VPN Availability Configuration Guide, Cisco IOS XE Release 2

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Reverse Route Injection

Reverse route injection (RRI) is the ability for static routes to be automatically inserted into the routing process for those networks and hosts protected by a remote tunnel endpoint. These protected hosts and networks are known as remote proxy identities.

Each route is created on the basis of the remote proxy network and mask, with the next hop to this network being the remote tunnel endpoint. By using the remote Virtual Private Network (VPN) router as the next hop, the traffic is forced through the crypto process to be encrypted.

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the Feature Information Table at the end of this document.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Prerequisites for Reverse Route Injection

- IP routing should be enabled and static routes should be redistributed if dynamic routing protocols are to be used to propagate RRI-generated static routes.

Restrictions for Reverse Route Injection

For static crypto maps, routes are always present if RRI is configured on an applied crypto map. The default behavior--of routes always being present for a static map--will not apply unless the **static** keyword is added to the **reverse-route** command.

Information About Reverse Route Injection

Reverse Route Injection

RRI is the ability for static routes to be automatically inserted into the routing process for those networks and hosts that are protected by a remote tunnel endpoint. These protected hosts and networks are known as remote proxy identities.

Each route is created on the basis of the remote proxy network and mask, with the next hop to this network being the remote tunnel endpoint. By using the remote VPN router as the next hop, the traffic is forced through the crypto process to be encrypted.

After the static route is created on the VPN router, this information is propagated to upstream devices, allowing them to determine the appropriate VPN router to which to send returning traffic in order to maintain IPsec state flows. Being able to determine the appropriate VPN router is particularly useful if multiple VPN routers are used at a site to provide load balancing or failover or if the remote VPN devices are not accessible via a default route. Routes are created in either the global routing table or the appropriate virtual route forwarding (VRF) table.

RRI is applied on a per-crypto map basis, whether this is via a static crypto map or a dynamic crypto map template. The default behavior for the two map types is as follows:

- In the case of a dynamic crypto map, routes are created upon the successful establishment of IPsec security associations (SAs) for those remote proxies. The next hop back to those remote proxies is via the remote VPN router whose address is learned and applied during the creation of the dynamic crypto map template. The routes are deleted after the SAs are deleted. Routes created on the basis of IPsec source proxies on static crypto maps is the default behavior on static maps and overrides the creation of routes on the basis of crypto ACLs (see the next bullet).
- For static crypto maps, routes are created on the basis of the destination information defined in the crypto access list. The next hop is taken from the first set peer statement that is attached to the crypto map. If at any time, RRI, the peer, or the access list is removed from the crypto map, routes will be deleted. This behavior changes with the addition of the RRI enhancements, as explained in the sections below.

How to Configure Reverse Route Injection

Configuring RRI Under a Static Crypto Map

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **crypto map {** *map-name* **}** **{** *seq-name***}** **ipsec-isakmp**
4. **reverse-route** [**static** | **tag** *tag-id* [**static**] | **remote-peer**[**static**] | **remote-peer** *ip-address* [**static**]]

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**crypto map {** *map-name* **}** **{** *seq-name***}** **ipsec-isakmp** **Example:** `Router (config)# crypto map mymap 1 ipsec-isakmp`	Creates or modifies a crypto map entry and enters crypto map configuration mode.
Step 4	**reverse-route** [**static** | **tag** *tag-id* [**static**] | **remote-peer**[**static**] | **remote-peer** *ip-address* [**static**]] **Example:** `Router (config-crypto-map)# reverse-route remote peer 10.1.1.1`	Creates source proxy information for a crypto map entry.

Configuring RRI Under a Dynamic Map Template

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **crypto dynamic-map** *dynamic-map-name dynamic-seq-name*
4. **reverse-route** [**static** | **tag** *tag-id* [**static**] | **remote-peer**[**static**] | **remote-peer** *ip-address* [**static**]]

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**crypto dynamic-map** *dynamic-map-name dynamic-seq-name* **Example:** `Router (config)# crypto dynamic-map mymap 1`	Creates a dynamic crypto map entry and enters the crypto map configuration command mode.
Step 4	**reverse-route** [**static** | **tag** *tag-id* [**static**] | **remote-peer**[**static**] | **remote-peer** *ip-address* [**static**]] **Example:** `Router (config-crypto-map)# reverse-route remote peer 10.1.1.1`	Creates source proxy information for a crypto map entry.

