



Open Source Used In Cisco Secure Endpoint Connector (Linux) 1.25.0

Cisco Systems, Inc.

www.cisco.com

Cisco has more than 200 offices worldwide. Addresses, phone numbers, and fax numbers are listed on the Cisco website at www.cisco.com/go/offices.

Text Part Number: 78EE117C99-2165526131

This document contains licenses and notices for open source software used in this product. With respect to the free/open source software listed in this document, if you have any questions or wish to receive a copy of any source code to which you may be entitled under the applicable free/open source license(s) (such as the GNU Lesser/General Public License), please submit this [form](#).

In your requests please include the following reference number 78EE117C99-2165526131

Contents

1.1 asn1c 0.9.24

1.1.1 Available under license

1.2 re2 20160201

1.2.1 Available under license

1.3 libmnl 1.0.4

1.3.1 Available under license

1.4 jansson 2.11

1.4.1 Available under license

1.5 pcre 10.34

1.5.1 Available under license

1.6 cre2 0.3.1

1.6.1 Available under license

1.7 libedit 20180525-3.1

1.7.1 Available under license

1.8 klib 70c0e397 + P

1.8.1 Available under license

1.9 tail 068b729 + P

1.9.1 Available under license

1.10 x-net 747e238

1.10.1 Available under license

1.11 llhttp 6.0.6 + P

1.11.1 Available under license

1.12 crashpad 0.8.0 + P + 36473e

1.12.1 Available under license

1.13 sqlite 3.39.3

1.13.1 Available under license

1.14 capnproto 0.10.4

1.14.1 Available under license

1.15 llvm 16.0.4 + P

1.15.1 Available under license

1.16 json-c 0.17

1.16.1 Available under license

1.17 curl 8.3.0

1.17.1 Available under license

1.18 boost 1.84.0

1.18.1 Available under license

1.19 libxml2 2.11.7

1.19.1 Available under license

1.20 bcc 0.31.0

1.20.1 Available under license

1.21 clamav 1.4.1

1.21.1 Available under license

1.22 xmlsec 1.2.38

1.22.1 Available under license

1.23 libbpf 1.30

1.23.1 Available under license

1.1 asn1c 0.9.24

1.1.1 Available under license :

/*-

* Copyright (c) 2003, 2004, 2005, 2006, 2007 Lev Walkin <vlm@lionet.info>

* All rights reserved.

*

* Redistribution and use in source and binary forms, with or without

* modification, are permitted provided that the following conditions

* are met:

* 1. Redistributions of source code must retain the above copyright

* notice, this list of conditions and the following disclaimer.

* 2. Redistributions in binary form must reproduce the above copyright

* notice, this list of conditions and the following disclaimer in the

* documentation and/or other materials provided with the distribution.

*

* THIS SOFTWARE IS PROVIDED BY THE AUTHOR AND CONTRIBUTORS ``AS IS" AND

* ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE

* IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE

* ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHOR OR CONTRIBUTORS BE LIABLE

* FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL

* DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS
* OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION)
* HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT
* LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY
* OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF
* SUCH DAMAGE.
*
* \$Id\$
*/

1.2 re2 20160201

1.2.1 Available under license :

```
// Copyright (c) 2009 The RE2 Authors. All rights reserved.
//
// Redistribution and use in source and binary forms, with or without
// modification, are permitted provided that the following conditions are
// met:
//
// * Redistributions of source code must retain the above copyright
// notice, this list of conditions and the following disclaimer.
// * Redistributions in binary form must reproduce the above
// copyright notice, this list of conditions and the following disclaimer
// in the documentation and/or other materials provided with the
// distribution.
// * Neither the name of Google Inc. nor the names of its
// contributors may be used to endorse or promote products derived from
// this software without specific prior written permission.
//
// THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS
// "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT
// LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR
// A PARTICULAR PURPOSE
// ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT
// OWNER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL,
// SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT
// LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE,
// DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY
// THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT
// (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE
// OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.
# This is the official list of people who can contribute
# (and typically have contributed) code to the RE2 repository.
# The AUTHORS file lists the copyright holders; this file
# lists people. For example, Google employees are listed here
# but not in AUTHORS, because Google holds the copyright.
#
```

```
# The submission process automatically checks to make sure
# that people submitting code are listed in this file (by email address).
#
# Names should be added to this file only after verifying that
# the individual or the individual's organization has agreed to
# the appropriate Contributor License Agreement, found here:
#
# http://code.google.com/legal/individual-cla-v1.0.html
# http://code.google.com/legal/corporate-cla-v1.0.html
#
# The agreement for individuals can be filled out on the web.
#
# When adding J Random Contributor's name to this file,
# either J's name or J's organization's name should be
# added to the AUTHORS file, depending on whether the
# individual or corporate
# CLA was used.

# Names should be added to this file like so:
# Name <email address>

# Please keep the list sorted.
```

```
Dominic Battr <battre@chromium.org>
Doug Kwan <dougkwan@google.com>
Dmitriy Vyukov <dvyukov@google.com>
John Millikin <jmillikin@gmail.com>
Mike Nazarewicz <mpn@google.com>
Nico Weber <thakis@chromium.org>
Pawel Hajdan <phajdan.jr@gmail.com>
Rob Pike <r@google.com>
Russ Cox <rsc@swtch.com>
Sanjay Ghemawat <sanjay@google.com>
Stefano Rivera <stefano.rivera@gmail.com>
Srinivasan Venkatachary <vsri@google.com>
Viatcheslav Ostapenko <sl.ostapenko@samsung.com>
```

1.3 libmnl 1.0.4

1.3.1 Available under license :

GNU LESSER GENERAL PUBLIC LICENSE

Version 2.1, February 1999

Copyright (C) 1991, 1999 Free Software Foundation, Inc.
51 Franklin Street, Fifth Floor, Boston, MA 02110-1301 USA
Everyone is permitted to copy and distribute verbatim copies
of this license document, but changing it is not allowed.

[This is the first released version of the Lesser GPL. It also counts as the successor of the GNU Library Public License, version 2, hence the version number 2.1.]

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.

This license, the Lesser General Public License, applies to some specially designated software packages--typically libraries--of the Free Software Foundation and other authors who decide to use it. You can use it too, but we suggest you first think carefully about whether this license or the ordinary General Public License is the better strategy to use in any particular case, based on the explanations below.

When we speak of free software, we are referring to freedom of use, not price. Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for this service if you wish); that you receive source code or can get it if you want it; that you can change the software and use pieces of it in new free programs; and that you are informed that you can do these things.

To protect your rights, we need to make restrictions that forbid distributors to deny you these rights or to ask you to surrender these rights. These restrictions translate to certain responsibilities for you if 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 you. You must make sure that they, too, receive or can get the source code. If you link other code 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.

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.

To protect each distributor, we want to make it very clear that there is no warranty for the free library. Also, if the library is

modified by someone else and passed on, the recipients should know that what they have is not the original version, so that the original author's reputation will not be affected by problems that might be introduced by others.

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.

Most GNU software, including some libraries, is covered by the ordinary GNU General Public License. This license, the GNU Lesser General Public License, applies to certain designated libraries, and is quite different from the ordinary General Public License. We use this license for certain libraries in order to permit linking those libraries into non-free programs.

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.

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.

GNU LESSER GENERAL PUBLIC LICENSE TERMS AND CONDITIONS FOR COPYING, DISTRIBUTION AND MODIFICATION

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 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 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.

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.

9. You are not required to accept this License, since you have not signed it. However, nothing else grants you permission to modify or distribute the Library or its derivative works. These actions are prohibited by law if you do not accept this License. Therefore, by modifying or distributing the Library (or any work based on the Library), you indicate your acceptance of this License to do so, and all its terms and conditions for copying, distributing or modifying the Library or works based on it.

10. Each time you redistribute the Library (or any work based on the Library), the recipient automatically receives a license from the original licensor to copy, distribute, link with or modify the Library subject to these terms and conditions. You may not impose any further restrictions on the recipients' exercise of the rights granted herein.

You are not responsible for enforcing compliance by third parties with this License.

11. If, as a consequence of a court judgment or allegation of patent infringement or for any other reason (not limited to patent issues), conditions are imposed on you (whether by court order, agreement or otherwise) that contradict the conditions of this License, they do not excuse you from the conditions of this License. If you cannot distribute so as to satisfy simultaneously your obligations under this License and any other pertinent obligations, then as a consequence you may not distribute the Library at all. For example, if a patent 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; it is up to the author/donor to decide if he or she is willing 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.

13. The Free Software Foundation may publish revised and/or new versions of the Lesser General Public License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns.

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.

14. If you wish to incorporate parts of the Library into other free programs whose distribution conditions are incompatible with these, write to the author to ask for permission. For software which is copyrighted by the Free Software Foundation, write to the Free Software Foundation; we sometimes make exceptions for this. Our decision will be guided by the two goals of preserving the free status of all derivatives of our free software and of promoting the sharing and reuse of software generally.

NO WARRANTY

15. BECAUSE THE LIBRARY IS LICENSED FREE OF CHARGE, THERE IS NO WARRANTY FOR THE LIBRARY, TO THE EXTENT PERMITTED BY APPLICABLE LAW. EXCEPT WHEN OTHERWISE STATED IN WRITING THE COPYRIGHT HOLDERS AND/OR OTHER PARTIES PROVIDE THE LIBRARY "AS IS" WITHOUT 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 THE LIBRARY IS WITH YOU. SHOULD THE LIBRARY PROVE DEFECTIVE, YOU ASSUME THE COST OF ALL NECESSARY SERVICING, REPAIR OR CORRECTION.

16. IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN WRITING WILL ANY COPYRIGHT HOLDER, OR ANY OTHER PARTY WHO MAY MODIFY AND/OR REDISTRIBUTE THE LIBRARY AS PERMITTED ABOVE, BE LIABLE TO YOU FOR DAMAGES, INCLUDING ANY GENERAL, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE LIBRARY (INCLUDING BUT NOT LIMITED TO LOSS OF DATA OR DATA BEING RENDERED INACCURATE OR LOSSES SUSTAINED BY YOU OR THIRD PARTIES OR A FAILURE OF THE LIBRARY TO OPERATE WITH ANY OTHER SOFTWARE), EVEN IF SUCH HOLDER OR OTHER PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

END OF TERMS AND CONDITIONS

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.>

Copyright (C) <year> <name of author>

This library is free software; you can redistribute it and/or modify it under the terms of the GNU Lesser General Public License as published by the Free Software Foundation; either version 2.1 of the License, or (at your option) any later version.

This 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 Lesser General Public License for more details.

You should have received a copy of the GNU Lesser 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!

1.4 jansson 2.11

1.4.1 Available under license :

Copyright (c) 2009-2018 Petri Lehtinen <petri@digip.org>

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal

in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

1.5 pcre 10.34

1.5.1 Available under license :

PCRE2 LICENCE

Please see the file LICENCE in the PCRE2 distribution for licensing details.

End

PCRE2 LICENCE

PCRE2 is a library of functions to support regular expressions whose syntax and semantics are as close as possible to those of the Perl 5 language.

Releases 10.00 and above of PCRE2 are distributed under the terms of the "BSD" licence, as specified below, with one exemption for certain binary redistributions. The documentation for PCRE2, supplied in the "doc" directory, is distributed under the same terms as the software itself. The data in the testdata directory is not copyrighted and is in the public domain.

The basic library functions are written in C and are freestanding. Also included in the distribution is a just-in-time compiler that can be used to optimize pattern matching. This is an optional feature that can be omitted when the library is built.

THE BASIC LIBRARY FUNCTIONS

Written by: Philip Hazel

Email local part: ph10
Email domain: cam.ac.uk

University of Cambridge Computing Service,
Cambridge, England.

Copyright
(c) 1997-2019 University of Cambridge
All rights reserved.

PCRE2 JUST-IN-TIME COMPILATION SUPPORT

Written by: Zoltan Herczeg
Email local part: hzmester
Email domain: freemail.hu

Copyright(c) 2010-2019 Zoltan Herczeg
All rights reserved.

STACK-LESS JUST-IN-TIME COMPILER

Written by: Zoltan Herczeg
Email local part: hzmester
Email domain: freemail.hu

Copyright(c) 2009-2019 Zoltan Herczeg
All rights reserved.

THE "BSD" LICENCE

Redistribution and use in source and binary forms, with or without
modification, are permitted provided that the following conditions are met:

* Redistributions of source code must retain the above copyright notices,
this list of conditions and the following disclaimer.

* Redistributions in binary form must reproduce the above copyright
notices, this list of conditions and the following disclaimer in the
documentation
and/or other materials provided with the distribution.

* Neither the name of the University of Cambridge nor the names of any

contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT OWNER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

EXEMPTION FOR BINARY LIBRARY-LIKE PACKAGES

The second condition in the BSD licence (covering binary redistributions) does not apply all the way down a chain of software. If binary package A includes PCRE2, it must respect the condition, but if package B is software that includes package A, the condition is not imposed on package B unless it uses PCRE2 independently.

End

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. The name of the author may not be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE AUTHOR ``AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHOR BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT

(INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

1.6 cre2 0.3.1

1.6.1 Available under license :

```
// Copyright (c) 2009 The RE2 Authors. All rights reserved.
//
// Redistribution and use in source and binary forms, with or without
// modification, are permitted provided that the following conditions are
// met:
//
// * Redistributions of source code must retain the above copyright
// notice, this list of conditions and the following disclaimer.
// * Redistributions in binary form must reproduce the above
// copyright notice, this list of conditions and the following disclaimer
// in the documentation and/or other materials provided with the
// distribution.
// * Neither the name of Google Inc. nor the names of its
// contributors may be used to endorse or promote products derived from
// this software without specific prior written permission.
//
// THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS
// "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT
// LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR
// A PARTICULAR PURPOSE
// ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT
// OWNER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL,
// SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT
// LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE,
// DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY
// THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT
// (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE
// OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.
Copyright (c) 2012 Marco Maggi <marco.maggi-ipsu@poste.it>
Copyright (c) 2011 Keegan McAllister
All rights reserved.
```

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above

copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.

3. Neither the name of the author nor the names of his contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS ``AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHORS OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

1.7 libedit 20180525-3.1

1.7.1 Available under license :

Copyright (c) 1992, 1993

The Regents of the University of California. All rights reserved.

This code is derived from software contributed to Berkeley by Christos Zoulas of Cornell University.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. Neither the name of the University nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE REGENTS AND CONTRIBUTORS ``AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED

TO, THE
IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE
ARE DISCLAIMED. IN NO EVENT SHALL THE REGENTS OR CONTRIBUTORS BE LIABLE
FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL
DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS
OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION)
HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT
LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY
OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF
SUCH DAMAGE.

1.8 klib 70c0e397 + P

1.8.1 Available under license :

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

/* The MIT License

Copyright (c) 2008, 2009, 2011 Attractive Chaos <attractor@live.co.uk>

Permission is hereby granted, free of charge, to any person obtaining
a copy of this software and associated documentation files (the
"Software"), to deal in the Software without restriction, including
without limitation the rights to use, copy, modify, merge, publish,
distribute, sublicense, and/or sell copies of the Software, and to
permit persons to whom the Software is furnished to do so, subject to
the following conditions:

The above copyright notice and this permission notice shall be
included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND,
EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF
MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND
NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR
COPYRIGHT HOLDERS
BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN
ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN
CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE
SOFTWARE.

*/

Found in path(s):

* /opt/cola/permits/1140903019_1614894938.43/0/klib-master-zip/klib-master/kseq.h

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

/* The MIT License

Copyright (c) by Attractive Chaos <attractor@live.co.uk>

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

*/

Found in path(s):

* /opt/cola/permits/1140903019_1614894938.43/0/klib-master-zip/klib-master/kstring.h

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

/* This code is public-domain - it is based on libcrypt placed in the public domain by Wei Dai and other contributors. */

Found in path(s):

* /opt/cola/permits/1140903019_1614894938.43/0/klib-master-zip/klib-master/kurl.c

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

/* The MIT License

Copyright (c) 2018 by Attractive Chaos <attractor@live.co.uk>

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be

included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS

BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

*/

Found in path(s):

* /opt/cola/permits/1140903019_1614894938.43/0/klib-master-zip/klib-master/kavl.h

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

/* The MIT License

Copyright (c) 2011 by Attractive Chaos <attractor@live.co.uk>

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS

BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

*/

Found in path(s):

* /opt/cola/permits/1140903019_1614894938.43/0/klib-master-zip/klib-master/ksw.c

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

/*-

* Copyright 1997-1999, 2001, John-Mark Gurney.
* 2008-2009, Attractive Chaos <attractor@live.co.uk>
*
* Redistribution and use in source and binary forms, with or without
* modification, are permitted provided that the following conditions
* are met:
*
* 1. Redistributions of source code must retain the above copyright
* notice, this list of conditions and the following disclaimer.
* 2. Redistributions in binary form must reproduce the above copyright
* notice, this list of conditions and the following disclaimer in the
* documentation and/or other materials provided with the distribution.
*
* THIS SOFTWARE IS PROVIDED BY THE AUTHOR AND CONTRIBUTORS ``AS IS'' AND
* ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE
* IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE
* ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHOR OR CONTRIBUTORS BE LIABLE
* FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL
* DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS
* OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION)
* HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT
* LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY
* OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF
* SUCH DAMAGE.
*/

Found in path(s):

* /opt/cola/permits/1140903019_1614894938.43/0/klib-master-zip/klib-master/kbtree.h

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

Klib: a Generic Library in C

Overview

Klib is a standalone and lightweight C library distributed under [MIT/X11 license][1]. Most components are independent of external libraries, except the standard C library, and independent of each other. To use a component of this library, you only need to copy a couple of files to your source code tree without worrying about library dependencies.

Klib strives for efficiency and a small memory footprint. Some components, such as khash.h, kbtree.h, ksort.h and kvec.h, are among the most efficient implementations of similar algorithms or data structures in all programming languages, in terms of both speed and memory use.

A new documentation is available [here](http://attractivechaos.github.io/klib/) which includes most information in this README file.

Common components

- * [khash.h][khash]: generic [hash table][2] with open addressing.
- * [kbtree.h][kbtree]:
generic search tree based on [B-tree][3].
- * [kavl.h][kavl]: generic intrusive [AVL tree][wiki-avl].
- * [ksort.h][ksort]: generic sort, including [introsort][4], [merge sort][5], [heap sort][6], [comb sort][7], [Knuth shuffle][8] and the [k-small][9] algorithm.
- * [kseq.h][kseq]: generic stream buffer and a [FASTA][10]/[FASTQ][11] format parser.
- * kvec.h: generic dynamic array.
- * klist.h: generic single-linked list and [memory pool][12].
- * kstring.{h,c}: basic string library.
- * kmath.{h,c}: numerical routines including [MT19937-64][13] [pseudorandom generator][14], basic [nonlinear programming][15] and a few special math functions.
- * [ketopt.h][ketopt]: portable command-line argument parser with getopt_long-like API.

Components for more specific use cases

- * ksa.c: constructing [suffix arrays][16] for strings with multiple sentinels, based on a revised [SAIS algorithm][17].
- * knetfile.{h,c}: random access to remote files on HTTP or FTP.
- * kopen.c: smart stream opening.
- *
- khmm.{h,c}: basic [HMM][18] library.
- * ksw.{h,c}: Striped [Smith-Waterman algorithm][19].
- * knhx.{h,c}: [Newick tree format][20] parser.

Methodology

For the implementation of generic [containers][21], klib extensively uses C macros. To use these data structures, we usually need to instantiate methods by expanding a long macro. This makes the source code look unusual or even ugly and adds difficulty to debugging. Unfortunately, for efficient generic programming in C that lacks [template][22], using macros is the only solution. Only with macros, we can write a generic container which, once instantiated, compete with a type-specific container in efficiency. Some generic libraries in C, such as [Glib][23], use the `void*` type to implement containers. These implementations are usually slower and use more memory than klib (see [this benchmark][31]).

To effectively use klib, it is important to understand how it achieves generic programming. We will use the hash table library as an example:

```
#include "khash.h"
KHASH_MAP_INIT_INT(m32, char) // instantiate structs and methods
int main() {
    int ret, is_missing;
```

```

khint_t k;
khash_t(m32) *h = kh_init(m32); // allocate a hash table
k = kh_put(m32, h, 5, &ret); // insert a key to the hash table
if (!ret) kh_del(m32, h, k);
kh_value(h, k) = 10; // set the value
k = kh_get(m32, h, 10); // query the hash table
is_missing = (k == kh_end(h)); // test if the key is present
k = kh_get(m32, h, 5);
kh_del(m32, h, k); // remove a key-value pair
for (k = kh_begin(h); k != kh_end(h); ++k) // traverse
    if (kh_exist(h, k)) // test if a bucket contains data
        kh_value(h, k) = 1;
kh_destroy(m32, h); // deallocate the hash table
return 0;
}

```

In this example, the second line instantiates a hash table with `unsigned` as the key type and `char` as the value type. `m32` names such a type of hash table. All types and functions associated with this name are macros, which will be explained later. Macro `kh_init()` initiates a hash table and `kh_destroy()` frees it. `kh_put()` inserts a key and returns the iterator (or the position) in the hash table. `kh_get()` and `kh_del()` get a key and delete an element, respectively. Macro `kh_exist()` tests if an iterator (or a position) is filled with data.

An immediate question is this piece of code does not look like a valid C program (e.g. lacking semicolon, assignment to an `_apparent_` function call and `_apparent_` undefined `m32` 'variable'). To understand why the code is correct, let's go a bit further into the source code of `khash.h`, whose skeleton looks like:

```

#define KHASH_INIT(name, SCOPE, key_t, val_t, is_map, _hashf, _hasheq) \
typedef struct { \
    int n_buckets, size, n_occupied, upper_bound; \
    unsigned *flags; \
\
    key_t *keys; \
    val_t *vals; \
} kh_##name##_t; \
SCOPE inline kh_##name##_t *init_##name() { \
    return (kh_##name##_t*)calloc(1, sizeof(kh_##name##_t)); \
} \
SCOPE inline int get_##name(kh_##name##_t *h, key_t k) \
... \
SCOPE inline void destroy_##name(kh_##name##_t *h) { \
    if (h) { \
        free(h->keys); free(h->flags); free(h->vals); free(h); \
    } \
}

```

```

    } \
}

#define _int_hf(key) (unsigned)(key)
#define _int_heq(a, b) (a == b)
#define khash_t(name) kh_##name##_t
#define kh_value(h, k) ((h)->vals[k])
#define kh_begin(h, k) 0
#define kh_end(h) ((h)->n_buckets)
#define kh_init(name) init_##name()
#define kh_get(name, h, k) get_##name(h, k)
#define kh_destroy(name, h) destroy_##name(h)
...
#define KHASH_MAP_INIT_INT(name, val_t) \
    KHASH_INIT(name, static, unsigned, val_t, is_map, _int_hf, _int_heq)

```

``KHASH_INIT()`` is a huge macro defining all the structs and methods.

When this

macro is called, all the code inside it will be inserted by the [C preprocessor][37] to the place where it is called. If the macro is called multiple times, multiple copies of the code will be inserted. To avoid naming conflict of hash tables with different key-value types, the library uses [token concatenation][36], which is a preprocessor feature whereby we can substitute part of a symbol based on the parameter of the macro. In the end, the C preprocessor will generate the following code and feed it to the compiler (macro ``kh_exist(h,k)`` is a little complex and not expanded for simplicity):

```

typedef struct {
    int n_buckets, size, n_occupied, upper_bound;
    unsigned *flags;
    unsigned *keys;
    char *vals;
} kh_m32_t;
static inline kh_m32_t *init_m32() {
    return (kh_m32_t*)calloc(1, sizeof(kh_m32_t));
}
static inline int get_m32(kh_m32_t *h, unsigned k)
...
static inline void destroy_m32(kh_m32_t *h) {
    if (h) {

        free(h->keys); free(h->flags); free(h->vals); free(h);
    }
}

int main() {
    int ret, is_missing;
    khint_t k;

```

```

kh_m32_t *h = init_m32();
k = put_m32(h, 5, &ret);
if (!ret) del_m32(h, k);
h->vals[k] = 10;
k = get_m32(h, 10);
is_missing = (k == h->n_buckets);
k = get_m32(h, 5);
del_m32(h, k);
for (k = 0; k != h->n_buckets; ++k)
    if (kh_exist(h, k)) h->vals[k] = 1;
destroy_m32(h);
return 0;
}

```

This is the C program we know.

From this example, we can see that macros and the C preprocessor plays a key role in klib. Klib is fast partly because the compiler knows the key-value type at the compile time and is able to optimize the code to the same level as type-specific code. A generic library written with `void*` will not get such performance boost.

Massively inserting code upon instantiation may remind us of C++'s slow compiling speed and huge binary size when STL/boost is in use. Klib is much better in this respect due to its small code size and component independency.

Inserting several hundreds lines of code won't make compiling obviously slower.

[Resources](#)

- * Library documentation, if present, is available in the header files. Examples can be found in the [test/][24] directory.
- * **Obsolete** documentation of the hash table library can be found at [SourceForge][25]. This README is partly adapted from the old documentation.
- * [Blog post][26] describing the hash table library.
- * [Blog post][27] on why using `void*` for generic programming may be inefficient.
- * [Blog post][28] on the generic stream buffer.
- * [Blog post][29] evaluating the performance of `kvec.h`.
- * [Blog post][30] arguing B-tree may be a better data structure than a binary search tree.
- * [Blog post][31] evaluating the performance of `khash.h` and `kbtrees.h` among many other implementations. [An older version][33] of the benchmark is also available.
- * [Blog post][34] benchmarking internal sorting algorithms and implementations.
- * [Blog post][32] on the k-small algorithm.
- * [Blog post][35] on the Hooke-Jeeve's algorithm for nonlinear programming.

[1]: http://en.wikipedia.org/wiki/MIT_License

[2]: https://en.wikipedia.org/wiki/Hash_table

[3]: <http://en.wikipedia.org/wiki/B-tree>
[4]: <http://en.wikipedia.org/wiki/Introsort>
[5]: http://en.wikipedia.org/wiki/Merge_sort
[6]: <http://en.wikipedia.org/wiki/Heapsort>
[7]: http://en.wikipedia.org/wiki/Comb_sort
[8]: http://en.wikipedia.org/wiki/Fisher-Yates_shuffle
[9]: http://en.wikipedia.org/wiki/Selection_algorithm
[10]: http://en.wikipedia.org/wiki/FASTA_format
[11]: http://en.wikipedia.org/wiki/FASTQ_format
[12]: http://en.wikipedia.org/wiki/Memory_pool
[13]: http://en.wikipedia.org/wiki/Mersenne_twister
[14]: http://en.wikipedia.org/wiki/Pseudorandom_generator
[15]: http://en.wikipedia.org/wiki/Nonlinear_programming
[16]: http://en.wikipedia.org/wiki/Suffix_array
[17]: <https://sites.google.com/site/yuta256/sais>
[18]: http://en.wikipedia.org/wiki/Hidden_Markov_model
[19]: http://en.wikipedia.org/wiki/Smith-Waterman_algorithm
[20]:
http://en.wikipedia.org/wiki/Newick_format
[21]: [http://en.wikipedia.org/wiki/Container_\(abstract_data_type\)](http://en.wikipedia.org/wiki/Container_(abstract_data_type))
[22]: [http://en.wikipedia.org/wiki/Template_\(C%2B%2B\)](http://en.wikipedia.org/wiki/Template_(C%2B%2B))
[23]: <http://en.wikipedia.org/wiki/GLib>
[24]: <https://github.com/attractivechaos/klib/tree/master/test>
[25]: <http://klib.sourceforge.net/>
[26]: <http://attractivechaos.wordpress.com/2008/09/02/implementing-generic-hash-library-in-c/>
[27]: <http://attractivechaos.wordpress.com/2008/10/02/using-void-in-generic-c-programming-may-be-inefficient/>
[28]: <http://attractivechaos.wordpress.com/2008/10/11/a-generic-buffered-stream-wrapper/>
[29]: <http://attractivechaos.wordpress.com/2008/09/19/c-array-vs-c-vector/>
[30]: <http://attractivechaos.wordpress.com/2008/09/24/b-tree-vs-binary-search-tree/>
[31]: <http://attractivechaos.wordpress.com/2008/10/07/another-look-at-my-old-benchmark/>
[32]: <http://attractivechaos.wordpress.com/2008/09/13/calculating-median/>
[33]: <http://attractivechaos.wordpress.com/2008/08/28/comparison-of-hash-table-libraries/>
[34]:
<http://attractivechaos.wordpress.com/2008/08/28/comparison-of-internal-sorting-algorithms/>
[35]: <http://attractivechaos.wordpress.com/2008/08/24/derivative-free-optimization-dfo/>
[36]: http://en.wikipedia.org/wiki/C_preprocessor#Token_concatenation
[37]: http://en.wikipedia.org/wiki/C_preprocessor

[wiki-avl]: https://en.wikipedia.org/wiki/AVL_tree

[kbtree]:
<http://attractivechaos.github.io/klib/#KBtree%3A%20generic%20ordered%20map:%5B%5BKBtree%3A%20generic%20ordered%20map%5D%5D>

[khash]:
<http://attractivechaos.github.io/klib/#Khash%3A%20generic%20hash%20table:%5B%5BKhash%3A%20generic%20hash%20table%5D%5D>

[kseq]:
<http://attractivechaos.github.io/klib/#Kseq%3A%20stream%20buffer%20and%20FASTA%2FQ%20parser:%5B%5>

BKseq%3A%20stream%20buffer%20and%20FASTA%2FQ%20parser%5D%5D
[ksort]: <http://attractivechaos.github.io/klib/#Ksort%3A%20sorting%2C%20shuffling%2C%20heap%20and%20k-small:%5B%5BKsort%3A%20sorting%2C%20shuffling%2C%20heap%20and%20k-small%5D%5D>
[kavl]:
<http://attractivechaos.github.io/klib/#KAVL%3A%20generic%20intrusive%20AVL%20tree>
[ketopt]: <http://attractivechaos.github.io/klib/#Ketopt%3A%20parsing%20command-line%20arguments>

Found in path(s):

* /opt/cola/permits/1140903019_1614894938.43/0/klib-master-zip/klib-master/README.md

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

/*

* Copyright (c) 2008 Yuta Mori All Rights Reserved.

* 2011 Attractive Chaos <attractor@live.co.uk>

*

* Permission is hereby granted, free of charge, to any person

* obtaining a copy of this software and associated documentation

* files (the "Software"), to deal in the Software without

* restriction, including without limitation the rights to use,

* copy, modify, merge, publish, distribute, sublicense, and/or sell

* copies of the Software, and to permit persons to whom the

* Software is furnished to do so, subject to the following

* conditions:

*

* The above copyright notice and this permission notice shall be

* included in all copies or substantial portions of the Software.

*

* THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND,

* EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES

* OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND

* NONINFRINGEMENT.

IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT

* HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY,

* WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING

* FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR

* OTHER DEALINGS IN THE SOFTWARE.

*/

Found in path(s):

* /opt/cola/permits/1140903019_1614894938.43/0/klib-master-zip/klib-master/ksa.c

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

/* The MIT License

Copyright (c) 2008 by Genome Research Ltd (GRL).

2010 by Attractive Chaos <attractor@live.co.uk>

Permission is hereby granted, free of charge, to any person obtaining

a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT.

IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

*/

Found in path(s):

* /opt/cola/permits/1140903019_1614894938.43/0/klib-master-zip/klib-master/knetfile.c

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

/* The MIT License

Copyright (c) 2008 Broad Institute / Massachusetts Institute of Technology
2011 Attractive Chaos <attractor@live.co.uk>

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

*/

Found in path(s):

* /opt/cola/permits/1140903019_1614894938.43/0/klib-master-zip/klib-master/bgzf.h

* /opt/cola/permits/1140903019_1614894938.43/0/klib-master-zip/klib-master/bgzf.c

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

/* The MIT License

Copyright (c) 2008, 2011 Attractive Chaos <attractor@live.co.uk>

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS

BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

*/

Found in path(s):

* /opt/cola/permits/1140903019_1614894938.43/0/klib-master-zip/klib-master/ksort.h

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

/* The MIT License

Copyright (c) 2008, 2009, 2011 by Attractive Chaos <attractor@live.co.uk>

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

*/

Found in path(s):

* /opt/cola/permits/1140903019_1614894938.43/0/klib-master-zip/klib-master/khash.h

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

--[[

The MIT License

Copyright (c) 2011, Attractive Chaos <attractor@live.co.uk>

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

]]

Found in path(s):

* /opt/cola/permits/1140903019_1614894938.43/0/klib-master-zip/klib-master/luasrc/klib.lua

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

/* The MIT License

Copyright (c) 2008-2009, by Attractive Chaos <attractor@live.co.uk>

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

*/

Found in path(s):

* /opt/cola/permits/1140903019_1614894938.43/0/klib-master-zip/klib-master/klist.h

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

/*

Copyright (c) 2004 Paul Hsieh

All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.

Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.

Neither the name of sorttest nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT OWNER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

*/

Found in path(s):

* /opt/cola/permits/1140903019_1614894938.43/0/klib-master-zip/klib-master/test/ksort_test.cc

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

/* The MIT License

Copyright (c) 2008, by Attractive Chaos <attractor@live.co.uk>

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

*/

Found in path(s):

* /opt/cola/permits/1140903019_1614894938.43/0/klib-master-zip/klib-master/kvec.h

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

/* The MIT License

Copyright (c) 2019 by Attractive Chaos <attractor@live.co.uk>

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

*/

Found in path(s):

- * /opt/cola/permits/1140903019_1614894938.43/0/klib-master-zip/klib-master/krmq.h
- * /opt/cola/permits/1140903019_1614894938.43/0/klib-master-zip/klib-master/khashl.h

1.9 tail 068b729 + P

1.9.1 Available under license :

The MIT License (MIT)

Copyright 2015 Hewlett Packard Enterprise Development LP
Copyright (c) 2014 ActiveState

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

tomb - support for clean goroutine termination in Go.

Copyright (c) 2010-2011 - Gustavo Niemeyer <gustavo@niemeyer.net>

All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

- * Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
- * Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
- * Neither the name of the copyright holder nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT OWNER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

Copyright (c) 2012 The Go Authors. All rights reserved.

Copyright (c) 2012 fsnotify Authors. All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

- * Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
- * Redistributions in binary form must reproduce the above

copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.

* Neither the name of Google Inc. nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE

ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT OWNER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

Copyright (C) 2013 99designs

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE

OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

1.10 x-net 747e238

1.10.1 Available under license :

This source code was written by the Go contributors.
The master list of contributors is in the main Go distribution,
visible at <http://tip.golang.org/CONTRIBUTORS>.
Copyright (c) 2009 The Go Authors. All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are

met:

* Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.

* Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.

* Neither the name of Google Inc. nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT OWNER

OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

1.11 **llhttp 6.0.6 + P**

1.11.1 Available under license :

This software is licensed under the MIT License.

Copyright Fedor Indutny, 2018.

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM,

DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE,
ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

1.12 crashpad 0.8.0 + P + 36473e

1.12.1 Available under license :

The MIT License (MIT)

Copyright (c) 2017 yhirose

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

GNU LESSER GENERAL PUBLIC LICENSE

Version 2.1, February 1999

Copyright (C) 1991, 1999 Free Software Foundation, Inc.
51 Franklin Street, Fifth Floor, Boston, MA 02110-1301 USA

Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.

[This is the first released version of the Lesser GPL. It also counts as the successor of the GNU Library Public License, version 2, hence the version number 2.1.]

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.

This license, the Lesser General Public License, applies to some specially designated software packages--typically libraries--of the Free Software Foundation and other authors who decide to use it. You can use it too, but we suggest you first think carefully about whether this license or the ordinary General Public License is the better strategy to use in any particular case, based on the explanations below.

When we speak of free software, we are referring to freedom of use, not price. Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for this service if you wish); that you receive source code or can get it if you want it; that you can change the software and use pieces of it in new free programs; and that you are informed that you can do these things.

To protect your rights, we need to make restrictions that forbid distributors to deny you these rights or to ask you to surrender these rights. These restrictions translate to certain responsibilities for you if 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 you. You must make sure that they, too, receive or can get the source code. If you link other code 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.

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.

To protect each distributor, we want to make it very clear that there is no warranty for the free library. Also, if the library is modified by someone else and passed on, the recipients should know that what they have is not the original version, so that the original author's reputation will not be affected by problems that might be introduced by others.

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.

Most GNU software, including some libraries, is covered by the ordinary GNU General Public License. This license, the GNU Lesser General Public License, applies to certain designated libraries, and is quite different from the ordinary General Public License. We use this license for certain libraries in order to permit linking those libraries into non-free programs.

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.

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.

GNU LESSER GENERAL PUBLIC LICENSE TERMS AND CONDITIONS FOR COPYING, DISTRIBUTION AND MODIFICATION

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 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 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.

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.

9. You are not required to accept this License, since you have not signed it. However, nothing else grants you permission to modify or distribute the Library or its derivative works. These actions are prohibited by law if you do not accept this License. Therefore, by modifying or distributing the Library (or any work based on the Library), you indicate your acceptance of this License to do so, and all its terms and conditions for copying, distributing or modifying the Library or works based on it.

10. Each time you redistribute the Library (or any work based on the Library), the recipient automatically receives a license from the original licensor to copy, distribute, link with or modify the Library subject to these terms and conditions. You may not impose any further restrictions on the recipients' exercise of the rights granted herein. You are not responsible for enforcing compliance by third parties with this License.

11. If, as a consequence of a court judgment or allegation of patent infringement or for any other reason (not limited to patent issues), conditions are imposed on you (whether by court order, agreement or otherwise) that contradict the conditions of this License, they do not excuse you from the conditions of this License. If you cannot distribute so as to satisfy simultaneously your obligations under this License and any other pertinent obligations, then as a consequence you may not distribute the Library at all. For example, if a patent

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; it is up to the author/donor to decide if he or she is willing 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.

13. The Free Software Foundation may publish revised and/or new versions of the Lesser General Public License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns.

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.

14. If you wish to incorporate parts of the Library into other free programs whose distribution conditions are incompatible with these,

write to the author to ask for permission. For software which is copyrighted by the Free Software Foundation, write to the Free Software Foundation; we sometimes make exceptions for this. Our decision

will be guided by the two goals of preserving the free status of all derivatives of our free software and of promoting the sharing and reuse of software generally.

NO WARRANTY

15. BECAUSE THE LIBRARY IS LICENSED FREE OF CHARGE, THERE IS NO WARRANTY FOR THE LIBRARY, TO THE EXTENT PERMITTED BY APPLICABLE LAW. EXCEPT WHEN OTHERWISE STATED IN WRITING THE COPYRIGHT HOLDERS AND/OR OTHER PARTIES PROVIDE THE LIBRARY "AS IS" WITHOUT 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 THE LIBRARY IS WITH YOU. SHOULD THE LIBRARY PROVE DEFECTIVE, YOU ASSUME THE COST OF ALL NECESSARY SERVICING, REPAIR OR CORRECTION.

16. IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN WRITING WILL ANY COPYRIGHT HOLDER, OR ANY OTHER PARTY WHO MAY MODIFY AND/OR REDISTRIBUTE THE LIBRARY AS PERMITTED ABOVE, BE LIABLE TO YOU FOR DAMAGES, INCLUDING ANY GENERAL, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE LIBRARY (INCLUDING BUT NOT LIMITED TO LOSS OF DATA OR DATA BEING RENDERED INACCURATE OR LOSSES SUSTAINED BY YOU OR THIRD PARTIES OR A FAILURE OF THE LIBRARY TO OPERATE WITH ANY OTHER SOFTWARE), EVEN IF SUCH HOLDER OR OTHER PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

END OF TERMS AND CONDITIONS

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.>

Copyright (C) <year> <name of author>

This library is free software; you can redistribute it and/or modify it under the terms of the GNU Lesser General Public License as published by the Free Software Foundation; either version 2.1 of the License, or (at your option) any later version.

This 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 Lesser General Public License for more details.

You should have received a copy of the GNU Lesser 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!

Apache License
Version 2.0, January 2004
<http://www.apache.org/licenses/>

TERMS AND CONDITIONS FOR USE, REPRODUCTION, AND DISTRIBUTION

1. Definitions.

"License" shall mean the terms and conditions for use, reproduction, and distribution as defined by Sections 1 through 9 of this document.

"Licensor" shall mean the copyright owner or entity authorized by the copyright owner that is granting the License.

"Legal Entity" shall mean the union of the acting entity and all other entities that control, are controlled by, or are under common

control with that entity. For the purposes of this definition, "control" means (i) the power, direct or indirect, to cause the direction or management of such entity, whether by contract or otherwise, or (ii) ownership of fifty percent (50%) or more of the outstanding shares, or (iii) beneficial ownership of such entity.

"You" (or "Your") shall mean an individual or Legal Entity exercising permissions granted by this License.

"Source" form shall mean the preferred form for making modifications, including but not limited to software source code, documentation source, and configuration files.

"Object" form shall mean any form resulting from mechanical transformation or translation of a Source form, including but not limited to compiled object code, generated documentation, and conversions to other media types.

"Work" shall mean the work of authorship, whether in Source or Object form, made available under the License, as indicated by a copyright notice that is included in or attached to the work (an example is provided in the Appendix below).

"Derivative Works" shall mean any work, whether in Source or Object form, that is based on (or derived from) the Work and for which the editorial revisions, annotations, elaborations, or other modifications represent, as a whole, an original work of authorship. For the purposes of this License, Derivative Works shall not include works that remain separable from, or merely link (or bind by name) to the interfaces of, the Work and Derivative Works thereof.

"Contribution" shall mean any work of authorship, including the original version of the Work and any modifications or additions to that Work or Derivative Works thereof, that is intentionally submitted to Licensor for inclusion in the Work by the copyright owner or by an individual or Legal Entity authorized to submit on behalf of the copyright owner. For the purposes of this definition, "submitted" means any form of electronic, verbal, or written communication sent to the Licensor or its representatives, including but not limited to communication on electronic mailing lists, source code control systems, and issue tracking systems that are managed by, or on behalf of, the Licensor for the purpose of discussing and improving the Work, but excluding communication that is conspicuously marked or otherwise designated in writing by the copyright owner as "Not a Contribution."

"Contributor" shall mean Licensor and any individual or Legal Entity

on behalf of whom a Contribution has been received by Licensor and subsequently incorporated within the Work.

2. Grant of Copyright License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable copyright license to reproduce, prepare Derivative Works of, publicly display, publicly perform, sublicense, and distribute the Work and such Derivative Works in Source or Object form.

3. Grant of Patent License. Subject to the terms and conditions of this

License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable (except as stated in this section) patent license to make, have made, use, offer to sell, sell, import, and otherwise transfer the Work, where such license applies only to those patent claims licensable by such Contributor that are necessarily infringed by their Contribution(s) alone or by combination of their Contribution(s) with the Work to which such Contribution(s) was submitted. If You institute patent litigation against any entity (including a cross-claim or counterclaim in a lawsuit) alleging that the Work or a Contribution incorporated within the Work constitutes direct or contributory patent infringement, then any patent licenses granted to You under this License for that Work shall terminate as of the date such litigation is filed.

4. Redistribution. You may reproduce and distribute copies of the

Work or Derivative Works thereof in any medium, with or without modifications, and in Source or Object form, provided that You meet the following conditions:

(a) You must give any other recipients of the Work or Derivative Works a copy of this License; and

(b) You must cause any modified files to carry prominent notices stating that You changed the files; and

(c) You must retain, in the Source form of any Derivative Works that You distribute, all copyright, patent, trademark, and attribution notices from the Source form of the Work, excluding those notices that do not pertain to any part of the Derivative Works; and

(d) If the Work includes a "NOTICE" text file as part of its distribution, then any Derivative Works that You distribute must include a readable copy of the attribution notices contained

within such NOTICE file, excluding those notices that do not pertain to any part of the Derivative Works, in at least one of the following places: within a NOTICE text file distributed as part of the Derivative Works; within the Source form or documentation, if provided along with the Derivative Works; or, within a display generated by the Derivative Works, if and wherever such third-party notices normally appear. The contents of the NOTICE file are for informational purposes only and do not modify the License. You may add Your own attribution notices within Derivative Works that You distribute, alongside or as an addendum to the NOTICE text from the Work, provided that such additional attribution notices cannot be construed as modifying the License.

You may add Your own copyright statement to Your modifications and may provide additional or different license terms and conditions

for use, reproduction, or distribution of Your modifications, or for any such Derivative Works as a whole, provided Your use, reproduction, and distribution of the Work otherwise complies with the conditions stated in this License.

5. Submission of Contributions. Unless You explicitly state otherwise, any Contribution intentionally submitted for inclusion in the Work by You to the Licensor shall be under the terms and conditions of this License, without any additional terms or conditions.

Notwithstanding the above, nothing herein shall supersede or modify the terms of any separate license agreement you may have executed with Licensor regarding such Contributions.

6. Trademarks. This License does not grant permission to use the trade names, trademarks, service marks, or product names of the Licensor, except as required for reasonable and customary use in describing the origin of the Work and reproducing the content of the NOTICE file.

7. Disclaimer of Warranty. Unless required by applicable law or agreed to in writing, Licensor provides the Work (and each Contributor provides its Contributions) on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied, including, without limitation, any warranties or conditions of TITLE, NON-INFRINGEMENT, MERCHANTABILITY, or FITNESS FOR A PARTICULAR PURPOSE. You are solely responsible for determining the appropriateness of using or redistributing the Work and assume any risks associated with Your exercise of permissions under this License.

8. Limitation of Liability. In no event and under no legal theory,

whether in tort (including negligence), contract, or otherwise, unless required by applicable law (such as deliberate and grossly negligent acts) or agreed to in writing, shall any Contributor be liable to You for damages, including any direct, indirect, special, incidental, or consequential damages of any character arising as a result of this License or out of the use or inability to use the Work (including but not limited to damages for loss of goodwill, work stoppage, computer failure or malfunction, or any and all other commercial damages or losses), even if such Contributor has been advised of the possibility of such damages.

9. Accepting Warranty or Additional Liability. While redistributing the Work or Derivative Works thereof, You may choose to offer, and charge a fee for, acceptance of support, warranty, indemnity, or other liability obligations and/or rights consistent with this License. However, in accepting such obligations, You may act only on Your own behalf and on Your sole responsibility, not on behalf of any other Contributor, and only if You agree to indemnify, defend, and hold each Contributor harmless for any liability incurred by, or claims asserted against, such Contributor by reason of your accepting any such warranty or additional liability.

END OF TERMS AND CONDITIONS

APPENDIX: How to apply the Apache License to your work.

To apply the Apache License to your work, attach the following boilerplate notice, with the fields enclosed by brackets "[]" replaced with your own identifying information. (Don't include the brackets!) The text should be enclosed in the appropriate comment syntax for the file format. We also recommend that a file or class name and description of purpose be included on the same "printed page" as the copyright notice for easier identification within third-party archives.

Copyright [yyyy] [name of copyright owner]

Licensed under the Apache License, Version 2.0 (the "License");
you may not use this file except in compliance with the License.
You may obtain a copy of the License at

<http://www.apache.org/licenses/LICENSE-2.0>

Unless required by applicable law or agreed to in writing, software distributed under the License is distributed on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and

limitations under the License.

Copyright (C) 1997 Gregory Pietsch

[These files] are hereby placed in the public domain without restrictions. Just give the author credit, don't claim you wrote it or prevent anyone else from using it.

APPLE PUBLIC SOURCE LICENSE

Version 2.0 - August 6, 2003

Please read this License carefully before downloading this software.

By downloading or using this software, you are agreeing to be bound by the terms of this License. If you do not or cannot agree to the terms of this License, please do not download or use the software.

1. General; Definitions. This License applies to any program or other work which Apple Computer, Inc. ("Apple") makes publicly available and which contains a notice placed by Apple identifying such program or work as "Original Code" and stating that it is subject to the terms of this Apple Public Source License version 2.0 ("License"). As used in this License:

1.1 "Applicable Patent Rights" mean: (a) in the case where Apple is the grantor of rights, (i) claims of patents that are now or hereafter acquired, owned by or assigned to Apple and (ii) that cover subject matter contained in the Original Code, but only to the extent necessary to use, reproduce and/or distribute the Original Code

without infringement; and (b) in the case where You are the grantor of rights, (i) claims of patents that are now or hereafter acquired, owned by or assigned to You and (ii) that cover subject matter in Your Modifications, taken alone or in combination with Original Code.

1.2 "Contributor" means any person or entity that creates or contributes to the creation of Modifications.

1.3 "Covered Code" means the Original Code, Modifications, the combination of Original Code and any Modifications, and/or any respective portions thereof.

1.4 "Externally Deploy" means: (a) to sublicense, distribute or otherwise make Covered Code available, directly or indirectly, to anyone other than You; and/or (b) to use Covered Code, alone or as part of a Larger Work, in any way to provide a service, including but not limited to delivery of content, through electronic communication with a client other than You.

1.5 "Larger Work" means a work which combines Covered Code or portions thereof

with code not governed by the terms of this License.

1.6 "Modifications" mean any addition to, deletion from, and/or change to, the substance and/or structure of the Original Code, any previous Modifications, the combination of Original Code and any previous Modifications, and/or any respective portions thereof. When code is released as a series of files, a Modification is: (a) any addition to or deletion from the contents of a file containing Covered Code; and/or (b) any new file or other representation of computer program statements that contains any part of Covered Code.

1.7 "Original Code" means (a) the Source Code of a program or other work as originally made available by Apple under this License, including the Source Code of any updates or upgrades to such programs or works made available by Apple under this License, and that has been expressly identified by Apple as such in the header file(s) of such work; and (b) the object code compiled from such Source Code and originally made available by Apple under this License.

1.8 "Source Code" means the human readable form of a program or other work that is suitable for making modifications to it, including all modules it contains, plus any associated interface definition files, scripts used to control compilation and installation of an executable (object code).

1.9 "You" or "Your" means an individual or a legal entity exercising rights under this License. For legal entities, "You" or "Your" includes any entity which controls, is controlled by, or is under common control with, You, where "control" means (a) the power, direct or indirect, to cause the direction or management of such entity, whether by contract or otherwise, or (b) ownership of fifty percent (50%) or more of the outstanding shares or beneficial ownership of such entity.

2. Permitted Uses; Conditions & Restrictions. Subject to the terms and conditions of this License, Apple hereby grants You, effective on the date You accept this License and download the Original Code, a world-wide, royalty-free, non-exclusive license, to the extent of Apple's Applicable Patent Rights and copyrights covering the Original Code, to do the following:

2.1 Unmodified Code. You may use, reproduce, display, perform, internally distribute within Your organization, and Externally Deploy verbatim, unmodified copies of the Original Code, for commercial or non-commercial purposes, provided that in each instance:

(a) You must retain and reproduce in all copies of Original Code the copyright and other proprietary notices and disclaimers of Apple as they appear in the Original Code, and keep intact all notices in the Original Code that refer to this License; and

(b) You must include a copy of this License with every copy of Source Code of Covered Code and documentation You distribute or Externally Deploy, and You may not offer or impose any terms on such Source Code that alter or restrict this License or the recipients' rights hereunder, except as permitted under Section 6.

2.2 Modified Code. You may modify Covered Code and use, reproduce, display, perform, internally distribute within Your organization, and Externally Deploy Your Modifications and Covered Code, for commercial or non-commercial purposes, provided that in each instance You also meet all of these conditions:

(a) You must satisfy all the conditions of Section 2.1 with respect to the Source Code of the Covered Code;

(b) You must duplicate, to the extent it does not already exist, the notice in Exhibit A in each file of the Source Code of all Your Modifications, and cause the modified files to carry prominent notices stating that You changed the files and the date of any change; and

(c) If You Externally Deploy Your Modifications, You must make Source Code of all Your Externally Deployed Modifications either available to those to whom You have Externally Deployed Your Modifications, or publicly available. Source Code of Your Externally Deployed Modifications must be released under the terms set forth in this License, including the license grants set forth in Section 3 below, for as long as you Externally Deploy the Covered Code or twelve (12) months from the date of initial External Deployment, whichever is longer. You should preferably distribute the Source Code of Your Externally Deployed Modifications electronically (e.g. download from a web site).

2.3 Distribution of Executable Versions. In addition, if You Externally Deploy Covered Code (Original Code and/or Modifications) in object code, executable form only, You must include a prominent notice, in the code itself as well as in related documentation, stating that Source Code of the Covered Code is available under the terms of this License with information on how and where to obtain such Source Code.

2.4 Third Party Rights. You expressly acknowledge and agree that

although Apple and each Contributor grants the licenses to their respective portions of the Covered Code set forth herein,

no

assurances are provided by Apple or any Contributor that the Covered Code does not infringe the patent or other intellectual property rights of any other entity. Apple and each Contributor disclaim any liability to You for claims brought by any other entity based on infringement of intellectual property rights or otherwise. As a condition to exercising the rights and licenses granted hereunder, You hereby assume sole responsibility to secure any other intellectual property rights needed, if any. For example, if a third party patent license is required to allow You to distribute the Covered Code, it is Your responsibility to acquire that license before distributing the Covered Code.

3. Your Grants. In consideration of, and as a condition to, the licenses granted to You under this License, You hereby grant to any person or entity receiving or distributing Covered Code under this License a non-exclusive, royalty-free, perpetual, irrevocable license, under Your Applicable Patent Rights and other intellectual property rights (other than patent) owned or controlled by You, to use, reproduce, display, perform, modify, sublicense, distribute and Externally Deploy Your Modifications of the same scope and extent as Apple's licenses under Sections 2.1 and 2.2 above.

4. Larger Works. You may create a Larger Work by combining Covered Code with other code not governed by the terms of this License and distribute the Larger Work as a single product. In each such instance, You must make sure the requirements of this License are fulfilled for the Covered Code or any portion thereof.

5. Limitations on Patent License. Except as expressly stated in Section 2, no other patent rights, express or implied, are granted by Apple herein. Modifications and/or Larger Works may require additional patent licenses from Apple which Apple may grant in its sole discretion.

6. Additional Terms. You may choose to offer, and to charge a fee for, warranty, support, indemnity or liability obligations and/or other rights consistent with the scope of the license granted herein ("Additional Terms") to one or more recipients of Covered Code. However, You may do so only on Your own behalf and as Your sole responsibility, and not on behalf of Apple or any Contributor. You must obtain the recipient's agreement that any such Additional Terms are offered by You alone, and You hereby agree to indemnify, defend and hold Apple and every Contributor harmless for any liability

incurred by or claims asserted against Apple or such Contributor by reason of any such Additional Terms.

7. Versions of the License. Apple may publish revised and/or new versions of this License from time to time. Each version will be given a distinguishing version number. Once Original Code has been published under a particular version of this License, You may continue to use it under the terms of that version. You may also choose to use such Original Code under the terms of any subsequent version of this License published

by Apple. No one other than Apple has the right to modify the terms applicable to Covered Code created under this License.

8. NO WARRANTY OR SUPPORT. The Covered Code may contain in whole or in part pre-release, untested, or not fully tested works. The Covered Code may contain errors that could cause failures or loss of data, and may be incomplete or contain inaccuracies. You expressly acknowledge and agree that use of the Covered Code, or any portion thereof, is at Your sole and entire risk. THE COVERED CODE IS PROVIDED "AS IS" AND WITHOUT WARRANTY, UPGRADES OR SUPPORT OF ANY KIND AND APPLE AND APPLE'S LICENSOR(S) (COLLECTIVELY REFERRED TO AS "APPLE" FOR THE PURPOSES OF SECTIONS 8 AND 9) AND ALL CONTRIBUTORS EXPRESSLY DISCLAIM ALL WARRANTIES AND/OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES AND/OR CONDITIONS OF MERCHANTABILITY, OF SATISFACTORY QUALITY, OF FITNESS FOR A PARTICULAR PURPOSE, OF ACCURACY, OF QUIET ENJOYMENT, AND NONINFRINGEMENT OF THIRD PARTY RIGHTS. APPLE AND EACH CONTRIBUTOR DOES NOT WARRANT AGAINST INTERFERENCE WITH YOUR ENJOYMENT OF THE COVERED CODE, THAT THE FUNCTIONS CONTAINED IN THE COVERED CODE WILL MEET YOUR REQUIREMENTS, THAT THE OPERATION OF THE COVERED CODE WILL BE UNINTERRUPTED OR ERROR-FREE, OR THAT DEFECTS IN THE COVERED CODE WILL BE CORRECTED. NO ORAL OR WRITTEN INFORMATION OR ADVICE GIVEN BY APPLE, AN APPLE AUTHORIZED REPRESENTATIVE OR ANY CONTRIBUTOR SHALL CREATE A WARRANTY. You acknowledge that the Covered Code is not intended for use in the operation of nuclear facilities, aircraft navigation, communication systems, or air traffic control machines in which case the failure of the Covered Code could lead to death, personal injury, or severe physical or environmental damage.

9. LIMITATION OF LIABILITY. TO THE EXTENT NOT PROHIBITED BY LAW, IN NO EVENT SHALL APPLE OR ANY CONTRIBUTOR BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES ARISING OUT OF OR RELATING TO THIS

LICENSE OR YOUR USE OR INABILITY TO USE THE COVERED CODE, OR ANY PORTION THEREOF, WHETHER UNDER A THEORY OF CONTRACT, WARRANTY, TORT (INCLUDING NEGLIGENCE), PRODUCTS LIABILITY OR OTHERWISE, EVEN IF

APPLE OR SUCH CONTRIBUTOR HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES AND NOTWITHSTANDING THE FAILURE OF ESSENTIAL PURPOSE OF ANY REMEDY. SOME JURISDICTIONS DO NOT ALLOW THE LIMITATION OF LIABILITY OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THIS LIMITATION MAY NOT APPLY TO YOU. In no event shall Apple's total liability to You for all damages (other than as may be required by applicable law) under this License exceed the amount of fifty dollars (\$50.00).

10. Trademarks. This License does not grant any rights to use the trademarks or trade names "Apple", "Apple Computer", "Mac", "Mac OS", "QuickTime", "QuickTime Streaming Server" or any other trademarks, service marks, logos or trade names belonging to Apple (collectively "Apple Marks") or to any trademark, service mark, logo or trade name belonging to any Contributor. You agree not to use any Apple Marks in or as part of the name of products derived from the Original Code or to endorse or promote products derived from the Original Code other than as expressly permitted by and in strict compliance at all times with Apple's third party trademark usage guidelines which are posted at <http://www.apple.com/legal/guidelinesfor3rdparties.html>.

11. Ownership. Subject to the licenses granted under this License, each Contributor retains all rights, title and interest in and to any Modifications made by such Contributor. Apple retains all rights, title and interest in and to the Original Code and any Modifications made by or on behalf of Apple ("Apple Modifications"), and such Apple Modifications will not be automatically subject to this License. Apple may, at its sole discretion, choose to license such Apple Modifications under this License, or on different terms from those contained in this License or may choose not to license them at all.

12. Termination.

12.1 Termination. This License and the rights granted hereunder will terminate:

(a) automatically without notice from Apple if You fail to comply with any term(s) of this License and fail to cure such breach within 30 days of becoming aware of such breach;

(b) immediately in the event of the circumstances described in Section 13.5(b); or

(c) automatically without notice from Apple if You, at any time during the term of this License, commence an action for patent infringement against Apple; provided that Apple did not first commence an action for patent infringement against You in that instance.

12.2 Effect of Termination. Upon termination, You agree to immediately stop any further use, reproduction, modification, sublicensing and distribution of the Covered Code. All sublicenses to the Covered Code which have been properly granted prior to termination shall survive any termination of this License. Provisions which, by their nature, should remain in effect beyond the termination of this License shall survive, including but not limited to Sections 3, 5, 8, 9, 10, 11, 12.2 and 13. No party will be liable to any other for compensation, indemnity or damages of any sort solely as a result of terminating this License in accordance with its terms, and termination of this License will be without prejudice to any other right or remedy of any party.

13. Miscellaneous.

13.1 Government End Users. The Covered Code is a "commercial item" as defined in FAR 2.101. Government software and technical data rights in the Covered Code include only those rights customarily provided to the public as defined in this License. This customary commercial license in technical data and software is provided in accordance with FAR 12.211 (Technical Data) and 12.212 (Computer Software) and, for Department of Defense purchases, DFAR 252.227-7015 (Technical Data -- Commercial Items) and 227.7202-3 (Rights in Commercial Computer Software or Computer Software Documentation). Accordingly, all U.S. Government End Users acquire Covered Code with only those rights set forth herein.

13.2 Relationship of Parties. This License will not be construed as creating an agency, partnership, joint venture or any other form of legal association between or among You, Apple or any Contributor, and You will not represent to the contrary, whether expressly, by implication, appearance or otherwise.

13.3 Independent Development. Nothing in this License will impair Apple's right to acquire, license, develop, have others develop for it, market and/or distribute technology or products that perform the same or similar functions as, or otherwise compete with, Modifications, Larger Works, technology or products that You may develop, produce, market or distribute.

13.4 Waiver; Construction. Failure by Apple or any Contributor to enforce any provision of this License will not be deemed a waiver of future enforcement of that or any other provision. Any law or regulation

which provides that the language of a contract shall be construed against the drafter will not apply to this License.

13.5 Severability. (a) If for any reason a court of competent jurisdiction finds any provision of this License, or portion thereof, to be unenforceable, that provision of the License will be enforced to the maximum extent permissible so as to effect the economic benefits and intent of the parties, and the remainder of this License will continue in full force and effect. (b) Notwithstanding the foregoing, if applicable law prohibits or restricts You from fully and/or specifically complying with Sections 2 and/or 3 or prevents the enforceability of either of those Sections, this License will immediately terminate and You must immediately discontinue any use of the Covered Code and destroy all copies of it that are in your possession or control.

13.6 Dispute Resolution. Any litigation or other dispute resolution between You and Apple relating to this License shall take place in the Northern District of California, and You and Apple hereby consent to the personal jurisdiction of, and venue in, the state and federal courts within that District with respect to this License. The application of the United Nations Convention on Contracts for the International Sale of Goods is expressly excluded.

13.7 Entire Agreement; Governing Law. This License constitutes the entire agreement between the parties with respect to the subject matter hereof. This License shall be governed by the laws of the United States and the State of California, except that body of California law concerning conflicts of law.

Where You are located in the province of Quebec, Canada, the following clause applies: The parties hereby confirm that they have requested that this License and all related documents be drafted in English. Les parties ont exigé que le présent contrat et tous les documents connexes soient rédigés en anglais.

EXHIBIT A.

"Portions Copyright (c) 1999-2003 Apple Computer, Inc. All Rights Reserved.

This file contains Original Code and/or Modifications of Original Code as defined in and that are subject to the Apple Public Source License Version 2.0 (the 'License'). You may not use this file except in compliance with the License. Please obtain a copy of the License at <http://www.opensource.apple.com/apsl/> and read it before using this

file.

The Original Code and all software distributed under the License are distributed on an 'AS IS' basis, WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, AND APPLE HEREBY DISCLAIMS ALL SUCH WARRANTIES, INCLUDING WITHOUT LIMITATION, ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, QUIET ENJOYMENT OR NON-INFRINGEMENT. Please see the License for the specific language governing rights and limitations under the License."

People who have agreed to one of the CLAs and can contribute patches.

The AUTHORS file lists the copyright holders; this file

lists people. For example, Google employees are listed here

but not in AUTHORS, because Google holds the copyright.

#

<https://developers.google.com/open-source/cla/individual>

<https://developers.google.com/open-source/cla/corporate>

#

Names should be added to this file as:

Name <email address>

Mark Mentovai <mark@chromium.org>

Robert Sesek <rsesek@chromium.org>

Scott Graham <scottmg@chromium.org>

Joshua Peraza <jperaza@chromium.org>

1.13 sqlite 3.39.3

1.13.1 Available under license :

The author disclaims copyright to this source code. In place of a legal notice, here is a blessing:

May you do good and not evil.

May you find forgiveness for yourself and forgive others.

May you share freely, never taking more than you give.

The author disclaims copyright to this source code. In place of a legal notice, here is a blessing:

* May you do good and not evil.

* May you find forgiveness for yourself and forgive others.

* May you share freely, never taking more than you give.

1.14 capnproto 0.10.4

1.14.1 Available under license :

The following people have made large code contributions to this repository. Those contributions are copyright the respective authors and licensed by them under the same MIT license terms as the rest of the library.

Kenton Varda <kenton@sandstorm.io> <kenton@cloudflare.com>: Primary Author
Jason Choy <jjwchoy@gmail.com>: kj/threadlocal.h and other iOS tweaks, `name` annotation in C++ code generator
Remy Blank <rblank@google.com> (contributions copyright Google Inc.): KJ Timers
Joshua Warner <joshuawarner32@gmail.com>: cmake build, AnyStruct/AnyList, other stuff
Scott Purdy <scott@fer.io>: kj/std iostream interface
Bryan Borham <bjboreham@gmail.com>: Initial MSVC support
Philip Quinn <p@partylemon.com>: cmake build and other assorted bits
Brian Taylor <el.wubo@gmail.com>: emacs syntax highlighting
Ben Laurie <ben@links.org>: discovered and responsibly disclosed security bugs
Kamal Marhubi <kamal@marhubi.com>: JSON parser
Oliver Kuckertz <oliver.kuckertz@mologie.de>: FdObserver POLLPRI support
Harris
Hancock <vortrag@gmail.com>: MSVC support
Branislav Katreniak <branislav.katreniak@digitalstrom.com>: JSON decode
Matthew Maurer <matthew.r.maurer@gmail.com>: Canonicalization Support
David Renshaw <david@sandstorm.io>: bugfixes and miscellaneous maintenance
Ingvar Stepanyan <me@rreverser.com> <ingvar@cloudflare.com>: Custom handlers for JSON decode

This file does not list people who maintain their own Cap'n Proto implementations as separate projects. Those people are awesome too! :)
Copyright (c) 2013-2017 Sandstorm Development Group, Inc.; Cloudflare, Inc.; and other contributors. Each commit is copyright by its respective author or author's employer.

Licensed under the MIT License:

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM,

OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

1.15 llvm 16.0.4 + P

1.15.1 Available under license :

; NOTE: Assertions have been autogenerated by utils/update_llc_test_checks.py

; RUN: llc < %s -mtriple=aarch64-- | FileCheck %s

; A shuffle mask with all undef elements is always legal.

```
define <4 x i32> @PR41535(<2 x i32> %p1, <2 x i32> %p2) {
; CHECK-LABEL: PR41535:
; CHECK:      // %bb.0:
; CHECK-NEXT:  ext v0.8b, v0.8b, v1.8b, #4
; CHECK-NEXT:  mov v0.d[1], v0.d[0]
; CHECK-NEXT:  ret
%cat1 = shufflevector <2 x i32> %p1, <2 x i32> undef, <4 x i32> <i32 undef, i32 1, i32 undef, i32 undef>
%cat2 = shufflevector <2 x i32> %p2, <2 x i32> undef, <4 x i32> <i32 0, i32 undef, i32 undef, i32 undef>
%r = shufflevector <4 x i32> %cat1, <4 x i32> %cat2, <4 x i32> <i32 undef, i32 undef, i32 1, i32 4>
ret <4 x i32> %r
}
```

Copyright (c) 2006 Kirill Simonov

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

\$OpenBSD: COPYRIGHT,v 1.3 2003/06/02 20:18:36 millert Exp \$

Copyright 1992, 1993, 1994 Henry Spencer. All rights reserved.

This software is not subject to any license of the American Telephone and Telegraph Company or of 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, subject to the following restrictions:

1. The author is not responsible for the consequences of use of this software, no matter how awful, even if they arise from flaws in it.
2. The origin of this software must not be misrepresented, either by explicit claim or by omission. Since few users ever read sources, credits must appear in the documentation.
3. Altered versions must be plainly marked as such, and must not be misrepresented as being the original software. Since few users ever read sources, credits must appear in the documentation.
4. This notice may not be removed or altered.

/*-

* Copyright (c) 1994

* The Regents of the University of California. All rights reserved.

*

* Redistribution and use in source and binary forms, with or without

* modification, are permitted provided that the following conditions

* are met:

* 1. Redistributions of source code must retain the above copyright

* notice, this list of conditions and the following disclaimer.

* 2. Redistributions in binary form must reproduce the above copyright

* notice, this list of conditions and the following disclaimer in the

* documentation and/or other materials provided with the distribution.

* 3. Neither the name of the University nor the names of its contributors

* may be used to endorse or promote products derived from this software

* without specific prior written permission.

*

* THIS SOFTWARE IS PROVIDED BY THE REGENTS AND CONTRIBUTORS ``AS IS" AND

* ANY EXPRESS OR IMPLIED WARRANTIES,

INCLUDING, BUT NOT LIMITED TO, THE

* IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE

* ARE DISCLAIMED. IN NO EVENT SHALL THE REGENTS OR CONTRIBUTORS BE LIABLE

* FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL

* DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS

* OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION)

* HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT

* LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY

* OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF

* SUCH DAMAGE.

*
* @(#)COPYRIGHT 8.1 (Berkeley) 3/16/94
*/
Copyright 2008, Google Inc.
All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

* Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.

* Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.

* Neither the name of Google Inc. nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT OWNER OR

CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

=====
The LLVM Project is under the Apache License v2.0 with LLVM Exceptions:
=====

Apache License
Version 2.0, January 2004
<http://www.apache.org/licenses/>

TERMS AND CONDITIONS FOR USE, REPRODUCTION, AND DISTRIBUTION

1. Definitions.

"License" shall mean the terms and conditions for use, reproduction, and distribution as defined by Sections 1 through 9 of this document.

"Licensor" shall mean the copyright owner or entity authorized by

the copyright owner that is granting the License.

"Legal Entity" shall mean the union of the acting entity and all other entities that control, are controlled by, or are under common control with that entity. For the purposes of this definition, "control" means (i) the power, direct or indirect, to cause the direction or management of such entity, whether by contract or otherwise, or (ii) ownership of fifty percent (50%) or more of the outstanding shares, or (iii) beneficial ownership of such entity.

"You" (or "Your") shall mean an individual or Legal Entity exercising permissions granted by this License.

"Source" form shall mean the preferred form for making modifications, including but not limited to software source code, documentation source, and configuration files.

"Object" form shall mean any form resulting from mechanical transformation or translation of a Source form, including but not limited to compiled object code, generated documentation, and conversions to other media types.

"Work" shall mean the work of authorship, whether in Source or Object form, made available under the License, as indicated by a copyright notice that is included in or attached to the work (an example is provided in the Appendix below).

"Derivative Works" shall mean any work, whether in Source or Object form, that is based on (or derived from) the Work and for which the editorial revisions, annotations, elaborations, or other modifications represent, as a whole, an original work of authorship. For the purposes of this License, Derivative Works shall not include works that remain separable from, or merely link (or bind by name) to the interfaces of, the Work and Derivative Works thereof.

"Contribution" shall mean any work of authorship, including the original version of the Work and any modifications or additions to that Work or Derivative Works thereof, that is intentionally submitted to Licensor for inclusion in the Work by the copyright owner or by an individual or Legal Entity authorized to submit on behalf of the copyright owner. For the purposes of this definition, "submitted" means any form of electronic, verbal, or written communication sent to the Licensor or its representatives, including but not limited to communication on electronic mailing lists, source code control systems, and issue tracking systems that are managed by, or on behalf of, the

Licensor for the purpose of discussing and improving the Work, but excluding communication that is conspicuously marked or otherwise designated in writing by the copyright owner as "Not a Contribution."

"Contributor" shall mean Licensor and any individual or Legal Entity on behalf of whom a Contribution has been received by Licensor and subsequently incorporated within the Work.

2. Grant of Copyright License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable copyright license to reproduce, prepare Derivative

Works of,

publicly display, publicly perform, sublicense, and distribute the Work and such Derivative Works in Source or Object form.

3. Grant of Patent License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable (except as stated in this section) patent license to make, have made, use, offer to sell, sell, import, and otherwise transfer the Work, where such license applies only to those patent claims licensable by such Contributor that are necessarily infringed by their Contribution(s) alone or by combination of their Contribution(s) with the Work to which such Contribution(s) was submitted. If You institute patent litigation against any entity (including a cross-claim or counterclaim in a lawsuit) alleging that the Work or a Contribution incorporated within the Work constitutes direct or contributory patent infringement, then any patent licenses granted to You under this License for that Work shall terminate as of the date such litigation is filed.

4. Redistribution. You may reproduce and distribute copies of the Work or Derivative Works thereof in any medium, with or without modifications, and in Source or Object form, provided that You meet the following conditions:

(a) You must give any other recipients of the Work or Derivative Works a copy of this License; and

(b) You must cause any modified files to carry prominent notices stating that You changed the files; and

(c) You must retain, in the Source form of any Derivative Works that You distribute, all copyright, patent, trademark, and attribution notices from the Source form of the Work, excluding those notices that do not pertain to any part of the Derivative Works; and

(d) If the Work includes a "NOTICE" text file as part of its distribution, then any Derivative Works that You distribute must include a readable copy of the attribution notices contained within such NOTICE file, excluding those notices that do not pertain to any part of the Derivative Works, in at least one of the following places: within a NOTICE text file distributed as part of the Derivative Works; within the Source form or documentation, if provided along with the Derivative Works; or, within a display generated by the Derivative Works, if and wherever such third-party notices normally appear. The contents of the NOTICE file are for informational purposes only and do not modify the License. You may add Your own attribution notices within Derivative Works that You distribute, alongside or as an addendum to the NOTICE text from the Work, provided that such additional attribution notices cannot be construed as modifying the License.

