy of this License. Also, you must do one of these things:

a) Accompany the work with the complete corresponding machine-readable source code for the Library including whatever changes were used in the work (which must be distributed under Sections 1 and 2 above); and, if the work is an executable linked with the Library, with the complete machine-readable "work that uses the Library", as object code and/or source code, so that the user can modify the Library and then relink to produce a modified executable containing the modified Library. (It is understood that the user who changes the contents of definitions files in the Library will not necessarily be able to recompile the application to use the modified definitions.)

b) Accompany the
work with a written offer, valid for at
least three years, to give the same user the materials specified in Subsection 6a, above, for a charge no more than the cost of performing this distribution.

c) If distribution of the work is made by offering access to copy from a designated place, offer equivalent access to copy the above specified materials from the same place.

d) Verify that the user has already received a copy of these materials or that you have already sent this user a copy.

For an executable, the required form of the "work that uses the Library" must include any data and utility programs needed for reproducing the executable from it. However, as a special exception, the source code distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

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(This file is under construction.) -*- text -*-

If you've contributed to gas and your name isn't listed here, it is
not meant as a slight. I just don't know about it. Email me,
nickc@redhat.com and I'll correct the situation.

This file will eventually be deleted: The general info will go into
the documentation, and info on specific files will go into an AUTHORS
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++++++++++++++++

Dean Elsner wrote the original gas for vax. [more details?]

Jay Fenlason maintained gas for a while, adding support for
gdb-specific debug information and the 68k series machines, most of
the preprocessing pass, and extensive changes in messages.c,
input-file.c, write.c.

K. Richard Pixley maintained gas for a while, adding various
enhancements and many bug fixes, including merging support for several
processors, breaking gas up to handle multiple object file format
backends (including heavy rewrite, testing, an integration of the coff
and b.out backends), adding configuration
 including heavy testing and
verification of cross assemblers and file splits and renaming,
converted gas to strictly ansi C including full prototypes, added
support for m680[34]0 & cpu32, considerable work on i960 including a
coff port (including considerable amounts of reverse engineering), a
sparc opcode file rewrite, decstation, rs6000, and hp300hpux host
ports, updated "know" assertions and made them work, much other
reorganization, cleanup, and lint.

Ken Raeburn wrote the high-level BFD interface code to replace most of
the code in format-specific I/O modules.

The original Vax-VMS support was contributed by David L. Kashtan.
Eric Youngdale and Pat Rankin have done much work with it since.

The Intel 80386 machine description was written by Eliot Dresselhaus.

Minh Tran-Le at IntelliCorp contributed some AIX 386 support.

The Motorola 88k machine description was contributed by Devon Bowen of
Buffalo University and Torbjorn Granlund of the Swedish Institute of
Computer Science.

Keith

Knowles at the Open Software Foundation wrote the original MIPS back end (tc-mips.c, tc-mips.h), and contributed Rose format support that hasn't been merged in yet. Ralph Campbell worked with the MIPS code to support a.out format.

Support for the Zilog Z8k and Hitachi H8/300, H8/500 and SH processors (tc-z8k, tc-h8300, tc-h8500, tc-sh), and IEEE 695 object file format (obj-ieee), was written by Steve Chamberlain of Cygnus Solutions. Steve also modified the COFF back end (obj-coffbfd) to use BFD for some low-level operations, for use with the Hitachi, 29k and Zilog targets.

John Gilmore built the AMD 29000 support, added .include support, and simplified the configuration of which versions accept which pseudo-ops. He updated the 68k machine description so that Motorola's opcodes always produced fixed-size instructions (e.g. jsr), while synthetic instructions remained shrinkable (jbsr). John fixed many bugs, including true tested cross-compilation support, and one bug in relaxation
that took a week and required the proverbial one-bit fix.

Ian Lance Taylor of Cygnus Solutions merged the Motorola and MIT syntaxes for the 68k, completed support for some COFF targets (68k, i386 SVR3, and SCO Unix), wrote the ECOFF support based on Michael Meissner's mips-tfile program, wrote the PowerPC and RS/6000 support, and made a few other minor patches. He handled the binutils releases for versions 2.7 through 2.9.

David Edelsohn contributed fixes for the PowerPC and AIX support.

Steve Chamberlain made gas able to generate listings.

Support for the HP9000/300 was contributed by Glenn Engel of HP.

Support for ELF format files has been worked on by Mark Eichin of Cygnus Solutions (original, incomplete implementation), Pete Hoogenboom at the University of Utah (HPPA mainly), Michael Meissner of the Open Software Foundation (i386 mainly), and Ken Raeburn of Cygnus Solutions (sparc, initial 64-bit support).

Several engineers at Cygnus Solutions have also provided many
small
bug fixes and configuration enhancements.

The initial Alpha support was contributed by Carnegie-Mellon University. Additional work was done by Ken Raeburn of Cygnus Solutions. Richard Henderson then rewrote much of the Alpha support.

Ian Dall updated the support code for the National Semiconductor 32000 series, and added support for Mach 3 and NetBSD running on the PC532.

Klaus Kaempf ported the assembler and the binutils to openVMS/Alpha.

Steve Haworth contributed the support for the Texas Instruction c30 (tms320c30).

H.J. Lu has contributed many patches and much testing.

Alan Modra reworked much of the i386 backend, improving the error checking, updating the code, and improving the 16 bit support, using patches from the work of Martynas Kunigelis and H.J. Lu.

Many others have contributed large or small bugfixes and enhancements. If you've contributed significant work and are not mentioned on this list, and want to be, let us know. Some of the history has been lost;
we aren't
intentionally leaving anyone out.

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1.221 shadow 4.12.3

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1.222 diffutils 3.9

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executable form with such
an offer, in accord with Subsection b above.)

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Version 2, June 1991

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treats it as such.

Because
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preserving your freedom as a user of such programs to change the free libraries that are incorporated in them. (We have not seen how to achieve this as regards changes in header files, but we have achieved it as regards changes in the actual functions of the Library.) The hope is that this will lead to faster development of free libraries.

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its purpose remains meaningful.

(For example, a function in a library to compute square roots has
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application-supplied function or table used by this
function must
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Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Library.

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This option is useful when you wish to copy part of the code
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distribute the source code, even though third parties are not
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If such an object file uses only numerical parameters, data
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gobject-introspection has two licenses; one for the typelib library,
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1.226 pathlib 2.3.7

1.226.1 Available under license :

No license file was found, but licenses were detected in source scan.

Metadata-Version: 2.1
Name: pathlib2
Version: 2.3.7
Summary: Object-oriented filesystem paths
Home-page: https://github.com/jazzband/pathlib2
Author: Matthias C. M. Troffaes
Author-email: matthias.troffaes@gmail.com
License: MIT
Platform: UNKNOWN
Classifier: Development Status :: 5 - Production/Stable
Classifier: Intended Audience :: Developers
Classifier: License :: OSI Approved :: MIT License
Classifier: Operating System :: OS Independent
Classifier: Programming Language :: Python
Classifier: Programming Language :: Python :: 2
Classifier: Programming Language :: Python :: 3
Classifier: Programming Language :: Python :: 2.7
Classifier: Programming Language :: Python :: 3.5
Classifier: Programming Language :: Python :: 3.6
Classifier: Programming Language :: Python :: 3.7
Classifier: Programming Language :: Python :: 3.8
Classifier: Programming Language :: Python :: 3.9
Classifier: Topic :: Software Development :: Libraries
Classifier:
 Topic :: System :: Filesystems
License-File: LICENSE.rst

The `old pathlib <https://bitbucket.org/pitrou/pathlib>`_
module on bitbucket is in bugfix-only mode.
The goal of pathlib2 is to provide a backport of
`standard pathlib <http://docs.python.org/dev/library/pathlib.html>`_
module which tracks the standard library module,
so all the newest features of the standard pathlib can be
used also on older Python versions.

Download

Standalone releases are available on PyPI:
http://pypi.python.org/pypi/pathlib2/

Development

The main development takes place in the Python standard library: see
the `Python developer's guide <http://docs.python.org/devguide/>`_.
In particular, new features should be submitted to the
`Python bug tracker <http://bugs.python.org/>`_.

Issues that occur in this backport, but that do not occur not in the
standard Python pathlib module can be submitted on
the `pathlib2 bug tracker <https://github.com/jazzband/pathlib2/issues>`_.

Documentation

Refer
 to the
`standard pathlib <http://docs.python.org/dev/library/pathlib.html>`_
documentation.

Known Issues

For historic reasons, pathlib2 still uses bytes to represent file paths internally.
Unfortunately, on Windows with Python 2.7, the file system encoder (``mcbs``)
has only poor support for non-ascii characters,
and can silently replace non-ascii characters without warning.
For example, ``u''.encode(sys.getfilesystemencoding())`` results in ``????``
which is obviously completely useless.

Therefore, on Windows with Python 2.7, until this problem is fixed upstream,
unfortunately you cannot rely on pathlib2 to support the full unicode range for filenames.
See `issue #56 <https://github.com/jazzband/pathlib2/issues/56>`_ for more details.

.. |github| image:: https://github.com/jazzband/pathlib2/actions/workflows/python-package.yml/badge.svg
  :target: https://github.com/jazzband/pathlib2/actions/workflows/python-package.yml
   :alt: github

.. |codecov| image:: https://codecov.io/gh/jazzband/pathlib2/branch/develop/graph/badge.svg
   :target: https://codecov.io/gh/jazzband/pathlib2
   :alt: codecov

.. |jazzband| image:: https://jazzband.co/static/img/badge.svg
  :alt: Jazzband
  :target: https://jazzband.co/

Found in path(s):
* /opt/cola/permits/1682050824_1684512778.5675108/0/pathlib2-2-3-7-tar-gz/pathlib2-2.3.7/pathlib2.egg-info/PKG-INFO

* /opt/cola/permits/1682050824_1684512778.5675108/0/pathlib2-2-3-7-tar-gz/pathlib2-2.3.7/PKG-INFO
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Found in path(s):
* /opt/cola/permits/1682050824_1684512778.5675108/0/pathlib2-2-3-7-tar-gz/pathlib2-2.3.7/tests/test_pathlib2.py
* /opt/cola/permits/1682050824_1684512778.5675108/0/pathlib2-2-3-7-tar-gz/pathlib2-2.3.7/setup.py
* /opt/cola/permits/1682050824_1684512778.5675108/0/pathlib2-2-3-7-tar-gz/pathlib2-2.3.7/pathlib2/__init__.py

1.227 nghttp2 1.49.0

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1.228 glibc 2.36

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man/bitstring.3bsd
man/errc.3bsd
man/explicit_bzero.3bsd
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src/heapsort.c
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src/arc4random_linux.h
src/arc4random_uniform.c
src/arc4random_unix.h
src/arc4random_win.h
src/closefrom.c
src/freezero.c
src/getentropy_aix.c
src/getentropy_bsd.c
src/getentropy_hpux.c
src/getentropy_hurd.c
src/getentropy_linux.c
src/getentropy_osx.c
src/getentropy_solaris.c
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1.232 gdb 12.1

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If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may distribute the object code for the work under the terms of Section 6. Any executables containing that work also fall under Section 6, whether or not they are linked directly with the Library itself.

6. As an exception to the Sections above, you may also compile or link a "work that uses the Library" with the Library to produce a work containing portions of the Library, and distribute that work under terms of your choice, provided that the terms permit modification of the work for the customer's own use and reverse engineering for debugging such modifications.

You must give prominent notice with each copy of the work that the Library is used in it and that the Library and its use are covered by this License. You must supply

a copy of this License. If the work
during execution displays copyright notices, you must include the
copyright notice for the Library among them, as well as a reference
directing the user to the copy of this License. Also, you must do one
of these things:

a) Accompany the work with the complete corresponding
machine-readable source code for the Library including whatever
changes were used in the work (which must be distributed under
Sections 1 and 2 above); and, if the work is an executable linked
with the Library, with the complete machine-readable "work that
uses the Library", as object code and/or source code, so that the
user can modify the Library and then relink to produce a modified
executable containing the modified Library. (It is understood
that the user who changes the contents of definitions files in the
Library will not necessarily be able to recompile the application
to use the modified definitions.)

b) Accompany the
work with a written offer, valid for at
least three years, to give the same user the materials
specified in Subsection 6a, above, for a charge no more
than the cost of performing this distribution.

c) If distribution of the work is made by offering access to copy
from a designated place, offer equivalent access to copy the above
specified materials from the same place.

d) Verify that the user has already received a copy of these
materials or that you have already sent this user a copy.