Configuration Examples for Reverse Route Injection

Configuring RRI When Crypto ACLs Exist Example

The following example shows that all remote VPN gateways connect to the router via 192.168.0.3. RRI is added on the static crypto map, which creates routes on the basis of the source network and source netmask that are defined in the crypto access control list (ACL):

```
crypto map mymap 1 ipsec-isakmp
 set peer 10.1.1.1
 reverse-route
 set transform-set esp-3des-sha
 match address 102
Interface FastEthernet 0/0/1
 ip address 192.168.0.2 255.255.255.0
```

```
 standby name group1
 standby ip 192.168.0.3
 crypto map mymap redundancy group1
access-list 102 permit ip 192.168.1.0 0.0.0.255 10.0.0.0 0.0.255.255
```

Configuring RRI When Two Routes Are Created One for the Remote Endpoint and One for Route Recursion Example

In the following example, two routes are created, one for the remote endpoint and one for route recursion to the remote endpoint via the interface on which the crypto map is configured:

```
reverse-route remote-peer
```

Additional References

Related Documents

Related Topic	Document Title
Cisco IOS Security commands	*Cisco IOS Security Command Reference*
Other Cisco IOS commands	Cisco IOS Master Command List

Standards

Standards	Title
None	--

MIBs

MIBs	MIBs Link
None	To locate and download MIBs for selected platforms, Cisco IOS software releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

RFCs

RFCs	Title
None	--

Technical Assistance

Description	Link
The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies. To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds. Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.	http://www.cisco.com/techsupport

Feature Information for Reverse Route Injection

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

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Table 1 Feature Information for Reverse Route Injection

Feature Name	Releases	Feature Information
Reverse Route Injection	Cisco IOS XE Release 2.1	Reverse route injection (RRI) is the ability for static routes to be automatically inserted into the routing process for those networks and hosts protected by a remote tunnel endpoint. These protected hosts and networks are known as remote proxy identities. Each route is created on the basis of the remote proxy network and mask, with the next hop to this network being the remote tunnel endpoint. By using the remote Virtual Private Network (VPN) router as the next hop, the traffic is forced through the crypto process to be encrypted. The following sections provide information about this feature: The following commands were introduced or modified by this feature: **reverse-route**.

IPsec Preferred Peer

The IP Security (IPsec) Preferred Peer feature allows you to control the circumstances by which multiple peers on a crypto map are tried in a failover scenario.

This feature includes the following capabilities:

- Default peer configuration
- IPsec idle-timer usage with default peer

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the Feature Information Table at the end of this document.

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Prerequisites for IPsec Preferred Peer

- You must have a properly defined, complete crypto map.

Restrictions for IPsec Preferred Peer

Default Peer

- This feature must be used in conjunction with Dead Peer Detection (DPD). It is most effective on a remote site running DPD in periodic mode. DPD detects the failure of a device quickly and resets the peer list so that the default peer is tried for the next attempted connection.
- Only one peer can be designated as the default peer in a crypto map.
- The default peer must be the first peer in the peer list.

IPsec Idle Timer Usage with Default Peer

- This feature works only on the crypto map for which it is configured. You cannot configure the capability globally for all crypto maps.
- If there is a global idle timer, the crypto map idle-timer value must be different from the global value; otherwise, the idle timer is not added to the crypto map.

IPsec Failover

IPsec on the Cisco ASR 1000 Series Router supports only stateless failover. IPsec failover is a feature that increases the total uptime (or availability) of an IPsec network. This is accomplished traditionally by employing a redundant (standby) router in addition to the original (active) router. If the active router becomes unavailable for any reason, the standby router takes over the processing of IKE and IPsec.

IPsec failover falls into two categories: stateless failover and stateful failover. Stateless failover uses protocols such as the Hot Standby Router Protocol (HSRP) to provide primary-to-secondary cutover and also allows the active and standby VPN gateways to share a common virtual IP address.

Information About IPsec Preferred Peer

IPsec

IPsec is a framework of open standards developed by the Internet Engineering Task Force (IETF). IPsec provides security for transmission of sensitive information over unprotected networks such as the Internet. IPsec acts at the network layer, protecting and authenticating Internet Protocol (IP) packets between participating IPsec devices (peers), such as Cisco routers.

