IPsec Management Configuration Guide, Cisco IOS Release 15M&T

Americas Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
http://www.cisco.com
Tel: 408 526-4000
800 553-NETS (6387)
Fax: 408 527-0883

CONTENTS

IP Security VPN Monitoring

The IP Security VPN Monitoring feature provides the following Virtual Private Network (VPN) session monitoring enhancements to troubleshoot and monitor the end-user interface:

- Ability to specify an Internet Key Exchange (IKE) peer description in the configuration file
- Summary listing of crypto session status
- Syslog notification for crypto session up or down status
- Ability to clear both IKE and IP Security (IPSec) security associations (SAs) using one command-line interface (CLI)

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see Bug Search Tool and 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 module.

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 IP Security VPN Monitoring

- You should be familiar with IPSec and encryption.
- Your router must support IPSec, and before using the IP Security VPN Monitoring feature, you must have configured IPSec on your router.

Restrictions for IP Security VPN Monitoring

- You must be running Cisco IOS k8 or k9 crypto images on your router.

Information About IPSec VPN Monitoring

Background Crypto Sessions

A crypto session is a set of IPSec connections (flows) between two crypto endpoints. If the two crypto endpoints use IKE as the keying protocol, they are IKE peers to each other. Typically, a crypto session consists of one IKE security association (for control traffic) and at least two IPSec security associations (for data traffic--one per each direction). There may be duplicated IKE security associations (SAs) and IPSec SAs or duplicated IKE SAs or IPSec SAs for the same session in the duration of rekeying or because of simultaneous setup requests from both sides.

Per-IKE Peer Description

The Per-IKE Peer Description function allows you to enter a description of your choosing for an IKE peer. (Before Cisco IOS Release 12.3(4)T, you could use only the IP address or fully qualified domain name [FQDN] to identify the peer; there was no way to configure a description string.) The unique peer description, which can include up to 80 characters, can be used whenever you are referencing that particular IKE peer. To add the peer description, use the **description** command.

Note IKE peers that “sit” behind a Network Address Translation (NAT) device cannot be uniquely identified; therefore, they have to share the same peer description.

The primary application of this description field is for monitoring purposes (for example, when using **show** commands or for logging [syslog messages]). The description field is purely informational (for example, it cannot act as a substitute for the peer address or FQDN when defining crypto maps).

Summary Listing of Crypto Session Status

You can get a list of all the active VPN sessions by entering the **show crypto session** command. The listing will include the following:

- Interface
- IKE peer description, if available
- IKE SAs that are associated with the peer by whom the IPSec SAs are created
- IPSec SAs serving the flows of a session

Multiple IKE or IPSec SAs may be established for the same peer (for the same session), in which case IKE peer descriptions will be repeated with different values for the IKE SAs that are associated with the peer and for the IPSec SAs that are serving the flows of the session.

You can also use the **show crypto session detail** variant of this command to obtain more detailed information about the sessions.

Syslog Notification for Crypto Session Up or Down Status

The Syslog Notification for Crypto Session Up or Down Status function provides syslog notification every time the crypto session comes up or goes down.

The following is a sample syslog notification showing that a crypto session is up:

```
%CRYPTO-5-SESSION_STATUS: Crypto session is UP. Peer 10.6.6.1:500 fvrf=name10
ivrf=name20  Description: SJC24-2-VPN-Gateway Id: 10.5.5.2
```

The following is a sample syslog notification showing that a crypto session is down:

```
%CRYPTO-5-SESSION_STATUS: Crypto session is DOWN. Peer 10.6.6.1:500 fvrf=name10
ivrf=name20 Description: SJC24-2-VPN-Gateway Id: 10.5.5.2
```

IKE and IPSec Security Exchange Clear Command

In previous IOS versions, there was no single command to clear both IKE and IPSec connections (that is, SAs). Instead, you had to use the **clear crypto isakmp** command to clear IKE and the **clear crypto ipsec** command to clear IPSec. The new **clear crypto session** command allows you to clear both IKE and IPSec with a single command. To clear a specific crypto session or a subset of all the sessions (for example, a single tunnel to one remote site), you need to provide session-specific parameters, such as a local or remote IP address, a local or remote port, a front door VPN routing and forwarding (FVRF) name, or an inside VRF (IVRF) name. Typically, the remote IP address will be used to specify a single tunnel to be deleted.

If a local IP address is provided as a parameter when you use the **clear crypto session** command, all the sessions (and their IKE SAs and IPSec SAs) that share the IP address as a local crypto endpoint (IKE local address) will be cleared. If you do not provide a parameter when you use the **clear crypto session** command, all IPSec SAs and IKE SAs that are in the router will be deleted.