For an executable, the required form of the "work that uses the
Library" must include any data and utility programs needed for
reproducing the executable from it. However, as a special exception,
the source code distributed need not include anything that is normally
distributed (in either source or binary form) with the major
components (compiler, kernel, and so on) of the operating system on
which the executable runs, unless that component itself accompanies
the executable.

It may happen that this requirement contradicts the license
restrictions of other proprietary libraries that do not normally
accompany the operating system. Such a contradiction means you cannot
use both them and the Library together in an executable that you
distribute.

7. You may place library facilities that are a work based on the
Library side-by-side in a single library together with other library

facilities not covered by this License, and distribute such a combined library, provided that the separate distribution of the work based on the Library and of the other library facilities is otherwise permitted, and provided that you do these two things:

a) Accompany the combined library with a copy of the same work based on the Library, uncombined with any other library facilities. This must be distributed under the terms of the Sections above.

b) Give prominent notice with the combined library of the fact that part of it is a work based on the Library, and explaining where to find the accompanying uncombined form of the same work.

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END OF TERMS AND CONDITIONS

Appendix: How to Apply These Terms to Your New Libraries

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To apply these terms, attach the following notices to the library. It is safest to attach them to the start of each source file to most effectively convey the exclusion of warranty; and each file should have at least the "copyright" line and a pointer to where the full notice is found.

<one line to give the library's name and a brief idea of what it does.>
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<name of author>

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Here is a sample; alter the names:

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library `Frob' (a library for tweaking knobs) written by James Random Hacker.

<signature of Ty Coon>, 1 April 1990
Ty Coon, President of Vice

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Version 2.1, February 1999

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suggest you first think carefully about whether
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recipients all the rights that we gave
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We protect your rights with a two-step method: (1) we copyright the library, and (2) we offer you this license, which gives you legal permission to copy, distribute and/or modify the library.

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Finally, software patents pose a constant threat to the existence

of
any free program. We wish to make sure that a company cannot effectively restrict the users of a free program by obtaining a restrictive license from a patent holder. Therefore, we insist that any patent license obtained for a version of the library must be consistent with the full freedom of use specified in this license.

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When a program is linked with a library, whether statically or using a shared library, the combination of the two is legally speaking a combined work, a derivative of the original library. The ordinary General Public License therefore permits such linking only if the entire combination
fits its criteria of freedom. The Lesser General
Public License permits more lax criteria for linking other code with the library.

We call this license the "Lesser" General Public License because it does Less to protect the user's freedom than the ordinary General Public License. It also provides other free software developers Less of an advantage over competing non-free programs. These disadvantages are the reason we use the ordinary General Public License for many libraries. However, the Lesser license provides advantages in certain special circumstances.

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use the Lesser General Public License.

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Although the Lesser General Public License is Less protective of the

users' freedom, it does ensure that the user of a program that is linked with the Library has the freedom and the wherewithal to run that program using a modified version of the Library.

The precise terms and conditions for copying, distribution and modification follow. Pay close attention to the difference between a "work based on the library" and a "work that uses the library". The former contains code derived from the library, whereas the latter must be combined with the library in order to run.

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A "library" means a collection of software functions and/or data prepared so as to be conveniently linked with application programs (which use some of those functions and data) to form executables.

The "Library", below, refers to any such software library or work which has been distributed under these terms. A "work based on the Library" means either the Library or any derivative work under copyright law: that is to say, a work containing the Library or a portion of it, either verbatim or with modifications and/or translated straightforwardly into another language. (Hereinafter, translation is included without
limitation in the term "modification".)

"Source code" for a work means the preferred form of the work for making modifications to it. For a library, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the library.

Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running a program using the Library is not restricted, and output from such a program is covered only if its contents constitute a work based on the Library (independent of the use of the Library in a tool for writing it). Whether that is true depends on what the Library does and what the program that uses the Library does.

1. You may copy and distribute verbatim copies of the Library's complete source code as you receive it, in any medium, provided that

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appropriate copyright notice and disclaimer of warranty; keep intact
all the notices that refer to this License and to the absence of any
warranty; and distribute a copy of this License along with the
Library.

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and you may at your option offer warranty protection in exchange for a
fee.

2. You may modify your copy or copies of the Library or any portion
of it, thus forming a work based on the Library, and copy and
distribute such modifications or work under the terms of Section 1
above, provided that you also meet all of these conditions:

a) The modified work must itself be a software library.

b) You must cause the files modified to carry prominent notices
stating that you changed the files and the date of any change.

c) You must cause the whole of the work to be licensed at no
charge to all third parties under the terms of this License.

d) If a facility in the modified
Library refers to a function or a
table of data to be supplied by an application program that uses
the facility, other than as an argument passed when the facility
is invoked, then you must make a good faith effort to ensure that,
in the event an application does not supply such function or
table, the facility still operates, and performs whatever part of
its purpose remains meaningful.

(For example, a function in a library to compute square roots has
a purpose that is entirely well-defined independent of the
application. Therefore, Subsection 2d requires that any
application-supplied function or table used by this function must
be optional: if the application does not supply it, the square
root function must still compute square roots.)

These requirements apply to the modified work as a whole. If
identifiable sections of that work are not derived from the Library,
and can be reasonably considered independent and separate works in
themselves,
then this License, and its terms, do not apply to those
sections when you distribute them as separate works. But when you
distribute the same sections as part of a whole which is a work based
on the Library, the distribution of the whole must be on the terms of

this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Library.

In addition, mere aggregation of another work not based on the Library with the Library (or with a work based on the Library) on a volume of a storage or distribution medium does not bring the other work under the scope of this License.

3. You may opt to apply the terms of the ordinary GNU General Public License instead of this License to a given copy of the Library. To do this, you must alter all the notices that refer to this License, so that they refer to the ordinary GNU General Public License, version 2, instead of to this License. (If a newer version than version 2 of the ordinary GNU General Public License has appeared, then you can specify that version instead if you wish.) Do not make any other change in these notices.

Once this change is made in a given copy, it is irreversible for that copy, so the ordinary GNU General Public License applies to all subsequent copies and derivative works made from that copy.

This option is useful when you wish to copy part of the code of the Library into a program that is not a library.

4. You may copy and distribute the Library (or a portion or derivative of it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange.

If distribution of object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place satisfies the requirement to distribute the source code, even though third parties are not compelled to copy the source along with the object code.

5. A program that contains no derivative of any portion of the Library, but is designed to work with the Library by being compiled or linked with it, is called a "work that uses the Library". Such a

work, in isolation, is not a derivative work of the Library, and therefore falls outside the scope of this License.

However, linking a "work that uses the Library" with the Library creates an executable that is a derivative of the Library (because it contains portions of the Library), rather than a "work that uses the library". The executable is therefore covered by this License.
Section 6 states terms for distribution of such executables.

When a "work that uses the Library" uses material from a header file that is part of the Library, the object code for the work may be a derivative work of the Library even though the source code is not. Whether this is true is especially significant if the work can be linked without the Library, or if the work is itself a library. The threshold for this to be true is not precisely defined by law.

If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may distribute the object code for the work under the terms of Section 6. Any executables containing that work also fall under Section 6, whether or not they are linked directly with the Library itself.

6. As an exception to the Sections above, you may also combine or link a "work that uses the Library" with the Library to produce a work containing portions of the Library, and distribute that work under terms of your choice, provided that the terms permit modification of the work for the customer's own use and reverse engineering for debugging such modifications.

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a) Accompany the work with the complete corresponding machine-readable

source code for the Library including whatever
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b) Use a suitable shared library mechanism for linking with the Library. A suitable mechanism is one that (1) uses at run time a copy of the library already present on the user's computer system, rather than copying library functions into the executable, and (2) will operate properly with a modified version of the library, if the
user installs one, as long as the modified version is interface-compatible with the version that the work was made with.

c) Accompany the work with a written offer, valid for at least three years, to give the same user the materials specified in Subsection 6a, above, for a charge no more than the cost of performing this distribution.

d) If distribution of the work is made by offering access to copy from a designated place, offer equivalent access to copy the above specified materials from the same place.

e) Verify that the user has already received a copy of these materials or that you have already sent this user a copy.

For an executable, the required form of the "work that uses the Library" must include any data and utility programs needed for reproducing the executable from it. However, as a special exception, the materials to be distributed need not include anything that is normally distributed (in either source or binary form) with the major
components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

It may happen that this requirement contradicts the license restrictions of other proprietary libraries that do not normally accompany the operating system. Such a contradiction means you cannot use both them and the Library together in an executable that you distribute.

7. You may place library facilities that are a work based on the Library side-by-side in a single library together with other library facilities not covered by this License, and distribute such a combined library, provided that the separate distribution of the work based on the Library and of the other library facilities is otherwise permitted, and provided that you do these two things:

a) Accompany the combined library with a copy of the same work based on the Library, uncombined with any other library facilities. This must be distributed under the terms of the Sections above.

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@enumerate 0
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*
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* --
*/

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* /opt/cola/permits/1715483989_1686310530.9530988/0/tipc-tipcutils-2-0-5-2-zip/tipc-tipcutils-f257000dd3be95dbd61dad4596a636f8692b5f9e/ptts/tipc_ts_server.c
No license file was found, but licenses were detected in source scan.

/* --
*
* tipc-pipe.c
*
* Short description: TIPC CLI utility, similar to netcat.
*
* --
*
* Written by Constantine Shulyupin const@makelinux.com for Compass EOS
*
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*
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No license file was found, but licenses were detected in source scan.

/*
* tipc-config.c: TIPC configuration management tool
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/* --
*
* server_tipc.c
*
* Short description: TIPC benchmark demo (server side)
*
* --
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* /opt/cola/permits/1715483989_1686310530.9530988/0/tipc-tipcutils-2-0-5-2-zip/tipc-tipcutils-f257000dd3be95dbd61dad4596a636f8692b5f9e/demos/benchmark/server_tipc.c
No license file was found, but licenses were detected in source scan.

/* --
*
* tipc_ts_client.c
*
* Short description: Portable TIPC Test Suite -- common client routines
*
* --
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No license file was found, but licenses were detected in source scan.

/* --
*
* tipc_ts_adapt.h
*
* Short description: Portable TIPC Test Suite -- wrapper declarations for Linux
*
* --
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No license file was found, but licenses were detected in source scan.

/* --
*
* tipc_ts_client_linux.c
*
* Short description: Portable TIPC Test Suite -- client wrapper for Linux
*
* --
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No license file was found, but licenses were detected in source scan.

