在 IPSec 上配置第二层隧道协议 (L2TP)

目录

简介

第 2 层隧道协议（如 L2TP）不会为以隧道传输的流量提供加密机制。相反，这些协议会依靠其他安全协议（如 IPSec）来加密其数据。使用此配置示例，可借助 IPSec 为拨入的用户加密 L2TP 流量。

L2TP 隧道建立在 L2TP 接入集中器 (LAC) 和 L2TP 网络服务器 (LNS) 之间。IPSec 隧道也建立在这些设备之间，并使用 IPSec 对所有 L2TP 隧道流量进行加密。

先决条件

要求

本文档需要对 IPSec 协议拥有基本的了解。有关 IPSec 的详细信息，请参见 IP 安全 (IPSec) 加密简介。

使用的组件

本文档中的信息基于以下软件和硬件版本。

- Cisco IOS® 软件版本 12.2(24a)
- Cisco 2500 系列路由器

本文档中的信息都是基于特定实验室环境中的设备创建的。本文档中使用的所有设备最初均采用原始（默认）配置。如果您是在真实网络上操作，请确保您在使用任何命令前已经了解其潜在影响。

规则

有关文档规则的详细信息，请参阅 Cisco 技术提示规则。

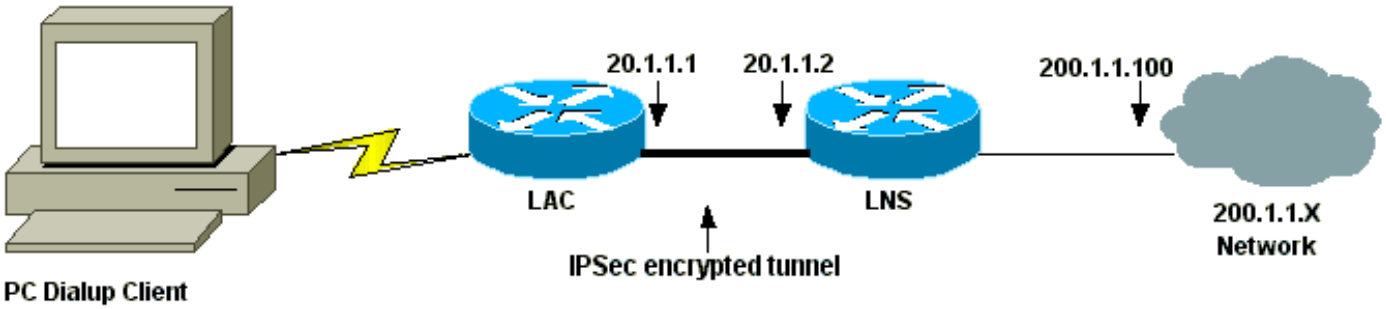
配置

本部分提供有关如何配置本文档所述功能的信息。

注：要查找有关本文档中所用命令的其他信息，请使用命令查找工具(仅限注册用户)(仅限注册客户)。

网络图

本文档使用此图所示的网络设置。拨号用户通过模拟电话系统启动与 LAC 的 PPP 会话。在对用户进行身份验证之后，LAC 会启动连接 LNS 的 L2TP 隧道。在创建隧道之前，隧道端点、LAC 和 LNS 之间会互相进行身份验证。一旦建立隧道，就为拨号用户创建 L2TP 会话。为了加密 LAC 和 LNS 之间的所有 L2TP 流量，L2TP 流量被定义为 IPSec 的关注流量（将被加密的流量）。