You may add Your own copyright statement to Your modifications and may provide additional or different license terms and conditions for use, reproduction, or distribution of Your modifications, or for any such Derivative Works as a whole, provided Your use, reproduction, and distribution of the Work otherwise complies with the conditions stated in this License.

5. Submission of Contributions. Unless You explicitly state otherwise, any Contribution intentionally submitted for inclusion in the Work by You to the Licensor shall be under the terms and conditions of this License, without any additional terms or conditions. Notwithstanding the above, nothing herein shall supersede or modify the terms of any separate license agreement you may have executed with Licensor regarding such Contributions.

6. Trademarks. This License does not grant permission to use the trade names, trademarks, service marks, or product names of the Licensor, except as required for reasonable and customary use in describing the origin of the Work and reproducing the content of the NOTICE file.

7. Disclaimer of Warranty. Unless required by applicable law or agreed to in writing, Licensor provides the Work (and each Contributor provides its Contributions) on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied, including, without limitation, any warranties or conditions of TITLE, NON-INFRINGEMENT, MERCHANTABILITY, or FITNESS FOR A PARTICULAR PURPOSE. You are solely responsible for determining the

appropriateness of using or redistributing the Work and assume any risks associated with Your exercise of permissions under this License.

8. Limitation of Liability. In no event and under no legal theory, whether in tort (including negligence), contract, or otherwise, unless required by applicable law (such as deliberate and grossly negligent acts) or agreed to in writing, shall any Contributor be liable to You for damages, including any direct, indirect, special, incidental, or consequential damages of any character arising as a result of this License or out of the use or inability to use the Work (including but not limited to damages for loss of goodwill, work stoppage, computer failure or malfunction, or any and all other commercial damages or losses), even if such Contributor has been advised of the possibility of such damages.

9. Accepting Warranty or Additional Liability. While redistributing the Work or Derivative Works thereof, You may choose to offer, and charge a fee for, acceptance of support, warranty, indemnity, or other liability obligations and/or rights consistent with this License. However, in accepting such obligations, You may act only on Your own behalf and on Your sole responsibility, not on behalf of any other Contributor, and only if You agree to indemnify, defend, and hold each Contributor harmless for any liability incurred by, or claims asserted against, such Contributor by reason of your accepting any such warranty or additional liability.

END OF TERMS AND CONDITIONS

APPENDIX: How to apply the Apache License to your work.

To apply the Apache License to your work, attach the following boilerplate notice, with the fields enclosed by brackets "[]" replaced with your own identifying information. (Don't include the brackets!) The text should be enclosed in the appropriate comment syntax for the file format. We also recommend that a file or class name and description of purpose be included on the same "printed page" as the copyright notice for easier identification within third-party archives.

Copyright [yyyy] [name of copyright owner]

Licensed under the Apache License, Version 2.0 (the "License"); you may not use this file except in compliance with the License. You may obtain a copy of the License at

<http://www.apache.org/licenses/LICENSE-2.0>

Unless required by applicable law or agreed to in writing, software distributed under the License is distributed on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.

---- LLVM Exceptions to the Apache 2.0 License ----

As an exception, if, as a result of your compiling your source code, portions of this Software are embedded into an Object form of such source code, you may redistribute such embedded portions in such Object form without complying with the conditions of Sections 4(a), 4(b) and 4(d) of the License.

In addition, if you combine or link compiled forms of this Software with software that is licensed under the GPLv2 ("Combined Software") and if a court of competent jurisdiction determines that the patent provision (Section 3), the indemnity provision (Section 9) or other Section of the License conflicts with the conditions of the GPLv2, you may retroactively and prospectively choose to deem waived or otherwise exclude such Section(s) of the License, but only in their entirety and only with respect to the Combined Software.

=====
Software from third parties included in the LLVM Project:
=====

The LLVM Project contains third party software which is under different license terms. All such code will be identified clearly using at least one of two mechanisms:

- 1) It will be in a separate directory tree with its own `LICENSE.txt` or `LICENSE` file at the top containing the specific license and restrictions which apply to that software, or
- 2) It will contain specific license and restriction terms at the top of every file.

=====
Legacy LLVM License (<https://llvm.org/docs/DeveloperPolicy.html#legacy>):
=====

The GPURuntime library is dual licensed under both the University of Illinois "BSD-Like" license and the MIT license. As a user of this code you may choose to use it under either license. As a contributor, you agree to allow your code to be used under both.

Full text of the relevant licenses is included below.

=====
University of Illinois/NCSA
Open Source License

Copyright (c) 2009-2019 by the contributors listed in CREDITS.TXT

All rights reserved.

Developed by:

Polly Team

<http://polly.llvm.org>

Permission is hereby granted,
free of charge, to any person obtaining a copy of
this software and associated documentation files (the "Software"), to deal with
the Software without restriction, including without limitation the rights to
use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies
of the Software, and to permit persons to whom the Software is furnished to do
so, subject to the following conditions:

- * Redistributions of source code must retain the above copyright notice,
this list of conditions and the following disclaimers.

- * Redistributions in binary form must reproduce the above copyright notice,
this list of conditions and the following disclaimers in the
documentation and/or other materials provided with the distribution.

- * Neither the names of the LLVM Team, University of Illinois at
Urbana-Champaign, nor the names of its contributors may be used to
endorse or promote products derived from this Software without specific
prior
written permission.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR
IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS
FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE
CONTRIBUTORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER
LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM,
OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS WITH THE
SOFTWARE.

=====
Copyright (c) 2009-2016 by the contributors listed in CREDITS.TXT

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

```
; NOTE: Assertions have been autogenerated by utils/update_llc_test_checks.py
; RUN: llc < %s -mtriple=x86_64-unknown-unknown -mcpu=skylake-avx512 -mattr=prefer-256-bit | FileCheck %s
--check-prefixes=CHECK,CHECK-AVX512
; RUN: llc < %s -mtriple=x86_64-unknown-unknown -mcpu=skylake-avx512 -mattr=prefer-256-bit,avx512vbmi |
FileCheck %s --check-prefixes=CHECK,CHECK-VBMI
; Make sure CPUs default to prefer-256-bit. avx512vnni isn't interesting as it just adds an isel peephole for
vpmaddwd+vpadd
; RUN: llc < %s -mtriple=x86_64-unknown-unknown -mcpu=skylake-avx512 | FileCheck %s --check-
prefixes=CHECK,CHECK-AVX512
; RUN: llc < %s -mtriple=x86_64-unknown-unknown -mattr=-avx512vnni -mcpu=cascadelake | FileCheck %s --
check-prefixes=CHECK,CHECK-AVX512
; RUN: llc < %s -mtriple=x86_64-unknown-unknown -mattr=-avx512vnni -mcpu=cooperlake | FileCheck %s --
check-prefixes=CHECK,CHECK-AVX512
; RUN: llc < %s -mtriple=x86_64-unknown-unknown -mcpu=cannonlake | FileCheck %s --check-
prefixes=CHECK,CHECK-VBMI
;
; RUN: llc < %s -mtriple=x86_64-unknown-unknown -mattr=-avx512vnni -mcpu=icelake-client | FileCheck %s --
check-prefixes=CHECK,CHECK-VBMI
; RUN: llc < %s -mtriple=x86_64-unknown-unknown -mattr=-avx512vnni -mcpu=icelake-server | FileCheck %s --
check-prefixes=CHECK,CHECK-VBMI
; RUN: llc < %s -mtriple=x86_64-unknown-unknown -mattr=-avx512vnni -mcpu=tigerlake | FileCheck %s --check-
prefixes=CHECK,CHECK-VBMI
```

; This file primarily contains tests for specific places in X86ISelLowering.cpp that needed be made aware of the legalizer not allowing 512-bit vectors due to prefer-256-bit even though AVX512 is enabled.

```
define dso_local void @add256(<16 x i32>* %a, <16 x i32>* %b, <16 x i32>* %c) "min-legal-vector-
width"="256" {
; CHECK-LABEL: add256:
```

```

; CHECK:    # %bb.0:
; CHECK-NEXT:  vmovdqa (%rdi), %ymm0
; CHECK-NEXT:  vmovdqa 32(%rdi), %ymm1
; CHECK-NEXT:  vpadd 32(%rsi), %ymm1, %ymm1
; CHECK-NEXT:  vpadd (%rsi), %ymm0, %ymm0
; CHECK-NEXT:  vmovdqa %ymm0, (%rdx)
; CHECK-NEXT:
vmovdqa %ymm1, 32(%rdx)
; CHECK-NEXT:  vzeroupper
; CHECK-NEXT:  retq
%d = load <16 x i32>, <16 x i32>* %a
%e = load <16 x i32>, <16 x i32>* %b
%f = add <16 x i32> %d, %e
store <16 x i32> %f, <16 x i32>* %c
ret void
}

```

```

define dso_local void @add512(<16 x i32>* %a, <16 x i32>* %b, <16 x i32>* %c) "min-legal-vector-
width"="512" {

```

```

; CHECK-LABEL: add512:
; CHECK:    # %bb.0:
; CHECK-NEXT:  vmovdqa64 (%rdi), %zmm0
; CHECK-NEXT:  vpadd (%rsi), %zmm0, %zmm0
; CHECK-NEXT:  vmovdqa64 %zmm0, (%rdx)
; CHECK-NEXT:  vzeroupper
; CHECK-NEXT:  retq
%d = load <16 x i32>, <16 x i32>* %a
%e = load <16 x i32>, <16 x i32>* %b
%f = add <16 x i32> %d, %e
store <16 x i32> %f, <16 x i32>* %c
ret void
}

```

```

define dso_local void @avg_v64i8_256(<64 x i8>* %a, <64 x i8>* %b) "min-legal-vector-width"="256" {

```

```

; CHECK-LABEL: avg_v64i8_256:
; CHECK:    # %bb.0:
; CHECK-NEXT:  vmovdqa (%rsi), %ymm0
; CHECK-NEXT:  vmovdqa 32(%rsi), %ymm1
; CHECK-NEXT:  vpavgb (%rdi), %ymm0,
%ymm0
; CHECK-NEXT:  vpavgb 32(%rdi), %ymm1, %ymm1
; CHECK-NEXT:  vmovdqu %ymm1, (%rax)
; CHECK-NEXT:  vmovdqu %ymm0, (%rax)
; CHECK-NEXT:  vzeroupper
; CHECK-NEXT:  retq
%1 = load <64 x i8>, <64 x i8>* %a
%2 = load <64 x i8>, <64 x i8>* %b
%3 = zext <64 x i8> %1 to <64 x i32>

```



```

; CHECK-NEXT: vmovdqa (%rdi), %ymm0
; CHECK-NEXT: vmovdqa 32(%rdi), %ymm1
; CHECK-NEXT: vpmaddwd 32(%rsi), %ymm1, %ymm1
; CHECK-NEXT: vpmaddwd (%rsi), %ymm0, %ymm0
; CHECK-NEXT: vmovdqa %ymm0, (%rdx)
; CHECK-NEXT: vmovdqa %ymm1, 32(%rdx)
; CHECK-NEXT: vzeroupper
; CHECK-NEXT: retq
%A = load <32 x i16>, <32 x i16>* %APtr
%B = load <32 x i16>, <32 x i16>* %BPtr
%a = sext <32 x i16> %A to <32 x i32>
%b = sext <32 x i16> %B to <32 x i32>
%m = mul nsw <32 x i32> %a, %b
%odd = shufflevector <32 x i32> %m, <32 x i32> undef, <16 x i32> <i32 0, i32 2, i32 4, i32 6, i32 8, i32 10, i32
12, i32 14, i32 16, i32 18, i32 20, i32 22, i32 24, i32 26, i32 28, i32 30>
%even = shufflevector <32 x i32> %m, <32 x i32> undef, <16 x i32> <i32 1, i32 3, i32 5, i32 7, i32 9,
i32 11, i32 13, i32 15, i32 17, i32 19, i32 21, i32 23, i32 25, i32 27, i32 29, i32 31>
%ret = add <16 x i32> %odd, %even
store <16 x i32> %ret, <16 x i32>* %CPtr
ret void
}

```

```

define dso_local void @pmaddwd_32_512(<32 x i16>* %APtr, <32 x i16>* %BPtr, <16 x i32>* %CPtr) "min-
legal-vector-width"="512" {

```

```

; CHECK-LABEL: pmaddwd_32_512:
; CHECK: # %bb.0:
; CHECK-NEXT: vmovdqa64 (%rdi), %zmm0
; CHECK-NEXT: vpmaddwd (%rsi), %zmm0, %zmm0
; CHECK-NEXT: vmovdqa64 %zmm0, (%rdx)
; CHECK-NEXT: vzeroupper
; CHECK-NEXT: retq
%A = load <32 x i16>, <32 x i16>* %APtr
%B = load <32 x i16>, <32 x i16>* %BPtr
%a = sext <32 x i16> %A to <32 x i32>
%b = sext <32 x i16> %B to <32 x i32>
%m = mul nsw <32 x i32> %a, %b
%odd = shufflevector <32 x i32> %m, <32 x i32> undef, <16 x i32> <i32 0, i32 2, i32 4, i32 6, i32 8, i32 10, i32
12, i32 14, i32 16, i32 18, i32 20, i32 22, i32 24, i32 26, i32 28, i32 30>
%even = shufflevector <32 x i32> %m, <32 x i32> undef, <16
x i32> <i32 1, i32 3, i32 5, i32 7, i32 9, i32 11, i32 13, i32 15, i32 17, i32 19, i32 21, i32 23, i32 25, i32 27, i32 29,
i32 31>
%ret = add <16 x i32> %odd, %even
store <16 x i32> %ret, <16 x i32>* %CPtr
ret void
}

```

```

define dso_local void @psubus_64i8_max_256(<64 x i8>* %xptr, <64 x i8>* %yptr, <64 x i8>* %zptr) "min-legal-
vector-width"="256" {

```

```

; CHECK-LABEL: psubus_64i8_max_256:
; CHECK:    # %bb.0:
; CHECK-NEXT:  vmovdqa (%rdi), %ymm0
; CHECK-NEXT:  vmovdqa 32(%rdi), %ymm1
; CHECK-NEXT:  vpsubusb 32(%rsi), %ymm1, %ymm1
; CHECK-NEXT:  vpsubusb (%rsi), %ymm0, %ymm0
; CHECK-NEXT:  vmovdqa %ymm0, (%rdx)
; CHECK-NEXT:  vmovdqa %ymm1, 32(%rdx)
; CHECK-NEXT:  vzeroupper
; CHECK-NEXT:  retq
%x = load <64 x i8>, <64 x i8>* %xptr
%y = load <64 x i8>, <64 x i8>* %yptr
%cmp = icmp ult <64 x i8> %x, %y
%max = select <64 x i1> %cmp, <64 x i8> %y, <64 x i8> %x
%res = sub <64 x i8> %max, %y
store <64 x i8> %res, <64 x i8>* %zptr
ret void
}

```

```
define dso_local
```

```
void @psubus_64i8_max_512(<64 x i8>* %xptr, <64 x i8>* %yptr, <64 x i8>* %zptr) "min-legal-vector-width"="512" {
```

```

; CHECK-LABEL: psubus_64i8_max_512:
; CHECK:    # %bb.0:
; CHECK-NEXT:  vmovdqa64 (%rdi), %zmm0
; CHECK-NEXT:  vpsubusb (%rsi), %zmm0, %zmm0
; CHECK-NEXT:  vmovdqa64 %zmm0, (%rdx)
; CHECK-NEXT:  vzeroupper
; CHECK-NEXT:  retq
%x = load <64 x i8>, <64 x i8>* %xptr
%y = load <64 x i8>, <64 x i8>* %yptr
%cmp = icmp ult <64 x i8> %x, %y
%max = select <64 x i1> %cmp, <64 x i8> %y, <64 x i8> %x
%res = sub <64 x i8> %max, %y
store <64 x i8> %res, <64 x i8>* %zptr
ret void
}

```

```
define dso_local i32 @_Z9test_charPcS_i_256(i8* nocapture readonly, i8* nocapture readonly, i32) "min-legal-vector-width"="256" {
```

```

; CHECK-LABEL: _Z9test_charPcS_i_256:
; CHECK:    # %bb.0: # %entry
; CHECK-NEXT:  movl %edx, %eax
; CHECK-NEXT:  vpxor %xmm0, %xmm0, %xmm0
; CHECK-NEXT:  xorl %ecx, %ecx
; CHECK-NEXT:  vpxor %xmm1, %xmm1, %xmm1
; CHECK-NEXT:  vpxor %xmm2,

```



```

%xmm2, %xmm2
; CHECK-NEXT: .p2align 4, 0x90
; CHECK-NEXT: .LBB8_1: # %vector.body
; CHECK-NEXT: # =>This Inner Loop Header: Depth=1
; CHECK-NEXT: vpmovsxbw 16(%rdi,%rcx), %ymm3
; CHECK-NEXT: vpmovsxbw (%rdi,%rcx), %ymm4
; CHECK-NEXT: vpmovsxbw 16(%rsi,%rcx), %ymm5
; CHECK-NEXT: vpmaddwd %ymm3, %ymm5, %ymm3
; CHECK-NEXT: vpadd %ymm2, %ymm3, %ymm2
; CHECK-NEXT: vpmovsxbw (%rsi,%rcx), %ymm3
; CHECK-NEXT: vpmaddwd %ymm4, %ymm3, %ymm3
; CHECK-NEXT: vpadd %ymm1, %ymm3, %ymm1
; CHECK-NEXT: addq $32, %rcx
; CHECK-NEXT: cmpq %rcx, %rax
; CHECK-NEXT: jne .LBB8_1
; CHECK-NEXT: # %bb.2: # %middle.block
; CHECK-NEXT: vpadd %ymm0, %ymm1, %ymm1
; CHECK-NEXT: vpadd %ymm0, %ymm2, %ymm0
; CHECK-NEXT: vpadd %ymm0, %ymm1, %ymm0
; CHECK-NEXT: vextracti128 $1, %ymm0, %xmm1
; CHECK-NEXT: vpadd %xmm1, %xmm0, %xmm0
; CHECK-NEXT: vpshufd {{.*#+}} xmm1 = xmm0[2,3,2,3]
; CHECK-NEXT: vpadd %xmm1, %xmm0, %xmm0
; CHECK-NEXT: vpshufd {{.*#+}} xmm1
= xmm0[1,1,1,1]
; CHECK-NEXT: vpadd %xmm1, %xmm0, %xmm0
; CHECK-NEXT: vmovd %xmm0, %eax
; CHECK-NEXT: vzeroupper
; CHECK-NEXT: retq
entry:
%3 = zext i32 %2 to i64
br label %vector.body

vector.body:
%index = phi i64 [ %index.next, %vector.body ], [ 0, %entry ]
%vec.phi = phi <32 x i32> [ %11, %vector.body ], [ zeroinitializer, %entry ]
%4 = getelementptr inbounds i8, i8* %0, i64 %index
%5 = bitcast i8* %4 to <32 x i8>*
%wide.load = load <32 x i8>, <32 x i8>* %5, align 1
%6 = sext <32 x i8> %wide.load to <32 x i32>
%7 = getelementptr inbounds i8, i8* %1, i64 %index
%8 = bitcast i8* %7 to <32 x i8>*
%wide.load14 = load <32 x i8>, <32 x i8>* %8, align 1
%9 = sext <32 x i8> %wide.load14 to <32 x i32>
%10 = mul nsw <32 x i32> %9, %6
%11 = add nsw <32 x i32> %10, %vec.phi
%index.next = add i64 %index, 32
%12 = icmp eq i64 %index.next, %3

```

```
br i1 %12, label %middle.block, label %vector.body
```

```
middle.block:
```

```
%rdx.shuf1 = shufflevector <32 x i32> %11,  
<32 x i32> undef, <32 x i32> <i32 16, i32 17, i32 18, i32 19, i32 20, i32 21, i32 22, i32 23, i32 24, i32 25, i32 26,  
i32 27, i32 28, i32 29, i32 30, i32 31, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32  
undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef>  
%bin.rdx1 = add <32 x i32> %11, %rdx.shuf1  
%rdx.shuf = shufflevector <32 x i32> %bin.rdx1, <32 x i32> undef, <32 x i32> <i32 8, i32 9, i32 10, i32 11, i32  
12, i32 13, i32 14, i32 15, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32  
undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef,  
i32 undef, i32 undef, i32 undef, i32 undef, i32 undef>  
%bin.rdx = add <32 x i32> %bin.rdx1, %rdx.shuf  
%rdx.shuf15 = shufflevector <32 x i32> %bin.rdx, <32 x i32> undef, <32 x i32> <i32 4, i32 5, i32 6, i32 7, i32  
undef, i32 undef, i32 undef, i32 undef, i32 undef,  
i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef,  
i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef,  
i32 undef, i32 undef>  
%bin.rdx32 = add <32 x i32> %bin.rdx, %rdx.shuf15  
%rdx.shuf17 = shufflevector <32 x i32> %bin.rdx32, <32 x i32> undef, <32 x i32> <i32 2, i32 3, i32 undef, i32  
undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef,  
i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef,  
i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef>  
%bin.rdx18 = add <32 x i32> %bin.rdx32, %rdx.shuf17  
%rdx.shuf19 = shufflevector <32 x i32> %bin.rdx18, <32 x i32> undef, <32 x i32> <i32 1, i32 undef, i32 undef,  
i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32  
undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef,  
i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef>  
%bin.rdx20 = add <32 x i32> %bin.rdx18, %rdx.shuf19  
%13 = extractelement <32 x i32> %bin.rdx20, i32 0  
ret i32 %13  
}
```

```
define dso_local i32 @_Z9test_charPcS_i_512(i8* nocapture readonly, i8* nocapture readonly, i32) "min-legal-  
vector-width"="512" {
```

```
; CHECK-LABEL: _Z9test_charPcS_i_512:  
; CHECK: # %bb.0: # %entry  
; CHECK-NEXT: movl %edx, %eax  
; CHECK-NEXT: vpxor %xmm0, %xmm0, %xmm0  
; CHECK-NEXT: xorl %ecx, %ecx  
; CHECK-NEXT: vpxor %xmm1, %xmm1, %xmm1  
; CHECK-NEXT: .p2align 4, 0x90  
; CHECK-NEXT: .LBB9_1: # %vector.body  
; CHECK-NEXT: # =>This Inner Loop Header: Depth=1  
; CHECK-NEXT: vpmovsxbw (%rdi,%rcx), %zmm2  
; CHECK-NEXT: vpmovsxbw (%rsi,%rcx), %zmm3  
; CHECK-NEXT: vpmaddwd %zmm2, %zmm3, %zmm2  
; CHECK-NEXT: vpadd %zmm1, %zmm2, %zmm1
```

```

;
CHECK-NEXT:  addq $32, %rcx
; CHECK-NEXT:  cmpq %rcx, %rax
; CHECK-NEXT:  jne .LBB9_1
; CHECK-NEXT:  # %bb.2: # %middle.block
; CHECK-NEXT:  vpaddd %zmm0, %zmm1, %zmm0
; CHECK-NEXT:  vextracti64x4 $1, %zmm0, %ymm1
; CHECK-NEXT:  vpaddd %zmm1, %zmm0, %zmm0
; CHECK-NEXT:  vextracti128 $1, %ymm0, %xmm1
; CHECK-NEXT:  vpaddd %xmm1, %xmm0, %xmm0
; CHECK-NEXT:  vpshufd { {. *#+ } } xmm1 = xmm0[2,3,2,3]
; CHECK-NEXT:  vpaddd %xmm1, %xmm0, %xmm0
; CHECK-NEXT:  vpshufd { {. *#+ } } xmm1 = xmm0[1,1,1,1]
; CHECK-NEXT:  vpaddd %xmm1, %xmm0, %xmm0
; CHECK-NEXT:  vmovd %xmm0, %eax
; CHECK-NEXT:  vzeroupper
; CHECK-NEXT:  retq
entry:
%3 = zext i32 %2 to i64
br label %vector.body

vector.body:
%index = phi i64 [ %index.next, %vector.body ], [ 0, %entry ]
%vec.phi = phi <32 x i32> [ %11, %vector.body ], [ zeroinitializer, %entry ]
%4 = getelementptr inbounds i8, i8* %0, i64 %index
%5 = bitcast i8* %4 to <32 x i8>*
%wide.load = load <32 x i8>, <32 x i8>* %5, align
1
%6 = sext <32 x i8> %wide.load to <32 x i32>
%7 = getelementptr inbounds i8, i8* %1, i64 %index
%8 = bitcast i8* %7 to <32 x i8>*
%wide.load14 = load <32 x i8>, <32 x i8>* %8, align 1
%9 = sext <32 x i8> %wide.load14 to <32 x i32>
%10 = mul nsw <32 x i32> %9, %6
%11 = add nsw <32 x i32> %10, %vec.phi
%index.next = add i64 %index, 32
%12 = icmp eq i64 %index.next, %3
br i1 %12, label %middle.block, label %vector.body

middle.block:
%rdx.shuf1 = shufflevector <32 x i32> %11, <32 x i32> undef, <32 x i32> <i32 16, i32 17, i32 18, i32 19, i32 20,
i32 21, i32 22, i32 23, i32 24, i32 25, i32 26, i32 27, i32 28, i32 29, i32 30, i32 31, i32 undef, i32 undef, i32 undef,
i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef,
undef, i32 undef, i32 undef>
%bin.rdx1 = add <32 x i32> %11, %rdx.shuf1
%rdx.shuf = shufflevector <32 x i32> %bin.rdx1, <32 x i32> undef, <32 x i32> <i32 8, i32 9, i32 10, i32 11, i32
12,

```

```

i32 13, i32 14, i32 15, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32
undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef,
i32 undef, i32 undef, i32 undef, i32 undef, i32 undef>
%bin.rdx = add <32 x i32> %bin.rdx1, %rdx.shuf
%rdx.shuf15 = shufflevector <32 x i32> %bin.rdx, <32 x i32> undef, <32 x i32> <i32 4, i32 5, i32 6, i32 7, i32
undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef,
i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32
undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef>
%bin.rdx32 = add <32 x i32> %bin.rdx, %rdx.shuf15
%rdx.shuf17 = shufflevector <32 x i32> %bin.rdx32, <32 x i32> undef, <32 x i32> <i32 2, i32 3, i32 undef, i32
undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32
undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32
undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef>
%bin.rdx18 = add <32 x i32> %bin.rdx32, %rdx.shuf17
%rdx.shuf19 = shufflevector <32 x i32> %bin.rdx18, <32 x i32> undef, <32 x i32> <i32 1, i32 undef, i32 undef,
i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32
undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef,
i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef>
%bin.rdx20 = add <32 x i32> %bin.rdx18, %rdx.shuf19
%13 = extractelement <32 x i32> %bin.rdx20, i32 0
ret i32 %13
}

```

```
@a = dso_local global [1024 x i8] zeroinitializer, align 16
```

```
@b = dso_local global [1024 x i8] zeroinitializer, align 16
```

```

define dso_local i32 @sad_16i8_256()
"min-legal-vector-width"="256" {
; CHECK-LABEL: sad_16i8_256:
; CHECK:      # %bb.0: # %entry
; CHECK-NEXT: vpxor %xmm0, %xmm0, %xmm0
; CHECK-NEXT: movq $-1024, %rax # imm = 0xFC00
; CHECK-NEXT: vpxor %xmm1, %xmm1, %xmm1
; CHECK-NEXT: .p2align 4, 0x90
; CHECK-NEXT: .LBB10_1: # %vector.body
; CHECK-NEXT: # =>This Inner Loop Header: Depth=1
; CHECK-NEXT: vmovdqu a+1024(%rax), %xmm2
; CHECK-NEXT: vpsadbw b+1024(%rax), %xmm2, %xmm2
; CHECK-NEXT: vpadd %ymm1, %ymm2, %ymm1
; CHECK-NEXT: addq $4, %rax
; CHECK-NEXT: jne .LBB10_1
; CHECK-NEXT: # %bb.2: # %middle.block
; CHECK-NEXT: vpadd %ymm0, %ymm1, %ymm0
; CHECK-NEXT: vextracti128 $1, %ymm0, %xmm1
; CHECK-NEXT: vpadd %xmm1, %xmm0, %xmm0
; CHECK-NEXT: vpshufd {{.*#+}} xmm1 = xmm0[2,3,2,3]
; CHECK-NEXT: vpadd %xmm1, %xmm0, %xmm0
; CHECK-NEXT: vpshufd {{.*#+}} xmm1 = xmm0[1,1,1,1]

```

```

; CHECK-NEXT:  vpaddd %xmm1, %xmm0, %xmm0
; CHECK-NEXT:  vmovd %xmm0, %eax
; CHECK-NEXT:  vzeroupper
; CHECK-NEXT:
    retq
entry:
    br label %vector.body

vector.body:
    %index = phi i64 [ 0, %entry ], [ %index.next, %vector.body ]
    %vec.phi = phi <16 x i32> [ zeroinitializer, %entry ], [ %10, %vector.body ]
    %0 = getelementptr inbounds [1024 x i8], [1024 x i8]* @a, i64 0, i64 %index
    %1 = bitcast i8* %0 to <16 x i8>*
    %wide.load = load <16 x i8>, <16 x i8>* %1, align 4
    %2 = zext <16 x i8> %wide.load to <16 x i32>
    %3 = getelementptr inbounds [1024 x i8], [1024 x i8]* @b, i64 0, i64 %index
    %4 = bitcast i8* %3 to <16 x i8>*
    %wide.load1 = load <16 x i8>, <16 x i8>* %4, align 4
    %5 = zext <16 x i8> %wide.load1 to <16 x i32>
    %6 = sub nsw <16 x i32> %2, %5
    %7 = icmp sgt <16 x i32> %6, <i32 -1, i32 -1, i32 -1, i32 -1, i32 -1, i32 -1, i32 -1, i32 -1, i32 -1, i32 -1, i32 -1, i32 -1, i32 -1, i32 -1, i32 -1, i32 -1>
    %8 = sub nsw <16 x i32> zeroinitializer, %6
    %9 = select <16 x i1> %7, <16 x i32> %6, <16 x i32> %8
    %10 = add nsw <16 x i32> %9, %vec.phi
    %index.next = add i64 %index,
    4
    %11 = icmp eq i64 %index.next, 1024
    br i1 %11, label %middle.block, label %vector.body

middle.block:
    %rdx.shuf = shufflevector <16 x i32> %10, <16 x i32> undef, <16 x i32> <i32 8, i32 9, i32 10, i32 11, i32 12, i32 13, i32 14, i32 15, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef>
    %bin.rdx = add <16 x i32> %10, %rdx.shuf
    %rdx.shuf2 = shufflevector <16 x i32> %bin.rdx, <16 x i32> undef, <16 x i32> <i32 4, i32 5, i32 6, i32 7, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef>
    %bin.rdx2 = add <16 x i32> %bin.rdx, %rdx.shuf2
    %rdx.shuf3 = shufflevector <16 x i32> %bin.rdx2, <16 x i32> undef, <16 x i32> <i32 2, i32 3, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef>
    %bin.rdx3 = add <16 x i32> %bin.rdx2, %rdx.shuf3
    %rdx.shuf4 = shufflevector
    <16 x i32> %bin.rdx3, <16 x i32> undef, <16 x i32> <i32 1, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef>
    %bin.rdx4 = add <16 x i32> %bin.rdx3, %rdx.shuf4
    %12 = extractelement <16 x i32> %bin.rdx4, i32 0
    ret i32 %12

```

```

}

define dso_local i32 @sad_16i8_512() "min-legal-vector-width"="512" {
; CHECK-LABEL: sad_16i8_512:
; CHECK:      # %bb.0: # %entry
; CHECK-NEXT:  vpxor %xmm0, %xmm0, %xmm0
; CHECK-NEXT:  movq $-1024, %rax # imm = 0xFC00
; CHECK-NEXT:  .p2align 4, 0x90
; CHECK-NEXT:  .LBB11_1: # %vector.body
; CHECK-NEXT:  # =>This Inner Loop Header: Depth=1
; CHECK-NEXT:  vmovdqu a+1024(%rax), %xmm1
; CHECK-NEXT:  vpsadbw b+1024(%rax), %xmm1, %xmm1
; CHECK-NEXT:  vpaddd %zmm0, %zmm1, %zmm0
; CHECK-NEXT:  addq $4, %rax
; CHECK-NEXT:  jne .LBB11_1
; CHECK-NEXT:  # %bb.2: # %middle.block
; CHECK-NEXT:  vextracti64x4 $1, %zmm0, %ymm1
; CHECK-NEXT:
    vpaddd %zmm1, %zmm0, %zmm0
; CHECK-NEXT:  vextracti128 $1, %ymm0, %xmm1
; CHECK-NEXT:  vpaddd %xmm1, %xmm0, %xmm0
; CHECK-NEXT:  vpshufd { {.#+} } xmm1 = xmm0[2,3,2,3]
; CHECK-NEXT:  vpaddd %xmm1, %xmm0, %xmm0
; CHECK-NEXT:  vpshufd { {.#+} } xmm1 = xmm0[1,1,1,1]
; CHECK-NEXT:  vpaddd %xmm1, %xmm0, %xmm0
; CHECK-NEXT:  vmovd %xmm0, %eax
; CHECK-NEXT:  vzeroupper
; CHECK-NEXT:  retq
entry:
    br label %vector.body

vector.body:
    %index = phi i64 [ 0, %entry ], [ %index.next, %vector.body ]
    %vec.phi = phi <16 x i32> [ zeroinitializer, %entry ], [ %10, %vector.body ]
    %0 = getelementptr inbounds [1024 x i8], [1024 x i8]* @a, i64 0, i64 %index
    %1 = bitcast i8* %0 to <16 x i8>*
    %wide.load = load <16 x i8>, <16 x i8>* %1, align 4
    %2 = zext <16 x i8> %wide.load to <16 x i32>
    %3 = getelementptr inbounds [1024 x i8], [1024 x i8]* @b, i64 0, i64 %index
    %4 = bitcast i8* %3 to <16 x i8>*
    %wide.load1 = load <16 x i8>, <16 x i8>* %4, align 4
    %5 = zext <16 x i8> %wide.load1
    to <16 x i32>
    %6 = sub nsw <16 x i32> %2, %5
    %7 = icmp sgt <16 x i32> %6, <i32 -1, i32 -1, i32 -1, i32 -1, i32 -1, i32 -1, i32 -1, i32 -1, i32 -1, i32 -1, i32 -1, i32 -1, i32 -1, i32 -1, i32 -1, i32 -1>
    %8 = sub nsw <16 x i32> zeroinitializer, %6
    %9 = select <16 x i1> %7, <16 x i32> %6, <16 x i32> %8

```

```

%10 = add nsw <16 x i32> %9, %vec.phi
%index.next = add i64 %index, 4
%11 = icmp eq i64 %index.next, 1024
br i1 %11, label %middle.block, label %vector.body

```

middle.block:

```

%rdx.shuf = shufflevector <16 x i32> %10, <16 x i32> undef, <16 x i32> <i32 8, i32 9, i32 10, i32 11, i32 12, i32 13, i32 14, i32 15, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef>
%bin.rdx = add <16 x i32> %10, %rdx.shuf
%rdx.shuf2 = shufflevector <16 x i32> %bin.rdx, <16 x i32> undef, <16 x i32> <i32 4, i32 5, i32 6, i32 7, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef>
%bin.rdx2 = add <16 x i32> %bin.rdx, %rdx.shuf2
%rdx.shuf3 = shufflevector <16 x i32> %bin.rdx2, <16 x i32> undef, <16 x i32> <i32 2, i32 3, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef>
%bin.rdx3 = add <16 x i32> %bin.rdx2, %rdx.shuf3
%rdx.shuf4 = shufflevector <16 x i32> %bin.rdx3, <16 x i32> undef, <16 x i32> <i32 1, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef, i32 undef>
%bin.rdx4 = add <16 x i32> %bin.rdx3, %rdx.shuf4
%12 = extractelement <16 x i32> %bin.rdx4, i32 0
ret i32 %12
}

```

```

define dso_local void @sbto16f32_256(<16 x i16> %a, <16 x float>* %res) "min-legal-vector-width"="256" {
; CHECK-LABEL: sbto16f32_256:
; CHECK:      # %bb.0:
; CHECK-NEXT:  vpmovw2m %ymm0, %k0
; CHECK-NEXT:  kshiftrw $8, %k0, %k1
; CHECK-NEXT:  vpmovm2d %k1, %ymm0
;
; CHECK-NEXT:  vcvt dq2ps %ymm0, %ymm0
; CHECK-NEXT:  vpmovm2d %k0, %ymm1
; CHECK-NEXT:  vcvt dq2ps %ymm1, %ymm1
; CHECK-NEXT:  vmovaps %ymm1, (%rdi)
; CHECK-NEXT:  vmovaps %ymm0, 32(%rdi)
; CHECK-NEXT:  vzeroupper
; CHECK-NEXT:  retq
%mask = icmp slt <16 x i16> %a, zeroinitializer
%1 = sitofp <16 x i1> %mask to <16 x float>
store <16 x float> %1, <16 x float>* %res
ret void
}

```

```

define dso_local void @sbto16f32_512(<16 x i16> %a, <16 x float>* %res) "min-legal-vector-width"="512" {
; CHECK-LABEL: sbto16f32_512:
; CHECK:      # %bb.0:

```

```

; CHECK-NEXT: vpmovw2m %ymm0, %k0
; CHECK-NEXT: vpmovm2d %k0, %zmm0
; CHECK-NEXT: vcvtdq2ps %zmm0, %zmm0
; CHECK-NEXT: vmovaps %zmm0, (%rdi)
; CHECK-NEXT: vzeroupper
; CHECK-NEXT: retq
%mask = icmp slt <16 x i16> %a, zeroinitializer
%1 = sitofp <16 x i1> %mask to <16 x float>
store <16 x float> %1, <16 x float>* %res
ret void
}

define dso_local void @sbto16f64_256(<16 x i16> %a, <16 x double>* %res) "min-legal-vector-width"="256"
{
; CHECK-LABEL: sbto16f64_256:
; CHECK:    # %bb.0:
; CHECK-NEXT: vpmovw2m %ymm0, %k0
; CHECK-NEXT: kshiftrw $8, %k0, %k1
; CHECK-NEXT: vpmovm2d %k1, %ymm0
; CHECK-NEXT: vcvtdq2pd %xmm0, %ymm1
; CHECK-NEXT: vextracti128 $1, %ymm0, %xmm0
; CHECK-NEXT: vcvtdq2pd %xmm0, %ymm0
; CHECK-NEXT: vpmovm2d %k0, %ymm2
; CHECK-NEXT: vcvtdq2pd %xmm2, %ymm3
; CHECK-NEXT: vextracti128 $1, %ymm2, %xmm2
; CHECK-NEXT: vcvtdq2pd %xmm2, %ymm2
; CHECK-NEXT: vmovaps %ymm2, 32(%rdi)
; CHECK-NEXT: vmovaps %ymm3, (%rdi)
; CHECK-NEXT: vmovaps %ymm0, 96(%rdi)
; CHECK-NEXT: vmovaps %ymm1, 64(%rdi)
; CHECK-NEXT: vzeroupper
; CHECK-NEXT: retq
%mask = icmp slt <16 x i16> %a, zeroinitializer
%1 = sitofp <16 x i1> %mask to <16 x double>
store <16 x double> %1, <16 x double>* %res
ret void
}

define dso_local void @sbto16f64_512(<16 x i16> %a, <16 x double>* %res) "min-legal-vector-width"="512" {
; CHECK-LABEL: sbto16f64_512:
; CHECK:
; CHECK:    # %bb.0:
; CHECK-NEXT: vpmovw2m %ymm0, %k0
; CHECK-NEXT: vpmovm2d %k0, %zmm0
; CHECK-NEXT: vcvtdq2pd %ymm0, %zmm1
; CHECK-NEXT: vextracti64x4 $1, %zmm0, %ymm0
; CHECK-NEXT: vcvtdq2pd %ymm0, %zmm0
; CHECK-NEXT: vmovaps %zmm0, 64(%rdi)

```



```

; CHECK-NEXT: vmovaps %zmm1, (%rdi)
; CHECK-NEXT: vzeroupper
; CHECK-NEXT: retq
%mask = icmp slt <16 x i16> %a, zeroinitializer
%1 = sitofp <16 x i1> %mask to <16 x double>
store <16 x double> %1, <16 x double>* %res
ret void
}

define dso_local void @ubto16f32_256(<16 x i16> %a, <16 x float>* %res) "min-legal-vector-width"="256" {
; CHECK-LABEL: ubto16f32_256:
; CHECK: # %bb.0:
; CHECK-NEXT: vpmovw2m %ymm0, %k0
; CHECK-NEXT: kshiftrw $8, %k0, %k1
; CHECK-NEXT: vpmovm2d %k1, %ymm0
; CHECK-NEXT: vpsrld $31, %ymm0, %ymm0
; CHECK-NEXT: vcvt dq2ps %ymm0, %ymm0
; CHECK-NEXT: vpmovm2d %k0, %ymm1
; CHECK-NEXT: vpsrld $31, %ymm1, %ymm1
; CHECK-NEXT: vcvt dq2ps %ymm1, %ymm1
; CHECK-NEXT: vmovaps %ymm1,
(%rdi)
; CHECK-NEXT: vmovaps %ymm0, 32(%rdi)
; CHECK-NEXT: vzeroupper
; CHECK-NEXT: retq
%mask = icmp slt <16 x i16> %a, zeroinitializer
%1 = uitofp <16 x i1> %mask to <16 x float>
store <16 x float> %1, <16 x float>* %res
ret void
}

define dso_local void @ubto16f32_512(<16 x i16> %a, <16 x float>* %res) "min-legal-vector-width"="512" {
; CHECK-LABEL: ubto16f32_512:
; CHECK: # %bb.0:
; CHECK-NEXT: vpmovw2m %ymm0, %k0
; CHECK-NEXT: vpmovm2d %k0, %zmm0
; CHECK-NEXT: vpsrld $31, %zmm0, %zmm0
; CHECK-NEXT: vcvt dq2ps %zmm0, %zmm0
; CHECK-NEXT: vmovaps %zmm0, (%rdi)
; CHECK-NEXT: vzeroupper
; CHECK-NEXT: retq
%mask = icmp slt <16 x i16> %a, zeroinitializer
%1 = uitofp <16 x i1> %mask to <16 x float>
store <16 x float> %1, <16 x float>* %res
ret void
}

define dso_local void @ubto16f64_256(<16 x i16> %a, <16 x double>* %res) "min-legal-vector-width"="256" {

```

```

; CHECK-LABEL: ubto16f64_256:
; CHECK:      # %bb.0:
; CHECK-NEXT:  vpmovw2m
               %ymm0, %k0
; CHECK-NEXT:  kshiftrw $8, %k0, %k1
; CHECK-NEXT:  vpmovm2d %k1, %ymm0
; CHECK-NEXT:  vpsrld $31, %ymm0, %ymm0
; CHECK-NEXT:  vcvtdq2pd %xmm0, %ymm1
; CHECK-NEXT:  vextracti128 $1, %ymm0, %xmm0
; CHECK-NEXT:  vcvtdq2pd %xmm0, %ymm0
; CHECK-NEXT:  vpmovm2d %k0, %ymm2
; CHECK-NEXT:  vpsrld $31, %ymm2, %ymm2
; CHECK-NEXT:  vcvtdq2pd %xmm2, %ymm3
; CHECK-NEXT:  vextracti128 $1, %ymm2, %xmm2
; CHECK-NEXT:  vcvtdq2pd %xmm2, %ymm2
; CHECK-NEXT:  vmovaps %ymm2, 32(%rdi)
; CHECK-NEXT:  vmovaps %ymm3, (%rdi)
; CHECK-NEXT:  vmovaps %ymm0, 96(%rdi)
; CHECK-NEXT:  vmovaps %ymm1, 64(%rdi)
; CHECK-NEXT:  vzeroupper
; CHECK-NEXT:  retq
               %mask = icmp slt <16 x i16> %a, zeroinitializer
               %1 = uitofp <16 x i1> %mask to <16 x double>
               store <16 x double> %1, <16 x double>* %res
               ret void
}

define dso_local void @ubto16f64_512(<16 x i16> %a, <16 x double>* %res) "min-legal-vector-width"="512" {
; CHECK-LABEL: ubto16f64_512:
; CHECK:      # %bb.0:
; CHECK-NEXT:
               vpmovw2m %ymm0, %k0
; CHECK-NEXT:  vpmovm2d %k0, %zmm0
; CHECK-NEXT:  vpsrld $31, %zmm0, %zmm0
; CHECK-NEXT:  vcvtdq2pd %ymm0, %zmm1
; CHECK-NEXT:  vextracti64x4 $1, %zmm0, %ymm0
; CHECK-NEXT:  vcvtdq2pd %ymm0, %zmm0
; CHECK-NEXT:  vmovaps %zmm0, 64(%rdi)
; CHECK-NEXT:  vmovaps %zmm1, (%rdi)
; CHECK-NEXT:  vzeroupper
; CHECK-NEXT:  retq
               %mask = icmp slt <16 x i16> %a, zeroinitializer
               %1 = uitofp <16 x i1> %mask to <16 x double>
               store <16 x double> %1, <16 x double>* %res
               ret void
}

define <16 x i16> @test_16f32toub_256(<16 x float>* %ptr, <16 x i16> %passthru) "min-legal-vector-

```

```

width="256" {
; CHECK-LABEL: test_16f32toub_256:
; CHECK:    # %bb.0:
; CHECK-NEXT:  vcvttps2dq (%rdi), %ymm1
; CHECK-NEXT:  vpslld $31, %ymm1, %ymm1
; CHECK-NEXT:  vpmovd2m %ymm1, %k0
; CHECK-NEXT:  vcvttps2dq 32(%rdi), %ymm1
; CHECK-NEXT:  vpslld $31, %ymm1, %ymm1
; CHECK-NEXT:  vpmovd2m %ymm1, %k1
; CHECK-NEXT:  kunpckbw %k0, %k1, %k1
; CHECK-NEXT:  vmovdqu16
%ymm0, %ymm0 {%k1} {z}
; CHECK-NEXT:  retq
%a = load <16 x float>, <16 x float>* %ptr
%mask = fptoui <16 x float> %a to <16 x i1>
%select = select <16 x i1> %mask, <16 x i16> %passthru, <16 x i16> zeroinitializer
ret <16 x i16> %select
}

define <16 x i16> @test_16f32toub_512(<16 x float>* %ptr, <16 x i16> %passthru) "min-legal-vector-
width="512" {
; CHECK-LABEL: test_16f32toub_512:
; CHECK:    # %bb.0:
; CHECK-NEXT:  vcvttps2dq (%rdi), %zmm1
; CHECK-NEXT:  vpslld $31, %zmm1, %zmm1
; CHECK-NEXT:  vpmovd2m %zmm1, %k1
; CHECK-NEXT:  vmovdqu16 %ymm0, %ymm0 {%k1} {z}
; CHECK-NEXT:  retq
%a = load <16 x float>, <16 x float>* %ptr
%mask = fptoui <16 x float> %a to <16 x i1>
%select = select <16 x i1> %mask, <16 x i16> %passthru, <16 x i16> zeroinitializer
ret <16 x i16> %select
}

define <16 x i16> @test_16f32tosb_256(<16 x float>* %ptr, <16 x i16> %passthru) "min-legal-vector-
width="256" {
; CHECK-LABEL: test_16f32tosb_256:
; CHECK:    # %bb.0:
; CHECK-NEXT:
    vcvttps2dq (%rdi), %ymm1
; CHECK-NEXT:  vpmovd2m %ymm1, %k0
; CHECK-NEXT:  vcvttps2dq 32(%rdi), %ymm1
; CHECK-NEXT:  vpmovd2m %ymm1, %k1
; CHECK-NEXT:  kunpckbw %k0, %k1, %k1
; CHECK-NEXT:  vmovdqu16 %ymm0, %ymm0 {%k1} {z}
; CHECK-NEXT:  retq
%a = load <16 x float>, <16 x float>* %ptr
%mask = fptosi <16 x float> %a to <16 x i1>

```

```

%select = select <16 x i1> %mask, <16 x i16> %passthru, <16 x i16> zeroinitializer
ret <16 x i16> %select
}

```

```

define <16 x i16> @test_16f32tosb_512(<16 x float>* %ptr, <16 x i16> %passthru) "min-legal-vector-
width"="512" {
; CHECK-LABEL: test_16f32tosb_512:
; CHECK:    # %bb.0:
; CHECK-NEXT:  vcvttps2dq (%rdi), %zmm1
; CHECK-NEXT:  vpmovd2m %zmm1, %k1
; CHECK-NEXT:  vmovdqu16 %ymm0, %ymm0 {%k1} {z}
; CHECK-NEXT:  retq
%a = load <16 x float>, <16 x float>* %ptr
%mask = fptosi <16 x float> %a to <16 x i1>
%select = select <16 x i1> %mask, <16 x i16> %passthru, <16 x i16> zeroinitializer
ret <16 x i16> %select
}

```

```

define
dso_local void @mul256(<64 x i8>* %a, <64 x i8>* %b, <64 x i8>* %c) "min-legal-vector-width"="256" {
; CHECK-AVX512-LABEL: mul256:
; CHECK-AVX512:    # %bb.0:
; CHECK-AVX512-NEXT:  vmovdqa (%rdi), %ymm0
; CHECK-AVX512-NEXT:  vmovdqa 32(%rdi), %ymm1
; CHECK-AVX512-NEXT:  vmovdqa (%rsi), %ymm2
; CHECK-AVX512-NEXT:  vmovdqa 32(%rsi), %ymm3
; CHECK-AVX512-NEXT:  vpunpckhbw {{.*#+}} %ymm4 =
ymm3[8,8,9,9,10,10,11,11,12,12,13,13,14,14,15,15,24,24,25,25,26,26,27,27,28,28,29,29,30,30,31,31]
; CHECK-AVX512-NEXT:  vpunpckhbw {{.*#+}} %ymm5 =
ymm1[8,8,9,9,10,10,11,11,12,12,13,13,14,14,15,15,24,24,25,25,26,26,27,27,28,28,29,29,30,30,31,31]
; CHECK-AVX512-NEXT:  vpmullw %ymm4, %ymm5, %ymm4
; CHECK-AVX512-NEXT:  vmovdqa {{.*#+}} %ymm5 =
[255,255,255,255,255,255,255,255,255,255,255,255,255,255,255]
; CHECK-AVX512-NEXT:  vpand %ymm5, %ymm4, %ymm4
; CHECK-AVX512-NEXT:  vpunpcklbw {{.*#+}} %ymm3 =
ymm3[0,0,1,1,2,2,3,3,4,4,5,5,6,6,7,7,16,16,17,17,18,18,19,19,20,20,21,21,22,22,23,23]
;
; CHECK-AVX512-NEXT:  vpunpcklbw {{.*#+}} %ymm1 =
ymm1[0,0,1,1,2,2,3,3,4,4,5,5,6,6,7,7,16,16,17,17,18,18,19,19,20,20,21,21,22,22,23,23]
; CHECK-AVX512-NEXT:  vpmullw %ymm3, %ymm1, %ymm1
; CHECK-AVX512-NEXT:  vpand %ymm5, %ymm1, %ymm1
; CHECK-AVX512-NEXT:  vpackuswb %ymm4, %ymm1, %ymm1
; CHECK-AVX512-NEXT:  vpunpckhbw {{.*#+}} %ymm3 =
ymm2[8,8,9,9,10,10,11,11,12,12,13,13,14,14,15,15,24,24,25,25,26,26,27,27,28,28,29,29,30,30,31,31]
; CHECK-AVX512-NEXT:  vpunpckhbw {{.*#+}} %ymm4 =
ymm0[8,8,9,9,10,10,11,11,12,12,13,13,14,14,15,15,24,24,25,25,26,26,27,27,28,28,29,29,30,30,31,31]
; CHECK-AVX512-NEXT:  vpmullw %ymm3, %ymm4, %ymm3
; CHECK-AVX512-NEXT:  vpand %ymm5, %ymm3, %ymm3

```

```

; CHECK-AVX512-NEXT:  vpunpcklbw {{.*#+}} ymm2 =
ymm2[0,0,1,1,2,2,3,3,4,4,5,5,6,6,7,7,16,16,17,17,18,18,19,19,20,20,21,21,22,22,23,23]
; CHECK-AVX512-NEXT:  vpunpcklbw {{.*#+}} ymm0 =
ymm0[0,0,1,1,2,2,3,3,4,4,5,5,6,6,7,7,16,16,17,17,18,18,19,19,20,20,21,21,22,22,23,23]
; CHECK-AVX512-NEXT:  vpmullw
%ymm2, %ymm0, %ymm0
; CHECK-AVX512-NEXT:  vpand %ymm5, %ymm0, %ymm0
; CHECK-AVX512-NEXT:  vpackuswb %ymm3, %ymm0, %ymm0
; CHECK-AVX512-NEXT:  vmovdqa %ymm0, (%rdx)
; CHECK-AVX512-NEXT:  vmovdqa %ymm1, 32(%rdx)
; CHECK-AVX512-NEXT:  vzeroupper
; CHECK-AVX512-NEXT:  retq
;
; CHECK-VBMI-LABEL: mul256:
; CHECK-VBMI:  # %bb.0:
; CHECK-VBMI-NEXT:  vmovdqa (%rdi), %ymm0
; CHECK-VBMI-NEXT:  vmovdqa 32(%rdi), %ymm1
; CHECK-VBMI-NEXT:  vmovdqa (%rsi), %ymm2
; CHECK-VBMI-NEXT:  vmovdqa 32(%rsi), %ymm3
; CHECK-VBMI-NEXT:  vpunpckhbw {{.*#+}} ymm4 =
ymm3[8,8,9,9,10,10,11,11,12,12,13,13,14,14,15,15,24,24,25,25,26,26,27,27,28,28,29,29,30,30,31,31]
; CHECK-VBMI-NEXT:  vpunpckhbw {{.*#+}} ymm5 =
ymm1[8,8,9,9,10,10,11,11,12,12,13,13,14,14,15,15,24,24,25,25,26,26,27,27,28,28,29,29,30,30,31,31]
; CHECK-VBMI-NEXT:  vpmullw %ymm4, %ymm5, %ymm4
; CHECK-VBMI-NEXT:  vpunpcklbw {{.*#+}} ymm3 =
ymm3[0,0,1,1,2,2,3,3,4,4,5,5,6,6,7,7,16,16,17,17,18,18,19,19,20,20,21,21,22,22,23,23]
;
CHECK-VBMI-NEXT:  vpunpcklbw {{.*#+}} ymm1 =
ymm1[0,0,1,1,2,2,3,3,4,4,5,5,6,6,7,7,16,16,17,17,18,18,19,19,20,20,21,21,22,22,23,23]
; CHECK-VBMI-NEXT:  vpmullw %ymm3, %ymm1, %ymm1
; CHECK-VBMI-NEXT:  vmovdqa {{.*#+}} ymm3 =
[0,2,4,6,8,10,12,14,32,34,36,38,40,42,44,46,16,18,20,22,24,26,28,30,48,50,52,54,56,58,60,62]
; CHECK-VBMI-NEXT:  vpermt2b %ymm4, %ymm3, %ymm1
; CHECK-VBMI-NEXT:  vpunpckhbw {{.*#+}} ymm4 =
ymm2[8,8,9,9,10,10,11,11,12,12,13,13,14,14,15,15,24,24,25,25,26,26,27,27,28,28,29,29,30,30,31,31]
; CHECK-VBMI-NEXT:  vpunpckhbw {{.*#+}} ymm5 =
ymm0[8,8,9,9,10,10,11,11,12,12,13,13,14,14,15,15,24,24,25,25,26,26,27,27,28,28,29,29,30,30,31,31]
; CHECK-VBMI-NEXT:  vpmullw %ymm4, %ymm5, %ymm4
; CHECK-VBMI-NEXT:  vpunpcklbw {{.*#+}} ymm2 =
ymm2[0,0,1,1,2,2,3,3,4,4,5,5,6,6,7,7,16,16,17,17,18,18,19,19,20,20,21,21,22,22,23,23]
; CHECK-VBMI-NEXT:  vpunpcklbw {{.*#+}} ymm0 =
ymm0[0,0,1,1,2,2,3,3,4,4,5,5,6,6,7,7,16,16,17,17,18,18,19,19,20,20,21,21,22,22,23,23]
; CHECK-VBMI-NEXT:
vpmullw %ymm2, %ymm0, %ymm0
; CHECK-VBMI-NEXT:  vpermt2b %ymm4, %ymm3, %ymm0
; CHECK-VBMI-NEXT:  vmovdqa %ymm0, (%rdx)
; CHECK-VBMI-NEXT:  vmovdqa %ymm1, 32(%rdx)
; CHECK-VBMI-NEXT:  vzeroupper

```



```

2,42,43,43,44,44,45,45,46,46,47,47,56,56,57,57,58,58,59,59,60,60,61,61,62,62,63,63]
; CHECK-VBMI-NEXT:  vpmullw %zmm2, %zmm3, %zmm2
; CHECK-VBMI-NEXT:  vpunpcklbw {{.*#+}} zmm1 =
zmm1[0,0,1,1,2,2,3,3,4,4,5,5,6,6,7,7,16,16,17,17,18,18,19,19,20,20,21,21,22,22,23,23,32,32,33,33,34,34,35,35,36,3
6,37,37,38,38,39,39,48,48,49,49,50,50,51,51,52,52,53,53,54,54,55,55]
;
CHECK-VBMI-NEXT:  vpunpcklbw {{.*#+}} zmm0 =
zmm0[0,0,1,1,2,2,3,3,4,4,5,5,6,6,7,7,16,16,17,17,18,18,19,19,20,20,21,21,22,22,23,23,32,32,33,33,34,34,35,35,36,3
6,37,37,38,38,39,39,48,48,49,49,50,50,51,51,52,52,53,53,54,54,55,55]
; CHECK-VBMI-NEXT:  vpmullw %zmm1, %zmm0, %zmm0
; CHECK-VBMI-NEXT:  vmovdqa64 {{.*#+}} zmm1 =
[0,2,4,6,8,10,12,14,64,66,68,70,72,74,76,78,16,18,20,22,24,26,28,30,80,82,84,86,88,90,92,94,32,34,36,38,40,42,44,
46,96,98,100,102,104,106,108,110,48,50,52,54,56,58,60,62,112,114,116,118,120,122,124,126]
; CHECK-VBMI-NEXT:  vpermi2b %zmm2, %zmm0, %zmm1
; CHECK-VBMI-NEXT:  vmovdqa64 %zmm1, (%rdx)
; CHECK-VBMI-NEXT:  vzeroupper
; CHECK-VBMI-NEXT:  retq
%d = load <64 x i8>, <64 x i8>* %a
%e = load <64 x i8>, <64 x i8>* %b
%f = mul <64 x i8> %d, %e
store <64 x i8> %f, <64 x i8>* %c
ret void
}

; This threw an assertion at one point.
define <4 x i32> @mload_v4i32(<4
x i32> %trigger, <4 x i32>* %addr, <4 x i32> %dst) "min-legal-vector-width"="256" {
; CHECK-LABEL: mload_v4i32:
; CHECK:      # %bb.0:
; CHECK-NEXT:  vptestnmd %xmm0, %xmm0, %k1
; CHECK-NEXT:  vpblendmd (%rdi), %xmm1, %xmm0 {%k1}
; CHECK-NEXT:  retq
%mask = icmp eq <4 x i32> %trigger, zeroinitializer
%res = call <4 x i32> @llvm.masked.load.v4i32.p0v4i32(<4 x i32>* %addr, i32 4, <4 x i1> %mask, <4 x i32>
%dst)
ret <4 x i32> %res
}
declare <4 x i32> @llvm.masked.load.v4i32.p0v4i32(<4 x i32>* , i32, <4 x i1>, <4 x i32>)

define <16 x i32> @trunc_v16i64_v16i32(<16 x i64>* %x) nounwind "min-legal-vector-width"="256" {
; CHECK-LABEL: trunc_v16i64_v16i32:
; CHECK:      # %bb.0:
; CHECK-NEXT:  vmovdqa (%rdi), %ymm0
; CHECK-NEXT:  vmovdqa 32(%rdi), %ymm1
; CHECK-NEXT:  vmovdqa 64(%rdi), %ymm2
; CHECK-NEXT:  vmovdqa 96(%rdi), %ymm3
; CHECK-NEXT:  vpmovqd %ymm0, %xmm0
; CHECK-NEXT:  vpmovqd %ymm1, %xmm1

```

```

; CHECK-NEXT:  vinserti128 $1, %xmm1, %ymm0, %ymm0
; CHECK-NEXT:
    vpmovq  %ymm2, %xmm1
; CHECK-NEXT:  vpmovq  %ymm3, %xmm2
; CHECK-NEXT:  vinserti128 $1, %xmm2, %ymm1, %ymm1
; CHECK-NEXT:  retq
%a = load <16 x i64>, <16 x i64>* %x
%b = trunc <16 x i64> %a to <16 x i32>
ret <16 x i32> %b
}

define <16 x i8> @trunc_v16i64_v16i8(<16 x i64>* %x) nounwind "min-legal-vector-width"="256" {
; CHECK-LABEL: trunc_v16i64_v16i8:
; CHECK:      # %bb.0:
; CHECK-NEXT:  vmovdqa (%rdi), %ymm0
; CHECK-NEXT:  vmovdqa 32(%rdi), %ymm1
; CHECK-NEXT:  vmovdqa 64(%rdi), %ymm2
; CHECK-NEXT:  vmovdqa 96(%rdi), %ymm3
; CHECK-NEXT:  vpmovqb %ymm3, %xmm3
; CHECK-NEXT:  vpmovqb %ymm2, %xmm2
; CHECK-NEXT:  vpunpckldq { {. *#+} } xmm2 = xmm2[0],xmm3[0],xmm2[1],xmm3[1]
; CHECK-NEXT:  vpmovqb %ymm1, %xmm1
; CHECK-NEXT:  vpmovqb %ymm0, %xmm0
; CHECK-NEXT:  vpunpckldq { {. *#+} } xmm0 = xmm0[0],xmm1[0],xmm0[1],xmm1[1]
; CHECK-NEXT:  vpunpckldq { {. *#+} } xmm0 = xmm0[0],xmm2[0]
; CHECK-NEXT:  vzeroupper
; CHECK-NEXT:  retq
%a = load <16 x i64>, <16
x i64>* %x
%b = trunc <16 x i64> %a to <16 x i8>
ret <16 x i8> %b
}

define <16 x i8> @trunc_v16i32_v16i8(<16 x i32>* %x) nounwind "min-legal-vector-width"="256" {
; CHECK-LABEL: trunc_v16i32_v16i8:
; CHECK:      # %bb.0:
; CHECK-NEXT:  vmovdqa (%rdi), %ymm0
; CHECK-NEXT:  vmovdqa 32(%rdi), %ymm1
; CHECK-NEXT:  vpmovdb %ymm1, %xmm1
; CHECK-NEXT:  vpmovdb %ymm0, %xmm0
; CHECK-NEXT:  vpunpckldq { {. *#+} } xmm0 = xmm0[0],xmm1[0]
; CHECK-NEXT:  vzeroupper
; CHECK-NEXT:  retq
%a = load <16 x i32>, <16 x i32>* %x
%b = trunc <16 x i32> %a to <16 x i8>
ret <16 x i8> %b
}

```



```

define <8 x i8> @trunc_v8i64_v8i8(<8 x i64>* %x) nounwind "min-legal-vector-width"="256" {
; CHECK-LABEL: trunc_v8i64_v8i8:
; CHECK:    # %bb.0:
; CHECK-NEXT:  vmovdqa (%rdi), %ymm0
; CHECK-NEXT:  vmovdqa 32(%rdi), %ymm1
; CHECK-NEXT:  vpmovqb %ymm1, %xmm1
; CHECK-NEXT:  vpmovqb %ymm0, %xmm0
; CHECK-NEXT:  vpunpckldq {{.*#+}} xmm0 = xmm0[0],xmm1[0],xmm0[1],xmm1[1]
; CHECK-NEXT:  vzeroupper
;
CHECK-NEXT:  retq
%a = load <8 x i64>, <8 x i64>* %x
%b = trunc <8 x i64> %a to <8 x i8>
ret <8 x i8> %b
}

```

```

define <8 x i16> @trunc_v8i64_v8i16(<8 x i64>* %x) nounwind "min-legal-vector-width"="256" {
; CHECK-LABEL: trunc_v8i64_v8i16:
; CHECK:    # %bb.0:
; CHECK-NEXT:  vmovdqa (%rdi), %ymm0
; CHECK-NEXT:  vmovdqa 32(%rdi), %ymm1
; CHECK-NEXT:  vpmovqw %ymm1, %xmm1
; CHECK-NEXT:  vpmovqw %ymm0, %xmm0
; CHECK-NEXT:  vpunpckldq {{.*#+}} xmm0 = xmm0[0],xmm1[0]
; CHECK-NEXT:  vzeroupper
; CHECK-NEXT:  retq
%a = load <8 x i64>, <8 x i64>* %x
%b = trunc <8 x i64> %a to <8 x i16>
ret <8 x i16> %b
}

```

```

define <8 x i32> @trunc_v8i64_v8i32_zeroes(<8 x i64>* %x) nounwind "min-legal-vector-width"="256" {
; CHECK-LABEL: trunc_v8i64_v8i32_zeroes:
; CHECK:    # %bb.0:
; CHECK-NEXT:  vpsrlq $48, 32(%rdi), %ymm0
; CHECK-NEXT:  vpsrlq $48, (%rdi), %ymm1
; CHECK-NEXT:  vpackusdw %ymm0, %ymm1, %ymm0
; CHECK-NEXT:  vpermq {{.*#+}} ymm0 = ymm0[0,2,1,3]
; CHECK-NEXT:
retq
%a = load <8 x i64>, <8 x i64>* %x
%b = lshr <8 x i64> %a, <i64 48, i64 48, i64 48, i64 48, i64 48, i64 48, i64 48, i64 48>
%c = trunc <8 x i64> %b to <8 x i32>
ret <8 x i32> %c
}

```

```

define <16 x i16> @trunc_v16i32_v16i16_zeroes(<16 x i32>* %x) nounwind "min-legal-vector-width"="256" {
; CHECK-LABEL: trunc_v16i32_v16i16_zeroes:

```



```

o,xmm0[8],zero,xmm0[9],zero,xmm0[10],zero,xmm0[11],zero,xmm0[12],zero,xmm0[13],zero,xmm0[14],zero,xm
m0[15],zero
; CHECK-NEXT: vpsshufd {{.*#+}} xmm2 = xmm1[2,3,2,3]
; CHECK-NEXT: vpmovzxwq {{.*#+}} ymm2 =
xmm2[0],zero,zero,zero,xmm2[1],zero,zero,zero,xmm2[2],zero,zero,zero,xmm2[3],zero,zero,zero
; CHECK-NEXT: vextracti128 $1, %ymm1, %xmm1
; CHECK-NEXT: vpsshufd {{.*#+}} xmm3 = xmm1[2,3,2,3]
; CHECK-NEXT:
    vpmovzxwq {{.*#+}} ymm3 =
xmm3[0],zero,zero,zero,xmm3[1],zero,zero,zero,xmm3[2],zero,zero,zero,xmm3[3],zero,zero,zero
; CHECK-NEXT: vpmovzxwq {{.*#+}} ymm1 =
xmm1[0],zero,zero,zero,xmm1[1],zero,zero,zero,xmm1[2],zero,zero,zero,xmm1[3],zero,zero,zero
; CHECK-NEXT: vpmovxbq {{.*#+}} ymm0 =
xmm0[0],zero,zero,zero,zero,zero,zero,zero,xmm0[1],zero,zero,zero,zero,zero,zero,zero,xmm0[2],zero,zero,zero,zer
o,zero,zero,zero,xmm0[3],zero,zero,zero,zero,zero,zero,zero
; CHECK-NEXT: vmovdqa %ymm0, (%rdi)
; CHECK-NEXT: vmovdqa %ymm1, 64(%rdi)
; CHECK-NEXT: vmovdqa %ymm3, 96(%rdi)
; CHECK-NEXT: vmovdqa %ymm2, 32(%rdi)
; CHECK-NEXT: vzeroupper
; CHECK-NEXT: retq
%a = zext <16 x i8> %x to <16 x i64>
store <16 x i64> %a, <16 x i64>* %y
ret void
}

```

```

define dso_local void @sext_v16i8_v16i64(<16 x i8> %x, <16 x i64>* %y) nounwind "min-legal-vector-
width"="256" {

```

```

; CHECK-LABEL: sext_v16i8_v16i64:
; CHECK:    # %bb.0:
; CHECK-NEXT: vpmovsxbw %xmm0, %ymm1
; CHECK-NEXT:
    vpsshufd {{.*#+}} xmm2 = xmm1[2,3,2,3]
; CHECK-NEXT: vpmovswwq %xmm2, %ymm2
; CHECK-NEXT: vextracti128 $1, %ymm1, %xmm1
; CHECK-NEXT: vpsshufd {{.*#+}} xmm3 = xmm1[2,3,2,3]
; CHECK-NEXT: vpmovswwq %xmm3, %ymm3
; CHECK-NEXT: vpmovswwq %xmm1, %ymm1
; CHECK-NEXT: vpmovsxbq %xmm0, %ymm0
; CHECK-NEXT: vmovdqa %ymm0, (%rdi)
; CHECK-NEXT: vmovdqa %ymm1, 64(%rdi)
; CHECK-NEXT: vmovdqa %ymm3, 96(%rdi)
; CHECK-NEXT: vmovdqa %ymm2, 32(%rdi)
; CHECK-NEXT: vzeroupper
; CHECK-NEXT: retq
%a = sext <16 x i8> %x to <16 x i64>
store <16 x i64> %a, <16 x i64>* %y
ret void

```

```

}

define dso_local void @vselect_split_v8i16_setcc(<8 x i16> %s, <8 x i16> %t, <8 x i64>* %p, <8 x i64>* %q, <8
x i64>* %r) "min-legal-vector-width"="256" {
; CHECK-LABEL: vselect_split_v8i16_setcc:
; CHECK:      # %bb.0:
; CHECK-NEXT: vmovdqa (%rsi), %ymm2
; CHECK-NEXT: vmovdqa 32(%rsi), %ymm3
; CHECK-NEXT: vpcmpeqw %xmm1, %xmm0, %k1
; CHECK-NEXT: kshiftrb $4, %k1, %k2
;
; CHECK-NEXT: vmovdqa64 32(%rdi), %ymm3 {%k2}
; CHECK-NEXT: vmovdqa64 (%rdi), %ymm2 {%k1}
; CHECK-NEXT: vmovdqa %ymm2, (%rdx)
; CHECK-NEXT: vmovdqa %ymm3, 32(%rdx)
; CHECK-NEXT: vzeroupper
; CHECK-NEXT: retq
%x = load <8 x i64>, <8 x i64>* %p
%y = load <8 x i64>, <8 x i64>* %q
%a = icmp eq <8 x i16> %s, %t
%b = select <8 x i1> %a, <8 x i64> %x, <8 x i64> %y
store <8 x i64> %b, <8 x i64>* %r
ret void
}

```

```

define dso_local void @vselect_split_v8i32_setcc(<8 x i32> %s, <8 x i32> %t, <8 x i64>* %p, <8 x i64>* %q, <8
x i64>* %r) "min-legal-vector-width"="256" {
; CHECK-LABEL: vselect_split_v8i32_setcc:
; CHECK:      # %bb.0:
; CHECK-NEXT: vmovdqa (%rsi), %ymm2
; CHECK-NEXT: vmovdqa 32(%rsi), %ymm3
; CHECK-NEXT: vpcmpeqd %ymm1, %ymm0, %k1
; CHECK-NEXT: kshiftrb $4, %k1, %k2
; CHECK-NEXT: vmovdqa64 32(%rdi), %ymm3 {%k2}
; CHECK-NEXT: vmovdqa64 (%rdi), %ymm2 {%k1}
; CHECK-NEXT: vmovdqa %ymm2, (%rdx)
; CHECK-NEXT: vmovdqa %ymm3, 32(%rdx)
; CHECK-NEXT:
; CHECK-NEXT: vzeroupper
; CHECK-NEXT: retq
%x = load <8 x i64>, <8 x i64>* %p
%y = load <8 x i64>, <8 x i64>* %q
%a = icmp eq <8 x i32> %s, %t
%b = select <8 x i1> %a, <8 x i64> %x, <8 x i64> %y
store <8 x i64> %b, <8 x i64>* %r
ret void
}

```

```

define dso_local void @vselect_split_v16i8_setcc(<16 x i8> %s, <16 x i8> %t, <16 x i32>* %p, <16 x i32>* %q,
<16 x i32>* %r) "min-legal-vector-width"="256" {
; CHECK-LABEL: vselect_split_v16i8_setcc:
; CHECK:      # %bb.0:
; CHECK-NEXT: vmovdqa (%rsi), %ymm2
; CHECK-NEXT: vmovdqa 32(%rsi), %ymm3
; CHECK-NEXT: vpcmpeqb %xmm1, %xmm0, %k1
; CHECK-NEXT: kshiftrw $8, %k1, %k2
; CHECK-NEXT: vmovdqa32 32(%rdi), %ymm3 {%k2}
; CHECK-NEXT: vmovdqa32 (%rdi), %ymm2 {%k1}
; CHECK-NEXT: vmovdqa %ymm2, (%rdx)
; CHECK-NEXT: vmovdqa %ymm3, 32(%rdx)
; CHECK-NEXT: vzeroupper
; CHECK-NEXT: retq
%x = load <16 x i32>, <16 x i32>* %p
%y = load <16 x i32>, <16 x i32>* %q
%a = icmp eq <16 x i8> %s, %t
%b = select <16 x i1>
%a, <16 x i32> %x, <16 x i32> %y
store <16 x i32> %b, <16 x i32>* %r
ret void
}