/* ---
*
* client_tipc.c
*
* Short description: TIPC connection demo (client side)
*
* ---
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*
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```
/* ----------------------------------------------------------------------
*
* client_tipc.c
*
* Short description: TIPC hello world demo (client side)
* ----------------------------------------------------------------------
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* ----------------------------------------------------------------------
*/
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```
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*
* server_tipc.c
*
* Short description: TIPC subscription demo (server side)
*
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* ----------------------------------------------------------------------
*/
```

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```
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*
* client_tipc.c
*
* Short description: TIPC subscription demo (client side)
*
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```
/* ----------------------------------------------------------------------
```

```
*
* tipc_ts.h
*
* Short description: Portable TIPC Test Suite -- common declarations
*
* ----------------------------------------------------------------------
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/* ----------------------------------------------------------------------
*
* client_tipc.c
*
* Short description: TIPC benchmark demo (client side)
*
```

```
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```
/* ----------------------------------------------------------------------
*
* client_tipc.c
*
* Short description: TIPC multicast demo (client side)
*
* ----------------------------------------------------------------------
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* server_tipc.c
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* Short description: TIPC connection demo (server side)
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* --
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*
* server_tipc.c
*
* Short description: TIPC stream demo (server side)
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* /opt/cola/permits/1715483989_1686310530.9530988/0/tipc-tipcutils-2-0-5-2-zip/tipc-tipcutils-f257000dd3be95dbd61dad4596a636f8692b5f9e/demos/stream_demo/server_tipc.c
No license file was found, but licenses were detected in source scan.

/* --
*
* tipc_ts_server_linux.c
*
* Short description: Portable TIPC Test Suite -- server wrapper for Linux
*
* --
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/* --

Name: inventory_sim.c

Short description: TIPC distributed inventory simulation (Linux version)

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DESCRIPTION
This file is a demo program that illustrates how TIPC can be used to support distributed applications. It takes advantage of TIPC's socket-based messaging, as well as its port naming and port name subscription capabilities.

The demo is a simulation
of a store that stocks a variety of numbered items
which are sold to customers upon request. By default, items and customers are created randomly (although there are limits on the number of each that can be present in the store at any given time). From time to time new items are delivered to the store; independently of this, customers enter the store, each looking for a specific item. If a desired item can be obtained before a customer gets tired of waiting for it, a sale is recorded; otherwise, a walk-out is recorded. If multiple customers attempt to obtain the same item, only one succeeds; the others are notified of their failure and try again.

Each item and customer is implemented as a separate task. An item makes itself available by creating a socket whose port name identifies the item number. A customer determines the availability of an item by creating a subscription for the item name and waiting for notification that the item exists; the customer then obtains the item
by sending a message to the socket for the item
and receiving a successful reply. A logging task is used to record all significant events encountered by the item and customer tasks during the simulation, as well as to display the simulation status and statistics on a periodic basis.

This simulation is most effective when it is run on multiple CPUs at the same time, which has the effect of creating a network of stores sharing a global inventory. Since the port name published by an item is visible throughout the TIPC cluster, customers are able to obtain items from other CPUs if they are not available locally. The more CPUs involved in the simulation, the more items are available and the less likely a customer will be to walk out of a store because the item they desire is unavailable.

When a simulation is terminated the logging task waits for all customers to leave, then creates a janitor task to dispose of the unsold items that remain. TIPC's name subscription capability allows
the janitor to distinguish the items
belonging to its own store from those in other stores.

The simulation can be temporarily halted to permit inspection of the various tasks used, or to assist in debugging problems. This is achieved by

publishing the name of a virtual item (item 0), which instructs the logging task on each CPU to temporarily suspend processing; this causes all customer and item tasks on the CPU to become blocked when they next attempt to log an event. (Note: Pausing the simulation may result in warning messages from customers about non-responsive items; this is normal behavior resulting from the way the pause capability is implemented, and is no cause for concern.)

The demo gives the user control over the number of item and customer tasks used in the simulation, as well as the ability to increase the speed of processing and to control the amount of output generated. By default, a simulation running at normal speed displays all transaction info, while a simulation
running at an accelerated rate displays only the periodic summary.
The simulation can also be run in a deterministic manner by creating a store having no items or customers, and then generating individual item and customer tasks manually.

Building the demo

The demo is built as a normal TIPC application. The accompanying Makefile builds a "inventory_sim" executable and creates softlinks to a set of aliases (eg. newSim, killSim, ...) that are used to invoke the main executable to do specific operations.

Running the demo

The simulation is run by issuing the following shell commands:

newSim [#items [#customers [speed [verbosity]]]]
- open store
killSim - close store and clean up
stopSim - pause simulation of all stores
startSim - unpause simulation of all stores
newItem [item [count]] - create item (repeat as specified)
newCust [item [count]] - create customer for item (repeat as specified)
helpSim
- display this menu

A missing (or 0) argument value causes the simulation to choose an appropriate default. In certain cases, an argument value that is < 0 can also be used to disable a specific feature of a command.

The output messages generated by the simulation should be self-explanatory.

Examples
---
1) Run default simulation: ./newSim

2) Run simulation at 10x normal speed: ./newSim 0 0 10

3) Run simulation manually: ./newSim -1 -1   [create empty store]
    ./newItem 3   [create item]
    ./newCust 3   [create customer]
*/

Found in path(s):
* /opt/cola/permits/1715483989_1686310530.9530988/0/tipc-tipcutils-2-0-5-2-zip/tipc-tipcutils-f257000dd3be95dbd61dad4596a636f8692b5f9e/demos/inventory_sim/inventory_sim.c
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/* --
*
* server_tipc.c
*
* Short description: TIPC hello world demo (server side)
* --
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```
/* ----------------------------------------------------------------------
*
* tipc_ts_common.c
*
* Short description: Portable TIPC Test Suite -- common client+server routines
*
* ----------------------------------------------------------------------
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```
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*
* server_tipc.c
*
* Short description: TIPC stream demo (server side)
*
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```

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```
/* ----------------------------------------------------------------------
```

```
*
* server_tipc.c
*
* Short description: TIPC multicast demo (server side)
*
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*
* ------------------------------------------------------------------------
*/

Found in
 path(s):
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f257000dd3be95dbd61dad4596a636f8692b5f9e/demos/multicast_demo/server_tipc.c
```

1.235 ipcalc 0.2.3

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1.236 libsepol 3.4-2

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1.238 lvm2 1.02.185

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```

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@item
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Accompany it with the information you received as to the offer
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1.245 policycoreutils 2.9-9.el8

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1.246 curl 7.85.0

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```
#!/usr/bin/env bash
# MIT licenses will each have a unique MD5 sum since they contain a unique copyright.
# This script will read the license file into memory, strip out the copyright, and then
# generate an MD5 that is not unique and can be matched against a known MIT MD5 sum.
set -e

calculate_md5_sum() {
 local FILE="$1"

 # Read the contents of the file into a variable
 local raw_license_text=$(<"$FILE")

 # Convert to lowercase
 local lowercase_license_text="${raw_license_text,,}"

 # Remove anything before the beginning of the license
 local stripped_license_text=$(awk '/permission is hereby granted,/{p=1} p' <<< "$lowercase_license_text")

 # Replace line breaks (Windows or Linux) with a single space
 local replaced_linebreaks=$(tr '\r\n' ' ' <<< "$stripped_license_text")

 # Replace multiple spaces with a single space
 local normalized_license_text=$(tr -s ' ' <<< "$replaced_linebreaks")

 # Strip away any non-printable, non-whitespace characters
 local clean_unprintable_license_text=$(tr
 -cd '[:print:][:space:]' <<< "$normalized_license_text")

 # Remove punctuation and special characters
 local clean_license_text=$(echo "$clean_unprintable_license_text" | sed 's/[^a-zA-Z ]//g')

 # Calculate the MD5 sum of the cleaned license text
 local MD5SUM=$(echo -n "$clean_license_text" | md5sum | awk '{print $1}')

 # Output the MD5 sum
 echo "$MD5SUM"
}

# Check if the FILE argument is provided
if [ -z "$1" ]; then
 echo "Please provide a FILE as an argument."
 exit 1
fi

# Invoke the function with the provided FILE argument
calculate_md5_sum "$1"
WEV @@ WEV[B  "1
```

x ?"U@,5 @mISmIN<GimCN7g1u|E
43mI,5WEV @@ WEV @mImImIAmImImI0mImImI*mImI
A0mImImI...
lost+found...

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1.248 python 3.10.6

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Python was created in the early 1990s by Guido van Rossum at Stichting Mathematisch Centrum (CWI, see http://www.cwi.nl) in the Netherlands as a successor of a language called ABC. Guido remains Python's principal author, although it includes many contributions from others.

In 1995, Guido continued his work on Python at the Corporation for National Research Initiatives (CNRI, see http://www.cnri.reston.va.us) in Reston, Virginia where he released several versions of the software.

In May 2000, Guido and the Python core development team moved to
BeOpen.com to form the BeOpen PythonLabs team. In October of the same
year, the PythonLabs team moved to Digital Creations, which became
Zope Corporation. In 2001, the Python Software Foundation (PSF, see
https://www.python.org/psf/) was formed, a non-profit organization
created specifically to own Python-related Intellectual Property.
Zope Corporation was a sponsoring member of the PSF.

All
Python releases are Open Source (see http://www.opensource.org for
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releases have also been GPL-compatible; the table below summarizes
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Release	Derived from	Year	Owner	GPL-compatible? (1)
0.9.0 thru 1.2		1991-1995	CWI	yes
1.3 thru 1.5.2	1.2	1995-1999	CNRI	yes
1.6	1.5.2	2000	CNRI	no
2.0	1.6	2000	BeOpen.com	no
1.6.1	1.6	2001	CNRI	yes (2)
2.1	2.0+1.6.1	2001	PSF	no
2.0.1	2.0+1.6.1	2001	PSF	yes
2.1.1	2.1+2.0.1	2001	PSF	yes
2.1.2	2.1.1	2002	PSF	yes
2.1.3	2.1.2	2002	PSF	yes
2.2 and above	2.1.1	2001-now	PSF	yes

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(2) According to Richard Stallman, 1.6.1 is not GPL-compatible,
because its license has a choice of law clause. According to
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Thanks to the many outside volunteers who have worked under Guido's
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1.251 e2fsprogs 1.43

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--- tdbsa.orig/tdb.c
+++ tdbsa/tdb.c
@@ -4,11 +4,11 @@ Rev: 23371
Last Changed Date: 2007-06-06 20:14:06 -0400 (Wed, 06 Jun 2007)
*/
 /*
-   Unix SMB/CIFS implementation.
+   trivial database library - standalone version

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#
# This is a Makefile stub which handles the creation of BSD shared
# libraries.
#
# In order to use this stub, the following makefile variables must be defined.
#
# BSDLIB_VERSION = 1.0
# BSDLIB_IMAGE = libce
# BSDLIB_MYDIR = et
# BSDLIB_INSTALL_DIR = $(SHLIBDIR)
#

all:: image

real-subdirs:: Makefile
 @echo " MKDIR pic"
 @mkdir -p pic

BSD_LIB = $(BSDLIB_IMAGE).so.$(BSDLIB_VERSION)
BSDLIB_PIC_FLAG = -fpic

image:  $(BSD_LIB)

$(BSD_LIB): $(OBJS)
 (cd pic; ld -Bshareable -o $(BSD_LIB) $(LDFLAGS) $(OBJS))
 $(MV) pic/$(BSD_LIB) .
 $(RM) -f ../$(BSD_LIB)
 (cd ..; $(LN) $(LINK_BUILD_FLAGS) \
  `echo $(my_dir) | sed -e 's;lib/;;'`/$(BSD_LIB) $(BSD_LIB))

install-shlibs install:: $(BSD_LIB)
 @echo " INSTALL_PROGRAM $(BSDLIB_INSTALL_DIR)/$(BSD_LIB)"
 @$(INSTALL_PROGRAM) $(BSD_LIB) \
  $(DESTDIR)$(BSDLIB_INSTALL_DIR)/$(BSD_LIB)
 @-$(LDCONFIG)

install-strip: install

install-shlibs-strip: install-shlibs

uninstall-shlibs uninstall::
 $(RM) -f $(DESTDIR)$(BSDLIB_INSTALL_DIR)/$(BSD_LIB)

clean::
```

$(RM)
-rf pic
$(RM) -f $(BSD_LIB)
$(RM) -f ../$(BSD_LIB)
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the GNU Public License version 2, with the exception of the lib/ext2fs
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repository from the development branch, please contact me
(tytso@mit.edu)
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package are flexible, if you give me enough lead time.

Theodore Ts'o
23-June-2007

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This is the Debian GNU/Linux prepackaged version of the Common Error
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This package was put together by Yann Dirson <dirson@debian.org>,
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written by Theodore Ts'o <tytso@mit.edu> and Remy Card <card@masi.ibp.fr>.