配置

本文档使用以下配置。

- LAC 配置
- LNS 配置

LAC 配置

```
Current configuration:
!
version 12.2
service timestamps debug datetime msec localtime show-
timezone
service timestamps log datetime msec localtime show-
timezone
service password-encryption
!
hostname LAC
!
enable password  7 094F471A1A0A
!
!--- Usernames and passwords are used !--- for L2TP
tunnel authentication. username LAC password 7
0107130A550E0A1F205F5D
```

```
username LNS password 7 001006080A5E07160E325F
!--- Username and password used for authenticating !---
the dial up user. username dialupuser password 7
14131B0A00142B3837
ip subnet-zero
!
!--- Enable VDPN. vpdn enable
vpdn search-order domain
!
!--- Configure vpdn group 1 to request dialin to the
LNS, !--- define L2TP as the protocol, and initiate a
tunnel to the LNS 20.1.1.2. !--- If the user belongs to
the domain cisco.com, !--- use the local name LAC as the
tunnel name.

vpdn-group 1
 request-dialin
  protocol l2tp
  domain cisco.com
 initiate-to ip 20.1.1.2
 local name LAC

!
!--- Create Internet Key Exchange (IKE) policy 1, !---
which is given highest priority if there are additional
!--- IKE policies. Specify the policy using pre-shared
key !--- for authentication, Diffie-Hellman group 2,
lifetime !--- and peer address. crypto isakmp policy 1
authentication pre-share
group 2
lifetime 3600
crypto isakmp key cisco address 20.1.1.2
!
!--- Create an IPSec transform set named "testtrans" !--
- with the DES for ESP with transport mode. !--- Note:
AH is not used.

crypto ipsec transform-set testtrans esp-des
!
!--- Create crypto map l2tpmap (assigned to Serial 0),
using IKE for !--- Security Associations with map-number
10 !--- and using "testrans" transform-set as a
template. !--- Set the peer and specify access list 101,
which is used !--- to determine which traffic (L2TP) is
to be protected by IPSec. crypto map l2tpmap 10 ipsec-
isakmp
set peer 20.1.1.2
set transform-set testtrans
match address 101
!
interface Ethernet0
ip address 10.31.1.6 255.255.255.0
no ip directed-broadcast
!
interface Serial0
ip address 20.1.1.1 255.255.255.252
no ip directed-broadcast
no ip route-cache
no ip mroute-cache
no fair-queue
!--- Assign crypto map l2tpmap to the interface. crypto
map l2tpmap
!
interface Async1
```

```
ip unnumbered Ethernet0
no ip directed-broadcast
encapsulation ppp
no ip route-cache
no ip mroute-cache
async mode dedicated
peer default ip address pool my_pool
ppp authentication chap
!
!--- Create an IP Pool named "my_pool" and !--- specify
the IP range. ip local pool my_pool 10.31.1.100
10.31.1.110
ip classless
ip route 0.0.0.0 0.0.0.0  Serial0
!--- Specify L2TP traffic as interesting to use with
IPSec. access-list 101 permit udp host 20.1.1.1 eq 1701
host 20.1.1.2 eq 1701
!

line con 0
exec-timeout 0 0
transport input none
line 1
autoselect during-login
autoselect ppp
modem InOut
transport input all
speed 38400
flowcontrol hardware
line aux 0
line vty 0 4
password
```

LNS 配置

```
Current configuration:
!
version 12.2
service timestamps debug datetime msec localtime show-
timezone
service timestamps log datetime msec localtime show-
timezone
service password-encryption
!
hostname LNS
!
enable password 7 0822455D0A16
!--- Usernames and passwords are used for !--- L2TP
tunnel authentication. username LAC password 7
0107130A550E0A1F205F5D
username LNS password 7 120D10191C0E00142B3837
!--- Username and password used to authenticate !--- the
dial up user. username dialupuser@cisco.com password 7
104A0018090713181F
!

ip subnet-zero
!
!--- Enable VDPN. vpdn enable
!
!--- Configure VPDN group 1 to accept !--- an open
tunnel request from LAC, !--- define L2TP as the
```

```
protocol, and identify virtual-template 1 !--- to use
for cloning virtual access interfaces. vpdn-group 1
 accept-dialin
  protocol l2tp
  virtual-template 1
 terminate-from hostname LAC
 local name LNS


!
!--- Create IKE policy 1, which is !--- given the
highest priority if there are additional IKE policies.
!--- Specify the policy using the pre-shared key for
authentication, !--- Diffie-Hellman group 2, lifetime
and peer address. crypto isakmp policy 1
authentication pre-share
group 2
lifetime 3600
crypto isakmp key cisco address 20.1.1.1
!
!
!--- Create an IPSec transform set named "testtrans" !--
- using DES for ESP with transport mode. !--- Note: AH
is not used.

crypto ipsec transform-set testtrans esp-des
!
!--- Create crypto map l2tpmap !--- (assigned to Serial
0), using IKE for !--- Security Associations with map-
number 10 !--- and using "testrans" transform-set as a
template. !--- Set the peer and specify access list 101,
which is used !--- to determine which traffic (L2TP) is
to be protected by IPSec. crypto map l2tpmap 10 ipsec-
isakmp
set peer 20.1.1.1
set transform-set testtrans
match address 101
!
interface Ethernet0
ip address 200.1.1.100 255.255.255.0
no ip directed-broadcast
no keepalive
!
!--- Create a virtual-template interface !--- used for
"cloning" !--- virtual-access interfaces using address
pool "mypool" !--- with Challenge Authentication
Protocol (CHAP) authentication. interface Virtual-
Template1 ip unnumbered Ethernet0 no ip directed-
broadcast no ip route-cache peer default ip address pool
mypool
ppp authentication chap
!
interface Serial0
ip address 20.1.1.2 255.255.255.252
no ip directed-broadcast
no ip route-cache
no ip mroute-cache
no fair-queue
clockrate 1300000
!--- Assign crypto map l2tpmap to the interface. crypto
map l2tpmap
!
!--- Create an IP Pool named "mypool" and !--- specify
the IP range. ip local pool mypool 200.1.1.1 200.1.1.10
```

```
ip classless
!
!--- Specify L2TP traffic as interesting to use with
IPSec. access-list 101 permit udp host 20.1.1.2 eq 1701
host 20.1.1.1 eq 1701
!
line con 0
exec-timeout 0 0
transport input none
line aux 0
line vty 0 4
password
login
!
end
```