IPsec provides the following network security services. These services are optional. In general, local security policy dictates the use of one or more of these services:

- Data Confidentiality--The IPsec sender can encrypt packets before transmitting them across a network.
- Data Integrity--The IPsec receiver can authenticate packets sent by the IPsec sender to ensure that the data has not been altered during transmission.
- Data Origin Authentication--The IPsec receiver can authenticate the source of the IPsec packets sent.
- Anti-Replay--The IPsec receiver can detect and reject replayed packets.

With IPsec, data can be transmitted across a public network without fear of observation, modification, or spoofing. This enables applications such as Virtual Private Networks (VPNs), including intranets, extranets, and remote user access.

IPsec provides secure tunnels between two peers, such as two routers. You define which packets are considered sensitive and should be sent through these secure tunnels, and you define the parameters that should be used to protect these sensitive packets, by specifying characteristics of these tunnels. When the IPsec peer sees such a sensitive packet, it sets up the appropriate secure tunnel and sends the packet through the tunnel to the remote peer.

Dead Peer Detection

The VPN Client uses a keepalive mechanism called Dead Peer Detection (DPD) to check the availability of the VPN device on the other side of an IPsec tunnel. If the network is unusually busy or unreliable, you can increase the number of seconds that the VPN Client will wait before deciding whether the peer is no longer active.

Keepalive packets are not sent if traffic is received. This lowers the overhead associated with DPD, because on a heavily loaded network very few keepalive packets will be sent because traffic is being received on the tunnels. In addition, DPD sends keepalive packets only if there is user traffic to send (and no user traffic is received).

You can configure Internet Key Exchange (IKE) DPD so that DPD sends the keepalive packets whether or not there is outbound user data. That is, as long as there is no inbound user data, the keepalive packets are sent at the configured keepalive interval.

Default Peer Configuration

If a connection timeout occurs, the connection to the current peer is closed. The **set peer** command allows you to configure the first peer as the default peer. If there is a default peer, the next time a connection is initiated, the connection is directed to the default peer instead of to the next peer in the peer list. If the default peer is unresponsive, the next peer in the peer list becomes the current peer and future connections through the crypto map try that peer.

This capability is useful when traffic on a physical link stops due to the failure of a remote peer. DPD indicates that the remote peer is unavailable, but that peer remains the current peer.

A default peer facilitates the failover to a preferred peer that was previously unavailable, but has returned to service. Users can give preference to certain peers in the event of a failover. This is useful if the original failure was due to a network connectivity problem rather than failure of the remote peer.

Idle Timers

When a router running Cisco IOS XE software creates an IPsec security association (SA) for a peer, resources must be allocated to maintain the SA. The SA requires both memory and several managed timers. For idle peers, these resources are wasted. If enough resources are wasted by idle peers, the router could be prevented from creating new SAs with other peers.

IPsec SA idle timers increase the availability of resources by deleting SAs associated with idle peers. Because IPsec SA idle timers prevent the wasting of resources by idle peers, more resources are available to create new SAs when required.

If IPsec SA idle timers are not configured, only the global lifetimes for IPsec SAs are applied. SAs are maintained until the global timers expire, regardless of peer activity.

IPsec Idle-Timer Usage with Default Peer

If all connections to the current peer time out, the next time a connection is initiated it is directed to the default peer configured in the **set peer** command. If a default peer is not configured and there is a connection timeout, the current peer remains the one that timed out.

This enhancement helps facilitate a failover to a preferred peer that was previously unavailable but is in service now.

Peers on Crypto Maps

A crypto map set can contain multiple entries, each with a different access list. The router searches the crypto map entries in order, and attempts to match the packet to the access list specified in that entry.

When a packet matches a **permit** entry in a particular access list, and the corresponding crypto map entry is tagged as Cisco, connections are established with the remote peer as specified in the set peer statements within the crypto map.

How to Configure IPsec Preferred Peer

Configuring a Default Peer

To configure a default peer, perform the following steps.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **crypto map** *map-name seq-num* [**ipsec-isakmp**] [**dynamic** *dynamic-map-name*] [**discover**] [**profile** *profile-name*]
4. **set peer** {*host-name* [**dynamic**] [**default**] | *ip-address* [**default**] }
5. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.