How to Configure IP Security VPN Monitoring

- Adding the Description of an IKE Peer, page 3
- Verifying Peer Descriptions, page 4
- Clearing a Crypto Session, page 5

Adding the Description of an IKE Peer

To add the description of an IKE peer to an IPSec VPN session, perform the following steps.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **crypto isakmp peer** {**ip-address***ip-address* }
4. **description**

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 isakmp peer** {**ip-address***ip-address* }
	Example:
	`Router (config)# crypto isakmp peer address 10.2.2.9`
		Enables an IPSec peer for IKE querying of authentication, authorization, and accounting (AAA) for tunnel attributes in aggressive mode and enters ISAKMP peer configuration mode.

Step 4	**description** **Example:** `Router (config-isakmp-peer)# description connection from site A`	Adds a description for an IKE peer.

Verifying Peer Descriptions

To verify peer descriptions, use the **show crypto isakmp peer** command.

SUMMARY STEPS

1. **enable**
2. **show crypto isakmp peer**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**show crypto isakmp peer** **Example:** `Router# show crypto isakmp peer`	Displays peer descriptions.

Examples

The following output example verifies that the description “connection from site A” has been added for IKE peer 10.2.2.9:

```
Router# show crypto isakmp peer
Peer: 10.2.2.9 Port: 500
 Description: connection from site A
  flags: PEER_POLICY
```

When the peer at address 10.2.2.9 connects and the session comes up, the syslog status will be shown as follows:

```
%CRYPTO-5-SESSION_STATUS: Crypto tunnel is UP. Peer 10.2.2.9:500 Description: connection
from site A Id: ezvpn
```

The following output example verifies that the description “connection from site A” has been added for IKE peer 10.2.2.9:

```
Router# show crypto isakmp peer
Peer: 10.2.2.9 Port: 500
 Description: connection from site A
  flags: PEER_POLICY
```

When the peer at address 10.2.2.9 connects and the session comes up, the syslog status will be shown as follows:

```
%CRYPTO-5-SESSION_STATUS: Crypto tunnel is UP. Peer 10.2.2.9:500 Description: connection
from site A Id: ezvpn
```

Clearing a Crypto Session

To clear a crypto session, use the **clear crypto session** command from the router command line. No configuration statements are required in the configuration file to use this command.

SUMMARY STEPS

1. **enable**
2. **clear crypto session**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**clear crypto session** **Example:** `Router# clear crypto session`	Deletes crypto sessions (IPSec and IKE SAs).

Configuration Examples for IP Security VPN Monitoring

show crypto session Command Output Examples

The following is sample output for the **show crypto session** output without the **detail** keyword:

```
Router# show crypto session
Crypto session current status
Interface: FastEthernet0/1
Session status: UP-ACTIVE
Peer: 172.0.0.2/500
   IKE SA: local 172.0.0.1/500 remote 172.0.0.2/500 Active
   IPSEC FLOW: permit ip 10.10.10.0/255.255.255.0 10.30.30.0/255.255.255.0
         Active SAs: 2, origin: crypto map
```

The following is sample output using the **show crypto session command and the detail** keyword:

```
Router# show crypto session detail
Interface: Tunnel0
Session status: UP-ACTIVE
Peer: 10.1.1.3 port 500 fvrf: (none) ivrf: (none)
      Desc: this is my peer at 10.1.1.3:500 Green
      Phase1_id: 10.1.1.3
  IKE SA: local 10.1.1.4/500 remote 10.1.1.3/500 Active
          Capabilities:(none) connid:3 lifetime:22:03:24
  IPSEC FLOW: permit 47 host 10.1.1.4 host 10.1.1.3
        Active SAs: 0, origin: crypto map
        Inbound:  #pkts dec'ed 0 drop 0 life (KB/Sec) 0/0
        Outbound: #pkts enc'ed 0 drop 0 life (KB/Sec) 0/0
  IPSEC FLOW: permit ip host 10.1.1.4 host 10.1.1.3
        Active SAs: 4, origin: crypto map
        Inbound:  #pkts dec'ed 4 drop 0 life (KB/Sec) 4605665/2949
        Outbound: #pkts enc'ed 4 drop 1 life (KB/Sec) 4605665/2949
```

Additional References

Related Documents

Related Topic	Document Title
IP security, encryption, and IKE	• Configuring Internet Key Exchange for IPsec VPNs • Configuring Security for VPNs with IPsec
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 IP Security VPN Monitoring