验证

本部分所提供的信息可用于确认您的配置是否正常工作。

命令输出解释程序工具（仅限注册用户）支持某些 **show 命令，使用此工具可以查看对 show 命令输出的分析。**

使用这些 show 命令可验证配置。

- show crypto isakmp sa - 显示对等体上的所有当前 IKE 安全关联 (SA)。

```
LAC#show crypto isakmp sa
dst             src             state          conn-id    slot
20.1.1.2        20.1.1.1        QM_IDLE              1       0

LAC#
```

- show crypto ipsec sa - 显示当前 SA 使用的设置。

```
LAC#show crypto ipsec sa

interface: Serial0
    Crypto map tag: l2tpmap, local addr. 20.1.1.1

   local  ident (addr/mask/prot/port): (20.1.1.1/255.255.255.255/0/0)
   remote ident (addr/mask/prot/port): (20.1.1.2/255.255.255.255/0/0)
   current_peer: 20.1.1.2
     PERMIT, flags={transport_parent,}
    #pkts encaps: 0, #pkts encrypt: 0, #pkts digest 0
    #pkts decaps: 0, #pkts decrypt: 0, #pkts verify 0
    #pkts compressed: 0, #pkts decompressed: 0
    #pkts not compressed: 0, #pkts compr. failed: 0, #pkts decompress failed: 0
    #send errors 0, #recv errors 0

     local crypto endpt.: 20.1.1.1, remote crypto endpt.: 20.1.1.2
     path mtu 1500, ip mtu 1500, ip mtu interface Serial0
     current outbound spi: 0

     inbound esp sas:

     inbound ah sas:
```

```
     inbound pcp sas:

     outbound esp sas:

     outbound ah sas:

     outbound pcp sas:


   local  ident (addr/mask/prot/port): (20.1.1.1/255.255.255.255/17/1701)
   remote ident (addr/mask/prot/port): (20.1.1.2/255.255.255.255/17/1701)
   current_peer: 20.1.1.2
     PERMIT, flags={origin_is_acl,reassembly_needed,parent_is_transport,}
    #pkts encaps: 1803, #pkts encrypt: 1803, #pkts digest 0
    #pkts decaps: 1762, #pkts decrypt: 1762, #pkts verify 0
    #pkts compressed: 0, #pkts decompressed: 0
    #pkts not compressed: 0, #pkts compr. failed: 0, #pkts decompress failed: 0
    #send errors 5, #recv errors 0

     local crypto endpt.: 20.1.1.1, remote crypto endpt.: 20.1.1.2
     path mtu 1500, ip mtu 1500, ip mtu interface Serial0
     current outbound spi: 43BE425B

     inbound esp sas:
      spi: 0xCB5483AD(3411313581)
        transform: esp-des ,
        in use settings ={Tunnel, }
        slot: 0, conn id: 2000, flow_id: 1, crypto map: l2tpmap
        sa timing: remaining key lifetime (k/sec): (4607760/1557)
        IV size: 8 bytes
        replay detection support: N

     inbound ah sas:

     inbound pcp sas:

     outbound esp sas:
      spi: 0x43BE425B(1136542299)
        transform: esp-des ,
        in use settings ={Tunnel, }
        slot: 0, conn id: 2001, flow_id: 2, crypto map: l2tpmap
        sa timing: remaining key lifetime (k/sec): (4607751/1557)
        IV size: 8 bytes
        replay detection support: N

     outbound ah sas:

     outbound pcp sas:


LAC#
```

- show vpdn — 显示有关活动L2TP隧道的信息。

```
LAC#show vpdn

L2TP Tunnel and Session Information Total tunnels 1 sessions 1

LocID RemID Remote Name   State  Remote Address  Port  Sessions
26489 64014 LNS           est    20.1.1.2        1701  1

LocID RemID TunID Intf          Username               State  Last Chg Fastswitch
41    9     26489 As1           dialupuser@cisco.com   est    00:12:21 enabled
```

```
%No active L2F tunnels

%No active PPTP tunnels

%No active PPPoE tunnels
LAC#
```

故障排除

本部分提供的信息可用于对配置进行故障排除。

故障排除命令

命令输出解释程序工具（仅限注册用户）支持某些 **show 命令，使用此工具可以查看对 show 命令输出的分析。**

注：在发出debug命令之前，请参阅有关Debug命令的重要信息。

- **debug crypto engine — 显示引擎事件。**
- **debug crypto ipsec — 显示 IPSec 事件。**
- **debug crypto isakmp — 显示关于 IKE 事件的消息。**
- **debug ppp authentication — 显示身份验证协议消息，包括 CHAP 数据包交换和口令身份验证协议 (PAP) 交换。**
- **debug vpdn event — 显示属于正常隧道建立或关闭一部分的事件的相关消息。**
- **debug vpdn error — 显示导致隧道无法建立的错误或导致已建立的隧道关闭的错误。**
- **debug ppp negotiation — 显示在 PPP 启动期间传输的 PPP 数据包，在此启动期间将协商 PPP 选项。**

相关信息

- IPSec RFC 1825
- IPSec 支持页
- 配置 IPSec 网络安全
- 配置 Internet 密钥交换安全协议
- 技术支持 - Cisco Systems

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