CHAPTER 30

Configuring L2TP over IPSec

This chapter describes how to configure IPSec over L2TP on the security appliance, and includes the following topics:

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- Configuring L2TP over IPSec Connections, page 30-3
- Viewing L2TP over IPSec Connection Information, page 30-6

L2TP Overview

Layer 2 Tunneling Protocol (L2TP) is a VPN tunneling protocol which allows remote clients to use the public IP network to securely communicate with private corporate network servers. L2TP uses PPP over UDP (port 1701) to tunnel the data.

L2TP protocol is based on the client/server model. The function is divided between the L2TP Network Server (LNS), and the L2TP Access Concentrator (LAC). The LNS typically runs on a network gateway such as a router, while the LAC can be a dial-up Network Access Server (NAS), or a PC with a bundled L2TP client such as Microsoft Windows 2000.

The primary benefit of configuring L2TP with IPSec in a remote access scenario is that remote users can access a VPN over a public IP network without a gateway or a dedicated line, enabling remote access from virtually anyplace with POTS. An additional benefit is that the only client requirement for VPN access is the use of Windows 2000 with Microsoft Dial-Up Networking (DUN). No additional client software, such as Cisco VPN client software, is required.

To configure L2TP over IPSec, first configure IPSec transport mode to enable IPSec with L2TP. Then configure L2TP with a virtual private dial-up network VPDN group.

The configuration of L2TP with IPSec supports certificates using the pre-shared keys or RSA signature methods, and the use of dynamic (as opposed to static) crypto maps. This summary of tasks assumes completion of IKE, as well as pre-shared keys or RSA signature configuration. See “Chapter 41, “Configuring Certificates,”” for the steps to configure pre-shared keys, RSA, and dynamic crypto maps.

Note L2TP with IPSec on the security appliance allows the LNS to interoperate with the Windows 2000 L2TP client. Interoperability with LACs from Cisco and other vendors is currently not supported. Only L2TP with IPSec is supported, native L2TP itself is not supported on security appliance.

Note The minimum IPSec security association lifetime supported by the Windows 2000 client is 300 seconds. If the lifetime on thesecurity appliance is set to less than 300 seconds, the Windows 2000 client ignores it and replaces it with a 300 second lifetime.

Note L2TP over IPsec sessions are not supported by stateful failover.

IPSec Transport and Tunnel Modes

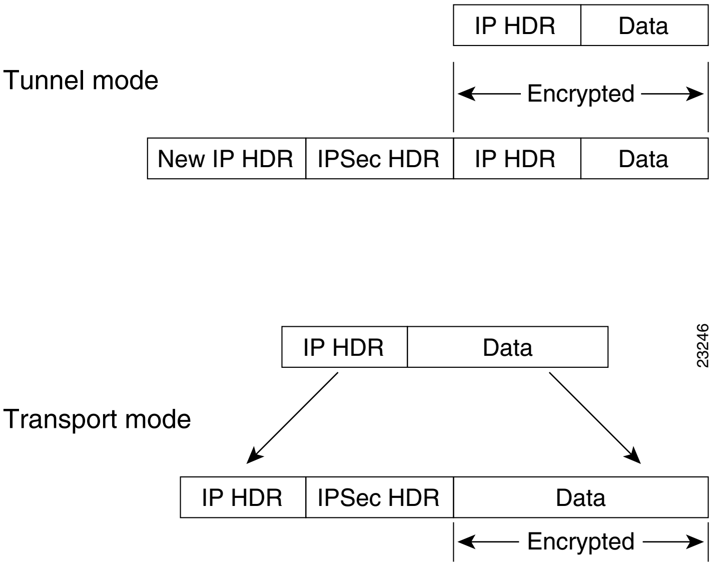
By default, the security appliance uses IPSec tunnel mode—the entire original IP datagram is encrypted, and it becomes the payload in a new IP packet. This mode allows a network device, such as a router, to act as an IPSec proxy. That is, the router performs encryption on behalf of the hosts. The source router encrypts packets and forwards them along the IPSec tunnel. The destination router decrypts the original IP datagram and forwards it on to the destination system. The major advantage of tunnel mode is that the end systems do not need to be modified to receive the benefits of IPSec. Tunnel mode also protects against traffic analysis; with tunnel mode, an attacker can only determine the tunnel endpoints and not the true source and destination of the tunneled packets, even if they are the same as the tunnel endpoints.