```

```

define dso_local void @vselect_split_v16i16_setcc(<16 x i16> %s, <16 x i16> %t, <16 x i32>* %p, <16 x i32>*
%q, <16 x i32>* %r) "min-legal-vector-width"="256" {
; CHECK-LABEL: vselect_split_v16i16_setcc:
; CHECK:      # %bb.0:
; CHECK-NEXT: vmovdqa (%rsi), %ymm2
; CHECK-NEXT: vmovdqa 32(%rsi), %ymm3
; CHECK-NEXT: vpcmpeqw %ymm1, %ymm0, %k1
; CHECK-NEXT: kshiftrw $8, %k1, %k2
; CHECK-NEXT: vmovdqa32 32(%rdi), %ymm3 {%k2}
; CHECK-NEXT: vmovdqa32 (%rdi), %ymm2 {%k1}
; CHECK-NEXT: vmovdqa %ymm2, (%rdx)
; CHECK-NEXT: vmovdqa %ymm3, 32(%rdx)
; CHECK-NEXT: vzeroupper
; CHECK-NEXT: retq
%x = load <16 x i32>, <16 x i32>* %p
%y = load <16 x i32>, <16 x i32>* %q
%a = icmp eq <16 x i16> %s, %t
%b = select <16 x i1> %a, <16 x i32> %x, <16 x i32> %y
store <16 x i32> %b, <16 x i32>* %r
ret void
}

```

```

define <16 x i8> @trunc_packus_v16i32_v16i8(<16 x i32>* %p) "min-legal-vector-width"="256"
{
; CHECK-LABEL: trunc_packus_v16i32_v16i8:

```

```

; CHECK:    # %bb.0:
; CHECK-NEXT:  vmovdqa (%rdi), %ymm0
; CHECK-NEXT:  vpackusdw 32(%rdi), %ymm0, %ymm0
; CHECK-NEXT:  vpermq {{.*#+}} ymm0 = ymm0[0,2,1,3]
; CHECK-NEXT:  vpmovuswb %ymm0, %xmm0
; CHECK-NEXT:  vzeroupper
; CHECK-NEXT:  retq
%a = load <16 x i32>, <16 x i32>* %p
%b = icmp slt <16 x i32> %a, <i32 255, i32 255, i32 255, i32 255, i32 255, i32 255, i32 255, i32 255, i32 255, i32 255, i32 255, i32 255, i32 255, i32 255, i32 255, i32 255>
%c = select <16 x i1> %b, <16 x i32> %a, <16 x i32> <i32 255, i32 255, i32 255, i32 255, i32 255, i32 255, i32 255, i32 255, i32 255, i32 255, i32 255, i32 255, i32 255, i32 255, i32 255, i32 255>
%d = icmp sgt <16 x i32> %c, zeroinitializer
%e = select <16 x i1> %d, <16 x i32> %c, <16 x i32> zeroinitializer
%f = trunc <16 x i32> %e to <16 x i8>
ret <16 x i8> %f
}

```

```

define dso_local void @trunc_packus_v16i32_v16i8_store(<16 x i32>* %p, <16 x i8>* %q) "min-legal-vector-width"="256"

```

```

{
; CHECK-LABEL: trunc_packus_v16i32_v16i8_store:
; CHECK:    # %bb.0:
; CHECK-NEXT:  vmovdqa (%rdi), %ymm0
; CHECK-NEXT:  vpackusdw 32(%rdi), %ymm0, %ymm0
; CHECK-NEXT:  vpermq {{.*#+}} ymm0 = ymm0[0,2,1,3]
; CHECK-NEXT:  vpmovuswb %ymm0, (%rsi)
; CHECK-NEXT:  vzeroupper
; CHECK-NEXT:  retq
%a = load <16 x i32>, <16 x i32>* %p
%b = icmp slt <16 x i32> %a, <i32 255, i32 255, i32 255, i32 255, i32 255, i32 255, i32 255, i32 255, i32 255, i32 255, i32 255, i32 255, i32 255, i32 255, i32 255, i32 255>
%c = select <16 x i1> %b, <16 x i32> %a, <16 x i32> <i32 255, i32 255, i32 255, i32 255, i32 255, i32 255, i32 255, i32 255, i32 255, i32 255, i32 255, i32 255, i32 255, i32 255, i32 255, i32 255>
%d = icmp sgt <16 x i32> %c, zeroinitializer
%e = select <16 x i1> %d, <16 x i32> %c, <16 x i32> zeroinitializer
%f = trunc <16 x i32> %e to <16 x i8>
store <16 x i8> %f, <16 x i8>* %q
ret void
}

```

```

define <64 x i1> @v64i1_argument_return(<64 x i1> %x) "min-legal-vector-width"="256" {
; CHECK-LABEL: v64i1_argument_return:
; CHECK:    # %bb.0:
; CHECK-NEXT:  retq
ret <64 x i1> %x
}

```

```

define dso_local void @v64i1_shuffle(<64 x i8>* %x, <64 x i8>* %y) "min-legal-vector-width"="256" {
; CHECK-LABEL: v64i1_shuffle:
; CHECK:      # %bb.0: # %entry
; CHECK-NEXT: vmovdqa (%rdi), %ymm1
; CHECK-NEXT: vmovdqa 32(%rdi), %ymm0
; CHECK-NEXT: vptestnmb %ymm1, %ymm1, %k0
; CHECK-NEXT: kshiftrd $1, %k0, %k1
; CHECK-NEXT: kshiftrlq $63, %k0, %k2
; CHECK-NEXT: kshiftrq $62, %k2, %k2
; CHECK-NEXT: kshiftrlq $63, %k1, %k1
; CHECK-NEXT: kshiftrq $63, %k1, %k1
; CHECK-NEXT: korq %k2, %k1, %k1
; CHECK-NEXT: movq $-5, %rax
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k1, %k1
; CHECK-NEXT: kshiftrd $3, %k0, %k2
; CHECK-NEXT: kshiftrlq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $61, %k2, %k2
; CHECK-NEXT: korq %k2, %k1, %k1
; CHECK-NEXT: movq $-9, %rax
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT:
    kandq %k2, %k1, %k1
; CHECK-NEXT: kshiftrd $2, %k0, %k2
; CHECK-NEXT: kshiftrlq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $60, %k2, %k2
; CHECK-NEXT: korq %k2, %k1, %k1
; CHECK-NEXT: movq $-17, %rax
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k1, %k1
; CHECK-NEXT: kshiftrd $5, %k0, %k2
; CHECK-NEXT: kshiftrlq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $59, %k2, %k2
; CHECK-NEXT: korq %k2, %k1, %k1
; CHECK-NEXT: movq $-33, %rax
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k1, %k1
; CHECK-NEXT: kshiftrd $4, %k0, %k2
; CHECK-NEXT: kshiftrlq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $58, %k2, %k2
; CHECK-NEXT: korq %k2, %k1, %k1
; CHECK-NEXT: movq $-65, %rax
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k1, %k1
; CHECK-NEXT: kshiftrd $7, %k0, %k2
; CHECK-NEXT: kshiftrlq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $57, %k2, %k2

```



```

; CHECK-NEXT: korq %k2, %k1, %k1
; CHECK-NEXT: movq $-129, %rax
; CHECK-NEXT:
    kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k1, %k1
; CHECK-NEXT: kshiftrd $6, %k0, %k2
; CHECK-NEXT: kshiftrlq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $56, %k2, %k2
; CHECK-NEXT: korq %k2, %k1, %k1
; CHECK-NEXT: movq $-257, %rax # imm = 0xFEFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k1, %k1
; CHECK-NEXT: kshiftrd $9, %k0, %k2
; CHECK-NEXT: kshiftrlq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $55, %k2, %k2
; CHECK-NEXT: korq %k2, %k1, %k1
; CHECK-NEXT: movq $-513, %rax # imm = 0xFDFD
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k1, %k1
; CHECK-NEXT: kshiftrd $8, %k0, %k2
; CHECK-NEXT: kshiftrlq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $54, %k2, %k2
; CHECK-NEXT: korq %k2, %k1, %k1
; CHECK-NEXT: movq $-1025, %rax # imm = 0xFBFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k1, %k1
; CHECK-NEXT: kshiftrd $11, %k0, %k2
; CHECK-NEXT: kshiftrlq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $53, %k2,
%k2
; CHECK-NEXT: korq %k2, %k1, %k1
; CHECK-NEXT: movq $-2049, %rax # imm = 0xF7FF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k1, %k1
; CHECK-NEXT: kshiftrd $10, %k0, %k2
; CHECK-NEXT: kshiftrlq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $52, %k2, %k2
; CHECK-NEXT: korq %k2, %k1, %k1
; CHECK-NEXT: movq $-4097, %rax # imm = 0xEFFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k1, %k1
; CHECK-NEXT: kshiftrd $13, %k0, %k2
; CHECK-NEXT: kshiftrlq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $51, %k2, %k2
; CHECK-NEXT: korq %k2, %k1, %k1
; CHECK-NEXT: movq $-8193, %rax # imm = 0xDFFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k1, %k1

```

```

; CHECK-NEXT: kshiftrd $12, %k0, %k2
; CHECK-NEXT: kshiftrlq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $50, %k2, %k2
; CHECK-NEXT: korq %k2, %k1, %k1
; CHECK-NEXT: movq $-16385, %rax # imm = 0xBFFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k1, %k1
; CHECK-NEXT:
    kshiftrd $15, %k0, %k2
; CHECK-NEXT: kshiftrlq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $49, %k2, %k2
; CHECK-NEXT: korq %k2, %k1, %k1
; CHECK-NEXT: movq $-32769, %rax # imm = 0xFFFF7FFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k1, %k1
; CHECK-NEXT: kshiftrd $14, %k0, %k2
; CHECK-NEXT: kshiftrlq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $48, %k2, %k2
; CHECK-NEXT: korq %k2, %k1, %k1
; CHECK-NEXT: movq $-65537, %rax # imm = 0xFFFEFFFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k1, %k1
; CHECK-NEXT: kshiftrd $17, %k0, %k2
; CHECK-NEXT: kshiftrlq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $47, %k2, %k2
; CHECK-NEXT: korq %k2, %k1, %k1
; CHECK-NEXT: movq $-131073, %rax # imm = 0xFFFDFFFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k1, %k1
; CHECK-NEXT: kshiftrd $16, %k0, %k2
; CHECK-NEXT: kshiftrlq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $46, %k2, %k2
; CHECK-NEXT: korq %k2, %k1, %k1
; CHECK-NEXT:
    movq $-262145, %rax # imm = 0xFFFBFFFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k1, %k1
; CHECK-NEXT: kshiftrd $19, %k0, %k2
; CHECK-NEXT: kshiftrlq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $45, %k2, %k2
; CHECK-NEXT: korq %k2, %k1, %k1
; CHECK-NEXT: movq $-524289, %rax # imm = 0xFFF7FFFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k1, %k1
; CHECK-NEXT: kshiftrd $18, %k0, %k2
; CHECK-NEXT: kshiftrlq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $44, %k2, %k2
; CHECK-NEXT: korq %k2, %k1, %k1

```

```

; CHECK-NEXT:  movq $-1048577, %rax # imm = 0xFFEFFFFFFF
; CHECK-NEXT:  kmovq %rax, %k2
; CHECK-NEXT:  kandq %k2, %k1, %k1
; CHECK-NEXT:  kshiftrd $21, %k0, %k2
; CHECK-NEXT:  kshiftlq $63, %k2, %k2
; CHECK-NEXT:  kshiftrq $43, %k2, %k2
; CHECK-NEXT:  korq %k2, %k1, %k1
; CHECK-NEXT:  movq $-2097153, %rax # imm = 0xFFDFFFFFFF
; CHECK-NEXT:  kmovq %rax, %k2
; CHECK-NEXT:  kandq %k2, %k1, %k1
; CHECK-NEXT:  kshiftrd $20, %k0,
%k2
; CHECK-NEXT:  kshiftlq $63, %k2, %k2
; CHECK-NEXT:  kshiftrq $42, %k2, %k2
; CHECK-NEXT:  korq %k2, %k1, %k1
; CHECK-NEXT:  movq $-4194305, %rax # imm = 0xFFBFFFFFFF
; CHECK-NEXT:  kmovq %rax, %k2
; CHECK-NEXT:  kandq %k2, %k1, %k1
; CHECK-NEXT:  kshiftrd $23, %k0, %k2
; CHECK-NEXT:  kshiftlq $63, %k2, %k2
; CHECK-NEXT:  kshiftrq $41, %k2, %k2
; CHECK-NEXT:  korq %k2, %k1, %k1
; CHECK-NEXT:  movq $-8388609, %rax # imm = 0xFF7FFFFFFF
; CHECK-NEXT:  kmovq %rax, %k2
; CHECK-NEXT:  kandq %k2, %k1, %k1
; CHECK-NEXT:  kshiftrd $22, %k0, %k2
; CHECK-NEXT:  kshiftlq $63, %k2, %k2
; CHECK-NEXT:  kshiftrq $40, %k2, %k2
; CHECK-NEXT:  korq %k2, %k1, %k1
; CHECK-NEXT:  movq $-16777217, %rax # imm = 0xFEFFFFFFF
; CHECK-NEXT:  kmovq %rax, %k2
; CHECK-NEXT:  kandq %k2, %k1, %k1
; CHECK-NEXT:  kshiftrd $25, %k0, %k2
; CHECK-NEXT:  kshiftlq $63, %k2, %k2
; CHECK-NEXT:  kshiftrq $39, %k2, %k2
; CHECK-NEXT:  korq %k2, %k1, %k1
; CHECK-NEXT:  movq $-33554433,
%rax # imm = 0xFDFFFFFFF
; CHECK-NEXT:  kmovq %rax, %k2
; CHECK-NEXT:  kandq %k2, %k1, %k1
; CHECK-NEXT:  kshiftrd $24, %k0, %k2
; CHECK-NEXT:  kshiftlq $63, %k2, %k2
; CHECK-NEXT:  kshiftrq $38, %k2, %k2
; CHECK-NEXT:  korq %k2, %k1, %k1
; CHECK-NEXT:  movq $-67108865, %rax # imm = 0xFBFFFFFFF
; CHECK-NEXT:  kmovq %rax, %k2
; CHECK-NEXT:  kandq %k2, %k1, %k1
; CHECK-NEXT:  kshiftrd $27, %k0, %k2

```

```

; CHECK-NEXT: kshiflq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $37, %k2, %k2
; CHECK-NEXT: korq %k2, %k1, %k1
; CHECK-NEXT: movq $-134217729, %rax # imm = 0xF7FFFFFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k1, %k1
; CHECK-NEXT: kshiftrd $26, %k0, %k2
; CHECK-NEXT: kshiflq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $36, %k2, %k2
; CHECK-NEXT: korq %k2, %k1, %k1
; CHECK-NEXT: movq $-268435457, %rax # imm = 0xEFFFFFFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k1, %k1
; CHECK-NEXT: kshiftrd $29, %k0, %k2
; CHECK-NEXT:
    kshiflq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $35, %k2, %k2
; CHECK-NEXT: korq %k2, %k1, %k1
; CHECK-NEXT: movq $-536870913, %rax # imm = 0xDFFFFFFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k1, %k1
; CHECK-NEXT: kshiftrd $28, %k0, %k2
; CHECK-NEXT: kshiflq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $34, %k2, %k2
; CHECK-NEXT: korq %k2, %k1, %k1
; CHECK-NEXT: movq $-1073741825, %rax # imm = 0xBFFFFFFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k1, %k1
; CHECK-NEXT: kshiftrd $31, %k0, %k2
; CHECK-NEXT: kshiflq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $33, %k2, %k2
; CHECK-NEXT: korq %k2, %k1, %k1
; CHECK-NEXT: movabsq $-2147483649, %rax # imm = 0xFFFFFFFF7FFFFFFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k1, %k2
; CHECK-NEXT: vptestnmb %ymm0, %ymm0, %k1
; CHECK-NEXT: kshiftrd $30, %k0, %k0
; CHECK-NEXT: kshiflq $63, %k0, %k0
; CHECK-NEXT: kshiftrq $32, %k0, %k0
; CHECK-NEXT:
    korq %k0, %k2, %k0
; CHECK-NEXT: movabsq $-4294967297, %rax # imm = 0xFFFFFFFFFFFFFFFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k0, %k0
; CHECK-NEXT: kshiftrd $1, %k1, %k2
; CHECK-NEXT: kshiflq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $31, %k2, %k2
; CHECK-NEXT: korq %k2, %k0, %k0

```

```

; CHECK-NEXT: movabsq $-8589934593, %rax # imm = 0xFFFFFFFFFFFFFFFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k0, %k0
; CHECK-NEXT: kshiflq $63, %k1, %k2
; CHECK-NEXT: kshiftrq $30, %k2, %k2
; CHECK-NEXT: korq %k2, %k0, %k0
; CHECK-NEXT: movabsq $-17179869185, %rax # imm = 0xFFFFFFFFBFFFFFFFFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k0, %k0
; CHECK-NEXT: kshiftrd $3, %k1, %k2
; CHECK-NEXT: kshiflq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $29, %k2, %k2
; CHECK-NEXT: korq %k2, %k0, %k0
; CHECK-NEXT: movabsq $-34359738369, %rax # imm = 0xFFFFFFFF7FFFFFFFFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq
%k2, %k0, %k0
; CHECK-NEXT: kshiftrd $2, %k1, %k2
; CHECK-NEXT: kshiflq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $28, %k2, %k2
; CHECK-NEXT: korq %k2, %k0, %k0
; CHECK-NEXT: movabsq $-68719476737, %rax # imm = 0xFFFFFFFFEFFFFFFFFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k0, %k0
; CHECK-NEXT: kshiftrd $5, %k1, %k2
; CHECK-NEXT: kshiflq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $27, %k2, %k2
; CHECK-NEXT: korq %k2, %k0, %k0
; CHECK-NEXT: movabsq $-137438953473, %rax # imm = 0xFFFFFFFFDFFFFFFFFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k0, %k0
; CHECK-NEXT: kshiftrd $4, %k1, %k2
; CHECK-NEXT: kshiflq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $26, %k2, %k2
; CHECK-NEXT: korq %k2, %k0, %k0
; CHECK-NEXT: movabsq $-274877906945, %rax # imm = 0xFFFFFFFFBFFFFFFFFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k0, %k0
; CHECK-NEXT: kshiftrd $7, %k1, %k2
; CHECK-NEXT: kshiflq $63, %k2, %k2
; CHECK-NEXT:
kshiftrq $25, %k2, %k2
; CHECK-NEXT: korq %k2, %k0, %k0
; CHECK-NEXT: movabsq $-549755813889, %rax # imm = 0xFFFFFFFF7FFFFFFFFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k0, %k0
; CHECK-NEXT: kshiftrd $6, %k1, %k2
; CHECK-NEXT: kshiflq $63, %k2, %k2

```

```

; CHECK-NEXT: kshiftrq $24, %k2, %k2
; CHECK-NEXT: korq %k2, %k0, %k0
; CHECK-NEXT: movabsq $-1099511627777, %rax # imm = 0xFFFFFFFFFFFFFFFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k0, %k0
; CHECK-NEXT: kshiftrd $9, %k1, %k2
; CHECK-NEXT: kshiftrlq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $23, %k2, %k2
; CHECK-NEXT: korq %k2, %k0, %k0
; CHECK-NEXT: movabsq $-2199023255553, %rax # imm = 0xFFFFDFFFFFFFFFFFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k0, %k0
; CHECK-NEXT: kshiftrd $8, %k1, %k2
; CHECK-NEXT: kshiftrlq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $22, %k2, %k2
; CHECK-NEXT: korq %k2, %k0, %k0
; CHECK-NEXT: movabsq $-4398046511105,
%rax # imm = 0xFFFFBFFFFFFFFFFFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k0, %k0
; CHECK-NEXT: kshiftrd $11, %k1, %k2
; CHECK-NEXT: kshiftrlq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $21, %k2, %k2
; CHECK-NEXT: korq %k2, %k0, %k0
; CHECK-NEXT: movabsq $-8796093022209, %rax # imm = 0xFFFFF7FFFFFFFFFFFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k0, %k0
; CHECK-NEXT: kshiftrd $10, %k1, %k2
; CHECK-NEXT: kshiftrlq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $20, %k2, %k2
; CHECK-NEXT: korq %k2, %k0, %k0
; CHECK-NEXT: movabsq $-17592186044417, %rax # imm = 0xFFFFEFFFFFFFFFFFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k0, %k0
; CHECK-NEXT: kshiftrd $13, %k1, %k2
; CHECK-NEXT: kshiftrlq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $19, %k2, %k2
; CHECK-NEXT: korq %k2, %k0, %k0
; CHECK-NEXT: movabsq $-35184372088833, %rax # imm = 0xFFFFDFFFFFFFFFFFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k0,
%k0
; CHECK-NEXT: kshiftrd $12, %k1, %k2
; CHECK-NEXT: kshiftrlq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $18, %k2, %k2
; CHECK-NEXT: korq %k2, %k0, %k0
; CHECK-NEXT: movabsq $-70368744177665, %rax # imm = 0xFFFFBFFFFFFFFFFFF
; CHECK-NEXT: kmovq %rax, %k2

```

```

; CHECK-NEXT: kandq %k2, %k0, %k0
; CHECK-NEXT: kshiftrd $15, %k1, %k2
; CHECK-NEXT: kshiftrlq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $17, %k2, %k2
; CHECK-NEXT: korq %k2, %k0, %k0
; CHECK-NEXT: movabsq $-140737488355329, %rax # imm = 0xFFFF7FFFFFFFFFFFFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k0, %k0
; CHECK-NEXT: kshiftrd $14, %k1, %k2
; CHECK-NEXT: kshiftrlq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $16, %k2, %k2
; CHECK-NEXT: korq %k2, %k0, %k0
; CHECK-NEXT: movabsq $-281474976710657, %rax # imm = 0xFFFEFFFFFFFFFFFFFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k0, %k0
; CHECK-NEXT: kshiftrd $17, %k1, %k2
; CHECK-NEXT: kshiftrlq $63, %k2, %k2
; CHECK-NEXT:
    kshiftrq $15, %k2, %k2
; CHECK-NEXT: korq %k2, %k0, %k0
; CHECK-NEXT: movabsq $-562949953421313, %rax # imm = 0xFFFDFFFFFFFFFFFFFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k0, %k0
; CHECK-NEXT: kshiftrd $16, %k1, %k2
; CHECK-NEXT: kshiftrlq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $14, %k2, %k2
; CHECK-NEXT: korq %k2, %k0, %k0
; CHECK-NEXT: movabsq $-1125899906842625, %rax # imm = 0xFFFBFFFFFFFFFFFFFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k0, %k0
; CHECK-NEXT: kshiftrd $19, %k1, %k2
; CHECK-NEXT: kshiftrlq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $13, %k2, %k2
; CHECK-NEXT: korq %k2, %k0, %k0
; CHECK-NEXT: movabsq $-2251799813685249, %rax # imm = 0xFFF7FFFFFFFFFFFFFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k0, %k0
; CHECK-NEXT: kshiftrd $18, %k1, %k2
; CHECK-NEXT: kshiftrlq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $12, %k2, %k2
; CHECK-NEXT: korq %k2, %k0, %k0
; CHECK-NEXT: movabsq $-4503599627370497,
%rax # imm = 0xFFEFFFFFFFFFFFFFFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k0, %k0
; CHECK-NEXT: kshiftrd $21, %k1, %k2
; CHECK-NEXT: kshiftrlq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $11, %k2, %k2

```

```

; CHECK-NEXT: korq %k2, %k0, %k0
; CHECK-NEXT: movabsq $-9007199254740993, %rax # imm = 0xFFDFFFFFFFFFFFFFFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k0, %k0
; CHECK-NEXT: kshiftrd $20, %k1, %k2
; CHECK-NEXT: kshiftrlq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $10, %k2, %k2
; CHECK-NEXT: korq %k2, %k0, %k0
; CHECK-NEXT: movabsq $-18014398509481985, %rax # imm = 0xFFBFFFFFFFFFFFFFFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k0, %k0
; CHECK-NEXT: kshiftrd $23, %k1, %k2
; CHECK-NEXT: kshiftrlq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $9, %k2, %k2
; CHECK-NEXT: korq %k2, %k0, %k0
; CHECK-NEXT: movabsq $-36028797018963969, %rax # imm = 0xFF7FFFFFFFFFFFFFFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT:
    kandq %k2, %k0, %k0
; CHECK-NEXT: kshiftrd $22, %k1, %k2
; CHECK-NEXT: kshiftrlq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $8, %k2, %k2
; CHECK-NEXT: korq %k2, %k0, %k0
; CHECK-NEXT: movabsq $-72057594037927937, %rax # imm = 0xFEFFFFFFFFFFFFFFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k0, %k0
; CHECK-NEXT: kshiftrd $25, %k1, %k2
; CHECK-NEXT: kshiftrlq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $7, %k2, %k2
; CHECK-NEXT: korq %k2, %k0, %k0
; CHECK-NEXT: movabsq $-144115188075855873, %rax # imm = 0xFDFFFFFFFFFFFFFFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k0, %k0
; CHECK-NEXT: kshiftrd $24, %k1, %k2
; CHECK-NEXT: kshiftrlq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $6, %k2, %k2
; CHECK-NEXT: korq %k2, %k0, %k0
; CHECK-NEXT: movabsq $-288230376151711745, %rax # imm = 0xFBFFFFFFFFFFFFFFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k0, %k0
; CHECK-NEXT: kshiftrd $27, %k1, %k2
; CHECK-NEXT: kshiftrlq
$63, %k2, %k2
; CHECK-NEXT: kshiftrq $5, %k2, %k2
; CHECK-NEXT: korq %k2, %k0, %k0
; CHECK-NEXT: movabsq $-576460752303423489, %rax # imm = 0xF7FFFFFFFFFFFFFFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k0, %k0

```



```

; CHECK-NEXT: kshiftrd $26, %k1, %k2
; CHECK-NEXT: kshiftrlq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $4, %k2, %k2
; CHECK-NEXT: korq %k2, %k0, %k0
; CHECK-NEXT: movabsq $-1152921504606846977, %rax # imm = 0xEFFFFFFFFFFFFFFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k0, %k0
; CHECK-NEXT: kshiftrd $29, %k1, %k2
; CHECK-NEXT: kshiftrlq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $3, %k2, %k2
; CHECK-NEXT: korq %k2, %k0, %k0
; CHECK-NEXT: movabsq $-2305843009213693953, %rax # imm = 0xDFFFFFFFFFFFFFFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k0, %k0
; CHECK-NEXT: kshiftrd $28, %k1, %k2
; CHECK-NEXT: kshiftrlq $63, %k2, %k2
; CHECK-NEXT: kshiftrq $2, %k2, %k2
; CHECK-NEXT: korq %k2,
%k0, %k0
; CHECK-NEXT: movabsq $-4611686018427387905, %rax # imm = 0xBFFFFFFFFFFFFFFF
; CHECK-NEXT: kmovq %rax, %k2
; CHECK-NEXT: kandq %k2, %k0, %k0
; CHECK-NEXT: kshiftrd $31, %k1, %k2
; CHECK-NEXT: kshiftrlq $62, %k2, %k2
; CHECK-NEXT: korq %k2, %k0, %k0
; CHECK-NEXT: kshiftrd $30, %k1, %k1
; CHECK-NEXT: kshiftrlq $1, %k0, %k0
; CHECK-NEXT: kshiftrq $1, %k0, %k0
; CHECK-NEXT: kshiftrlq $63, %k1, %k1
; CHECK-NEXT: korq %k1, %k0, %k1
; CHECK-NEXT: vmovdqu8 %ymm1, (%rsi) {%k1}
; CHECK-NEXT: kshiftrq $32, %k1, %k1
; CHECK-NEXT: vmovdqu8 %ymm0, 32(%rsi) {%k1}
; CHECK-NEXT: vzeroupper
; CHECK-NEXT: retq
entry:
%a = load <64 x i8>, <64 x i8>* %x
%b = icmp eq <64 x i8> %a, zeroinitializer
%shuf = shufflevector <64 x i1> %b, <64 x i1> undef, <64 x i32> <i32 1, i32 0, i32 3, i32 2, i32 5, i32 4, i32 7, i32
6, i32 9, i32 8, i32 11, i32 10, i32 13, i32 12, i32 15, i32 14, i32 17, i32 16, i32 19, i32 18, i32 21, i32 20, i32 23, i32
22, i32 25,
i32 24, i32 27, i32 26, i32 29, i32 28, i32 31, i32 30, i32 33, i32 32, i32 35, i32 34, i32 37, i32 36, i32 39, i32 38,
i32 41, i32 40, i32 43, i32 42, i32 45, i32 44, i32 47, i32 46, i32 49, i32 48, i32 51, i32 50, i32 53, i32 52, i32 55, i32
54, i32 57, i32 56, i32 59, i32 58, i32 61, i32 60, i32 63, i32 62>
call void @llvm.masked.store.v64i8.p0v64i8(<64 x i8> %a, <64 x i8>* %y, i32 1, <64 x i1> %shuf)
ret void
}
declare void @llvm.masked.store.v64i8.p0v64i8(<64 x i8>, <64 x i8>*, i32, <64 x i1>)

```

```

@mem64_dst = dso_local global i64 0, align 8
@mem64_src = dso_local global i64 0, align 8
define dso_local i32 @v64i1_inline_asm() "min-legal-vector-width"="256" {
; CHECK-LABEL: v64i1_inline_asm:
; CHECK:      # %bb.0:
; CHECK-NEXT:  kmovq mem64_src(%rip), %k0
; CHECK-NEXT:  #APP
; CHECK-NEXT:  #NO_APP
; CHECK-NEXT:  kmovq %k0, mem64_dst(%rip)
; CHECK-NEXT:  movl -{[0-9]+}(%rsp), %eax
; CHECK-NEXT:  retq
%1 = alloca i32, align 4
%2 = load i64, i64* @mem64_src, align
8
%3 = call i64 @asm "", "=k,k,~{dirflag},~{fpsr},~{flags}"(i64 %2)
store i64 %3, i64* @mem64_dst, align 8
%4 = load i32, i32* %1, align 4
ret i32 %4
}

```

```

define dso_local void @cmp_v8i64_sext(<8 x i64>* %xptra, <8 x i64>* %yptra, <8 x i64>* %zptr) "min-legal-
vector-width"="256" {
; CHECK-LABEL: cmp_v8i64_sext:
; CHECK:      # %bb.0:
; CHECK-NEXT:  vmovdqa (%rsi), %ymm0
; CHECK-NEXT:  vmovdqa 32(%rsi), %ymm1
; CHECK-NEXT:  vpcmpgtq 32(%rdi), %ymm1, %ymm1
; CHECK-NEXT:  vpcmpgtq (%rdi), %ymm0, %ymm0
; CHECK-NEXT:  vmovdqa %ymm0, (%rdx)
; CHECK-NEXT:  vmovdqa %ymm1, 32(%rdx)
; CHECK-NEXT:  vzeroupper
; CHECK-NEXT:  retq
%x = load <8 x i64>, <8 x i64>* %xptra
%y = load <8 x i64>, <8 x i64>* %yptra
%cmp = icmp slt <8 x i64> %x, %y
%ext = sext <8 x i1> %cmp to <8 x i64>
store <8 x i64> %ext, <8 x i64>* %zptr
ret void
}

```

```

define dso_local void @cmp_v8i64_zext(<8 x i64>* %xptra, <8 x i64>* %yptra, <8 x i64>* %zptr) "min-legal-
vector-width"="256" {
; CHECK-LABEL: cmp_v8i64_zext:
;
; CHECK:      # %bb.0:
; CHECK-NEXT:  vmovdqa (%rsi), %ymm0
; CHECK-NEXT:  vmovdqa 32(%rsi), %ymm1

```

```

; CHECK-NEXT: vpcmpgtq 32(%rdi), %ymm1, %ymm1
; CHECK-NEXT: vpcmpgtq (%rdi), %ymm0, %ymm0
; CHECK-NEXT: vpsrlq $63, %ymm1, %ymm1
; CHECK-NEXT: vpsrlq $63, %ymm0, %ymm0
; CHECK-NEXT: vmovdqa %ymm0, (%rdx)
; CHECK-NEXT: vmovdqa %ymm1, 32(%rdx)
; CHECK-NEXT: vzeroupper
; CHECK-NEXT: retq
%x = load <8 x i64>, <8 x i64>* %xptr
%y = load <8 x i64>, <8 x i64>* %yptr
%cmp = icmp slt <8 x i64> %x, %y
%ext = zext <8 x i1> %cmp to <8 x i64>
store <8 x i64> %ext, <8 x i64>* %zptr
ret void
}

define <16 x i8> @var_rotate_v16i8(<16 x i8> %a, <16 x i8> %b) nounwind "min-legal-vector-width"="256" {
; CHECK-AVX512-LABEL: var_rotate_v16i8:
; CHECK-AVX512: # %bb.0:
; CHECK-AVX512-NEXT: vpand {{\.?LCPI[0-9]+_[0-9]+}}(%rip), %xmm1, %xmm1
; CHECK-AVX512-NEXT: vpmovzxbw {{.*#+}} ymm1 =
xmm1[0],zero,xmm1[1],zero,xmm1[2],zero,xmm1[3],zero,xmm1[4],zero,xmm1[5],zero,xmm1[6],zero,xmm1[7],zer
o,xmm1[8],zero,xmm1[9],zero,xmm1[10],zero,xmm1[11],zero,xmm1[12],zero,xmm1[13],zero,xmm1[14],zero,xm
m1[15],zero
;
CHECK-AVX512-NEXT: vpmovzxbw {{.*#+}} ymm0 =
xmm0[0],zero,xmm0[1],zero,xmm0[2],zero,xmm0[3],zero,xmm0[4],zero,xmm0[5],zero,xmm0[6],zero,xmm0[7],zer
o,xmm0[8],zero,xmm0[9],zero,xmm0[10],zero,xmm0[11],zero,xmm0[12],zero,xmm0[13],zero,xmm0[14],zero,xm
m0[15],zero
; CHECK-AVX512-NEXT: vpslq {{.*#+}} ymm0 =
ymm0[0,0,2,2,4,4,6,6,8,8,10,10,12,12,14,14,16,16,18,18,20,20,22,22,24,24,26,26,28,28,30,30]
; CHECK-AVX512-NEXT: vpsllvw %ymm1, %ymm0, %ymm0
; CHECK-AVX512-NEXT: vpsrlw $8, %ymm0, %ymm0
; CHECK-AVX512-NEXT: vpmovwb %ymm0, %xmm0
; CHECK-AVX512-NEXT: vzeroupper
; CHECK-AVX512-NEXT: retq
;
; CHECK-VBMI-LABEL: var_rotate_v16i8:
; CHECK-VBMI: # %bb.0:
; CHECK-VBMI-NEXT: # kill: def $xmm0 killed $xmm0 def $ymm0
; CHECK-VBMI-NEXT: vmovdqa {{.*#+}} ymm2 =
[0,0,1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,13,13,14,14,15,15]
;
CHECK-VBMI-NEXT: vpand {{\.?LCPI[0-9]+_[0-9]+}}(%rip), %xmm1, %xmm1
; CHECK-VBMI-NEXT: vperm %ymm0, %ymm2, %ymm0
; CHECK-VBMI-NEXT: vpmovzxbw {{.*#+}} ymm1 =
xmm1[0],zero,xmm1[1],zero,xmm1[2],zero,xmm1[3],zero,xmm1[4],zero,xmm1[5],zero,xmm1[6],zero,xmm1[7],zer
o,xmm1[8],zero,xmm1[9],zero,xmm1[10],zero,xmm1[11],zero,xmm1[12],zero,xmm1[13],zero,xmm1[14],zero,xm

```



```

{
; CHECK-LABEL: splatvar_rotate_v32i8:
; CHECK:      # %bb.0:
; CHECK-NEXT:  vpunpckhbw {{.*#+}} ymm2 =
ymm0[8,8,9,9,10,10,11,11,12,12,13,13,14,14,15,15,24,24,25,25,26,26,27,27,28,28,29,29,30,30,31,31]
; CHECK-NEXT:  vpand {{\?.?LCPI[0-9]+_[0-9]+}}(%rip), %xmm1, %xmm1
; CHECK-NEXT:
    vpsllw %xmm1, %ymm2, %ymm2
; CHECK-NEXT:  vpsrlw $8, %ymm2, %ymm2
; CHECK-NEXT:  vpunpcklbw {{.*#+}} ymm0 =
ymm0[0,0,1,1,2,2,3,3,4,4,5,5,6,6,7,7,16,16,17,17,18,18,19,19,20,20,21,21,22,22,23,23]
; CHECK-NEXT:  vpsllw %xmm1, %ymm0, %ymm0
; CHECK-NEXT:  vpsrlw $8, %ymm0, %ymm0
; CHECK-NEXT:  vpackuswb %ymm2, %ymm0, %ymm0
; CHECK-NEXT:  retq
    %splat = shufflevector <32 x i8> %b, <32 x i8> undef, <32 x i32> zeroinitializer
    %splat8 = sub <32 x i8> <i8 8, i8 8, i8 8, i8 8, i8 8, i8 8, i8 8, i8 8, i8 8, i8 8, i8 8, i8 8, i8 8, i8 8, i8 8, i8 8, i8 8, i8 8, i8 8, i8 8, i8 8, i8 8, i8 8, i8 8, i8 8, i8 8, i8 8, i8 8, i8 8, i8 8, i8 8, i8 8>, %splat
    %shl = shl <32 x i8> %a, %splat
    %lshr = lshr <32 x i8> %a, %splat8
    %or = or <32 x i8> %shl, %lshr
    ret <32 x i8> %or
}

define <32 x i8> @constant_rotate_v32i8(<32 x i8> %a) nounwind "min-legal-vector-width"="256" {
; CHECK-LABEL: constant_rotate_v32i8:
; CHECK:      # %bb.0:
; CHECK-NEXT:  vpunpckhbw {{.*#+}} ymm1
= ymm0[8,8,9,9,10,10,11,11,12,12,13,13,14,14,15,15,24,24,25,25,26,26,27,27,28,28,29,29,30,30,31,31]
; CHECK-NEXT:  vpsllvw {{\?.?LCPI[0-9]+_[0-9]+}}(%rip), %ymm1, %ymm1
; CHECK-NEXT:  vpsrlw $8, %ymm1, %ymm1
; CHECK-NEXT:  vpunpcklbw {{.*#+}} ymm0 =
ymm0[0,0,1,1,2,2,3,3,4,4,5,5,6,6,7,7,16,16,17,17,18,18,19,19,20,20,21,21,22,22,23,23]
; CHECK-NEXT:  vpsllvw {{\?.?LCPI[0-9]+_[0-9]+}}(%rip), %ymm0, %ymm0
; CHECK-NEXT:  vpsrlw $8, %ymm0, %ymm0
; CHECK-NEXT:  vpackuswb %ymm1, %ymm0, %ymm0
; CHECK-NEXT:  retq
    %shl = shl <32 x i8> %a, <i8 0, i8 1, i8 2, i8 3, i8 4, i8 5, i8 6, i8 7, i8 8, i8 7, i8 6, i8 5, i8 4, i8 3, i8 2, i8 1, i8 0, i8 1, i8 2, i8 3, i8 4, i8 5, i8 6, i8 7, i8 8, i8 7, i8 6, i8 5, i8 4, i8 3, i8 2, i8 1>
    %lshr = lshr <32 x i8> %a, <i8 8, i8 7, i8 6, i8 5, i8 4, i8 3, i8 2, i8 1, i8 0, i8 1, i8 2, i8 3, i8 4, i8 5, i8 6, i8 7, i8 8, i8 7, i8 6, i8 5, i8 4, i8 3, i8 2, i8 1, i8 0, i8 1, i8 2, i8 3, i8 4, i8 5, i8 6, i8 7>
    %or = or <32 x i8> %shl, %lshr
    ret <32 x i8> %or
}

define <32 x i8> @splatconstant_rotate_v32i8(<32 x i8> %a) nounwind "min-legal-vector-width"="256" {
; CHECK-LABEL: splatconstant_rotate_v32i8:
; CHECK:      # %bb.0:

```


"Licensor" shall mean the copyright owner or entity authorized by the copyright owner that is granting the License.

"Legal Entity" shall mean the union of the acting entity and all other entities that control, are controlled by, or are under common control with that entity. For the purposes of this definition, "control" means (i) the power, direct or indirect, to cause the direction or management of such entity, whether by contract or otherwise, or (ii) ownership of fifty percent (50%) or more of the outstanding shares, or (iii) beneficial ownership of such entity.

"You" (or "Your") shall mean an individual or Legal Entity exercising permissions granted by this License.

"Source" form shall mean the preferred form for making modifications, including but not limited to software source code, documentation source, and configuration files.

"Object" form shall mean any form resulting from mechanical transformation or translation of a Source form, including but not limited to compiled object code, generated documentation, and conversions to other media types.

"Work" shall mean the work of authorship, whether in Source or Object form, made available under the License, as indicated by a copyright notice that is included in or attached to the work (an example is provided in the Appendix below).

"Derivative Works" shall mean any work, whether in Source or Object form, that is based on (or derived from) the Work and for which the editorial revisions, annotations, elaborations, or other modifications represent, as a whole, an original work of authorship. For the purposes of this License, Derivative Works shall not include works that remain separable from, or merely link (or bind by name) to the interfaces of, the Work and Derivative Works thereof.

"Contribution" shall mean any work of authorship, including the original version of the Work and any modifications or additions to that Work or Derivative Works thereof, that is intentionally submitted to Licensor for inclusion in the Work by the copyright owner or by an individual or Legal Entity authorized to submit on behalf of the copyright owner. For the purposes of this definition, "submitted" means any form of electronic, verbal, or written communication sent to the Licensor or its representatives, including but not limited to

communication on electronic mailing lists, source code control systems, and issue tracking systems that are managed by, or on behalf of, the Licensor for the purpose of discussing and improving the Work, but excluding communication that is conspicuously marked or otherwise designated in writing by the copyright owner as "Not a Contribution."

"Contributor" shall mean Licensor and any individual or Legal Entity on behalf of whom a Contribution has been received by Licensor and subsequently incorporated within the Work.

2. Grant of Copyright License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable copyright license to reproduce, prepare Derivative Works of, publicly display, publicly perform, sublicense, and distribute the Work and such Derivative Works in Source or Object form.

3. Grant of Patent License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable (except as stated in this section) patent license to make, have made, use, offer to sell, sell, import, and otherwise transfer the Work, where such license applies only to those patent claims licensable by such Contributor that are necessarily infringed by their Contribution(s) alone or by combination of their Contribution(s) with the Work to which such Contribution(s) was submitted. If You institute patent litigation against any entity (including a cross-claim or counterclaim in a lawsuit) alleging that the Work or a Contribution incorporated within the Work constitutes direct or contributory patent infringement, then any patent licenses granted to You under this License for that Work shall terminate as of the date such litigation is filed.

4. Redistribution. You may reproduce and distribute copies of the Work or Derivative Works thereof in any medium, with or without modifications, and in Source or Object form, provided that You meet the following conditions:

- (a) You must give any other recipients of the Work or Derivative Works a copy of this License; and
- (b) You must cause any modified files to carry prominent notices stating that You changed the files; and
- (c) You must retain, in the Source form of any Derivative Works that You distribute, all copyright, patent, trademark, and attribution notices from the Source form of the Work,

excluding those notices that do not pertain to any part of the Derivative Works; and

(d) If the Work includes a "NOTICE" text file as part of its distribution, then any Derivative Works that You distribute must include a readable copy of the attribution notices contained within such NOTICE file, excluding those notices that do not pertain to any part of the Derivative Works, in at least one of the following places: within a NOTICE text file distributed as part of the Derivative Works; within the Source form or documentation, if provided along with the Derivative Works; or, within a display generated by the Derivative Works, if and wherever such third-party notices normally appear. The contents of the NOTICE file are for informational purposes only and do not modify the License. You may add Your own attribution notices within Derivative Works that You distribute, alongside or as an addendum to the NOTICE text from the Work, provided that such additional attribution notices cannot be construed as modifying the License.

You may add Your own copyright statement to Your modifications and may provide additional or different license terms and conditions for use, reproduction, or distribution of Your modifications, or for any such Derivative Works as a whole, provided Your use, reproduction, and distribution of the Work otherwise complies with the conditions stated in this License.

5. Submission of Contributions. Unless You explicitly state otherwise, any Contribution intentionally submitted for inclusion in the Work by You to the Licensor shall be under the terms and conditions of this License, without any additional terms or conditions. Notwithstanding the above, nothing herein shall supersede or modify the terms of any separate license agreement you may have executed with Licensor regarding such Contributions.

6. Trademarks. This License does not grant permission to use the trade names, trademarks, service marks, or product names of the Licensor, except as required for reasonable and customary use in describing the origin of the Work and reproducing the content of the NOTICE file.

7. Disclaimer of Warranty. Unless required by applicable law or agreed to in writing, Licensor provides the Work (and each Contributor provides its Contributions) on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied, including, without limitation, any warranties or conditions

of TITLE, NON-INFRINGEMENT, MERCHANTABILITY, or FITNESS FOR A PARTICULAR PURPOSE. You are solely responsible for determining the appropriateness of using or redistributing the Work and assume any risks associated with Your exercise of permissions under this License.

8. Limitation of Liability. In no event and under no legal theory, whether in tort (including negligence), contract, or otherwise, unless required by applicable law (such as deliberate and grossly negligent acts) or agreed to in writing, shall any Contributor be liable to You for damages, including any direct, indirect, special, incidental, or consequential damages of any character arising as a result of this License or out of the use or inability to use the Work (including but not limited to damages for loss of goodwill, work stoppage, computer failure or malfunction, or any and all other commercial damages or losses), even if such Contributor has been advised of the possibility of such damages.

9. Accepting Warranty or Additional Liability. While redistributing the Work or Derivative Works thereof, You may choose to offer, and charge a fee for, acceptance of support, warranty, indemnity, or other liability obligations and/or rights consistent with this License. However, in accepting such obligations, You may act only on Your own behalf and on Your sole responsibility, not on behalf of any other Contributor, and only if You agree to indemnify, defend, and hold each Contributor harmless for any liability incurred by, or claims asserted against, such Contributor by reason of your accepting any such warranty or additional liability.

END OF TERMS AND CONDITIONS

APPENDIX: How to apply the Apache License to your work.

To apply the Apache License to your work, attach the following boilerplate notice, with the fields enclosed by brackets "[]" replaced with your own identifying information. (Don't include the brackets!) The text should be enclosed in the appropriate comment syntax for the file format. We also recommend that a file or class name and description of purpose be included on the same "printed page" as the copyright notice for easier identification within third-party archives.

Copyright [yyyy] [name of copyright owner]

Licensed under the Apache License, Version 2.0 (the "License");
you may not use this file except in compliance with the License.
You may obtain a copy of the License at

<http://www.apache.org/licenses/LICENSE-2.0>

Unless required by applicable law or agreed to in writing, software distributed under the License is distributed on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.

---- LLVM Exceptions to the Apache 2.0 License ----

As an exception, if, as a result of your compiling your source code, portions of this Software are embedded into an Object form of such source code, you may redistribute such embedded portions in such Object form without complying with the conditions of Sections 4(a), 4(b) and 4(d) of the License.

In addition, if you combine or link compiled forms of this Software with software that is licensed under the GPLv2 ("Combined Software") and if a court of competent jurisdiction determines that the patent provision (Section 3), the indemnity provision (Section 9) or other Section of the License conflicts with the conditions of the GPLv2, you may retroactively and prospectively choose to deem waived or otherwise exclude such Section(s) of the License, but only in their entirety and only with respect to the Combined Software.

=====
Software from third parties included in the LLVM Project:
=====

The LLVM Project contains third party software which is under different license terms. All such code will be identified clearly using at least one of two mechanisms:

- 1) It will be in a separate directory tree with its own `LICENSE.txt` or `LICENSE` file at the top containing the specific license and restrictions which apply to that software, or
- 2) It will contain specific license and restriction terms at the top of every file.

=====
Legacy LLVM License (<https://llvm.org/docs/DeveloperPolicy.html#legacy>):
=====

University of Illinois/NCSA
Open Source License

Copyright (c) 2003-2019 University of Illinois at Urbana-Champaign.
All rights reserved.

Developed by:

LLVM Team

University of Illinois at Urbana-Champaign

<http://llvm.org>

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal with the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do

so, subject to the following conditions:

- * Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimers.
- * Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimers in the documentation and/or other materials provided with the distribution.
- * Neither the names of the LLVM Team, University of Illinois at Urbana-Champaign, nor the names of its contributors may be used to endorse or promote products derived from this Software without specific prior written permission.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE CONTRIBUTORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS WITH THE SOFTWARE.

=====
The LLVM Project is under the Apache License v2.0 with LLVM Exceptions:
=====

Apache License
Version 2.0, January 2004
<http://www.apache.org/licenses/>

TERMS AND CONDITIONS FOR USE, REPRODUCTION, AND DISTRIBUTION

1. Definitions.

"License" shall mean the terms and conditions for use, reproduction, and distribution as defined by Sections 1 through 9 of this document.

"Licensor" shall mean the copyright owner or entity authorized by the copyright owner that is granting the License.

"Legal Entity" shall mean the union of the acting entity and all other entities that control, are controlled by, or are under common control with that entity. For the purposes of this definition,

"control" means (i) the power, direct or indirect, to cause the direction or management of such entity, whether by contract or otherwise, or (ii) ownership of fifty percent (50%) or more of the outstanding shares, or (iii) beneficial ownership of such entity.

"You" (or "Your") shall mean an individual or Legal Entity exercising permissions granted by this License.

"Source" form shall mean the preferred form for making modifications, including but not limited to software source code, documentation source, and configuration files.

"Object" form shall mean any form resulting from mechanical transformation or translation of a Source form, including but not limited to compiled object code, generated documentation, and conversions to other media types.

"Work" shall mean the work of authorship, whether in Source or Object form, made available under the License, as indicated by a copyright notice that is included in or attached to the work (an example is provided in the Appendix below).

"Derivative Works" shall mean any work, whether in Source or Object form, that is based on (or derived from) the Work and for which the editorial revisions, annotations, elaborations, or other modifications represent, as a whole, an original work of authorship. For the purposes of this License, Derivative Works shall not include works that remain separable from, or merely link (or bind by name) to the interfaces of, the Work and Derivative Works thereof.

"Contribution" shall mean any work of authorship, including the original version of the Work and any modifications or additions to that Work or Derivative Works thereof, that is intentionally submitted to Licensor for inclusion in the Work by the copyright owner or by an individual or Legal Entity authorized to submit on behalf of the copyright owner. For the purposes of this definition,

"submitted"

means any form of electronic, verbal, or written communication sent to the Licensor or its representatives, including but not limited to communication on electronic mailing lists, source code control systems, and issue tracking systems that are managed by, or on behalf of, the Licensor for the purpose of discussing and improving the Work, but excluding communication that is conspicuously marked or otherwise designated in writing by the copyright owner as "Not a Contribution."

"Contributor" shall mean Licensor and any individual or Legal Entity on behalf of whom a Contribution has been received by Licensor and subsequently incorporated within the Work.

2. Grant of Copyright License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable copyright license to reproduce, prepare Derivative Works of, publicly display, publicly perform, sublicense, and distribute the Work and such Derivative Works in Source or Object form.

3. Grant of Patent License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable (except as stated in this section) patent license to make, have made, use, offer to sell, sell, import, and otherwise transfer the Work, where such license applies only to those patent claims licensable by such Contributor that are necessarily infringed by their Contribution(s) alone or by combination of their Contribution(s) with the Work to which such Contribution(s) was submitted. If You institute patent litigation against any entity (including a cross-claim or counterclaim in a lawsuit) alleging that the Work or a Contribution incorporated within the Work constitutes direct or contributory patent infringement, then any patent licenses granted to You under this License for that Work shall terminate as of the date such litigation is filed.

4. Redistribution. You may reproduce and distribute copies of the Work or Derivative Works thereof in any medium, with or without modifications, and in Source or Object form, provided that You meet the following conditions:

(a) You must give any other recipients of the Work or Derivative Works a copy of this License; and

(b) You must cause any modified files to carry prominent notices stating that You changed the files; and

(c) You must retain, in the Source form of any Derivative Works that You distribute, all copyright, patent, trademark, and attribution notices from the Source form of the Work, excluding those notices that do not pertain to any part of the Derivative Works; and

(d) If the Work includes a "NOTICE" text file as part of its distribution, then any Derivative Works that You distribute must include a readable copy of the attribution notices contained within such NOTICE file, excluding those notices that do not pertain to any part of the Derivative Works, in at least one of the following places: within a NOTICE text file distributed as part of the Derivative Works; within the Source form or documentation, if provided along with the Derivative Works; or, within a display generated by the Derivative Works, if and wherever such third-party notices normally appear. The contents of the NOTICE file are for informational purposes only and do not modify the License. You may add Your own attribution notices within Derivative Works that You distribute, alongside or as an addendum to the NOTICE text from the Work, provided that such additional attribution notices cannot be construed as modifying the License.

You may add Your own copyright statement to Your modifications and may provide additional or different license terms and conditions for use, reproduction, or distribution of Your modifications, or for any such Derivative Works as a whole, provided Your use, reproduction, and distribution of the Work otherwise complies with the conditions stated in this License.

5. Submission of Contributions. Unless You explicitly state otherwise, any Contribution intentionally submitted for inclusion in the Work by You to the Licensor shall be under the terms and conditions of this License, without any additional terms or conditions.

Notwithstanding the above, nothing herein shall supersede or modify the terms of any separate license agreement you may have executed with Licensor regarding such Contributions.

6. Trademarks. This License does not grant permission to use the trade names, trademarks, service marks, or product names of the Licensor, except as required for reasonable and customary use in describing the origin of the Work and reproducing the content of the NOTICE file.

7. Disclaimer of Warranty. Unless required by applicable law or agreed to in writing, Licensor provides the Work (and each

Contributor provides its Contributions) on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied, including, without limitation, any warranties or conditions of TITLE, NON-INFRINGEMENT, MERCHANTABILITY, or FITNESS FOR A PARTICULAR PURPOSE. You are solely responsible for determining the appropriateness of using or redistributing the Work and assume any risks associated with Your exercise of permissions under this License.

8. Limitation of Liability. In no event and under no legal theory, whether in tort (including negligence), contract, or otherwise, unless required by applicable law (such as deliberate and grossly negligent acts) or agreed to in writing, shall any Contributor be liable to You for damages, including any direct, indirect, special, incidental, or consequential damages of any character arising as a result of this License or out of the use or inability to use the Work (including but not limited to damages for loss of goodwill, work stoppage, computer failure or malfunction, or any and all other commercial damages or losses), even if such Contributor has been advised of the possibility of such damages.

9. Accepting Warranty or Additional Liability. While redistributing the Work or Derivative Works thereof, You may choose to offer, and charge a fee for, acceptance of support, warranty, indemnity, or other liability obligations and/or rights consistent with this License. However, in accepting such obligations, You may act only on Your own behalf and on Your sole responsibility, not on behalf of any other Contributor, and only if You agree to indemnify, defend, and hold each Contributor harmless for any liability incurred by, or claims asserted against, such Contributor by reason of your accepting any such warranty or additional liability.

END OF TERMS AND CONDITIONS

APPENDIX: How to apply the Apache License to your work.

To apply the Apache License to your work, attach the following boilerplate notice, with the fields enclosed by brackets "[]" replaced with your own identifying information. (Don't include the brackets!) The text should be enclosed in the appropriate comment syntax for the file format. We also recommend that a file or class name and description of purpose be included on the same "printed page" as the copyright notice for easier identification within third-party archives.

Copyright [yyyy] [name of copyright owner]

Licensed under the Apache License, Version 2.0 (the "License");
you may not use this file except in compliance with the License.
You may obtain a copy of the License at

<http://www.apache.org/licenses/LICENSE-2.0>

Unless required by applicable law or agreed to in writing, software
distributed under the License is distributed on an "AS IS" BASIS,
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
See the License for the specific language governing permissions and
limitations under the License.

---- LLVM Exceptions to the Apache 2.0 License ----

As an exception, if, as a result of your compiling your source code, portions
of this Software are embedded into an Object form of such source code, you
may redistribute such embedded portions in such Object form without complying
with the conditions of Sections 4(a), 4(b) and 4(d) of the License.

In addition, if you combine or link compiled
forms of this Software with
software that is licensed under the GPLv2 ("Combined Software") and if a
court of competent jurisdiction determines that the patent provision (Section
3), the indemnity provision (Section 9) or other Section of the License
conflicts with the conditions of the GPLv2, you may retroactively and
prospectively choose to deem waived or otherwise exclude such Section(s) of
the License, but only in their entirety and only with respect to the Combined
Software.

=====
Software from third parties included in the LLVM Project:
=====

The LLVM Project contains third party software which is under different license
terms. All such code will be identified clearly using at least one of two
mechanisms:

- 1) It will be in a separate directory tree with its own `LICENSE.txt` or
`LICENSE` file at the top containing the specific
license and restrictions
which apply to that software, or
- 2) It will contain specific license and restriction terms at the top of every
file.

=====
Legacy LLVM License (<https://llvm.org/docs/DeveloperPolicy.html#legacy>):
=====

University of Illinois/NCSA
Open Source License

Copyright (c) 2010 Apple Inc.
All rights reserved.

Developed by:

LLDB Team

<http://lldb.lvm.org/>

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal with the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

- * Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimers.
- * Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimers in the documentation and/or other materials provided with the distribution.
- * Neither the names of the LLDB Team, copyright holders, nor the names of its contributors may be used to endorse or promote products derived from this Software without specific prior written permission.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE CONTRIBUTORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS WITH THE SOFTWARE.

ISC LICENSE

This license is approved by the OSI and FSF as GPL-compatible.
<http://opensource.org/licenses/isc-license.txt>

Copyright (c) 2013-2014, Pexpect development team
Copyright (c) 2012, Noah Spurrier <noah@noah.org>

Permission to use, copy, modify, and/or distribute this software for any purpose with or without fee is hereby granted, provided that the above copyright notice and this permission notice appear in all copies.

THE SOFTWARE IS PROVIDED "AS IS" AND THE AUTHOR DISCLAIMS ALL WARRANTIES WITH REGARD TO THIS SOFTWARE INCLUDING ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS. IN NO EVENT SHALL THE AUTHOR BE LIABLE FOR ANY SPECIAL, DIRECT, INDIRECT, OR CONSEQUENTIAL DAMAGES OR ANY DAMAGES WHATSOEVER RESULTING FROM LOSS OF USE, DATA OR PROFITS, WHETHER IN AN ACTION OF CONTRACT, NEGLIGENCE OR OTHER TORTIOUS ACTION, ARISING OUT OF OR IN CONNECTION WITH THE USE OR PERFORMANCE OF THIS SOFTWARE.

```
; RUN: opt -passes=consthoist -S -o - %s | FileCheck %s
target datalayout = "e-m:e-p:32:32-i64:64-v128:64:128-a:0:32-n32-S64"
target triple = "thumbv6m-none--musleabi"
```

```
; Check that for i8 type, the maximum legal offset is 31.
; Also check that a constant used as value to be stored rather than
; pointer in a store instruction is hoisted.
; CHECK: foo_i8
; CHECK-DAG: %[[C1:const[0-9]?]] = bitcast i32 805874720 to i32
; CHECK-DAG: %[[C2:const[0-9]?]] = bitcast i32 805874688 to i32
; CHECK-DAG: %[[C3:const[0-9]?]] = bitcast i32 805873720 to i32
; CHECK-DAG: %[[C4:const[0-9]?]] = bitcast i32 805873688 to i32
; CHECK: %0 = inttoptr i32 %[[C2]] to ptr
; CHECK-NEXT: %1 = load volatile i8, ptr %0
; CHECK-NEXT: %[[M1:const_mat[0-9]?]] = add i32 %[[C2]], 4
; CHECK-NEXT: %2 = inttoptr i32 %[[M1]] to ptr
; CHECK-NEXT: %3 = load volatile i8, ptr %2
; CHECK-NEXT: %[[M2:const_mat[0-9]?]] = add i32 %[[C2]], 31
; CHECK-NEXT: %4 = inttoptr i32 %[[M2]] to ptr
; CHECK-NEXT: %5 = load volatile
i8, ptr %4
; CHECK-NEXT: %6 = inttoptr i32 %[[C1]] to ptr
; CHECK-NEXT: %7 = load volatile i8, ptr %6
; CHECK-NEXT: %[[M3:const_mat[0-9]?]] = add i32 %[[C1]], 7
; CHECK-NEXT: %8 = inttoptr i32 %[[M3]] to ptr
; CHECK-NEXT: %9 = load volatile i8, ptr %8
; CHECK-NEXT: %10 = inttoptr i32 %[[C4]] to ptr
; CHECK-NEXT: store i8 %9, ptr %10
; CHECK-NEXT: %[[M4:const_mat[0-9]?]] = add i32 %[[C4]], 31
; CHECK-NEXT: %11 = inttoptr i32 %[[M4]] to ptr
; CHECK-NEXT: store i8 %7, ptr %11
; CHECK-NEXT: %12 = inttoptr i32 %[[C3]] to ptr
; CHECK-NEXT: store i8 %5, ptr %12
; CHECK-NEXT: %[[M5:const_mat[0-9]?]] = add i32 %[[C3]], 7
; CHECK-NEXT: %13 = inttoptr i32 %[[M5]] to ptr
; CHECK-NEXT: store i8 %3, ptr %13
; CHECK-NEXT: %[[M6:const_mat[0-9]?]] = add i32 %[[C1]], 80
; CHECK-NEXT: %14 = inttoptr i32 %[[M6]] to ptr
; CHECK-NEXT: store ptr %14, ptr @goo
```

@goo = global ptr undef

```
define void @foo_i8() {
entry:
%0 = load volatile i8, ptr inttoptr (i32 805874688 to ptr)
%1 = load volatile
i8, ptr inttoptr (i32 805874692 to ptr)
%2 = load volatile i8, ptr inttoptr (i32 805874719 to ptr)
%3 = load volatile i8, ptr inttoptr (i32 805874720 to ptr)
%4 = load volatile i8, ptr inttoptr (i32 805874727 to ptr)
store i8 %4, ptr inttoptr(i32 805873688 to ptr)
store i8 %3, ptr inttoptr(i32 805873719 to ptr)
store i8 %2, ptr inttoptr(i32 805873720 to ptr)
store i8 %1, ptr inttoptr(i32 805873727 to ptr)
store ptr inttoptr(i32 805874800 to ptr), ptr @goo
ret void
}
```

```
; Check that for i16 type, the maximum legal offset is 62.
; CHECK: foo_i16
; CHECK-DAG: %[[C1:const[0-9]?]] = bitcast i32 805874752 to i32
; CHECK-DAG: %[[C2:const[0-9]?]] = bitcast i32 805874688 to i32
; CHECK: %0 = inttoptr i32 %[[C2]] to ptr
; CHECK-NEXT: %1 = load volatile i16, ptr %0, align 2
; CHECK-NEXT: %[[M1:const_mat[0-9]?]] = add i32 %[[C2]], 4
; CHECK-NEXT: %2 = inttoptr i32 %[[M1]] to ptr
; CHECK-NEXT: %3 = load volatile i16, ptr %2, align 2
; CHECK-NEXT: %[[M2:const_mat[0-9]?]] = add
i32 %[[C2]], 32
; CHECK-NEXT: %4 = inttoptr i32 %[[M2]] to ptr
; CHECK-NEXT: %5 = load volatile i16, ptr %4, align 2
; CHECK-NEXT: %[[M3:const_mat[0-9]?]] = add i32 %[[C2]], 62
; CHECK-NEXT: %6 = inttoptr i32 %[[M3]] to ptr
; CHECK-NEXT: %7 = load volatile i16, ptr %6, align 2
; CHECK-NEXT: %8 = inttoptr i32 %[[C1]] to ptr
; CHECK-NEXT: %9 = load volatile i16, ptr %8, align 2
; CHECK-NEXT: %[[M4:const_mat[0-9]?]] = add i32 %[[C1]], 22
; CHECK-NEXT: %10 = inttoptr i32 %[[M4]] to ptr
; CHECK-NEXT: %11 = load volatile i16, ptr %10, align 2
```

```
define void @foo_i16() {
entry:
%0 = load volatile i16, ptr inttoptr (i32 805874688 to ptr), align 2
%1 = load volatile i16, ptr inttoptr (i32 805874692 to ptr), align 2
%2 = load volatile i16, ptr inttoptr (i32 805874720 to ptr), align 2
%3 = load volatile i16, ptr inttoptr (i32 805874750 to ptr), align 2
%4 = load volatile i16, ptr inttoptr (i32 805874752 to ptr), align 2
%5 = load volatile i16, ptr inttoptr (i32 805874774 to ptr), align
```

2

```
ret void  
}
```

```
; Check that for i32 type, the maximum legal offset is 124.  
; CHECK: foo_i32  
; CHECK-DAG: %[[C1:const[0-9]?]] = bitcast i32 805874816 to i32  
; CHECK-DAG: %[[C2:const[0-9]?]] = bitcast i32 805874688 to i32  
; CHECK: %0 = inttoptr i32 %[[C2]] to ptr  
; CHECK-NEXT: %1 = load volatile i32, ptr %0, align 4  
; CHECK-NEXT: %[[M1:const_mat[0-9]?]] = add i32 %[[C2]], 4  
; CHECK-NEXT: %2 = inttoptr i32 %[[M1]] to ptr  
; CHECK-NEXT: %3 = load volatile i32, ptr %2, align 4  
; CHECK-NEXT: %[[M2:const_mat[0-9]?]] = add i32 %[[C2]], 124  
; CHECK-NEXT: %4 = inttoptr i32 %[[M2]] to ptr  
; CHECK-NEXT: %5 = load volatile i32, ptr %4, align 4  
; CHECK-NEXT: %6 = inttoptr i32 %[[C1]] to ptr  
; CHECK-NEXT: %7 = load volatile i32, ptr %6, align 4  
; CHECK-NEXT: %[[M3:const_mat[0-9]?]] = add i32 %[[C1]], 8  
; CHECK-NEXT: %8 = inttoptr i32 %[[M3]] to ptr  
; CHECK-NEXT: %9 = load volatile i32, ptr %8, align 4  
; CHECK-NEXT: %[[M4:const_mat[0-9]?]] = add i32 %[[C1]], 12  
; CHECK-NEXT: %10 = inttoptr  
i32 %[[M4]] to ptr  
; CHECK-NEXT: %11 = load volatile i32, ptr %10, align 4
```

```
define void @foo_i32() {  
entry:  
%0 = load volatile i32, ptr inttoptr (i32 805874688 to ptr), align 4  
%1 = load volatile i32, ptr inttoptr (i32 805874692 to ptr), align 4  
%2 = load volatile i32, ptr inttoptr (i32 805874812 to ptr), align 4  
%3 = load volatile i32, ptr inttoptr (i32 805874816 to ptr), align 4  
%4 = load volatile i32, ptr inttoptr (i32 805874824 to ptr), align 4  
%5 = load volatile i32, ptr inttoptr (i32 805874828 to ptr), align 4  
ret void  
}
```

clang-tidy High-Integrity C++ Files

All clang-tidy files are licensed under the same terms as the rest of the LLVM project with the following additions:

Any file referencing a High-Integrity C++ Coding guideline:

HIC++ Coding Standard as created by PRQA.