	Command or Action	Purpose
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**crypto map** *map-name seq-num* [**ipsec-isakmp**] [**dynamic** *dynamic-map-name*] [**discover**] [**profile** *profile-name*] **Example:** `Router(config)# crypto map mymap 10 ipsec-isakmp`	Enters crypto map configuration mode. Creates or modifies a crypto map entry, creates a crypto profile that provides a template for configuration of dynamically created crypto maps, or configures a client accounting list.
Step 4	**set peer** {*host-name* [**dynamic**] [**default**] | *ip-address* [**default**] } **Example:** `Router(config-crypto-map)# set peer 10.0.0.2 default`	Specifies an IPsec peer in a crypto map entry. Ensures that the first peer specified is defined as the default peer.
Step 5	**exit** **Example:** `Router(config-crypto-map)# exit`	Exits crypto map configuration mode and returns to global configuration mode.

Configuring the Idle Timer

To configure the idle timer, perform the following steps.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **crypto map** *map-name seq-num* [**ipsec-isakmp**] [**dynamic** *dynamic-map-name*] [**discover**] [**profile** *profile-name*]
4. **set security-association idletime** *seconds* [**default**]
5. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**crypto map** *map-name seq-num* [**ipsec-isakmp**] [**dynamic** *dynamic-map-name*] [**discover**] [**profile** *profile-name*] **Example:** `Router(config)# crypto map mymap 10 ipsec-isakmp`	Enters crypto map configuration mode. Creates or modifies a crypto map entry, creates a crypto profile that provides a template for configuration of dynamically created crypto maps, or configures a client accounting list.
Step 4	**set security-association idletime** *seconds* [**default**] **Example:** `Router(config-crypto-map)# set security-association idletime 120 default`	Specifies the maximum amount of time for which the current peer can be idle before the default peer is used.
Step 5	**exit** **Example:** `Router(config-crypto-map)# exit`	Exits crypto map configuration mode and returns to global configuration mode.

Configuration Examples for IPsec Preferred Peer

Configuring a Default Peer Example

The following example shows that the first peer, at IP address 10.1.1.1, is the default peer:

```
crypto map tohub 1 ipsec-isakmp
```

```
 set peer 10.1.1.1 default
 set peer 10.2.2.2
```

Configuring the IPsec Idle Timer Example

In the following example, if the current peer is idle for 120 seconds, the default peer 10.1.1.1 (which was specified in the **set peer**command) is used for the next attempted connection:

```
crypto map tohub 1 ipsec-isakmp
 set peer 10.1.1.1 default
 set peer 10.2.2.2
 set security-association idletime 120 default
```

Additional References

Related Documents

Related Topic	Document Title
Cisco IOS commands	Cisco IOS Master Commands List, All Releases
IPsec	*Security for VPNs with IPsec*
Crypto map	• *Security for VPNs with IPsec* • *Configuring Internet Key Exchange for IPsec VPNs*
DPD	*IPsec Dead Peer Detection Periodic Message Option*
Security commands	*Cisco IOS Security Command Reference*

MIBs

MIBs	MIBs Link
None.	To locate and download MIBs for selected platforms, Cisco IOS software releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

Technical Assistance

Description	Link
The Cisco Support and Documentation website provides online resources to download documentation, software, and tools. Use these resources to install and configure the software and to troubleshoot and resolve technical issues with Cisco products and technologies. Access to most tools on the Cisco Support and Documentation website requires a Cisco.com user ID and password.	http://www.cisco.com/cisco/web/support/index.html

Feature Information for IPsec Preferred Peer

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Table 2 Feature Information for IPsec Preferred Peer

Feature Name	Releases	Feature Information
IPsec Preferred Peer	Cisco IOS XE Release 2.1	The IPsec Preferred Peer feature allows you to control the circumstances by which multiple peers on a crypto map are tried in a failover scenario. The following commands were introduced or modified: **set peer** (IPsec) and **set security-association idle-time**.

Glossary

crypto access list --A list that defines which IP traffic will be protected by crypto and which traffic will not be protected by crypto.

crypto map --A map that specifies which traffic should be protected by IPsec, where IPsec-protected traffic should be sent, and what IPsec transform sets should be applied to this traffic.

dead peer detection --A feature that allows the router to detect an unresponsive peer.

keepalive message --A message sent by one network device to inform another network device that the virtual circuit between the two is still active.

peer --Router or other device that participates in IPsec and IKE. In IPsec, peers are devices or entities that communicate securely either through the exchange of keys or the exchange of digital certificates.