However, the Windows 2000 L2TP/IPSec client uses IPSec transport mode—only the IP payload is encrypted, and the original IP headers are left intact. This mode has the advantages of adding only a few bytes to each packet and allowing devices on the public network to see the final source and destination of the packet. Figure 30-1 illustrates the differences between IPSec Tunnel and Transport modes.

Therefore, In order for Windows 2000 L2TP/IPSec clients to connect to the security appliance, you must configure IPSec transport mode for a transform set using the **crypto ipsec transform-set trans_name mode transport** command. This command is the configuration procedure that follows, "Configuring L2TP over IPSec Connections" section on page 30-3**.**

With this capability (transport), you can enable special processing (for example, QoS) on the intermediate network based on the information in the IP header. However, the Layer 4 header will be encrypted, limiting the examination of the packet. Unfortunately, transmitting the IP header in clear text, transport mode allows an attacker to perform some traffic analysis.

Figure 30-1 IPSec in Tunnel and Transport Modes



Configuring L2TP over IPSec Connections

To configure the security appliance to accept L2TP over IPSec connections, follow these steps:

Note The security appliance does not establish an L2TP/IPSec tunnel with Windows 2000 if either the Cisco VPN Client Version 3.x or the Cisco VPN 3000 Client Version 2.5 is installed. Disable the *Cisco VPN Service* for the Cisco VPN Client Version 3.x, or the *ANetIKE Service* for the Cisco VPN 3000 Client Version 2.5 from the Services panel in Windows 2000 (click **Start>Programs>Administrative Tools>Services**). Then restart the IPSec Policy Agent Service from the **Services** panel, and reboot the machine.

Step 1 Specify IPSec to use transport mode rather than tunnel mode with the **mode** keyword of the **crypto ipsec transform-set** command:

```
hostname(config)# crypto ipsec transform-set trans_name mode transport
```

Step 2 (Optional) Specify the local address pool used to allocate the IP address to the client using the **address-pool** command in tunnel-group general-attributes mode:

```
hostname(config)# tunnel-group name general-attributes
hostname(config-tunnel-general)# address-pool pool_name
```

Step 3 (Optional) Instruct the security appliance to send DNS server IP addresses to the client with the **dns value** command from group policy configuration mode:

```
hostname(config)# group-policy group_policy_name attributes
hostname(config-group-policy)# dns value [none | IP_primary [IP_secondary]]
```

Step 4 (Optional) Instruct the security appliance to send WINS server IP addresses to the client using the **wins-server** command from group policy configuration mode:

```
hostname(config-group-policy)# wins-server value [none | IP_primary [IP_secondary]]
```

Step 5 (Optional) Generate a AAA accounting start and stop record for an L2TP session using the **accounting-server-group** command from tunnel group general-attributes mode:

```
hostname(config)# tunnel-group name general-attributes
hostname(config-tunnel-general)# accounting-server-group aaa_server_group
```

Step 6 Configure L2TP over IPSec as a valid VPN tunneling protocol for a group or user with the **vpn-tunnel-protocol l2tp-ipsec command**:

For a group, enter group-policy attributes mode:

```
hostname(config)# group-policy group_policy_name attributes
hostname(config-group-policy)# vpn-tunnel-protocol l2tp-ipsec
```

For a user, enter username attributes mode:

```
hostname(config)# username user_name attributes
hostname(config-username)# vpn-tunnel-protocol l2tp-ipsec
```

Step 7 Create a tunnel group with the **tunnel-group** command, and link the name of the group policy to the tunnel group with the **default-group-policy** command from tunnel group general-attributes mode:

```
hostname(config)# tunnel-group name type ipsec-ra
hostname(config)# tunnel-group name general-attributes
hostname(config-tunnel-general)# default-group-policy group_policy_name
```

Step 8 Configure the PPP authentication protocol using the **authentication** *type* command from tunnel group ppp-attributes mode. Table 30-1 shows the types of PPP authentication, and their characteristics.

```
hostname(config)# tunnel-group name ppp-attributes
hostname(config-ppp)# authentication pap
```