Please see <http://www.codingstandard.com/section/conditions-of-use/> for more information.

```
; RUN: llc -march=hexagon < %s
```

```
; REQUIRES: asserts
```

```
; The two loads based on %struct.0, loading two different data types  
; cause LSR to assume type "void" for the memory type. This would then  
; cause an assert in isLegalAddressingMode. Make sure we no longer crash.
```

```
target triple = "hexagon"
```

```
%struct.0 = type { ptr, i8, %union.anon.0 }
```

```
%union.anon.0 = type { ptr }
```

```
define hidden fastcc void @fred() unnamed_addr #0 {
```

```
entry:
```

```
br i1 undef, label %while.end, label %while.body.lr.ph
```

```
while.body.lr.ph:                                ; preds = %entry
```

```
br label %while.body
```

```
while.body:                                      ; preds = %exit.2, %while.body.lr.ph
```

```
%lsr.iv = phi ptr [ %cgep22, %exit.2 ], [ undef, %while.body.lr.ph ]
```

```
switch i32 undef, label %exit [
```

```
  i32 1, label %sw.bb.i
```

```
  i32 2, label %sw.bb3.i
```

```
]
```

```
sw.bb.i:                                         ; preds = %while.body
```

```
unreachable
```

```
sw.bb3.i:                                       ; preds = %while.body
```

```
unreachable
```

```
exit:
```

```
                                ; preds = %while.body
```

```
switch i32 undef, label %exit.2 [
```

```
  i32 1, label %sw.bb.i17
```

```
  i32 2, label %sw.bb3.i20
```

```
]
```

```
sw.bb.i17:                                       ; preds = %exit
```

```
%0 = load i32, ptr %lsr.iv, align 4
```

```
unreachable
```

```
sw.bb3.i20:                                      ; preds = %exit
```

```
%1 = load ptr, ptr %lsr.iv, align 4
```

```
unreachable
```

```
exit.2:                                          ; preds = %exit
```

```
%cgep22 = getelementptr %struct.0, ptr %lstr.iv, i32 1  
br label %while.body
```

```
while.end:                ; preds = %entry  
ret void  
}
```

```
attributes #0 = { nounwind optsize "target-cpu"="hexagonv55" }
```

```
; NOTE: Assertions have been autogenerated by utils/update_test_checks.py UTC_ARGS: --include-generated-funcs
```

```
; RUN: opt -S -passes=verify,iroutliner -ir-outlining-no-cost < %s | FileCheck %s
```

```
; This test checks that debug info is recognized as able to be extracted along  
; with the other instructions, but is not included in the consolidated function.
```

```
define void @function1() !dbg !6 {  
entry:  
  %a = alloca i32, align 4, !dbg !17  
  call void @llvm.dbg.value(metadata ptr %a, metadata !9, metadata !DIExpression()), !dbg !17  
  %b = alloca i32, align 4, !dbg !18  
  call void @llvm.dbg.value(metadata ptr %b, metadata !11, metadata !DIExpression()), !dbg !18  
  %c = alloca i32, align 4, !dbg !19  
  call void @llvm.dbg.value(metadata ptr %c, metadata !12, metadata !DIExpression()), !dbg !19  
  store i32 2, ptr %a, align 4, !dbg !20  
  store i32 3, ptr %b, align 4, !dbg !21  
  store i32 4, ptr %c, align 4, !dbg !22  
  %al = load i32, ptr %a, align 4, !dbg !23  
  call void @llvm.dbg.value(metadata i32 %al,  
  metadata !13, metadata !DIExpression()), !dbg !23  
  %bl = load i32, ptr %b, align 4, !dbg !24  
  call void @llvm.dbg.value(metadata i32 %bl, metadata !15, metadata !DIExpression()), !dbg !24  
  %cl = load i32, ptr %c, align 4, !dbg !25  
  call void @llvm.dbg.value(metadata i32 %cl, metadata !16, metadata !DIExpression()), !dbg !25  
  ret void, !dbg !26  
}
```

```
define void @function2() !dbg !27 {  
entry:  
  %a = alloca i32, align 4, !dbg !35  
  call void @llvm.dbg.value(metadata ptr %a, metadata !29, metadata !DIExpression()), !dbg !35  
  %b = alloca i32, align 4, !dbg !36  
  call void @llvm.dbg.value(metadata ptr %b, metadata !30, metadata !DIExpression()), !dbg !36  
  %c = alloca i32, align 4, !dbg !37  
  call void @llvm.dbg.value(metadata ptr %c, metadata !31, metadata !DIExpression()), !dbg !37  
  store i32 2, ptr %a, align 4, !dbg !38  
  store i32 3, ptr %b, align 4, !dbg !39  
  store i32 4, ptr %c, align 4, !dbg !40  
  %al = load i32, ptr %a, align 4, !dbg !41
```

```

call void @llvm.dbg.value(metadata
i32 %a1, metadata !32, metadata !DIExpression()), !dbg !41
%b1 = load i32, ptr %b, align 4, !dbg !42
call void @llvm.dbg.value(metadata i32 %b1, metadata !33, metadata !DIExpression()), !dbg !42
%c1 = load i32, ptr %c, align 4, !dbg !43
call void @llvm.dbg.value(metadata i32 %c1, metadata !34, metadata !DIExpression()), !dbg !43
ret void, !dbg !44
}

; Function Attrs: nounwind readnone speculatable willreturn
declare void @llvm.dbg.value(metadata, metadata, metadata) #0

attributes #0 = { nounwind readnone speculatable willreturn }

!llvm.dbg.cu = !{!0}
!llvm.debugify = !{!3, !4}
!llvm.module.flags = !{!5}

!0 = distinct !DICompileUnit(language: DW_LANG_C, file: !1, producer: "debugify", isOptimized: true,
runtimeVersion: 0, emissionKind: FullDebug, enums: !2)
!1 = !DIFile(filename: "legal-debug.ll", directory: "")
!2 = !{}
!3 = !{i32 20}
!4 = !{i32 12}
!5 = !{i32 2, !"Debug Info Version", i32 3}
!6 = distinct !DISubprogram(name: "function1", linkageName: "function1", scope:
null, file: !1, line: 1, type: !7, scopeLine: 1, spFlags: DISPFlagDefinition | DISPFlagOptimized, unit: !0,
retainedNodes: !8)
!7 = !DISubroutineType(types: !2)
!8 = !{!9, !11, !12, !13, !15, !16}
!9 = !DILocalVariable(name: "1", scope: !6, file: !1, line: 1, type: !10)
!10 = !DIBasicType(name: "ty64", size: 64, encoding: DW_ATE_unsigned)
!11 = !DILocalVariable(name: "2", scope: !6, file: !1, line: 2, type: !10)
!12 = !DILocalVariable(name: "3", scope: !6, file: !1, line: 3, type: !10)
!13 = !DILocalVariable(name: "4", scope: !6, file: !1, line: 7, type: !14)
!14 = !DIBasicType(name: "ty32", size: 32, encoding: DW_ATE_unsigned)
!15 = !DILocalVariable(name: "5", scope: !6, file: !1, line: 8, type: !14)
!16 = !DILocalVariable(name: "6", scope: !6, file: !1, line: 9, type: !14)
!17 = !DILocation(line: 1, column: 1, scope: !6)
!18 = !DILocation(line: 2, column: 1, scope: !6)
!19 = !DILocation(line: 3, column: 1, scope: !6)
!20 = !DILocation(line: 4, column: 1, scope: !6)
!21 = !DILocation(line:
5, column: 1, scope: !6)
!22 = !DILocation(line: 6, column: 1, scope: !6)
!23 = !DILocation(line: 7, column: 1, scope: !6)
!24 = !DILocation(line: 8, column: 1, scope: !6)

```



```

!25 = !DILocation(line: 9, column: 1, scope: !6)
!26 = !DILocation(line: 10, column: 1, scope: !6)
!27 = distinct !DISubprogram(name: "function2", linkageName: "function2", scope: null, file: !1, line: 11, type: !7,
scopeLine: 11, spFlags: DISPFlagDefinition | DISPFlagOptimized, unit: !0, retainedNodes: !28)
!28 = !{!29, !30, !31, !32, !33, !34}
!29 = !DILocalVariable(name: "7", scope: !27, file: !1, line: 11, type: !10)
!30 = !DILocalVariable(name: "8", scope: !27, file: !1, line: 12, type: !10)
!31 = !DILocalVariable(name: "9", scope: !27, file: !1, line: 13, type: !10)
!32 = !DILocalVariable(name: "10", scope: !27, file: !1, line: 17, type: !14)
!33 = !DILocalVariable(name: "11", scope: !27, file: !1, line: 18, type: !14)
!34 = !DILocalVariable(name: "12", scope: !27, file: !1, line: 19, type: !14)
!35 = !DILocation(line:
  11, column: 1, scope: !27)
!36 = !DILocation(line: 12, column: 1, scope: !27)
!37 = !DILocation(line: 13, column: 1, scope: !27)
!38 = !DILocation(line: 14, column: 1, scope: !27)
!39 = !DILocation(line: 15, column: 1, scope: !27)
!40 = !DILocation(line: 16, column: 1, scope: !27)
!41 = !DILocation(line: 17, column: 1, scope: !27)
!42 = !DILocation(line: 18, column: 1, scope: !27)
!43 = !DILocation(line: 19, column: 1, scope: !27)
!44 = !DILocation(line: 20, column: 1, scope: !27)
; CHECK-LABEL: @function1(
; CHECK-NEXT: entry:
; CHECK-NEXT:  [[A:%.*]] = alloca i32, align 4, !dbg [[DBG17:![0-9]+]]
; CHECK-NEXT:  call void @llvm.dbg.value(metadata ptr [[A]], metadata [[META9:![0-9]+]], metadata
!DIExpression()), !dbg [[DBG17]]
; CHECK-NEXT:  [[B:%.*]] = alloca i32, align 4, !dbg [[DBG18:![0-9]+]]
; CHECK-NEXT:  call void @llvm.dbg.value(metadata ptr [[B]], metadata [[META11:![0-9]+]], metadata
!DIExpression()), !dbg [[DBG18]]
; CHECK-NEXT:  [[C:%.*]] = alloca
i32, align 4, !dbg [[DBG19:![0-9]+]]
; CHECK-NEXT:  call void @llvm.dbg.value(metadata ptr [[C]], metadata [[META12:![0-9]+]], metadata
!DIExpression()), !dbg [[DBG19]]
; CHECK-NEXT:  call void @outlined_ir_func_0(ptr [[A]], ptr [[B]], ptr [[C]]), !dbg [[DBG20:![0-9]+]]
; CHECK-NEXT:  ret void, !dbg [[DBG21:![0-9]+]]
;
;
; CHECK-LABEL: @function2(
; CHECK-NEXT: entry:
; CHECK-NEXT:  [[A:%.*]] = alloca i32, align 4, !dbg [[DBG30:![0-9]+]]
; CHECK-NEXT:  call void @llvm.dbg.value(metadata ptr [[A]], metadata [[META24:![0-9]+]], metadata
!DIExpression()), !dbg [[DBG30]]
; CHECK-NEXT:  [[B:%.*]] = alloca i32, align 4, !dbg [[DBG31:![0-9]+]]
; CHECK-NEXT:  call void @llvm.dbg.value(metadata ptr [[B]], metadata [[META25:![0-9]+]], metadata
!DIExpression()), !dbg [[DBG31]]
; CHECK-NEXT:  [[C:%.*]] = alloca i32, align 4, !dbg [[DBG32:![0-9]+]]
; CHECK-NEXT:  call void @llvm.dbg.value(metadata ptr [[C]], metadata [[META26:![0-9]+]], metadata

```

```

!DIExpression()), !dbg [[DBG32]]
;
CHECK-NEXT: call void @outlined_ir_func_0(ptr [[A]], ptr [[B]], ptr [[C]], !dbg [[DBG33:![0-9]+]])
; CHECK-NEXT: ret void, !dbg [[DBG34:![0-9]+]])
;
;
; CHECK: @outlined_ir_func_0(ptr [[TMP0:%.*]], ptr [[TMP1:%.*]], ptr [[TMP2:%.*]])
; CHECK: entry_to_outline:
; CHECK-NEXT: store i32 2, ptr [[TMP0]], align 4
; CHECK-NEXT: store i32 3, ptr [[TMP1]], align 4
; CHECK-NEXT: store i32 4, ptr [[TMP2]], align 4
; CHECK-NEXT: [[AL:%.*]] = load i32, ptr [[TMP0]], align 4
; CHECK-NEXT: [[BL:%.*]] = load i32, ptr [[TMP1]], align 4
; CHECK-NEXT: [[CL:%.*]] = load i32, ptr [[TMP2]], align 4
; CHECK-NEXT: br label [[ENTRY_AFTER_OUTLINE_EXITSTUB:%.*]]
;
; RUN: opt < %s -passes=argpromotion -S | FileCheck %s

; CHECK-LABEL: define i32 @foo() #0 {
; CHECK-NEXT:   %.val = load <32 x half>, ptr undef, align 4
; CHECK-NEXT:   call void @bar(<32 x half> %.val)
; CHECK-NEXT:   ret i32 0
; CHECK-NEXT: }

; CHECK-LABEL: define internal void @bar(<32 x half> %.0.val) #0 {
; CHECK-NEXT:   ret void
; CHECK-NEXT: }

; CHECK: attributes #0 = { uwtable "min-legal-vector-width"="512" }

define i32 @foo() #0 {
  call void @bar(ptr undef)
  ret i32 0
}

define internal void @bar(ptr) #0 {
  %2 = load <32 x half>, ptr %0, align 4
  ret void
}

attributes #0 = { uwtable "min-legal-vector-width"="0" }
MIT License (MIT)

```

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do

so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

=====
The LLVM Project is under the Apache License v2.0 with LLVM Exceptions:
=====

Apache License
Version 2.0, January 2004
<http://www.apache.org/licenses/>

TERMS AND CONDITIONS FOR USE, REPRODUCTION, AND DISTRIBUTION

1. Definitions.

"License" shall mean the terms and conditions for use, reproduction, and distribution as defined by Sections 1 through 9 of this document.

"Licensor" shall mean the copyright owner or entity authorized by the copyright owner that is granting the License.

"Legal Entity" shall mean the union of the acting entity and all other entities that control, are controlled by, or are under common control with that entity. For the purposes of this definition, "control" means (i) the power, direct or indirect, to cause the direction or management of such entity, whether by contract or otherwise, or (ii) ownership of fifty percent (50%) or more of the outstanding shares, or (iii) beneficial ownership of such entity.

"You" (or "Your") shall mean an individual or Legal Entity exercising permissions granted by this License.

"Source" form shall mean the preferred form for making modifications, including but not limited to software source code, documentation source, and configuration files.

"Object" form shall mean any form resulting from mechanical

transformation or translation of a Source form, including but not limited to compiled object code, generated documentation, and conversions to other media types.

"Work" shall mean the work of authorship, whether in Source or Object form, made available under the License, as indicated by a copyright notice that is included in or attached to the work (an example is provided in the Appendix below).

"Derivative Works" shall mean any work, whether in Source or Object form, that is based on (or derived from) the Work and for which the editorial revisions, annotations, elaborations, or other modifications represent, as a whole, an original work of authorship. For the purposes of this License, Derivative Works shall not include works that remain separable from, or merely link (or bind by name) to the interfaces of, the Work and Derivative Works thereof.

"Contribution" shall mean any work of authorship, including the original version of the Work and any modifications or additions to that Work or Derivative Works thereof, that is intentionally submitted to Licensor for inclusion in the Work by the copyright owner or by an individual or Legal Entity authorized to submit on behalf of the copyright owner. For the purposes of this definition,

"submitted"

means any form of electronic, verbal, or written communication sent to the Licensor or its representatives, including but not limited to communication on electronic mailing lists, source code control systems, and issue tracking systems that are managed by, or on behalf of, the Licensor for the purpose of discussing and improving the Work, but excluding communication that is conspicuously marked or otherwise designated in writing by the copyright owner as "Not a Contribution."

"Contributor" shall mean Licensor and any individual or Legal Entity on behalf of whom a Contribution has been received by Licensor and subsequently incorporated within the Work.

2. Grant of Copyright License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable copyright license to reproduce, prepare Derivative Works of, publicly display, publicly perform, sublicense, and distribute the Work and such Derivative Works in Source or Object form.

3. Grant of Patent License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable

(except as stated in this section) patent license to make, have made, use, offer to sell, sell, import, and otherwise transfer the Work, where such license applies only to those patent claims licensable by such Contributor that are necessarily infringed by their Contribution(s) alone or by combination of their Contribution(s) with the Work to which such Contribution(s) was submitted. If You institute patent litigation against any entity (including a cross-claim or counterclaim in a lawsuit) alleging that the Work or a Contribution incorporated within the Work constitutes direct or contributory patent infringement, then any patent licenses granted to You under this License for that Work shall terminate as of the date such litigation is filed.

4. Redistribution. You may reproduce and distribute copies of the Work or Derivative Works thereof in any medium, with or without modifications, and in Source or Object form, provided that You meet the following conditions:

(a) You must give any other recipients of the Work or Derivative Works a copy of this License; and

(b) You must cause any modified files to carry prominent notices stating that You changed the files; and

(c) You must retain, in the Source form of any Derivative Works that You distribute, all copyright, patent, trademark, and attribution notices from the Source form of the Work, excluding those notices that do not pertain to any part of the Derivative Works; and

(d) If the Work includes a "NOTICE" text file as part of its distribution, then any Derivative Works that You distribute must include a readable copy of the attribution notices contained within such NOTICE file, excluding those notices that do not pertain to any part of the Derivative Works, in at least one of the following places: within a NOTICE text file distributed as part of the Derivative Works; within the Source form or documentation, if provided along with the Derivative Works; or, within a display generated by the Derivative Works, if and wherever such third-party notices normally appear. The contents of the NOTICE file are for informational purposes only and do not modify the License. You may add Your own attribution notices within Derivative Works that You distribute, alongside or as an addendum to the NOTICE text from the Work, provided that such additional attribution notices cannot be construed as modifying the License.

You may add Your own copyright statement to Your modifications and may provide additional or different license terms and conditions for use, reproduction, or distribution of Your modifications, or for any such Derivative Works as a whole, provided Your use, reproduction, and distribution of the Work otherwise complies with the conditions stated in this License.

5. Submission of Contributions. Unless You explicitly state otherwise, any Contribution intentionally submitted for inclusion in the Work by You to the Licensor shall be under the terms and conditions of this License, without any additional terms or conditions.

Notwithstanding the above, nothing herein shall supersede or modify the terms of any separate license agreement you may have executed with Licensor regarding such Contributions.

6. Trademarks. This License

does not grant permission to use the trade

names, trademarks, service marks, or product names of the Licensor, except as required for reasonable and customary use in describing the origin of the Work and reproducing the content of the NOTICE file.

7. Disclaimer of Warranty. Unless required by applicable law or agreed to in writing, Licensor provides the Work (and each Contributor provides its Contributions) on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied, including, without limitation, any warranties or conditions of TITLE, NON-INFRINGEMENT, MERCHANTABILITY, or FITNESS FOR A PARTICULAR PURPOSE. You are solely responsible for determining the appropriateness of using or redistributing the Work and assume any risks associated with Your exercise of permissions under this License.

8. Limitation of Liability. In no event and under no legal theory, whether in tort (including negligence), contract, or otherwise, unless required by applicable law (such as deliberate and grossly negligent acts) or agreed to in writing, shall any Contributor be liable to You for damages, including any direct, indirect, special, incidental, or consequential damages of any character arising as a result of this License or out of the use or inability to use the Work (including but not limited to damages for loss of goodwill, work stoppage, computer failure or malfunction, or any and all other commercial damages or losses), even if such Contributor has been advised of the possibility of such damages.

9. Accepting Warranty or Additional Liability. While redistributing the Work or Derivative Works thereof, You may choose to offer, and charge a fee for, acceptance of support, warranty, indemnity,

or other liability obligations and/or rights consistent with this License. However, in accepting such obligations, You may act only on Your own behalf and on Your sole responsibility, not on behalf of any other Contributor, and only if You agree to indemnify, defend, and hold each Contributor harmless for any liability incurred by, or claims asserted against, such Contributor by reason of your accepting any such warranty or additional liability.

END OF TERMS AND CONDITIONS

APPENDIX: How to apply the Apache License to your work.

To apply the Apache License to your work, attach the following boilerplate notice, with the fields enclosed by brackets "[]" replaced with your own identifying information. (Don't include the brackets!) The text should be enclosed in the appropriate comment syntax for the file format. We also recommend that a file or class name and description of purpose be included on the same "printed page" as the copyright notice for easier identification within third-party archives.

Copyright [yyyy] [name of copyright owner]

Licensed under the Apache License, Version 2.0 (the "License");
you may not use this file except in compliance with the License.
You may obtain a copy of the License at

<http://www.apache.org/licenses/LICENSE-2.0>

Unless required by applicable law or agreed to in writing, software distributed under the License is distributed on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.

---- LLVM Exceptions to the Apache 2.0 License ----

As an exception, if, as a result of your compiling your source code, portions of this Software are embedded into an Object form of such source code, you may redistribute such embedded portions in such Object form without complying with the conditions of Sections 4(a), 4(b) and 4(d) of the License.

In addition, if you combine or link compiled forms of this Software with software that is licensed under the GPLv2 ("Combined Software") and if a court of competent jurisdiction determines that the patent provision (Section

3), the indemnity provision (Section 9) or other Section of the License conflicts with the conditions of the GPLv2, you may retroactively and prospectively choose to deem waived or otherwise exclude such Section(s) of the License, but only in their entirety and only with respect to the Combined Software.

=====
Software from third parties included in the LLVM Project:
=====

The LLVM Project contains third party software which is under different license terms. All such code will be identified clearly using at least one of two mechanisms:

- 1) It will be in a separate directory tree with its own `LICENSE.txt` or `LICENSE` file at the top containing the specific license and restrictions which apply to that software, or
- 2) It will contain specific license and restriction terms at the top of every file.

=====
Legacy LLVM License (<https://llvm.org/docs/DeveloperPolicy.html#legacy>):
=====

The libC++ library is dual licensed under both the University of Illinois "BSD-Like" license and the MIT license. As a user of this code you may choose to use it under either license. As a contributor, you agree to allow your code to be used under both.

Full text of the relevant licenses is included below.

=====
University of Illinois/NCSA
Open Source License

Copyright (c) 2009-2019 by the contributors listed in CREDITS.TXT

All rights reserved.

Developed by:

LLVM Team

University of Illinois at Urbana-Champaign

<http://llvm.org>

Permission

is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal with the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

- * Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimers.

- * Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimers in the documentation and/or other materials provided with the distribution.

- * Neither the names of the LLVM Team, University of Illinois at Urbana-Champaign, nor the names of its contributors may be used to endorse or promote products derived from this Software without specific prior written permission.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE CONTRIBUTORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS WITH THE SOFTWARE.

=====

Copyright (c) 2009-2014 by the contributors listed in CREDITS.TXT

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM,

OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

This work is released into the public domain with CC0 1.0. Alternatively, it is licensed under the Apache License 2.0.

Creative Commons Legal Code

CC0 1.0 Universal

CREATIVE COMMONS CORPORATION IS NOT A LAW FIRM AND DOES NOT PROVIDE LEGAL SERVICES. DISTRIBUTION OF THIS DOCUMENT DOES NOT CREATE AN ATTORNEY-CLIENT RELATIONSHIP. CREATIVE COMMONS PROVIDES THIS INFORMATION ON AN "AS-IS" BASIS. CREATIVE COMMONS MAKES NO WARRANTIES REGARDING THE USE OF THIS DOCUMENT OR THE INFORMATION OR WORKS PROVIDED HEREUNDER, AND DISCLAIMS LIABILITY FOR DAMAGES RESULTING FROM THE USE OF THIS DOCUMENT OR THE INFORMATION OR WORKS PROVIDED HEREUNDER.

Statement of Purpose

The laws of most jurisdictions throughout the world automatically confer exclusive Copyright and Related Rights (defined below) upon the creator and subsequent owner(s) (each and all, an "owner") of an original work of authorship and/or a database (each, a "Work").

Certain owners wish to permanently relinquish those rights to a Work for the purpose of contributing to a commons of creative, cultural and scientific works ("Commons") that the public can reliably and without fear of later claims of infringement build upon, modify, incorporate in other works, reuse and redistribute as freely as possible in any form whatsoever and for any purposes, including without limitation commercial purposes. These owners may contribute to the Commons to promote the ideal of a free culture and the further production of creative, cultural and scientific works, or to gain reputation or greater distribution for their Work in part through the use and efforts of others.

For these and/or other purposes and motivations, and without any expectation of additional consideration or compensation, the person associating CC0 with a Work (the "Affirmer"), to the extent that he or she is an owner of Copyright and Related Rights in the Work, voluntarily elects to apply CC0 to the Work and publicly distribute the Work under its terms, with knowledge of his or her Copyright and Related Rights in the Work and the meaning and intended legal effect of CC0 on those rights.

1. Copyright and Related Rights. A Work made available under CC0 may be protected by copyright and related or neighboring rights ("Copyright and Related Rights"). Copyright and Related Rights include, but are not limited to, the following:

- i. the right to reproduce, adapt, distribute, perform, display, communicate, and translate a Work;
- ii. moral rights retained by the original author(s) and/or performer(s);
- iii. publicity and privacy rights pertaining to a person's image or likeness depicted in a Work;
- iv. rights protecting against unfair competition in regards to a Work, subject to the limitations in paragraph 4(a), below;
- v. rights protecting the extraction, dissemination, use and reuse of data in a Work;
- vi. database rights (such as those arising under Directive 96/9/EC of the European Parliament and of the Council of 11 March 1996 on the legal protection of databases, and under any national implementation thereof, including any amended or successor version of such directive); and
- vii. other similar, equivalent or corresponding rights throughout the world based on applicable law or treaty, and any national implementations thereof.

2. Waiver. To the greatest extent permitted by, but not in contravention of, applicable law, Affirmer hereby overtly, fully, permanently, irrevocably and unconditionally waives, abandons, and surrenders all of Affirmer's Copyright and Related Rights and associated claims and causes of action, whether now known or unknown (including existing as well as future claims and causes of action), in the Work (i) in all territories worldwide, (ii) for the maximum duration provided by applicable law or treaty (including future time extensions), (iii) in any current or future medium and for any number of copies, and (iv) for any purpose whatsoever, including without limitation commercial, advertising or promotional purposes (the "Waiver"). Affirmer makes the Waiver for the benefit of each member of the public at large and to the detriment of Affirmer's heirs and successors, fully intending that such Waiver shall not be subject to revocation, rescission, cancellation, termination, or any other legal or equitable action to disrupt the quiet enjoyment of the Work by the public as contemplated by Affirmer's express Statement of Purpose.

3. Public License Fallback. Should any part of the Waiver for any reason be judged legally invalid or ineffective under applicable law, then the Waiver shall be preserved to the maximum extent permitted taking into account Affirmer's express Statement of Purpose. In addition, to the extent the Waiver is so judged Affirmer hereby grants to each affected person a royalty-free, non transferable, non sublicensable,

non exclusive,
irrevocable and unconditional license to exercise Affirmer's Copyright and Related Rights in the Work (i) in all territories worldwide, (ii) for the maximum duration provided by applicable law or treaty (including future time extensions), (iii) in any current or future medium and for any number of copies, and (iv) for any purpose whatsoever, including without limitation commercial, advertising or promotional purposes (the "License"). The License shall be deemed effective as of the date CC0 was applied by Affirmer to the Work. Should any part of the License for any reason be judged legally invalid or ineffective under applicable law, such partial invalidity or ineffectiveness shall not invalidate the remainder of the License, and in such case Affirmer hereby affirms that he or she will not (i) exercise any of his or her remaining Copyright and Related Rights in the Work or (ii) assert any associated claims and causes of action with respect to the Work, in either case contrary to Affirmer's express Statement of Purpose.

4. Limitations and Disclaimers.

- a. No trademark or patent rights held by Affirmer are waived, abandoned, surrendered, licensed or otherwise affected by this document.
- b. Affirmer offers the Work as-is and makes no representations or warranties of any kind concerning the Work, express, implied, statutory or otherwise, including without limitation warranties of title, merchantability, fitness for a particular purpose, non infringement, or the absence of latent or other defects, accuracy, or the present or absence of errors, whether or not discoverable, all to the greatest extent permissible under applicable law.
- c. Affirmer disclaims responsibility for clearing rights of other persons that may apply to the Work or any use thereof, including without limitation any person's Copyright and Related Rights in the Work. Further, Affirmer disclaims responsibility for obtaining any necessary consents, permissions or other rights required for any use of the Work.
- d. Affirmer understands and acknowledges that Creative Commons is not a party to this document and has no duty or obligation with respect to this CC0 or use of the Work.

Apache License
Version 2.0, January 2004
<http://www.apache.org/licenses/>

TERMS AND CONDITIONS FOR USE, REPRODUCTION, AND DISTRIBUTION

1. Definitions.

"License" shall mean the terms and conditions for use, reproduction, and distribution as defined by Sections 1 through 9 of this document.

"Licensor" shall mean the copyright owner or entity authorized by the copyright owner that is granting the License.

"Legal Entity" shall mean the union of the acting entity and all other entities that control, are controlled by, or are under common control with that entity. For the purposes of this definition, "control" means (i) the power, direct or indirect, to cause the direction or management of such entity, whether by contract or otherwise, or (ii) ownership of fifty percent (50%) or more of the outstanding shares, or (iii) beneficial ownership of such entity.

"You" (or "Your") shall mean an individual or Legal Entity exercising permissions granted by this License.

"Source" form shall mean the preferred form for making modifications, including but not limited to software source code, documentation source, and configuration files.

"Object" form shall mean any form resulting from mechanical transformation or translation of a Source form, including but not limited to compiled object code, generated documentation, and conversions to other media types.

"Work" shall mean the work of authorship, whether in Source or Object form, made available under the License, as indicated by a copyright notice that is included in or attached to the work (an example is provided in the Appendix below).

"Derivative Works" shall mean any work, whether in Source or Object form, that is based on (or derived from) the Work and for which the editorial revisions, annotations, elaborations, or other modifications represent, as a whole, an original work of authorship. For the purposes of this License, Derivative Works shall not include works that remain separable from, or merely link (or bind by name) to the interfaces of, the Work and Derivative Works thereof.

"Contribution" shall mean any work of authorship, including the original version of the Work and any modifications or additions to that Work or Derivative Works thereof, that is intentionally submitted to Licensor for inclusion in the Work by the copyright owner or by an individual or Legal Entity

authorized to submit on behalf of

the copyright owner. For the purposes of this definition, "submitted" means any form of electronic, verbal, or written communication sent to the Licensor or its representatives, including but not limited to communication on electronic mailing lists, source code control systems, and issue tracking systems that are managed by, or on behalf of, the Licensor for the purpose of discussing and improving the Work, but excluding communication that is conspicuously marked or otherwise designated in writing by the copyright owner as "Not a Contribution."

"Contributor" shall mean Licensor and any individual or Legal Entity on behalf of whom a Contribution has been received by Licensor and subsequently incorporated within the Work.

2. Grant of Copyright License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable copyright license to reproduce, prepare Derivative Works of, publicly display, publicly perform, sublicense, and distribute the Work and such Derivative Works in Source or Object form.

3. Grant of Patent License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable (except as stated in this section) patent license to make, have made, use, offer to sell, sell, import, and otherwise transfer the Work, where such license applies only to those patent claims licensable by such Contributor that are necessarily infringed by their Contribution(s) alone or by combination of their Contribution(s) with the Work to which such Contribution(s) was submitted. If You institute patent litigation against any entity (including a cross-claim or counterclaim in a lawsuit)

alleging that the Work

or a Contribution incorporated within the Work constitutes direct or contributory patent infringement, then any patent licenses granted to You under this License for that Work shall terminate as of the date such litigation is filed.

4. Redistribution. You may reproduce and distribute copies of the Work or Derivative Works thereof in any medium, with or without modifications, and in Source or Object form, provided that You meet the following conditions:

(a) You must give any other recipients of the Work or Derivative Works a copy of this License; and

(b) You must cause any modified files to carry prominent notices

stating that You changed the files; and

(c) You must retain, in the Source form of any Derivative Works that You distribute, all copyright, patent, trademark, and attribution notices from the Source form of the Work, excluding those notices that do not pertain to any part of the Derivative Works; and

(d) If the Work includes a "NOTICE" text file as part of its distribution, then any Derivative Works that You distribute must include a readable copy of the attribution notices contained within such NOTICE file, excluding those notices that do not pertain to any part of the Derivative Works, in at least one of the following places: within a NOTICE text file distributed as part of the Derivative Works; within the Source form or documentation, if provided along with the Derivative Works; or, within a display generated by the Derivative Works, if and wherever such third-party notices normally appear. The contents of the NOTICE file are for informational purposes only and do not modify the License. You may add Your own attribution notices within Derivative Works that You distribute, alongside or as an addendum to the NOTICE text from the Work, provided that such additional attribution notices cannot be construed as modifying the License.

You may add Your own copyright statement to Your modifications and may provide additional or different license terms and conditions for use, reproduction, or distribution of Your modifications, or for any such Derivative Works as a whole, provided Your use, reproduction, and distribution of the Work otherwise complies with the conditions stated in this License.

5. Submission of Contributions. Unless You explicitly state otherwise, any Contribution intentionally submitted for inclusion in the Work by You to the Licensor shall be under the terms and conditions of this License, without any additional terms or conditions. Notwithstanding the above, nothing herein shall supersede or modify the terms of any separate license agreement you may have executed with Licensor regarding such Contributions.

6. Trademarks. This License does not grant permission to use the trade names, trademarks, service marks, or product names of the Licensor, except as required for reasonable and customary use in describing the origin of the Work and reproducing the content of the NOTICE file.

7. Disclaimer of Warranty. Unless required by applicable law or

agreed to in writing, Licensor provides the Work (and each Contributor provides its Contributions) on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied, including, without limitation, any warranties or conditions of TITLE, NON-INFRINGEMENT, MERCHANTABILITY, or FITNESS FOR A PARTICULAR PURPOSE. You are solely responsible for determining the appropriateness of using or redistributing the Work and assume any risks associated with Your exercise of permissions under this License.

8. Limitation of Liability. In no event and under no legal theory, whether in tort (including negligence), contract, or otherwise, unless required by applicable law (such as deliberate and grossly negligent acts) or agreed to in writing, shall any Contributor be liable to You for damages, including any direct, indirect, special, incidental, or consequential damages of any character arising as a result of this License or out of the use or inability to use the Work (including but not limited to damages for loss of goodwill, work stoppage, computer failure or malfunction, or any and all other commercial damages or losses), even if such Contributor has been advised of the possibility of such damages.

9. Accepting Warranty or Additional Liability. While redistributing the Work or Derivative Works thereof, You may choose to offer, and charge a fee for, acceptance of support, warranty, indemnity, or other liability

obligations and/or rights consistent with this

License. However, in accepting such obligations, You may act only on Your own behalf and on Your sole responsibility, not on behalf of any other Contributor, and only if You agree to indemnify, defend, and hold each Contributor harmless for any liability incurred by, or claims asserted against, such Contributor by reason of your accepting any such warranty or additional liability.

END OF TERMS AND CONDITIONS

APPENDIX: How to apply the Apache License to your work.

To apply the Apache License to your work, attach the following boilerplate notice, with the fields enclosed by brackets "[]" replaced with your own identifying information. (Don't include the brackets!) The text should be enclosed in the appropriate comment syntax for the file format. We also recommend that a file or class name and description of purpose be included on the same "printed page"

as the copyright notice for easier

identification within third-party archives.

Copyright 2019 Jack O'Connor and Samuel Neves

Licensed under the Apache License, Version 2.0 (the "License");
you may not use this file except in compliance with the License.
You may obtain a copy of the License at

<http://www.apache.org/licenses/LICENSE-2.0>

Unless required by applicable law or agreed to in writing, software
distributed under the License is distributed on an "AS IS" BASIS,
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
See the License for the specific language governing permissions and
limitations under the License.

=====
The LLVM Project is under the Apache License v2.0 with LLVM Exceptions:
=====

Apache License
Version 2.0, January 2004
<http://www.apache.org/licenses/>

TERMS AND CONDITIONS FOR USE, REPRODUCTION, AND DISTRIBUTION

1. Definitions.

"License" shall mean the terms and conditions for use, reproduction,
and distribution as defined by Sections 1 through 9 of this document.

"Licensor" shall mean the copyright owner or entity authorized by
the copyright owner that is granting the License.

"Legal Entity" shall mean the union of the acting entity and all
other entities that control, are controlled by, or are under common
control with that entity. For the purposes of this definition,
"control" means (i) the
power, direct or indirect, to cause the
direction or management of such entity, whether by contract or
otherwise, or (ii) ownership of fifty percent (50%) or more of the
outstanding shares, or (iii) beneficial ownership of such entity.

"You" (or "Your") shall mean an individual or Legal Entity
exercising permissions granted by this License.

"Source" form shall mean the preferred form for making modifications,
including but not limited to software source code, documentation
source, and configuration files.

"Object" form shall mean any form resulting from mechanical

transformation or translation of a Source form, including but not limited to compiled object code, generated documentation, and conversions to other media types.

"Work" shall mean the work of authorship, whether in Source or Object form, made available under the License, as indicated by a copyright notice that is included in or attached to the work (an example is provided in the Appendix below).

"Derivative Works" shall mean any work, whether in Source or Object form, that is based on (or derived from) the Work and for which the editorial revisions, annotations, elaborations, or other modifications represent, as a whole, an original work of authorship. For the purposes of this License, Derivative Works shall not include works that remain separable from, or merely link (or bind by name) to the interfaces of, the Work and Derivative Works thereof.

"Contribution" shall mean any work of authorship, including the original version of the Work and any modifications or additions to that Work or Derivative Works thereof, that is intentionally submitted to Licensor for inclusion in the Work by the copyright owner or by an individual or Legal Entity authorized to submit on behalf of the copyright owner. For the purposes of this definition, "submitted"

means any form of electronic, verbal, or written communication sent to the Licensor or its representatives, including but not limited to communication on electronic mailing lists, source code control systems, and issue tracking systems that are managed by, or on behalf of, the Licensor for the purpose of discussing and improving the Work, but excluding communication that is conspicuously marked or otherwise designated in writing by the copyright owner as "Not a Contribution."

"Contributor" shall mean Licensor and any individual or Legal Entity on behalf of whom a Contribution has been received by Licensor and subsequently incorporated within the Work.

2. Grant of Copyright License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable copyright license to reproduce, prepare Derivative Works of, publicly display, publicly perform, sublicense, and distribute the Work and such Derivative Works in Source or Object form.

3. Grant of Patent License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable

(except as stated in this section) patent license to make, have made, use, offer to sell, sell, import, and otherwise transfer the Work, where such license applies only to those patent claims licensable by such Contributor that are necessarily infringed by their Contribution(s) alone or by combination of their Contribution(s) with the Work to which such Contribution(s) was submitted. If You institute patent litigation against any entity (including a cross-claim or counterclaim in a lawsuit) alleging that the Work or a Contribution incorporated within the Work constitutes direct or contributory patent infringement, then any patent licenses granted to You under this License for that Work shall terminate as of the date such litigation is filed.

4. Redistribution. You may reproduce and distribute copies of the Work or Derivative Works thereof in any medium, with or without modifications, and in Source or Object form, provided that You meet the following conditions:

(a) You must give any other recipients of the Work or Derivative Works a copy of this License; and

(b) You must cause any modified files to carry prominent notices stating that You changed the files; and

(c) You must retain, in the Source form of any Derivative Works that You distribute, all copyright, patent, trademark, and attribution notices from the Source form of the Work, excluding those notices that do not pertain to any part of the Derivative Works; and

(d) If the Work includes a "NOTICE" text file as part of its distribution, then any Derivative Works that You distribute must include a readable copy of the attribution notices contained within such NOTICE file, excluding those notices that do not pertain to any part of the Derivative Works, in at least one of the following places: within a NOTICE text file distributed as part of the Derivative Works; within the Source form or documentation, if provided along with the Derivative Works; or, within a display generated by the Derivative Works, if and wherever such third-party notices normally appear. The contents of the NOTICE file are for informational purposes only and do not modify the License. You may add Your own attribution notices within Derivative Works that You distribute, alongside or as an addendum to the NOTICE text from the Work, provided that such additional

attribution notices cannot be construed as modifying the License.

You may add Your own copyright statement to Your modifications and may provide additional or different license terms and conditions for use, reproduction, or distribution of Your modifications, or for any such Derivative Works as a whole, provided Your use, reproduction, and distribution of the Work otherwise complies with the conditions stated in this License.

5. Submission of Contributions. Unless You explicitly state otherwise, any Contribution intentionally submitted for inclusion in the Work by You to the Licensor shall be under the terms and conditions of this License, without any additional terms or conditions.

Notwithstanding the above, nothing herein shall supersede or modify the terms of any separate license agreement you may have executed with Licensor regarding such Contributions.

6. Trademarks. This License

does not grant permission to use the trade

names, trademarks, service marks, or product names of the Licensor, except as required for reasonable and customary use in describing the origin of the Work and reproducing the content of the NOTICE file.

7. Disclaimer of Warranty. Unless required by applicable law or agreed to in writing, Licensor provides the Work (and each Contributor provides its Contributions) on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied, including, without limitation, any warranties or conditions of TITLE, NON-INFRINGEMENT, MERCHANTABILITY, or FITNESS FOR A PARTICULAR PURPOSE. You are solely responsible for determining the appropriateness of using or redistributing the Work and assume any risks associated with Your exercise of permissions under this License.

8. Limitation of Liability. In no event and under no legal theory, whether in tort (including negligence), contract, or otherwise, unless required by applicable law (such as deliberate and grossly negligent acts) or agreed to in writing, shall any Contributor be liable to You for damages, including any direct, indirect, special, incidental, or consequential damages of any character arising as a result of this License or out of the use or inability to use the Work (including but not limited to damages for loss of goodwill, work stoppage, computer failure or malfunction, or any and all other commercial damages or losses), even if such Contributor has been advised of the possibility of such damages.

9. Accepting Warranty or Additional Liability. While redistributing the Work or Derivative Works thereof, You may choose to offer, and charge a fee for, acceptance of support, warranty, indemnity,

or other liability obligations and/or rights consistent with this License. However, in accepting such obligations, You may act only on Your own behalf and on Your sole responsibility, not on behalf of any other Contributor, and only if You agree to indemnify, defend, and hold each Contributor harmless for any liability incurred by, or claims asserted against, such Contributor by reason of your accepting any such warranty or additional liability.

END OF TERMS AND CONDITIONS

APPENDIX: How to apply the Apache License to your work.

To apply the Apache License to your work, attach the following boilerplate notice, with the fields enclosed by brackets "[]" replaced with your own identifying information. (Don't include the brackets!) The text should be enclosed in the appropriate comment syntax for the file format. We also recommend that a file or class name and description of purpose be included on the same "printed page" as the copyright notice for easier identification within third-party archives.

Copyright [yyyy] [name of copyright owner]

Licensed under the Apache License, Version 2.0 (the "License");
you may not use this file except in compliance with the License.
You may obtain a copy of the License at

<http://www.apache.org/licenses/LICENSE-2.0>

Unless required by applicable law or agreed to in writing, software distributed under the License is distributed on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.

---- LLVM Exceptions to the Apache 2.0 License ----

As an exception, if, as a result of your compiling your source code, portions of this Software are embedded into an Object form of such source code, you may redistribute such embedded portions in such Object form without complying with the conditions of Sections 4(a), 4(b) and 4(d) of the License.

In addition, if you combine or link compiled forms of this Software with software that is licensed under the GPLv2 ("Combined Software") and if a court of competent jurisdiction determines that the patent provision (Section

3), the indemnity provision (Section 9) or other Section of the License conflicts with the conditions of the GPLv2, you may retroactively and prospectively choose to deem waived or otherwise exclude such Section(s) of the License, but only in their entirety and only with respect to the Combined Software.

=====
Software from third parties included in the LLVM Project:
=====

The LLVM Project contains third party software which is under different license terms. All such code will be identified clearly using at least one of two mechanisms:

- 1) It will be in a separate directory tree with its own `LICENSE.txt` or `LICENSE` file at the top containing the specific license and restrictions which apply to that software, or
- 2) It will contain specific license and restriction terms at the top of every file.

=====
Legacy LLVM License (<https://llvm.org/docs/DeveloperPolicy.html#legacy>):
=====

The software contained in this directory tree is dual licensed under both the University of Illinois "BSD-Like" license and the MIT license. As a user of this code you may choose to use it under either license. As a contributor, you agree to allow your code to be used under both.

Full text of the relevant licenses is included below.

=====
University of Illinois/NCSA
Open Source License

Copyright (c) 2017-2019 by the contributors listed in CREDITS.TXT

All rights reserved.

Developed by:
Threading Runtimes Team
Intel Corporation
<http://www.intel.com>

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal with the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies

of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

- * Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimers.
- * Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimers in the documentation and/or other materials provided with the distribution.
- * Neither the names of Intel Corporation Threading Runtimes Team nor the names of its contributors may be used to endorse or promote products derived from this Software without specific prior written permission.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE CONTRIBUTORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS WITH THE SOFTWARE.

=====

Copyright (c) 2017-2019 by the contributors listed in CREDITS.TXT

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

```
! RUN: %python %S/./test_errors.py %s %flang -fopenmp -Werror
! OpenMP Version 5.0
! 2.19.4.4 firstprivate Clause
```

! 2.19.4.5 lastprivate Clause

! 2.19.6.1 copyin Clause

! 2.19.6.2 copyprivate Clause

! If the list item is a polymorphic variable with the allocatable attribute,

! the behavior is unspecified.

```
subroutine firstprivate()  
  class(*), allocatable, save :: x
```

!PORTABILITY: If a polymorphic variable with allocatable attribute 'x' is in FIRSTPRIVATE clause, the behavior is unspecified

```
!$omp parallel firstprivate(x)  
  call sub()  
!$omp end parallel
```

end

```
subroutine lastprivate()  
  class(*), allocatable, save :: x
```

!PORTABILITY: If a polymorphic variable with allocatable attribute 'x' is in LASTPRIVATE clause, the behavior is unspecified

```
!$omp do lastprivate(x)  
do i = 1, 10  
  call sub()  
enddo  
!$omp end do
```

end

```
subroutine copyin()  
  class(*), allocatable, save :: x  
!$omp threadprivate(x)
```

!PORTABILITY: If a polymorphic variable with allocatable attribute 'x' is in COPYIN clause, the behavior is unspecified

```
!$omp parallel copyin(x)  
  call sub()  
!$omp end parallel
```

end

```
subroutine copyprivate()  
  class(*), allocatable, save :: x  
!$omp threadprivate(x)
```

!PORTABILITY: If a polymorphic variable with allocatable attribute 'x' is in COPYPRIVATE clause, the behavior is unspecified


```
!$omp single copyprivate(x)
  call sub()
!$omp end single
```

end

IMath is Copyright 2002-2009 Michael J. Fromberger
You may use it subject to the following Licensing Terms:

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

; NOTE: Assertions have been autogenerated by utils/update_llc_test_checks.py

; RUN: llc -march=amdgcn -mcpu=fiji < %s | FileCheck -enable-var-scope --check-prefixes=GCN,GCN-SAFE,VI,VI-SAFE %s

; RUN: llc -enable-no-signed-zeros-fp-math -march=amdgcn -mcpu=fiji < %s | FileCheck -enable-var-scope --check-prefixes=GCN,GCN-NSZ,VI,VI-NSZ %s

```
; -----
; rcp tests
; -----
```

```
define half @v_fneg_rcp_f16(half %a) #0 {
; GCN-LABEL: v_fneg_rcp_f16:
; GCN:      ; %bb.0:
; GCN-NEXT:  s_waitcnt vmcnt(0) expcnt(0) lgkmcnt(0)
; GCN-NEXT:  v_rcp_f16_e64 v0, -v0
; GCN-NEXT:  s_setpc_b64 s[30:31]
%rcp = call half @llvm.amdgcn.rcp.f16(half %a)
%fneg = fneg half %rcp
ret half %fneg
}
```

```
define half @v_fneg_rcp_fneg_f16(half %a) #0 {
```

```

; GCN-LABEL: v_fneg_rcp_fneg_f16:
; GCN:      ; %bb.0:
; GCN-NEXT: s_waitcnt vmcnt(0) expcnt(0) lgkmcnt(0)
; GCN-NEXT:
    v_rcp_f16_e32 v0, v0
; GCN-NEXT: s_setpc_b64 s[30:31]
    %fneg.a = fneg half %a
    %rcp = call half @llvm.amdgcn.rcp.f16(half %fneg.a)
    %fneg = fneg half %rcp
    ret half %fneg
}

define { half, half } @v_fneg_rcp_store_use_fneg_f16(half %a) #0 {
; GCN-LABEL: v_fneg_rcp_store_use_fneg_f16:
; GCN:      ; %bb.0:
; GCN-NEXT: s_waitcnt vmcnt(0) expcnt(0) lgkmcnt(0)
; GCN-NEXT: v_rcp_f16_e32 v2, v0
; GCN-NEXT: v_xor_b32_e32 v1, 0x8000, v0
; GCN-NEXT: v_mov_b32_e32 v0, v2
; GCN-NEXT: s_setpc_b64 s[30:31]
    %fneg.a = fneg half %a
    %rcp = call half @llvm.amdgcn.rcp.f16(half %fneg.a)
    %fneg = fneg half %rcp
    %insert.0 = insertvalue { half, half } poison, half %fneg, 0
    %insert.1 = insertvalue { half, half } %insert.0, half %fneg.a, 1
    ret { half, half } %insert.1
}

define { half, half } @v_fneg_rcp_multi_use_fneg_f16(half %a, half %c) #0 {
; GCN-LABEL: v_fneg_rcp_multi_use_fneg_f16:
; GCN:      ; %bb.0:
; GCN-NEXT: s_waitcnt vmcnt(0) expcnt(0) lgkmcnt(0)
; GCN-NEXT:
    v_rcp_f16_e32 v2, v0
; GCN-NEXT: v_mul_f16_e64 v1, -v0, v1
; GCN-NEXT: v_mov_b32_e32 v0, v2
; GCN-NEXT: s_setpc_b64 s[30:31]
    %fneg.a = fneg half %a
    %rcp = call half @llvm.amdgcn.rcp.f16(half %fneg.a)
    %fneg = fneg half %rcp
    %use1 = fmul half %fneg.a, %c
    %insert.0 = insertvalue { half, half } poison, half %fneg, 0
    %insert.1 = insertvalue { half, half } %insert.0, half %use1, 1
    ret { half, half } %insert.1
}

; -----
; sin tests

```

;-----

```
define half @v_fneg_amdgcnsin_f16(half %a) #0 {
; GCN-LABEL: v_fneg_amdgcnsin_f16:
; GCN:      ; %bb.0:
; GCN-NEXT: s_waitcnt vmcnt(0) expcnt(0) lgkmcnt(0)
; GCN-NEXT: v_sin_f16_e64 v0, -v0
; GCN-NEXT: s_setpc_b64 s[30:31]
%sin = call half @llvm.amdgcnsin.f16(half %a)
%fneg = fneg half %sin
ret half %fneg
}
```

;-----

```
;
vintrp tests
```

;-----

```
define { float, float } @v_fneg_interp_p1_f16(float %a, float %b) #0 {
; SI-LABEL: v_fneg_interp_p1_f16:
; SI:      ; %bb.0:
; SI-NEXT: s_waitcnt vmcnt(0) expcnt(0) lgkmcnt(0)
; SI-NEXT: v_mul_f16_e64 v1, v0, -v1
; SI-NEXT: s_mov_b32 m0, 0
; SI-NEXT: v_interp_p1_f16 v0, v1, attr0.x
; SI-NEXT: v_interp_p1_f16 v1, v1, attr0.y
; SI-NEXT: s_setpc_b64 s[30:31]
;
; GCN-LABEL: v_fneg_interp_p1_f16:
; GCN:      ; %bb.0:
; GCN-NEXT: s_waitcnt vmcnt(0) expcnt(0) lgkmcnt(0)
; GCN-NEXT: v_mul_f32_e64 v1, v0, -v1
; GCN-NEXT: s_mov_b32 m0, 0
; GCN-NEXT: s_setreg_imm32_b32 hwreg(HW_REG_MODE, 2, 2), 3
; GCN-NEXT: v_interp_p1ll_f16 v0, v1, attr0.x
; GCN-NEXT: v_interp_p1ll_f16 v1, v1, attr0.y
; GCN-NEXT: s_setpc_b64 s[30:31]
%mul = fmul float %a, %b
%fneg = fneg float %mul
%intrp0 = call float @llvm.amdgcnsin.f16(float %fneg,
i32 0, i32 0, i1 false, i32 0)
%intrp1 = call float @llvm.amdgcnsin.f16(float %fneg, i32 1, i32 0, i1 false, i32 0)
%insert.0 = insertvalue { float, float } poison, float %intrp0, 0
%insert.1 = insertvalue { float, float } %insert.0, float %intrp1, 1
ret { float, float } %insert.1
}
```

```
define { half, half } @v_fneg_interp_p2_f16(float %a, float %b) #0 {
```

```

; SI-LABEL: v_fneg_interp_p2_f16:
; SI:    ; %bb.0:
; SI-NEXT:  s_waitcnt vmcnt(0) expcnt(0) lgkmcnt(0)
; SI-NEXT:  v_mul_f16_e64 v2, v0, -v1
; SI-NEXT:  v_mov_b32_e32 v1, 4.0
; SI-NEXT:  v_mov_b32_e32 v0, 4.0
; SI-NEXT:  s_mov_b32 m0, 0
; SI-NEXT:  v_interp_p2_f16 v0, v2, attr0.x
; SI-NEXT:  v_interp_p2_f16 v1, v2, attr0.y
; SI-NEXT:  s_setpc_b64 s[30:31]
;
; GCN-LABEL: v_fneg_interp_p2_f16:
; GCN:    ; %bb.0:
; GCN-NEXT:  s_waitcnt vmcnt(0) expcnt(0) lgkmcnt(0)
; GCN-NEXT:  v_mul_f32_e64 v1, v0, -v1
; GCN-NEXT:  v_mov_b32_e32 v2, 4.0
; GCN-NEXT:  s_mov_b32 m0, 0
; GCN-NEXT:  s_setreg_imm32_b32
hwreg(HW_REG_MODE, 2, 2), 3
; GCN-NEXT:  v_interp_p2_f16 v0, v1, attr0.x, v2
; GCN-NEXT:  v_interp_p2_f16 v1, v1, attr0.y, v2
; GCN-NEXT:  s_setpc_b64 s[30:31]
%mul = fmul float %a, %b
%fneg = fneg float %mul
%intrap0 = call half @llvm.amdgcn.interp.p2.f16(float 4.0, float %fneg, i32 0, i32 0, i1 false, i32 0)
%intrap1 = call half @llvm.amdgcn.interp.p2.f16(float 4.0, float %fneg, i32 1, i32 0, i1 false, i32 0)
%insert.0 = insertvalue { half, half } poison, half %intrap0, 0
%insert.1 = insertvalue { half, half } %insert.0, half %intrap1, 1
ret { half, half } %insert.1
}

; -----
; arithmetic.fence tests
; -----

; FIXME: Legalization/promote is broken
define half @v_fneg_arithmetic_fence_f16(half %a) #0 {
; GCN-LABEL: v_fneg_arithmetic_fence_f16:
; GCN:    ; %bb.0:
; GCN-NEXT:  ; ARITH_FENCE
; GCN-NEXT:  s_waitcnt
vmcnt(0) expcnt(0) lgkmcnt(0)
; GCN-NEXT:  v_xor_b32_e32 v0, 0x8000, v0
; GCN-NEXT:  s_setpc_b64 s[30:31]
%fence = call half @llvm.arithmetic.fence.f16(half %a)
%fneg = fneg half %fence
ret half %fneg
}

```

```

define half @v_fneg_arithmetic_fence_fmuls16(half %a, half %b) #0 {
; GCN-LABEL: v_fneg_arithmetic_fence_fmuls16:
; GCN:      ;%bb.0:
; GCN-NEXT:  s_waitcnt vmcnt(0) expcnt(0) lgkmcnt(0)
; GCN-NEXT:  v_mul_f16_e32 v0, v0, v1
; GCN-NEXT:  ;ARITH_FENCE
; GCN-NEXT:  v_xor_b32_e32 v0, 0x8000, v0
; GCN-NEXT:  s_setpc_b64 s[30:31]
%mul = fmul half %a, %b
%fence = call half @llvm.arithmetic.fence.f16(half %mul)
%fneg = fneg half %fence
ret half %fneg
}

declare half @llvm.amdgcn.rcp.f16(half) #1
declare half @llvm.amdgcn.sin.f16(half) #1
declare half @llvm.arithmetic.fence.f16(half) #1
declare float @llvm.amdgcn.interp.p1.f16(float, i32, i32, i1, i32) #0
declare half @llvm.amdgcn.interp.p2.f16(float, float, i32, i32, i1, i32) #0

attributes #0 = { nounwind
"denormal-fp-math-f32"="preserve-sign,preserve-sign" }
attributes #1 = { nounwind readnone }
attributes #2 = { nounwind "unsafe-fp-math"="true" }
attributes #3 = { nounwind "no-signed-zeros-fp-math"="true" }
attributes #4 = { nounwind "amdgpu-ieee"="false" "denormal-fp-math-f32"="preserve-sign,preserve-sign" }
;; NOTE: These prefixes are unused and the list is autogenerated. Do not add tests below this line:
; GCN-NSZ: {{.*}}
; GCN-SAFE: {{.*}}
; VI: {{.*}}
; VI-NSZ: {{.*}}
; VI-SAFE: {{.*}}
; NOTE: Assertions have been autogenerated by utils/update_test_checks.py UTC_ARGS: --function-signature --
check-attributes --check-globals
; RUN: opt -aa-pipeline=basic-aa -passes=attributor -attributor-manifest-internal -attributor-max-iterations-verify -
attributor-annotate-decl-cs -attributor-max-iterations=10 -S < %s | FileCheck %s --check-prefixes=CHECK,TUNIT
; RUN: opt -aa-pipeline=basic-aa -passes=attributor-cgsc -attributor-manifest-internal -attributor-annotate-decl-cs -
S < %s | FileCheck %s --check-prefixes=CHECK,CGSCC
; Test that we only promote arguments when the caller/callee have compatible
; function attributes.

target triple = "x86_64-unknown-linux-gnu"

; This should promote
define internal fastcc void @callee_avx512_legal512_prefer512_call_avx512_legal512_prefer512(ptr %arg, ptr
readonly %arg1) #0 {
;

```

```

; CHECK: Function Attrs: inlinehint nofree norecurse nosync nounwind willreturn memory(argmem: readwrite)
uwtable
; CHECK-LABEL: define {{{^@}+}}@callee_avx512_legal512_prefer512_call_avx512_legal512_prefer512
;
CHECK-SAME: (ptr noalias nocapture nofree noundef nonnull writeonly align 64 dereferenceable(64)
[[ARG:%.*]], <8 x i64> [[TMP0:%.*]]) #[[ATTR0:[0-9]+]] {
; CHECK-NEXT: bb:
; CHECK-NEXT: [[ARG1_PRIV:%.*]] = alloca <8 x i64>, align 64
; CHECK-NEXT: store <8 x i64> [[TMP0]], ptr [[ARG1_PRIV]], align 64
; CHECK-NEXT: [[TMP:%.*]] = load <8 x i64>, ptr [[ARG1_PRIV]], align 64
; CHECK-NEXT: store <8 x i64> [[TMP]], ptr [[ARG]], align 64
; CHECK-NEXT: ret void
;
;
bb:
%tmp = load <8 x i64>, ptr %arg1
store <8 x i64> %tmp, ptr %arg
ret void
}

define void @avx512_legal512_prefer512_call_avx512_legal512_prefer512(ptr %arg) #0 {
;
; TUNIT: Function Attrs: inlinehint nofree norecurse nosync nounwind willreturn memory(argmem: readwrite)
uwtable
; TUNIT-LABEL: define {{{^@}+}}@avx512_legal512_prefer512_call_avx512_legal512_prefer512
; TUNIT-SAME: (ptr nocapture nofree writeonly [[ARG:%.*]]) #[[ATTR0]] {
; TUNIT-NEXT: bb:
; TUNIT-NEXT:
[[TMP:%.*]] = alloca <8 x i64>, align 32
; TUNIT-NEXT: [[TMP2:%.*]] = alloca <8 x i64>, align 32
; TUNIT-NEXT: call void @llvm.memset.p0.i64(ptr noalias nocapture nofree noundef nonnull writeonly align 32
dereferenceable(64) [[TMP]], i8 noundef 0, i64 noundef 32, i1 noundef false) #[[ATTR5:[0-9]+]]
; TUNIT-NEXT: [[TMP0:%.*]] = load <8 x i64>, ptr [[TMP]], align 64
; TUNIT-NEXT: call fastcc void @callee_avx512_legal512_prefer512_call_avx512_legal512_prefer512(ptr
noalias nocapture nofree noundef nonnull writeonly align 64 dereferenceable(64) [[TMP2]], <8 x i64> [[TMP0]])
#[[ATTR6:[0-9]+]]
; TUNIT-NEXT: [[TMP4:%.*]] = load <8 x i64>, ptr [[TMP2]], align 64
; TUNIT-NEXT: store <8 x i64> [[TMP4]], ptr [[ARG]], align 2
; TUNIT-NEXT: ret void
;
; CGSCC: Function Attrs: inlinehint nofree norecurse nosync nounwind willreturn memory(argmem: readwrite)
uwtable
; CGSCC-LABEL: define {{{^@}+}}@avx512_legal512_prefer512_call_avx512_legal512_prefer512
; CGSCC-SAME: (ptr nocapture
nofree noundef nonnull writeonly align 2 dereferenceable(64) [[ARG:%.*]]) #[[ATTR0]] {
; CGSCC-NEXT: bb:
; CGSCC-NEXT: [[TMP:%.*]] = alloca <8 x i64>, align 32
; CGSCC-NEXT: [[TMP2:%.*]] = alloca <8 x i64>, align 32
; CGSCC-NEXT: call void @llvm.memset.p0.i64(ptr noalias nocapture nofree noundef nonnull writeonly align 64

```

```

dereferenceable(64) [[TMP]], i8 noundef 0, i64 noundef 32, i1 noundef false) #[[ATTR5:[0-9]+]]
; CGSCC-NEXT:  [[TMP0:%.*]] = load <8 x i64>, ptr [[TMP]], align 64
; CGSCC-NEXT:  call fastcc void @callee_avx512_legal512_prefer512_call_avx512_legal512_prefer512(ptr
noalias nocapture nofree noundef nonnull writeonly align 64 dereferenceable(64) [[TMP2]], <8 x i64> [[TMP0]])
#[[ATTR6:[0-9]+]]
; CGSCC-NEXT:  [[TMP4:%.*]] = load <8 x i64>, ptr [[TMP2]], align 64
; CGSCC-NEXT:  store <8 x i64> [[TMP4]], ptr [[ARG]], align 2
; CGSCC-NEXT:  ret void
;
bb:
%tmp = alloca <8 x i64>, align 32
%tmp2 = alloca <8 x i64>, align 32
call void @llvm.memset.p0.i64(ptr
align 32 %tmp, i8 0, i64 32, i1 false)
call fastcc void @callee_avx512_legal512_prefer512_call_avx512_legal512_prefer512(ptr %tmp2, ptr %tmp)
%tmp4 = load <8 x i64>, ptr %tmp2, align 32
store <8 x i64> %tmp4, ptr %arg, align 2
ret void
}

; This should promote
define internal fastcc void @callee_avx512_legal512_prefer256_call_avx512_legal512_prefer256(ptr %arg, ptr
readonly %arg1) #1 {
;
; CHECK: Function Attrs: inlinehint nofree norecurse nosync nounwind willreturn memory(argmem: readwrite)
uwtable
; CHECK-LABEL: define {{{^@+}}@callee_avx512_legal512_prefer256_call_avx512_legal512_prefer256
; CHECK-SAME: (ptr noalias nocapture nofree noundef nonnull writeonly align 64 dereferenceable(64)
[[ARG:%.*]], <8 x i64> [[TMP0:%.*]]) #[[ATTR1:[0-9]+]] {
; CHECK-NEXT: bb:
; CHECK-NEXT:  [[ARG1_PRIV:%.*]] = alloca <8 x i64>, align 64
; CHECK-NEXT:  store <8 x i64> [[TMP0]], ptr [[ARG1_PRIV]], align 64
; CHECK-NEXT:  [[TMP:%.*]] = load <8 x i64>, ptr [[ARG1_PRIV]], align
64
; CHECK-NEXT:  store <8 x i64> [[TMP]], ptr [[ARG]], align 64
; CHECK-NEXT:  ret void
;
bb:
%tmp = load <8 x i64>, ptr %arg1
store <8 x i64> %tmp, ptr %arg
ret void
}

define void @avx512_legal512_prefer256_call_avx512_legal512_prefer256(ptr %arg) #1 {
;
; TUNIT: Function Attrs: inlinehint nofree norecurse nosync nounwind willreturn memory(argmem: readwrite)
uwtable
; TUNIT-LABEL: define {{{^@+}}@avx512_legal512_prefer256_call_avx512_legal512_prefer256

```

```

; TUNIT-SAME: (ptr nocapture nofree writeonly [[ARG:%.*]]) #[[ATTR1]] {
; TUNIT-NEXT: bb:
; TUNIT-NEXT: [[TMP:%.*]] = alloca <8 x i64>, align 32
; TUNIT-NEXT: [[TMP2:%.*]] = alloca <8 x i64>, align 32
; TUNIT-NEXT: call void @llvm.memset.p0.i64(ptr noalias nocapture nofree noundef nonnull writeonly align 32
dereferenceable(64) [[TMP]], i8 noundef 0, i64 noundef 32, i1 noundef false) #[[ATTR5]]
; TUNIT-NEXT: [[TMP0:%.*]] = load <8 x i64>, ptr [[TMP]], align 64
; TUNIT-NEXT: call fastcc void @callee_avx512_legal512_prefer256_call_avx512_legal512_prefer256(ptr
noalias nocapture nofree noundef nonnull writeonly align 64 dereferenceable(64) [[TMP2]], <8 x i64> [[TMP0]])
#[[ATTR6]]
; TUNIT-NEXT: [[TMP4:%.*]] = load <8 x i64>, ptr [[TMP2]], align 64
; TUNIT-NEXT: store <8 x i64> [[TMP4]], ptr [[ARG]], align 2
; TUNIT-NEXT: ret void
;
; CGSCC: Function Attrs: inlinehint nofree norecurse nosync nounwind willreturn memory(argmem: readwrite)
uwtable
; CGSCC-LABEL: define {[^@+]}@avx512_legal512_prefer256_call_avx512_legal512_prefer256
; CGSCC-SAME: (ptr nocapture nofree noundef nonnull writeonly align 2 dereferenceable(64) [[ARG:%.*]])
#[[ATTR1]] {
; CGSCC-NEXT: bb:
; CGSCC-NEXT: [[TMP:%.*]] = alloca <8 x i64>, align 32
; CGSCC-NEXT: [[TMP2:%.*]] = alloca <8 x i64>, align 32
; CGSCC-NEXT: call void @llvm.memset.p0.i64(ptr noalias nocapture nofree noundef nonnull writeonly align 64
dereferenceable(64) [[TMP]], i8 noundef 0, i64 noundef 32, i1 noundef false) #[[ATTR5]]
; CGSCC-NEXT:
[[TMP0:%.*]] = load <8 x i64>, ptr [[TMP]], align 64
; CGSCC-NEXT: call fastcc void @callee_avx512_legal512_prefer256_call_avx512_legal512_prefer256(ptr
noalias nocapture nofree noundef nonnull writeonly align 64 dereferenceable(64) [[TMP2]], <8 x i64> [[TMP0]])
#[[ATTR6]]
; CGSCC-NEXT: [[TMP4:%.*]] = load <8 x i64>, ptr [[TMP2]], align 64
; CGSCC-NEXT: store <8 x i64> [[TMP4]], ptr [[ARG]], align 2
; CGSCC-NEXT: ret void
;
bb:
%tmp = alloca <8 x i64>, align 32
%tmp2 = alloca <8 x i64>, align 32
call void @llvm.memset.p0.i64(ptr align 32 %tmp, i8 0, i64 32, i1 false)
call fastcc void @callee_avx512_legal512_prefer256_call_avx512_legal512_prefer256(ptr %tmp2, ptr %tmp)
%tmp4 = load <8 x i64>, ptr %tmp2, align 32
store <8 x i64> %tmp4, ptr %arg, align 2
ret void
}

; This should promote
define internal fastcc void @callee_avx512_legal512_prefer512_call_avx512_legal512_prefer256(ptr %arg, ptr
readonly %arg1) #1 {
;
; CHECK: Function Attrs: inlinehint nofree

```



```

norecurse nosync nounwind willreturn memory(argmem: readwrite) uwtable
; CHECK-LABEL: define {{{^@+}}@callee_avx512_legal512_prefer512_call_avx512_legal512_prefer256
; CHECK-SAME: (ptr noalias nocapture nofree noundef nonnull writeonly align 64 dereferenceable(64)
[[ARG:%.*]], <8 x i64> [[TMP0:%.*]]) #[[ATTR1]] {
; CHECK-NEXT: bb:
; CHECK-NEXT: [[ARG1_PRIV:%.*]] = alloca <8 x i64>, align 64
; CHECK-NEXT: store <8 x i64> [[TMP0]], ptr [[ARG1_PRIV]], align 64
; CHECK-NEXT: [[TMP:%.*]] = load <8 x i64>, ptr [[ARG1_PRIV]], align 64
; CHECK-NEXT: store <8 x i64> [[TMP]], ptr [[ARG]], align 64
; CHECK-NEXT: ret void
;
bb:
%tmp = load <8 x i64>, ptr %arg1
store <8 x i64> %tmp, ptr %arg
ret void
}

define void @avx512_legal512_prefer512_call_avx512_legal512_prefer256(ptr %arg) #0 {
;
; TUNIT: Function Attrs: inlinehint nofree norecurse nosync nounwind willreturn memory(argmem: readwrite)
uwtable
; TUNIT-LABEL: define {{{^@+}}@avx512_legal512_prefer512_call_avx512_legal512_prefer256
;
; TUNIT-SAME: (ptr nocapture nofree writeonly [[ARG:%.*]]) #[[ATTR0]] {
; TUNIT-NEXT: bb:
; TUNIT-NEXT: [[TMP:%.*]] = alloca <8 x i64>, align 32
; TUNIT-NEXT: [[TMP2:%.*]] = alloca <8 x i64>, align 32
; TUNIT-NEXT: call void @llvm.memset.p0.i64(ptr noalias nocapture nofree noundef nonnull writeonly align 32
dereferenceable(64) [[TMP]], i8 noundef 0, i64 noundef 32, i1 noundef false) #[[ATTR5]]
; TUNIT-NEXT: [[TMP0:%.*]] = load <8 x i64>, ptr [[TMP]], align 64
; TUNIT-NEXT: call fastcc void @callee_avx512_legal512_prefer512_call_avx512_legal512_prefer256(ptr
noalias nocapture nofree noundef nonnull writeonly align 64 dereferenceable(64) [[TMP2]], <8 x i64> [[TMP0]])
#[[ATTR6]]
; TUNIT-NEXT: [[TMP4:%.*]] = load <8 x i64>, ptr [[TMP2]], align 64
; TUNIT-NEXT: store <8 x i64> [[TMP4]], ptr [[ARG]], align 2
; TUNIT-NEXT: ret void
;
; CGSCC: Function Attrs: inlinehint nofree norecurse nosync nounwind willreturn memory(argmem: readwrite)
uwtable
; CGSCC-LABEL:
define {{{^@+}}@avx512_legal512_prefer512_call_avx512_legal512_prefer256
; CGSCC-SAME: (ptr nocapture nofree noundef nonnull writeonly align 2 dereferenceable(64) [[ARG:%.*]])
#[[ATTR0]] {
; CGSCC-NEXT: bb:
; CGSCC-NEXT: [[TMP:%.*]] = alloca <8 x i64>, align 32
; CGSCC-NEXT: [[TMP2:%.*]] = alloca <8 x i64>, align 32
; CGSCC-NEXT: call void @llvm.memset.p0.i64(ptr noalias nocapture nofree noundef nonnull writeonly align 64
dereferenceable(64) [[TMP]], i8 noundef 0, i64 noundef 32, i1 noundef false) #[[ATTR5]]

```

```

; CGSCC-NEXT:  [[TMP0:%.*]] = load <8 x i64>, ptr [[TMP]], align 64
; CGSCC-NEXT:  call fastcc void @callee_avx512_legal512_prefer512_call_avx512_legal512_prefer256(ptr
noalias nocapture nofree noundef nonnull writeonly align 64 dereferenceable(64) [[TMP2]], <8 x i64> [[TMP0]])
#[[ATTR6]]
; CGSCC-NEXT:  [[TMP4:%.*]] = load <8 x i64>, ptr [[TMP2]], align 64
; CGSCC-NEXT:  store <8 x i64> [[TMP4]], ptr [[ARG]], align 2
; CGSCC-NEXT:  ret void
;
bb:
%tmp
= alloca <8 x i64>, align 32
%tmp2 = alloca <8 x i64>, align 32
call void @llvm.memset.p0.i64(ptr align 32 %tmp, i8 0, i64 32, i1 false)
call fastcc void @callee_avx512_legal512_prefer512_call_avx512_legal512_prefer256(ptr %tmp2, ptr %tmp)
%tmp4 = load <8 x i64>, ptr %tmp2, align 32
store <8 x i64> %tmp4, ptr %arg, align 2
ret void
}

; This should promote
define internal fastcc void @callee_avx512_legal512_prefer256_call_avx512_legal512_prefer512(ptr %arg, ptr
readonly %arg1) #0 {
;
; CHECK: Function Attrs: inlinehint nofree norecurse nosync nounwind willreturn memory(argmem: readwrite)
uwtable
; CHECK-LABEL: define {{{^@}+}}@callee_avx512_legal512_prefer256_call_avx512_legal512_prefer512
; CHECK-SAME: (ptr noalias nocapture nofree noundef nonnull writeonly align 64 dereferenceable(64)
[[ARG:%.*]], <8 x i64> [[TMP0:%.*]]) #[[ATTR0]] {
; CHECK-NEXT: bb:
; CHECK-NEXT:  [[ARG1_PRIV:%.*]] = alloca <8 x i64>, align 64
; CHECK-NEXT:  store <8 x i64> [[TMP0]], ptr [[ARG1_PRIV]],
align 64
; CHECK-NEXT:  [[TMP:%.*]] = load <8 x i64>, ptr [[ARG1_PRIV]], align 64
; CHECK-NEXT:  store <8 x i64> [[TMP]], ptr [[ARG]], align 64
; CHECK-NEXT:  ret void
;
bb:
%tmp = load <8 x i64>, ptr %arg1
store <8 x i64> %tmp, ptr %arg
ret void
}

define void @avx512_legal512_prefer256_call_avx512_legal512_prefer512(ptr %arg) #1 {
;
; TUNIT: Function Attrs: inlinehint nofree norecurse nosync nounwind willreturn memory(argmem: readwrite)
uwtable
; TUNIT-LABEL: define {{{^@}+}}@avx512_legal512_prefer256_call_avx512_legal512_prefer512
; TUNIT-SAME: (ptr nocapture nofree writeonly [[ARG:%.*]]) #[[ATTR1]] {

```

```

; TUNIT-NEXT: bb:
; TUNIT-NEXT: [[TMP:%.*]] = alloca <8 x i64>, align 32
; TUNIT-NEXT: [[TMP2:%.*]] = alloca <8 x i64>, align 32
; TUNIT-NEXT: call void @llvm.memset.p0.i64(ptr noalias nocapture nofree noundef nonnull writeonly align 32
dereferenceable(64) [[TMP]], i8 noundef 0, i64 noundef 32, i1 noundef false) #[[ATTR5]]
; TUNIT-NEXT: [[TMP0:%.*]] = load
<8 x i64>, ptr [[TMP]], align 64
; TUNIT-NEXT: call fastcc void @callee_avx512_legal512_prefer256_call_avx512_legal512_prefer512(ptr
noalias nocapture nofree noundef nonnull writeonly align 64 dereferenceable(64) [[TMP2]], <8 x i64> [[TMP0]])
#[[ATTR6]]
; TUNIT-NEXT: [[TMP4:%.*]] = load <8 x i64>, ptr [[TMP2]], align 64
; TUNIT-NEXT: store <8 x i64> [[TMP4]], ptr [[ARG]], align 2
; TUNIT-NEXT: ret void
;
; CGSCC: Function Attrs: inlinehint nofree norecurse nosync nounwind willreturn memory(argmem: readwrite)
uwtable
; CGSCC-LABEL: define {{{^@+}}}@avx512_legal512_prefer256_call_avx512_legal512_prefer512
; CGSCC-SAME: (ptr nocapture nofree noundef nonnull writeonly align 2 dereferenceable(64) [[ARG:%.*]])
#[[ATTR1]] {
; CGSCC-NEXT: bb:
; CGSCC-NEXT: [[TMP:%.*]] = alloca <8 x i64>, align 32
; CGSCC-NEXT: [[TMP2:%.*]] = alloca <8 x i64>, align 32
; CGSCC-NEXT: call void @llvm.memset.p0.i64(ptr noalias nocapture nofree noundef nonnull writeonly align 64
dereferenceable(64)
[[TMP]], i8 noundef 0, i64 noundef 32, i1 noundef false) #[[ATTR5]]
; CGSCC-NEXT: [[TMP0:%.*]] = load <8 x i64>, ptr [[TMP]], align 64
; CGSCC-NEXT: call fastcc void @callee_avx512_legal512_prefer256_call_avx512_legal512_prefer512(ptr
noalias nocapture nofree noundef nonnull writeonly align 64 dereferenceable(64) [[TMP2]], <8 x i64> [[TMP0]])
#[[ATTR6]]
; CGSCC-NEXT: [[TMP4:%.*]] = load <8 x i64>, ptr [[TMP2]], align 64
; CGSCC-NEXT: store <8 x i64> [[TMP4]], ptr [[ARG]], align 2
; CGSCC-NEXT: ret void
;
bb:
%tmp = alloca <8 x i64>, align 32
%tmp2 = alloca <8 x i64>, align 32
call void @llvm.memset.p0.i64(ptr align 32 %tmp, i8 0, i64 32, i1 false)
call fastcc void @callee_avx512_legal512_prefer256_call_avx512_legal512_prefer512(ptr %tmp2, ptr %tmp)
%tmp4 = load <8 x i64>, ptr %tmp2, align 32
store <8 x i64> %tmp4, ptr %arg, align 2
ret void
}

; This should not promote
define internal fastcc void @callee_avx512_legal256_prefer256_call_avx512_legal512_prefer256(ptr
%arg, ptr readonly %arg1) #1 {
;
; CHECK: Function Attrs: inlinehint nofree norecurse nosync nounwind willreturn memory(argmem: readwrite)