SA --security association. An instance of security policy and keying material applied to a data flow. Both IKE and IPsec use SAs, although SAs are independent of one another. IPsec SAs are unidirectional and are unique in each security protocol. An IKE SA is used by IKE only, and unlike the IPsec SA, it is bidirectional. IKE negotiates and establishes SAs on behalf of IPsec. A user also can establish IPsec SAs manually. A set of SAs are needed for a protected data pipe, one per direction per protocol. For example, if you have a pipe that supports Encapsulating Security Payload (ESP) between peers, one ESP SA is required for each direction. SAs are identified uniquely by destination (IPsec endpoint) address, security protocol (AH or ESP), and security parameter index (SPI).

transform set --An acceptable combination of security protocols, algorithms, and other settings to apply to IPsec-protected traffic. During the IPsec security association negotiation, the peers agree to use a particular transform set when protecting a particular data flow.

Real-Time Resolution for IPsec Tunnel Peer

After a user specifies a host name (instead of an IP address) for remote IP Security (IPsec) peer, the Real-Time Resolution for IPsec Tunnel Peer feature allows the host name to be domain name server (DNS) resolved before the router establishes the IPsec tunnel. Thus, the router can immediately discover whether the IP address of the peer has changed.

Finding Feature Information

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Restrictions for Real-Time Resolution for IPsec Tunnel Peer

Secure DNS Requirement

It is recommended that you use this feature only with secure DNS and when the DNS responses can be authenticated. Otherwise, an attacker can spoof or forge DNS responses and have access to Internet Key Exchange (IKE) authentication data, such as a certificate. If an attacker has a certificate that is trusted by the initiating host, the attacker can successfully establish Phase 1 IKE security association (SA), or the attacker can try to guess the preshared key that is shared between the initiator and the actual responder.

DNS Initiator

DNS names resolution for remote IPsec peers will work only if they are used as an initiator. The first packet that is to be encrypted will trigger a DNS lookup; after the DNS lookup is complete, subsequent packets will trigger IKE.

Information About Real-Time Resolution for IPsec Tunnel Peer

Real-Time Resolution Via Secure DNS

When specifying the host name of a remote IPsec peer via the **set peer** command, you can also issue the **dynamic** keyword, which defers DNS resolution of the host name until right before the IPsec tunnel has been established. Deferring resolution enables the Cisco IOS XE software to detect whether the IP address of the remote IPsec peer has changed. Thus, the software can contact the peer at the new IP address.

If the **dynamic** keyword is not issued, the host name is resolved immediately after it is specified. So, the software cannot detect an IP address change and, therefore, attempts to connect to the IP address that it previously resolved.

DNS resolution assures users that their established IPsec tunnel is secure and authenticated.

How to Configure Real-Time Resolution

Configuring Real-Time Resolution for IPsec Peers

Use this task to configure a router to perform real-time DNS resolution with a remote IPsec peer; that is, the host name of peer is resolved via a DNS lookup right before the router establishes a connection (an IPsec tunnel) with the peer.

Before creating a crypto map, you should perform the following tasks:

- Define Internet Security Association Key Management Protocol (ISAKMP) policies.
- Define IPsec transform sets.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **crypto map** *map-name seq-num* **ipsec-isakmp**
4. **match address** *access-list-id*
5. **set peer** {*host-name* [**dynamic**] | *ip-address*
6. **set transform-set** *transform-set-name1* [*transform-set-name2 ... transform-set-name6*]

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**crypto map** *map-name seq-num* **ipsec-isakmp** **Example:** `Router(config)# crypto map secure_b 10 ipsec-isakmp`	Specifies the crypto map entry to create (or modify) and enters crypto map configuration mode.
Step 4	**match address** *access-list-id* **Example:** `Router(config-crypto-m)# match address 140`	Names an extended access list. This access list determines which traffic should be protected by IPsec and which traffic should not be protected by IPsec in the context of this crypto map entry.
Step 5	**set peer** {*host-name* [**dynamic**] | *ip-address* **Example:** `Router(config-crypto-m)# set peer b.cisco.com dynamic`	Specifies a remote IPsec peer. This is the peer to which IPsec-protected traffic can be forwarded. • **dynamic** --Allows the host name to be resolved via a DNS lookup just before the router establishes the IPsec tunnel with the remote peer. If this keyword is not specified, the host name will be resolved immediately after the host name is specified. Repeat for multiple remote peers.
Step 6	**set transform-set** *transform-set-name1* [*transform-set-name2 ... transform-set-name6*] **Example:** `Router(config-crypto-m)# set transform-set myset`	Specifies which transform sets are allowed for this crypto map entry. List multiple transform sets in order of priority (highest priority first).