Table 30-1 Authentication Type Characteristics

Keyword	Authentication Type	Characteristics
chap	CHAP	In response to the server challenge, the client returns the encrypted [challenge plus password] with a cleartext username. This protocol is more secure than the PAP, but it does not encrypt data.
eap-proxy	EAP	Enables EAP which permits the security appliance to proxy the PPP authentication process to an external RADIUS authentication server.
ms-chap-v1 **ms-chap-v2**	Microsoft CHAP, Version 1 Microsoft CHAP, Version, 2	Similar to CHAP but more secure in that the server stores and compares only encrypted passwords rather than cleartext passwords as in CHAP. This protocol also generates a key for data encryption by MPPE.
pap	PAP	Passes cleartext username and password during authentication and is not secure.

Step 9 Specify a method to authenticate users attempting L2TP over IPSec connections. Use the **authentication-server-group** command from tunnel-group general-attributes mode to configure the security appliance to use an authentication server or its own local database.

Using an Authentication Server

To use an authentication server, use the **authentication server group** keyword:

```
hostname(config)# tunnel-group name general-attributes
hostname(config-tunnel-general)# authentication-server-group auth_server_group
```

Using the Local Database

To use the local database, enter the **LOCAL** keyword.

```
hostname(config)# tunnel-group name general-attributes
hostname(config-tunnel-general)# authentication-server-group LOCAL
```

Note The security appliance only supports the PPP authentications PAP and Microsoft CHAP, Versions 1 and 2, on the local database. EAP and CHAP are performed by proxy authentication servers. Therefore, if a remote user belongs to a tunnel group configured with the **authentication eap-proxy** or **authentication chap** commands, and the security appliance is configured to use the local database, that user will not be able to connect.

Step 10 Create a user in the local database with the **username** command from global configuration mode.

If the user is an L2TP client using Microsoft CHAP, Version 1 or Version 2, and the security appliance is configured to authenticate against the local database, you must include the **mschap** keyword. For Example:

```
hostname(config)# username t_wmith password eu5d93h mschap
```

Step 11 Configure the interval (in seconds) between hello messages using the **l2tp tunnel hello** command in global configuration mode:

```
hostname(config)# l2tp tunnel hello seconds
```

Step 12 (Optional) If you expect multiple L2TP clients behind a NAT device to attempt L2TP over IPSec connections to the security appliance, you must enable NAT traversal so that ESP packets can pass through one or more NAT devices.

To enable NAT traversal globally, check that ISAKMP is enabled (you can enable it with the **crypto isakmp enable** command) in global configuration mode and then use the **crypto isakmp nat-traversal** command. For example:

```
hostname(config)# crypto isakmp enable
hostname(config)# crypto isakmp nat-traversal 30
```

Tunnel Group Switching

Tunnel Group Switching enables the security appliance to associate different users that are establishing L2TP over IPSec connections with different tunnel groups. Since each tunnel group has its own AAA server group and IP address pools, users can be authenticated through methods specific to their tunnel group.

With this feature, instead of sending just a username, the user sends a username and a group name in the format *username@group_name, where “@” represents a delimiter that you can configure, and the group name is the name of a tunnel group that has been configured on the security appliance.*

To enable Tunnel Group Switching, you must enable Strip Group processing using the **strip-group** command from tunnel-group general-attributes mode. When enabled, the security appliance selects the tunnel group for user connections by obtaining the group name from the username presented by the VPN client. The security appliance then sends only the user part of the username for authorization and authentication. Otherwise (if disabled), the security appliance sends the entire username, including the realm. In the following example, Strip Group processing is enabled for the tunnel-group *telecommuters*:

```
asa1(config)# tunnel-group telecommuters general-attributes
asa1(config-tunnel-general)# strip-group
```

Apple iPhone and MAC OS X Compatibility

The security appliance requires the following IKE (ISAKMP) policy settings for successful Apple iPhone or MAC OS X connections:

- IKE phase 1—3DES encryption with SHA1 hash method.
- IPSec phase 2—3DES or AES encryption with MD5 or SHA hash method.
- PPP Authentication—PAP, MS-CHAPv1, or MSCHAPv2 (preferred).
- Pre-shared key (only for iPhone).