```

```

uwtable
; CHECK-LABEL: define {{{^@+}}}@callee_avx512_legal256_prefer256_call_avx512_legal512_prefer256
; CHECK-SAME: (ptr noalias nocapture nofree noundef nonnull writeonly align 64 dereferenceable(64)
[[ARG:%.*]], ptr noalias nocapture nofree noundef nonnull readonly align 64 dereferenceable(64) [[ARG1:%.*]])
#[[ATTR1]] {
; CHECK-NEXT: bb:
; CHECK-NEXT: [[TMP:%.*]] = load <8 x i64>, ptr [[ARG1]], align 64
; CHECK-NEXT: store <8 x i64> [[TMP]], ptr [[ARG]], align 64
; CHECK-NEXT: ret void
;
bb:
%tmp = load <8 x i64>, ptr %arg1
store <8 x i64> %tmp, ptr %arg
ret void
}

define void @avx512_legal256_prefer256_call_avx512_legal512_prefer256(ptr %arg) #2 {
;
; TUNIT: Function Attrs: inlinehint nofree norecurse nosync nounwind willreturn memory(argmem: readwrite)
uwtable
; TUNIT-LABEL: define {{{^@+}}}@avx512_legal256_prefer256_call_avx512_legal512_prefer256
;
; TUNIT-SAME: (ptr nocapture nofree writeonly [[ARG:%.*]]) #[[ATTR2:[0-9]+]] {
; TUNIT-NEXT: bb:
; TUNIT-NEXT: [[TMP:%.*]] = alloca <8 x i64>, align 32
; TUNIT-NEXT: [[TMP2:%.*]] = alloca <8 x i64>, align 32
; TUNIT-NEXT: call void @llvm.memset.p0.i64(ptr noalias nocapture nofree noundef nonnull writeonly align 32
dereferenceable(64) [[TMP]], i8 noundef 0, i64 noundef 32, i1 noundef false) #[[ATTR5]]
; TUNIT-NEXT: call fastcc void @callee_avx512_legal256_prefer256_call_avx512_legal512_prefer256(ptr
noalias nocapture nofree noundef nonnull writeonly align 64 dereferenceable(64) [[TMP2]], ptr noalias nocapture
nofree noundef nonnull readonly align 64 dereferenceable(64) [[TMP]]) #[[ATTR6]]
; TUNIT-NEXT: [[TMP4:%.*]] = load <8 x i64>, ptr [[TMP2]], align 64
; TUNIT-NEXT: store <8 x i64> [[TMP4]], ptr [[ARG]], align 2
; TUNIT-NEXT: ret void
;
; CGSCC: Function Attrs: inlinehint nofree norecurse nosync nounwind willreturn memory(argmem:
readwrite) uwtable
; CGSCC-LABEL: define {{{^@+}}}@avx512_legal256_prefer256_call_avx512_legal512_prefer256
; CGSCC-SAME: (ptr nocapture nofree noundef nonnull writeonly align 2 dereferenceable(64) [[ARG:%.*]])
#[[ATTR2:[0-9]+]] {
; CGSCC-NEXT: bb:
; CGSCC-NEXT: [[TMP:%.*]] = alloca <8 x i64>, align 32
; CGSCC-NEXT: [[TMP2:%.*]] = alloca <8 x i64>, align 32
; CGSCC-NEXT: call void @llvm.memset.p0.i64(ptr noalias nocapture nofree noundef nonnull writeonly align 64
dereferenceable(64) [[TMP]], i8 noundef 0, i64 noundef 32, i1 noundef false) #[[ATTR5]]
; CGSCC-NEXT: call fastcc void @callee_avx512_legal256_prefer256_call_avx512_legal512_prefer256(ptr
noalias nocapture nofree noundef nonnull writeonly align 64 dereferenceable(64) [[TMP2]], ptr noalias nocapture
nofree noundef nonnull readonly align 64 dereferenceable(64) [[TMP]]) #[[ATTR6]]

```

```

; CGSCC-NEXT:  [[TMP4:%.*]] = load <8 x i64>, ptr [[TMP2]], align 64
; CGSCC-NEXT:  store <8 x i64> [[TMP4]], ptr [[ARG]], align
2
; CGSCC-NEXT:  ret void
;
bb:
%tmp = alloca <8 x i64>, align 32
%tmp2 = alloca <8 x i64>, align 32
call void @llvm.memset.p0.i64(ptr align 32 %tmp, i8 0, i64 32, i1 false)
call fastcc void @callee_avx512_legal256_prefer256_call_avx512_legal512_prefer256(ptr %tmp2, ptr %tmp)
%tmp4 = load <8 x i64>, ptr %tmp2, align 32
store <8 x i64> %tmp4, ptr %arg, align 2
ret void
}

; This should not promote
define internal fastcc void @callee_avx512_legal512_prefer256_call_avx512_legal256_prefer256(ptr %arg, ptr
readonly %arg1) #2 {
;
; CHECK: Function Attrs: inlinehint nofree norecurse nosync nounwind willreturn memory(argmem: readwrite)
uwtable
; CHECK-LABEL: define {{{^@+}}}@callee_avx512_legal512_prefer256_call_avx512_legal256_prefer256
; CHECK-SAME: (ptr noalias nocapture nofree noundef nonnull writeonly align 64 dereferenceable(64)
[[ARG:%.*]], ptr noalias nocapture nofree noundef nonnull readonly align 64 dereferenceable(64) [[ARG1:%.*]])
#[[ATTR2:[0-9]+]] {
; CHECK-NEXT:
bb:
; CHECK-NEXT:  [[TMP:%.*]] = load <8 x i64>, ptr [[ARG1]], align 64
; CHECK-NEXT:  store <8 x i64> [[TMP]], ptr [[ARG]], align 64
; CHECK-NEXT:  ret void
;
bb:
%tmp = load <8 x i64>, ptr %arg1
store <8 x i64> %tmp, ptr %arg
ret void
}

define void @avx512_legal512_prefer256_call_avx512_legal256_prefer256(ptr %arg) #1 {
;
; TUNIT: Function Attrs: inlinehint nofree norecurse nosync nounwind willreturn memory(argmem: readwrite)
uwtable
; TUNIT-LABEL: define {{{^@+}}}@avx512_legal512_prefer256_call_avx512_legal256_prefer256
; TUNIT-SAME: (ptr nocapture nofree writeonly [[ARG:%.*]]) #[[ATTR1]] {
; TUNIT-NEXT: bb:
; TUNIT-NEXT:  [[TMP:%.*]] = alloca <8 x i64>, align 32
; TUNIT-NEXT:  [[TMP2:%.*]] = alloca <8 x i64>, align 32
; TUNIT-NEXT:  call void @llvm.memset.p0.i64(ptr noalias nocapture nofree noundef nonnull writeonly align 32
dereferenceable(64) [[TMP]], i8 noundef 0, i64 noundef 32, i1 noundef false) #[[ATTR5]]

```

```

; TUNIT-NEXT:  call fastcc void @callee_avx512_legal512_prefer256_call_avx512_legal256_prefer256(ptr
noalias nocapture nofree noundef nonnull writeonly align 64 dereferenceable(64) [[TMP2]], ptr noalias nocapture
nofree noundef nonnull readonly align 64 dereferenceable(64) [[TMP]]) #[[ATTR6]]
; TUNIT-NEXT:  [[TMP4:%.*]] = load <8 x i64>, ptr [[TMP2]], align 64
; TUNIT-NEXT:  store <8 x i64> [[TMP4]], ptr [[ARG]], align 2
; TUNIT-NEXT:  ret void
;
; CGSCC: Function Attrs: inlinehint nofree norecurse nosync nounwind willreturn memory(argmem: readwrite)
uwtable
; CGSCC-LABEL: define {{{^@}+}}@avx512_legal512_prefer256_call_avx512_legal256_prefer256
; CGSCC-SAME: (ptr nocapture nofree noundef nonnull writeonly align 2 dereferenceable(64) [[ARG:%.*]])
#[[ATTR1]] {
; CGSCC-NEXT: bb:
; CGSCC-NEXT:  [[TMP:%.*]] = alloca <8 x i64>, align 32
; CGSCC-NEXT:  [[TMP2:%.*]] = alloca <8 x i64>, align 32
; CGSCC-NEXT:  call void @llvm.memset.p0.i64(ptr noalias nocapture nofree noundef nonnull writeonly align 64
dereferenceable(64) [[TMP]],
i8 noundef 0, i64 noundef 32, i1 noundef false) #[[ATTR5]]
; CGSCC-NEXT:  call fastcc void @callee_avx512_legal512_prefer256_call_avx512_legal256_prefer256(ptr
noalias nocapture nofree noundef nonnull writeonly align 64 dereferenceable(64) [[TMP2]], ptr noalias nocapture
nofree noundef nonnull readonly align 64 dereferenceable(64) [[TMP]]) #[[ATTR6]]
; CGSCC-NEXT:  [[TMP4:%.*]] = load <8 x i64>, ptr [[TMP2]], align 64
; CGSCC-NEXT:  store <8 x i64> [[TMP4]], ptr [[ARG]], align 2
; CGSCC-NEXT:  ret void
;
bb:
%tmp = alloca <8 x i64>, align 32
%tmp2 = alloca <8 x i64>, align 32
call void @llvm.memset.p0.i64(ptr align 32 %tmp, i8 0, i64 32, i1 false)
call fastcc void @callee_avx512_legal512_prefer256_call_avx512_legal256_prefer256(ptr %tmp2, ptr %tmp)
%tmp4 = load <8 x i64>, ptr %tmp2, align 32
store <8 x i64> %tmp4, ptr %arg, align 2
ret void
}

; This should promote
define internal fastcc void @callee_avx2_legal256_prefer256_call_avx2_legal512_prefer256(ptr %arg,
ptr readonly %arg1) #3 {
;
; CHECK: Function Attrs: inlinehint nofree norecurse nosync nounwind willreturn memory(argmem: readwrite)
uwtable
; CHECK-LABEL: define {{{^@}+}}@callee_avx2_legal256_prefer256_call_avx2_legal512_prefer256
; CHECK-SAME: (ptr noalias nocapture nofree noundef nonnull writeonly align 64 dereferenceable(64)
[[ARG:%.*]], <8 x i64> [[TMP0:%.*]]) #[[ATTR3:[0-9]+]] {
; CHECK-NEXT: bb:
; CHECK-NEXT:  [[ARG1_PRIV:%.*]] = alloca <8 x i64>, align 64
; CHECK-NEXT:  store <8 x i64> [[TMP0]], ptr [[ARG1_PRIV]], align 64
; CHECK-NEXT:  [[TMP:%.*]] = load <8 x i64>, ptr [[ARG1_PRIV]], align 64

```

```

; CHECK-NEXT: store <8 x i64> [[TMP]], ptr [[ARG]], align 64
; CHECK-NEXT: ret void
;
bb:
  %tmp = load <8 x i64>, ptr %arg1
  store <8 x i64> %tmp, ptr %arg
  ret void
}

define void @avx2_legal256_prefer256_call_avx2_legal512_prefer256(ptr %arg) #4 {
;
; TUNIT: Function Attrs: inlinehint nofree norecurse nosync nounwind willreturn memory(argmem: readwrite)
uwtable
;
  TUNIT-LABEL: define {{{^@+}}} @avx2_legal256_prefer256_call_avx2_legal512_prefer256
; TUNIT-SAME: (ptr nocapture nofree writeonly [[ARG:%.*]]) #[[ATTR3]] {
; TUNIT-NEXT: bb:
; TUNIT-NEXT: [[TMP:%.*]] = alloca <8 x i64>, align 32
; TUNIT-NEXT: [[TMP2:%.*]] = alloca <8 x i64>, align 32
; TUNIT-NEXT: call void @llvm.memset.p0.i64(ptr noalias nocapture nofree noundef nonnull writeonly align 32
dereferenceable(64) [[TMP]], i8 noundef 0, i64 noundef 32, i1 noundef false) #[[ATTR5]]
; TUNIT-NEXT: [[TMP0:%.*]] = load <8 x i64>, ptr [[TMP]], align 64
; TUNIT-NEXT: call fastcc void @callee_avx2_legal256_prefer256_call_avx2_legal512_prefer256(ptr noalias
nocapture nofree noundef nonnull writeonly align 64 dereferenceable(64) [[TMP2]], <8 x i64> [[TMP0]])
#[[ATTR6]]
; TUNIT-NEXT: [[TMP4:%.*]] = load <8 x i64>, ptr [[TMP2]], align 64
; TUNIT-NEXT: store <8 x i64> [[TMP4]], ptr [[ARG]], align 2
; TUNIT-NEXT: ret void
;
; CGSCC: Function Attrs: inlinehint nofree norecurse nosync
nounwind willreturn memory(argmem: readwrite) uwtable
; CGSCC-LABEL: define {{{^@+}}} @avx2_legal256_prefer256_call_avx2_legal512_prefer256
; CGSCC-SAME: (ptr nocapture nofree noundef nonnull writeonly align 2 dereferenceable(64) [[ARG:%.*]])
#[[ATTR3]] {
; CGSCC-NEXT: bb:
; CGSCC-NEXT: [[TMP:%.*]] = alloca <8 x i64>, align 32
; CGSCC-NEXT: [[TMP2:%.*]] = alloca <8 x i64>, align 32
; CGSCC-NEXT: call void @llvm.memset.p0.i64(ptr noalias nocapture nofree noundef nonnull writeonly align 64
dereferenceable(64) [[TMP]], i8 noundef 0, i64 noundef 32, i1 noundef false) #[[ATTR5]]
; CGSCC-NEXT: [[TMP0:%.*]] = load <8 x i64>, ptr [[TMP]], align 64
; CGSCC-NEXT: call fastcc void @callee_avx2_legal256_prefer256_call_avx2_legal512_prefer256(ptr noalias
nocapture nofree noundef nonnull writeonly align 64 dereferenceable(64) [[TMP2]], <8 x i64> [[TMP0]])
#[[ATTR6]]
; CGSCC-NEXT: [[TMP4:%.*]] = load <8 x i64>, ptr [[TMP2]], align 64
; CGSCC-NEXT: store <8 x i64> [[TMP4]], ptr
[[ARG]], align 2
; CGSCC-NEXT: ret void
;

```

```

bb:
%tmp = alloca <8 x i64>, align 32
%tmp2 = alloca <8 x i64>, align 32
call void @llvm.memset.p0.i64(ptr align 32 %tmp, i8 0, i64 32, i1 false)
call fastcc void @callee_avx2_legal256_prefer256_call_avx2_legal512_prefer256(ptr %tmp2, ptr %tmp)
%tmp4 = load <8 x i64>, ptr %tmp2, align 32
store <8 x i64> %tmp4, ptr %arg, align 2
ret void
}

; This should promote
define internal fastcc void @callee_avx2_legal512_prefer256_call_avx2_legal256_prefer256(ptr %arg, ptr readonly %arg1) #4 {
;
; CHECK: Function Attrs: inlinehint nofree norecurse nosync nounwind willreturn memory(argmem: readwrite)
uwtable
; CHECK-LABEL: define {{{^@+}}}@callee_avx2_legal512_prefer256_call_avx2_legal256_prefer256
; CHECK-SAME: (ptr noalias nocapture nofree noundef nonnull writeonly align 64 dereferenceable(64)
[[ARG:%.*]], <8 x i64> [[TMP0:%.*]]) #[[ATTR3]] {
; CHECK-NEXT: bb:
; CHECK-NEXT:  [[ARG1_PRIV:%.*]] = alloca <8 x i64>, align 64
; CHECK-NEXT:
    store <8 x i64> [[TMP0]], ptr [[ARG1_PRIV]], align 64
; CHECK-NEXT:  [[TMP:%.*]] = load <8 x i64>, ptr [[ARG1_PRIV]], align 64
; CHECK-NEXT:  store <8 x i64> [[TMP]], ptr [[ARG]], align 64
; CHECK-NEXT:  ret void
;
bb:
%tmp = load <8 x i64>, ptr %arg1
store <8 x i64> %tmp, ptr %arg
ret void
}

define void @avx2_legal512_prefer256_call_avx2_legal256_prefer256(ptr %arg) #3 {
;
; TUNIT: Function Attrs: inlinehint nofree norecurse nosync nounwind willreturn memory(argmem: readwrite)
uwtable
; TUNIT-LABEL: define {{{^@+}}}@avx2_legal512_prefer256_call_avx2_legal256_prefer256
; TUNIT-SAME: (ptr nocapture nofree writeonly [[ARG:%.*]]) #[[ATTR3]] {
; TUNIT-NEXT: bb:
; TUNIT-NEXT:  [[TMP:%.*]] = alloca <8 x i64>, align 32
; TUNIT-NEXT:  [[TMP2:%.*]] = alloca <8 x i64>, align 32
; TUNIT-NEXT:  call void @llvm.memset.p0.i64(ptr noalias nocapture nofree noundef nonnull writeonly align 32
dereferenceable(64) [[TMP]], i8 noundef 0, i64 noundef 32, i1 noundef false) #[[ATTR5]]
;
; TUNIT-NEXT:  [[TMP0:%.*]] = load <8 x i64>, ptr [[TMP]], align 64
; TUNIT-NEXT:  call fastcc void @callee_avx2_legal512_prefer256_call_avx2_legal256_prefer256(ptr noalias
nocapture nofree noundef nonnull writeonly align 64 dereferenceable(64) [[TMP2]], <8 x i64> [[TMP0]])

```



```

#[[ATTR6]]
; TUNIT-NEXT:  [[TMP4:%.*]] = load <8 x i64>, ptr [[TMP2]], align 64
; TUNIT-NEXT:  store <8 x i64> [[TMP4]], ptr [[ARG]], align 2
; TUNIT-NEXT:  ret void
;
; CGSCC: Function Attrs: inlinehint norecurse nosync nounwind willreturn memory(argmem: readwrite)
uwtable
; CGSCC-LABEL: define {{{^@+}}} @avx2_legal512_prefer256_call_avx2_legal256_prefer256
; CGSCC-SAME: (ptr nocapture norecurse noundef nonnull writeonly align 2 dereferenceable(64) [[ARG:%.*]])
#[[ATTR3]] {
; CGSCC-NEXT: bb:
; CGSCC-NEXT:  [[TMP:%.*]] = alloca <8 x i64>, align 32
; CGSCC-NEXT:  [[TMP2:%.*]] = alloca <8 x i64>, align 32
; CGSCC-NEXT:  call void @llvm.memset.p0.i64(ptr noalias nocapture norecurse noundef nonnull writeonly
align 64 dereferenceable(64) [[TMP]], i8 noundef 0, i64 noundef 32, i1 noundef false) #[[ATTR5]]
; CGSCC-NEXT:  [[TMP0:%.*]] = load <8 x i64>, ptr [[TMP]], align 64
; CGSCC-NEXT:  call fastcc void @callee_avx2_legal512_prefer256_call_avx2_legal256_prefer256(ptr noalias
nocapture norecurse noundef nonnull writeonly align 64 dereferenceable(64) [[TMP2]], <8 x i64> [[TMP0]])
#[[ATTR6]]
; CGSCC-NEXT:  [[TMP4:%.*]] = load <8 x i64>, ptr [[TMP2]], align 64
; CGSCC-NEXT:  store <8 x i64> [[TMP4]], ptr [[ARG]], align 2
; CGSCC-NEXT:  ret void
;
bb:
%tmp = alloca <8 x i64>, align 32
%tmp2 = alloca <8 x i64>, align 32
call void @llvm.memset.p0.i64(ptr align 32 %tmp, i8 0, i64 32, i1 false)
call fastcc void @callee_avx2_legal512_prefer256_call_avx2_legal256_prefer256(ptr %tmp2, ptr %tmp)
%tmp4 = load <8 x i64>, ptr %tmp2, align 32
store <8 x i64> %tmp4, ptr %arg, align 2
ret void
}

; Function Attrs: argmemonly nounwind
declare void @llvm.memset.p0.i64(ptr nocapture writeonly,
i8, i64, i1) #5

attributes #0 = { inlinehint norecurse nounwind uwtable "target-features"="+avx512vl" "min-legal-vector-
width"="512" "prefer-vector-width"="512" }
attributes #1 = { inlinehint norecurse nounwind uwtable "target-features"="+avx512vl" "min-legal-vector-
width"="512" "prefer-vector-width"="256" }
attributes #2 = { inlinehint norecurse nounwind uwtable "target-features"="+avx512vl" "min-legal-vector-
width"="256" "prefer-vector-width"="256" }
attributes #3 = { inlinehint norecurse nounwind uwtable "target-features"="+avx2" "min-legal-vector-width"="512"
"prefer-vector-width"="256" }
attributes #4 = { inlinehint norecurse nounwind uwtable "target-features"="+avx2" "min-legal-vector-width"="256"
"prefer-vector-width"="256" }
attributes #5 = { argmemonly nounwind }

```

```

;
; TUNIT: attributes #[[ATTR0]] = { inlinehint nofree norecurse nosync nounwind willreturn memory(argmem:
readwrite) uwtable "min-legal-vector-width"="512" "prefer-vector-width"="512" "target-features"="+avx512vl"
}
; TUNIT: attributes #[[ATTR1]] = { inlinehint nofree norecurse nosync nounwind willreturn memory(argmem:
readwrite) uwtable "min-legal-vector-width"="512" "prefer-vector-width"="256" "target-features"="+avx512vl" }
; TUNIT: attributes #[[ATTR2]] = { inlinehint nofree norecurse nosync nounwind willreturn memory(argmem:
readwrite) uwtable "min-legal-vector-width"="256" "prefer-vector-width"="256" "target-features"="+avx512vl" }
; TUNIT: attributes #[[ATTR3]] = { inlinehint nofree norecurse nosync nounwind willreturn memory(argmem:
readwrite) uwtable "min-legal-vector-width"="512" "prefer-vector-width"="256" "target-features"="+avx2" }
; TUNIT: attributes #[[ATTR4:[0-9]+]] = { nocallback nofree nounwind willreturn memory(argmem: write) }
; TUNIT: attributes #[[ATTR5]] = { willreturn }
; TUNIT: attributes #[[ATTR6]] = { nofree nosync nounwind willreturn }
;
; CGSCC: attributes #[[ATTR0]] = { inlinehint nofree norecurse nosync nounwind willreturn memory(argmem:
readwrite) uwtable
"min-legal-vector-width"="512" "prefer-vector-width"="512" "target-features"="+avx512vl" }
; CGSCC: attributes #[[ATTR1]] = { inlinehint nofree norecurse nosync nounwind willreturn memory(argmem:
readwrite) uwtable "min-legal-vector-width"="512" "prefer-vector-width"="256" "target-features"="+avx512vl" }
; CGSCC: attributes #[[ATTR2]] = { inlinehint nofree norecurse nosync nounwind willreturn memory(argmem:
readwrite) uwtable "min-legal-vector-width"="256" "prefer-vector-width"="256" "target-features"="+avx512vl" }
; CGSCC: attributes #[[ATTR3]] = { inlinehint nofree norecurse nosync nounwind willreturn memory(argmem:
readwrite) uwtable "min-legal-vector-width"="512" "prefer-vector-width"="256" "target-features"="+avx2" }
; CGSCC: attributes #[[ATTR4:[0-9]+]] = { nocallback nofree nounwind willreturn memory(argmem: write) }
; CGSCC: attributes #[[ATTR5]] = { willreturn }
; CGSCC: attributes #[[ATTR6]] = { nounwind willreturn }
;
; RUN: opt %s -passes=inline -S | FileCheck %s

define internal void @innerSmall() "min-legal-vector-width"="128" {
    ret void
}

define internal void @innerLarge() "min-legal-vector-width"="512" {
    ret void
}

define internal void @innerNoAttribute() {
    ret void
}

; We should not add an attribute during inlining. No attribute means unknown.
; Inlining doesn't change the fact that we don't know anything about this
; function.
define void @outerNoAttribute() {
    call void @innerLarge()
    ret void
}

```

```

define void @outerConflictingAttributeSmall() "min-legal-vector-width"="128" {
  call void @innerLarge()
  ret void
}

```

```

define void @outerConflictingAttributeLarge() "min-legal-vector-width"="512" {
  call void @innerSmall()
  ret void
}

```

; We should remove the attribute after inlining since the callee's
; vector width requirements are unknown.

```

define void @outerAttribute() "min-legal-vector-width"="128" {
  call void @innerNoAttribute()
  ret void
}

```

```

; CHECK: define void @outerNoAttribute()
{

```

```

; CHECK: define void @outerConflictingAttributeSmall() #0

```

```

; CHECK: define void @outerConflictingAttributeLarge() #0

```

```

; CHECK: define void @outerAttribute() {

```

```

; CHECK: attributes #0 = { "min-legal-vector-width"="512" }

```

```

; RUN: opt -mtriple=aarch64-linux-gnu -mattr=+sve -passes=sanitize-masked-mem-intrin -S < %s | FileCheck %s

```

; Testing that masked scatters operating on scalable vectors that are
; packed in SVE registers are not scalarized.

```

; CHECK-LABEL: @masked_scatter_nxv4i32(

```

```

; CHECK: call void @llvm.masked.scatter.nxv4i32

```

```

define void @masked_scatter_nxv4i32(<vscale x 4 x i32> %data, <vscale x 4 x ptr> %ptrs, <vscale x 4 x i1>
%mask) {

```

```

  call void @llvm.masked.scatter.nxv4i32(<vscale x 4 x i32> %data, <vscale x 4 x ptr> %ptrs, i32 0, <vscale x 4 x
i1> %mask)

```

```

  ret void

```

```

}

```

; Testing that masked scatters operating on scalable vectors of FP
; data that is packed in SVE registers are not scalarized.

```

; CHECK-LABEL: @masked_scatter_nxv2f64(

```

```

; CHECK: call void @llvm.masked.scatter.nxv2f64

```

```

define void @masked_scatter_nxv2f64(<vscale x 2 x double> %data, <vscale x 2 x ptr> %ptrs, <vscale x 2 x i1>
%mask) {

```

```

  call void @llvm.masked.scatter.nxv2f64(<vscale x 2 x double> %data, <vscale x 2 x ptr> %ptrs,
i32 0, <vscale x 2 x i1> %mask)

```

```

  ret void

```

```

}

; Testing that masked scatters operating on scalable vectors of FP
; data that is unpacked in SVE registers are not scalarized.

; CHECK-LABEL: @masked_scatter_nxv2f16(
; CHECK: call void @llvm.masked.scatter.nxv2f16
define void @masked_scatter_nxv2f16(<vscale x 2 x half> %data, <vscale x 2 x ptr> %ptrs, <vscale x 2 x i1>
%mask) {
    call void @llvm.masked.scatter.nxv2f16(<vscale x 2 x half> %data, <vscale x 2 x ptr> %ptrs, i32 0, <vscale x 2 x
i1> %mask)
    ret void
}

; Testing that masked scatters operating on 64-bit fixed vectors are
; scalarized because NEON doesn't have support for masked scatter
; instructions.

; CHECK-LABEL: @masked_scatter_v2f32(
; CHECK-NOT: @llvm.masked.scatter.v2f32(
define void @masked_scatter_v2f32(<2 x float> %data, <2 x ptr> %ptrs, <2 x i1> %mask) {
    call void @llvm.masked.scatter.v2f32(<2 x float> %data, <2 x ptr> %ptrs, i32 0, <2 x i1> %mask)
    ret void
}

; Testing that masked scatters operating on 128-bit
fixed vectors are
; scalarized because NEON doesn't have support for masked scatter
; instructions and because we are not targeting fixed width SVE.

; CHECK-LABEL: @masked_scatter_v4i32(
; CHECK-NOT: @llvm.masked.scatter.v4i32(
define void @masked_scatter_v4i32(<4 x i32> %data, <4 x ptr> %ptrs, <4 x i1> %mask) {
    call void @llvm.masked.scatter.v4i32(<4 x i32> %data, <4 x ptr> %ptrs, i32 0, <4 x i1> %mask)
    ret void
}

declare void @llvm.masked.scatter.nxv4i32(<vscale x 4 x i32> %data, <vscale x 4 x ptr> %ptrs, i32 %align,
<vscale x 4 x i1> %mask)
declare void @llvm.masked.scatter.nxv2f64(<vscale x 2 x double> %data, <vscale x 2 x ptr> %ptrs, i32 %align,
<vscale x 2 x i1> %mask)
declare void @llvm.masked.scatter.nxv2f16(<vscale x 2 x half> %data, <vscale x 2 x ptr> %ptrs, i32 %align,
<vscale x 2 x i1> %mask)
declare void @llvm.masked.scatter.v2f32(<2 x float> %data, <2 x ptr> %ptrs, i32 %align, <2 x i1> %mask)
declare void @llvm.masked.scatter.v4i32(<4 x i32> %data, <4 x
ptr> %ptrs, i32 %align, <4 x i1> %mask)

```

=====

The LLVM Project is under the Apache License v2.0 with LLVM Exceptions:

TERMS AND CONDITIONS FOR USE, REPRODUCTION, AND DISTRIBUTION

1. Definitions.

"License" shall mean the terms and conditions for use, reproduction, and distribution as defined by Sections 1 through 9 of this document.

"Licensor" shall mean the copyright owner or entity authorized by the copyright owner that is granting the License.

"Legal Entity" shall mean the union of the acting entity and all other entities that control, are controlled by, or are under common control with that entity. For the purposes of this definition, "control" means (i) the power, direct or indirect, to cause the direction or management of such entity, whether by contract or otherwise, or (ii) ownership of fifty percent (50%) or more of the outstanding shares, or (iii) beneficial ownership of such entity.

"You" (or "Your") shall mean an individual or Legal Entity exercising permissions granted by this License.

"Source" form shall mean the preferred form for making modifications, including but not limited to software source code, documentation source, and configuration files.

"Object" form shall mean any form resulting from mechanical transformation or translation of a Source form, including but not limited to compiled object code, generated documentation, and conversions to other media types.

"Work" shall mean the work of authorship, whether in Source or Object form, made available under the License, as indicated by a copyright notice that is included in or attached to the work (an example is provided in the Appendix below).

"Derivative Works" shall mean any work, whether in Source or Object form, that is based on (or derived from) the Work and for which the editorial revisions, annotations, elaborations, or other modifications represent, as a whole, an original work of authorship. For the purposes of this License, Derivative Works shall not include works that remain

separable from, or merely link (or bind by name) to the interfaces of, the Work and Derivative Works thereof.

"Contribution" shall mean any work of authorship, including the original version of the Work and any modifications or additions to that Work or Derivative Works thereof, that is intentionally submitted to Licensor for inclusion in the Work by the copyright owner or by an individual or Legal Entity authorized to submit on behalf of the copyright owner. For the purposes of this definition, "submitted"

means any form of electronic, verbal, or written communication sent to the Licensor or its representatives, including but not limited to communication on electronic mailing lists, source code control systems, and issue tracking systems that are managed by, or on behalf of, the Licensor for the purpose of discussing and improving the Work, but excluding communication that is conspicuously marked or otherwise designated in writing by the copyright owner as "Not a Contribution."

"Contributor" shall mean Licensor and any individual or Legal Entity on behalf of whom a Contribution has been received by Licensor and subsequently incorporated within the Work.

2. Grant of Copyright License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable copyright license to reproduce, prepare Derivative Works of, publicly display, publicly perform, sublicense, and distribute the Work and such Derivative Works in Source or Object form.

3. Grant of Patent License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable (except as stated in this section) patent license to make, have made, use, offer to sell, sell, import, and otherwise transfer the Work, where such license applies only to those patent claims licensable by such Contributor that are necessarily infringed by their Contribution(s) alone or by combination of their Contribution(s) with the Work to which such Contribution(s) was submitted. If You institute patent litigation against any entity (including a cross-claim or counterclaim in a lawsuit) alleging that the Work or a Contribution incorporated within the Work constitutes direct or contributory patent infringement, then any patent licenses granted to You under this License for that Work shall terminate as of the date such litigation is filed.

4. Redistribution. You may reproduce and distribute copies of the Work or Derivative Works thereof in any medium, with or without

modifications, and in Source or Object form, provided that You meet the following conditions:

- (a) You must give any other recipients of the Work or Derivative Works a copy of this License; and
- (b) You must cause any modified files to carry prominent notices stating that You changed the files; and
- (c) You must retain, in the Source form of any Derivative Works that You distribute, all copyright, patent, trademark, and attribution notices from the Source form of the Work, excluding those notices that do not pertain to any part of the Derivative Works; and
- (d) If the Work includes a "NOTICE" text file as part of its distribution, then any Derivative Works that You distribute must include a readable copy of the attribution notices contained within such NOTICE file, excluding those notices that do not pertain to any part of the Derivative Works, in at least one of the following places: within a NOTICE text file distributed as part of the Derivative Works; within the Source form or documentation, if provided along with the Derivative Works; or, within a display generated by the Derivative Works, if and wherever such third-party notices normally appear. The contents of the NOTICE file are for informational purposes only and do not modify the License. You may add Your own attribution notices within Derivative Works that You distribute, alongside or as an addendum to the NOTICE text from the Work, provided that such additional attribution notices cannot be construed as modifying the License.

You may add Your own copyright statement to Your modifications and may provide additional or different license terms and conditions for use, reproduction, or distribution of Your modifications, or for any such Derivative Works as a whole, provided Your use, reproduction, and distribution of the Work otherwise complies with the conditions stated in this License.

5. Submission of Contributions. Unless You explicitly state otherwise, any Contribution intentionally submitted for inclusion in the Work by You to the Licensor shall be under the terms and conditions of this License, without any additional terms or conditions.

Notwithstanding the above, nothing herein shall supersede or modify the terms of any separate license agreement you may have executed with Licensor regarding such Contributions.

6. Trademarks. This License does not grant permission to use the trade names, trademarks, service marks, or product names of the Licensor, except as required for reasonable and customary use in describing the origin of the Work and reproducing the content of the NOTICE file.
7. Disclaimer of Warranty. Unless required by applicable law or agreed to in writing, Licensor provides the Work (and each Contributor provides its Contributions) on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied, including, without limitation, any warranties or conditions of TITLE, NON-INFRINGEMENT, MERCHANTABILITY, or FITNESS FOR A PARTICULAR PURPOSE. You are solely responsible for determining the appropriateness of using or redistributing the Work and assume any risks associated with Your exercise of permissions under this License.
8. Limitation of Liability. In no event and under no legal theory, whether in tort (including negligence), contract, or otherwise, unless required by applicable law (such as deliberate and grossly negligent acts) or agreed to in writing, shall any Contributor be liable to You for damages, including any direct, indirect, special, incidental, or consequential damages of any character arising as a result of this License or out of the use or inability to use the Work (including but not limited to damages for loss of goodwill, work stoppage, computer failure or malfunction, or any and all other commercial damages or losses), even if such Contributor has been advised of the possibility of such damages.
9. Accepting Warranty or Additional Liability. While redistributing the Work or Derivative Works thereof, You may choose to offer, and charge a fee for, acceptance of support, warranty, indemnity, or other liability obligations and/or rights consistent with this License. However, in accepting such obligations, You may act only on Your own behalf and on Your sole responsibility, not on behalf of any other Contributor, and only if You agree to indemnify, defend, and hold each Contributor harmless for any liability incurred by, or claims asserted against, such Contributor by reason of your accepting any such warranty or additional liability.

END OF TERMS AND CONDITIONS

APPENDIX: How to apply the Apache License to your work.

To apply the Apache License to your work, attach the following boilerplate notice, with the fields enclosed by brackets "[]"

replaced with your own identifying information. (Don't include the brackets!) The text should be enclosed in the appropriate comment syntax for the file format. We also recommend that a file or class name and description of purpose be included on the same "printed page" as the copyright notice for easier identification within third-party archives.

Copyright [yyyy] [name of copyright owner]

Licensed under the Apache License, Version 2.0 (the "License");
you may not use this file except in compliance with the License.
You may obtain a copy of the License at

<http://www.apache.org/licenses/LICENSE-2.0>

Unless required by applicable law or agreed to in writing, software distributed under the License is distributed on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.

---- LLVM Exceptions to the Apache 2.0 License ----

As an exception, if, as a result of your compiling your source code, portions of this Software are embedded into an Object form of such source code, you may redistribute such embedded portions in such Object form without complying with the conditions of Sections 4(a), 4(b) and 4(d) of the License.

In addition, if you combine or link compiled forms of this Software with software that is licensed under the GPLv2 ("Combined Software") and if a court of competent jurisdiction determines that the patent provision (Section 3), the indemnity provision (Section 9) or other Section of the License conflicts with the conditions of the GPLv2, you may retroactively and prospectively choose to deem waived or otherwise exclude such Section(s) of the License, but only in their entirety and only with respect to the Combined Software.

=====
Software from third parties included in the LLVM Project:
=====

The LLVM Project contains third party software which is under different license terms. All such code will be identified clearly using at least one of two mechanisms:

- 1) It will be in a separate directory tree with its own `LICENSE.txt` or `LICENSE` file at the top containing the specific

license and restrictions
which apply to that software, or
2) It will contain specific license and restriction terms at the top of every
file.

=====
Legacy LLVM License (<https://llvm.org/docs/DeveloperPolicy.html#legacy>):
=====

The libunwind library is dual licensed under both the University of Illinois
"BSD-Like" license and the MIT license. As a user of this code you may choose
to use it under either license. As a contributor, you agree to allow your code
to be used under both.

Full text of the relevant licenses is included below.

=====
University of Illinois/NCSA
Open Source License

Copyright (c) 2009-2019 by the contributors listed in CREDITS.TXT

All rights reserved.

Developed by:

LLVM Team

University of Illinois at Urbana-Champaign

<http://llvm.org>

Permission

is hereby granted, free of charge, to any person obtaining a copy of
this software and associated documentation files (the "Software"), to deal with
the Software without restriction, including without limitation the rights to
use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies
of the Software, and to permit persons to whom the Software is furnished to do
so, subject to the following conditions:

* Redistributions of source code must retain the above copyright notice,
this list of conditions and the following disclaimers.

* Redistributions in binary form must reproduce the above copyright notice,
this list of conditions and the following disclaimers in the
documentation and/or other materials provided with the distribution.

* Neither the names of the LLVM Team, University of Illinois at Urbana-Champaign, nor the names of its contributors may be used to endorse or promote products derived from this Software without specific prior written permission.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE CONTRIBUTORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS WITH THE SOFTWARE.

=====
Copyright (c) 2009-2014 by the contributors listed in CREDITS.TXT

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the

Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

```
static_library("BSD-Archive") {
  output_name = "lldbPluginObjectContainerBSDArchive"
  configs += [ "//llvm/utils/gn/build:lldb_code" ]
  deps = [
    "//lldb/source/Core",
    "//lldb/source/Host",
    "//lldb/source/Symbol",
    "//llvm/lib/Support",
  ]
  sources = [ "ObjectContainerBSDArchive.cpp" ]
}
```

```

; RUN: opt -mtriple=aarch64-linux-gnu -mattr=+sve -passes=sanitize-masked-mem-intrin -S < %s | FileCheck %s

; Testing that masked gathers operating on scalable vectors that are
; packed in SVE registers are not scalarized.

; CHECK-LABEL: @masked_gather_nxv4i32(
; CHECK: call <vscale x 4 x i32> @llvm.masked.gather.nxv4i32
define <vscale x 4 x i32> @masked_gather_nxv4i32(<vscale x 4 x ptr> %ld, <vscale x 4 x i1> %masks, <vscale x 4
x i32> %passthru) {
    %res = call <vscale x 4 x i32> @llvm.masked.gather.nxv4i32(<vscale x 4 x ptr> %ld, i32 0, <vscale x 4 x i1>
    %masks, <vscale x 4 x i32> %passthru)
    ret <vscale x 4 x i32> %res
}

; Testing that masked gathers operating on scalable vectors of FP data
; that is packed in SVE registers are not scalarized.

; CHECK-LABEL: @masked_gather_nxv2f64(
; CHECK: call <vscale x 2 x double> @llvm.masked.gather.nxv2f64
define <vscale x 2 x double> @masked_gather_nxv2f64(<vscale x 2 x ptr> %ld, <vscale x 2 x i1> %masks, <vscale
x 2 x double> %passthru)
{
    %res = call <vscale x 2 x double> @llvm.masked.gather.nxv2f64(<vscale x 2 x ptr> %ld, i32 0, <vscale x 2 x i1>
    %masks, <vscale x 2 x double> %passthru)
    ret <vscale x 2 x double> %res
}

; Testing that masked gathers operating on scalable vectors of FP data
; that is unpacked in SVE registers are not scalarized.

; CHECK-LABEL: @masked_gather_nxv2f16(
; CHECK: call <vscale x 2 x half> @llvm.masked.gather.nxv2f16
define <vscale x 2 x half> @masked_gather_nxv2f16(<vscale x 2 x ptr> %ld, <vscale x 2 x i1> %masks, <vscale x
2 x half> %passthru) {
    %res = call <vscale x 2 x half> @llvm.masked.gather.nxv2f16(<vscale x 2 x ptr> %ld, i32 0, <vscale x 2 x i1>
    %masks, <vscale x 2 x half> %passthru)
    ret <vscale x 2 x half> %res
}

; Testing that masked gathers operating on 64-bit fixed vectors are
; scalarized because NEON doesn't have support for masked gather
; instructions.

; CHECK-LABEL: @masked_gather_v2f32(
; CHECK-NOT: @llvm.masked.gather.v2f32(
define <2 x float> @masked_gather_v2f32(<2
x ptr> %ld, <2 x i1> %masks, <2 x float> %passthru) {
    %res = call <2 x float> @llvm.masked.gather.v2f32(<2 x ptr> %ld, i32 0, <2 x i1> %masks, <2 x float> %passthru)

```

```

ret <2 x float> %res
}

; Testing that masked gathers operating on 128-bit fixed vectors are
; scalarized because NEON doesn't have support for masked gather
; instructions and because we are not targeting fixed width SVE.

; CHECK-LABEL: @masked_gather_v4i32(
; CHECK-NOT: @llvm.masked.gather.v4i32(
define <4 x i32> @masked_gather_v4i32(<4 x ptr> %ld, <4 x i1> %masks, <4 x i32> %passthru) {
    %res = call <4 x i32> @llvm.masked.gather.v4i32(<4 x ptr> %ld, i32 0, <4 x i1> %masks, <4 x i32> %passthru)
    ret <4 x i32> %res
}

declare <vscale x 4 x i32> @llvm.masked.gather.nxv4i32(<vscale x 4 x ptr> %ptrs, i32 %align, <vscale x 4 x i1>
%.masks, <vscale x 4 x i32> %passthru)
declare <vscale x 2 x double> @llvm.masked.gather.nxv2f64(<vscale x 2 x ptr> %ptrs, i32 %align, <vscale x 2 x
i1> %masks, <vscale x 2 x double>
%passthru)
declare <vscale x 2 x half> @llvm.masked.gather.nxv2f16(<vscale x 2 x ptr> %ptrs, i32 %align, <vscale x 2 x i1>
%.masks, <vscale x 2 x half> %passthru)
declare <2 x float> @llvm.masked.gather.v2f32(<2 x ptr> %ptrs, i32 %align, <2 x i1> %masks, <2 x float>
%passthru)
declare <4 x i32> @llvm.masked.gather.v4i32(<4 x ptr> %ptrs, i32 %align, <4 x i1> %masks, <4 x i32> %passthru)
# RUN: llc -O0 -mtriple=m68k -start-after=prologuepilog -verify-machineinstrs %s -o - | FileCheck %s

name: is-pcrel-register-operand-legal
body:      |
bb.0.entry:
    ; CHECK: move.l (0,%pc,%a0), (%a1)
    ; CHECK: move.l (%a0), (0,%pc,%a1)

    MOV32jk $a1, 0, $a0, implicit-def $ccr
    MOV32kj 0, $a1, $a0, implicit-def $ccr
; NOTE: Assertions have been autogenerated by utils/update_llc_test_checks.py
; RUN: llc -mtriple=aarch64-apple-ios %s -o - | FileCheck %s

define <16 x double> @test_sitofp_fixed(<16 x i32> %in) {
; CHECK-LABEL: test_sitofp_fixed:
; CHECK:      ; %bb.0:
; CHECK-NEXT:  sshll2.2d v4, v2, #0
; CHECK-NEXT:  sshll2.2d v5, v0, #0
; CHECK-NEXT:  sshll2.2d v6, v1, #0
; CHECK-NEXT:  sshll2.2d v7, v3, #0
; CHECK-NEXT:  sshll.2d v0, v0, #0
; CHECK-NEXT:  sshll.2d v16, v1, #0
; CHECK-NEXT:  sshll.2d v17, v2, #0
; CHECK-NEXT:  sshll.2d v18, v3, #0

```

```

; CHECK-NEXT:   scvtf.2d v1, v5, #6
; CHECK-NEXT:   scvtf.2d v0, v0, #6
; CHECK-NEXT:   scvtf.2d v3, v6, #6
; CHECK-NEXT:   scvtf.2d v2, v16, #6
; CHECK-NEXT:   scvtf.2d v5, v4, #6
; CHECK-NEXT:   scvtf.2d v4, v17, #6
; CHECK-NEXT:   scvtf.2d v7, v7, #6
; CHECK-NEXT:   scvtf.2d v6, v18, #6
; CHECK-NEXT:   ret

```

```

%flt = sitofp <16 x i32> %in to <16 x double>
%res = fdiv <16 x double> %flt, <double 64.0, double 64.0, double 64.0,
double 64.0, double 64.0, double 64.0, double 64.0, double 64.0, double 64.0, double 64.0, double 64.0, double 64.0, double 64.0, double 64.0, double 64.0>
ret <16 x double> %res
}

```

; This one is small enough to satisfy isSimple, but still illegally large.

```

define <4 x double> @test_sitofp_fixed_shortish(<4 x i64> %in) {
; CHECK-LABEL: test_sitofp_fixed_shortish:
; CHECK:      ; %bb.0:
; CHECK-NEXT:   scvtf.2d v0, v0, #6
; CHECK-NEXT:   scvtf.2d v1, v1, #6
; CHECK-NEXT:   ret

```

```

%flt = sitofp <4 x i64> %in to <4 x double>
%res = fdiv <4 x double> %flt, <double 64.0, double 64.0, double 64.0, double 64.0>
ret <4 x double> %res
}

```

Ptyprocess is under the ISC license, as code derived from Pexpect.

<http://opensource.org/licenses/ISC>

Copyright (c) 2013-2014, Pexpect development team

Copyright (c) 2012, Noah Spurrier <noah@noah.org>

PERMISSION TO USE, COPY, MODIFY, AND/OR DISTRIBUTE THIS SOFTWARE FOR ANY PURPOSE WITH OR WITHOUT FEE IS HEREBY GRANTED, PROVIDED THAT THE ABOVE COPYRIGHT NOTICE AND THIS PERMISSION NOTICE APPEAR IN ALL COPIES. THE SOFTWARE IS PROVIDED "AS IS" AND THE AUTHOR DISCLAIMS ALL WARRANTIES WITH REGARD TO THIS SOFTWARE INCLUDING ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS. IN NO EVENT SHALL THE AUTHOR BE LIABLE FOR ANY SPECIAL, DIRECT, INDIRECT, OR CONSEQUENTIAL DAMAGES OR ANY DAMAGES WHATSOEVER RESULTING FROM LOSS OF USE, DATA OR PROFITS, WHETHER IN AN ACTION OF CONTRACT, NEGLIGENCE OR OTHER TORTIOUS ACTION, ARISING OUT OF OR IN CONNECTION WITH THE USE OR PERFORMANCE OF THIS SOFTWARE.

=====
The LLVM Project is under the Apache License v2.0 with LLVM Exceptions:
=====

TERMS AND CONDITIONS FOR USE, REPRODUCTION, AND DISTRIBUTION

1. Definitions.

"License" shall mean the terms and conditions for use, reproduction, and distribution as defined by Sections 1 through 9 of this document.

"Licensor" shall mean the copyright owner or entity authorized by the copyright owner that is granting the License.

"Legal Entity" shall mean the union of the acting entity and all other entities that control, are controlled by, or are under common control with that entity. For the purposes of this definition,

"control" means (i) the power, direct or indirect, to cause the direction or management of such entity, whether by contract or otherwise, or (ii) ownership of fifty percent (50%) or more of the outstanding shares, or (iii) beneficial ownership of such entity.

"You" (or "Your") shall mean an individual or Legal Entity exercising permissions granted by this License.

"Source" form shall mean the preferred form for making modifications, including but not limited to software source code, documentation source, and configuration files.

"Object" form shall mean any form resulting from mechanical transformation or translation of a Source form, including but not limited to compiled object code, generated documentation, and conversions to other media types.

"Work" shall mean the work of authorship, whether in Source or Object form, made available under the License, as indicated by a copyright notice that is included in or attached to the work (an example is provided in the Appendix below).

"Derivative Works" shall mean any work, whether in Source or Object form, that is based on (or derived from) the Work and for which the editorial revisions, annotations, elaborations, or other modifications represent, as a whole, an original work of authorship. For the purposes of this License, Derivative Works shall not include works that remain separable from, or merely link (or bind by name) to the interfaces of,

the Work and Derivative Works thereof.

"Contribution" shall mean any work of authorship, including the original version of the Work and any modifications or additions to that Work or Derivative Works thereof, that is intentionally submitted to Licensor for inclusion in the Work by the copyright owner or by an individual or Legal Entity authorized to submit on behalf of the copyright owner. For the purposes of this definition,

"submitted"

means any form of electronic, verbal, or written communication sent to the Licensor or its representatives, including but not limited to communication on electronic mailing lists, source code control systems, and issue tracking systems that are managed by, or on behalf of, the Licensor for the purpose of discussing and improving the Work, but excluding communication that is conspicuously marked or otherwise designated in writing by the copyright owner as "Not a Contribution."

"Contributor" shall mean Licensor and any individual or Legal Entity on behalf of whom a Contribution has been received by Licensor and subsequently incorporated within the Work.

2. Grant of Copyright License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable copyright license to reproduce, prepare Derivative Works of, publicly display, publicly perform, sublicense, and distribute the Work and such Derivative Works in Source or Object form.

3. Grant of Patent License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable (except as stated in this section) patent license to make, have made, use, offer to sell, sell, import, and otherwise transfer the Work, where such license applies only to those patent claims licensable by such Contributor that are necessarily infringed by their Contribution(s) alone or by combination of their Contribution(s) with the Work to which such Contribution(s) was submitted. If You institute patent litigation against any entity (including a cross-claim or counterclaim in a lawsuit) alleging that the Work or a Contribution incorporated within the Work constitutes direct or contributory patent infringement, then any patent licenses granted to You under this License for that Work shall terminate as of the date such litigation is filed.

4. Redistribution. You may reproduce and distribute copies of the Work or Derivative Works thereof in any medium, with or without modifications, and in Source or Object form, provided that You

meet the following conditions:

- (a) You must give any other recipients of the Work or Derivative Works a copy of this License; and
- (b) You must cause any modified files to carry prominent notices stating that You changed the files; and
- (c) You must retain, in the Source form of any Derivative Works that You distribute, all copyright, patent, trademark, and attribution notices from the Source form of the Work, excluding those notices that do not pertain to any part of the Derivative Works; and
- (d) If the Work includes a "NOTICE" text file as part of its distribution, then any Derivative Works that You distribute must include a readable copy of the attribution notices contained within such NOTICE file, excluding those notices that do not pertain to any part of the Derivative Works, in at least one of the following places: within a NOTICE text file distributed as part of the Derivative Works; within the Source form or documentation, if provided along with the Derivative Works; or, within a display generated by the Derivative Works, if and wherever such third-party notices normally appear. The contents of the NOTICE file are for informational purposes only and do not modify the License. You may add Your own attribution notices within Derivative Works that You distribute, alongside or as an addendum to the NOTICE text from the Work, provided that such additional attribution notices cannot be construed as modifying the License.

You may add Your own copyright statement to Your modifications and may provide additional or different license terms and conditions for use, reproduction, or distribution of Your modifications, or for any such Derivative Works as a whole, provided Your use, reproduction, and distribution of the Work otherwise complies with the conditions stated in this License.

5. Submission of Contributions. Unless You explicitly state otherwise, any Contribution intentionally submitted for inclusion in the Work by You to the Licensor shall be under the terms and conditions of this License, without any additional terms or conditions. Notwithstanding the above, nothing herein shall supersede or modify the terms of any separate license agreement you may have executed with Licensor regarding such Contributions.

6. Trademarks. This License

does not grant permission to use the trade

names, trademarks, service marks, or product names of the Licensor, except as required for reasonable and customary use in describing the origin of the Work and reproducing the content of the NOTICE file.

7. Disclaimer of Warranty. Unless required by applicable law or agreed to in writing, Licensor provides the Work (and each Contributor provides its Contributions) on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied, including, without limitation, any warranties or conditions of TITLE, NON-INFRINGEMENT, MERCHANTABILITY, or FITNESS FOR A PARTICULAR PURPOSE. You are solely responsible for determining the appropriateness of using or redistributing the Work and assume any risks associated with Your exercise of permissions under this License.

8. Limitation of Liability. In no event and under no legal theory, whether in tort (including negligence), contract, or otherwise, unless required by applicable law (such as deliberate and grossly negligent acts) or agreed to in writing, shall any Contributor be liable to You for damages, including any direct, indirect, special, incidental, or consequential damages of any character arising as a result of this License or out of the use or inability to use the Work (including but not limited to damages for loss of goodwill, work stoppage, computer failure or malfunction, or any and all other commercial damages or losses), even if such Contributor has been advised of the possibility of such damages.

9. Accepting Warranty or Additional Liability. While redistributing the Work or Derivative Works thereof, You may choose to offer, and charge a fee for, acceptance of support, warranty, indemnity, or other liability obligations and/or rights consistent with this License. However, in accepting such obligations, You may act only on Your own behalf and on Your sole responsibility, not on behalf of any other Contributor, and only if You agree to indemnify, defend, and hold each Contributor harmless for any liability incurred by, or claims asserted against, such Contributor by reason of your accepting any such warranty or additional liability.

END OF TERMS AND CONDITIONS

APPENDIX: How to apply the Apache License to your work.

To apply the Apache License to your work, attach the following boilerplate notice, with the fields enclosed by brackets "[]" replaced with your own identifying information. (Don't include

the brackets!) The text should be enclosed in the appropriate comment syntax for the file format. We also recommend that a file or class name and description of purpose be included on the same "printed page" as the copyright notice for easier identification within third-party archives.

Copyright [yyyy] [name of copyright owner]

Licensed under the Apache License, Version 2.0 (the "License");
you may not use this file except in compliance with the License.
You may obtain a copy of the License at

<http://www.apache.org/licenses/LICENSE-2.0>

Unless required by applicable law or agreed to in writing, software distributed under the License is distributed on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.

---- LLVM Exceptions to the Apache 2.0 License ----

As an exception, if, as a result of your compiling your source code, portions of this Software are embedded into an Object form of such source code, you may redistribute such embedded portions in such Object form without complying with the conditions of Sections 4(a), 4(b) and 4(d) of the License.

In addition, if you combine or link compiled forms of this Software with software that is licensed under the GPLv2 ("Combined Software") and if a court of competent jurisdiction determines that the patent provision (Section 3), the indemnity provision (Section 9) or other Section of the License conflicts with the conditions of the GPLv2, you may retroactively and prospectively choose to deem waived or otherwise exclude such Section(s) of the License, but only in their entirety and only with respect to the Combined Software.

=====
Software from third parties included in the LLVM Project:
=====

The LLVM Project contains third party software which is under different license terms. All such code will be identified clearly using at least one of two mechanisms:

- 1) It will be in a separate directory tree with its own `LICENSE.txt` or `LICENSE` file at the top containing the specific license and restrictions which apply to that software, or

2) It will contain specific license and restriction terms at the top of every file.

- # People who have agreed to one of the CLAs and can contribute patches.
- # The AUTHORS file lists the copyright holders; this file
- # lists people. For example, Google employees are listed here
- # but not in AUTHORS, because Google holds the copyright.
- #
- # Names should be added to this file only after verifying that
- # the individual or the individual's organization has agreed to
- # the appropriate Contributor License Agreement, found here:
- #
- # <https://developers.google.com/open-source/cla/individual>
- # <https://developers.google.com/open-source/cla/corporate>
- #
- # The agreement for individuals can be filled out on the web.
- #
- # When adding J Random Contributor's name to this file,
- # either J's name or J's organization's name should be
- # added to the AUTHORS file, depending on whether the
- # individual or corporate CLA was used.
- #
- # Names should be added to this file as:
- # Name <email address>
- #
- # Please keep the list sorted.

Abhina Sreeskantharajan <abhina.sreeskantharajan@ibm.com>
Albert Pretorius
<pretoalb@gmail.com>
Alex Steele <steelal123@gmail.com>
Andriy Berestovskyy <berestovskyy@gmail.com>
Arne Beer <arne@twobeer.de>
Billy Robert O'Neal III <billy.oneal@gmail.com> <bion@microsoft.com>
Chris Kennelly <ckennelly@google.com> <ckennelly@ckennelly.com>
Christian Wassermann <christian_wassermann@web.de>
Christopher Seymour <chris.j.seymour@hotmail.com>
Colin Braley <braley.colin@gmail.com>
Cyrille Faucheux <cyrille.faucheux@gmail.com>
Daniel Harvey <danielharvey458@gmail.com>
David Coeurjolly <david.coeurjolly@liris.cnrs.fr>
Deniz Evrenci <denizevrenci@gmail.com>
Dominic Hamon <dma@stripysock.com> <dominic@google.com>
Dominik Czarnota <dominik.b.czarnota@gmail.com>
Dominik Korman <kormandominik@gmail.com>
Donald Aingworth <donalds_junk_mail@yahoo.com>
Eric Backus <eric_backus@alum.mit.edu>
Eric Fiselier <eric@efcs.ca>
Eugene Zhuk <eugene.zhuk@gmail.com>

Evgeny Safronov <division494@gmail.com>
Fanbo Meng <fanbo.meng@ibm.com>
Federico Ficarelli <federico.ficarelli@gmail.com>
Felix
Homann <linuxaudio@showlabor.de>
Geoffrey Martin-Noble <gcmn@google.com> <gmngeoffrey@gmail.com>
Gerg Szitr <szitar.gergo@gmail.com>
Hannes Hauswedell <h2@fsfe.org>
Ismael Jimenez Martinez <ismael.jimenez.martinez@gmail.com>
Jern-Kuan Leong <jernkuan@gmail.com>
JianXiong Zhou <zhoujianxiong2@gmail.com>
Joao Paulo Magalhaes <joaoppmagalhaes@gmail.com>
John Millikin <jmillikin@stripe.com>
Jordan Williams <jwillikers@protonmail.com>
Jussi Knuutila <jussi.knuutila@gmail.com>
Kai Wolf <kai.wolf@gmail.com>
Kaito Udagawa <umireon@gmail.com>
Kishan Kumar <kumar.kishan@outlook.com>
Lei Xu <eddyxu@gmail.com>
Matt Clarkson <mattyclarkson@gmail.com>
Maxim Vafin <maxvafin@gmail.com>
Nick Hutchinson <nshutchinson@gmail.com>
Norman Heino <norman.heino@gmail.com>
Oleksandr Sochka <sasha.sochka@gmail.com>
Ori Livneh <ori.livneh@gmail.com>
Pascal Leroy <phl@google.com>
Paul Redmond <paul.redmond@gmail.com>
Pierre Phaneuf <pphaneuf@google.com>
Radoslav Yovchev <radoslav.tm@gmail.com>
Raul Marin
<rmrodriguez@cartodb.com>
Ray Glover <ray.glover@uk.ibm.com>
Robert Guo <robert.guo@mongodb.com>
Roman Lebedev <lebedev.ri@gmail.com>
Sayan Bhattacharjee <aero.sayan@gmail.com>
Shuo Chen <chenshuo@chenshuo.com>
Steven Wan <wan.yu@ibm.com>
Tobias Schmidt <tobias.schmidt@in.tum.de>
Tobias Ulvgrd <tobias.ulvgard@dirac.se>
Tom Madams <tom.ej.madams@gmail.com> <tmadams@google.com>
Yixuan Qiu <yixuanq@gmail.com>
Yusuke Suzuki <utatane.tea@gmail.com>
Zbigniew Skowron <zbychs@gmail.com>
Min-Yih Hsu <yihshyng223@gmail.com>

=====
The LLVM Project is under the Apache License v2.0 with LLVM Exceptions:
=====

TERMS AND CONDITIONS FOR USE, REPRODUCTION, AND DISTRIBUTION

1. Definitions.

"License" shall mean the terms and conditions for use, reproduction, and distribution as defined by Sections 1 through 9 of this document.

"Licensor" shall mean the copyright owner or entity authorized by the copyright owner that is granting the License.

"Legal Entity" shall mean the union of the acting entity and all other entities that control, are controlled by, or are under common control with that entity. For the purposes of this definition,

"control" means (i) the power, direct or indirect, to cause the direction or management of such entity, whether by contract or otherwise, or (ii) ownership of fifty percent (50%) or more of the outstanding shares, or (iii) beneficial ownership of such entity.

"You" (or "Your") shall mean an individual or Legal Entity exercising permissions granted by this License.

"Source" form shall mean the preferred form for making modifications, including but not limited to software source code, documentation source, and configuration files.

"Object" form shall mean any form resulting from mechanical transformation or translation of a Source form, including but not limited to compiled object code, generated documentation, and conversions to other media types.

"Work" shall mean the work of authorship, whether in Source or Object form, made available under the License, as indicated by a copyright notice that is included in or attached to the work (an example is provided in the Appendix below).

"Derivative Works" shall mean any work, whether in Source or Object form, that is based on (or derived from) the Work and for which the editorial revisions, annotations, elaborations, or other modifications represent, as a whole, an original work of authorship. For the purposes of this License, Derivative Works shall not include works that remain separable from, or merely link (or bind by name) to the interfaces of, the Work and Derivative Works thereof.

"Contribution" shall mean any work of authorship, including the original version of the Work and any modifications or additions to that Work or Derivative Works thereof, that is intentionally submitted to Licensor for inclusion in the Work by the copyright owner or by an individual or Legal Entity authorized to submit on behalf of the copyright owner. For the purposes of this definition, "submitted"

means any form of electronic, verbal, or written communication sent to the Licensor or its representatives, including but not limited to communication on electronic mailing lists, source code control systems, and issue tracking systems that are managed by, or on behalf of, the Licensor for the purpose of discussing and improving the Work, but excluding communication that is conspicuously marked or otherwise designated in writing by the copyright owner as "Not a Contribution."

"Contributor" shall mean Licensor and any individual or Legal Entity on behalf of whom a Contribution has been received by Licensor and subsequently incorporated within the Work.

2. Grant of Copyright License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable copyright license to reproduce, prepare Derivative Works of, publicly display, publicly perform, sublicense, and distribute the Work and such Derivative Works in Source or Object form.

3. Grant of Patent License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable (except as stated in this section) patent license to make, have made, use, offer to sell, sell, import, and otherwise transfer the Work, where such license applies only to those patent claims licensable by such Contributor that are necessarily infringed by their Contribution(s) alone or by combination of their Contribution(s) with the Work to which such Contribution(s) was submitted. If You institute patent litigation against any entity (including a cross-claim or counterclaim in a lawsuit) alleging that the Work or a Contribution incorporated within the Work constitutes direct or contributory patent infringement, then any patent licenses granted to You under this License for that Work shall terminate as of the date such litigation is filed.

4. Redistribution. You may reproduce and distribute copies of the Work or Derivative Works thereof in any medium, with or without modifications, and in Source or Object form, provided that You meet the following conditions:

- (a) You must give any other recipients of the Work or Derivative Works a copy of this License; and
- (b) You must cause any modified files to carry prominent notices stating that You changed the files; and
- (c) You must retain, in the Source form of any Derivative Works that You distribute, all copyright, patent, trademark, and attribution notices from the Source form of the Work, excluding those notices that do not pertain to any part of the Derivative Works; and
- (d) If the Work includes a "NOTICE" text file as part of its distribution, then any Derivative Works that You distribute must include a readable copy of the attribution notices contained within such NOTICE file, excluding those notices that do not pertain to any part of the Derivative Works, in at least one of the following places: within a NOTICE text file distributed as part of the Derivative Works; within the Source form or documentation, if provided along with the Derivative Works; or, within a display generated by the Derivative Works, if and wherever such third-party notices normally appear. The contents of the NOTICE file are for informational purposes only and do not modify the License. You may add Your own attribution notices within Derivative Works that You distribute, alongside or as an addendum to the NOTICE text from the Work, provided that such additional attribution notices cannot be construed as modifying the License.

You may add Your own copyright statement to Your modifications and may provide additional or different license terms and conditions for use, reproduction, or distribution of Your modifications, or for any such Derivative Works as a whole, provided Your use, reproduction, and distribution of the Work otherwise complies with the conditions stated in this License.

5. **Submission of Contributions.** Unless You explicitly state otherwise, any Contribution intentionally submitted for inclusion in the Work by You to the Licensor shall be under the terms and conditions of this License, without any additional terms or conditions. Notwithstanding the above, nothing herein shall supersede or modify the terms of any separate license agreement you may have executed with Licensor regarding such Contributions.

6. **Trademarks.** This License

does not grant permission to use the trade

names, trademarks, service marks, or product names of the Licensor, except as required for reasonable and customary use in describing the origin of the Work and reproducing the content of the NOTICE file.

7. Disclaimer of Warranty. Unless required by applicable law or agreed to in writing, Licensor provides the Work (and each Contributor provides its Contributions) on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied, including, without limitation, any warranties or conditions of TITLE, NON-INFRINGEMENT, MERCHANTABILITY, or FITNESS FOR A PARTICULAR PURPOSE. You are solely responsible for determining the appropriateness of using or redistributing the Work and assume any risks associated with Your exercise of permissions under this License.

8. Limitation of Liability. In no event and under no legal theory, whether in tort (including negligence), contract, or otherwise, unless required by applicable law (such as deliberate and grossly negligent acts) or agreed to in writing, shall any Contributor be liable to You for damages, including any direct, indirect, special, incidental, or consequential damages of any character arising as a result of this License or out of the use or inability to use the Work (including but not limited to damages for loss of goodwill, work stoppage, computer failure or malfunction, or any and all other commercial damages or losses), even if such Contributor has been advised of the possibility of such damages.

9. Accepting Warranty or Additional Liability. While redistributing the Work or Derivative Works thereof, You may choose to offer, and charge a fee for, acceptance of support, warranty, indemnity, or other liability obligations and/or rights consistent with this License. However, in accepting such obligations, You may act only on Your own behalf and on Your sole responsibility, not on behalf of any other Contributor, and only if You agree to indemnify, defend, and hold each Contributor harmless for any liability incurred by, or claims asserted against, such Contributor by reason of your accepting any such warranty or additional liability.

END OF TERMS AND CONDITIONS

APPENDIX: How to apply the Apache License to your work.

To apply the Apache License to your work, attach the following boilerplate notice, with the fields enclosed by brackets "[]" replaced with your own identifying information. (Don't include the brackets!) The text should be enclosed in the appropriate

comment syntax for the file format. We also recommend that a file or class name and description of purpose be included on the same "printed page" as the copyright notice for easier identification within third-party archives.

Copyright [yyyy] [name of copyright owner]

Licensed under the Apache License, Version 2.0 (the "License");
you may not use this file except in compliance with the License.
You may obtain a copy of the License at

<http://www.apache.org/licenses/LICENSE-2.0>

Unless required by applicable law or agreed to in writing, software distributed under the License is distributed on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.

---- LLVM Exceptions to the Apache 2.0 License ----

As an exception, if, as a result of your compiling your source code, portions of this Software are embedded into an Object form of such source code, you may redistribute such embedded portions in such Object form without complying with the conditions of Sections 4(a), 4(b) and 4(d) of the License.

In addition, if you combine or link compiled forms of this Software with software that is licensed under the GPLv2 ("Combined Software") and if a court of competent jurisdiction determines that the patent provision (Section 3), the indemnity provision (Section 9) or other Section of the License conflicts with the conditions of the GPLv2, you may retroactively and prospectively choose to deem waived or otherwise exclude such Section(s) of the License, but only in their entirety and only with respect to the Combined Software.

=====
Software from third parties included in the LLVM Project:
=====

The LLVM Project contains third party software which is under different license terms. All such code will be identified clearly using at least one of two mechanisms:

- 1) It will be in a separate directory tree with its own `LICENSE.txt` or `LICENSE` file at the top containing the specific license and restrictions which apply to that software, or
- 2) It will contain specific license and restriction terms at the top of every

file.

=====
Legacy LLVM License (<https://llvm.org/docs/DeveloperPolicy.html#legacy>):
=====

University of Illinois/NCSA
Open Source License

Copyright (c) 2007-2018 University of Illinois at Urbana-Champaign.
All rights reserved.

Developed by:

LLVM Team

University of Illinois at Urbana-Champaign

<http://llvm.org>

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal with the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

* Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimers.

* Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimers in the documentation and/or other materials provided with the distribution.

* Neither the names of the LLVM Team, University of Illinois at Urbana-Champaign, nor the names of its contributors may be used to endorse or promote products derived from this Software without specific prior written permission.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE CONTRIBUTORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS WITH THE SOFTWARE.

```
; NOTE: Assertions have been autogenerated by utils/update_llc_test_checks.py  
; RUN: llc < %s -mtriple=x86_64-linux-android -mattr=+mmx -enable-legalize-types-checking | FileCheck %s  
;  
; D31946  
; Check that we dont end up with the ""LLVM ERROR: Cannot select" error.  
; Additionally ensure that the output code actually put fp128 values in SSE registers.
```

```

declare fp128 @llvm.fabs.f128(fp128)
declare fp128 @llvm.copysign.f128(fp128, fp128)

define fp128 @TestSelect(fp128 %a, fp128 %b) {
; CHECK-LABEL: TestSelect:
; CHECK:      # %bb.0:
; CHECK-NEXT: pushq %rbx
; CHECK-NEXT: .cfi_def_cfa_offset 16
; CHECK-NEXT: subq $32, %rsp
; CHECK-NEXT: .cfi_def_cfa_offset 48
; CHECK-NEXT: .cfi_offset %rbx, -16
; CHECK-NEXT: movaps %xmm1, {[[-0-9]+]}(%r{[sb]})p) # 16-byte Spill
; CHECK-NEXT: movaps %xmm0, (%rsp) # 16-byte Spill
; CHECK-NEXT: callq __gttf2@PLT
; CHECK-NEXT: movl %eax, %ebx
; CHECK-NEXT: movaps (%rsp), %xmm0 # 16-byte Reload
; CHECK-NEXT: movaps {[[-0-9]+]}(%r{[sb]})p),
%xmm1 # 16-byte Reload
; CHECK-NEXT: callq __subtf3@PLT
; CHECK-NEXT: testl %ebx, %ebx
; CHECK-NEXT: jg .LBB0_2
; CHECK-NEXT: # %bb.1:
; CHECK-NEXT: xorps %xmm0, %xmm0
; CHECK-NEXT: .LBB0_2:
; CHECK-NEXT: addq $32, %rsp
; CHECK-NEXT: .cfi_def_cfa_offset 16
; CHECK-NEXT: popq %rbx
; CHECK-NEXT: .cfi_def_cfa_offset 8
; CHECK-NEXT: retq
%cmp = fcmp ogt fp128 %a, %b
%sub = fsub fp128 %a, %b
%res = select i1 %cmp, fp128 %sub, fp128 0xL00000000000000000000000000000000
ret fp128 %res
}

define fp128 @TestFabs(fp128 %a) {
; CHECK-LABEL: TestFabs:
; CHECK:      # %bb.0:
; CHECK-NEXT: andps {[.?.LCPI[0-9]+_[0-9]+]}(%rip), %xmm0
; CHECK-NEXT: retq
%res = call fp128 @llvm.fabs.f128(fp128 %a)
ret fp128 %res
}

define fp128 @TestCopysign(fp128 %a, fp128 %b) {
; CHECK-LABEL: TestCopysign:
; CHECK:      # %bb.0:

```

```

; CHECK-NEXT: andps { {\.?LCPI[0-9]+_[0-9]+} }(%rip), %xmm1
; CHECK-NEXT: andps { {\.?LCPI[0-9]+_[0-9]+} }(%rip), %xmm0
; CHECK-NEXT:
    orps %xmm1, %xmm0
; CHECK-NEXT: retq
%res = call fp128 @llvm.copysign.f128(fp128 %a, fp128 %b)
ret fp128 %res
}

```

```

define fp128 @TestFneg(fp128 %a) {
; CHECK-LABEL: TestFneg:
; CHECK:      # %bb.0:
; CHECK-NEXT: pushq %rax
; CHECK-NEXT: .cfi_def_cfa_offset 16
; CHECK-NEXT: movaps %xmm0, %xmm1
; CHECK-NEXT: callq __multf3@PLT
; CHECK-NEXT: xorps { {\.?LCPI[0-9]+_[0-9]+} }(%rip), %xmm0
; CHECK-NEXT: popq %rax
; CHECK-NEXT: .cfi_def_cfa_offset 8
; CHECK-NEXT: retq
%mul = fmul fp128 %a, %a
%res = fsub fp128 0xL00000000000000008000000000000000, %mul
ret fp128 %res
}

```

clang-tidy CERT Files

All clang-tidy files are licensed under the same terms as the rest of the LLVM project with the following additions:

Any file referencing a CERT Secure Coding guideline:

Please allow this letter to serve as confirmation that open source projects on <http://llvm.org> are permitted to link via hypertext to the CERT(R) secure coding guidelines available at <https://www.securecoding.cert.org>.