- Troubleshooting Tips, page 22
- What to Do Next, page 22

Troubleshooting Tips

To display crypto map configuration information, use the **show crypto map** command.

What to Do Next

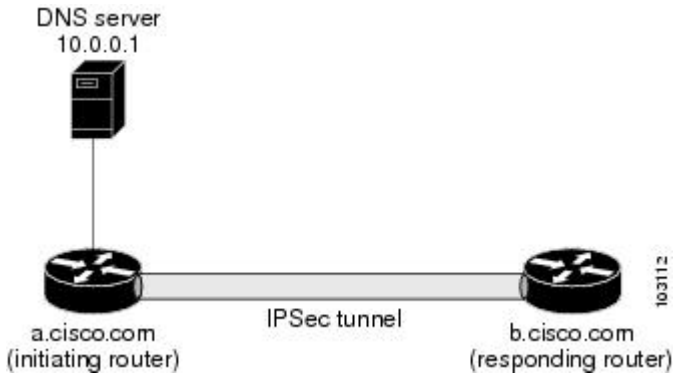
You need to apply a crypto map set to each interface through which IPsec traffic will flow. Applying the crypto map set to an interface instructs the router to evaluate all the interface's traffic against the crypto map set and to use the specified policy during connection or security association (SA) negotiation on behalf of traffic to be protected by crypto.

Configuration Examples for Real-Time Resolution

Configuring Real-Time Resolution for an IPsec Peer Example

The figure below and the following example illustrate how to create a crypto map that configures the host name of a remote IPsec peer to DNS resolved via a DNS lookup right before the Cisco IOS XE software attempts to establish a connection with that peer.

Figure 1 Real-Time Resolution Sample Topology




```
! Configure the initiating router.
hostname a.cisco.com
ip domain name cisco.com
ip name server 10.0.0.1
!
crypto map secure_b 10 ipsec-isakmp
  match address 140
  set peer b.cisco.com dynamic
  set transform-set xset
interface serial1
  ip address 10.10.0.1
  crypto map secure_b
access-list 140 permit ...
!
! Configure the responding router (the remote IPSec peer).
hostname b.cisco.com
!
```

```
crypto map secure_a 10 ipsec-isakmp
  match address 150
  set peer 10.10.0.1
  set transform-set
interface serial0/1
  ip address 10.0.0.1
  crypto map secure_a
access-list 150 ...
! DNS server configuration
b.cisco.com 10.0.0.1       # the address of serial0/1 of b.cisco.com
```

Additional References

Related Documents

Related Topic	Document Title
Crypto maps	"Configuring Security for VPNs with IPsec" module in the *Security for VPNs with IPsec Configuration Guide*
ISAKMP policies	"Configuring Internet Key Exchange for IPsec VPNs" module in the *Internet Key Exchange for IPsec VPNs Configuration Guide*
IPsec and IKE configuration commands	*Cisco IOS Security Command Reference*

Standards

Standards	Title
No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature	--

MIBs

MIBs	MIBs Link
No new or modified MIBs are supported by this feature, and support for existing MIBs has not been modified by this feature.	To locate and download MIBs for selected platforms, Cisco IOS XE software releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

RFCs

RFCs	Title
No new or modified RFCs are supported by this feature, and support for existing RFCs has not been modified by this feature.	--

Technical Assistance

Description	Link
The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies. To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds. Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.	http://www.cisco.com/techsupport

Feature Information for Real-Time Resolution for IPsec Tunnel Peer

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Table 3 Feature Information for Real-Time Resolution for IPsec Tunnel Peer

Feature Name	Releases	Feature Information
Real-Time Resolution for IPsec Tunnel Peer	Cisco IOS XE Release 2.1	After a user specifies a host name (instead of an IP address) for remote IP Security (IPsec) peer, this feature allows the host name to be domain name server (DNS) resolved before the router establishes the IPsec tunnel. Thus, the router can immediately discover whether the IP address of the peer has changed. The following commands were introduced or modified: **set peer (IPsec)**.