The following example shows configuration file commands that ensure iPhone and OS X compatibility:

```
tunnel-group DefaultRAGroup general-attributes
    address-pool pool
tunnel-group DefaultRAGroup ipsec-attributes
 pre-shared-key *
tunnel-group DefaultRAGroup ppp-attributes
    no authentication pap
    authentication chap
    authentication ms-chap-v1
    authentication ms-chap-v2
crypto ipsec transform-set trans esp-3des esp-sha-hmac
crypto ipsec transform-set trans mode transport
crypto dynamic-map dyno 10 set transform-set set trans
crypto map vpn 20 ipsec-isakmp dynamic dyno
crypto map vpn interface outside
crypto isakmp identity auto
crypto isakmp enable outside
crypto isakmp policy 10
    authentication pre-share
    encryption 3des
    hash sha
    group 2
    lifetime 86400
crypto isakmp nat-traversal 3600
```

For more information about setting IKE policies, see the *Configuring IPSec and ISAKMP*.

Viewing L2TP over IPSec Connection Information

The **show vpn-sessiondb** command includes protocol filters that you can use to view detailed information about L2TP over IPSec connections. The full command from global configuration mode is **show vpn-sessoindb detailed remote filter protocol l2tpOverIpsec.**

The following example shows the details of a single L2TP over IPSec connection:

```
hostname# show vpn-sessiondb detail remote filter protocol L2TPOverIPSec

Session Type: Remote Detailed

Username     : b_smith
Index        : 1
Assigned IP  : 90.208.1.200          Public IP    : 70.208.1.212
Protocol     : L2TPOverIPSec         Encryption   : 3DES
Hashing      : SHA1
Bytes Tx     : 418464                Bytes Rx     : 424440
Client Type  :                       Client Ver   :
Group Policy : DfltGrpPolicy
Tunnel Group : DefaultRAGroup
```

```
Login Time   : 13:24:48 UTC Thu Mar 30 2006
Duration     : 1h:09m:18s
Filter Name  : #ACSACL#-IP-ACL4Clients-440fa5aa
NAC Result   : N/A
Posture Token:

IKE Sessions: 1
IPSec Sessions: 1
L2TPOverIPSec Sessions: 1


IKE:
  Session ID   : 1
  UDP Src Port : 500                    UDP Dst Port : 500
  IKE Neg Mode : Main                   Auth Mode    : preSharedKeys
  Encryption   : 3DES                   Hashing      : SHA1
  Rekey Int (T): 28800 Seconds          Rekey Left(T): 24643 Seconds
  D/H Group    : 2

IPSec:
  Session ID   : 2
  Local Addr   : 80.208.1.2/255.255.255.255/17/1701
  Remote Addr  : 70.208.1.212/255.255.255.255/17/1701
  Encryption   : 3DES                   Hashing      : SHA1
  Encapsulation: Transport
  Rekey Int (T): 3600 Seconds           Rekey Left(T): 2856 Seconds
  Rekey Int (D): 95000 K-Bytes          Rekey Left(D): 95000 K-Bytes
  Idle Time Out: 30 Minutes             Idle TO Left : 30 Minutes
  Bytes Tx     : 419064                 Bytes Rx     : 425040
  Pkts Tx      : 4201                   Pkts Rx      : 4227


L2TPOverIPSec:
  Session ID   : 3
  Username     : l2tp
  Assigned IP  : 90.208.1.200
  Encryption   : none                   Auth Mode    : PAP
  Idle Time Out: 30 Minutes             Idle TO Left : 30 Minutes
  Bytes Tx     : 301386                 Bytes Rx     : 306480
  Pkts Tx      : 4198                   Pkts Rx      : 4224
```