Sources were obtained from http://sourceforge.net/projects/e2fsprogs

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This package was added to the e2fsprogs debian source package by
Theodore Ts'o <tytso@mit.edu> on Fri Dec 14 22:24:35 EST 2007

It is part of the main e2fsprogs distribution, which can be found at:

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1.252 c-ares 1.18.1

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1.253 tcpdump 4.99.1

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```
# -*- perl -*-

$testlist = [
  # This specific test fails on OpenBSD because the .pcap file uses DLT_RAW,
  # which OpenBSD treats as DLT_LOOP. The macro is set on all three BSDs.
  {
    config_unset => 'HAVE_NET_IF_PFLOG_H',
    name => 'heap-overflow-1',
    input => 'heap-overflow-1.pcap',
    output => 'heap-overflow-1.out',
    args   => '-v'
  },
];

1;
```

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1.254 tftp-hpa 5.2

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*
/opt/cola/permits/1820789344_1697168617.6683886/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-hpa-5.2/tftp/extern.h
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* /opt/cola/permits/1820789344_1697168617.6683886/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-hpa-5.2/config.h
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*
 /opt/cola/permits/1820789344_1697168617.6683886/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-hpa-5.2/tftp/main.c
* /opt/cola/permits/1820789344_1697168617.6683886/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-hpa-5.2/common/tftpsubs.c
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Summary: The client for the Trivial File Transfer Protocol (TFTP).
Name: tftp
Version: 5.2
Release: 1
License: BSD
Group: Applications/Internet
Source0: http://www.kernel.org/pub/software/network/tftp/tftp-hpa-%{version}.tar.gz
BuildRequires: tcp_wrappers-devel
BuildRoot: %{_tmppath}/%{name}-root

%description
```

```
The Trivial File Transfer Protocol (TFTP) is normally used only for
booting diskless workstations.  The tftp package provides the user
interface for TFTP, which allows users to transfer files to and from a
remote machine.  This program and TFTP provide very little security,
and should not be enabled unless it is expressly needed.

%package server
Group: System Environment/Daemons
Summary: The server for the Trivial File Transfer Protocol (TFTP).
Requires: xinetd

%description server
The Trivial File Transfer Protocol (TFTP) is normally used only for
booting diskless workstations.  The tftp-server package provides
 the
server for TFTP, which allows users to transfer files to and from a
remote machine. TFTP provides very little security, and should not be
enabled unless it is expressly needed.  The TFTP server is run from
/etc/xinetd.d/tftp, and is disabled by default on Red Hat Linux systems.

%prep
%setup -q -n tftp-hpa-%{version}

%build

%configure
make %{?_smp_mflags}

%install
rm -rf ${RPM_BUILD_ROOT}
mkdir -p ${RPM_BUILD_ROOT}%{_bindir}
mkdir -p ${RPM_BUILD_ROOT}%{_mandir}/man{1,8}
mkdir -p ${RPM_BUILD_ROOT}%{_sbindir}

make INSTALLROOT=${RPM_BUILD_ROOT} \
   SBINDIR=%{_sbindir} MANDIR=%{_mandir} \
 install
install -m755 -d ${RPM_BUILD_ROOT}%{_sysconfdir}/xinetd.d/ ${RPM_BUILD_ROOT}/tftpboot
install -m644 tftp-xinetd ${RPM_BUILD_ROOT}%{_sysconfdir}/xinetd.d/tftp

%post server
/sbin/service xinetd reload > /dev/null 2>&1 || :

%postun server
if [ $1 = 0 ]; then
   /sbin/service xinetd reload > /dev/null 2>&1 || :
fi
```

```
%clean
rm -rf ${RPM_BUILD_ROOT}

%files
%defattr(-,root,root)
%{_bindir}/tftp
%{_mandir}/man1/*

%files
 server
%defattr(-,root,root)
%config(noreplace) %{_sysconfdir}/xinetd.d/tftp
%dir /tftpboot
%{_sbindir}/in.tftpd
%{_mandir}/man8/*

%changelog
* Tue Sep 14 2004 H. Peter Anvin <hpa@zytor.com>
- removed completely broken "Malta" patch.
- integrated into build machinery so rpm -ta works.

* Fri Feb 13 2004 Elliot Lee <sopwith@redhat.com>
- rebuilt

* Wed Jun 04 2003 Elliot Lee <sopwith@redhat.com>
- rebuilt

* Fri Apr 11 2003 Elliot Lee <sopwith@redhat.com>
- 0.33
- Add /tftpboot directory (#88204)

* Mon Feb 24 2003 Elliot Lee <sopwith@redhat.com>
- rebuilt

* Sun Feb 23 2003 Tim Powers <timp@redhat.com>
- add BuildPreReq on tcp_wrappers

* Wed Jan 22 2003 Tim Powers <timp@redhat.com>
- rebuilt

* Mon Nov 11 2002 Elliot Lee <sopwith@redhat.com> 0.32-1
- Update to 0.32

* Wed Oct 23 2002 Elliot Lee <sopwith@redhat.com> 0.30-1
- Fix #55789
- Update to 0.30

* Thu Jun 27 2002 Elliot Lee <sopwith@redhat.com>
```

- Try applying HJ's patch from #65476

* Fri Jun
 21 2002 Tim Powers <timp@redhat.com>
- automated rebuild

* Mon Jun 17 2002 Elliot Lee <sopwith@redhat.com>
- Update to 0.29

* Thu May 23 2002 Tim Powers <timp@redhat.com>
- automated rebuild

* Wed Jan 09 2002 Tim Powers <timp@redhat.com>
- automated rebuild

* Tue Dec 18 2001 Elliot Lee <sopwith@redhat.com> 0.17-15
- Add patch4: netkit-tftp-0.17-defaultport.patch for bug #57562
- Update to tftp-hpa-0.28 (bug #56131)
- Remove include/arpa/tftp.h to fix #57259
- Add resource limits in tftp-xinetd (#56722)

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- Bump release + rebuild.

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- tweaked specfile with different defines for tftp-netkit and tftp-hpa version
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- rebuilt in 7.1.x

* Wed Apr 18 2001 Helge Deller <hdeller@redhat.de>
- fix tftp client's put problems (#29529)
- update
 to tftp-hpa-0.16

* Wed Apr 4 2001 Jakub Jelinek <jakub@redhat.com>
- don't let configure to guess compiler, it can pick up egcs

* Thu Feb 08 2001 Helge Deller <hdeller@redhat.de>
- changed "wait" in xinetd file to "yes" (hpa-tftpd forks and exits) (#26467)
- fixed hpa-tftpd to handle files greater than 32MB (#23725)
- added "-l" flag to hpa-tftpd for file-logging (#26467)
- added description for "-l" to the man-page

* Thu Feb 08 2001 Helge Deller <hdeller@redhat.de>
- updated tftp client to 0.17 stable (#19640),

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* Wed Jan 17 2001 Jeff Johnson <jbj@redhat.com>
- xinetd shouldn't wait on tftp (which forks) (#23923).

* Sat Jan 6 2001 Jeff Johnson <jbj@redhat.com>
- fix to permit tftp put's (#18128).
- startup as root with chroot to /tftpboot with early reversion to nobody
 is preferable to starting as nobody w/o ability to chroot.
- %%post is needed by server, not client. Add %%postun for erasure as well.

* Wed Aug 23 2000
 Nalin Dahyabhai <nalin@redhat.com>
- default to being disabled

* Thu Aug 17 2000 Jeff Johnson <jbj@redhat.com>
- correct group.

* Tue Jul 25 2000 Nalin Dahyabhai <nalin@redhat.com>
- change user from root to nobody

* Sat Jul 22 2000 Jeff Johnson <jbj@redhat.com>
- update to tftp-hpa-0.14 (#14003).
- add server_args (#14003).
- remove -D_BSD_SOURCE (#14003).

* Fri Jul 21 2000 Nalin Dahyabhai <nalin@redhat.com>
- cook up an xinetd config file for tftpd

* Wed Jul 12 2000 Prospector <bugzilla@redhat.com>
- automatic rebuild

* Sun Jun 18 2000 Jeff Johnson <jbj@redhat.com>
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- update to 0.17.

* Fri May 5 2000 Matt Wilson <msw@redhat.com>
- use _BSD_SOURCE for hpa's tftpd so we get BSD signal semantics.

* Fri Feb 11 2000 Bill Nottingham <notting@redhat.com>
- fix description

* Wed Feb 9 2000 Jeff Johnson <jbj@redhat.com>
- compress man pages (again).

* Wed Feb 02 2000 Cristian Gafton <gafton@redhat.com>
- man pages are compressed
- fix description and summary

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Jan 4 2000 Bill Nottingham <notting@redhat.com>
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* Tue Dec 21 1999 Jeff Johnson <jbj@redhat.com>
- update to 0.16.

* Sat Aug 28 1999 Jeff Johnson <jbj@redhat.com>
- update to 0.15.

* Wed Apr 7 1999 Jeff Johnson <jbj@redhat.com>
- tftpd should truncate file when overwriting (#412)

* Sun Mar 21 1999 Cristian Gafton <gafton@redhat.com>
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* Mon Mar 15 1999 Jeff Johnson <jbj@redhat.com>
- compile for 6.0.

* Fri Aug 7 1998 Jeff Johnson <jbj@redhat.com>
- build root

* Mon Apr 27 1998 Prospector System <bugs@redhat.com>
- translations modified for de, fr, tr

* Mon Sep 22 1997 Erik Troan <ewt@redhat.com>
- added check for getpwnam() failure

* Tue Jul 15 1997 Erik Troan <ewt@redhat.com>
- initial build

Found in path(s):
* /opt/cola/permits/1820789344_1697168617.6683886/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-hpa-5.2/tftp.spec
No license file was found, but licenses were detected in source scan.

Summary: The client for the Trivial File Transfer Protocol (TFTP).
Name: tftp
Version: @@VERSION@@
Release: 1
License: BSD
Group: Applications/Internet
Source0: http://www.kernel.org/pub/software/network/tftp/tftp-hpa-%{version}.tar.gz
BuildRequires: tcp_wrappers-devel
BuildRoot: %{_tmppath}/%{name}-root

%description

```
The Trivial File Transfer Protocol (TFTP) is normally used only for
booting diskless workstations.  The tftp package provides the user
interface for TFTP, which allows users to transfer files to and from a
remote machine.  This program and TFTP provide very little security,
and should not be enabled unless it is expressly needed.

%package server
Group: System Environment/Daemons
Summary: The server for the Trivial File Transfer Protocol (TFTP).
Requires: xinetd

%description server
The Trivial File Transfer Protocol (TFTP) is normally used only for
booting diskless workstations.  The tftp-server package
 provides the
server for TFTP, which allows users to transfer files to and from a
remote machine. TFTP provides very little security, and should not be
enabled unless it is expressly needed.  The TFTP server is run from
/etc/xinetd.d/tftp, and is disabled by default on Red Hat Linux systems.

%prep
%setup -q -n tftp-hpa-%{version}

%build

%configure
make %{?_smp_mflags}

%install
rm -rf ${RPM_BUILD_ROOT}
mkdir -p ${RPM_BUILD_ROOT}%{_bindir}
mkdir -p ${RPM_BUILD_ROOT}%{_mandir}/man{1,8}
mkdir -p ${RPM_BUILD_ROOT}%{_sbindir}

make INSTALLROOT=${RPM_BUILD_ROOT} \
   SBINDIR=%{_sbindir} MANDIR=%{_mandir} \
 install
install -m755 -d ${RPM_BUILD_ROOT}%{_sysconfdir}/xinetd.d/ ${RPM_BUILD_ROOT}/tftpboot
install -m644 tftp-xinetd ${RPM_BUILD_ROOT}%{_sysconfdir}/xinetd.d/tftp

%post server
/sbin/service xinetd reload > /dev/null 2>&1 || :

%postun server
if [ $1 = 0 ]; then
   /sbin/service xinetd reload > /dev/null 2>&1 || :
fi
```

```
%clean
rm -rf ${RPM_BUILD_ROOT}

%files
%defattr(-,root,root)
%{_bindir}/tftp
%{_mandir}/man1/*

%files
 server
%defattr(-,root,root)
%config(noreplace) %{_sysconfdir}/xinetd.d/tftp
%dir /tftpboot
%{_sbindir}/in.tftpd
%{_mandir}/man8/*

%changelog
* Tue Sep 14 2004 H. Peter Anvin <hpa@zytor.com>
- removed completely broken "Malta" patch.
- integrated into build machinery so rpm -ta works.

* Fri Feb 13 2004 Elliot Lee <sopwith@redhat.com>
- rebuilt

* Wed Jun 04 2003 Elliot Lee <sopwith@redhat.com>
- rebuilt

* Fri Apr 11 2003 Elliot Lee <sopwith@redhat.com>
- 0.33
- Add /tftpboot directory (#88204)

* Mon Feb 24 2003 Elliot Lee <sopwith@redhat.com>
- rebuilt

* Sun Feb 23 2003 Tim Powers <timp@redhat.com>
- add BuildPreReq on tcp_wrappers

* Wed Jan 22 2003 Tim Powers <timp@redhat.com>
- rebuilt

* Mon Nov 11 2002 Elliot Lee <sopwith@redhat.com> 0.32-1
- Update to 0.32

* Wed Oct 23 2002 Elliot Lee <sopwith@redhat.com> 0.30-1
- Fix #55789
- Update to 0.30

* Thu Jun 27 2002 Elliot Lee <sopwith@redhat.com>
```

- Try applying HJ's patch from #65476

*
 Fri Jun 21 2002 Tim Powers <timp@redhat.com>
- automated rebuild

* Mon Jun 17 2002 Elliot Lee <sopwith@redhat.com>
- Update to 0.29

* Thu May 23 2002 Tim Powers <timp@redhat.com>
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No license file was found, but licenses were detected in source scan.