The foregoing is permitted by the Terms of Use as follows:

"Linking to the Service

Because we update many of our Web documents regularly, we would prefer that you link to our Web pages whenever possible rather than reproduce them. It is not necessary to request permission to make referential hypertext links to The Service."

<http://www.sei.cmu.edu/legal/ip/index.cfm>.

Please allow this letter to also confirm that no formal permission is required

to reproduce the title of the content being linked to, nor to reproduce any de Minimis description of such content.

The LLVM Project is under the Apache License v2.0 with LLVM Exceptions:

Apache License
Version 2.0, January 2004
<http://www.apache.org/licenses/>

TERMS AND CONDITIONS FOR USE, REPRODUCTION, AND DISTRIBUTION

1. Definitions.

"License" shall mean the terms and conditions for use, reproduction, and distribution as defined by Sections 1 through 9 of this document.

"Licensor" shall mean the copyright owner or entity authorized by the copyright owner that is granting the License.

"Legal Entity" shall mean the union of the acting entity and all other entities that control, are controlled by, or are under common control with that entity. For the purposes of this definition, "control" means (i) the power, direct or indirect, to cause the direction or management of such entity, whether by contract or otherwise, or (ii) ownership of fifty percent (50%) or more of the outstanding shares, or (iii) beneficial ownership of such entity.

"You" (or "Your") shall mean an individual or Legal Entity exercising permissions granted by this License.

"Source" form shall mean the preferred form for making modifications, including but not limited to software source code, documentation source, and configuration files.

"Object" form shall mean any form resulting from mechanical transformation or translation of a Source form, including but not limited to compiled object code, generated documentation, and conversions to other media types.

"Work" shall mean the work of authorship, whether in Source or Object form, made available under the License, as indicated by a copyright notice that is included in or attached to the work (an example is provided in the Appendix below).

"Derivative Works" shall mean any work, whether in Source or Object form, that is based on (or derived from) the Work and for which the editorial revisions, annotations, elaborations, or other modifications

represent, as a whole, an original work of authorship. For the purposes of this License, Derivative Works shall not include works that remain separable from, or merely link (or bind by name) to the interfaces of, the Work and Derivative Works thereof.

"Contribution" shall mean any work of authorship, including the original version of the Work and any modifications or additions to that Work or Derivative Works thereof, that is intentionally submitted to Licensor for inclusion in the Work by the copyright owner or by an individual or Legal Entity authorized to submit on behalf of the copyright owner. For the purposes of this definition, "submitted"

means any form of electronic, verbal, or written communication sent to the Licensor or its representatives, including but not limited to communication on electronic mailing lists, source code control systems, and issue tracking systems that are managed by, or on behalf of, the Licensor for the purpose of discussing and improving the Work, but excluding communication that is conspicuously marked or otherwise designated in writing by the copyright owner as "Not a Contribution."

"Contributor" shall mean Licensor and any individual or Legal Entity on behalf of whom a Contribution has been received by Licensor and subsequently incorporated within the Work.

2. Grant of Copyright License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable copyright license to reproduce, prepare Derivative Works of, publicly display, publicly perform, sublicense, and distribute the Work and such Derivative Works in Source or Object form.

3. Grant of Patent License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable (except as stated in this section) patent license to make, have made, use, offer to sell, sell, import, and otherwise transfer the Work, where such license applies only to those patent claims licensable by such Contributor that are necessarily infringed by their Contribution(s) alone or by combination of their Contribution(s) with the Work to which such Contribution(s) was submitted. If You institute patent litigation against any entity (including a cross-claim or counterclaim in a lawsuit) alleging that the Work or a Contribution incorporated within the Work constitutes direct or contributory patent infringement, then any patent licenses granted to You under this License for that Work shall terminate as of the date such litigation is filed.

4. Redistribution. You may reproduce and distribute copies of the Work or Derivative Works thereof in any medium, with or without modifications, and in Source or Object form, provided that You meet the following conditions:

- (a) You must give any other recipients of the Work or Derivative Works a copy of this License; and
- (b) You must cause any modified files to carry prominent notices stating that You changed the files; and
- (c) You must retain, in the Source form of any Derivative Works that You distribute, all copyright, patent, trademark, and attribution notices from the Source form of the Work, excluding those notices that do not pertain to any part of the Derivative Works; and

(d) If the Work includes a "NOTICE" text file as part of its distribution, then any Derivative Works that You distribute must include a readable copy of the attribution notices contained within such NOTICE file, excluding those notices that do not pertain to any part of the Derivative Works, in at least one of the following places: within a NOTICE text file distributed as part of the Derivative Works; within the Source form or documentation, if provided along with the Derivative Works; or, within a display generated by the Derivative Works, if and wherever such third-party notices normally appear. The contents of the NOTICE file are for informational purposes only and do not modify the License. You may add Your own attribution notices within Derivative Works that You distribute, alongside or as an addendum to the NOTICE text from the Work, provided that such additional attribution notices cannot be construed as modifying the License.

You may add Your own copyright statement to Your modifications and may provide additional or different license terms and conditions for use, reproduction, or distribution of Your modifications, or for any such Derivative Works as a whole, provided Your use, reproduction, and distribution of the Work otherwise complies with the conditions stated in this License.

5. Submission of Contributions. Unless You explicitly state otherwise, any Contribution intentionally submitted for inclusion in the Work by You to the Licensor shall be under the terms and conditions of this License, without any additional terms or conditions.

Notwithstanding the above, nothing herein shall supersede or modify

the terms of any separate license agreement you may have executed with Licensor regarding such Contributions.

6. Trademarks. This License does not grant permission to use the trade names, trademarks, service marks, or product names of the Licensor, except as required for reasonable and customary use in describing the origin of the Work and reproducing the content of the NOTICE file.

7. Disclaimer of Warranty. Unless required by applicable law or agreed to in writing, Licensor provides the Work (and each Contributor provides its Contributions) on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied, including, without limitation, any warranties or conditions of TITLE, NON-INFRINGEMENT, MERCHANTABILITY, or FITNESS FOR A PARTICULAR PURPOSE. You are solely responsible for determining the appropriateness of using or redistributing the Work and assume any risks associated with Your exercise of permissions under this License.

8. Limitation of Liability. In no event and under no legal theory, whether in tort (including negligence), contract, or otherwise, unless required by applicable law (such as deliberate and grossly negligent acts) or agreed to in writing, shall any Contributor be liable to You for damages, including any direct, indirect, special, incidental, or consequential damages of any character arising as a result of this License or out of the use or inability to use the Work (including but not limited to damages for loss of goodwill, work stoppage, computer failure or malfunction, or any and all other commercial damages or losses), even if such Contributor has been advised of the possibility of such damages.

9. Accepting Warranty or Additional Liability. While redistributing the Work or Derivative Works thereof, You may choose to offer, and charge a fee for, acceptance of support, warranty, indemnity, or other liability obligations and/or rights consistent with this License. However, in accepting such obligations, You may act only on Your own behalf and on Your sole responsibility, not on behalf of any other Contributor, and only if You agree to indemnify, defend, and hold each Contributor harmless for any liability incurred by, or claims asserted against, such Contributor by reason of your accepting any such warranty or additional liability.

END OF TERMS AND CONDITIONS

APPENDIX: How to apply the Apache License to your work.

To apply the Apache License to your work, attach the following boilerplate notice, with the fields enclosed by brackets "[]" replaced with your own identifying information. (Don't include the brackets!) The text should be enclosed in the appropriate comment syntax for the file format. We also recommend that a file or class name and description of purpose be included on the same "printed page" as the copyright notice for easier identification within third-party archives.

Copyright [yyyy] [name of copyright owner]

Licensed under the Apache License, Version 2.0 (the "License");
you may not use this file except in compliance with the License.
You may obtain a copy of the License at

<http://www.apache.org/licenses/LICENSE-2.0>

Unless required by applicable law or agreed to in writing, software distributed under the License is distributed on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.

---- LLVM Exceptions to the Apache 2.0 License ----

As an exception, if, as a result of your compiling your source code, portions of this Software are embedded into an Object form of such source code, you may redistribute such embedded portions in such Object form without complying with the conditions of Sections 4(a), 4(b) and 4(d) of the License.

In addition, if you combine or link compiled forms of this Software with software that is licensed under the GPLv2 ("Combined Software") and if a court of competent jurisdiction determines that the patent provision (Section 3), the indemnity provision (Section 9) or other Section of the License conflicts with the conditions of the GPLv2, you may retroactively and prospectively choose to deem waived or otherwise exclude such Section(s) of the License, but only in their entirety and only with respect to the Combined Software.

=====
Software from third parties included in the LLVM Project:
=====

The LLVM Project contains third party software which is under different license terms. All such code will be identified clearly using at least one of two mechanisms:

1) It will be in a separate directory tree with its own `LICENSE.txt` or

`LICENSE` file at the top containing the specific license and restrictions which apply to that software, or
2) It will contain specific license and restriction terms at the top of every file.

=====
Legacy LLVM License (<https://llvm.org/docs/DeveloperPolicy.html#legacy>):
=====

The libclc library is dual licensed under both the University of Illinois "BSD-Like" license and the MIT license. As a user of this code you may choose to use it under either license. As a contributor, you agree to allow your code to be used under both.

Full text of the relevant licenses is included below.

=====
Copyright (c) 2011-2019 by the contributors listed in CREDITS.TXT

All rights reserved.

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal with the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

- * Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimers.
- * Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimers in the documentation and/or other materials provided with the distribution.
- * The names of the contributors may not be used to endorse or promote products derived from this Software without specific prior written permission.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE CONTRIBUTORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM,

OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS WITH THE SOFTWARE.

=====
Copyright (c) 2011-2014 by the contributors listed in CREDITS.TXT

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

; NOTE: Assertions have been autogenerated by utils/update_llc_test_checks.py
; RUN: llc -march=amdgcn -mcpu=fiji < %s | FileCheck -check-prefixes=VI %s

```
; FIXME: This one should fold to rcp
define half @select_fneg_posk_src_rcp_f16(i32 %c, half %x, half %y) {
; VI-LABEL: select_fneg_posk_src_rcp_f16:
; VI:      ; %bb.0:
; VI-NEXT: s_waitcnt vmcnt(0) expcnt(0) lgkmcnt(0)
; VI-NEXT: v_rcp_f16_e32 v1, v1
; VI-NEXT: v_mov_b32_e32 v2, 0xc000
; VI-NEXT: v_cmp_eq_u32_e32 vcc, 0, v0
; VI-NEXT: v_cndmask_b32_e32 v0, v2, v1, vcc
; VI-NEXT: v_xor_b32_e32 v0, 0x8000, v0
; VI-NEXT: s_setpc_b64 s[30:31]
    %cmp = icmp eq i32 %c, 0
    %rcp = call half @llvm.amdgcn.rcp.f16(half %x)
    %fneg = fneg half %rcp
    %select = select i1 %cmp, half %fneg, half 2.0
    ret half %select
}
```

```
declare half @llvm.amdgcn.rcp.f16(half) #0
```

```
attributes #0 = { nocallback nofree nosync nounwind speculatable willreturn memory(none) }
; NOTE: Assertions have been autogenerated by utils/update_test_checks.py UTC_ARGS: --include-generated-
funcs
; RUN: opt -S -passes=verify,iroutliner -ir-outlining-no-cost < %s | FileCheck %s
```

```
; This test checks that we do outline indirect calls when it is not specified
; that we should not.
```

```
declare void @f1(ptr, ptr);
declare void @f2(ptr, ptr);
```

```
define void @function1(ptr %func) {
entry:
  %a = alloca i32, align 4
  %b = alloca i32, align 4
  %c = alloca i32, align 4
  store i32 2, ptr %a, align 4
  store i32 3, ptr %b, align 4
  store i32 4, ptr %c, align 4
  call void %func()
  %a1 = load i32, ptr %a
  %b1 = load i32, ptr %b
  %c1 = load i32, ptr %c
  ret void
}
```

```
define void @function2(ptr %func) {
entry:
  %a = alloca i32, align 4
  %b = alloca i32, align 4
  %c = alloca i32, align 4
  store i32 2, ptr %a, align 4
  store i32 3, ptr %b, align 4
  store i32 4, ptr %c, align 4
  call void %func()
  %a1 = load i32, ptr %a
  %b1 = load i32, ptr %b
  %c1 = load i32, ptr %c
  ret void
}
```

```
;
CHECK-LABEL: @function1(
; CHECK-NEXT: entry:
; CHECK-NEXT: [[A:%.*]] = alloca i32, align 4
; CHECK-NEXT: [[B:%.*]] = alloca i32, align 4
; CHECK-NEXT: [[C:%.*]] = alloca i32, align 4
; CHECK-NEXT: call void @outlined_ir_func_0(ptr [[A]], ptr [[B]], ptr [[C]], ptr [[FUNC:%.*]])
; CHECK-NEXT: ret void
```

```

;
;
; CHECK-LABEL: @function2(
; CHECK-NEXT: entry:
; CHECK-NEXT: [[A:%.*]] = alloca i32, align 4
; CHECK-NEXT: [[B:%.*]] = alloca i32, align 4
; CHECK-NEXT: [[C:%.*]] = alloca i32, align 4
; CHECK-NEXT: call void @outlined_ir_func_0(ptr [[A]], ptr [[B]], ptr [[C]], ptr [[FUNC:%.*]])
; CHECK-NEXT: ret void
;
;
; CHECK-LABEL: define internal void @outlined_ir_func_0(
; CHECK-NEXT: newFuncRoot:
; CHECK-NEXT: br label [[ENTRY_TO_OUTLINE:%.*]]
; CHECK: entry_to_outline:
; CHECK-NEXT: store i32 2, ptr [[TMP0:%.*]], align 4
; CHECK-NEXT: store i32 3, ptr [[TMP1:%.*]], align 4
; CHECK-NEXT: store i32 4, ptr [[TMP2:%.*]], align 4
; CHECK-NEXT:
; call void [[TMP3:%.*]]()
; CHECK-NEXT: [[AL:%.*]] = load i32, ptr [[TMP0]], align 4
; CHECK-NEXT: [[BL:%.*]] = load i32, ptr [[TMP1]], align 4
; CHECK-NEXT: [[CL:%.*]] = load i32, ptr [[TMP2]], align 4
; CHECK-NEXT: br label [[ENTRY_AFTER_OUTLINE_EXITSTUB:%.*]]
; CHECK: entry_after_outline.exitStub:
; CHECK-NEXT: ret void
;
;
; RUN: llc < %s -mtriple=s390x-linux-gnu -mcpu=zEC12 -verify-machineinstrs | FileCheck %s
;
; Test that early if conversion produces LOCR with operands of the right
; register classes.

define void @autogen_SD4739(ptr) {
; CHECK-NOT: Expected a GR32Bit register, but got a GRX32Bit register
BB:
%L34 = load i8, ptr %0
%Cmp56 = icmp sgt i8 undef, %L34
br label %CF246

CF246:
; preds = %CF246, %BB
%S1163 = select i1 %Cmp56, i8 %L34, i8 undef
br i1 undef, label %CF246, label %CF248

CF248:
; preds = %CF248, %CF246
store i8 %S1163, ptr %0
br label %CF248
}

```

```
; RUN: llc -march=hexagon -hexagon-hvx-widen=32 < %s | FileCheck %s
```

```
; Truncating a type-to-be-widened to a legal type (v8i8).
```

```
; Check that this compiles successfully.
```

```
; CHECK-LABEL: f0:
```

```
; CHECK: dealloc_return
```

```
target datalayout = "e-m:e-p:32:32:32-a:0-n16:32-i64:64:64-i32:32:32-i16:16:16-i1:8:8-f32:32:32-f64:64:64-v32:32:32-v64:64:64-v512:512:512-v1024:1024:1024-v2048:2048:2048"
```

```
target triple = "hexagon"
```

```
define dlllexport void @f0(ptr %a0) local_unnamed_addr #0 {
```

```
  b0:
```

```
    %v0 = load i8, ptr undef, align 1
```

```
    %v1 = zext i8 %v0 to i16
```

```
    %v2 = add i16 0, %v1
```

```
    %v3 = icmp sgt i16 %v2, 1
```

```
    %v4 = select i1 %v3, i16 %v2, i16 1
```

```
    %v5 = udiv i16 -32768, %v4
```

```
    %v6 = zext i16 %v5 to i32
```

```
    %v7 = insertelement <8 x i32> undef, i32 %v6, i32 0
```

```
    %v8 = shufflevector <8 x i32> %v7, <8 x i32> undef, <8 x i32> zeroinitializer
```

```
    %v9 = load <8 x i16>, ptr undef, align 2
```

```
    %v10 = sext <8 x i16> %v9 to <8 x i32>
```

```
    %v11 = mul nsw <8 x i32> %v8, %v10
```

```
    %v12 = add nsw <8 x i32> %v11, <i32 16384, i32 16384, i32 16384,
```

```
    i32 16384, i32 16384, i32 16384, i32 16384, i32 16384>
```

```
    %v13 = lshr <8 x i32> %v12, <i32 15, i32 15, i32 15, i32 15, i32 15, i32 15, i32 15, i32 15>
```

```
    %v14 = trunc <8 x i32> %v13 to <8 x i8>
```

```
    %v15 = getelementptr inbounds i8, ptr %a0, i32 undef
```

```
    store <8 x i8> %v14, ptr %v15, align 1
```

```
    ret void
```

```
  }
```

```
attributes #0 = { "target-features"="+hvx,+hvx-length128b" }
```

```
; NOTE: Assertions have been autogenerated by utils/update_analyze_test_checks.py
```

```
; RUN: opt < %s -passes="print<cost-model>" 2>&1 -disable-output -mtriple=x86_64-apple-macosx10.8.0 -mattr=+avx2 | FileCheck %s --check-prefixes=VEC256,AVX
```

```
; RUN: opt < %s -passes="print<cost-model>" 2>&1 -disable-output -mtriple=x86_64-apple-macosx10.8.0 -mattr=+avx512vl,+prefer-256-bit | FileCheck %s --check-prefixes=VEC256,AVX512VL256
```

```
; RUN: opt < %s -passes="print<cost-model>" 2>&1 -disable-output -mtriple=x86_64-apple-macosx10.8.0 -mattr=+avx512vl,-prefer-256-bit | FileCheck %s --check-prefixes=AVX512VL512
```

```
; RUN: opt < %s -passes="print<cost-model>" 2>&1 -disable-output -mtriple=x86_64-apple-macosx10.8.0 -mattr=+avx512vl,+avx512bw,+avx512dq,+prefer-256-bit | FileCheck %s --check-prefixes=VEC256,SKX256
```

```
; RUN: opt < %s -passes="print<cost-model>" 2>&1 -disable-output -mtriple=x86_64-apple-macosx10.8.0 -mattr=+avx512vl,+avx512bw,+avx512dq,-prefer-256-bit | FileCheck %s --check-prefixes=SKX512
```

```
define
```

```

void @zext256() "min-legal-vector-width"="256" {
; AVX-LABEL: 'zext256'
; AVX-NEXT: Cost Model: Found an estimated cost of 4 for instruction: %A = zext <8 x i16> undef to <8 x i64>
; AVX-NEXT: Cost Model: Found an estimated cost of 5 for instruction: %B = zext <8 x i32> undef to <8 x i64>
; AVX-NEXT: Cost Model: Found an estimated cost of 4 for instruction: %C = zext <16 x i8> undef to <16 x i32>
; AVX-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %D = zext <16 x i16> undef to <16 x
i32>
; AVX-NEXT: Cost Model: Found an estimated cost of 5 for instruction: %E = zext <32 x i8> undef to <32 x i16>
; AVX-NEXT: Cost Model: Found an estimated cost of 0 for instruction: ret void
;
; AVX512VL256-LABEL: 'zext256'
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %A = zext <8 x i16> undef to
<8 x i64>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %B = zext <8 x i32> undef to
<8 x i64>
; AVX512VL256-NEXT: Cost
Model: Found an estimated cost of 2 for instruction: %C = zext <16 x i8> undef to <16 x i32>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %D = zext <16 x i16> undef to
<16 x i32>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %E = zext <32 x i8> undef to
<32 x i16>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 0 for instruction: ret void
;
; AVX512VL512-LABEL: 'zext256'
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %A = zext <8 x i16> undef to
<8 x i64>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %B = zext <8 x i32> undef to
<8 x i64>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %C = zext <16 x i8> undef to
<16 x i32>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %D = zext <16 x i16> undef to
<16 x i32>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 3 for instruction:
%E = zext <32 x i8> undef to <32 x i16>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 0 for instruction: ret void
;
; SKX256-LABEL: 'zext256'
; SKX256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %A = zext <8 x i16> undef to <8 x
i64>
; SKX256-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %B = zext <8 x i32> undef to <8 x
i64>
; SKX256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %C = zext <16 x i8> undef to <16 x
i32>
; SKX256-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %D = zext <16 x i16> undef to <16 x
i32>
; SKX256-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %E = zext <32 x i8> undef to <32 x
i16>
; SKX256-NEXT: Cost Model: Found an estimated cost of 0 for instruction: ret void

```



```

;
; SKX512-LABEL: 'zext256'
; SKX512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %A = zext <8 x i16> undef to <8 x i64>
; SKX512-NEXT: Cost Model: Found an estimated
cost of 1 for instruction: %B = zext <8 x i32> undef to <8 x i64>
; SKX512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %C = zext <16 x i8> undef to <16 x i32>
; SKX512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %D = zext <16 x i16> undef to <16 x i32>
; SKX512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %E = zext <32 x i8> undef to <32 x i16>
; SKX512-NEXT: Cost Model: Found an estimated cost of 0 for instruction: ret void
;
%A = zext <8 x i16> undef to <8 x i64>
%B = zext <8 x i32> undef to <8 x i64>
%C = zext <16 x i8> undef to <16 x i32>
%D = zext <16 x i16> undef to <16 x i32>
%E = zext <32 x i8> undef to <32 x i16>
ret void
}

```

```

define void @zext512() "min-legal-vector-width"="512" {
; AVX-LABEL: 'zext512'
; AVX-NEXT: Cost Model: Found an estimated cost of 4 for instruction: %A = zext <8 x i16> undef to <8 x i64>
; AVX-NEXT: Cost Model: Found an estimated cost of 5 for instruction: %B = zext <8 x i32>
undef to <8 x i64>
; AVX-NEXT: Cost Model: Found an estimated cost of 4 for instruction: %C = zext <16 x i8> undef to <16 x i32>
; AVX-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %D = zext <16 x i16> undef to <16 x i32>
; AVX-NEXT: Cost Model: Found an estimated cost of 5 for instruction: %E = zext <32 x i8> undef to <32 x i16>
; AVX-NEXT: Cost Model: Found an estimated cost of 0 for instruction: ret void
;
; AVX512VL256-LABEL: 'zext512'
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %A = zext <8 x i16> undef to
<8 x i64>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %B = zext <8 x i32> undef to
<8 x i64>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %C = zext <16 x i8> undef to
<16 x i32>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %D = zext <16 x i16> undef to
<16 x i32>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost
of 3 for instruction: %E = zext <32 x i8> undef to <32 x i16>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 0 for instruction: ret void
;
; AVX512VL512-LABEL: 'zext512'
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %A = zext <8 x i16> undef to

```

```

<8 x i64>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %B = zext <8 x i32> undef to
<8 x i64>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %C = zext <16 x i8> undef to
<16 x i32>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %D = zext <16 x i16> undef to
<16 x i32>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %E = zext <32 x i8> undef to
<32 x i16>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 0 for instruction: ret void
;
; SKX256-LABEL: 'zext512'
; SKX256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %A = zext <8 x i16> undef to <8
x i64>
; SKX256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %B = zext <8 x i32> undef to <8 x
i64>
; SKX256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %C = zext <16 x i8> undef to <16 x
i32>
; SKX256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %D = zext <16 x i16> undef to <16 x
i32>
; SKX256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %E = zext <32 x i8> undef to <32 x
i16>
; SKX256-NEXT: Cost Model: Found an estimated cost of 0 for instruction: ret void
;
; SKX512-LABEL: 'zext512'
; SKX512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %A = zext <8 x i16> undef to <8 x
i64>
; SKX512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %B = zext <8 x i32> undef to <8 x
i64>
; SKX512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %C = zext <16 x i8> undef to <16 x
i32>
; SKX512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %D = zext <16
x i16> undef to <16 x i32>
; SKX512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %E = zext <32 x i8> undef to <32 x
i16>
; SKX512-NEXT: Cost Model: Found an estimated cost of 0 for instruction: ret void
;
%A = zext <8 x i16> undef to <8 x i64>
%B = zext <8 x i32> undef to <8 x i64>
%C = zext <16 x i8> undef to <16 x i32>
%D = zext <16 x i16> undef to <16 x i32>
%E = zext <32 x i8> undef to <32 x i16>
ret void
}

define void @sext256() "min-legal-vector-width"="256" {
; AVX-LABEL: 'sext256'
; AVX-NEXT: Cost Model: Found an estimated cost of 4 for instruction: %A = sext <8 x i8> undef to <8 x i64>

```

```

; AVX-NEXT: Cost Model: Found an estimated cost of 4 for instruction: %B = sext <8 x i16> undef to <8 x i64>
; AVX-NEXT: Cost Model: Found an estimated cost of 5 for instruction: %C = sext <8 x i32> undef to <8 x i64>
; AVX-NEXT: Cost Model: Found an estimated cost of 4 for instruction: %D = sext <16 x i8> undef to <16 x i32>
; AVX-NEXT: Cost Model: Found
an estimated cost of 3 for instruction: %E = sext <16 x i16> undef to <16 x i32>
; AVX-NEXT: Cost Model: Found an estimated cost of 5 for instruction: %F = sext <32 x i8> undef to <32 x i16>
; AVX-NEXT: Cost Model: Found an estimated cost of 0 for instruction: ret void
;
; AVX512VL256-LABEL: 'sext256'
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %A = sext <8 x i8> undef to <8
x i64>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %B = sext <8 x i16> undef to
<8 x i64>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %C = sext <8 x i32> undef to
<8 x i64>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %D = sext <16 x i8> undef to
<16 x i32>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %E = sext <16 x i16> undef to
<16 x i32>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %F = sext <32 x i8> undef
to <32 x i16>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 0 for instruction: ret void
;
; AVX512VL512-LABEL: 'sext256'
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %A = sext <8 x i8> undef to <8
x i64>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %B = sext <8 x i16> undef to
<8 x i64>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %C = sext <8 x i32> undef to
<8 x i64>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %D = sext <16 x i8> undef to
<16 x i32>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %E = sext <16 x i16> undef to
<16 x i32>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %F = sext <32 x i8> undef to
<32 x i16>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 0 for instruction: ret void
;
; SKX256-LABEL: 'sext256'
; SKX256-NEXT: Cost Model: Found an
estimated cost of 2 for instruction: %A = sext <8 x i8> undef to <8 x i64>
; SKX256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %B = sext <8 x i16> undef to <8 x
i64>
; SKX256-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %C = sext <8 x i32> undef to <8 x
i64>
; SKX256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %D = sext <16 x i8> undef to <16 x
i32>
; SKX256-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %E = sext <16 x i16> undef to <16 x

```

```

i32>
; SKX256-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %F = sext <32 x i8> undef to <32 x
i16>
; SKX256-NEXT: Cost Model: Found an estimated cost of 0 for instruction: ret void
;
; SKX512-LABEL: 'sext256'
; SKX512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %A = sext <8 x i8> undef to <8 x i64>
; SKX512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %B = sext <8 x i16> undef to <8 x
i64>
; SKX512-NEXT: Cost
Model: Found an estimated cost of 1 for instruction: %C = sext <8 x i32> undef to <8 x i64>
; SKX512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %D = sext <16 x i8> undef to <16 x
i32>
; SKX512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %E = sext <16 x i16> undef to <16 x
i32>
; SKX512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %F = sext <32 x i8> undef to <32 x
i16>
; SKX512-NEXT: Cost Model: Found an estimated cost of 0 for instruction: ret void
;
%A = sext <8 x i8> undef to <8 x i64>
%B = sext <8 x i16> undef to <8 x i64>
%C = sext <8 x i32> undef to <8 x i64>
%D = sext <16 x i8> undef to <16 x i32>
%E = sext <16 x i16> undef to <16 x i32>
%F = sext <32 x i8> undef to <32 x i16>
ret void
}

define void @sext512() "min-legal-vector-width"="512" {
; AVX-LABEL: 'sext512'
; AVX-NEXT: Cost Model: Found an estimated cost of 4 for instruction: %A = sext <8 x i8> undef to <8 x i64>
; AVX-NEXT: Cost Model: Found
an estimated cost of 4 for instruction: %B = sext <8 x i16> undef to <8 x i64>
; AVX-NEXT: Cost Model: Found an estimated cost of 5 for instruction: %C = sext <8 x i32> undef to <8 x i64>
; AVX-NEXT: Cost Model: Found an estimated cost of 4 for instruction: %D = sext <16 x i8> undef to <16 x i32>
; AVX-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %E = sext <16 x i16> undef to <16 x i32>
; AVX-NEXT: Cost Model: Found an estimated cost of 5 for instruction: %F = sext <32 x i8> undef to <32 x i16>
; AVX-NEXT: Cost Model: Found an estimated cost of 0 for instruction: ret void
;
; AVX512VL256-LABEL: 'sext512'
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %A = sext <8 x i8> undef to <8
x i64>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %B = sext <8 x i16> undef to
<8 x i64>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %C = sext <8 x i32> undef to
<8 x i64>
; AVX512VL256-NEXT:

```

```

Cost Model: Found an estimated cost of 1 for instruction: %D = sext <16 x i8> undef to <16 x i32>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %E = sext <16 x i16> undef to
<16 x i32>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %F = sext <32 x i8> undef to
<32 x i16>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 0 for instruction: ret void
;
; AVX512VL512-LABEL: 'sext512'
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %A = sext <8 x i8> undef to <8
x i64>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %B = sext <8 x i16> undef to
<8 x i64>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %C = sext <8 x i32> undef to
<8 x i64>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %D = sext <16 x i8> undef to
<16 x i32>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost
of 1 for instruction: %E = sext <16 x i16> undef to <16 x i32>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %F = sext <32 x i8> undef to
<32 x i16>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 0 for instruction: ret void
;
; SKX256-LABEL: 'sext512'
; SKX256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %A = sext <8 x i8> undef to <8 x i64>
; SKX256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %B = sext <8 x i16> undef to <8 x
i64>
; SKX256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %C = sext <8 x i32> undef to <8 x
i64>
; SKX256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %D = sext <16 x i8> undef to <16 x
i32>
; SKX256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %E = sext <16 x i16> undef to <16 x
i32>
; SKX256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %F = sext <32 x i8> undef to <32 x
i16>
; SKX256-NEXT: Cost
Model: Found an estimated cost of 0 for instruction: ret void
;
; SKX512-LABEL: 'sext512'
; SKX512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %A = sext <8 x i8> undef to <8 x i64>
; SKX512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %B = sext <8 x i16> undef to <8 x
i64>
; SKX512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %C = sext <8 x i32> undef to <8 x
i64>
; SKX512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %D = sext <16 x i8> undef to <16 x
i32>
; SKX512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %E = sext <16 x i16> undef to <16 x
i32>
; SKX512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %F = sext <32 x i8> undef to <32 x

```

```

i16>
; SKX512-NEXT: Cost Model: Found an estimated cost of 0 for instruction: ret void
;
%A = sext <8 x i8> undef to <8 x i64>
%B = sext <8 x i16> undef to <8 x i64>
%C = sext <8 x i32> undef to <8 x i64>
%D = sext <16 x i8>
undef to <16 x i32>
%E = sext <16 x i16> undef to <16 x i32>
%F = sext <32 x i8> undef to <32 x i16>
ret void
}

define void @trunc256() "min-legal-vector-width"="256" {
; VEC256-LABEL: 'trunc256'
; VEC256-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %A = trunc <8 x i64> undef to <8 x
i32>
; VEC256-NEXT: Cost Model: Found an estimated cost of 10 for instruction: %B = trunc <8 x i64> undef to <8 x
i16>
; VEC256-NEXT: Cost Model: Found an estimated cost of 8 for instruction: %C = trunc <8 x i64> undef to <8 x
i8>
; VEC256-NEXT: Cost Model: Found an estimated cost of 4 for instruction: %D = trunc <16 x i32> undef to <16 x
i16>
; VEC256-NEXT: Cost Model: Found an estimated cost of 4 for instruction: %E = trunc <16 x i32> undef to <16 x
i8>
; VEC256-NEXT: Cost Model: Found an estimated cost of 5 for instruction: %F = trunc <32 x i16> undef to <32 x
i8>
; VEC256-NEXT: Cost Model: Found an estimated cost of 0 for instruction: ret void
;
; AVX512VL512-LABEL: 'trunc256'
;
AVX512VL512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %A = trunc <8 x i64> undef to
<8 x i32>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %B = trunc <8 x i64> undef to
<8 x i16>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %C = trunc <8 x i64> undef to
<8 x i8>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %D = trunc <16 x i32> undef
to <16 x i16>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %E = trunc <16 x i32> undef to
<16 x i8>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 8 for instruction: %F = trunc <32 x i16> undef to
<32 x i8>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 0 for instruction: ret void
;
; SKX512-LABEL: 'trunc256'
; SKX512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %A = trunc <8 x i64> undef to <8 x
i32>

```

```

; SKX512-NEXT: Cost Model: Found an estimated
cost of 2 for instruction: %B = trunc <8 x i64> undef to <8 x i16>
; SKX512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %C = trunc <8 x i64> undef to <8 x
i8>
; SKX512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %D = trunc <16 x i32> undef to <16 x
i16>
; SKX512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %E = trunc <16 x i32> undef to <16 x
i8>
; SKX512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %F = trunc <32 x i16> undef to <32 x
i8>
; SKX512-NEXT: Cost Model: Found an estimated cost of 0 for instruction: ret void
;
%A = trunc <8 x i64> undef to <8 x i32>
%B = trunc <8 x i64> undef to <8 x i16>
%C = trunc <8 x i64> undef to <8 x i8>
%D = trunc <16 x i32> undef to <16 x i16>
%E = trunc <16 x i32> undef to <16 x i8>
%F = trunc <32 x i16> undef to <32 x i8>
ret void
}

define i32 @zext256_vXi1() "min-legal-vector-width"="256" {
; AVX-LABEL: 'zext256_vXi1'
; AVX-NEXT: Cost Model: Found
an estimated cost of 1 for instruction: %V2i64 = zext <2 x i1> undef to <2 x i64>
; AVX-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %V4i64 = zext <4 x i1> undef to <4 x
i64>
; AVX-NEXT: Cost Model: Found an estimated cost of 4 for instruction: %V8i64 = zext <8 x i1> undef to <8 x
i64>
; AVX-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V2i32 = zext <2 x i1> undef to <2 x
i32>
; AVX-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V4i32 = zext <4 x i1> undef to <4 x
i32>
; AVX-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %V8i32 = zext <8 x i1> undef to <8 x
i32>
; AVX-NEXT: Cost Model: Found an estimated cost of 4 for instruction: %V16i32 = zext <16 x i1> undef to <16 x
i32>
; AVX-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V2i16 = zext <2 x i1> undef to <2 x
i16>
; AVX-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V4i16 = zext <4 x i1> undef to <4 x
i16>
; AVX-NEXT:
Cost Model: Found an estimated cost of 1 for instruction: %V8i16 = zext <8 x i1> undef to <8 x i16>
; AVX-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V16i16 = zext <16 x i1> undef to <16 x
i16>
; AVX-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %V32i16 = zext <32 x i1> undef to <32 x
i16>
; AVX-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V2i8 = zext <2 x i1> undef to <2 x i8>

```

```

; AVX-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V4i8 = zext <4 x i1> undef to <4 x i8>
; AVX-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V8i8 = zext <8 x i1> undef to <8 x i8>
; AVX-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V16i8 = zext <16 x i1> undef to <16 x i8>
; AVX-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V32i8 = zext <32 x i1> undef to <32 x i8>
; AVX-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V64i8 = zext <64 x i1> undef to <64 x i8>
; AVX-NEXT: Cost Model: Found an estimated cost of 0 for instruction: ret i32 undef
;
; AVX512VL256-LABEL: 'zext256_vXi1'
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V2i64 = zext <2 x i1> undef to <2 x i64>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V4i64 = zext <4 x i1> undef to <4 x i64>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 5 for instruction: %V8i64 = zext <8 x i1> undef to <8 x i64>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V2i32 = zext <2 x i1> undef to <2 x i32>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V4i32 = zext <4 x i1> undef to <4 x i32>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V8i32 = zext <8 x i1> undef to <8 x i32>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 4 for instruction: %V16i32 = zext <16 x i1> undef to <16 x i32>
; AVX512VL256-NEXT:
  Cost Model: Found an estimated cost of 5 for instruction: %V2i16 = zext <2 x i1> undef to <2 x i16>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 5 for instruction: %V4i16 = zext <4 x i1> undef to <4 x i16>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 5 for instruction: %V8i16 = zext <8 x i1> undef to <8 x i16>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 12 for instruction: %V16i16 = zext <16 x i1> undef to <16 x i16>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 24 for instruction: %V32i16 = zext <32 x i1> undef to <32 x i16>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 6 for instruction: %V2i8 = zext <2 x i1> undef to <2 x i8>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 6 for instruction: %V4i8 = zext <4 x i1> undef to <4 x i8>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 6 for instruction: %V8i8 = zext <8 x i1> undef to <8 x i8>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 12 for instruction: %V16i8 = zext <16 x i1> undef to <16 x i8>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 25 for instruction: %V32i8 = zext <32 x i1> undef to <32 x i8>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 50 for instruction: %V64i8 = zext <64 x i1> undef to <64 x i8>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 0 for instruction: ret i32 undef

```



```

;
; AVX512VL512-LABEL: 'zext256_vXi1'
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V2i64 = zext <2 x i1> undef
to <2 x i64>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V4i64 = zext <4 x i1> undef
to <4 x i64>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V8i64 = zext <8 x i1> undef
to <8 x i64>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V2i32 = zext <2 x i1> undef
to <2 x i32>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of
2 for instruction: %V4i32 = zext <4 x i1> undef to <4 x i32>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V8i32 = zext <8 x i1> undef
to <8 x i32>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V16i32 = zext <16 x i1>
undef to <16 x i32>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 4 for instruction: %V2i16 = zext <2 x i1> undef
to <2 x i16>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 4 for instruction: %V4i16 = zext <4 x i1> undef
to <4 x i16>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 4 for instruction: %V8i16 = zext <8 x i1> undef
to <8 x i16>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 4 for instruction: %V16i16 = zext <16 x i1>
undef to <16 x i16>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 9 for instruction: %V32i16 = zext <32 x i1>
undef to <32 x i16>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 4 for instruction: %V2i8
= zext <2 x i1> undef to <2 x i8>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 4 for instruction: %V4i8 = zext <4 x i1> undef to
<4 x i8>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 4 for instruction: %V8i8 = zext <8 x i1> undef to
<8 x i8>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 4 for instruction: %V16i8 = zext <16 x i1> undef
to <16 x i8>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 9 for instruction: %V32i8 = zext <32 x i1> undef
to <32 x i8>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 19 for instruction: %V64i8 = zext <64 x i1>
undef to <64 x i8>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 0 for instruction: ret i32 undef
;
; SKX256-LABEL: 'zext256_vXi1'
; SKX256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V2i64 = zext <2 x i1> undef to <2 x
i64>
; SKX256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V4i64 = zext <4 x i1> undef to <4 x
i64>
;
; SKX256-NEXT: Cost Model: Found an estimated cost of 4 for instruction: %V8i64 = zext <8 x i1> undef to <8 x
i64>

```

```

; SKX256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V2i32 = zext <2 x i1> undef to <2 x
i32>
; SKX256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V4i32 = zext <4 x i1> undef to <4 x
i32>
; SKX256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V8i32 = zext <8 x i1> undef to <8 x
i32>
; SKX256-NEXT: Cost Model: Found an estimated cost of 4 for instruction: %V16i32 = zext <16 x i1> undef to
<16 x i32>
; SKX256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V2i16 = zext <2 x i1> undef to <2 x
i16>
; SKX256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V4i16 = zext <4 x i1> undef to <4 x
i16>
; SKX256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V8i16 = zext <8 x i1> undef to <8 x
i16>
; SKX256-NEXT: Cost Model: Found an estimated cost of 2 for instruction:
%V16i16 = zext <16 x i1> undef to <16 x i16>
; SKX256-NEXT: Cost Model: Found an estimated cost of 4 for instruction: %V32i16 = zext <32 x i1> undef to
<32 x i16>
; SKX256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V2i8 = zext <2 x i1> undef to <2 x
i8>
; SKX256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V4i8 = zext <4 x i1> undef to <4 x
i8>
; SKX256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V8i8 = zext <8 x i1> undef to <8 x
i8>
; SKX256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V16i8 = zext <16 x i1> undef to <16
x i8>
; SKX256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V32i8 = zext <32 x i1> undef to <32
x i8>
; SKX256-NEXT: Cost Model: Found an estimated cost of 4 for instruction: %V64i8 = zext <64 x i1> undef to <64
x i8>
; SKX256-NEXT: Cost Model: Found an estimated cost of 0 for instruction: ret i32 undef
;
; SKX512-LABEL: 'zext256_vXi1'
; SKX512-NEXT: Cost
Model: Found an estimated cost of 2 for instruction: %V2i64 = zext <2 x i1> undef to <2 x i64>
; SKX512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V4i64 = zext <4 x i1> undef to <4 x
i64>
; SKX512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V8i64 = zext <8 x i1> undef to <8 x
i64>
; SKX512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V2i32 = zext <2 x i1> undef to <2 x
i32>
; SKX512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V4i32 = zext <4 x i1> undef to <4 x
i32>
; SKX512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V8i32 = zext <8 x i1> undef to <8 x
i32>
; SKX512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V16i32 = zext <16 x i1> undef to
<16 x i32>
; SKX512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V2i16 = zext <2 x i1> undef to <2 x

```

```

i16>
; SKX512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V4i16 = zext
<4 x i1> undef to <4 x i16>
; SKX512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V8i16 = zext <8 x i1> undef to <8 x
i16>
; SKX512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V16i16 = zext <16 x i1> undef to
<16 x i16>
; SKX512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V32i16 = zext <32 x i1> undef to
<32 x i16>
; SKX512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V2i8 = zext <2 x i1> undef to <2 x
i8>
; SKX512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V4i8 = zext <4 x i1> undef to <4 x
i8>
; SKX512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V8i8 = zext <8 x i1> undef to <8 x
i8>
; SKX512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V16i8 = zext <16 x i1> undef to <16
x i8>
; SKX512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V32i8 = zext <32 x i1> undef to <32
x i8>
; SKX512-NEXT: Cost Model: Found an estimated
cost of 2 for instruction: %V64i8 = zext <64 x i1> undef to <64 x i8>
; SKX512-NEXT: Cost Model: Found an estimated cost of 0 for instruction: ret i32 undef
;
%V2i64 = zext <2 x i1> undef to <2 x i64>
%V4i64 = zext <4 x i1> undef to <4 x i64>
%V8i64 = zext <8 x i1> undef to <8 x i64>

%V2i32 = zext <2 x i1> undef to <2 x i32>
%V4i32 = zext <4 x i1> undef to <4 x i32>
%V8i32 = zext <8 x i1> undef to <8 x i32>
%V16i32 = zext <16 x i1> undef to <16 x i32>

%V2i16 = zext <2 x i1> undef to <2 x i16>
%V4i16 = zext <4 x i1> undef to <4 x i16>
%V8i16 = zext <8 x i1> undef to <8 x i16>
%V16i16 = zext <16 x i1> undef to <16 x i16>
%V32i16 = zext <32 x i1> undef to <32 x i16>

%V2i8 = zext <2 x i1> undef to <2 x i8>
%V4i8 = zext <4 x i1> undef to <4 x i8>
%V8i8 = zext <8 x i1> undef to <8 x i8>
%V16i8 = zext <16 x i1> undef to <16 x i8>
%V32i8 = zext <32 x i1> undef to <32 x i8>
%V64i8 = zext <64 x i1> undef to <64 x i8>

ret i32 undef
}

```

```

define i32 @sext256_vXi1()
  "min-legal-vector-width"="256" {
; AVX-LABEL: 'sext256_vXi1'
; AVX-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %I64 = sext i1 undef to i64
; AVX-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V2i64 = sext <2 x i1> undef to <2 x
i64>
; AVX-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %V4i64 = sext <4 x i1> undef to <4 x
i64>
; AVX-NEXT: Cost Model: Found an estimated cost of 4 for instruction: %V8i64 = sext <8 x i1> undef to <8 x
i64>
; AVX-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %I32 = sext i1 undef to i32
; AVX-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V2i32 = sext <2 x i1> undef to <2 x
i32>
; AVX-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V4i32 = sext <4 x i1> undef to <4 x
i32>
; AVX-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %V8i32 = sext <8 x i1> undef to <8 x
i32>
; AVX-NEXT: Cost Model: Found an estimated cost
of 4 for instruction: %V16i32 = sext <16 x i1> undef to <16 x i32>
; AVX-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %I16 = sext i1 undef to i16
; AVX-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V2i16 = sext <2 x i1> undef to <2 x
i16>
; AVX-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V4i16 = sext <4 x i1> undef to <4 x
i16>
; AVX-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V8i16 = sext <8 x i1> undef to <8 x
i16>
; AVX-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V16i16 = sext <16 x i1> undef to <16 x
i16>
; AVX-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %V32i16 = sext <32 x i1> undef to <32 x
i16>
; AVX-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %I8 = sext i1 undef to i8
; AVX-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V2i8 = sext <2 x i1> undef to <2 x i8>
; AVX-NEXT: Cost Model: Found an estimated cost of 2 for
instruction: %V4i8 = sext <4 x i1> undef to <4 x i8>
; AVX-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V8i8 = sext <8 x i1> undef to <8 x i8>
; AVX-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V16i8 = sext <16 x i1> undef to <16 x
i8>
; AVX-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V32i8 = sext <32 x i1> undef to <32 x
i8>
; AVX-NEXT: Cost Model: Found an estimated cost of 4 for instruction: %V64i8 = sext <64 x i1> undef to <64 x
i8>
; AVX-NEXT: Cost Model: Found an estimated cost of 0 for instruction: ret i32 undef
;
; AVX512VL256-LABEL: 'sext256_vXi1'
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %I64 = sext i1 undef to i64
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V2i64 = sext <2 x i1> undef
to <2 x i64>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V4i64 = sext <4 x i1> undef

```

```

to <4 x i64>
; AVX512VL256-NEXT:
  Cost Model: Found an estimated cost of 3 for instruction: %V8i64 = sext <8 x i1> undef to <8 x i64>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %I32 = sext i1 undef to i32
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V2i32 = sext <2 x i1> undef
to <2 x i32>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V4i32 = sext <4 x i1> undef
to <4 x i32>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V8i32 = sext <8 x i1> undef
to <8 x i32>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V16i32 = sext <16 x i1>
undef to <16 x i32>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %I16 = sext i1 undef to i16
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 4 for instruction: %V2i16 = sext <2 x i1> undef
to <2 x i16>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 4 for instruction:
%V4i16 = sext <4 x i1> undef to <4 x i16>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 4 for instruction: %V8i16 = sext <8 x i1> undef
to <8 x i16>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 10 for instruction: %V16i16 = sext <16 x i1>
undef to <16 x i16>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 20 for instruction: %V32i16 = sext <32 x i1>
undef to <32 x i16>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %I8 = sext i1 undef to i8
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 5 for instruction: %V2i8 = sext <2 x i1> undef to
<2 x i8>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 5 for instruction: %V4i8 = sext <4 x i1> undef to
<4 x i8>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 5 for instruction: %V8i8 = sext <8 x i1> undef to
<8 x i8>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 10 for instruction: %V16i8 = sext <16 x i1>
undef to <16 x i8>
;
  AVX512VL256-NEXT: Cost Model: Found an estimated cost of 21 for instruction: %V32i8 = sext <32 x i1>
undef to <32 x i8>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 42 for instruction: %V64i8 = sext <64 x i1>
undef to <64 x i8>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 0 for instruction: ret i32 undef
;
; AVX512VL512-LABEL: 'sext256_vXi1'
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %I64 = sext i1 undef to i64
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V2i64 = sext <2 x i1> undef
to <2 x i64>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V4i64 = sext <4 x i1> undef
to <4 x i64>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V8i64 = sext <8 x i1> undef
to <8 x i64>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %I32 = sext i1 undef to i32

```

```

; AVX512VL512-NEXT: Cost Model: Found an estimated
cost of 1 for instruction: %V2i32 = sext <2 x i1> undef to <2 x i32>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V4i32 = sext <4 x i1> undef
to <4 x i32>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V8i32 = sext <8 x i1> undef
to <8 x i32>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V16i32 = sext <16 x i1>
undef to <16 x i32>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %I16 = sext i1 undef to i16
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %V2i16 = sext <2 x i1> undef
to <2 x i16>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %V4i16 = sext <4 x i1> undef
to <4 x i16>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %V8i16 = sext <8 x i1> undef
to <8 x i16>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %V16i16 =
sext <16 x i1> undef to <16 x i16>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 7 for instruction: %V32i16 = sext <32 x i1>
undef to <32 x i16>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %I8 = sext i1 undef to i8
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %V2i8 = sext <2 x i1> undef to
<2 x i8>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %V4i8 = sext <4 x i1> undef to
<4 x i8>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %V8i8 = sext <8 x i1> undef to
<8 x i8>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %V16i8 = sext <16 x i1> undef
to <16 x i8>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 7 for instruction: %V32i8 = sext <32 x i1> undef
to <32 x i8>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 15 for instruction: %V64i8 = sext <64 x i1>
undef to <64 x i8>
; AVX512VL512-NEXT:
Cost Model: Found an estimated cost of 0 for instruction: ret i32 undef
;
; SKX256-LABEL: 'sext256_vXi1'
; SKX256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %I64 = sext i1 undef to i64
; SKX256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V2i64 = sext <2 x i1> undef to <2 x
i64>
; SKX256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V4i64 = sext <4 x i1> undef to <4 x
i64>
; SKX256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V8i64 = sext <8 x i1> undef to <8 x
i64>
; SKX256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %I32 = sext i1 undef to i32
; SKX256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V2i32 = sext <2 x i1> undef to <2 x
i32>
; SKX256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V4i32 = sext <4 x i1> undef to <4 x
i32>

```

```

; SKX256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V8i32 = sext <8 x i1> undef
to <8 x i32>
; SKX256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V16i32 = sext <16 x i1> undef to
<16 x i32>
; SKX256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %I16 = sext i1 undef to i16
; SKX256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V2i16 = sext <2 x i1> undef to <2 x
i16>
; SKX256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V4i16 = sext <4 x i1> undef to <4 x
i16>
; SKX256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V8i16 = sext <8 x i1> undef to <8 x
i16>
; SKX256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V16i16 = sext <16 x i1> undef to
<16 x i16>
; SKX256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V32i16 = sext <32 x i1> undef to
<32 x i16>
; SKX256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %I8 = sext i1 undef to i8
; SKX256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V2i8
= sext <2 x i1> undef to <2 x i8>
; SKX256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V4i8 = sext <4 x i1> undef to <4 x
i8>
; SKX256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V8i8 = sext <8 x i1> undef to <8 x
i8>
; SKX256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V16i8 = sext <16 x i1> undef to <16
x i8>
; SKX256-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V32i8 = sext <32 x i1> undef to <32
x i8>
; SKX256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V64i8 = sext <64 x i1> undef to <64
x i8>
; SKX256-NEXT: Cost Model: Found an estimated cost of 0 for instruction: ret i32 undef
;
; SKX512-LABEL: 'sext256_vXi1'
; SKX512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %I64 = sext i1 undef to i64
; SKX512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V2i64 = sext <2 x i1> undef to <2 x
i64>
; SKX512-NEXT: Cost Model: Found an estimated
cost of 1 for instruction: %V4i64 = sext <4 x i1> undef to <4 x i64>
; SKX512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V8i64 = sext <8 x i1> undef to <8 x
i64>
; SKX512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %I32 = sext i1 undef to i32
; SKX512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V2i32 = sext <2 x i1> undef to <2 x
i32>
; SKX512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V4i32 = sext <4 x i1> undef to <4 x
i32>
; SKX512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V8i32 = sext <8 x i1> undef to <8 x
i32>
; SKX512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V16i32 = sext <16 x i1> undef to
<16 x i32>
; SKX512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %I16 = sext i1 undef to i16

```

```

; SKX512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V2i16 = sext <2 x i1> undef to <2 x
i16>
; SKX512-NEXT: Cost Model:
Found an estimated cost of 1 for instruction: %V4i16 = sext <4 x i1> undef to <4 x i16>
; SKX512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V8i16 = sext <8 x i1> undef to <8 x
i16>
; SKX512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V16i16 = sext <16 x i1> undef to
<16 x i16>
; SKX512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V32i16 = sext <32 x i1> undef to
<32 x i16>
; SKX512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %I8 = sext i1 undef to i8
; SKX512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V2i8 = sext <2 x i1> undef to <2 x
i8>
; SKX512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V4i8 = sext <4 x i1> undef to <4 x
i8>
; SKX512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V8i8 = sext <8 x i1> undef to <8 x
i8>
; SKX512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V16i8 = sext <16 x i1> undef to <16
x i8>
;
SKX512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V32i8 = sext <32 x i1> undef to <32
x i8>
; SKX512-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V64i8 = sext <64 x i1> undef to <64
x i8>
; SKX512-NEXT: Cost Model: Found an estimated cost of 0 for instruction: ret i32 undef
;
%I64 = sext i1 undef to i64
%V2i64 = sext <2 x i1> undef to <2 x i64>
%V4i64 = sext <4 x i1> undef to <4 x i64>
%V8i64 = sext <8 x i1> undef to <8 x i64>

%I32 = sext i1 undef to i32
%V2i32 = sext <2 x i1> undef to <2 x i32>
%V4i32 = sext <4 x i1> undef to <4 x i32>
%V8i32 = sext <8 x i1> undef to <8 x i32>
%V16i32 = sext <16 x i1> undef to <16 x i32>

%I16 = sext i1 undef to i16
%V2i16 = sext <2 x i1> undef to <2 x i16>
%V4i16 = sext <4 x i1> undef to <4 x i16>
%V8i16 = sext <8 x i1> undef to <8 x i16>
%V16i16 = sext <16 x i1> undef to <16 x i16>
%V32i16 = sext <32 x i1> undef to <32 x i16>

%I8 = sext i1 undef to i8
%V2i8 = sext <2
x i1> undef to <2 x i8>
%V4i8 = sext <4 x i1> undef to <4 x i8>

```



```

%V8i8 = sext <8 x i1> undef to <8 x i8>
%V16i8 = sext <16 x i1> undef to <16 x i8>
%V32i8 = sext <32 x i1> undef to <32 x i8>
%V64i8 = sext <64 x i1> undef to <64 x i8>

ret i32 undef
}

define i32 @trunc_vXi1() "min-legal-vector-width"="256" {
; AVX-LABEL: 'trunc_vXi1'
; AVX-NEXT: Cost Model: Found an estimated cost of 0 for instruction: %V2i64 = trunc <2 x i64> undef to <2 x
i1>
; AVX-NEXT: Cost Model: Found an estimated cost of 4 for instruction: %V4i64 = trunc <4 x i64> undef to <4 x
i1>
; AVX-NEXT: Cost Model: Found an estimated cost of 9 for instruction: %V8i64 = trunc <8 x i64> undef to <8 x
i1>
; AVX-NEXT: Cost Model: Found an estimated cost of 11 for instruction: %V16i64 = trunc <16 x i64> undef to
<16 x i1>
; AVX-NEXT: Cost Model: Found an estimated cost of 23 for instruction: %V32i64 = trunc <32 x i64> undef to
<32 x i1>
; AVX-NEXT: Cost Model: Found an estimated cost of 46 for instruction: %V64i64
= trunc <64 x i64> undef to <64 x i1>
; AVX-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V2i32 = trunc <2 x i32> undef to <2 x
i1>
; AVX-NEXT: Cost Model: Found an estimated cost of 0 for instruction: %V4i32 = trunc <4 x i32> undef to <4 x
i1>
; AVX-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V8i32 = trunc <8 x i32> undef to <8 x
i1>
; AVX-NEXT: Cost Model: Found an estimated cost of 8 for instruction: %V16i32 = trunc <16 x i32> undef to <16
x i1>
; AVX-NEXT: Cost Model: Found an estimated cost of 17 for instruction: %V32i32 = trunc <32 x i32> undef to
<32 x i1>
; AVX-NEXT: Cost Model: Found an estimated cost of 34 for instruction: %V64i32 = trunc <64 x i32> undef to
<64 x i1>
; AVX-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V2i16 = trunc <2 x i16> undef to <2 x
i1>
; AVX-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V4i16 = trunc <4 x i16> undef to <4 x
i1>
; AVX-NEXT: Cost Model: Found an
estimated cost of 0 for instruction: %V8i16 = trunc <8 x i16> undef to <8 x i1>
; AVX-NEXT: Cost Model: Found an estimated cost of 4 for instruction: %V16i16 = trunc <16 x i16> undef to <16
x i1>
; AVX-NEXT: Cost Model: Found an estimated cost of 9 for instruction: %V32i16 = trunc <32 x i16> undef to <32
x i1>
; AVX-NEXT: Cost Model: Found an estimated cost of 18 for instruction: %V64i16 = trunc <64 x i16> undef to
<64 x i1>
; AVX-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V2i8 = trunc <2 x i8> undef to <2 x i1>
; AVX-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V4i8 = trunc <4 x i8> undef to <4 x i1>

```

```

; AVX-NEXT: Cost Model: Found an estimated cost of 1 for instruction: %V8i8 = trunc <8 x i8> undef to <8 x i1>
; AVX-NEXT: Cost Model: Found an estimated cost of 0 for instruction: %V16i8 = trunc <16 x i8> undef to <16 x i1>
; AVX-NEXT: Cost Model: Found an estimated cost of 0 for instruction: %V32i8 = trunc <32 x i8> undef to <32 x i1>
;
AVX-NEXT: Cost Model: Found an estimated cost of 0 for instruction: %V64i8 = trunc <64 x i8> undef to <64 x i1>
; AVX-NEXT: Cost Model: Found an estimated cost of 0 for instruction: ret i32 undef
;
; AVX512VL256-LABEL: 'trunc_vXi1'
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V2i64 = trunc <2 x i64> undef to <2 x i1>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V4i64 = trunc <4 x i64> undef to <4 x i1>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 9 for instruction: %V8i64 = trunc <8 x i64> undef to <8 x i1>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 11 for instruction: %V16i64 = trunc <16 x i64> undef to <16 x i1>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 22 for instruction: %V32i64 = trunc <32 x i64> undef to <32 x i1>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 44 for instruction: %V64i64 = trunc <64 x i64> undef to <64 x i1>
; AVX512VL256-NEXT:
Cost Model: Found an estimated cost of 2 for instruction: %V2i32 = trunc <2 x i32> undef to <2 x i1>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V4i32 = trunc <4 x i32> undef to <4 x i1>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V8i32 = trunc <8 x i32> undef to <8 x i1>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 4 for instruction: %V16i32 = trunc <16 x i32> undef to <16 x i1>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 8 for instruction: %V32i32 = trunc <32 x i32> undef to <32 x i1>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 16 for instruction: %V64i32 = trunc <64 x i32> undef to <64 x i1>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %V2i16 = trunc <2 x i16> undef to <2 x i1>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %V4i16 = trunc <4 x i16> undef to <4 x i1>
; AVX512VL256-NEXT: Cost Model: Found
an estimated cost of 3 for instruction: %V8i16 = trunc <8 x i16> undef to <8 x i1>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 8 for instruction: %V16i16 = trunc <16 x i16> undef to <16 x i1>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 16 for instruction: %V32i16 = trunc <32 x i16> undef to <32 x i1>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 32 for instruction: %V64i16 = trunc <64 x i16> undef to <64 x i1>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %V2i8 = trunc <2 x i8> undef

```

```

to <2 x i1>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %V4i8 = trunc <4 x i8> undef
to <4 x i1>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %V8i8 = trunc <8 x i8> undef
to <8 x i1>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 8 for instruction: %V16i8 = trunc <16 x i8>
undef to <16 x i1>
; AVX512VL256-NEXT: Cost Model: Found an estimated
cost of 17 for instruction: %V32i8 = trunc <32 x i8> undef to <32 x i1>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 34 for instruction: %V64i8 = trunc <64 x i8>
undef to <64 x i1>
; AVX512VL256-NEXT: Cost Model: Found an estimated cost of 0 for instruction: ret i32 undef
;
; AVX512VL512-LABEL: 'trunc_vXi1'
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V2i64 = trunc <2 x i64>
undef to <2 x i1>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V4i64 = trunc <4 x i64>
undef to <4 x i1>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V8i64 = trunc <8 x i64>
undef to <8 x i1>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 11 for instruction: %V16i64 = trunc <16 x i64>
undef to <16 x i1>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 22 for instruction: %V32i64 = trunc <32 x i64>
undef to <32 x i1>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost
of 44 for instruction: %V64i64 = trunc <64 x i64> undef to <64 x i1>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V2i32 = trunc <2 x i32>
undef to <2 x i1>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V4i32 = trunc <4 x i32>
undef to <4 x i1>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V8i32 = trunc <8 x i32>
undef to <8 x i1>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V16i32 = trunc <16 x i32>
undef to <16 x i1>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 4 for instruction: %V32i32 = trunc <32 x i32>
undef to <32 x i1>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 8 for instruction: %V64i32 = trunc <64 x i32>
undef to <64 x i1>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %V2i16 = trunc <2 x i16>
undef to <2 x i1>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 3 for instruction:
%V4i16 = trunc <4 x i16> undef to <4 x i1>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %V8i16 = trunc <8 x i16>
undef to <8 x i1>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %V16i16 = trunc <16 x i16>
undef to <16 x i1>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 7 for instruction: %V32i16 = trunc <32 x i16>
undef to <32 x i1>

```

```

; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 14 for instruction: %V64i16 = trunc <64 x i16>
undef to <64 x i1>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %V2i8 = trunc <2 x i8> undef
to <2 x i1>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %V4i8 = trunc <4 x i8> undef
to <4 x i1>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %V8i8 = trunc <8 x i8> undef
to <8 x i1>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 3 for instruction: %V16i8 =
trunc <16 x i8> undef to <16 x i1>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 7 for instruction: %V32i8 = trunc <32 x i8>
undef to <32 x i1>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 15 for instruction: %V64i8 = trunc <64 x i8>
undef to <64 x i1>
; AVX512VL512-NEXT: Cost Model: Found an estimated cost of 0 for instruction: ret i32 undef
;
; SKX256-LABEL: 'trunc_vXi1'
; SKX256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V2i64 = trunc <2 x i64> undef to <2
x i1>
; SKX256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V4i64 = trunc <4 x i64> undef to <4
x i1>
; SKX256-NEXT: Cost Model: Found an estimated cost of 9 for instruction: %V8i64 = trunc <8 x i64> undef to <8
x i1>
; SKX256-NEXT: Cost Model: Found an estimated cost of 11 for instruction: %V16i64 = trunc <16 x i64> undef to
<16 x i1>
; SKX256-NEXT: Cost Model: Found an estimated cost of 23 for instruction: %V32i64 = trunc <32 x i64> undef to
<32 x i1>
;
; SKX256-NEXT: Cost Model: Found an estimated cost of 47 for instruction: %V64i64 = trunc <64 x i64> undef to
<64 x i1>
; SKX256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V2i32 = trunc <2 x i32> undef to <2
x i1>
; SKX256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V4i32 = trunc <4 x i32> undef to <4
x i1>
; SKX256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V8i32 = trunc <8 x i32> undef to <8
x i1>
; SKX256-NEXT: Cost Model: Found an estimated cost of 4 for instruction: %V16i32 = trunc <16 x i32> undef to
<16 x i1>
; SKX256-NEXT: Cost Model: Found an estimated cost of 9 for instruction: %V32i32 = trunc <32 x i32> undef to
<32 x i1>
; SKX256-NEXT: Cost Model: Found an estimated cost of 19 for instruction: %V64i32 = trunc <64 x i32> undef to
<64 x i1>
; SKX256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V2i16 = trunc <2 x i16> undef to <2
x i1>
; SKX256-NEXT: Cost Model: Found an estimated cost
of 2 for instruction: %V4i16 = trunc <4 x i16> undef to <4 x i1>
; SKX256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V8i16 = trunc <8 x i16> undef to <8
x i1>

```

```

; SKX256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V16i16 = trunc <16 x i16> undef to
<16 x i1>
; SKX256-NEXT: Cost Model: Found an estimated cost of 4 for instruction: %V32i16 = trunc <32 x i16> undef to
<32 x i1>
; SKX256-NEXT: Cost Model: Found an estimated cost of 8 for instruction: %V64i16 = trunc <64 x i16> undef to
<64 x i1>
; SKX256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V2i8 = trunc <2 x i8> undef to <2 x
i1>
; SKX256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V4i8 = trunc <4 x i8> undef to <4 x
i1>
; SKX256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V8i8 = trunc <8 x i8> undef to <8 x
i1>
; SKX256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V16i8 = trunc <16 x i8> undef to
<16
x i1>
; SKX256-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V32i8 = trunc <32 x i8> undef to
<32 x i1>
; SKX256-NEXT: Cost Model: Found an estimated cost of 4 for instruction: %V64i8 = trunc <64 x i8> undef to
<64 x i1>
; SKX256-NEXT: Cost Model: Found an estimated cost of 0 for instruction: ret i32 undef
;
; SKX512-LABEL: 'trunc_vXi1'
; SKX512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V2i64 = trunc <2 x i64> undef to <2
x i1>
; SKX512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V4i64 = trunc <4 x i64> undef to <4
x i1>
; SKX512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V8i64 = trunc <8 x i64> undef to <8
x i1>
; SKX512-NEXT: Cost Model: Found an estimated cost of 11 for instruction: %V16i64 = trunc <16 x i64> undef to
<16 x i1>
; SKX512-NEXT: Cost Model: Found an estimated cost of 23 for instruction: %V32i64 = trunc <32 x i64> undef to
<32 x i1>
; SKX512-NEXT: Cost Model: Found an estimated
cost of 47 for instruction: %V64i64 = trunc <64 x i64> undef to <64 x i1>
; SKX512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V2i32 = trunc <2 x i32> undef to <2
x i1>
; SKX512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V4i32 = trunc <4 x i32> undef to <4
x i1>
; SKX512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V8i32 = trunc <8 x i32> undef to <8
x i1>
; SKX512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V16i32 = trunc <16 x i32> undef to
<16 x i1>
; SKX512-NEXT: Cost Model: Found an estimated cost of 5 for instruction: %V32i32 = trunc <32 x i32> undef to
<32 x i1>
; SKX512-NEXT: Cost Model: Found an estimated cost of 11 for instruction: %V64i32 = trunc <64 x i32> undef to
<64 x i1>
; SKX512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V2i16 = trunc <2 x i16> undef to <2
x i1>

```

```

; SKX512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V4i16 = trunc <4 x i16>
undef to <4 x i1>
; SKX512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V8i16 = trunc <8 x i16> undef to <8
x i1>
; SKX512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V16i16 = trunc <16 x i16> undef to
<16 x i1>
; SKX512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V32i16 = trunc <32 x i16> undef to
<32 x i1>
; SKX512-NEXT: Cost Model: Found an estimated cost of 4 for instruction: %V64i16 = trunc <64 x i16> undef to
<64 x i1>
; SKX512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V2i8 = trunc <2 x i8> undef to <2 x
i1>
; SKX512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V4i8 = trunc <4 x i8> undef to <4 x
i1>
; SKX512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V8i8 = trunc <8 x i8> undef to <8 x
i1>
; SKX512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V16i8 = trunc <16 x i8> undef to
<16 x i1>
; SKX512-NEXT: Cost Model: Found an estimated
cost of 2 for instruction: %V32i8 = trunc <32 x i8> undef to <32 x i1>
; SKX512-NEXT: Cost Model: Found an estimated cost of 2 for instruction: %V64i8 = trunc <64 x i8> undef to
<64 x i1>
; SKX512-NEXT: Cost Model: Found an estimated cost of 0 for instruction: ret i32 undef
;
%V2i64 = trunc <2 x i64> undef to <2 x i1>
%V4i64 = trunc <4 x i64> undef to <4 x i1>
%V8i64 = trunc <8 x i64> undef to <8 x i1>
%V16i64 = trunc <16 x i64> undef to <16 x i1>
%V32i64 = trunc <32 x i64> undef to <32 x i1>
%V64i64 = trunc <64 x i64> undef to <64 x i1>

%V2i32 = trunc <2 x i32> undef to <2 x i1>
%V4i32 = trunc <4 x i32> undef to <4 x i1>
%V8i32 = trunc <8 x i32> undef to <8 x i1>
%V16i32 = trunc <16 x i32> undef to <16 x i1>
%V32i32 = trunc <32 x i32> undef to <32 x i1>
%V64i32 = trunc <64 x i32> undef to <64 x i1>

%V2i16 = trunc <2 x i16> undef to <2 x i1>
%V4i16 = trunc <4 x i16> undef to <4 x i1>
%V8i16 = trunc <8 x i16> undef to <8 x i1>
%V16i16 = trunc
<16 x i16> undef to <16 x i1>
%V32i16 = trunc <32 x i16> undef to <32 x i1>
%V64i16 = trunc <64 x i16> undef to <64 x i1>

%V2i8 = trunc <2 x i8> undef to <2 x i1>
%V4i8 = trunc <4 x i8> undef to <4 x i1>

```

```

%V8i8 = trunc <8 x i8> undef to <8 x i1>
%V16i8 = trunc <16 x i8> undef to <16 x i1>
%V32i8 = trunc <32 x i8> undef to <32 x i1>
%V64i8 = trunc <64 x i8> undef to <64 x i1>

ret i32 undef
}
; RUN: llc -O3 -mtriple=powerpc-unknown-linux-gnu -mcpu=e500 -mattr=spe < %s | FileCheck %s

```

; PowerPC SPE is a rare in-tree target that has the FP_TO_SINT node marked
; as Legal.

; Verify that fptosi(42.1) isn't simplified when the rounding mode is
; unknown.

; Verify that no gross errors happen.

; CHECK-LABEL: @f20

; COMMON: cfdtsiz

```

define i32 @f20(double %a) strictfp {
entry:
  %result = call i32 @llvm.experimental.constrained.fptosi.i32.f64(double 42.1,
    metadata !"fpexcept.strict")
    strictfp
ret i32 %result
}

```

@llvm.fp.env = thread_local global i8 zeroinitializer, section "llvm.metadata"

declare i32 @llvm.experimental.constrained.fptosi.i32.f64(double, metadata)

Copyright (c) 2019 Intel Corporation. All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. Neither the name of the copyright holder nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT

HOLDER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH

DAMAGE.

=====
The LLVM Project is under the Apache License v2.0 with LLVM Exceptions:
=====

Apache License
Version 2.0, January 2004
<http://www.apache.org/licenses/>

TERMS AND CONDITIONS FOR USE, REPRODUCTION, AND DISTRIBUTION

1. Definitions.

"License" shall mean the terms and conditions for use, reproduction, and distribution as defined by Sections 1 through 9 of this document.

"Licensor" shall mean the copyright owner or entity authorized by the copyright owner that is granting the License.

"Legal Entity" shall mean the union of the acting entity and all other entities that control, are controlled by, or are under common control with that entity. For the purposes of this definition, "control" means (i) the power, direct or indirect, to cause the direction or management of such entity, whether by contract or otherwise, or (ii) ownership of fifty percent (50%) or more of the outstanding shares, or (iii) beneficial ownership of such entity.

"You" (or "Your") shall mean an individual or Legal Entity exercising permissions granted by this License.

"Source" form shall mean the preferred form for making modifications, including but not limited to software source code, documentation source, and configuration files.

"Object" form shall mean any form resulting from mechanical transformation or translation of a Source form, including but not limited to compiled object code, generated documentation, and conversions to other media types.

"Work" shall mean the work of authorship, whether in Source or Object form, made available under the License, as indicated by a copyright notice that is included in or attached to the work (an example is provided in the Appendix below).

"Derivative Works" shall mean any work, whether in Source or Object form, that is based on (or derived from) the Work and for which the

editorial revisions, annotations, elaborations, or other modifications represent, as a whole, an original work of authorship. For the purposes of this License, Derivative Works shall not include works that remain separable from, or merely link (or bind by name) to the interfaces of, the Work and Derivative Works thereof.