The following example shows the details of a single L2TP over IPSec over NAT connection:

```
hostname# show vpn-sessiondb detail remote filter protocol L2TPOverIPSecOverNAtT

Session Type: Remote Detailed

Username     : v_gonzalez
Index        : 2
Assigned IP  : 90.208.1.202           Public IP    : 70.208.1.2
Protocol     : L2TPOverIPSecOverNatT  Encryption   : 3DES
Hashing      : MD5
Bytes Tx     : 1009                   Bytes Rx     : 2241
Client Type  :                        Client Ver   :
Group Policy : DfltGrpPolicy
Tunnel Group : l2tpcert
Login Time   : 14:35:15 UTC Thu Mar 30 2006
Duration     : 0h:00m:07s
Filter Name  :
NAC Result   : N/A
Posture Token:

IKE Sessions: 1
```

```
IPSecOverNatT Sessions: 1
L2TPOverIPSecOverNatT Sessions: 1


IKE:
  Session ID   : 1
  UDP Src Port : 4500                    UDP Dst Port : 4500
  IKE Neg Mode : Main                    Auth Mode    : rsaCertificate
  Encryption   : 3DES                    Hashing      : MD5
  Rekey Int (T): 300 Seconds             Rekey Left(T): 294 Seconds
  D/H Group    : 2

IPSecOverNatT:
  Session ID   : 2
  Local Addr   : 80.208.1.2/255.255.255.255/17/1701
  Remote Addr  : 70.208.1.2/255.255.255.255/17/0
  Encryption   : 3DES                    Hashing      : MD5
  Encapsulation: Transport
  Rekey Int (T): 300 Seconds             Rekey Left(T): 293 Seconds
  Idle Time Out: 1 Minutes               Idle TO Left : 1 Minutes
  Bytes Tx     : 1209                    Bytes Rx     : 2793
  Pkts Tx      : 20                      Pkts Rx      : 32


L2TPOverIPSecOverNatT:
  Session ID   : 3
  Username     : v_gonzalez
  Assigned IP  : 90.208.1.202
  Encryption   : none                    Auth Mode    : PAP
  Idle Time Out: 1 Minutes               Idle TO Left : 1 Minutes
  Bytes Tx     : 584                     Bytes Rx     : 2224
  Pkts Tx      : 18                      Pkts Rx      : 30
===================
```

Using L2TP Debug Commands

You can display L2TP debug information using the **debug l2tp** command in privileged EXEC mode. To disable the display of debug information, use the **no** form of this command:

debug l2tp {**data** | **error** | **event** | **packet**} *level*

data displays data packet trace information.

error displays error events.

event displays L2TP connection events.

packet displays packet trace information.

level sets the debug message level to display, between 1 and 255. The default is 1. To display additional messages at higher levels, set the level to a higher number.

The following example enables L2TP debug messages for connection events. The **show debug** command reveals that L2TP debug messages are enabled.

```
hostname# debug l2tp event 1
hostname# show debug
debug l2tp event enabled at level 1
hostname#
```

Enabling IPSec Debug

IPSec debug information can be added to a Windows 2000 client by adding the following registry:

Step 1 Run the Windows 2000 registry editor: REGEDIT.

Step 2 Locate the following registry entry:

MyComputer\HKEY_LOCAL_MACHINE\CurrentControlSet\Services\PolicyAgent

Step 3 Create the key by entering **`oakley`**.

Step 4 Create the DWORD by entering **`EnableLogging`**.

Step 5 Set the “Enable Logging” value to “1”.

Step 6 Stop and Start the IPSec Policy Agent (click **Start>Programs>Administrative Tools>Services**). The debug file will be found at “%windir%\debug\oakley.log”.

Getting Additional Information

Additional information on various topics can be found at www.microsoft.com:

http://support.microsoft.com/support/kb/articles/Q240/2/62.ASP

How to Configure an L2TP/IPSec Connection Using Pre-Shared Keys Authentication:

http://support.microsoft.com/support/kb/articles/Q253/4/98.ASP

How to Install a Certificate for Use with IP Security (IPSec):

http://www.microsoft.com/windows2000/en/server/help/default.asp?url=/WINDOWS2000/en/server/help/sag_VPN_us26.htm

How to use a Windows 2000 Machine Certificate for L2TP over IPSec VPN Connections:

http://www.microsoft.com/windows2000/techinfo/planning/security/ipsecsteps.asp#heading3

How to Create a Custom MMC Console and Enabling Audit Policy for Your Computer:

http://support.microsoft.com/support/kb/articles/Q259/3/35.ASP