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* /opt/cola/permits/1820789344_1697168617.6683886/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-hpa-5.2/tftpd/tftpd.8.in
No license file was found, but licenses were detected in source scan.

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Found in path(s):
* /opt/cola/permits/1820789344_1697168617.6683886/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-hpa-5.2/MCONFIG.in
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*
* -- */

Found in path(s):
* /opt/cola/permits/1820789344_1697168617.6683886/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-hpa-5.2/tftpd/remap.h
* /opt/cola/permits/1820789344_1697168617.6683886/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-hpa-5.2/tftpd/misc.c
* /opt/cola/permits/1820789344_1697168617.6683886/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-hpa-5.2/tftpd/remap.c
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* /opt/cola/permits/1820789344_1697168617.6683886/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-hpa-5.2/tftp/tftp.1.in
No license file was found, but licenses were detected in source scan.

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*
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* /opt/cola/permits/1820789344_1697168617.6683886/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-hpa-5.2/tftpd/recvfrom.h

1.255 libvirt 5.5.0

1.255.1 Available under license :

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1.267 paramiko 2.11.0

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(For example, a function in a library to compute square roots has a purpose that is entirely well-defined independent of the application. Therefore, Subsection 2d requires that any application-supplied function or table used by this function must be optional: if the application does not supply it, the square root function must still compute square roots.)

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This option is useful when you wish to copy part of the code of

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a) Accompany
the work with the complete corresponding
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b) Use a suitable shared library mechanism for linking with the Library. A suitable mechanism is one that (1) uses at run time a copy of the library already present on the user's computer system, rather than copying library functions into the executable, and (2) will operate
properly with a modified version of the library, if
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@c ispell-local-pdict: "ispell-dict"
@c End:
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1.269 gevent 22.10.1

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gevent/libuv/_corecffi_source.c
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1.270 pycryptodome 3.15.0

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1.272 python-pip 22.2.2

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Certificate data from Mozilla as of: Thu Nov 3 19:04:19 2011#
This is a bundle of X.509 certificates of public Certificate Authorities
(CA). These were automatically extracted from Mozilla's root certificates
file (certdata.txt). This file can be found in the mozilla source tree:
http://mxr.mozilla.org/mozilla/source/security/nss/lib/ckfw/builtins/certdata.txt?raw=1#
It contains the certificates in PEM format and therefore
can be directly used with curl / libcurl / php_curl, or with
an Apache+mod_ssl webserver for SSL client authentication.
Just configure this file as the SSLCACertificateFile.#

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@(#) $RCSfile: certdata.txt,v $
$Revision: 1.80 $ $Date: 2011/11/03 15:11:58 $
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Python was created in the early 1990s by Guido van Rossum at Stichting Mathematisch Centrum (CWI, see http://www.cwi.nl) in the Netherlands as a successor of a language called ABC. Guido remains Python's principal author, although it includes many contributions from others.

In 1995, Guido continued his work on Python at the Corporation for National Research Initiatives (CNRI, see http://www.cnri.reston.va.us) in Reston, Virginia where he released several versions of the software.

In May 2000, Guido and the Python core development team moved to BeOpen.com to form the BeOpen PythonLabs team. In October of the same year, the PythonLabs team moved to Digital Creations (now Zope Corporation, see http://www.zope.com). In 2001, the Python Software Foundation (PSF, see http://www.python.org/psf/) was formed, a non-profit organization created specifically to own Python-related Intellectual Property. Zope Corporation is a sponsoring member of the PSF.

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1.3 thru 1.5.2	1.2	1995-1999	CNRI	yes
1.6	1.5.2	2000	CNRI	no
2.0	1.6	2000	BeOpen.com	no
1.6.1	1.6	2001	CNRI	yes (2)
2.1	2.0+1.6.1	2001	PSF	no
2.0.1	2.0+1.6.1	2001	PSF	yes
2.1.1	2.1+2.0.1	2001	PSF	yes
2.2	2.1.1	2001	PSF	yes
2.1.2	2.1.1	2002	PSF	yes
2.1.3	2.1.2	2002	PSF	yes
2.2.1	2.2	2002	PSF	yes
2.2.2	2.2.1	2002	PSF	yes
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Thanks to the many outside volunteers who have worked under Guido's direction to make these releases possible.

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1.273 networkx 2.8.7

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1.274 python-pip 22.2.1

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A. HISTORY OF THE SOFTWARE
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Python was created in the early 1990s by Guido van Rossum at Stichting
Mathematisch Centrum (CWI, see http://www.cwi.nl) in the Netherlands
as a successor of a language called ABC. Guido remains Python's
principal author, although it includes many contributions from others.

In 1995, Guido continued his work on Python at the Corporation for
National Research Initiatives (CNRI, see http://www.cnri.reston.va.us)
in Reston, Virginia where he released several versions of the
software.

In May 2000, Guido and the Python core development team moved to
BeOpen.com to form the BeOpen PythonLabs team. In October of the same
year, the PythonLabs team moved to Digital Creations (now Zope
Corporation, see http://www.zope.com). In 2001, the Python Software
Foundation (PSF, see http://www.python.org/psf/) was formed, a
non-profit organization created specifically to own Python-related
Intellectual Property. Zope Corporation is a sponsoring member
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All Python releases are Open Source (see http://www.opensource.org for
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the various releases.

Release	Derived	Year	Owner	GPL-

	from		compatible? (1)
0.9.0 thru 1.2		1991-1995	CWI yes
1.3 thru 1.5.2	1.2	1995-1999	CNRI yes
1.6	1.5.2	2000	CNRI no
2.0	1.6	2000	BeOpen.com no
1.6.1	1.6	2001	CNRI yes (2)
2.1	2.0+1.6.1	2001	PSF no
2.0.1	2.0+1.6.1	2001	PSF yes
2.1.1	2.1+2.0.1	2001	PSF yes
2.2	2.1.1	2001	PSF yes
2.1.2	2.1.1	2002	PSF yes
2.1.3	2.1.2	2002	PSF yes
2.2.1	2.2	2002	PSF yes
2.2.2	2.2.1	2002	PSF yes
2.2.3	2.2.2	2003	PSF yes
2.3	2.2.2	2002-2003	PSF yes
2.3.1	2.3	2002-2003	PSF yes
2.3.2	2.3.1	2002-2003	PSF yes
2.3.3	2.3.2	2002-2003	PSF yes
2.3.4	2.3.3	2004	PSF yes
2.3.5	2.3.4	2005	PSF yes
2.4	2.3	2004	PSF yes
2.4.1	2.4	2005	PSF yes
2.4.2	2.4.1	2005	PSF yes
2.4.3	2.4.2	2006	PSF yes
2.4.4	2.4.3	2006	PSF yes
2.5	2.4	2006	PSF yes
2.5.1	2.5	2007	PSF yes
2.5.2	2.5.1	2008	PSF yes
2.5.3	2.5.2	2008	PSF yes
2.6	2.5	2008	PSF yes
2.6.1	2.6	2008	PSF yes
2.6.2	2.6.1	2009	PSF yes
2.6.3	2.6.2	2009	PSF yes
2.6.4	2.6.3	2009	PSF yes
2.6.5	2.6.4	2010	PSF yes
3.0	2.6	2008	PSF yes
3.0.1	3.0	2009	PSF yes
3.1	3.0.1	2009	PSF yes
3.1.1	3.1	2009	PSF yes
3.1.2	3.1	2010	PSF yes
3.2	3.1	2010	PSF yes

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A. HISTORY OF THE SOFTWARE
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Python was created in the early 1990s by Guido van Rossum at Stichting
Mathematisch Centrum (CWI, see http://www.cwi.nl) in the Netherlands
as a successor of a language called ABC. Guido remains Python's
principal author, although it includes many contributions from others.

In 1995, Guido continued his work on Python at the Corporation for
National Research Initiatives (CNRI, see http://www.cnri.reston.va.us)
in Reston, Virginia where he released several versions of the
software.

In May 2000, Guido and the Python core development team moved to
BeOpen.com to form the BeOpen PythonLabs team. In October of the same
year, the PythonLabs team moved to Digital Creations (now Zope
Corporation, see http://www.zope.com). In 2001, the Python Software
Foundation (PSF, see http://www.python.org/psf/) was formed, a
non-profit organization created specifically to own Python-related
Intellectual Property. Zope Corporation is a sponsoring member

of
the PSF.

All Python releases are Open Source (see http://www.opensource.org for the Open Source Definition). Historically, most, but not all, Python releases have also been GPL-compatible; the table below summarizes the various releases.

Release	Derived from	Year	Owner	GPL-compatible? (1)
0.9.0 thru 1.2		1991-1995	CWI	yes
1.3 thru 1.5.2	1.2	1995-1999	CNRI	yes
1.6	1.5.2	2000	CNRI	no
2.0	1.6	2000	BeOpen.com	no
1.6.1	1.6	2001	CNRI	yes (2)
2.1	2.0+1.6.1	2001	PSF	no
2.0.1	2.0+1.6.1	2001	PSF	yes
2.1.1	2.1+2.0.1	2001	PSF	yes
2.1.2	2.1.1	2002	PSF	yes
2.1.3	2.1.2	2002	PSF	yes
2.2 and above				
2.1.1		2001-now	PSF	yes

Footnotes:

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(2) According to Richard Stallman, 1.6.1 is not GPL-compatible, because its license has a choice of law clause. According to CNRI, however, Stallman's lawyer has told CNRI's lawyer that 1.6.1 is "not incompatible" with the GPL.

Thanks to the many outside volunteers who have worked under Guido's direction to make these releases possible.

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1.275 python-certifi 2022.09.14

1.275.1 Available under license :

This package contains a modified version of ca-bundle.crt:

ca-bundle.crt -- Bundle of CA Root Certificates

Certificate data from Mozilla as of: Thu Nov 3 19:04:19 2011#
This is a bundle of X.509 certificates of public Certificate Authorities
(CA). These were automatically extracted from Mozilla's root certificates
file (certdata.txt). This file can be found in the mozilla source tree:
https://hg.mozilla.org/mozilla-central/file/tip/security/nss/lib/ckfw/builtins/certdata.txt
It contains the certificates in PEM format and therefore
can be directly used with curl / libcurl / php_curl, or with
an Apache+mod_ssl webserver for SSL client authentication.
Just configure this file as the SSLCACertificateFile.#

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@(#) $RCSfile: certdata.txt,v
 $ $Revision: 1.80 $ $Date: 2011/11/03 15:11:58 $

1.276 errors 0.9.1

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1.277 tftp-hpa 5.2

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Found in path(s):
* /opt/cola/permits/1833546142_1698379726.218706/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-hpa-5.2/tftpd/tftpd.8.in
No license file was found, but licenses were detected in source scan.