"Contribution" shall mean any work of authorship, including the original version of the Work and any modifications or additions to that Work or Derivative Works thereof, that is intentionally submitted to Licensor for inclusion in the Work by the copyright owner or by an individual or Legal Entity authorized to submit on behalf of the copyright owner. For the purposes of this definition,

"submitted"

means any form of electronic, verbal, or written communication sent to the Licensor or its representatives, including but not limited to communication on electronic mailing lists, source code control systems, and issue tracking systems that are managed by, or on behalf of, the Licensor for the purpose of discussing and improving the Work, but excluding communication that is conspicuously marked or otherwise designated in writing by the copyright owner as "Not a Contribution."

"Contributor" shall mean Licensor and any individual or Legal Entity on behalf of whom a Contribution has been received by Licensor and subsequently incorporated within the Work.

2. Grant of Copyright License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable copyright license to reproduce, prepare Derivative Works of, publicly display, publicly perform, sublicense, and distribute the Work and such Derivative Works in Source or Object form.

3. Grant of Patent License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable (except as stated in this section) patent license to make, have made, use, offer to sell, sell, import, and otherwise transfer the Work, where such license applies only to those patent claims licensable by such Contributor that are necessarily infringed by their Contribution(s) alone or by combination of their Contribution(s) with the Work to which such Contribution(s) was submitted. If You institute patent litigation against any entity (including a cross-claim or counterclaim in a lawsuit) alleging that the Work or a Contribution incorporated within the Work constitutes direct or contributory patent infringement, then any patent licenses granted to You under this License for that Work shall terminate as of the date such litigation is filed.

4. Redistribution. You may reproduce and distribute copies of the Work or Derivative Works thereof in any medium, with or without modifications, and in Source or Object form, provided that You meet the following conditions:

- (a) You must give any other recipients of the Work or Derivative Works a copy of this License; and
- (b) You must cause any modified files to carry prominent notices stating that You changed the files; and
- (c) You must retain, in the Source form of any Derivative Works that You distribute, all copyright, patent, trademark, and attribution notices from the Source form of the Work, excluding those notices that do not pertain to any part of the Derivative Works; and

(d) If the Work includes a "NOTICE" text file as part of its distribution, then any Derivative Works that You distribute must include a readable copy of the attribution notices contained within such NOTICE file, excluding those notices that do not pertain to any part of the Derivative Works, in at least one of the following places: within a NOTICE text file distributed as part of the Derivative Works; within the Source form or documentation, if provided along with the Derivative Works; or, within a display generated by the Derivative Works, if and wherever such third-party notices normally appear. The contents of the NOTICE file are for informational purposes only and do not modify the License. You may add Your own attribution notices within Derivative Works that You distribute, alongside or as an addendum to the NOTICE text from the Work, provided that such additional attribution notices cannot be construed as modifying the License.

You may add Your own copyright statement to Your modifications and may provide additional or different license terms and conditions for use, reproduction, or distribution of Your modifications, or for any such Derivative Works as a whole, provided Your use, reproduction, and distribution of the Work otherwise complies with the conditions stated in this License.

5. Submission of Contributions. Unless You explicitly state otherwise, any Contribution intentionally submitted for inclusion in the Work by You to the Licensor shall be under the terms and conditions of this License, without any additional terms or conditions.

Notwithstanding the above, nothing herein shall supersede or modify the terms of any separate license agreement you may have executed with Licensor regarding such Contributions.

6. Trademarks. This License does not grant permission to use the trade names, trademarks, service marks, or product names of the Licensor, except as required for reasonable and customary use in describing the origin of the Work and reproducing the content of the NOTICE file.
7. Disclaimer of Warranty. Unless required by applicable law or agreed to in writing, Licensor provides the Work (and each Contributor provides its Contributions) on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied, including, without limitation, any warranties or conditions of TITLE, NON-INFRINGEMENT, MERCHANTABILITY, or FITNESS FOR A PARTICULAR PURPOSE. You are solely responsible for determining the appropriateness of using or redistributing the Work and assume any risks associated with Your exercise of permissions under this License.
8. Limitation of Liability. In no event and under no legal theory, whether in tort (including negligence), contract, or otherwise, unless required by applicable law (such as deliberate and grossly negligent acts) or agreed to in writing, shall any Contributor be liable to You for damages, including any direct, indirect, special, incidental, or consequential damages of any character arising as a result of this License or out of the use or inability to use the Work (including but not limited to damages for loss of goodwill, work stoppage, computer failure or malfunction, or any and all other commercial damages or losses), even if such Contributor has been advised of the possibility of such damages.
9. Accepting Warranty or Additional Liability. While redistributing the Work or Derivative Works thereof, You may choose to offer, and charge a fee for, acceptance of support, warranty, indemnity, or other liability obligations and/or rights consistent with this License. However, in accepting such obligations, You may act only on Your own behalf and on Your sole responsibility, not on behalf of any other Contributor, and only if You agree to indemnify, defend, and hold each Contributor harmless for any liability incurred by, or claims asserted against, such Contributor by reason of your accepting any such warranty or additional liability.

END OF TERMS AND CONDITIONS

APPENDIX: How to apply the Apache License to your work.

To apply the Apache License to your work, attach the following boilerplate notice, with the fields enclosed by brackets "[]" replaced with your own identifying information. (Don't include the brackets!) The text should be enclosed in the appropriate comment syntax for the file format. We also recommend that a file or class name and description of purpose be included on the same "printed page" as the copyright notice for easier identification within third-party archives.

Copyright [yyyy] [name of copyright owner]

Licensed under the Apache License, Version 2.0 (the "License");
you may not use this file except in compliance with the License.
You may obtain a copy of the License at

<http://www.apache.org/licenses/LICENSE-2.0>

Unless required by applicable law or agreed to in writing, software distributed under the License is distributed on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.

---- LLVM Exceptions to the Apache 2.0 License ----

As an exception, if, as a result of your compiling your source code, portions of this Software are embedded into an Object form of such source code, you may redistribute such embedded portions in such Object form without complying with the conditions of Sections 4(a), 4(b) and 4(d) of the License.

In addition, if you combine or link compiled forms of this Software with software that is licensed under the GPLv2 ("Combined Software") and if a court of competent jurisdiction determines that the patent provision (Section 3), the indemnity provision (Section 9) or other Section of the License conflicts with the conditions of the GPLv2, you may retroactively and prospectively choose to deem waived or otherwise exclude such Section(s) of the License, but only in their entirety and only with respect to the Combined Software.

=====
Software from third parties included in the LLVM Project:
=====

The LLVM Project contains third party software which is under different license terms. All such code will be identified clearly using at least one of two mechanisms:

- 1) It will be in a separate directory tree with its own `LICENSE.txt` or `LICENSE` file at the top containing the specific license and restrictions which apply to that software, or
- 2) It will contain specific license and restriction terms at the top of every file.

=====
Legacy LLVM License (<https://llvm.org/docs/DeveloperPolicy.html#legacy>):
=====

The libcplusplus library is dual licensed under both the University of Illinois "BSD-Like" license and the MIT license. As a user of this code you may choose to use it under either license. As a contributor, you agree to allow your code to be used under both.

Full text of the relevant licenses is included below.

=====
University of Illinois/NCSA
Open Source License

Copyright (c) 2009-2019 by the contributors listed in CREDITS.TXT

All rights reserved.

Developed by:

LLVM Team

University of Illinois at Urbana-Champaign

<http://llvm.org>

Permission

is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal with the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

* Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimers.

* Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimers in the

documentation and/or other materials provided with the distribution.

* Neither the names of the LLVM Team, University of Illinois at Urbana-Champaign, nor the names of its contributors may be used to endorse or promote products derived from this Software without specific prior written permission.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE CONTRIBUTORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS WITH THE SOFTWARE.

Copyright (c) 2009-2014 by the contributors listed in CREDITS.TXT

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

```
add_lldb_library(lldbPluginObjectContainerBSDArchive PLUGIN
ObjectContainerBSDArchive.cpp
```

```
LINK_LIBS
```

```
  lldbCore
```

```
  lldbHost
```

```
  lldbSymbol
```

```
LINK_COMPONENTS
```

```
  Support
```

```
)
```

The LLVM Project is under the Apache License v2.0 with LLVM Exceptions:

Apache License
Version 2.0, January 2004
<http://www.apache.org/licenses/>

TERMS AND CONDITIONS FOR USE, REPRODUCTION, AND DISTRIBUTION

1. Definitions.

"License" shall mean the terms and conditions for use, reproduction, and distribution as defined by Sections 1 through 9 of this document.

"Licensor" shall mean the copyright owner or entity authorized by the copyright owner that is granting the License.

"Legal Entity" shall mean the union of the acting entity and all other entities that control, are controlled by, or are under common control with that entity. For the purposes of this definition, "control" means (i) the power, direct or indirect, to cause the direction or management of such entity, whether by contract or otherwise, or (ii) ownership of fifty percent (50%) or more of the outstanding shares, or (iii) beneficial ownership of such entity.

"You" (or "Your") shall mean an individual or Legal Entity exercising permissions granted by this License.

"Source" form shall mean the preferred form for making modifications, including but not limited to software source code, documentation source, and configuration files.

"Object" form shall mean any form resulting from mechanical transformation or translation of a Source form, including but not limited to compiled object code, generated documentation, and conversions to other media types.

"Work" shall mean the work of authorship, whether in Source or Object form, made available under the License, as indicated by a copyright notice that is included in or attached to the work (an example is provided in the Appendix below).

"Derivative Works" shall mean any work, whether in Source or Object form, that is based on (or derived from) the Work and for which the editorial revisions, annotations, elaborations, or other modifications

represent, as a whole, an original work of authorship. For the purposes of this License, Derivative Works shall not include works that remain separable from, or merely link (or bind by name) to the interfaces of, the Work and Derivative Works thereof.

"Contribution" shall mean any work of authorship, including the original version of the Work and any modifications or additions to that Work or Derivative Works thereof, that is intentionally submitted to Licensor for inclusion in the Work by the copyright owner or by an individual or Legal Entity authorized to submit on behalf of the copyright owner. For the purposes of this definition,

"submitted"

means any form of electronic, verbal, or written communication sent to the Licensor or its representatives, including but not limited to communication on electronic mailing lists, source code control systems, and issue tracking systems that are managed by, or on behalf of, the Licensor for the purpose of discussing and improving the Work, but excluding communication that is conspicuously marked or otherwise designated in writing by the copyright owner as "Not a Contribution."

"Contributor" shall mean Licensor and any individual or Legal Entity on behalf of whom a Contribution has been received by Licensor and subsequently incorporated within the Work.

2. Grant of Copyright License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable copyright license to reproduce, prepare Derivative Works of, publicly display, publicly perform, sublicense, and distribute the Work and such Derivative Works in Source or Object form.

3. Grant of Patent License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable (except as stated in this section) patent license to make, have made, use, offer to sell, sell, import, and otherwise transfer the Work, where such license applies only to those patent claims licensable by such Contributor that are necessarily infringed by their Contribution(s) alone or by combination of their Contribution(s) with the Work to which such Contribution(s) was submitted. If You institute patent litigation against any entity (including a cross-claim or counterclaim in a lawsuit) alleging that the Work or a Contribution incorporated within the Work constitutes direct or contributory patent infringement, then any patent licenses granted to You under this License for that Work shall terminate as of the date such litigation is filed.

4. Redistribution. You may reproduce and distribute copies of the Work or Derivative Works thereof in any medium, with or without modifications, and in Source or Object form, provided that You meet the following conditions:

- (a) You must give any other recipients of the Work or Derivative Works a copy of this License; and
- (b) You must cause any modified files to carry prominent notices stating that You changed the files; and
- (c) You must retain, in the Source form of any Derivative Works that You distribute, all copyright, patent, trademark, and attribution notices from the Source form of the Work, excluding those notices that do not pertain to any part of the Derivative Works; and

(d) If the Work includes a "NOTICE" text file as part of its distribution, then any Derivative Works that You distribute must include a readable copy of the attribution notices contained within such NOTICE file, excluding those notices that do not pertain to any part of the Derivative Works, in at least one of the following places: within a NOTICE text file distributed as part of the Derivative Works; within the Source form or documentation, if provided along with the Derivative Works; or, within a display generated by the Derivative Works, if and wherever such third-party notices normally appear. The contents of the NOTICE file are for informational purposes only and do not modify the License. You may add Your own attribution notices within Derivative Works that You distribute, alongside or as an addendum to the NOTICE text from the Work, provided that such additional attribution notices cannot be construed as modifying the License.

You may add Your own copyright statement to Your modifications and may provide additional or different license terms and conditions for use, reproduction, or distribution of Your modifications, or for any such Derivative Works as a whole, provided Your use, reproduction, and distribution of the Work otherwise complies with the conditions stated in this License.

5. Submission of Contributions. Unless You explicitly state otherwise, any Contribution intentionally submitted for inclusion in the Work by You to the Licensor shall be under the terms and conditions of this License, without any additional terms or conditions.

Notwithstanding the above, nothing herein shall supersede or modify

the terms of any separate license agreement you may have executed with Licensor regarding such Contributions.

6. Trademarks. This License does not grant permission to use the trade names, trademarks, service marks, or product names of the Licensor, except as required for reasonable and customary use in describing the origin of the Work and reproducing the content of the NOTICE file.

7. Disclaimer of Warranty. Unless required by applicable law or agreed to in writing, Licensor provides the Work (and each Contributor provides its Contributions) on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied, including, without limitation, any warranties or conditions of TITLE, NON-INFRINGEMENT, MERCHANTABILITY, or FITNESS FOR A PARTICULAR PURPOSE. You are solely responsible for determining the appropriateness of using or redistributing the Work and assume any risks associated with Your exercise of permissions under this License.

8. Limitation of Liability. In no event and under no legal theory, whether in tort (including negligence), contract, or otherwise, unless required by applicable law (such as deliberate and grossly negligent acts) or agreed to in writing, shall any Contributor be liable to You for damages, including any direct, indirect, special, incidental, or consequential damages of any character arising as a result of this License or out of the use or inability to use the Work (including but not limited to damages for loss of goodwill, work stoppage, computer failure or malfunction, or any and all other commercial damages or losses), even if such Contributor has been advised of the possibility of such damages.

9. Accepting Warranty or Additional Liability. While redistributing the Work or Derivative Works thereof, You may choose to offer, and charge a fee for, acceptance of support, warranty, indemnity, or other liability obligations and/or rights consistent with this License. However, in accepting such obligations, You may act only on Your own behalf and on Your sole responsibility, not on behalf of any other Contributor, and only if You agree to indemnify, defend, and hold each Contributor harmless for any liability incurred by, or claims asserted against, such Contributor by reason of your accepting any such warranty or additional liability.

END OF TERMS AND CONDITIONS

APPENDIX: How to apply the Apache License to your work.

To apply the Apache License to your work, attach the following boilerplate notice, with the fields enclosed by brackets "[]" replaced with your own identifying information. (Don't include the brackets!) The text should be enclosed in the appropriate comment syntax for the file format. We also recommend that a file or class name and description of purpose be included on the same "printed page" as the copyright notice for easier identification within third-party archives.

Copyright [yyyy] [name of copyright owner]

Licensed under the Apache License, Version 2.0 (the "License");
you may not use this file except in compliance with the License.
You may obtain a copy of the License at

<http://www.apache.org/licenses/LICENSE-2.0>

Unless required by applicable law or agreed to in writing, software distributed under the License is distributed on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.

---- LLVM Exceptions to the Apache 2.0 License ----

As an exception, if, as a result of your compiling your source code, portions of this Software are embedded into an Object form of such source code, you may redistribute such embedded portions in such Object form without complying with the conditions of Sections 4(a), 4(b) and 4(d) of the License.

In addition, if you combine or link compiled forms of this Software with software that is licensed under the GPLv2 ("Combined Software") and if a court of competent jurisdiction determines that the patent provision (Section 3), the indemnity provision (Section 9) or other Section of the License conflicts with the conditions of the GPLv2, you may retroactively and prospectively choose to deem waived or otherwise exclude such Section(s) of the License, but only in their entirety and only with respect to the Combined Software.

=====
Software from third parties included in the LLVM Project:
=====

The LLVM Project contains third party software which is under different license terms. All such code will be identified clearly using at least one of two mechanisms:

1) It will be in a separate directory tree with its own `LICENSE.txt` or

`LICENSE` file at the top containing the specific license and restrictions which apply to that software, or
2) It will contain specific license and restriction terms at the top of every file.

Legacy LLVM License (<https://llvm.org/docs/DeveloperPolicy.html#legacy>):

University of Illinois/NCSA
Open Source License

Copyright (c) 2007-2019 University of Illinois at Urbana-Champaign.
All rights reserved.

Developed by:

LLVM Team

University of Illinois at Urbana-Champaign

<http://llvm.org>

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal with the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do

so, subject to the following conditions:

- * Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimers.
- * Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimers in the documentation and/or other materials provided with the distribution.
- * Neither the names of the LLVM Team, University of Illinois at Urbana-Champaign, nor the names of its contributors may be used to endorse or promote products derived from this Software without specific prior written permission.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE CONTRIBUTORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION

OF CONTRACT, TORT OR OTHERWISE, ARISING FROM,
OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS WITH THE
SOFTWARE.

LLVM System Interface Library

Part of the LLVM Project, under the Apache License v2.0 with LLVM Exceptions.

See <https://llvm.org/LICENSE.txt> for license information.

SPDX-License-Identifier: Apache-2.0 WITH LLVM-exception

=====
The LLVM Project is under the Apache License v2.0 with LLVM Exceptions:
=====

Apache License
Version 2.0, January 2004
<http://www.apache.org/licenses/>

TERMS AND CONDITIONS FOR USE, REPRODUCTION, AND DISTRIBUTION

1. Definitions.

"License" shall mean the terms and conditions for use, reproduction,
and distribution as defined by Sections 1 through 9 of this document.

"Licensor" shall mean the copyright owner or entity authorized by
the copyright owner that is granting the License.

"Legal Entity" shall mean the union of the acting entity and all
other entities that control, are controlled by, or are under common
control with that entity. For the purposes of this definition,
"control" means (i) the
power, direct or indirect, to cause the
direction or management of such entity, whether by contract or
otherwise, or (ii) ownership of fifty percent (50%) or more of the
outstanding shares, or (iii) beneficial ownership of such entity.

"You" (or "Your") shall mean an individual or Legal Entity
exercising permissions granted by this License.

"Source" form shall mean the preferred form for making modifications,
including but not limited to software source code, documentation
source, and configuration files.

"Object" form shall mean any form resulting from mechanical
transformation or translation of a Source form, including but
not limited to compiled object code, generated documentation,
and conversions to other media types.

"Work" shall mean the work of authorship, whether in Source or Object form, made available under the License, as indicated by a copyright notice that is included in or attached to the work (an example is provided in the Appendix below).

"Derivative Works" shall mean any work, whether in Source or Object form, that is based on (or derived from) the Work and for which the editorial revisions, annotations, elaborations, or other modifications represent, as a whole, an original work of authorship. For the purposes of this License, Derivative Works shall not include works that remain separable from, or merely link (or bind by name) to the interfaces of, the Work and Derivative Works thereof.

"Contribution" shall mean any work of authorship, including the original version of the Work and any modifications or additions to that Work or Derivative Works thereof, that is intentionally submitted to Licensor for inclusion in the Work by the copyright owner or by an individual or Legal Entity authorized to submit on behalf of the copyright owner. For the purposes of this definition, "submitted"

means any form of electronic, verbal, or written communication sent to the Licensor or its representatives, including but not limited to communication on electronic mailing lists, source code control systems, and issue tracking systems that are managed by, or on behalf of, the Licensor for the purpose of discussing and improving the Work, but excluding communication that is conspicuously marked or otherwise designated in writing by the copyright owner as "Not a Contribution."

"Contributor" shall mean Licensor and any individual or Legal Entity on behalf of whom a Contribution has been received by Licensor and subsequently incorporated within the Work.

2. Grant of Copyright License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable copyright license to reproduce, prepare Derivative Works of, publicly display, publicly perform, sublicense, and distribute the Work and such Derivative Works in Source or Object form.

3. Grant of Patent License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable (except as stated in this section) patent license to make, have made, use, offer to sell, sell, import, and otherwise transfer the Work, where such license applies only to those patent claims licensable by such Contributor that are necessarily infringed by their

Contribution(s) alone or by combination of their Contribution(s) with the Work to which such Contribution(s) was submitted. If You institute patent litigation against any entity (including a cross-claim or counterclaim in a lawsuit) alleging that the Work or a Contribution incorporated within the Work constitutes direct or contributory patent infringement, then any patent licenses granted to You under this License for that Work shall terminate as of the date such litigation is filed.

4. Redistribution. You may reproduce and distribute copies of the Work or Derivative Works thereof in any medium, with or without modifications, and in Source or Object form, provided that You meet the following conditions:

(a) You must give any other recipients of the Work or Derivative Works a copy of this License; and

(b) You must cause any modified files to carry prominent notices stating that You changed the files; and

(c) You must retain, in the Source form of any Derivative Works that You distribute, all copyright, patent, trademark, and attribution notices from the Source form of the Work, excluding those notices that do not pertain to any part of the Derivative Works; and

(d) If the Work includes a "NOTICE" text file as part of its distribution, then any Derivative Works that You distribute must include a readable copy of the attribution notices contained within such NOTICE file, excluding those notices that do not pertain to any part of the Derivative Works, in at least one of the following places: within a NOTICE text file distributed as part of the Derivative Works; within the Source form or documentation, if provided along with the Derivative Works; or, within a display generated by the Derivative Works, if and wherever such third-party notices normally appear. The contents of the NOTICE file are for informational purposes only and do not modify the License. You may add Your own attribution notices within Derivative Works that You distribute, alongside or as an addendum to the NOTICE text from the Work, provided that such additional attribution notices cannot be construed as modifying the License.

You may add Your own copyright statement to Your modifications and may provide additional or different license terms and conditions for use, reproduction, or distribution of Your modifications, or

for any such Derivative Works as a whole, provided Your use, reproduction, and distribution of the Work otherwise complies with the conditions stated in this License.

5. Submission of Contributions. Unless You explicitly state otherwise, any Contribution intentionally submitted for inclusion in the Work by You to the Licensor shall be under the terms and conditions of this License, without any additional terms or conditions.

Notwithstanding the above, nothing herein shall supersede or modify the terms of any separate license agreement you may have executed with Licensor regarding such Contributions.

6. Trademarks. This License

does not grant permission to use the trade

names, trademarks, service marks, or product names of the Licensor, except as required for reasonable and customary use in describing the origin of the Work and reproducing the content of the NOTICE file.

7. Disclaimer of Warranty. Unless required by applicable law or agreed to in writing, Licensor provides the Work (and each Contributor provides its Contributions) on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied, including, without limitation, any warranties or conditions of TITLE, NON-INFRINGEMENT, MERCHANTABILITY, or FITNESS FOR A PARTICULAR PURPOSE. You are solely responsible for determining the appropriateness of using or redistributing the Work and assume any risks associated with Your exercise of permissions under this License.

8. Limitation of Liability. In no event and under no legal theory, whether in tort (including negligence), contract, or otherwise,

unless required by applicable law (such as deliberate and grossly negligent acts) or agreed to in writing, shall any Contributor be liable to You for damages, including any direct, indirect, special, incidental, or consequential damages of any character arising as a result of this License or out of the use or inability to use the Work (including but not limited to damages for loss of goodwill, work stoppage, computer failure or malfunction, or any and all other commercial damages or losses), even if such Contributor has been advised of the possibility of such damages.

9. Accepting Warranty or Additional Liability. While redistributing the Work or Derivative Works thereof, You may choose to offer, and charge a fee for, acceptance of support, warranty, indemnity, or other liability obligations and/or rights consistent with this License. However, in accepting such obligations, You may act only

on Your own behalf and on Your sole responsibility, not on behalf

of any other Contributor, and only if You agree to indemnify, defend, and hold each Contributor harmless for any liability incurred by, or claims asserted against, such Contributor by reason of your accepting any such warranty or additional liability.

END OF TERMS AND CONDITIONS

APPENDIX: How to apply the Apache License to your work.

To apply the Apache License to your work, attach the following boilerplate notice, with the fields enclosed by brackets "[]" replaced with your own identifying information. (Don't include the brackets!) The text should be enclosed in the appropriate comment syntax for the file format. We also recommend that a file or class name and description of purpose be included on the same "printed page" as the copyright notice for easier identification within third-party archives.

Copyright [yyyy] [name of copyright owner]

Licensed under the Apache License, Version 2.0 (the "License");
you may not use this file except in compliance with the License.
You may obtain a copy of the License at

<http://www.apache.org/licenses/LICENSE-2.0>

Unless required by applicable law or agreed to in writing, software distributed under the License is distributed on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.

---- LLVM Exceptions to the Apache 2.0 License ----

As an exception, if, as a result of your compiling your source code, portions of this Software are embedded into an Object form of such source code, you may redistribute such embedded portions in such Object form without complying with the conditions of Sections 4(a), 4(b) and 4(d) of the License.

In addition, if you combine or link compiled forms of this Software with software that is licensed under the GPLv2 ("Combined Software") and if a court of competent jurisdiction determines that the patent provision (Section 3), the indemnity provision (Section 9) or other Section of the License conflicts with the conditions of the GPLv2, you may retroactively and prospectively choose to deem waived or otherwise exclude such Section(s) of the License, but only in their entirety and only with respect to the Combined

Software.

Software from third parties included in the LLVM Project:

The LLVM Project contains third party software which is under different license terms. All such code will be identified clearly using at least one of two mechanisms:

- 1) It will be in a separate directory tree with its own `LICENSE.txt` or `LICENSE` file at the top containing the specific license and restrictions which apply to that software, or
- 2) It will contain specific license and restriction terms at the top of every file.

Legacy LLVM License (<https://llvm.org/docs/DeveloperPolicy.html#legacy>):

University of Illinois/NCSA
Open Source License

Copyright (c) 2011-2019 by the contributors listed in CREDITS.TXT
All rights reserved.

Developed by:

LLVM Team

University of Illinois at Urbana-Champaign

<http://llvm.org>

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal with the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do

so, subject to the following conditions:

- * Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimers.
- * Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimers in the documentation and/or other materials provided with the distribution.
- * Neither the names of the LLVM Team, University of Illinois at

Urbana-Champaign, nor the names of its contributors may be used to endorse or promote products derived from this Software without specific prior written permission.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE CONTRIBUTORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS WITH THE SOFTWARE.

=====

The LLVM Project is under the Apache License v2.0 with LLVM Exceptions:

=====

Apache License
Version 2.0, January 2004
<http://www.apache.org/licenses/>

TERMS AND CONDITIONS FOR USE, REPRODUCTION, AND DISTRIBUTION

1. Definitions.

"License" shall mean the terms and conditions for use, reproduction, and distribution as defined by Sections 1 through 9 of this document.

"Licensor" shall mean the copyright owner or entity authorized by the copyright owner that is granting the License.

"Legal Entity" shall mean the union of the acting entity and all other entities that control, are controlled by, or are under common control with that entity. For the purposes of this definition, "control" means (i) the power, direct or indirect, to cause the direction or management of such entity, whether by contract or otherwise, or (ii) ownership of fifty percent (50%) or more of the outstanding shares, or (iii) beneficial ownership of such entity.

"You" (or "Your") shall mean an individual or Legal Entity exercising permissions granted by this License.

"Source" form shall mean the preferred form for making modifications, including but not limited to software source code, documentation source, and configuration files.

"Object" form shall mean any form resulting from mechanical transformation or translation of a Source form, including but

not limited to compiled object code, generated documentation, and conversions to other media types.

"Work" shall mean the work of authorship, whether in Source or Object form, made available under the License, as indicated by a copyright notice that is included in or attached to the work (an example is provided in the Appendix below).

"Derivative Works" shall mean any work, whether in Source or Object form, that is based on (or derived from) the Work and for which the editorial revisions, annotations, elaborations, or other modifications represent, as a whole, an original work of authorship. For the purposes of this License, Derivative Works shall not include works that remain separable from, or merely link (or bind by name) to the interfaces of, the Work and Derivative Works thereof.

"Contribution" shall mean any work of authorship, including the original version of the Work and any modifications or additions to that Work or Derivative Works thereof, that is intentionally submitted to Licensor for inclusion in the Work by the copyright owner or by an individual or Legal Entity authorized to submit on behalf of the copyright owner. For the purposes of this definition, "submitted"

means any form of electronic, verbal, or written communication sent to the Licensor or its representatives, including but not limited to communication on electronic mailing lists, source code control systems, and issue tracking systems that are managed by, or on behalf of, the Licensor for the purpose of discussing and improving the Work, but excluding communication that is conspicuously marked or otherwise designated in writing by the copyright owner as "Not a Contribution."

"Contributor" shall mean Licensor and any individual or Legal Entity on behalf of whom a Contribution has been received by Licensor and subsequently incorporated within the Work.

2. Grant of Copyright License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable copyright license to reproduce, prepare Derivative Works of, publicly display, publicly perform, sublicense, and distribute the Work and such Derivative Works in Source or Object form.

3. Grant of Patent License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable (except as stated in this section) patent license to make, have made,

use, offer to sell, sell, import, and otherwise transfer the Work, where such license applies only to those patent claims licensable by such Contributor that are necessarily infringed by their Contribution(s) alone or by combination of their Contribution(s) with the Work to which such Contribution(s) was submitted. If You institute patent litigation against any entity (including a cross-claim or counterclaim in a lawsuit) alleging that the Work or a Contribution incorporated within the Work constitutes direct or contributory patent infringement, then any patent licenses granted to You under this License for that Work shall terminate as of the date such litigation is filed.

4. Redistribution. You may reproduce and distribute copies of the Work or Derivative Works thereof in any medium, with or without modifications, and in Source or Object form, provided that You meet the following conditions:

- (a) You must give any other recipients of the Work or Derivative Works a copy of this License; and
- (b) You must cause any modified files to carry prominent notices stating that You changed the files; and
- (c) You must retain, in the Source form of any Derivative Works that You distribute, all copyright, patent, trademark, and attribution notices from the Source form of the Work, excluding those notices that do not pertain to any part of the Derivative Works; and

(d) If the Work includes a "NOTICE" text file as part of its distribution, then any Derivative Works that You distribute must include a readable copy of the attribution notices contained within such NOTICE file, excluding those notices that do not pertain to any part of the Derivative Works, in at least one of the following places: within a NOTICE text file distributed as part of the Derivative Works; within the Source form or documentation, if provided along with the Derivative Works; or, within a display generated by the Derivative Works, if and wherever such third-party notices normally appear. The contents of the NOTICE file are for informational purposes only and do not modify the License. You may add Your own attribution notices within Derivative Works that You distribute, alongside or as an addendum to the NOTICE text from the Work, provided that such additional attribution notices cannot be construed as modifying the License.

You may add Your own copyright statement to Your modifications and may provide additional or different license terms and conditions for use, reproduction, or distribution of Your modifications, or for any such Derivative Works as a whole, provided Your use, reproduction, and distribution of the Work otherwise complies with the conditions stated in this License.

5. Submission of Contributions. Unless You explicitly state otherwise, any Contribution intentionally submitted for inclusion in the Work by You to the Licensor shall be under the terms and conditions of this License, without any additional terms or conditions.

Notwithstanding the above, nothing herein shall supersede or modify the terms of any separate license agreement you may have executed with Licensor regarding such Contributions.

6. Trademarks. This License does not grant permission to use the trade names, trademarks, service marks, or product names of the Licensor, except as required for reasonable and customary use in describing the origin of the Work and reproducing the content of the NOTICE file.

7. Disclaimer of Warranty. Unless required by applicable law or agreed to in writing, Licensor provides the Work (and each Contributor provides its Contributions) on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied, including, without limitation, any warranties or conditions of TITLE, NON-INFRINGEMENT, MERCHANTABILITY, or FITNESS FOR A PARTICULAR PURPOSE. You are solely responsible for determining the appropriateness of using or redistributing the Work and assume any risks associated with Your exercise of permissions under this License.

8. Limitation of Liability. In no event and under no legal theory, whether in tort (including negligence), contract, or otherwise, unless required by applicable law (such as deliberate and grossly negligent acts) or agreed to in writing, shall any Contributor be liable to You for damages, including any direct, indirect, special, incidental, or consequential damages of any character arising as a result of this License or out of the use or inability to use the Work (including but not limited to damages for loss of goodwill, work stoppage, computer failure or malfunction, or any and all other commercial damages or losses), even if such Contributor has been advised of the possibility of such damages.

9. Accepting Warranty or Additional Liability. While redistributing the Work or Derivative Works thereof, You may choose to offer, and charge a fee for, acceptance of support, warranty, indemnity, or other liability obligations and/or rights consistent with this

License. However, in accepting such obligations, You may act only on Your own behalf and on Your sole responsibility, not on behalf of any other Contributor, and only if You agree to indemnify, defend, and hold each Contributor harmless for any liability incurred by, or claims asserted against, such Contributor by reason of your accepting any such warranty or additional liability.

END OF TERMS AND CONDITIONS

APPENDIX: How to apply the Apache License to your work.

To apply the Apache License to your work, attach the following boilerplate notice, with the fields enclosed by brackets "[]" replaced with your own identifying information. (Don't include the brackets!) The text should be enclosed in the appropriate comment syntax for the file format. We also recommend that a file or class name and description of purpose be included on the same "printed page" as the copyright notice for easier identification within third-party archives.

Copyright [yyyy] [name of copyright owner]

Licensed under the Apache License, Version 2.0 (the "License"); you may not use this file except in compliance with the License. You may obtain a copy of the License at

<http://www.apache.org/licenses/LICENSE-2.0>

Unless required by applicable law or agreed to in writing, software distributed under the License is distributed on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.

---- LLVM Exceptions to the Apache 2.0 License ----

As an exception, if, as a result of your compiling your source code, portions of this Software are embedded into an Object form of such source code, you may redistribute such embedded portions in such Object form without complying with the conditions of Sections 4(a), 4(b) and 4(d) of the License.

In addition, if you combine or link compiled forms of this Software with software that is licensed under the GPLv2 ("Combined Software") and if a court of competent jurisdiction determines that the patent provision (Section 3), the indemnity provision (Section 9) or other Section of the License

conflicts with the conditions of the GPLv2, you may retroactively and prospectively choose to deem waived or otherwise exclude such Section(s) of the License, but only in their entirety and only with respect to the Combined Software.

Software from third parties included in the LLVM Project:

The LLVM Project contains third party software which is under different license terms. All such code will be identified clearly using at least one of two mechanisms:

- 1) It will be in a separate directory tree with its own `LICENSE.txt` or `LICENSE` file at the top containing the specific license and restrictions which apply to that software, or
- 2) It will contain specific license and restriction terms at the top of every file.

Legacy LLVM License (<https://llvm.org/docs/DeveloperPolicy.html#legacy>):

The software contained in this directory tree is dual licensed under both the University of Illinois "BSD-Like" license and the MIT license. As a user of this code you may choose to use it under either license. As a contributor, you agree to allow your code to be used under both. The full text of the relevant licenses is included below.

In addition, a license agreement from the copyright/patent holders of the software contained in this directory tree is included below.

University of Illinois/NCSA
Open Source License

Copyright
(c) 1997-2019 Intel Corporation

All rights reserved.

Developed by:
OpenMP Runtime Team
Intel Corporation
<http://www.openmp.rtl.org>

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal with

the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

* Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimers.

* Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimers in the documentation and/or other materials provided with the distribution.

* Neither the names of Intel Corporation OpenMP Runtime Team nor the names of its contributors may be used to endorse or promote products derived from this Software without specific prior written permission.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE CONTRIBUTORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS WITH THE SOFTWARE.

=====
Copyright (c) 1997-2019 Intel Corporation

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

Intel Corporation

Software Grant License Agreement ("Agreement")

Except for the license granted herein to you, Intel Corporation ("Intel") reserves all right, title, and interest in and to the Software (defined below).

Definition

"Software" means the code and documentation as well as any original work of authorship, including any modifications or additions to an existing work, that is intentionally submitted by Intel to llvm.org ("LLVM") for inclusion in, or documentation of, any of the products owned or managed by LLVM (the "Work"). For the purposes of this definition, "submitted" means any form of electronic, verbal, or written communication sent to LLVM or its representatives, including but not limited to communication on electronic mailing lists, source code control systems, and issue tracking systems that are managed by, or on behalf of, LLVM for the purpose of discussing and improving the Work, but excluding communication that is conspicuously marked otherwise.

1. Grant of Copyright License. Subject to the terms and conditions of this Agreement, Intel hereby grants to you and to recipients of the Software distributed by LLVM a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable copyright license to reproduce, prepare derivative works of, publicly display, publicly perform, sublicense, and distribute the Software and such derivative works.
2. Grant of Patent License. Subject to the terms and conditions of this Agreement, Intel hereby grants you and to recipients of the Software distributed by LLVM a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable (except as stated in this section) patent license to make, have made, use, offer to sell, sell, import, and otherwise transfer the Work, where such license applies only to those patent claims licensable by Intel that are necessarily infringed by Intel's Software alone or by combination of the Software with the Work to which such Software was submitted. If any entity institutes patent litigation against Intel or any other entity (including a cross-claim or counterclaim in a lawsuit) alleging that Intel's Software, or the Work to which Intel has contributed constitutes direct or contributory patent infringement, then any patent licenses granted to that entity under this Agreement for the Software or Work shall terminate as of the date such litigation is filed.

Unless required by applicable law or agreed to in writing, the software is

provided on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied, including, without limitation, any warranties or conditions of TITLE, NON-INFRINGEMENT, MERCHANTABILITY, or FITNESS FOR A PARTICULAR PURPOSE.

=====
Apache License
Version 2.0, January 2004
<http://www.apache.org/licenses/>

TERMS AND CONDITIONS FOR USE, REPRODUCTION, AND DISTRIBUTION

1. Definitions.

"License" shall mean the terms and conditions for use, reproduction, and distribution as defined by Sections 1 through 9 of this document.

"Licensor" shall mean the copyright owner or entity authorized by the copyright owner that is granting the License.

"Legal Entity" shall mean the union of the acting entity and all other entities that control, are controlled by, or are under common control with that entity. For the purposes of this definition, "control" means (i) the power, direct or indirect, to cause the direction or management of such entity, whether by contract or otherwise, or (ii) ownership of fifty percent (50%) or more of the outstanding shares, or (iii) beneficial ownership of such entity.

"You" (or "Your") shall mean an individual or Legal Entity exercising permissions granted by this License.

"Source" form shall mean the preferred form for making modifications, including but not limited to software source code, documentation source, and configuration files.

"Object" form shall mean any form resulting from mechanical transformation or translation of a Source form, including but not limited to compiled object code, generated documentation, and conversions to other media types.

"Work" shall mean the work of authorship, whether in Source or Object form, made available under the License, as indicated by a copyright notice that is included in or attached to the work (an example is provided in the Appendix below).

"Derivative Works" shall mean any work, whether in Source or Object

form, that is based on (or derived from) the Work and for which the editorial revisions, annotations, elaborations, or other modifications represent, as a whole, an original work of authorship. For the purposes of this License, Derivative Works shall not include works that remain separable from, or merely link (or bind by name) to the interfaces of, the Work and Derivative Works thereof.

"Contribution" shall mean any work of authorship, including the original version of the Work and any modifications or additions to that Work or Derivative Works thereof, that is intentionally submitted to Licensor for inclusion in the Work by the copyright owner or by an individual or Legal Entity authorized to submit on behalf of the copyright owner. For the purposes of this definition, "submitted" means any form of electronic, verbal, or written communication sent to the Licensor or its representatives, including but not limited to communication on electronic mailing lists, source code control systems, and issue tracking systems that are managed by, or on behalf of, the Licensor for the purpose of discussing and improving the Work, but excluding communication that is conspicuously marked or otherwise designated in writing by the copyright owner as "Not a Contribution."

"Contributor" shall mean Licensor and any individual or Legal Entity on behalf of whom a Contribution has been received by Licensor and subsequently incorporated within the Work.

2. Grant of Copyright License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable copyright license to reproduce, prepare Derivative Works of, publicly display, publicly perform, sublicense, and distribute the Work and such Derivative Works in Source or Object form.

3. Grant of Patent License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable (except as stated in this section) patent license to make, have made, use, offer to sell, sell, import, and otherwise transfer the Work, where such license applies only to those patent claims licensable by such Contributor that are necessarily infringed by their Contribution(s) alone or by combination of their Contribution(s) with the Work to which such Contribution(s) was submitted. If You institute patent litigation against any entity (including a cross-claim or counterclaim in a lawsuit) alleging that the Work or a Contribution incorporated within the Work constitutes direct or contributory patent infringement, then any patent licenses granted to You under this License for that Work shall terminate

as of the date such litigation is filed.

4. Redistribution. You may reproduce and distribute copies of the

Work or Derivative Works thereof in any medium, with or without modifications, and in Source or Object form, provided that You meet the following conditions:

(a) You must give any other recipients of the Work or Derivative Works a copy of this License; and

(b) You must cause any modified files to carry prominent notices stating that You changed the files; and

(c) You must retain, in the Source form of any Derivative Works that You distribute, all copyright, patent, trademark, and attribution notices from the Source form of the Work, excluding those notices that do not pertain to any part of the Derivative Works; and

(d) If the Work includes a "NOTICE" text file as part of its distribution, then any Derivative Works that You distribute must include a readable copy of the attribution notices contained within such NOTICE file, excluding those notices that do not pertain to any part of the Derivative Works, in at least one of the following places: within a NOTICE text file distributed as part of the Derivative Works; within the Source form or documentation, if provided along with the Derivative Works; or, within a display generated by the Derivative Works, if and wherever such third-party notices normally appear. The contents of the NOTICE file are for informational purposes only and do not modify the License. You may add Your own attribution notices within Derivative Works that You distribute, alongside or as an addendum to the NOTICE text from the Work, provided that such additional attribution notices cannot be construed as modifying the License.

You may add Your own copyright statement to Your modifications and may provide additional or different license terms and conditions

for use, reproduction, or distribution of Your modifications, or for any such Derivative Works as a whole, provided Your use, reproduction, and distribution of the Work otherwise complies with the conditions stated in this License.

5. Submission of Contributions. Unless You explicitly state otherwise, any Contribution intentionally submitted for inclusion in the Work

by You to the Licensor shall be under the terms and conditions of this License, without any additional terms or conditions.

Notwithstanding the above, nothing herein shall supersede or modify the terms of any separate license agreement you may have executed with Licensor regarding such Contributions.

6. Trademarks. This License does not grant permission to use the trade names, trademarks, service marks, or product names of the Licensor, except as required for reasonable and customary use in describing the origin of the Work and reproducing the content of the NOTICE file.
7. Disclaimer of Warranty. Unless required by applicable law or agreed to in writing, Licensor provides the Work (and each Contributor provides its Contributions) on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied, including, without limitation, any warranties or conditions of TITLE, NON-INFRINGEMENT, MERCHANTABILITY, or FITNESS FOR A PARTICULAR PURPOSE. You are solely responsible for determining the appropriateness of using or redistributing the Work and assume any risks associated with Your exercise of permissions under this License.
8. Limitation of Liability. In no event and under no legal theory, whether in tort (including negligence), contract, or otherwise, unless required by applicable law (such as deliberate and grossly negligent acts) or agreed to in writing, shall any Contributor be liable to You for damages, including any direct, indirect, special, incidental, or consequential damages of any character arising as a result of this License or out of the use or inability to use the Work (including but not limited to damages for loss of goodwill, work stoppage, computer failure or malfunction, or any and all other commercial damages or losses), even if such Contributor has been advised of the possibility of such damages.
9. Accepting Warranty or Additional Liability. While redistributing the Work or Derivative Works thereof, You may choose to offer, and charge a fee for, acceptance of support, warranty, indemnity, or other liability obligations and/or rights consistent with this License. However, in accepting such obligations, You may act only on Your own behalf and on Your sole responsibility, not on behalf of any other Contributor, and only if You agree to indemnify, defend, and hold each Contributor harmless for any liability incurred by, or claims asserted against, such Contributor by reason of your accepting any such warranty or additional liability.

END OF TERMS AND CONDITIONS

APPENDIX: How to apply the Apache License to your work.

To apply the Apache License to your work, attach the following boilerplate notice, with the fields enclosed by brackets "[]" replaced with your own identifying information. (Don't include the brackets!) The text should be enclosed in the appropriate comment syntax for the file format. We also recommend that a file or class name and description of purpose be included on the same "printed page" as the copyright notice for easier identification within third-party archives.

Copyright [yyyy] [name of copyright owner]

Licensed under the Apache License, Version 2.0 (the "License");
you may not use this file except in compliance with the License.
You may obtain a copy of the License at

<http://www.apache.org/licenses/LICENSE-2.0>

Unless required by applicable law or agreed to in writing, software distributed under the License is distributed on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.

=====
The LLVM Project is under the Apache License v2.0 with LLVM Exceptions:
=====

Apache License
Version 2.0, January 2004
<http://www.apache.org/licenses/>

TERMS AND CONDITIONS FOR USE, REPRODUCTION, AND DISTRIBUTION

1. Definitions.

"License" shall mean the terms and conditions for use, reproduction, and distribution as defined by Sections 1 through 9 of this document.

"Licensor" shall mean the copyright owner or entity authorized by the copyright owner that is granting the License.

"Legal Entity" shall mean the union of the acting entity and all other entities that control, are controlled by, or are under common control with that entity. For the purposes of this definition, "control" means (i) the power, direct or indirect, to cause the direction or management of such entity, whether by contract or

otherwise, or (ii) ownership of fifty percent (50%) or more of the outstanding shares, or (iii) beneficial ownership of such entity.

"You" (or "Your") shall mean an individual or Legal Entity exercising permissions granted by this License.

"Source" form shall mean the preferred form for making modifications, including but not limited to software source code, documentation source, and configuration files.

"Object" form shall mean any form resulting from mechanical transformation or translation of a Source form, including but not limited to compiled object code, generated documentation, and conversions to other media types.

"Work" shall mean the work of authorship, whether in Source or Object form, made available under the License, as indicated by a copyright notice that is included in or attached to the work (an example is provided in the Appendix below).

"Derivative Works" shall mean any work, whether in Source or Object form, that is based on (or derived from) the Work and for which the editorial revisions, annotations, elaborations, or other modifications represent, as a whole, an original work of authorship. For the purposes of this License, Derivative Works shall not include works that remain separable from, or merely link (or bind by name) to the interfaces of, the Work and Derivative Works thereof.

"Contribution" shall mean any work of authorship, including the original version of the Work and any modifications or additions to that Work or Derivative Works thereof, that is intentionally submitted to Licensor for inclusion in the Work by the copyright owner or by an individual or Legal Entity authorized to submit on behalf of the copyright owner. For the purposes of this definition, "submitted"

means any form of electronic, verbal, or written communication sent to the Licensor or its representatives, including but not limited to communication on electronic mailing lists, source code control systems, and issue tracking systems that are managed by, or on behalf of, the Licensor for the purpose of discussing and improving the Work, but excluding communication that is conspicuously marked or otherwise designated in writing by the copyright owner as "Not a Contribution."

"Contributor" shall mean Licensor and any individual or Legal Entity on behalf of whom a Contribution has been received by Licensor and subsequently incorporated within the Work.

2. Grant of Copyright License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable copyright license to reproduce, prepare Derivative

Works of,

publicly display, publicly perform, sublicense, and distribute the Work and such Derivative Works in Source or Object form.

3. Grant of Patent License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable (except as stated in this section) patent license to make, have made, use, offer to sell, sell, import, and otherwise transfer the Work, where such license applies only to those patent claims licensable by such Contributor that are necessarily infringed by their Contribution(s) alone or by combination of their Contribution(s) with the Work to which such Contribution(s) was submitted. If You institute patent litigation against any entity (including a cross-claim or counterclaim in a lawsuit) alleging that the Work or a Contribution incorporated within the Work constitutes direct or contributory patent infringement, then any patent licenses granted to You under this License for that Work shall terminate as of the date such litigation is filed.

4. Redistribution. You may reproduce and distribute copies of the Work or Derivative Works thereof in any medium, with or without modifications, and in Source or Object form, provided that You meet the following conditions:

(a) You must give any other recipients of the Work or Derivative Works a copy of this License; and

(b) You must cause any modified files to carry prominent notices stating that You changed the files; and

(c) You must retain, in the Source form of any Derivative Works that You distribute, all copyright, patent, trademark, and attribution notices from the Source form of the Work, excluding those notices that do not pertain to any part of the Derivative Works; and

(d) If the Work includes a "NOTICE" text file as part of its distribution, then any Derivative Works that You distribute must include a readable copy of the attribution notices contained within such NOTICE file, excluding those notices that do not pertain to any part of the Derivative Works, in at least one of the following places: within a NOTICE text file distributed

as part of the Derivative Works; within the Source form or documentation, if provided along with the Derivative Works; or, within a display generated by the Derivative Works, if and wherever such third-party notices normally appear. The contents of the NOTICE file are for informational purposes only and do not modify the License. You may add Your own attribution notices within Derivative Works that You distribute, alongside or as an addendum to the NOTICE text from the Work, provided that such additional attribution notices cannot be construed as modifying the License.

You may add Your own copyright statement to Your modifications and may provide additional or different license terms and conditions for use, reproduction, or distribution of Your modifications, or for any such Derivative Works as a whole, provided Your use, reproduction, and distribution of the Work otherwise complies with the conditions stated in this License.

5. Submission of Contributions. Unless You explicitly state otherwise, any Contribution intentionally submitted for inclusion in the Work by You to the Licensor shall be under the terms and conditions of this License, without any additional terms or conditions. Notwithstanding the above, nothing herein shall supersede or modify the terms of any separate license agreement you may have executed with Licensor regarding such Contributions.

6. Trademarks. This License does not grant permission to use the trade names, trademarks, service marks, or product names of the Licensor, except as required for reasonable and customary use in describing the origin of the Work and reproducing the content of the NOTICE file.

7. Disclaimer of Warranty. Unless required by applicable law or agreed to in writing, Licensor provides the Work (and each Contributor provides its Contributions) on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied, including, without limitation, any warranties or conditions of TITLE, NON-INFRINGEMENT, MERCHANTABILITY, or FITNESS FOR A PARTICULAR PURPOSE. You are solely responsible for determining the appropriateness of using or redistributing the Work and assume any risks associated with Your exercise of permissions under this License.

8. Limitation of Liability. In no event and under no legal theory, whether in tort (including negligence), contract, or otherwise, unless required by applicable law (such as deliberate and grossly negligent acts) or agreed to in writing, shall any Contributor be

liable to You for damages, including any direct, indirect, special, incidental, or consequential damages of any character arising as a result of this License or out of the use or inability to use the Work (including but not limited to damages for loss of goodwill, work stoppage, computer failure or malfunction, or any and all other commercial damages or losses), even if such Contributor has been advised of the possibility of such damages.

9. Accepting Warranty or Additional Liability. While redistributing the Work or Derivative Works thereof, You may choose to offer, and charge a fee for, acceptance of support, warranty, indemnity, or other liability obligations and/or rights consistent with this License. However, in accepting such obligations, You may act only on Your own behalf and on Your sole responsibility, not on behalf of any other Contributor, and only if You agree to indemnify, defend, and hold each Contributor harmless for any liability incurred by, or claims asserted against, such Contributor by reason of your accepting any such warranty or additional liability.

END OF TERMS AND CONDITIONS

APPENDIX: How to apply the Apache License to your work.

To apply the Apache License to your work, attach the following boilerplate notice, with the fields enclosed by brackets "[]" replaced with your own identifying information. (Don't include the brackets!) The text should be enclosed in the appropriate comment syntax for the file format. We also recommend that a file or class name and description of purpose be included on the same "printed page" as the copyright notice for easier identification within third-party archives.

Copyright [yyyy] [name of copyright owner]

Licensed under the Apache License, Version 2.0 (the "License");
you may not use this file except in compliance with the License.
You may obtain a copy of the License at

<http://www.apache.org/licenses/LICENSE-2.0>

Unless required by applicable law or agreed to in writing, software distributed under the License is distributed on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.

---- LLVM Exceptions to the Apache 2.0 License ----

As an exception, if, as a result of your compiling your source code, portions of this Software are embedded into an Object form of such source code, you may redistribute such embedded portions in such Object form without complying with the conditions of Sections 4(a), 4(b) and 4(d) of the License.

In addition, if you combine or link compiled forms of this Software with software that is licensed under the GPLv2 ("Combined Software") and if a court of competent jurisdiction determines that the patent provision (Section 3), the indemnity provision (Section 9) or other Section of the License conflicts with the conditions of the GPLv2, you may retroactively and prospectively choose to deem waived or otherwise exclude such Section(s) of the License, but only in their entirety and only with respect to the Combined Software.

=====
Software from third parties included in the LLVM Project:
=====

The LLVM Project contains third party software which is under different license terms. All such code will be identified clearly using at least one of two mechanisms:

- 1) It will be in a separate directory tree with its own `LICENSE.txt` or `LICENSE` file at the top containing the specific license and restrictions which apply to that software, or
- 2) It will contain specific license and restriction terms at the top of every file.

=====
Legacy LLVM License (<https://llvm.org/docs/DeveloperPolicy.html#legacy>):
=====

University of Illinois/NCSA
Open Source License

Copyright (c) 2009-2019 Polly Team
All rights reserved.

Developed by:

Polly Team

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal with the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do

so, subject to the following conditions:

- * Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimers.
- * Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimers in the documentation and/or other materials provided with the distribution.
- * Neither the names of the Polly Team, copyright holders, nor the names of its contributors may be used to endorse or promote products derived from this Software without specific prior written permission.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE CONTRIBUTORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS WITH THE SOFTWARE.

=====
The LLVM Project is under the Apache License v2.0 with LLVM Exceptions:
=====

Apache License
Version 2.0, January 2004
<http://www.apache.org/licenses/>

TERMS AND CONDITIONS FOR USE, REPRODUCTION, AND DISTRIBUTION

1. Definitions.

"License" shall mean the terms and conditions for use, reproduction, and distribution as defined by Sections 1 through 9 of this document.

"Licensor" shall mean the copyright owner or entity authorized by the copyright owner that is granting the License.

"Legal Entity" shall mean the union of the acting entity and all other entities that control, are controlled by, or are under common control with that entity. For the purposes of this definition, "control" means (i) the power, direct or indirect, to cause the direction or management of such entity, whether by contract or otherwise, or (ii) ownership of fifty percent (50%) or more of the outstanding shares, or (iii) beneficial ownership of such entity.

"You" (or "Your") shall mean an individual or Legal Entity exercising permissions granted by this License.

"Source" form shall mean the preferred form for making modifications, including but not limited to software source code, documentation source, and configuration files.

"Object" form shall mean any form resulting from mechanical transformation or translation of a Source form, including but not limited to compiled object code, generated documentation, and conversions to other media types.

"Work" shall mean the work of authorship, whether in Source or Object form, made available under the License, as indicated by a copyright notice that is included in or attached to the work (an example is provided in the Appendix below).

"Derivative Works" shall mean any work, whether in Source or Object form, that is based on (or derived from) the Work and for which the editorial revisions, annotations, elaborations, or other modifications represent, as a whole, an original work of authorship. For the purposes of this License, Derivative Works shall not include works that remain separable from, or merely link (or bind by name) to the interfaces of, the Work and Derivative Works thereof.

"Contribution" shall mean any work of authorship, including the original version of the Work and any modifications or additions to that Work or Derivative Works thereof, that is intentionally submitted to Licensor for inclusion in the Work by the copyright owner or by an individual or Legal Entity authorized to submit on behalf of the copyright owner. For the purposes of this definition, "submitted"

means any form of electronic, verbal, or written communication sent to the Licensor or its representatives, including but not limited to communication on electronic mailing lists, source code control systems, and issue tracking systems that are managed by, or on behalf of, the Licensor for the purpose of discussing and improving the Work, but excluding communication that is conspicuously marked or otherwise designated in writing by the copyright owner as "Not a Contribution."

"Contributor" shall mean Licensor and any individual or Legal Entity on behalf of whom a Contribution has been received by Licensor and subsequently incorporated within the Work.

2. Grant of Copyright License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable

copyright license to reproduce, prepare Derivative Works of, publicly display, publicly perform, sublicense, and distribute the Work and such Derivative Works in Source or Object form.

3. Grant of Patent License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable (except as stated in this section) patent license to make, have made, use, offer to sell, sell, import, and otherwise transfer the Work, where such license applies only to those patent claims licensable by such Contributor that are necessarily infringed by their Contribution(s) alone or by combination of their Contribution(s) with the Work to which such Contribution(s) was submitted. If You institute patent litigation against any entity (including a cross-claim or counterclaim in a lawsuit) alleging that the Work or a Contribution incorporated within the Work constitutes direct or contributory patent infringement, then any patent licenses granted to You under this License for that Work shall terminate as of the date such litigation is filed.

4. Redistribution. You may reproduce and distribute copies of the Work or Derivative Works thereof in any medium, with or without modifications, and in Source or Object form, provided that You meet the following conditions:

(a) You must give any other recipients of the Work or Derivative Works a copy of this License; and

(b) You must cause any modified files to carry prominent notices stating that You changed the files; and

(c) You must retain, in the Source form of any Derivative Works that You distribute, all copyright, patent, trademark, and attribution notices from the Source form of the Work, excluding those notices that do not pertain to any part of the Derivative Works; and

(d) If the Work includes a "NOTICE" text file as part of its distribution, then any Derivative Works that You distribute must include a readable copy of the attribution notices contained within such NOTICE file, excluding those notices that do not pertain to any part of the Derivative Works, in at least one of the following places: within a NOTICE text file distributed as part of the Derivative Works; within the Source form or documentation, if provided along with the Derivative Works; or, within a display generated by the Derivative Works, if and

wherever such third-party notices normally appear. The contents of the NOTICE file are for informational purposes only and do not modify the License. You may add Your own attribution notices within Derivative Works that You distribute, alongside or as an addendum to the NOTICE text from the Work, provided that such additional attribution notices cannot be construed as modifying the License.

You may add Your own copyright statement to Your modifications and may provide additional or different license terms and conditions for use, reproduction, or distribution of Your modifications, or for any such Derivative Works as a whole, provided Your use, reproduction, and distribution of the Work otherwise complies with the conditions stated in this License.

5. Submission of Contributions. Unless You explicitly state otherwise, any Contribution intentionally submitted for inclusion in the Work by You to the Licensor shall be under the terms and conditions of this License, without any additional terms or conditions. Notwithstanding the above, nothing herein shall supersede or modify the terms of any separate license agreement you may have executed with Licensor regarding such Contributions.

6. Trademarks. This License does not grant permission to use the trade names, trademarks, service marks, or product names of the Licensor, except as required for reasonable and customary use in describing the origin of the Work and reproducing the content of the NOTICE file.

7. Disclaimer of Warranty. Unless required by applicable law or agreed to in writing, Licensor provides the Work (and each Contributor provides its Contributions) on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied, including, without limitation, any warranties or conditions of TITLE, NON-INFRINGEMENT, MERCHANTABILITY, or FITNESS FOR A PARTICULAR PURPOSE. You are solely responsible for determining the appropriateness of using or redistributing the Work and assume any risks associated with Your exercise of permissions under this License.

8. Limitation of Liability. In no event and under no legal theory, whether in tort (including negligence), contract, or otherwise, unless required by applicable law (such as deliberate and grossly negligent acts) or agreed to in writing, shall any Contributor be liable to You for damages, including any direct, indirect, special, incidental, or consequential damages of any character arising as a result of this License or out of the use or inability to use the

Work (including but not limited to damages for loss of goodwill, work stoppage, computer failure or malfunction, or any and all other commercial damages or losses), even if such Contributor has been advised of the possibility of such damages.

9. Accepting Warranty or Additional Liability. While redistributing the Work or Derivative Works thereof, You may choose to offer, and charge a fee for, acceptance of support, warranty, indemnity, or other liability obligations and/or rights consistent with this License. However, in accepting such obligations, You may act only on Your own behalf and on Your sole responsibility, not on behalf of any other Contributor, and only if You agree to indemnify, defend, and hold each Contributor harmless for any liability incurred by, or claims asserted against, such Contributor by reason of your accepting any such warranty or additional liability.

END OF TERMS AND CONDITIONS

APPENDIX: How to apply the Apache License to your work.

To apply the Apache License to your work, attach the following boilerplate notice, with the fields enclosed by brackets "[]" replaced with your own identifying information. (Don't include the brackets!) The text should be enclosed in the appropriate comment syntax for the file format. We also recommend that a file or class name and description of purpose be included on the same "printed page" as the copyright notice for easier identification within third-party archives.

Copyright [yyyy] [name of copyright owner]

Licensed under the Apache License, Version 2.0 (the "License");
you may not use this file except in compliance with the License.
You may obtain a copy of the License at

<http://www.apache.org/licenses/LICENSE-2.0>

Unless required by applicable law or agreed to in writing, software distributed under the License is distributed on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.

---- LLVM Exceptions to the Apache 2.0 License ----

As an exception, if, as a result of your compiling your source code, portions

of this Software are embedded into an Object form of such source code, you may redistribute such embedded portions in such Object form without complying with the conditions of Sections 4(a), 4(b) and 4(d) of the License.

In addition, if you combine or link compiled forms of this Software with software that is licensed under the GPLv2 ("Combined Software") and if a court of competent jurisdiction determines that the patent provision (Section 3), the indemnity provision (Section 9) or other Section of the License conflicts with the conditions of the GPLv2, you may retroactively and prospectively choose to deem waived or otherwise exclude such Section(s) of the License, but only in their entirety and only with respect to the Combined Software.

=====
Software from third parties included in the LLVM Project:
=====

The LLVM Project contains third party software which is under different license terms. All such code will be identified clearly using at least one of two mechanisms:

- 1) It will be in a separate directory tree with its own `LICENSE.txt` or `LICENSE` file at the top containing the specific license and restrictions which apply to that software, or
- 2) It will contain specific license and restriction terms at the top of every file.

=====
Legacy LLVM License (<https://llvm.org/docs/DeveloperPolicy.html#legacy>):
=====

The compiler_rt library is dual licensed under both the University of Illinois "BSD-Like" license and the MIT license. As a user of this code you may choose to use it under either license. As a contributor, you agree to allow your code to be used under both.

Full text of the relevant licenses is included below.

=====
University of Illinois/NCSA
Open Source License

Copyright (c) 2009-2019 by the contributors listed in CREDITS.TXT

All rights reserved.

Developed by:

LLVM Team

University of Illinois at Urbana-Champaign

<http://llvm.org>

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal with the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

* Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimers.

* Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimers in the documentation and/or other materials provided with the distribution.

* Neither the names of the LLVM Team, University of Illinois at Urbana-Champaign, nor the names of its contributors may be used to endorse or promote products derived from this Software without specific prior written permission.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE CONTRIBUTORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS WITH THE SOFTWARE.