Summary: The client for the Trivial File Transfer Protocol (TFTP).
Name: tftp
Version: 5.2
Release: 1
License: BSD
Group: Applications/Internet
Source0: http://www.kernel.org/pub/software/network/tftp/tftp-hpa-%{version}.tar.gz
BuildRequires: tcp_wrappers-devel
BuildRoot: %{_tmppath}/%{name}-root

%description
The Trivial File Transfer Protocol (TFTP) is normally used only for
booting diskless workstations. The tftp package provides the user

```
interface for TFTP, which allows users to transfer files to and from a
remote machine.  This program and TFTP provide very little security,
and should not be enabled unless it is expressly needed.

%package server
Group: System Environment/Daemons
Summary: The server for the Trivial File Transfer Protocol (TFTP).
Requires: xinetd

%description server
The Trivial File Transfer Protocol (TFTP) is normally used only for
booting diskless workstations.  The tftp-server package provides
 the
server for TFTP, which allows users to transfer files to and from a
remote machine. TFTP provides very little security, and should not be
enabled unless it is expressly needed.  The TFTP server is run from
/etc/xinetd.d/tftp, and is disabled by default on Red Hat Linux systems.

%prep
%setup -q -n tftp-hpa-%{version}

%build

%configure
make %{?_smp_mflags}

%install
rm -rf ${RPM_BUILD_ROOT}
mkdir -p ${RPM_BUILD_ROOT}%{_bindir}
mkdir -p ${RPM_BUILD_ROOT}%{_mandir}/man{1,8}
mkdir -p ${RPM_BUILD_ROOT}%{_sbindir}

make INSTALLROOT=${RPM_BUILD_ROOT} \
   SBINDIR=%{_sbindir} MANDIR=%{_mandir} \
 install
install -m755 -d ${RPM_BUILD_ROOT}%{_sysconfdir}/xinetd.d/ ${RPM_BUILD_ROOT}/tftpboot
install -m644 tftp-xinetd ${RPM_BUILD_ROOT}%{_sysconfdir}/xinetd.d/tftp

%post server
/sbin/service xinetd reload > /dev/null 2>&1 || :

%postun server
if [ $1 = 0 ]; then
   /sbin/service xinetd reload > /dev/null 2>&1 || :
fi

%clean
rm -rf ${RPM_BUILD_ROOT}
```

```
%files
%defattr(-,root,root)
%{_bindir}/tftp
%{_mandir}/man1/*

%files
 server
%defattr(-,root,root)
%config(noreplace) %{_sysconfdir}/xinetd.d/tftp
%dir /tftpboot
%{_sbindir}/in.tftpd
%{_mandir}/man8/*

%changelog
* Tue Sep 14 2004 H. Peter Anvin <hpa@zytor.com>
- removed completely broken "Malta" patch.
- integrated into build machinery so rpm -ta works.

* Fri Feb 13 2004 Elliot Lee <sopwith@redhat.com>
- rebuilt

* Wed Jun 04 2003 Elliot Lee <sopwith@redhat.com>
- rebuilt

* Fri Apr 11 2003 Elliot Lee <sopwith@redhat.com>
- 0.33
- Add /tftpboot directory (#88204)

* Mon Feb 24 2003 Elliot Lee <sopwith@redhat.com>
- rebuilt

* Sun Feb 23 2003 Tim Powers <timp@redhat.com>
- add BuildPreReq on tcp_wrappers

* Wed Jan 22 2003 Tim Powers <timp@redhat.com>
- rebuilt

* Mon Nov 11 2002 Elliot Lee <sopwith@redhat.com> 0.32-1
- Update to 0.32

* Wed Oct 23 2002 Elliot Lee <sopwith@redhat.com> 0.30-1
- Fix #55789
- Update to 0.30

* Thu Jun 27 2002 Elliot Lee <sopwith@redhat.com>
- Try applying HJ's patch from #65476
```

* Fri Jun
21 2002 Tim Powers <timp@redhat.com>
- automated rebuild

* Mon Jun 17 2002 Elliot Lee <sopwith@redhat.com>
- Update to 0.29

* Thu May 23 2002 Tim Powers <timp@redhat.com>
- automated rebuild

* Wed Jan 09 2002 Tim Powers <timp@redhat.com>
- automated rebuild

* Tue Dec 18 2001 Elliot Lee <sopwith@redhat.com> 0.17-15
- Add patch4: netkit-tftp-0.17-defaultport.patch for bug #57562
- Update to tftp-hpa-0.28 (bug #56131)
- Remove include/arpa/tftp.h to fix #57259
- Add resource limits in tftp-xinetd (#56722)

* Sun Jun 24 2001 Elliot Lee <sopwith@redhat.com>
- Bump release + rebuild.

* Tue Jun 12 2001 Helge Deller <hdeller@redhat.de> (0.17-13)
- updated tftp-hpa source to tftp-hpa-0.17
- tweaked specfile with different defines for tftp-netkit and tftp-hpa version
- use hpa's tftpd.8 man page instead of the netkits one

* Mon May 07 2001 Helge Deller <hdeller@redhat.de>
- rebuilt in 7.1.x

* Wed Apr 18 2001 Helge Deller <hdeller@redhat.de>
- fix tftp client's put problems (#29529)
- update
to tftp-hpa-0.16

* Wed Apr 4 2001 Jakub Jelinek <jakub@redhat.com>
- don't let configure to guess compiler, it can pick up egcs

* Thu Feb 08 2001 Helge Deller <hdeller@redhat.de>
- changed "wait" in xinetd file to "yes" (hpa-tftpd forks and exits) (#26467)
- fixed hpa-tftpd to handle files greater than 32MB (#23725)
- added "-l" flag to hpa-tftpd for file-logging (#26467)
- added description for "-l" to the man-page

* Thu Feb 08 2001 Helge Deller <hdeller@redhat.de>
- updated tftp client to 0.17 stable (#19640),
- drop dependency on xinetd for tftp client (#25051),

* Wed Jan 17 2001 Jeff Johnson <jbj@redhat.com>
- xinetd shouldn't wait on tftp (which forks) (#23923).

* Sat Jan 6 2001 Jeff Johnson <jbj@redhat.com>
- fix to permit tftp put's (#18128).
- startup as root with chroot to /tftpboot with early reversion to nobody
 is preferable to starting as nobody w/o ability to chroot.
- %%post is needed by server, not client. Add %%postun for erasure as well.

* Wed Aug 23 2000
 Nalin Dahyabhai <nalin@redhat.com>
- default to being disabled

* Thu Aug 17 2000 Jeff Johnson <jbj@redhat.com>
- correct group.

* Tue Jul 25 2000 Nalin Dahyabhai <nalin@redhat.com>
- change user from root to nobody

* Sat Jul 22 2000 Jeff Johnson <jbj@redhat.com>
- update to tftp-hpa-0.14 (#14003).
- add server_args (#14003).
- remove -D_BSD_SOURCE (#14003).

* Fri Jul 21 2000 Nalin Dahyabhai <nalin@redhat.com>
- cook up an xinetd config file for tftpd

* Wed Jul 12 2000 Prospector <bugzilla@redhat.com>
- automatic rebuild

* Sun Jun 18 2000 Jeff Johnson <jbj@redhat.com>
- FHS packaging.
- update to 0.17.

* Fri May 5 2000 Matt Wilson <msw@redhat.com>
- use _BSD_SOURCE for hpa's tftpd so we get BSD signal semantics.

* Fri Feb 11 2000 Bill Nottingham <notting@redhat.com>
- fix description

* Wed Feb 9 2000 Jeff Johnson <jbj@redhat.com>
- compress man pages (again).

* Wed Feb 02 2000 Cristian Gafton <gafton@redhat.com>
- man pages are compressed
- fix description and summary

* Tue

Jan 4 2000 Bill Nottingham <notting@redhat.com>
- split client and server

* Tue Dec 21 1999 Jeff Johnson <jbj@redhat.com>
- update to 0.16.

* Sat Aug 28 1999 Jeff Johnson <jbj@redhat.com>
- update to 0.15.

* Wed Apr 7 1999 Jeff Johnson <jbj@redhat.com>
- tftpd should truncate file when overwriting (#412)

* Sun Mar 21 1999 Cristian Gafton <gafton@redhat.com>
- auto rebuild in the new build environment (release 22)

* Mon Mar 15 1999 Jeff Johnson <jbj@redhat.com>
- compile for 6.0.

* Fri Aug 7 1998 Jeff Johnson <jbj@redhat.com>
- build root

* Mon Apr 27 1998 Prospector System <bugs@redhat.com>
- translations modified for de, fr, tr

* Mon Sep 22 1997 Erik Troan <ewt@redhat.com>
- added check for getpwnam() failure

* Tue Jul 15 1997 Erik Troan <ewt@redhat.com>
- initial build

Found in path(s):
* /opt/cola/permits/1833546142_1698379726.218706/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-hpa-5.2/tftp.spec
No license file was found, but licenses were detected in source scan.

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.\"   without specific prior written permission.

Found in path(s):
* /opt/cola/permits/1833546142_1698379726.218706/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp/tftp.1.in
No license file was found, but licenses were detected in source scan.

```
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*
* ------------------------------------------------------------------------- */
```

Found in path(s):
* /opt/cola/permits/1833546142_1698379726.218706/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/config.h
No license file was found, but licenses were detected in source scan.

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*   http://www.openbsd.org/.
*
* ------------------------------------------------------------------------- */
```

Found in path(s):
* /opt/cola/permits/1833546142_1698379726.218706/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftpd/remap.h
* /opt/cola/permits/1833546142_1698379726.218706/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftpd/remap.c
* /opt/cola/permits/1833546142_1698379726.218706/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftpd/misc.c
No license file was found, but licenses were detected in source scan.

Summary: The client for the Trivial File Transfer Protocol (TFTP).
Name: tftp
Version: @@VERSION@@
Release: 1
License: BSD
Group: Applications/Internet
Source0: http://www.kernel.org/pub/software/network/tftp/tftp-hpa-%{version}.tar.gz
BuildRequires: tcp_wrappers-devel
BuildRoot: %{_tmppath}/%{name}-root

```
%description
The Trivial File Transfer Protocol (TFTP) is normally used only for
booting diskless workstations.  The tftp package provides the user
interface for TFTP, which allows users to transfer files to and from a
remote machine.  This program and TFTP provide very little security,
and should not be enabled unless it is expressly needed.

%package server
Group: System Environment/Daemons
Summary: The server for the Trivial File Transfer Protocol (TFTP).
Requires: xinetd

%description server
The Trivial File Transfer Protocol (TFTP) is normally used only for
booting diskless workstations.  The tftp-server package
 provides the
server for TFTP, which allows users to transfer files to and from a
remote machine. TFTP provides very little security, and should not be
enabled unless it is expressly needed.  The TFTP server is run from
/etc/xinetd.d/tftp, and is disabled by default on Red Hat Linux systems.

%prep
%setup -q -n tftp-hpa-%{version}

%build

%configure
make %{?_smp_mflags}

%install
rm -rf ${RPM_BUILD_ROOT}
mkdir -p ${RPM_BUILD_ROOT}%{_bindir}
mkdir -p ${RPM_BUILD_ROOT}%{_mandir}/man{1,8}
mkdir -p ${RPM_BUILD_ROOT}%{_sbindir}

make INSTALLROOT=${RPM_BUILD_ROOT} \
   SBINDIR=%{_sbindir} MANDIR=%{_mandir} \
 install
install -m755 -d ${RPM_BUILD_ROOT}%{_sysconfdir}/xinetd.d/ ${RPM_BUILD_ROOT}/tftpboot
install -m644 tftp-xinetd ${RPM_BUILD_ROOT}%{_sysconfdir}/xinetd.d/tftp

%post server
/sbin/service xinetd reload > /dev/null 2>&1 || :

%postun server
if [ $1 = 0 ]; then
   /sbin/service xinetd reload > /dev/null 2>&1 || :
```

```
fi

%clean
rm -rf ${RPM_BUILD_ROOT}

%files
%defattr(-,root,root)
%{_bindir}/tftp
%{_mandir}/man1/*

%files
 server
%defattr(-,root,root)
%config(noreplace) %{_sysconfdir}/xinetd.d/tftp
%dir /tftpboot
%{_sbindir}/in.tftpd
%{_mandir}/man8/*

%changelog
* Tue Sep 14 2004 H. Peter Anvin <hpa@zytor.com>
- removed completely broken "Malta" patch.
- integrated into build machinery so rpm -ta works.

* Fri Feb 13 2004 Elliot Lee <sopwith@redhat.com>
- rebuilt

* Wed Jun 04 2003 Elliot Lee <sopwith@redhat.com>
- rebuilt

* Fri Apr 11 2003 Elliot Lee <sopwith@redhat.com>
- 0.33
- Add /tftpboot directory (#88204)

* Mon Feb 24 2003 Elliot Lee <sopwith@redhat.com>
- rebuilt

* Sun Feb 23 2003 Tim Powers <timp@redhat.com>
- add BuildPreReq on tcp_wrappers

* Wed Jan 22 2003 Tim Powers <timp@redhat.com>
- rebuilt

* Mon Nov 11 2002 Elliot Lee <sopwith@redhat.com> 0.32-1
- Update to 0.32

* Wed Oct 23 2002 Elliot Lee <sopwith@redhat.com> 0.30-1
- Fix #55789
- Update to 0.30
```

* Thu Jun 27 2002 Elliot Lee <sopwith@redhat.com>
- Try applying HJ's patch from #65476

*
 Fri Jun 21 2002 Tim Powers <timp@redhat.com>
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- Add patch4: netkit-tftp-0.17-defaultport.patch for bug #57562
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- tweaked specfile with different defines for tftp-netkit and tftp-hpa version
- use hpa's tftpd.8 man page instead of the netkits one

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-
 update to tftp-hpa-0.16

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- don't let configure to guess compiler, it can pick up egcs

* Thu Feb 08 2001 Helge Deller <hdeller@redhat.de>
- changed "wait" in xinetd file to "yes" (hpa-tftpd forks and exits) (#26467)
- fixed hpa-tftpd to handle files greater than 32MB (#23725)
- added "-l" flag to hpa-tftpd for file-logging (#26467)
- added description for "-l" to the man-page

* Thu Feb 08 2001 Helge Deller <hdeller@redhat.de>
- updated tftp client to 0.17 stable (#19640),
- drop dependency on xinetd for tftp client (#25051),

* Wed Jan 17 2001 Jeff Johnson <jbj@redhat.com>
- xinetd shouldn't wait on tftp (which forks) (#23923).

* Sat Jan 6 2001 Jeff Johnson <jbj@redhat.com>
- fix to permit tftp put's (#18128).
- startup as root with chroot to /tftpboot with early reversion to nobody
 is preferable to starting as nobody w/o ability to chroot.
- %%post is needed by server, not client. Add %%postun for erasure as well.

* Wed Aug
 23 2000 Nalin Dahyabhai <nalin@redhat.com>
- default to being disabled

* Thu Aug 17 2000 Jeff Johnson <jbj@redhat.com>
- correct group.

* Tue Jul 25 2000 Nalin Dahyabhai <nalin@redhat.com>
- change user from root to nobody

* Sat Jul 22 2000 Jeff Johnson <jbj@redhat.com>
- update to tftp-hpa-0.14 (#14003).
- add server_args (#14003).
- remove -D_BSD_SOURCE (#14003).

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- cook up an xinetd config file for tftpd

* Wed Jul 12 2000 Prospector <bugzilla@redhat.com>
- automatic rebuild

* Sun Jun 18 2000 Jeff Johnson <jbj@redhat.com>
- FHS packaging.
- update to 0.17.

* Fri May 5 2000 Matt Wilson <msw@redhat.com>
- use _BSD_SOURCE for hpa's tftpd so we get BSD signal semantics.

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- compress man pages (again).

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- man pages are compressed
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Tue Jan 4 2000 Bill Nottingham <notting@redhat.com>
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- compile for 6.0.

* Fri Aug 7 1998 Jeff Johnson <jbj@redhat.com>
- build root

* Mon Apr 27 1998 Prospector System <bugs@redhat.com>
- translations modified for de, fr, tr

* Mon Sep 22 1997 Erik Troan <ewt@redhat.com>
- added check for getpwnam() failure

* Tue Jul 15 1997 Erik Troan <ewt@redhat.com>
- initial build

Found in path(s):
* /opt/cola/permits/1833546142_1698379726.218706/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-hpa-5.2/tftp.spec.in
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Found in path(s):
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* /opt/cola/permits/1833546142_1698379726.218706/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftpd/recvfrom.c
No license file was found, but licenses were detected in source scan.

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*
* -- */

Found in path(s):
* /opt/cola/permits/1833546142_1698379726.218706/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftpd/tftpd.h
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Found in path(s):
* /opt/cola/permits/1833546142_1698379726.218706/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/MCONFIG.in
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Found
in path(s):
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*
 /opt/cola/permits/1833546142_1698379726.218706/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-hpa-5.2/common/tftpsubs.h
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*
/opt/cola/permits/1833546142_1698379726.218706/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-hpa-5.2/tftp/main.c
* /opt/cola/permits/1833546142_1698379726.218706/0/tftp-hpa-5-2-r0-tar-bz2/tftp-hpa-5.2-r0/tftp-hpa-5.2/tftp-hpa-5.2/tftp/tftp.c

1.278 gawk 5.1.1

1.278.1 Available under license :

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[This is the first released version of the library GPL. It is
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Finally, any free program is threatened constantly by software patents. We wish to avoid the danger that companies distributing free software will individually obtain patent licenses, thus in effect transforming the program into proprietary software. To prevent this, we have made it clear that any patent must be licensed
for everyone's
free use or not licensed at all.

Most GNU software, including some libraries, is covered by the ordinary GNU General Public License, which was designed for utility programs. This license, the GNU Library General Public License, applies to certain designated libraries. This license is quite different from the ordinary one; be sure to read it in full, and don't assume that anything in it is the same as in the ordinary license.

The reason we have a separate public license for some libraries is that they blur the distinction we usually make between modifying or adding to a program and simply using it. Linking a program with a library, without changing the library, is in some sense simply using the library, and is analogous to running a utility program or application program. However, in a textual and legal sense, the linked executable is a combined work, a derivative of the original library, and the ordinary General Public License

treats it as such.

Because of this blurred distinction, using the ordinary General Public License for libraries did not effectively promote software sharing, because most developers did not use the libraries. We concluded that weaker conditions might promote sharing better.

However, unrestricted linking of non-free programs would deprive the users of those programs of all benefit from the free status of the libraries themselves. This Library General Public License is intended to permit developers of non-free programs to use free libraries, while preserving your freedom as a user of such programs to change the free libraries that are incorporated in them. (We have not seen how to achieve this as regards changes in header files, but we have achieved it as regards changes in the actual functions of the Library.) The hope is that this will lead to faster development of free libraries.

The precise terms and conditions for copying, distribution and modification follow. Pay close attention to the difference between a "work based on the library" and a "work that uses the library". The former contains code derived from the library, while the latter only works together with the library.

Note that it is possible for a library to be covered by the ordinary General Public License rather than by this special one.

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0. This License Agreement applies to any software library which contains a notice placed by the copyright holder or other authorized party saying it may be distributed under the terms of this Library General Public License (also called "this License"). Each licensee is addressed as "you".

A "library" means a collection of software functions and/or data prepared so as to be conveniently linked with application programs (which use some of those functions and data) to form executables.

The "Library", below, refers to any such software library or work which has been distributed under these terms. A "work based on the Library" means either the Library or any derivative work under copyright law: that is to say, a work containing the Library or a portion of it, either verbatim or with modifications and/or translated straightforwardly into another language. (Hereinafter, translation is

included without limitation in the term "modification".)

"Source code" for a work means the preferred form of the work for making modifications to it. For a library, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the library.

Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running a program using the Library is not restricted, and output from such a program is covered only if its contents constitute a work based on the Library (independent
of the use of the Library in a tool for
writing it). Whether that is true depends on what the Library does and what the program that uses the Library does.

1. You may copy and distribute verbatim copies of the Library's complete source code as you receive it, in any medium, provided that you conspicuously and appropriately publish on each copy an appropriate copyright notice and disclaimer of warranty; keep intact all the notices that refer to this License and to the absence of any warranty; and distribute a copy of this License along with the Library.

You may charge a fee for the physical act of transferring a copy, and you may at your option offer warranty protection in exchange for a fee.

2. You may modify your copy or copies of the Library or any portion of it, thus forming a work based on the Library, and copy and distribute such modifications or work under the terms of Section 1 above, provided that you also meet all of these conditions:

a) The modified work must
itself be a software library.

b) You must cause the files modified to carry prominent notices stating that you changed the files and the date of any change.

c) You must cause the whole of the work to be licensed at no charge to all third parties under the terms of this License.

d) If a facility in the modified Library refers to a function or a table of data to be supplied by an application program that uses the facility, other than as an argument passed when the facility is invoked, then you must make a good faith effort to ensure that, in the event an application does not supply such function or

table, the facility still operates, and performs whatever part of its purpose remains meaningful.

(For example, a function in a library to compute square roots has a purpose that is entirely well-defined independent of the application. Therefore, Subsection 2d requires that any application-supplied function or table used by this function must be optional: if the application does not supply it, the square root function must still compute square roots.)

These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Library, and can be reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works. But when you distribute the same sections as part of a whole which is a work based on the Library, the distribution of the whole must be on the terms of this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Library.

In addition, mere aggregation of another work not based on the Library with the Library (or with a work based on the Library) on a volume of a storage or distribution medium does not bring the other work under the scope of this License.

3. You may opt to apply the terms of the ordinary GNU General Public License instead of this License to a given copy of the Library. To do this, you must alter all the notices that refer to this License, so that they refer to the ordinary GNU General Public License, version 2, instead of to this License. (If a newer version than version 2 of the ordinary GNU General Public License has appeared, then you can specify that version instead if you wish.) Do not make any other change in these notices.

Once this change is made in a given copy, it is irreversible for that copy, so the ordinary GNU General Public License applies to all subsequent copies and derivative works made from that copy.

This option is useful when you wish to copy part of the code of the

Library into a program that is not a library.

4. You may copy and distribute the Library (or a portion or derivative of it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange.

If distribution of object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place satisfies the requirement to distribute the source code, even though third parties are not compelled to copy the source along with the object code.

5. A program that contains no derivative of any portion of the Library, but is designed to work with the Library by being compiled or linked with it, is called a "work that uses the Library". Such a work, in isolation, is not a derivative work of the Library, and therefore falls outside the scope of this License.

However, linking a "work that uses the Library" with the Library creates an executable that is a derivative of the Library (because it contains portions of the Library), rather than a "work that uses the library". The executable is therefore covered by this License. Section 6 states terms for distribution of such executables.

When a "work that uses the Library" uses material from a header file that is part of the Library, the object code for the work may be a derivative work of the Library even though the source code is not. Whether this is true is especially significant if the work can be linked without the Library, or if the work is itself a library. The threshold for this to be true is not precisely defined by law.

If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may distribute the object code for the work under the terms of Section 6. Any executables containing that work also fall under Section 6, whether or not they are linked directly with the Library itself.

6. As an exception to the Sections above, you may also compile or link a "work that uses the Library" with the Library to produce a work containing portions of the Library, and distribute that work under terms of your choice, provided that the terms permit modification of the work for the customer's own use and reverse engineering for debugging such modifications.

You must give prominent notice with each copy of the work that the Library is used in it and that the Library and its use are covered by this License. You must supply
a copy of this License. If the work
during execution displays copyright notices, you must include the copyright notice for the Library among them, as well as a reference directing the user to the copy of this License. Also, you must do one of these things:

a) Accompany the work with the complete corresponding machine-readable source code for the Library including whatever changes were used in the work (which must be distributed under Sections 1 and 2 above); and, if the work is an executable linked with the Library, with the complete machine-readable "work that uses the Library", as object code and/or source code, so that the user can modify the Library and then relink to produce a modified executable containing the modified Library. (It is understood that the user who changes the contents of definitions files in the Library will not necessarily be able to recompile the application to use the modified definitions.)

b) Accompany the
work with a written offer, valid for at
least three years, to give the same user the materials specified in Subsection 6a, above, for a charge no more than the cost of performing this distribution.

c) If distribution of the work is made by offering access to copy from a designated place, offer equivalent access to copy the above specified materials from the same place.

d) Verify that the user has already received a copy of these materials or that you have already sent this user a copy.

For an executable, the required form of the "work that uses the Library" must include any data and utility programs needed for reproducing the executable from it. However, as a special exception, the source code distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies

the executable.

It may happen that this requirement contradicts the license restrictions of other proprietary libraries that do not normally accompany the operating system. Such a contradiction means you cannot use both them and the Library together in an executable that you distribute.

7. You may place library facilities that are a work based on the Library side-by-side in a single library together with other library facilities not covered by this License, and distribute such a combined library, provided that the separate distribution of the work based on the Library and of the other library facilities is otherwise permitted, and provided that you do these two things:

a) Accompany the combined library with a copy of the same work based on the Library, uncombined with any other library facilities. This must be distributed under the terms of the Sections above.

b) Give prominent notice with the combined library of the fact that part of it is a work based on the Library, and explaining where to find the accompanying uncombined form of the same work.

8. You may not copy, modify, sublicense, link with, or distribute the Library except as expressly provided under this License. Any attempt otherwise to copy, modify, sublicense, link with, or distribute the Library is void, and will automatically terminate your rights under this License. However, parties who have received copies, or rights, from you under this License will not have their licenses terminated so long as such parties remain in full compliance.

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license would not permit royalty-free redistribution of the Library by all those who receive copies directly or indirectly through you, then the only way you could satisfy both it and this License would be to refrain entirely from distribution of the Library.

If any portion of this section is held invalid or unenforceable under any particular circumstance, the balance of the section is intended to apply, and the section as a whole is intended to apply in other circumstances.

It is not the purpose of this section to induce you to infringe any patents or other property right claims or to contest validity of any such claims; this section has the sole purpose of protecting the integrity of the free software distribution system which is implemented by public license practices. Many people have made generous contributions to the wide range of software distributed through that system in reliance on consistent application of that system;