=====
Copyright (c) 2009-2015 by the contributors listed in CREDITS.TXT

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

; NOTE: Assertions have been autogenerated by utils/update_test_checks.py UTC_ARGS: --function-signature --scrub-attributes

; RUN: opt -S -passes=argpromotion < %s | FileCheck %s

; Test that we only promote arguments when the caller/callee have compatible

; function attributes.

target triple = "x86_64-unknown-linux-gnu"

; This should promote

define internal fastcc void @callee_avx512_legal512_prefer512_call_avx512_legal512_prefer512(ptr %arg, ptr readonly %arg1) #0 {

; CHECK-LABEL: define {{{^@+}}} @callee_avx512_legal512_prefer512_call_avx512_legal512_prefer512

; CHECK-SAME: (ptr [[ARG:%.*]], <8 x i64> [[ARG1_VAL:%.*]])

; CHECK-NEXT: bb:

; CHECK-NEXT: store <8 x i64> [[ARG1_VAL]], ptr [[ARG]]

; CHECK-NEXT: ret void

;

bb:

%tmp = load <8 x i64>, ptr %arg1

store <8 x i64> %tmp, ptr %arg

ret void

}

define void @avx512_legal512_prefer512_call_avx512_legal512_prefer512(ptr %arg) #0 {

; CHECK-LABEL: define {{{^@+}}} @avx512_legal512_prefer512_call_avx512_legal512_prefer512

; CHECK-SAME:

(ptr [[ARG:%.*]])

; CHECK-NEXT: bb:

; CHECK-NEXT: [[TMP:%.*]] = alloca <8 x i64>, align 32

; CHECK-NEXT: [[TMP2:%.*]] = alloca <8 x i64>, align 32

; CHECK-NEXT: call void @llvm.memset.p0.i64(ptr align 32 [[TMP]], i8 0, i64 32, i1 false)

; CHECK-NEXT: [[TMP_VAL:%.*]] = load <8 x i64>, ptr [[TMP]]

; CHECK-NEXT: call fastcc void @callee_avx512_legal512_prefer512_call_avx512_legal512_prefer512(ptr [[TMP2]], <8 x i64> [[TMP_VAL]])

; CHECK-NEXT: [[TMP4:%.*]] = load <8 x i64>, ptr [[TMP2]], align 32

; CHECK-NEXT: store <8 x i64> [[TMP4]], ptr [[ARG]], align 2

; CHECK-NEXT: ret void

;

```

bb:
%tmp = alloca <8 x i64>, align 32
%tmp2 = alloca <8 x i64>, align 32
call void @llvm.memset.p0.i64(ptr align 32 %tmp, i8 0, i64 32, i1 false)
call fastcc void @callee_avx512_legal512_prefer512_call_avx512_legal512_prefer512(ptr %tmp2, ptr %tmp)
%tmp4 = load <8 x i64>, ptr %tmp2, align 32
store <8 x i64> %tmp4, ptr %arg, align 2
ret void
}

; This should promote
define
internal fastcc void @callee_avx512_legal512_prefer256_call_avx512_legal512_prefer256(ptr %arg, ptr readonly
%arg1) #1 {
; CHECK-LABEL: define {{{^@+}}}@callee_avx512_legal512_prefer256_call_avx512_legal512_prefer256
; CHECK-SAME: (ptr [[ARG:%.*]], <8 x i64> [[ARG1_VAL:%.*]])
; CHECK-NEXT: bb:
; CHECK-NEXT: store <8 x i64> [[ARG1_VAL]], ptr [[ARG]]
; CHECK-NEXT: ret void
;
bb:
%tmp = load <8 x i64>, ptr %arg1
store <8 x i64> %tmp, ptr %arg
ret void
}

define void @avx512_legal512_prefer256_call_avx512_legal512_prefer256(ptr %arg) #1 {
; CHECK-LABEL: define {{{^@+}}}@avx512_legal512_prefer256_call_avx512_legal512_prefer256
; CHECK-SAME: (ptr [[ARG:%.*]])
; CHECK-NEXT: bb:
; CHECK-NEXT: [[TMP:%.*]] = alloca <8 x i64>, align 32
; CHECK-NEXT: [[TMP2:%.*]] = alloca <8 x i64>, align 32
; CHECK-NEXT: call void @llvm.memset.p0.i64(ptr align 32 [[TMP]], i8 0, i64 32, i1 false)
; CHECK-NEXT: [[TMP_VAL:%.*]] = load <8 x i64>, ptr [[TMP]]
; CHECK-NEXT: call fastcc
void @callee_avx512_legal512_prefer256_call_avx512_legal512_prefer256(ptr [[TMP2]], <8 x i64>
[[TMP_VAL]])
; CHECK-NEXT: [[TMP4:%.*]] = load <8 x i64>, ptr [[TMP2]], align 32
; CHECK-NEXT: store <8 x i64> [[TMP4]], ptr [[ARG]], align 2
; CHECK-NEXT: ret void
;
bb:
%tmp = alloca <8 x i64>, align 32
%tmp2 = alloca <8 x i64>, align 32
call void @llvm.memset.p0.i64(ptr align 32 %tmp, i8 0, i64 32, i1 false)
call fastcc void @callee_avx512_legal512_prefer256_call_avx512_legal512_prefer256(ptr %tmp2, ptr %tmp)
%tmp4 = load <8 x i64>, ptr %tmp2, align 32
store <8 x i64> %tmp4, ptr %arg, align 2

```

```
ret void
}
```

; This should promote

```
define internal fastcc void @callee_avx512_legal512_prefer512_call_avx512_legal512_prefer256(ptr %arg, ptr
readonly %arg1) #1 {
; CHECK-LABEL: define {{{^@+}}}@callee_avx512_legal512_prefer512_call_avx512_legal512_prefer256
; CHECK-SAME: (ptr [[ARG:%.*]], <8 x i64> [[ARG1_VAL:%.*]])
; CHECK-NEXT: bb:
; CHECK-NEXT: store <8 x i64> [[ARG1_VAL]],
ptr [[ARG]]
; CHECK-NEXT: ret void
;
bb:
%tmp = load <8 x i64>, ptr %arg1
store <8 x i64> %tmp, ptr %arg
ret void
}
```

```
define void @avx512_legal512_prefer512_call_avx512_legal512_prefer256(ptr %arg) #0 {
; CHECK-LABEL: define {{{^@+}}}@avx512_legal512_prefer512_call_avx512_legal512_prefer256
; CHECK-SAME: (ptr [[ARG:%.*]])
; CHECK-NEXT: bb:
; CHECK-NEXT: [[TMP:%.*]] = alloca <8 x i64>, align 32
; CHECK-NEXT: [[TMP2:%.*]] = alloca <8 x i64>, align 32
; CHECK-NEXT: call void @llvm.memset.p0.i64(ptr align 32 [[TMP]], i8 0, i64 32, i1 false)
; CHECK-NEXT: [[TMP_VAL:%.*]] = load <8 x i64>, ptr [[TMP]]
; CHECK-NEXT: call fastcc void @callee_avx512_legal512_prefer512_call_avx512_legal512_prefer256(ptr
[[TMP2]], <8 x i64> [[TMP_VAL]])
; CHECK-NEXT: [[TMP4:%.*]] = load <8 x i64>, ptr [[TMP2]], align 32
; CHECK-NEXT: store <8 x i64> [[TMP4]], ptr [[ARG]], align 2
; CHECK-NEXT: ret void
;
bb:
%tmp = alloca <8 x i64>, align 32
%tmp2 = alloca <8 x i64>, align
32
call void @llvm.memset.p0.i64(ptr align 32 %tmp, i8 0, i64 32, i1 false)
call fastcc void @callee_avx512_legal512_prefer512_call_avx512_legal512_prefer256(ptr %tmp2, ptr %tmp)
%tmp4 = load <8 x i64>, ptr %tmp2, align 32
store <8 x i64> %tmp4, ptr %arg, align 2
ret void
}
```

; This should promote

```
define internal fastcc void @callee_avx512_legal512_prefer256_call_avx512_legal512_prefer512(ptr %arg, ptr
readonly %arg1) #0 {
; CHECK-LABEL: define {{{^@+}}}@callee_avx512_legal512_prefer256_call_avx512_legal512_prefer512
```

```

; CHECK-SAME: (ptr [[ARG:%.*]], <8 x i64> [[ARG1_VAL:%.*]])
; CHECK-NEXT: bb:
; CHECK-NEXT: store <8 x i64> [[ARG1_VAL]], ptr [[ARG]]
; CHECK-NEXT: ret void
;
;
bb:
%tmp = load <8 x i64>, ptr %arg1
store <8 x i64> %tmp, ptr %arg
ret void
}

define void @avx512_legal512_prefer256_call_avx512_legal512_prefer512(ptr %arg) #1 {
; CHECK-LABEL: define {{{^@+}}} @avx512_legal512_prefer256_call_avx512_legal512_prefer512
; CHECK-SAME: (ptr [[ARG:%.*]])
; CHECK-NEXT:
bb:
; CHECK-NEXT: [[TMP:%.*]] = alloca <8 x i64>, align 32
; CHECK-NEXT: [[TMP2:%.*]] = alloca <8 x i64>, align 32
; CHECK-NEXT: call void @llvm.memset.p0.i64(ptr align 32 [[TMP]], i8 0, i64 32, i1 false)
; CHECK-NEXT: [[TMP_VAL:%.*]] = load <8 x i64>, ptr [[TMP]]
; CHECK-NEXT: call fastcc void @callee_avx512_legal512_prefer256_call_avx512_legal512_prefer512(ptr
[[TMP2]], <8 x i64> [[TMP_VAL]])
; CHECK-NEXT: [[TMP4:%.*]] = load <8 x i64>, ptr [[TMP2]], align 32
; CHECK-NEXT: store <8 x i64> [[TMP4]], ptr [[ARG]], align 2
; CHECK-NEXT: ret void
;
;
bb:
%tmp = alloca <8 x i64>, align 32
%tmp2 = alloca <8 x i64>, align 32
call void @llvm.memset.p0.i64(ptr align 32 %tmp, i8 0, i64 32, i1 false)
call fastcc void @callee_avx512_legal512_prefer256_call_avx512_legal512_prefer512(ptr %tmp2, ptr %tmp)
%tmp4 = load <8 x i64>, ptr %tmp2, align 32
store <8 x i64> %tmp4, ptr %arg, align 2
ret void
}

; This should not promote
define internal fastcc void @callee_avx512_legal256_prefer256_call_avx512_legal512_prefer256(ptr
%arg, ptr readonly %arg1) #1 {
; CHECK-LABEL: define {{{^@+}}} @callee_avx512_legal256_prefer256_call_avx512_legal512_prefer256
; CHECK-SAME: (ptr [[ARG:%.*]], ptr readonly [[ARG1:%.*]])
; CHECK-NEXT: bb:
; CHECK-NEXT: [[TMP:%.*]] = load <8 x i64>, ptr [[ARG1]]
; CHECK-NEXT: store <8 x i64> [[TMP]], ptr [[ARG]]
; CHECK-NEXT: ret void
;
;
bb:
%tmp = load <8 x i64>, ptr %arg1

```

```

store <8 x i64> %tmp, ptr %arg
ret void
}

define void @avx512_legal256_prefer256_call_avx512_legal512_prefer256(ptr %arg) #2 {
; CHECK-LABEL: define {{{^@}+}}@avx512_legal256_prefer256_call_avx512_legal512_prefer256
; CHECK-SAME: (ptr [[ARG:%.*]])
; CHECK-NEXT: bb:
; CHECK-NEXT: [[TMP:%.*]] = alloca <8 x i64>, align 32
; CHECK-NEXT: [[TMP2:%.*]] = alloca <8 x i64>, align 32
; CHECK-NEXT: call void @llvm.memset.p0.i64(ptr align 32 [[TMP]], i8 0, i64 32, i1 false)
; CHECK-NEXT: call fastcc void @callee_avx512_legal256_prefer256_call_avx512_legal512_prefer256(ptr
[[TMP2]], ptr [[TMP]])
; CHECK-NEXT: [[TMP4:%.*]] = load <8 x i64>, ptr [[TMP2]], align 32
; CHECK-NEXT: store <8 x i64> [[TMP4]], ptr [[ARG]], align 2
; CHECK-NEXT: ret void
;
bb:
%tmp = alloca <8 x i64>, align 32
%tmp2 = alloca <8 x i64>, align 32
call void @llvm.memset.p0.i64(ptr align 32 %tmp, i8 0, i64 32, i1 false)
call fastcc void @callee_avx512_legal256_prefer256_call_avx512_legal512_prefer256(ptr %tmp2, ptr %tmp)
%tmp4 = load <8 x i64>, ptr %tmp2, align 32
store <8 x i64> %tmp4, ptr %arg, align 2
ret void
}

; This should not promote
define internal fastcc void @callee_avx512_legal512_prefer256_call_avx512_legal256_prefer256(ptr %arg, ptr
readonly %arg1) #2 {
; CHECK-LABEL: define {{{^@}+}}@callee_avx512_legal512_prefer256_call_avx512_legal256_prefer256
; CHECK-SAME: (ptr [[ARG:%.*]], ptr readonly [[ARG1:%.*]])
; CHECK-NEXT: bb:
; CHECK-NEXT: [[TMP:%.*]] = load <8 x i64>, ptr [[ARG1]]
; CHECK-NEXT: store <8 x i64>
[[TMP]], ptr [[ARG]]
; CHECK-NEXT: ret void
;
bb:
%tmp = load <8 x i64>, ptr %arg1
store <8 x i64> %tmp, ptr %arg
ret void
}

define void @avx512_legal512_prefer256_call_avx512_legal256_prefer256(ptr %arg) #1 {
; CHECK-LABEL: define {{{^@}+}}@avx512_legal512_prefer256_call_avx512_legal256_prefer256
; CHECK-SAME: (ptr [[ARG:%.*]])
; CHECK-NEXT: bb:

```



```

; CHECK-NEXT: [[TMP:%.*]] = alloca <8 x i64>, align 32
; CHECK-NEXT: [[TMP2:%.*]] = alloca <8 x i64>, align 32
; CHECK-NEXT: call void @llvm.memset.p0.i64(ptr align 32 [[TMP]], i8 0, i64 32, i1 false)
; CHECK-NEXT: call fastcc void @callee_avx512_legal512_prefer256_call_avx512_legal256_prefer256(ptr
[[TMP2]], ptr [[TMP]])
; CHECK-NEXT: [[TMP4:%.*]] = load <8 x i64>, ptr [[TMP2]], align 32
; CHECK-NEXT: store <8 x i64> [[TMP4]], ptr [[ARG]], align 2
; CHECK-NEXT: ret void
;
bb:
  %tmp = alloca <8 x i64>, align 32
  %tmp2 = alloca <8 x i64>, align 32
  call void @llvm.memset.p0.i64(ptr align 32 %tmp, i8 0, i64
32, i1 false)
  call fastcc void @callee_avx512_legal512_prefer256_call_avx512_legal256_prefer256(ptr %tmp2, ptr %tmp)
  %tmp4 = load <8 x i64>, ptr %tmp2, align 32
  store <8 x i64> %tmp4, ptr %arg, align 2
  ret void
}

; This should promote
define internal fastcc void @callee_avx2_legal256_prefer256_call_avx2_legal512_prefer256(ptr %arg, ptr readonly
%arg1) #3 {
; CHECK-LABEL: define {{{^@+}}} @callee_avx2_legal256_prefer256_call_avx2_legal512_prefer256
; CHECK-SAME: (ptr [[ARG:%.*]], <8 x i64> [[ARG1_VAL:%.*]])
; CHECK-NEXT: bb:
; CHECK-NEXT: store <8 x i64> [[ARG1_VAL]], ptr [[ARG]]
; CHECK-NEXT: ret void
;
bb:
  %tmp = load <8 x i64>, ptr %arg1
  store <8 x i64> %tmp, ptr %arg
  ret void
}

define void @avx2_legal256_prefer256_call_avx2_legal512_prefer256(ptr %arg) #4 {
; CHECK-LABEL: define {{{^@+}}} @avx2_legal256_prefer256_call_avx2_legal512_prefer256
; CHECK-SAME: (ptr [[ARG:%.*]])
; CHECK-NEXT: bb:
; CHECK-NEXT: [[TMP:%.*]] = alloca <8 x i64>, align 32
; CHECK-NEXT:
  [[TMP2:%.*]] = alloca <8 x i64>, align 32
; CHECK-NEXT: call void @llvm.memset.p0.i64(ptr align 32 [[TMP]], i8 0, i64 32, i1 false)
; CHECK-NEXT: [[TMP_VAL:%.*]] = load <8 x i64>, ptr [[TMP]]
; CHECK-NEXT: call fastcc void @callee_avx2_legal256_prefer256_call_avx2_legal512_prefer256(ptr
[[TMP2]], <8 x i64> [[TMP_VAL]])
; CHECK-NEXT: [[TMP4:%.*]] = load <8 x i64>, ptr [[TMP2]], align 32
; CHECK-NEXT: store <8 x i64> [[TMP4]], ptr [[ARG]], align 2

```

```

; CHECK-NEXT:  ret void
;
bb:
%tmp = alloca <8 x i64>, align 32
%tmp2 = alloca <8 x i64>, align 32
call void @llvm.memset.p0.i64(ptr align 32 %tmp, i8 0, i64 32, i1 false)
call fastcc void @callee_avx2_legal256_prefer256_call_avx2_legal512_prefer256(ptr %tmp2, ptr %tmp)
%tmp4 = load <8 x i64>, ptr %tmp2, align 32
store <8 x i64> %tmp4, ptr %arg, align 2
ret void
}

; This should promote
define internal fastcc void @callee_avx2_legal512_prefer256_call_avx2_legal256_prefer256(ptr %arg, ptr readonly %arg1) #4 {
;
CHECK-LABEL: define {{{^@+}}} @callee_avx2_legal512_prefer256_call_avx2_legal256_prefer256
; CHECK-SAME: (ptr [[ARG:%.*]], <8 x i64> [[ARG1_VAL:%.*]])
; CHECK-NEXT: bb:
; CHECK-NEXT:  store <8 x i64> [[ARG1_VAL]], ptr [[ARG]]
; CHECK-NEXT:  ret void
;
bb:
%tmp = load <8 x i64>, ptr %arg1
store <8 x i64> %tmp, ptr %arg
ret void
}

define void @avx2_legal512_prefer256_call_avx2_legal256_prefer256(ptr %arg) #3 {
; CHECK-LABEL: define {{{^@+}}} @avx2_legal512_prefer256_call_avx2_legal256_prefer256
; CHECK-SAME: (ptr [[ARG:%.*]])
; CHECK-NEXT: bb:
; CHECK-NEXT:  [[TMP:%.*]] = alloca <8 x i64>, align 32
; CHECK-NEXT:  [[TMP2:%.*]] = alloca <8 x i64>, align 32
; CHECK-NEXT:  call void @llvm.memset.p0.i64(ptr align 32 [[TMP]], i8 0, i64 32, i1 false)
; CHECK-NEXT:  [[TMP_VAL:%.*]] = load <8 x i64>, ptr [[TMP]]
; CHECK-NEXT:  call fastcc void @callee_avx2_legal512_prefer256_call_avx2_legal256_prefer256(ptr
[[TMP2]], <8 x i64> [[TMP_VAL]])
; CHECK-NEXT:  [[TMP4:%.*]] = load
<8 x i64>, ptr [[TMP2]], align 32
; CHECK-NEXT:  store <8 x i64> [[TMP4]], ptr [[ARG]], align 2
; CHECK-NEXT:  ret void
;
bb:
%tmp = alloca <8 x i64>, align 32
%tmp2 = alloca <8 x i64>, align 32
call void @llvm.memset.p0.i64(ptr align 32 %tmp, i8 0, i64 32, i1 false)
call fastcc void @callee_avx2_legal512_prefer256_call_avx2_legal256_prefer256(ptr %tmp2, ptr %tmp)

```

```

%tmp4 = load <8 x i64>, ptr %tmp2, align 32
store <8 x i64> %tmp4, ptr %arg, align 2
ret void
}

```

; If the arguments are scalar, its ok to promote.

```

define internal i32 @scalar_callee_avx512_legal256_prefer256_call_avx512_legal512_prefer256(ptr %X, ptr %Y)
#2 {
; CHECK-LABEL: define
{{{^@+}}@scalar_callee_avx512_legal256_prefer256_call_avx512_legal512_prefer256
; CHECK-SAME: (i32 [[X_VAL:%.*]], i32 [[Y_VAL:%.*]])
; CHECK-NEXT:  [[C:%.*]] = add i32 [[X_VAL]], [[Y_VAL]]
; CHECK-NEXT:  ret i32 [[C]]
;
%A = load i32, ptr %X
%B = load i32, ptr %Y
%C = add i32 %A, %B
ret i32 %C
}

```

```

define i32 @scalar_avx512_legal256_prefer256_call_avx512_legal512_prefer256(ptr
%B) #2 {
; CHECK-LABEL: define {{{^@+}}@scalar_avx512_legal256_prefer256_call_avx512_legal512_prefer256
; CHECK-SAME: (ptr [[B:%.*]])
; CHECK-NEXT:  [[A:%.*]] = alloca i32
; CHECK-NEXT:  store i32 1, ptr [[A]]
; CHECK-NEXT:  [[A_VAL:%.*]] = load i32, ptr [[A]]
; CHECK-NEXT:  [[B_VAL:%.*]] = load i32, ptr [[B]]
; CHECK-NEXT:  [[C:%.*]] = call i32
@scalar_callee_avx512_legal256_prefer256_call_avx512_legal512_prefer256(i32 [[A_VAL]], i32 [[B_VAL]])
; CHECK-NEXT:  ret i32 [[C]]
;
%A = alloca i32
store i32 1, ptr %A
%C = call i32 @scalar_callee_avx512_legal256_prefer256_call_avx512_legal512_prefer256(ptr %A, ptr %B)
ret i32 %C
}

```

; If the arguments are scalar, its ok to promote.

```

define internal i32 @scalar_callee_avx512_legal512_prefer256_call_avx512_legal256_prefer256(ptr %X, ptr %Y)
#2 {
; CHECK-LABEL: define
{{{^@+}}@scalar_callee_avx512_legal512_prefer256_call_avx512_legal256_prefer256
; CHECK-SAME: (i32 [[X_VAL:%.*]],
i32 [[Y_VAL:%.*]])
; CHECK-NEXT:  [[C:%.*]] = add i32 [[X_VAL]], [[Y_VAL]]
; CHECK-NEXT:  ret i32 [[C]]
;

```

```

%A = load i32, ptr %X
%B = load i32, ptr %Y
%C = add i32 %A, %B
ret i32 %C
}

define i32 @scalar_avx512_legal512_prefer256_call_avx512_legal256_prefer256(ptr %B) #2 {
; CHECK-LABEL: define {{{^@+}}}@scalar_avx512_legal512_prefer256_call_avx512_legal256_prefer256
; CHECK-SAME: (ptr [[B:%.*]])
; CHECK-NEXT:  [[A:%.*]] = alloca i32
; CHECK-NEXT:  store i32 1, ptr [[A]]
; CHECK-NEXT:  [[A_VAL:%.*]] = load i32, ptr [[A]]
; CHECK-NEXT:  [[B_VAL:%.*]] = load i32, ptr [[B]]
; CHECK-NEXT:  [[C:%.*]] = call i32
@scalar_callee_avx512_legal512_prefer256_call_avx512_legal256_prefer256(i32 [[A_VAL]], i32 [[B_VAL]])
; CHECK-NEXT:  ret i32 [[C]]
;
%A = alloca i32
store i32 1, ptr %A
%C = call i32 @scalar_callee_avx512_legal512_prefer256_call_avx512_legal256_prefer256(ptr %A, ptr %B)
ret i32 %C
}

; Function Attrs: argmemonly nounwind
declare void @llvm.memset.p0.i64(ptr
nocapture writeonly, i8, i64, i1) #5

attributes #0 = { inlinehint norecurse nounwind uwtable "target-features"="+avx512vl" "min-legal-vector-
width"="512" "prefer-vector-width"="512" }
attributes #1 = { inlinehint norecurse nounwind uwtable "target-features"="+avx512vl" "min-legal-vector-
width"="512" "prefer-vector-width"="256" }
attributes #2 = { inlinehint norecurse nounwind uwtable "target-features"="+avx512vl" "min-legal-vector-
width"="256" "prefer-vector-width"="256" }
attributes #3 = { inlinehint norecurse nounwind uwtable "target-features"="+avx2" "min-legal-vector-width"="512"
"prefer-vector-width"="256" }
attributes #4 = { inlinehint norecurse nounwind uwtable "target-features"="+avx2" "min-legal-vector-width"="256"
"prefer-vector-width"="256" }
attributes #5 = { argmemonly nounwind }

```

1.16 json-c 0.17

1.16.1 Available under license :

Copyright (c) 2009-2012 Eric Haszlakiewicz

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"),

to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

Copyright (c) 2004, 2005 Metaparadigm Pte Ltd

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

1.17 curl 8.3.0

1.17.1 Available under license :

COPYRIGHT AND PERMISSION NOTICE

Copyright (c) 1996 - 2023, Daniel Stenberg, <daniel@haxx.se>, and many contributors, see the THANKS file.

All rights reserved.

Permission to use, copy, modify, and distribute this software for any purpose with or without fee is hereby granted, provided that the above copyright notice and this permission notice appear in all copies.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NON-INFRINGEMENT OF THIRD PARTY RIGHTS. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

Except as contained in this notice, the name of a copyright holder shall not be used in advertising or otherwise to promote the sale, use or other dealings in this Software without prior written authorization of the copyright holder.

1.18 boost 1.84.0

1.18.1 Available under license :

Boost Software License - Version 1.0 - August 17th, 2003

Permission is hereby granted, free of charge, to any person or organization obtaining a copy of the software and accompanying documentation covered by this license (the "Software") to use, reproduce, display, distribute, execute, and transmit the Software, and to prepare derivative works of the Software, and to permit third-parties to whom the Software is furnished to do so, all subject to the following:

The copyright notices in the Software and this entire statement, including the above license grant, this restriction and the following disclaimer, must be included in all copies of the Software, in whole or in part, and all derivative works of the Software, unless such copies or derivative works are solely in the form of machine-executable object code generated by a source language processor.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS

FOR A PARTICULAR PURPOSE, TITLE AND NON-INFRINGEMENT. IN NO EVENT SHALL THE COPYRIGHT HOLDERS OR ANYONE DISTRIBUTING THE SOFTWARE BE LIABLE FOR ANY DAMAGES OR OTHER LIABILITY, WHETHER IN CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

1.19 libxml2 2.11.7

1.19.1 Available under license :

Except where otherwise noted in the source code (e.g. the files hash.c, list.c and the trio files, which are covered by a similar licence but with different Copyright notices) all the files are:

Copyright (C) 1998-2012 Daniel Veillard. All Rights Reserved.

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

1.20 bcc 0.31.0

1.20.1 Available under license :

Format: <http://www.debian.org/doc/packaging-manuals/copyright-format/1.0/>

Upstream-Name: bcc

Source: <https://github.com/iovisor/bcc>

Files: *

Copyright: 2015 PLUMgrid, Inc.

License: Apache-2.0

Apache License

Version 2.0, January 2004

<http://www.apache.org/licenses/>

TERMS AND CONDITIONS FOR USE, REPRODUCTION, AND DISTRIBUTION

1. Definitions.

"License" shall mean the terms and conditions for use, reproduction, and distribution as defined by Sections 1 through 9 of this document.

"Licensor" shall mean the copyright owner or entity authorized by the copyright owner that is granting the License.

"Legal Entity" shall mean the union of the acting entity and all other entities that control, are controlled by, or are under common control with that entity. For the purposes of this definition, "control" means (i) the power, direct or indirect, to cause the direction or management of such entity, whether by contract or otherwise, or (ii) ownership of fifty percent (50%) or more of the outstanding shares, or (iii) beneficial ownership of such entity.

"You" (or "Your") shall mean an individual or Legal Entity exercising permissions granted by this License.

"Source" form shall mean the preferred form for making modifications, including but not limited to software source code, documentation source, and configuration files.

"Object" form shall mean any form resulting from mechanical transformation or translation of a Source form, including but not limited to compiled object code, generated documentation, and conversions to other media types.

"Work" shall mean the work of authorship, whether in Source or Object form, made available under the License, as indicated by a copyright notice that is included in or attached to the work (an example is provided in the Appendix below).

"Derivative Works" shall mean any work, whether in Source or Object form, that is based on (or derived from) the Work and for which the editorial revisions, annotations, elaborations, or other modifications represent, as a whole, an original work of authorship. For the purposes of this License, Derivative Works shall not include works that remain separable from, or merely link (or bind by name) to the interfaces of, the Work and Derivative Works thereof.

"Contribution" shall mean any work of authorship, including the original version of the Work and any modifications or additions to that Work or Derivative Works thereof, that is intentionally submitted to Licensor for inclusion in the Work by the copyright owner or by an individual or Legal Entity authorized to submit on behalf of the copyright owner. For the purposes of this definition, "submitted"

means any form of electronic, verbal, or written communication sent to the Licensor or its representatives, including but not limited to communication on electronic mailing lists, source code control systems, and issue tracking systems that are managed by, or on behalf of, the Licensor for the purpose of discussing and improving the Work, but excluding communication that is conspicuously marked or otherwise designated in writing by the copyright owner as "Not a Contribution."

"Contributor" shall mean Licensor and any individual or Legal Entity on behalf of whom a Contribution has been received by Licensor and subsequently incorporated within the Work.

2. Grant of Copyright License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable copyright license to reproduce, prepare Derivative Works of, publicly display, publicly perform, sublicense, and distribute the Work and such Derivative Works in Source or Object form.

3. Grant of Patent License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable (except as stated in this section) patent license to make, have made, use, offer to sell, sell, import, and otherwise transfer the Work, where such license applies only to those patent claims licensable by such Contributor that are necessarily infringed by their Contribution(s) alone or by combination of their Contribution(s) with the Work to which such Contribution(s) was submitted. If You institute patent litigation against any entity (including a cross-claim or counterclaim in a lawsuit) alleging that the Work or a Contribution incorporated within the Work constitutes direct or contributory patent infringement, then any patent licenses granted to You under this License for that Work shall terminate as of the date such litigation is filed.

4. Redistribution. You may reproduce and distribute copies of the Work or Derivative Works thereof in any medium, with or without modifications, and in Source or Object form, provided that You meet the following conditions:

(a) You must give any other recipients of the Work or Derivative Works a copy of this License; and

(b) You must cause any modified files to carry prominent notices stating that You changed the files; and

- (c) You must retain, in the Source form of any Derivative Works that You distribute, all copyright, patent, trademark, and attribution notices from the Source form of the Work, excluding those notices that do not pertain to any part of the Derivative Works; and
- (d) If the Work includes a "NOTICE" text file as part of its distribution, then any Derivative Works that You distribute must include a readable copy of the attribution notices contained within such NOTICE file, excluding those notices that do not pertain to any part of the Derivative Works, in at least one of the following places: within a NOTICE text file distributed as part of the Derivative Works; within the Source form or documentation, if provided along with the Derivative Works; or, within a display generated by the Derivative Works, if and wherever such third-party notices normally appear. The contents of the NOTICE file are for informational purposes only and do not modify the License. You may add Your own attribution notices within Derivative Works that You distribute, alongside or as an addendum to the NOTICE text from the Work, provided that such additional attribution notices cannot be construed as modifying the License.

You may add Your own copyright statement to Your modifications and may provide additional or different license terms and conditions

for use, reproduction, or distribution of Your modifications, or for any such Derivative Works as a whole, provided Your use, reproduction, and distribution of the Work otherwise complies with the conditions stated in this License.

5. Submission of Contributions. Unless You explicitly state otherwise, any Contribution intentionally submitted for inclusion in the Work by You to the Licensor shall be under the terms and conditions of this License, without any additional terms or conditions.

Notwithstanding the above, nothing herein shall supersede or modify the terms of any separate license agreement you may have executed with Licensor regarding such Contributions.

6. Trademarks. This License does not grant permission to use the trade names, trademarks, service marks, or product names of the Licensor, except as required for reasonable and customary use in describing the origin of the Work and reproducing the content of the NOTICE file.

7. Disclaimer of Warranty. Unless required by applicable law or agreed to in writing, Licensor provides the Work (and each

Contributor provides its Contributions) on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied, including, without limitation, any warranties or conditions of TITLE, NON-INFRINGEMENT, MERCHANTABILITY, or FITNESS FOR A PARTICULAR PURPOSE. You are solely responsible for determining the appropriateness of using or redistributing the Work and assume any risks associated with Your exercise of permissions under this License.

8. Limitation of Liability. In no event and under no legal theory, whether in tort (including negligence), contract, or otherwise, unless required by applicable law (such as deliberate and grossly negligent acts) or agreed to in writing, shall any Contributor be liable to You for damages, including any direct, indirect, special, incidental, or consequential damages of any character arising as a result of this License or out of the use or inability to use the Work (including but not limited to damages for loss of goodwill, work stoppage, computer failure or malfunction, or any and all other commercial damages or losses), even if such Contributor has been advised of the possibility of such damages.

9. Accepting Warranty or Additional Liability. While redistributing the Work or Derivative Works thereof, You may choose to offer, and charge a fee for, acceptance of support, warranty, indemnity, or other liability obligations and/or rights consistent with this License. However, in accepting such obligations, You may act only on Your own behalf and on Your sole responsibility, not on behalf of any other Contributor, and only if You agree to indemnify, defend, and hold each Contributor harmless for any liability incurred by, or claims asserted against, such Contributor by reason of your accepting any such warranty or additional liability.

END OF TERMS AND CONDITIONS

APPENDIX: How to apply the Apache License to your work.

To apply the Apache License to your work, attach the following boilerplate notice, with the fields enclosed by brackets "{}" replaced with your own identifying information. (Don't include the brackets!) The text should be enclosed in the appropriate comment syntax for the file format. We also recommend that a file or class name and description of purpose be included on the same "printed page" as the copyright notice for easier identification within third-party archives.

Copyright {yyyy} {name of copyright owner}

Licensed under the Apache License, Version 2.0 (the "License");

you may not use this file except in compliance with the License.

You may obtain a copy of the License at

<http://www.apache.org/licenses/LICENSE-2.0>

Unless required by applicable law or agreed to in writing, software distributed under the License is distributed on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.

1.21 clamav 1.4.1

1.21.1 Available under license :

GNU GENERAL PUBLIC LICENSE

Version 2, June 1991

Copyright (C) 1989, 1991 Free Software Foundation, Inc.

51 Franklin St, Fifth Floor, Boston, MA 02110-1301 USA

Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.

Preamble

The licenses for most software are designed to take away your freedom to share and change it. By contrast, the GNU General Public License is intended to guarantee your freedom to share and change free software--to make sure the software is free for all its users. This General Public License applies to most of the Free Software Foundation's software and to any other program whose authors commit to using it. (Some other Free Software Foundation software is covered by the GNU Library General Public License instead.) You can apply it to your programs, too.

When we speak of free software, we are referring to freedom, not price. Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for this service if you wish), that you receive source code or can get it 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. These restrictions translate to certain responsibilities for you if you distribute copies of the software, or if you modify it.

For example, if you distribute copies of such a program, whether gratis or for a fee, you must give the recipients all the rights that you have. 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.

We protect your rights with two steps: (1) copyright the software, and (2) offer you this license which gives you legal permission to copy, distribute and/or modify the software.

Also, for each author's protection and ours, we want to make certain that everyone understands that there is no warranty for this free software. If the software is modified by someone else and passed on, we want its recipients to know that what they have is not the original, so that any problems introduced by others will not reflect on the original authors' reputations.

Finally, any free program is threatened constantly by software patents. We wish to avoid the danger that redistributors of a free program will individually obtain patent licenses, in effect making the program proprietary. To prevent this, we have made it clear that any patent must be licensed for everyone's free use or not licensed at all.

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

GNU GENERAL PUBLIC LICENSE TERMS AND CONDITIONS FOR COPYING, DISTRIBUTION AND MODIFICATION

0. This License applies to any program or other work which contains a notice placed by the copyright holder saying it may be distributed under the terms of this General Public License. The "Program", below, refers to any such program or work, and a "work based on the Program" means either the Program or any derivative work under copyright law: that is to say, a work containing the Program or a portion of it, either verbatim or with modifications and/or translated into another language. (Hereinafter, translation is included without limitation in the term "modification".) Each licensee is addressed as "you".

Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running the Program is not restricted, and the output from the Program is covered only if its contents constitute a work based on the Program (independent of having been made by running the Program). Whether that is true depends on what the Program does.

1. You may copy and distribute 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 and disclaimer of warranty; keep intact all the notices that refer to this License and to the absence of any warranty; and give any other recipients of the Program a copy of this License along with the Program.

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 Program or any portion of it, thus forming a work based on the Program, 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) You must cause the modified files to carry prominent notices stating that you changed the files and the date of any change.

b) You must cause any work that you distribute or publish, that in whole or in part contains or is derived from the Program or any part thereof, to be licensed as a whole at no charge to all third parties under the terms of this License.

c) If the modified program normally reads commands interactively when run, you must cause it, when started running for such interactive use in the most ordinary way, to print or display an announcement including an appropriate copyright notice and a notice that there is no warranty (or else, saying that you provide a warranty) and that users may redistribute the program under these conditions, and telling the user how to view a copy of this License. (Exception: if the Program itself is interactive but does not normally print such an announcement, your work based on the Program is not required to print an announcement.)

These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Program, 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 Program, 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 Program.

In addition, mere aggregation of another work not based on the Program with the Program (or with a work based on the Program) on a volume of a storage or distribution medium does not bring the other work under the scope of this License.

3. You may copy and distribute the Program (or a work based on it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you also do one of the following:

a) 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; or,

b) Accompany it with a written offer, valid for at least three years, to give any third party, for a charge no more than your cost of physically performing source distribution, a complete machine-readable copy of the corresponding source code, to be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange; or,

c) Accompany it with the information you received as to the offer to distribute corresponding source code. (This alternative is allowed only for noncommercial distribution and only if you received the program in object code or executable form with such an offer, in accord with Subsection b above.)

The source code for a work means the preferred form of the work for making modifications to it. For an executable work, 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 executable. 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.

If distribution of executable or 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 counts as distribution of the source code, even though third parties are not

compelled to copy the source along with the object code.

4. You may not copy, modify, sublicense, or distribute the Program except as expressly provided under this License. Any attempt otherwise to copy, modify, sublicense or distribute the Program 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.

5. You are not required to accept this License, since you have not signed it. However, nothing else grants you permission to modify or distribute the Program or its derivative works. These actions are prohibited by law if you do not accept this License. Therefore, by modifying or distributing the Program (or any work based on the Program), you indicate your acceptance of this License to do so, and all its terms and conditions for copying, distributing or modifying the Program or works based on it.

6. Each time you redistribute the Program (or any work based on the Program), the recipient automatically receives a license from the original licensor to copy, distribute or modify the Program subject to these terms and conditions. You may not impose any further restrictions on the recipients' exercise of the rights granted herein. You are not responsible for enforcing compliance by third parties to this License.

7. If, as a consequence of a court judgment or allegation of patent infringement or for any other reason (not limited to patent issues), conditions are imposed on you (whether by court order, agreement or otherwise) that contradict the conditions of this License, they do not excuse you from the conditions of this License. If you cannot distribute so as to satisfy simultaneously your obligations under this License and any other pertinent obligations, then as a consequence you may not distribute the Program at all. For example, if a patent license would not permit royalty-free redistribution of the Program 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 Program.

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; it is up to the author/donor to decide if he or she is willing 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.

8. If the distribution and/or use of the Program is restricted in certain countries either by patents or by copyrighted interfaces, the original copyright holder who places the Program 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.

9. The Free Software Foundation may publish revised and/or new versions of the General Public License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns.

Each version is given a distinguishing version number. If the Program 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 Program does not specify a version number of this License, you may choose any version ever published by the Free Software Foundation.

10. If you wish to incorporate parts of the Program into other free programs whose distribution conditions are different, write to the author to ask for permission. For software which is copyrighted by the Free Software Foundation, write to the Free Software Foundation; we sometimes make exceptions for this. Our decision will be guided by the two goals of preserving the free status of all derivatives of our free software and of promoting the sharing and reuse of software generally.

NO WARRANTY

11. BECAUSE THE PROGRAM IS LICENSED FREE OF CHARGE, THERE IS NO WARRANTY

FOR THE PROGRAM, TO THE EXTENT PERMITTED BY APPLICABLE LAW.

EXCEPT WHEN

OTHERWISE STATED IN WRITING THE COPYRIGHT HOLDERS AND/OR OTHER PARTIES PROVIDE THE PROGRAM "AS IS" WITHOUT 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 THE PROGRAM IS WITH YOU. SHOULD THE PROGRAM PROVE DEFECTIVE, YOU ASSUME THE COST OF ALL NECESSARY SERVICING, REPAIR OR CORRECTION.

12. IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN WRITING WILL ANY COPYRIGHT HOLDER, OR ANY OTHER PARTY WHO MAY MODIFY AND/OR REDISTRIBUTE THE PROGRAM AS PERMITTED ABOVE, BE LIABLE TO YOU FOR DAMAGES, INCLUDING ANY GENERAL, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE PROGRAM (INCLUDING BUT NOT LIMITED TO LOSS OF DATA OR DATA BEING RENDERED INACCURATE OR LOSSES SUSTAINED BY YOU OR THIRD PARTIES OR A FAILURE OF THE PROGRAM TO OPERATE WITH ANY OTHER PROGRAMS), EVEN

IF SUCH HOLDER OR OTHER PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

END OF TERMS AND CONDITIONS

How to Apply These Terms to Your New Programs

If you develop a new program, and you want it to be of the greatest possible use to the public, the best way to achieve this is to make it free software which everyone can redistribute and change under these terms.

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.

<one line to give the program's name and a brief idea of what it does.>

Copyright (C) <year> <name of author>

This program is free software; you can redistribute it and/or modify it under the terms of the GNU General Public License as published by the Free Software Foundation; either version 2 of the License,

or

(at your option) any later version.

This program 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 General Public License for more details.

You should have received a copy of the GNU General Public License along with this program; if not, write to the Free Software Foundation, Inc., 59 Temple Place, Suite 330, Boston, MA 02111-1307 USA

Also add information on how to contact you by electronic and paper mail.

If the program is interactive, make it output a short notice like this when it starts in an interactive mode:

```
Gnomovision version 69, Copyright (C) year name of author
Gnomovision comes with ABSOLUTELY NO WARRANTY; for details type `show w'.
This is free software, and you are welcome to redistribute it
under certain conditions; type `show c' for details.
```

The hypothetical commands `show w' and `show c' should show the appropriate parts of the General Public License. Of course, the commands you use may be called something other than `show w' and `show c'; they could even be mouse-clicks or menu items--whatever suits your program.

You should also get your employer (if you work as a programmer) or your school, if any, to sign a "copyright disclaimer" for the program, if necessary. Here is a sample; alter the names:

```
Yoyodyne, Inc., hereby disclaims all copyright interest in the program
`Gnomovision' (which makes passes at compilers) written by James Hacker.
```

```
<signature of Ty Coon>, 1 April 1989
Ty Coon, President of Vice
```

This General Public License does not permit incorporating your program into proprietary programs. If your program is a subroutine library, you may consider it more useful to permit linking proprietary applications with the library. If this is what you want to do, use the GNU Library General Public License instead of this License.

REGARDING OPENSSL

In addition, as a special exception, the copyright holders give permission to link the code of portions of this program with the OpenSSL library under certain conditions as described in each individual source file, and distribute linked combinations including the two.

You must obey the GNU General Public License in all respects for all of the code used other than OpenSSL. If you modify

file(s) with this exception, you may extend this exception to your version of the file(s), but you are not obligated to do so. If you do not wish to do so, delete this exception statement from your version. If you delete this exception statement from all source files in the program, then also delete it here.

GNU LESSER GENERAL PUBLIC LICENSE
Version 2.1, February 1999

Copyright (C) 1991, 1999 Free Software Foundation, Inc.
51 Franklin St, Fifth Floor, Boston, MA 02110-1301 USA
Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.

[This is the first released version of the Lesser GPL. It also counts as the successor of the GNU Library Public License, version 2, hence the version number 2.1.]

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.

This license, the Lesser General Public License, applies to some specially designated software packages--typically libraries--of the Free Software Foundation and other authors who decide to use it. You can use it too, but we suggest you first think carefully about whether this license or the ordinary General Public License is the better strategy to use in any particular case, based on the explanations below.

When we speak of free software, we are referring to freedom of use, not price. Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for this service if you wish); that you receive source code or can get it if you want it; that you can change the software and use pieces of it in new free programs; and that you are informed that you can do these things.

To protect your rights, we need to make restrictions that forbid distributors to deny you these rights or to ask you to surrender these rights. These restrictions translate to certain responsibilities for you if 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 you. You must make sure that they, too, receive or can get the source code. If you link other code 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.

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.

To protect each distributor, we want to make it very clear that there is no warranty for the free library. Also, if the library is modified by someone else and passed on, the recipients should know that what they have is not the original version, so that the original author's reputation will not be affected by problems that might be introduced by others.

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.

Most GNU software, including some libraries, is covered by the ordinary GNU General Public License. This license, the GNU Lesser General Public License, applies to certain designated libraries, and is quite different from the ordinary General Public License. We use this license for certain libraries in order to permit linking those libraries into non-free programs.

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.

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.

GNU LESSER GENERAL PUBLIC LICENSE TERMS AND CONDITIONS FOR COPYING, DISTRIBUTION AND MODIFICATION

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 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 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.

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.

9. You are not required to accept this License, since you have not signed it. However, nothing else grants you permission to modify or

distribute the Library or its derivative works. These actions are prohibited by law if you do not accept this License. Therefore, by modifying or distributing the Library (or any work based on the Library), you indicate your acceptance of this License to do so, and all its terms and conditions for copying, distributing or modifying the Library or works based on it.

10. Each time you redistribute the Library (or any work based on the Library), the recipient automatically receives a license from the original licensor to copy, distribute, link with or modify the Library subject to these terms and conditions. You may not impose any further restrictions on the recipients' exercise of the rights granted herein. You are not responsible for enforcing compliance by third parties with this License.

11. If, as a consequence of a court judgment or allegation of patent infringement or for any other reason (not limited to patent issues), conditions are imposed on you (whether by court order, agreement or otherwise) that contradict the conditions of this License, they do not excuse you from the conditions of this License. If you cannot distribute so as to satisfy simultaneously your obligations under this License and any other pertinent obligations, then as a consequence you may not distribute the Library at all. For example, if a patent 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; it is up to the author/donor to decide if he or she is willing 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.

13. The Free Software Foundation may publish revised and/or new versions of the Lesser General Public License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns.

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.

14. If you wish to incorporate parts of the Library into other free programs whose distribution conditions are incompatible with these, write to the author to ask for permission. For software which is copyrighted by the Free Software Foundation, write to the Free Software Foundation; we sometimes make exceptions for this. Our decision will be guided by the two goals of preserving the free status of all derivatives of our free software and of promoting the sharing and reuse of software generally.

NO WARRANTY

15. BECAUSE THE LIBRARY IS LICENSED FREE OF CHARGE, THERE IS NO WARRANTY FOR THE LIBRARY, TO THE EXTENT PERMITTED BY APPLICABLE LAW. EXCEPT WHEN OTHERWISE STATED IN WRITING THE COPYRIGHT HOLDERS AND/OR OTHER PARTIES PROVIDE THE LIBRARY "AS IS" WITHOUT 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 THE LIBRARY IS WITH YOU. SHOULD THE LIBRARY PROVE DEFECTIVE, YOU ASSUME THE COST OF ALL NECESSARY SERVICING, REPAIR OR CORRECTION.

16. IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN WRITING WILL ANY COPYRIGHT HOLDER, OR ANY OTHER PARTY WHO MAY MODIFY

AND/OR REDISTRIBUTE THE LIBRARY AS PERMITTED ABOVE, BE
LIABLE TO YOU
FOR DAMAGES, INCLUDING ANY GENERAL, SPECIAL, INCIDENTAL OR
CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE
LIBRARY (INCLUDING BUT NOT LIMITED TO LOSS OF DATA OR DATA BEING
RENDERED INACCURATE OR LOSSES SUSTAINED BY YOU OR THIRD PARTIES OR A
FAILURE OF THE LIBRARY TO OPERATE WITH ANY OTHER SOFTWARE), EVEN IF
SUCH HOLDER OR OTHER PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH
DAMAGES.

END OF TERMS AND CONDITIONS

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.>  
Copyright (C) <year> <name of author>
```

This library is free software; you can redistribute it and/or modify it under the terms of the GNU Lesser General Public License as published by the Free Software Foundation; either version 2.1 of the License, or (at your option) any later version.

This 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 Lesser General Public License for more details.

You should have received a copy of the GNU Lesser General Public License along with this library; if not, write to the Free Software Foundation, Inc., 51 Franklin St, 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!

GNU LESSER GENERAL PUBLIC LICENSE
Version 2.1, February 1999

Copyright (C) 1991, 1999 Free Software Foundation, Inc.
59 Temple Place, Suite 330, Boston, MA 02111-1307 USA
Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.

[This is the first released version of the Lesser GPL. It also counts as the successor of the GNU Library Public License, version 2, hence the version number 2.1.]

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.

This license, the Lesser General Public License, applies to some specially designated software packages--typically libraries--of the Free Software Foundation and other authors who decide to use it. You can use it too, but we suggest you first think carefully about whether this license or the ordinary General Public License is the better strategy to use in any particular case, based on the explanations below.

When we speak of free software, we are referring to freedom of use, not price. Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for this service if you wish); that you receive source code or can get it if you want it; that you can change the software and use pieces of it in new free programs; and that you are informed that you can do these things.

To protect your rights, we need to make restrictions that forbid

distributors to deny you these rights or to ask you to surrender these rights. These restrictions translate to certain responsibilities for you if 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 you. You must make sure that they, too, receive or can get the source code. If you link other code 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.

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.

To protect each distributor, we want to make it very clear that there is no warranty for the free library. Also, if the library is modified by someone else and passed on, the recipients should know that what they have is not the original version, so that the original author's reputation will not be affected by problems that might be introduced by others.

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.

Most GNU software, including some libraries, is covered by the ordinary GNU General Public License. This license, the GNU Lesser General Public License, applies to certain designated libraries, and is quite different from the ordinary General Public License. We use this license for certain libraries in order to permit linking those libraries into non-free programs.

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.

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.

GNU LESSER GENERAL PUBLIC LICENSE TERMS AND CONDITIONS FOR COPYING, DISTRIBUTION AND MODIFICATION

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 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 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.

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.

9. You are not required to accept this License, since you have not signed it. However, nothing else grants you permission to modify or distribute the Library or its derivative works. These actions are prohibited by law if you do not accept this License. Therefore, by modifying or distributing the Library (or any work based on the Library), you indicate your acceptance of this License to do so, and all its terms and conditions for copying, distributing or modifying the Library or works based on it.

10. Each time you redistribute the Library (or any work based on the Library), the recipient automatically receives a license from the original licensor to copy, distribute, link with or modify the Library subject to these terms and conditions. You may not impose any further restrictions on the recipients' exercise of the rights granted herein. You are not responsible for enforcing compliance by third parties with this License.

11. If, as a consequence of a court judgment or allegation of patent infringement or for any other reason (not limited to patent issues), conditions are imposed on you (whether by court order, agreement or otherwise) that contradict the conditions of this License, they do not excuse you from the conditions of this License. If you cannot distribute so as to satisfy simultaneously your obligations under this License and any other pertinent obligations, then as a consequence you may not distribute the Library at all. For example, if a patent 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; it is up to the author/donor to decide if he or she is willing 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.

13. The Free Software Foundation may publish revised and/or new versions of the Lesser General Public License from time to time.

Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns.

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.

14. If you wish to incorporate parts of the Library into other free programs whose distribution conditions are incompatible with these, write to the author to ask for permission. For software which is copyrighted by the Free Software Foundation, write to the Free Software Foundation; we sometimes make exceptions for this. Our decision will be guided by the two goals of preserving the free status of all derivatives of our free software and of promoting the sharing and reuse of software generally.

NO WARRANTY

15. BECAUSE THE LIBRARY IS LICENSED FREE OF CHARGE, THERE IS NO WARRANTY FOR THE LIBRARY, TO THE EXTENT PERMITTED BY APPLICABLE LAW. EXCEPT WHEN OTHERWISE STATED IN WRITING THE COPYRIGHT HOLDERS AND/OR OTHER PARTIES PROVIDE THE LIBRARY "AS IS" WITHOUT 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 THE LIBRARY IS WITH YOU. SHOULD THE LIBRARY PROVE DEFECTIVE, YOU ASSUME THE COST OF ALL NECESSARY SERVICING, REPAIR OR CORRECTION.

16. IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN WRITING WILL ANY COPYRIGHT HOLDER, OR ANY OTHER PARTY WHO MAY MODIFY AND/OR REDISTRIBUTE THE LIBRARY AS PERMITTED ABOVE, BE LIABLE TO YOU FOR DAMAGES, INCLUDING ANY GENERAL, SPECIAL, INCIDENTAL OR CONSEQUENTIAL

DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE LIBRARY (INCLUDING BUT NOT LIMITED TO LOSS OF DATA OR DATA BEING RENDERED INACCURATE OR LOSSES SUSTAINED BY YOU OR THIRD PARTIES OR A FAILURE OF THE LIBRARY TO OPERATE WITH ANY OTHER SOFTWARE), EVEN IF SUCH HOLDER OR OTHER PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

END OF TERMS AND CONDITIONS

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.>  
Copyright (C) <year> <name of author>
```

This library is free software; you can redistribute it and/or modify it under the terms of the GNU Lesser General Public License as published by the Free Software Foundation; either version 2.1 of the License, or (at your option) any later version.

This 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 Lesser General Public License for more details.

You should have received a copy of the GNU Lesser General Public License along with this library; if not, write to the Free Software Foundation, Inc., 59 Temple Place, Suite 330, Boston, MA 02111-1307 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!
getopt.c - my re-implementation of getopt.
Copyright 1997, 2000, 2001, 2002, 2006, Benjamin Sittler

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

```
*****  *****  *****  UnRAR - free utility for RAR archives
**  **  **  **  **  **  ~~~~~
*****  *****  *****  License for use and distribution of
**  **  **  **  **  **  ~~~~~
**  **  **  **  **  **  FREE portable version
~~~~~
```

The source code of UnRAR utility is freeware. This means:

1. All copyrights to RAR and the utility UnRAR are exclusively owned by the author - Alexander Roshal.
2. UnRAR source code may be used in any software to handle RAR archives without limitations free of charge, but cannot be

used to develop RAR (WinRAR) compatible archiver and to re-create RAR compression algorithm, which is proprietary. Distribution of modified UnRAR source code in separate form or as a part of other software is permitted, provided that full text of this paragraph, starting from "UnRAR source code" words, is included in license, or in documentation if license is not available, and in source code comments of resulting package.

3. The UnRAR utility may be freely distributed. It is allowed to distribute UnRAR inside of other software packages.
4. THE RAR ARCHIVER AND THE UnRAR UTILITY ARE DISTRIBUTED "AS IS". NO WARRANTY OF ANY KIND IS EXPRESSED OR IMPLIED. YOU USE AT YOUR OWN RISK. THE AUTHOR WILL NOT BE LIABLE FOR DATA LOSS, DAMAGES, LOSS OF PROFITS OR ANY OTHER KIND OF LOSS WHILE USING OR MISUSING THIS SOFTWARE.
5. Installing and using the UnRAR utility signifies acceptance of these terms and conditions of the license.
6. If you don't agree with terms of the license you must remove UnRAR files from your storage devices and cease to use the utility.

Thank you for your interest in RAR and UnRAR.

Alexander L. Roshal
GNU GENERAL PUBLIC LICENSE
Version 2, June 1991

Copyright (C) 1989, 1991 Free Software Foundation, Inc.
59 Temple Place, Suite 330, Boston, MA 02111-1307 USA
Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.

Preamble

The licenses for most software are designed to take away your freedom to share and change it. By contrast, the GNU General Public License is intended to guarantee your freedom to share and change free software--to make sure the software is free for all its users. This General Public License applies to most of the Free Software Foundation's software and to any other program whose authors commit to using it. (Some other Free Software Foundation software is covered by the GNU Library General Public License instead.) You can apply it to your programs, too.

When we speak of free software, we are referring to freedom, not price. Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for this service if you wish), that you receive source code or can get it 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. These restrictions translate to certain responsibilities for you if you distribute copies of the software, or if you modify it.

For example, if you distribute copies of such a program, whether gratis or for a fee, you must give the recipients all the rights that you have. 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.

We protect your rights with two steps: (1) copyright the software, and (2) offer you this license which gives you legal permission to copy, distribute and/or modify the software.

Also, for each author's protection and ours, we want to make certain that everyone understands that there is no warranty for this free software. If the software is modified by someone else and passed on, we want its recipients to know that what they have is not the original, so that any problems introduced by others will not reflect on the original authors' reputations.

Finally, any free program is threatened constantly by software patents. We wish to avoid the danger that redistributors of a free program will individually obtain patent licenses, in effect making the program proprietary. To prevent this, we have made it clear that any patent must be licensed for everyone's free use or not licensed at all.

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

GNU GENERAL PUBLIC LICENSE TERMS AND CONDITIONS FOR COPYING, DISTRIBUTION AND MODIFICATION

0. This License applies to any program or other work which contains a notice placed by the copyright holder saying it may be distributed under the terms of this General Public License. The "Program", below,

refers to any such program or work, and a "work based on the Program" means either the Program or any derivative work under copyright law: that is to say, a work containing the Program or a portion of it, either verbatim or with modifications and/or translated into another language. (Hereinafter, translation is included without limitation in the term "modification".) Each licensee is addressed as "you".

Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running the Program is not restricted, and the output from the Program is covered only if its contents constitute a work based on the Program (independent of having been made by running the Program). Whether that is true depends on what the Program does.

1. You may copy and distribute 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 and disclaimer of warranty; keep intact all the notices that refer to this License and to the absence of any warranty; and give any other recipients of the Program a copy of this License along with the Program.

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 Program or any portion of it, thus forming a work based on the Program, 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) You must cause the modified files to carry prominent notices stating that you changed the files and the date of any change.

b) You must cause any work that you distribute or publish, that in whole or in part contains or is derived from the Program or any part thereof, to be licensed as a whole at no charge to all third parties under the terms of this License.

c) If the modified program normally reads commands interactively when run, you must cause it, when started running for such interactive use in the most ordinary way, to print or display an announcement including an appropriate copyright notice and a notice that there is no warranty (or else, saying that you provide a warranty) and that users may redistribute the program under these conditions, and telling the user how to view a copy of this License. (Exception: if the Program itself is interactive but

does not normally print such an announcement, your work based on the Program is not required to print an announcement.)

These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Program, 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 Program, 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 Program.

In addition, mere aggregation of another work not based on the Program with the Program (or with a work based on the Program) on a volume of a storage or distribution medium does not bring the other work under the scope of this License.

3. You may copy and distribute the Program (or a work based on it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you also do one of the following:

a) 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; or,

b) Accompany it with a written offer, valid for at least three years, to give any third party, for a charge no more than your cost of physically performing source distribution, a complete machine-readable copy of the corresponding source code, to be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange; or,

c) Accompany it with the information you received as to the offer to distribute corresponding source code. (This alternative is allowed only for noncommercial distribution and only if you received the program in object code or executable form with such an offer, in accord with Subsection b above.)

The source code for a work means the preferred form of the work for

making modifications to it. For an executable work, 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 executable. 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.

If distribution of executable or 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 counts as distribution of the source code, even though third parties are not compelled to copy the source along with the object code.

4. You may not copy, modify, sublicense, or distribute the Program except as expressly provided under this License. Any attempt otherwise to copy, modify, sublicense or distribute the Program 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.

5. You are not required to accept this License, since you have not signed it. However, nothing else grants you permission to modify or distribute the Program or its derivative works. These actions are prohibited by law if you do not accept this License. Therefore, by modifying or distributing the Program (or any work based on the Program), you indicate your acceptance of this License to do so, and all its terms and conditions for copying, distributing or modifying the Program or works based on it.

6. Each time you redistribute the Program (or any work based on the Program), the recipient automatically receives a license from the original licensor to copy, distribute or modify the Program subject to these terms and conditions. You may not impose any further restrictions on the recipients' exercise of the rights granted herein. You are not responsible for enforcing compliance by third parties to this License.

7. If, as a consequence of a court judgment or allegation of patent infringement or for any other reason (not limited to patent issues), conditions are imposed on you (whether by court order, agreement or otherwise) that contradict the conditions of this License, they do not excuse you from the conditions of this License. If you cannot

distribute so as to satisfy simultaneously your obligations under this License and any other pertinent obligations, then as a consequence you may not distribute the Program at all. For example, if a patent license would not permit royalty-free redistribution of the Program 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 Program.

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; it is up to the author/donor to decide if he or she is willing 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.

8. If the distribution and/or use of the Program is restricted in certain countries either by patents or by copyrighted interfaces, the original copyright holder who places the Program 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.

9. The Free Software Foundation may publish revised and/or new versions of the General Public License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns.

Each version is given a distinguishing version number. If the Program 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 Program does not specify a version number of

this License, you may choose any version ever published by the Free Software Foundation.

10. If you wish to incorporate parts of the Program into other free programs whose distribution conditions are different, write to the author to ask for permission. For software which is copyrighted by the Free Software Foundation, write to the Free Software Foundation; we sometimes make exceptions for this. Our decision will be guided by the two goals of preserving the free status of all derivatives of our free software and of promoting the sharing and reuse of software generally.

NO WARRANTY

11. BECAUSE THE PROGRAM IS LICENSED FREE OF CHARGE, THERE IS NO WARRANTY FOR THE PROGRAM, TO THE EXTENT PERMITTED BY APPLICABLE LAW.

EXCEPT WHEN

OTHERWISE STATED IN WRITING THE COPYRIGHT HOLDERS AND/OR OTHER PARTIES PROVIDE THE PROGRAM "AS IS" WITHOUT 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 THE PROGRAM IS WITH YOU. SHOULD THE PROGRAM PROVE DEFECTIVE, YOU ASSUME THE COST OF ALL NECESSARY SERVICING, REPAIR OR CORRECTION.

12. IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN WRITING WILL ANY COPYRIGHT HOLDER, OR ANY OTHER PARTY WHO MAY MODIFY AND/OR REDISTRIBUTE THE PROGRAM AS PERMITTED ABOVE, BE LIABLE TO YOU FOR DAMAGES, INCLUDING ANY GENERAL, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE PROGRAM (INCLUDING BUT NOT LIMITED TO LOSS OF DATA OR DATA BEING RENDERED INACCURATE OR LOSSES SUSTAINED BY YOU OR THIRD PARTIES OR A FAILURE OF THE PROGRAM TO OPERATE WITH ANY OTHER PROGRAMS), EVEN IF SUCH HOLDER OR OTHER PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

END OF TERMS AND CONDITIONS

How to Apply These Terms to Your New Programs

If you develop a new program, and you want it to be of the greatest possible use to the public, the best way to achieve this is to make it free software which everyone can redistribute and change under these terms.

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.

<one line to give the program's name and a brief idea of what it does.>

Copyright (C) <year> <name of author>

This program is free software; you can redistribute it and/or modify it under the terms of the GNU General Public License as published by the Free Software Foundation; either version 2 of the License, or (at your option) any later version.

This program 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 General Public License for more details.

You should have received a copy of the GNU General Public License along with this program; if not, write to the Free Software Foundation, Inc., 59 Temple Place, Suite 330, Boston, MA 02111-1307 USA

Also add information on how to contact you by electronic and paper mail.

If the program is interactive, make it output a short notice like this when it starts in an interactive mode:

```
Gnomovision version 69, Copyright (C) year name of author
Gnomovision comes with ABSOLUTELY NO WARRANTY; for details type `show w'.
This is free software, and you are welcome to redistribute it
under certain conditions; type `show c' for details.
```

The hypothetical commands `show w' and `show c' should show the appropriate parts of the General Public License. Of course, the commands you use may be called something other than `show w' and `show c'; they could even be mouse-clicks or menu items--whatever suits your program.

You should also get your employer (if you work as a programmer) or your school, if any, to sign a "copyright disclaimer" for the program, if necessary. Here is a sample; alter the names:

```
Yoyodyne, Inc., hereby disclaims all copyright interest in the program
`Gnomovision' (which makes passes at compilers) written by James Hacker.
```

```
<signature of Ty Coon>, 1 April 1989
Ty Coon, President of Vice
```

This General Public License does not permit incorporating your program into proprietary programs. If your program is a subroutine library, you may consider it more useful to permit linking proprietary applications with the

library. If this is what you want to do, use the GNU Library General Public License instead of this License.

libclamav/textdet.c includes modified code from file-4.23/src/ascmagic.c.

The original LEGAL.NOTICE file for file-4.23 is reproduced below.

\$File: LEGAL.NOTICE,v 1.15 2006/05/03 18:48:33 christos Exp \$
Copyright (c) Ian F. Darwin 1986, 1987, 1989, 1990, 1991, 1992, 1994, 1995.
Software written by Ian F. Darwin and others;
maintained 1994- Christos Zoulas.

This software is not subject to any export provision of the United States Department of Commerce, and may be exported to any country or planet.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice immediately at the beginning of the file, without modification, this list of conditions, and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.

THIS SOFTWARE IS PROVIDED BY THE AUTHOR AND CONTRIBUTORS ``AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHOR OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

zlib/libpng license

This software is provided 'as-is', without any express or implied warranty. In no event will the authors be held liable for any damages arising from the use of this software.

Permission is granted to anyone to use this software for any purpose, including commercial applications, and to alter it and redistribute it freely, subject to the following restrictions:

1. The origin of this software must not be misrepresented; you must not

claim that you wrote the original software. If you use this software in a product, an acknowledgment in the product documentation would be appreciated but is not required.

2. Altered source versions must be plainly marked as such, and must not be misrepresented as being the original software.

3. This notice may not be removed or altered from any source distribution.

Modified files from libbzip2 are present under libclamav/nsis.

The original LICENSE file for bzip2 and libbzip2 is reproduced below.

This program, "bzip2", the associated library "libbzip2", and all documentation, are copyright (C) 1996-2006 Julian R Seward. All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. The origin of this software must not be misrepresented; you must not claim that you wrote the original software. If you use this software in a product, an acknowledgment in the product documentation would be appreciated but is not required.
3. Altered source versions must be plainly marked as such, and must not be misrepresented as being the original software.
4. The name of the author may not be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE AUTHOR ``AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHOR BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

Julian Seward, Cambridge, UK.
jseward@bzip.org
bzip2/libbzip2 version 1.0.4 of 20 December 2006

COPYRIGHT AND PERMISSION NOTICE

Copyright (c) 1996 - 2019, Daniel Stenberg, <daniel@haxx.se>, and many contributors, see the THANKS file.

All rights reserved.

Permission to use, copy, modify, and distribute this software for any purpose with or without fee is hereby granted, provided that the above copyright notice and this permission notice appear in all copies.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT OF THIRD PARTY RIGHTS. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

Except as contained in this notice, the name of a copyright holder shall not be used in advertising or otherwise to promote the sale, use or other dealings

in this Software without prior written authorization of the copyright holder.

Modified files from the YARA project exist in libclamav. These have file names with "yara_" prefixing the original yara file names. The YARA project uses the license below:

Apache License
Version 2.0, January 2004
<http://www.apache.org/licenses/>

TERMS AND CONDITIONS FOR USE, REPRODUCTION, AND DISTRIBUTION

1. Definitions.

"License" shall mean the terms and conditions for use, reproduction, and distribution as defined by Sections 1 through 9 of this document.

"Licensor" shall mean the copyright owner or entity authorized by the copyright owner that is granting the License.

"Legal Entity" shall mean the union of the acting entity and all other entities that control, are controlled by, or are under common control with that entity. For the purposes of this definition, "control" means (i) the power, direct or indirect, to cause the direction or management of such entity, whether by contract or otherwise, or (ii) ownership of fifty percent (50%) or more of the outstanding shares, or (iii) beneficial ownership of such entity.

"You" (or "Your") shall mean an individual or Legal Entity exercising permissions granted by this License.

"Source" form shall mean the preferred form for making modifications, including but not limited to software source code, documentation source, and configuration files.

"Object" form shall mean any form resulting from mechanical transformation or translation of a Source form, including but not limited to compiled object code, generated documentation, and conversions to other media types.

"Work" shall mean the work of authorship, whether in Source or Object form, made available under the License, as indicated by a copyright notice that is included in or attached to the work (an example is provided in the Appendix below).

"Derivative Works" shall mean any work, whether in Source or Object form, that is based on (or derived from) the Work and for which the editorial revisions, annotations, elaborations, or other modifications represent, as a whole, an original work of authorship. For the purposes of this License, Derivative Works shall not include works that remain separable from, or merely link (or bind by name) to the interfaces of, the Work and Derivative Works thereof.

"Contribution" shall mean any work of authorship, including the original version of the Work and any modifications or additions to that Work or Derivative Works thereof, that is intentionally submitted to Licensor for inclusion in the Work by the copyright owner or by an individual or Legal Entity authorized to submit on behalf of the copyright owner. For the purposes of this definition, "submitted" means any form of electronic, verbal, or written communication sent to the Licensor or its representatives, including but not limited to communication on electronic mailing lists, source code control systems, and issue tracking systems that are managed by, or on behalf of, the Licensor for the purpose of discussing and improving the Work, but excluding communication that is conspicuously marked or otherwise

designated in writing by the copyright owner as "Not a Contribution."

"Contributor" shall mean Licensor and any individual or Legal Entity on behalf of whom a Contribution has been received by Licensor and subsequently incorporated within the Work.

2. Grant of Copyright License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable copyright license to reproduce, prepare Derivative Works of, publicly display, publicly perform, sublicense, and distribute the Work and such Derivative Works in Source or Object form.

3. Grant of Patent License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable (except as stated in this section) patent license to make, have made, use, offer to sell, sell, import, and otherwise transfer the Work, where such license applies only to those patent claims licensable by such Contributor that are necessarily infringed by their Contribution(s) alone or by combination of their Contribution(s) with the Work to which such Contribution(s) was submitted. If You institute patent litigation against any entity (including a cross-claim or counterclaim in a lawsuit) alleging that the Work or a Contribution incorporated within the Work constitutes direct or contributory patent infringement, then any patent licenses granted to You under this License for that Work shall terminate as of the date such litigation is filed.

4. Redistribution. You may reproduce and distribute copies of the Work or Derivative Works thereof in any medium, with or without modifications, and in Source or Object form, provided that You meet the following conditions:

- (a) You must give any other recipients of the Work or Derivative Works a copy of this License; and
- (b) You must cause any modified files to carry prominent notices stating that You changed the files; and
- (c) You must retain, in the Source form of any Derivative Works that You distribute, all copyright, patent, trademark, and attribution notices from the Source form of the Work, excluding those notices that do not pertain to any part of the Derivative Works; and

(d) If the Work includes a "NOTICE" text file as part of its distribution, then any Derivative Works that You distribute must include a readable copy of the attribution notices contained within such NOTICE file, excluding those notices that do not pertain to any part of the Derivative Works, in at least one of the following places: within a NOTICE text file distributed as part of the Derivative Works; within the Source form or documentation, if provided along with the Derivative Works; or, within a display generated by the Derivative Works, if and wherever such third-party notices normally appear. The contents of the NOTICE file are for informational purposes only and do not modify the License. You may add Your own attribution notices within Derivative Works that You distribute, alongside or as an addendum to the NOTICE text from the Work, provided that such additional attribution notices cannot be construed as modifying the License.

You may add Your own copyright statement to Your modifications and may provide additional or different license terms and conditions for use, reproduction, or distribution of Your modifications, or for any such Derivative Works as a whole, provided Your use, reproduction, and distribution of the Work otherwise complies with the conditions stated in this License.

5. Submission of Contributions. Unless You explicitly state otherwise, any Contribution intentionally submitted for inclusion in the Work by You to the Licensor shall be under the terms and conditions of this License, without any additional terms or conditions.

Notwithstanding the above, nothing herein shall supersede or modify the terms of any separate license agreement you may have executed with Licensor regarding such Contributions.

6. Trademarks. This License does not grant permission to use the trade names, trademarks, service marks, or product names of the Licensor, except as required for reasonable and customary use in describing the origin of the Work and reproducing the content of the NOTICE file.

7. Disclaimer of Warranty. Unless required by applicable law or agreed to in writing, Licensor provides the Work (and each Contributor provides its Contributions) on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied, including, without limitation, any warranties or conditions of TITLE, NON-INFRINGEMENT, MERCHANTABILITY, or FITNESS FOR A PARTICULAR PURPOSE. You are solely responsible for determining the appropriateness of using or redistributing the Work and assume any

risks associated with Your exercise of permissions under this License.

8. **Limitation of Liability.** In no event and under no legal theory, whether in tort (including negligence), contract, or otherwise, unless required by applicable law (such as deliberate and grossly negligent acts) or agreed to in writing, shall any Contributor be liable to You for damages, including any direct, indirect, special, incidental, or consequential damages of any character arising as a result of this License or out of the use or inability to use the Work (including but not limited to damages for loss of goodwill, work stoppage, computer failure or malfunction, or any and all other commercial damages or losses), even if such Contributor has been advised of the possibility of such damages.
9. **Accepting Warranty or Additional Liability.** While redistributing the Work or Derivative Works thereof, You may choose to offer, and charge a fee for, acceptance of support, warranty, indemnity, or other liability obligations and/or rights consistent with this License. However, in accepting such obligations, You may act only on Your own behalf and on Your sole responsibility, not on behalf of any other Contributor, and only if You agree to indemnify, defend, and hold each Contributor harmless for any liability incurred by, or claims asserted against, such Contributor by reason of your accepting any such warranty or additional liability.

END OF TERMS AND CONDITIONS

APPENDIX: How to apply the Apache License to your work.

To apply the Apache License to your work, attach the following boilerplate notice, with the fields enclosed by brackets "[]" replaced with your own identifying information. (Don't include the brackets!) The text should be enclosed in the appropriate comment syntax for the file format. We also recommend that a file or class name and description of purpose be included on the same "printed page" as the copyright notice for easier identification within third-party archives.

Copyright [yyyy] [name of copyright owner]

Licensed under the
Apache License, Version 2.0 (the "License");
you may not use this file except in compliance with the License.
You may obtain a copy of the License at

<http://www.apache.org/licenses/LICENSE-2.0>

Unless required by applicable law or agreed to in writing, software distributed under the License is distributed on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.

The original lzma.txt license file, a small portion of which is reproduced below, is available under libclamav/7z/lzma.txt.

LICENSE

LZMA SDK is written and placed in the public domain by Igor Pavlov. The files in libclamav/c++/llvm are from the LLVM project, original license is in libclamav/c++/llvm/LICENSE.TXT:

LLVM Release License

University of Illinois/NCSA
Open Source License

Copyright (c) 2003-2009 University of Illinois at Urbana-Champaign.
All rights reserved.

Developed by:

LLVM Team

University of Illinois at Urbana-Champaign

<http://llvm.org>

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal with the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

- * Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimers.
- * Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimers in the documentation and/or other materials provided with the distribution.

* Neither the names of the LLVM Team, University of Illinois at Urbana-Champaign, nor the names of its contributors may be used to endorse or promote products derived from this Software without specific prior written permission.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE CONTRIBUTORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS WITH THE SOFTWARE.

Copyrights and Licenses for Third Party Software Distributed with LLVM:

The LLVM software contains code written by third parties. Such software will have its own individual LICENSE.TXT file in the directory in which it appears. This file will describe the copyrights, license, and restrictions which apply to that code.

The disclaimer of warranty in the University of Illinois Open Source License applies to all code in the LLVM Distribution, and nothing in any of the other licenses gives permission to use the names of the LLVM Team or the University of Illinois to endorse or promote products derived from this Software.

The following pieces of software have additional or alternate copyrights, licenses, and/or restrictions:

Program	Directory
-----	-----
Autoconf	llvm/autoconf llvm/projects/ModuleMaker/autoconf llvm/projects/sample/autoconf
CellSPU backend	llvm/lib/Target/CellSPU/README.txt
Google Test	llvm/utils/unittest/googletest

The code in libclamav/regex/ is derived from OpenBSD's libc/regex, original license follows:

Copyright (c) 1992, 1993, 1994 Henry Spencer.

Copyright (c) 1992, 1993, 1994

The Regents of the University of California. All rights reserved.

This code is derived from software contributed to Berkeley by Henry Spencer.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. Neither the name of the University nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE REGENTS AND CONTRIBUTORS ``AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE REGENTS OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

The libclamunrar code is based on the work of Alexander L. Roshal (C)

The UnRAR sources may be used in any software to handle RAR archives without limitations free of charge, but cannot be used to re-create the RAR compression algorithm, which is proprietary. Distribution of modified unRAR sources in separate form or as a part of other software is permitted, provided that it is clearly stated in the documentation and source comments that the code may not be used to develop a RAR (WinRAR) compatible archiver.

Original UnRAR licence:

```
*****  *****  *****  UnRAR - free utility for RAR archives
**  **  **  **  **  **  ~~~~~
*****  *****  *****  License for use and distribution of
**  **  **  **  **  **  ~~~~~
**  **  **  **  **  **  FREE portable version
~~~~~
```

The source code of UnRAR utility is freeware. This means:

1. All copyrights to RAR and the utility UnRAR are exclusively owned by the author - Alexander Roshal.

2. The UnRAR sources may be used in any software to handle RAR archives without limitations free of charge, but cannot be used to re-create the RAR compression algorithm, which is proprietary. Distribution of modified UnRAR sources in separate form or as a part of other software is permitted, provided that it is clearly stated in the documentation and source comments that the code may not be used to develop a RAR (WinRAR) compatible archiver.
3. The UnRAR utility may be freely distributed. It is allowed to distribute UnRAR inside of other software packages.
4. THE RAR ARCHIVER AND THE UnRAR UTILITY ARE DISTRIBUTED "AS IS". NO WARRANTY OF ANY KIND IS EXPRESSED OR IMPLIED. YOU USE AT YOUR OWN RISK. THE AUTHOR WILL NOT BE LIABLE FOR DATA LOSS, DAMAGES, LOSS OF PROFITS OR ANY OTHER KIND OF LOSS WHILE USING OR MISUSING THIS SOFTWARE.
5. Installing and using the UnRAR utility signifies acceptance of these terms and conditions of the license.
6. If you don't agree with terms of the license you must remove UnRAR files from your storage devices and cease to use the utility.

Thank you for your interest in RAR and UnRAR.

Alexander L. Roshal

The MIT License (MIT)

Copyright (c) 2016 Johan Hanssen Seferidis

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM,

OUT

OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

PCRE LICENCE

PCRE is a library of functions to support regular expressions whose syntax and semantics are as close as possible to those of the Perl 5 language.

Release 7 of PCRE is distributed under the terms of the "BSD" licence, as specified below. The documentation for PCRE, supplied in the "doc" directory, is distributed under the same terms as the software itself.

The basic library functions are written in C and are freestanding. Also included in the distribution is a set of C++ wrapper functions.

THE BASIC LIBRARY FUNCTIONS

Written by: Philip Hazel
Email local part: ph10
Email domain: cam.ac.uk

University of Cambridge Computing Service,
Cambridge, England. Phone: +44 1223 334714.

Copyright (c) 1997-2006 University of Cambridge
All rights reserved.

THE C++ WRAPPER FUNCTIONS

Contributed by: Google Inc.

Copyright (c) 2006, Google Inc.
All rights reserved.

THE "BSD" LICENCE

Redistribution
and use in source and binary forms, with or without
modification, are permitted provided that the following conditions are met:

* Redistributions of source code must retain the above copyright notice,

this list of conditions and the following disclaimer.

* Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.

* Neither the name of the University of Cambridge nor the name of Google Inc. nor the names of their contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT OWNER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

End

1.22 xmlsec 1.2.38

1.22.1 Available under license :

See Copyright file for information about the copyright
xmlsec, xmlsec-openssl, xmlsec-gnutls, xmlsec-gcrypt libraries

Copyright (C) 2002-2016 Aleksey Sanin <aleksey@aleksey.com>. All Rights Reserved.

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FIT-

NESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO
EVENT SHALL THE
ALEKSEY SANIN BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER
IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CON-
NECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

Except as contained in this notice, the name of Aleksey Sanin shall not
be used in advertising or otherwise to promote the sale, use or other deal-
ings in this Software without prior written authorization from him.

xmlsec-nss library

Copyright (C) 2002-2016 Aleksey Sanin <aleksey@aleksey.com>. All Rights Reserved.
Copyright (c) 2003 America Online, Inc. All rights reserved.

Permission is hereby granted, free of charge, to any person obtaining a copy
of this software and associated documentation files (the "Software"), to deal
in the Software without restriction, including without limitation the rights
to use, copy, modify, merge, publish, distribute, sublicense, and/or
sell
copies of the Software, and to permit persons to whom the Software is fur-
nished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in
all copies or substantial portions of the Software.

Portions of the Software were created using source code and/or APIs
governed by the Mozilla Public License (MPL). The MPL is available
at <http://www.mozilla.org/MPL/MPL-1.1.html>. The MPL permits such
portions to be distributed with code not governed by MPL, as long
as the requirements of MPL are fulfilled for such portions.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR
IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FIT-
NESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE
ALEKSEY SANIN BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER
IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CON-
NECTION WITH THE SOFTWARE OR
THE USE OR OTHER DEALINGS IN THE SOFTWARE.

Except as contained in this notice, the name of Aleksey Sanin shall not
be used in advertising or otherwise to promote the sale, use or other deal-
ings in this Software without prior written authorization from him.

xmlsec-mscrypto library

Copyright (C) 2002-2016 Aleksey Sanin <aleksey@aleksey.com>. All Rights Reserved.

Copyright (C) 2003 Cordys R&D BV, All rights reserved.

Copyright (C) 2007 Roumen Petrov.

Copyright (c) 2005-2006 Cryptocom LTD (<http://www.cryptocom.ru>).

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do

so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE ALEKSEY SANIN BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

Except as contained in this notice, the name of Aleksey Sanin shall not be used in advertising or otherwise to promote the sale, use or other dealings in this Software without prior written authorization from him.

xmlsec-mscng library

Copyright (C) 2018 Aleksey Sanin. All Rights Reserved.

Copyright

(C) 2018 Miklos Vajna. All Rights Reserved.

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE ALEKSEY SANIN BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION

WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

Except as contained in this notice, the name of Aleksey Sanin shall not be used in advertising or otherwise to promote the sale, use or other dealings in this Software without prior written authorization from him.

References

* AOL

<http://www.aleksey.com/pipermail/xmlsec/2003/005488.html>

<http://www.aleksey.com/pipermail/xmlsec/attachments/20030729/0e25648e/attachment.htm>

* Cordys R&D BV

<http://www.aleksey.com/pipermail/xmlsec/2003/005581.html>

* Cryptocom LTD

<http://www.aleksey.com/pipermail/xmlsec/2006/007410.html>

1.23 libbpf 1.30

1.23.1 Available under license :

Valid-License-Identifier: BSD-2-Clause

SPDX-URL: <https://spdx.org/licenses/BSD-2-Clause.html>

Usage-Guide:

To use the BSD 2-clause "Simplified" License put the following SPDX tag/value pair into a comment according to the placement guidelines in the licensing rules documentation:

SPDX-License-Identifier: BSD-2-Clause

License-Text:

Copyright (c) 2015 The Libbpf Authors. All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the

documentation and/or other materials provided with the distribution.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT HOLDER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

LGPL-2.1 OR BSD-2-Clause

Cisco and the Cisco logo are trademarks or registered trademarks of Cisco and/or its affiliates in the U.S. and other countries. To view a list of Cisco trademarks, go to this URL: www.cisco.com/go/trademarks. Third-party trademarks mentioned are the property of their respective owners. The use of the word partner does not imply a partnership relationship between Cisco and any other company. (1110R)

©2024 Cisco Systems, Inc. All rights reserved.