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to distribute software through any other system and a licensee cannot impose that choice.

This section is intended to make thoroughly clear what is believed to be a consequence of the rest of this License.

12. If the distribution and/or use of the Library is restricted in certain countries either by patents or by copyrighted interfaces, the original copyright holder who places the Library under this License may add an explicit geographical distribution limitation excluding those countries, so that distribution is permitted only in or among countries not thus excluded. In such case, this License incorporates the limitation as if written in the body of this License.

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Each
version is given a distinguishing version number. If the Library specifies a version number of this License which applies to it and "any later version", you have the option of following the terms and conditions either of that version or of any later version published by the Free Software Foundation. If the Library does not specify a license version number, you may choose any version ever published by the Free Software Foundation.

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END OF TERMS AND CONDITIONS

Appendix: How to Apply These Terms to Your New Libraries

If you develop a new library, and you want it to be of the greatest possible use to the public, we recommend making it free software that everyone can redistribute and change. You can do so by permitting redistribution under these terms (or, alternatively, under the terms of the ordinary General Public License).

To apply these terms, attach the following notices to the library. It is safest to attach them to the start of each source file to most effectively convey the exclusion of warranty; and each file should have at least the "copyright" line and a pointer to where the full notice is found.

<one line to give the library's name and a brief idea of what it does.>
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<name of author>

This library is free software; you can redistribute it and/or modify it under the terms of the GNU Library General Public License as published by the Free Software Foundation; either version 2 of the License, or (at your option) any later version.

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You should have received a copy of the GNU Library General Public License along with this library; if not, write to the Free Software Foundation, Inc., 51 Franklin Street, Fifth Floor, Boston, MA 02110-1301, USA

Also add information on how to contact you by electronic and paper mail.

You should also get your employer (if you work as a programmer) or your school, if any, to sign a "copyright disclaimer" for the library, if necessary.
Here is a sample; alter the names:

Yoyodyne, Inc., hereby disclaims all copyright interest in the library `Frob' (a library for tweaking knobs) written by James Random Hacker.

<signature of Ty Coon>, 1 April 1990
Ty Coon, President of Vice

That's all there is to it!

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Version 3, 29 June 2007

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Preamble

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The licenses for most software and other practical works are designed
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share and change all versions of a program--to make sure it remains free
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When we speak of free software, we are referring to
freedom, not
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want it, that you can change the software or use pieces of it in new
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To protect your rights, we need to prevent others from denying you
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certain responsibilities if you distribute copies of the software, or if
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For example, if you distribute copies of such a program, whether
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freedoms that you received. You must make sure that they, too, receive
or can get the source code. And you must show them these terms so they
know their rights.

Developers that use the GNU GPL protect your rights with two steps:
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assert copyright on the software, and (2) offer you this License
giving you legal permission to copy, distribute and/or modify it.

For the developers' and authors' protection, the GPL clearly explains
that there is no warranty for this free software. For both users' and
authors' sake, the GPL requires that modified versions be marked as
changed, so that their problems will not be attributed erroneously to
authors of previous versions.

Some devices are designed to deny users access to install or run

modified versions of the software inside them, although the manufacturer can do so. This is fundamentally incompatible with the aim of protecting users' freedom to change the software. The systematic pattern of such abuse occurs in the area of products for individuals to use, which is precisely where it is most unacceptable. Therefore, we have designed this version of the GPL to prohibit the practice for those products. If such problems arise substantially in other domains, we stand
ready to extend this provision to those domains in future versions of the GPL, as needed to protect the freedom of users.

Finally, every program is threatened constantly by software patents. States should not allow patents to restrict development and use of software on general-purpose computers, but in those that do, we wish to avoid the special danger that patents applied to a free program could make it effectively proprietary. To prevent this, the GPL assures that patents cannot be used to render the program non-free.

The precise terms and conditions for copying, distribution and modification follow.

TERMS AND CONDITIONS

0. Definitions.

"This License" refers to version 3 of the GNU General Public License.

"Copyright" also means copyright-like laws that apply to other kinds of works, such as semiconductor masks.

"The Program" refers to any copyrightable work licensed under this License. Each licensee is addressed as "you". "Licensees"
and
"recipients" may be individuals or organizations.

To "modify" a work means to copy from or adapt all or part of the work in a fashion requiring copyright permission, other than the making of an exact copy. The resulting work is called a "modified version" of the earlier work or a work "based on" the earlier work.

A "covered work" means either the unmodified Program or a work based on the Program.

To "propagate" a work means to do anything with it that, without permission, would make you directly or secondarily liable for infringement under applicable copyright law, except executing it on a computer or modifying a private copy. Propagation includes copying, distribution (with or without modification), making available to the

public, and in some countries other activities as well.

To "convey" a work means any kind of propagation that enables other parties to make or receive copies. Mere interaction with a user through a computer network, with no transfer of a copy, is not conveying.

An interactive user interface displays "Appropriate Legal Notices" to the extent that it includes a convenient and prominently visible feature that (1) displays an appropriate copyright notice, and (2) tells the user that there is no warranty for the work (except to the extent that warranties are provided), that licensees may convey the work under this License, and how to view a copy of this License. If the interface presents a list of user commands or options, such as a menu, a prominent item in the list meets this criterion.

1. Source Code.

The "source code" for a work means the preferred form of the work for making modifications to it. "Object code" means any non-source form of a work.

A "Standard Interface" means an interface that either is an official standard defined by a recognized standards body, or, in the case of interfaces specified for a particular programming language, one that is widely used among developers working in that language.

The "System Libraries" of an executable work include anything, other than the work as a whole, that (a) is included in the normal form of packaging a Major Component, but which is not part of that Major Component, and (b) serves only to enable use of the work with that Major Component, or to implement a Standard Interface for which an implementation is available to the public in source code form. A "Major Component", in this context, means a major essential component (kernel, window system, and so on) of the specific operating system (if any) on which the executable work runs, or a compiler used to produce the work, or an object code interpreter used to run it.

The "Corresponding Source" for a work in object code form means all the source code needed to generate, install, and (for an executable work) run the object code and to modify the work, including scripts to control those activities. However, it does not include the work's System Libraries, or general-purpose tools or generally available free programs which are used unmodified in performing those activities but which are not part of the work. For example, Corresponding Source includes interface definition files associated with source files for

the work, and the source code for shared libraries and dynamically linked subprograms that the work is specifically designed to require, such as by intimate data communication or control flow between those subprograms and other parts of the work.

The Corresponding Source need not include anything that users can regenerate automatically from other parts of the Corresponding Source.

The Corresponding Source for a work in source code form is that same work.

2. Basic Permissions.

All rights granted under this License are granted for the term of copyright on the Program, and are irrevocable provided the stated conditions are met. This License explicitly affirms your unlimited permission to run the unmodified Program. The output from running a covered work is covered
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Conveying under any other circumstances is permitted solely under the conditions stated below. Sublicensing is not allowed;
section 10
makes it unnecessary.

3. Protecting Users' Legal Rights From Anti-Circumvention Law.

No covered work shall be deemed part of an effective technological measure under any applicable law fulfilling obligations under article 11 of the WIPO copyright treaty adopted on 20 December 1996, or similar laws prohibiting or restricting circumvention of such measures.

When you convey a covered work, you waive any legal power to forbid

circumvention of technological measures to the extent such circumvention is effected by exercising rights under this License with respect to the covered work, and you disclaim any intention to limit operation or modification of the work as a means of enforcing, against the work's users, your or third parties' legal rights to forbid circumvention of technological measures.

4. Conveying Verbatim Copies.

You may convey verbatim copies of the Program's source code as you receive it, in any medium, provided that you conspicuously and appropriately
publish on each copy an appropriate copyright notice;
keep intact all notices stating that this License and any non-permissive terms added in accord with section 7 apply to the code; keep intact all notices of the absence of any warranty; and give all recipients a copy of this License along with the Program.

You may charge any price or no price for each copy that you convey, and you may offer support or warranty protection for a fee.

5. Conveying Modified Source Versions.

You may convey a work based on the Program, or the modifications to produce it from the Program, in the form of source code under the terms of section 4, provided that you also meet all of these conditions:

a) The work must carry prominent notices stating that you modified it, and giving a relevant date.

b) The work must carry prominent notices stating that it is released under this License and any conditions added under section 7. This requirement modifies the requirement in section 4 to
"keep intact all notices".

c) You must license the entire work, as a whole, under this License to anyone who comes into possession of a copy. This License will therefore apply, along with any applicable section 7 additional terms, to the whole of the work, and all its parts, regardless of how they are packaged. This License gives no permission to license the work in any other way, but it does not invalidate such permission if you have separately received it.

d) If the work has interactive user interfaces, each must display Appropriate Legal Notices; however, if the Program has interactive interfaces that do not display Appropriate Legal Notices, your work need not make them do so.

A compilation of a covered work with other separate and independent works, which are not by their nature extensions of the covered work, and which are not combined with it such as to form a larger program, in or on a volume of a storage or distribution medium, is called an "aggregate" if the compilation and its resulting copyright are not used to limit the access or legal rights of the compilation's users beyond what the individual works permit. Inclusion of a covered work in an aggregate does not cause this License to apply to the other parts of the aggregate.

6. Conveying Non-Source Forms.

You may convey a covered work in object code form under the terms of sections 4 and 5, provided that you also convey the machine-readable Corresponding Source under the terms of this License, in one of these ways:

a) Convey the object code in, or embodied in, a physical product (including a physical distribution medium), accompanied by the Corresponding Source fixed on a durable physical medium customarily used for software interchange.

b) Convey the object code in, or embodied in, a physical product (including a physical distribution medium), accompanied by a written offer, valid for at least three years and valid for as long as you offer spare parts or customer support for that product model, to give anyone who possesses the object code either (1) a copy of the Corresponding Source for all the software in the product that is covered by this License, on a durable physical medium customarily used for software interchange, for a price no more than your reasonable cost of physically performing this conveying of source, or (2) access to copy the Corresponding Source from a network server at no charge.

c) Convey individual copies of the object code with a copy of the written offer to provide the Corresponding Source. This alternative is allowed only occasionally and noncommercially, and only if you received the object code with such an offer, in accord with subsection 6b.

d) Convey the object code by offering access from a designated place (gratis or for a charge), and offer equivalent access to the Corresponding Source in the same way through the same place at no further charge. You need not require recipients to copy the

Corresponding Source along with the object code. If the place to copy the object code is a network server, the Corresponding Source may be on a different server (operated by you or a third party) that supports equivalent copying facilities, provided you maintain clear directions next to the object code saying where to find the Corresponding Source. Regardless of what server hosts the Corresponding Source, you remain obligated to ensure that it is available for as long as needed to satisfy these requirements.

e) Convey the object code using peer-to-peer transmission, provided you inform other peers where the object code and Corresponding Source of the work are being offered to the general public at no charge under subsection 6d.

A separable portion of the object code, whose source code is excluded from the Corresponding Source as a System Library, need not be included in conveying the object code work.

A "User Product" is either (1) a "consumer product", which means any tangible personal property which is normally used for personal, family, or household purposes, or (2) anything designed or sold for incorporation into a dwelling. In determining whether a product is a consumer product, doubtful cases shall be resolved in favor of coverage. For a particular product received by a particular user, "normally used" refers to a typical or common use of that class of product, regardless of the status of the particular user or of the way in which the particular user actually uses, or expects or is expected to use, the product. A product is a consumer product regardless of whether the product has substantial commercial, industrial or non-consumer uses, unless such uses represent the only significant mode of use of the product.

"Installation Information" for a User Product means any methods, procedures, authorization keys, or other information required to install and execute modified versions of a covered work in that User Product from a modified version of its Corresponding Source. The information must suffice to ensure that the continued functioning of the modified object code is in no case prevented or interfered with solely because modification has been made.

If you convey an object code work under this section in, or with, or specifically for use in, a User Product, and the conveying occurs as part of a transaction in which the right of possession and use of the User Product is transferred to the recipient in perpetuity or for a fixed term (regardless of how the transaction is characterized), the Corresponding Source conveyed under this section must be accompanied by the Installation Information. But this requirement does not apply

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1.279 pynacl 1.5.0

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1.280 importlib-metadata 4.11.1

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1.281 mini-xml 2.6

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1.282 zstd 1.5.2

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1.289 pciutils 3.9.0

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1.291 libcap 2.26-4.el8

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