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 1 Feature Information for IP Security VPN Monitoring

Feature Name	Releases	Feature Information
IP Security VPN Monitoring	12.3(4)T	The IP Security VPN Monitoring feature provides the following Virtual Private Network (VPN) session monitoring enhancements to troubleshoot and monitor the end-user interface: • Ability to specify an Internet Key Exchange (IKE) peer description in the configuration file • Summary listing of crypto session status • Syslog notification for crypto session up or down status • Ability to clear both IKE and IP Security (IPSec) security associations (SAs) using one command-line interface (CLI) This feature was introduced in Cisco IOS Release 12.3(4)T. The following commands were introduced or modified: **clear crypto session, description (isakmp peer), show crypto isakmp peers, show crypto session .**

Any Internet Protocol (IP) addresses and phone numbers used in this document are not intended to be actual addresses and phone numbers. Any examples, command display output, network topology diagrams, and other figures included in the document are shown for illustrative purposes only. Any use of actual IP addresses or phone numbers in illustrative content is unintentional and coincidental.

IPsec and IKE MIB Support forCisco VRF-Aware IPsec

The IPsec and IKE MIB Support for Cisco VRF-Aware IPsec feature provides manageability of Virtual Private Network routing and forwarding- (VRF-) aware IP security (IPsec) using MIBs. The benefit of this feature is that VRF-aware IPsec MIBs provide the granular details of IPsec statistics and performance metrics on a VRF basis.

Note Security threats, as well as the cryptographic technologies to help protect against them, are constantly changing. For more information about the latest Cisco cryptographic recommendations, see the *Next Generation Encryption* (NGE) white paper.

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see Bug Search Tool and 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 module.

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Prerequisites for IPsec and IKE MIB Support forCisco VRF-Aware IPsec

- You should be familiar with configuring Simple Network Management Protocol (SNMP).

Information About IPsec and IKE MIB Support forCisco VRF-Aware IPsec

MIBs Supported by the IPsec and IKE MIB Support forCisco VRF-Aware IPsec Feature

The following MIBs are supported by the IPsec and IKE MIB Support for Cisco VRF-Aware IPsec feature:

- CISCO-IPSEC-FLOW-MONITOR-MIB
- CISCO-IPSEC-MIB
- The CISCO-IPSEC-POLICY-MAP-MIB continues to be supported. However, because this MIB applies to the entire router rather than to a specific VPN VRF instance, it is not VRF aware; therefore, polling of the object identifiers (OIDs) that belong to this MIB is accomplished with respect to the global VRF context.

The IPv6 compliance of Cisco IPSec MIBs and IKEv2 extensions to Cisco IPSec MIB feature provides IPv6 and IKEv2 support for the Cisco IPsec MIBs.

How to Configure IPsec and IKE MIB Support for Cisco VRF-Aware IPsec

No special configuration is needed for this feature. The SNMP framework can be used to manage VRF-aware IPsec using MIBs. See the Configuration Examples for IPsec and IKE MIB Support for Cisco VRF-Aware IPsec section for more information.

The following section provides information about troubleshooting this feature:

How to Troubleshoot the IPsec and IKE MIB Support for Cisco VRF-Aware IPsec Feature

The following **debug crypto mib** command and keywords may be used to display information about the IPsec and Internet Key Exchange (IKE) MIB as it relates to Cisco VRF-aware IPsec.

SUMMARY STEPS

1. **enable**
2. **debug crypto mib detail**
3. **debug crypto mib error**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**debug crypto mib detail** **Example:** `Router# debug crypto mib detail`	Displays different events as they occur in the IPsec MIB subsystem. • Due consideration should be given to enabling **debug crypto mib detail**because the output for the **detail** keyword can be quite long.
Step 3	**debug crypto mib error** **Example:** `Router# debug crypto mib error`	Displays error events in the MIB agent.

Configuration Examples for IPsec and IKE MIB Support for Cisco VRF-Aware IPsec

Configuration That Has Two VRFs Examples

The following output example is for a typical hub configuration that has two VRFs. The output is what you would see if you were to poll for the IPsec security association (SA). Router 3745b is the VRF-aware router.

Two VRFs Configured

The following output shows that two VRFs have been configured (vrf1 and vrf2).

```
Router3745b# show running-config
Building configuration...
Current configuration : 6567 bytes
!
version 12.4
service timestamps debug datetime msec localtime
service timestamps log uptime
no service password-encryption
!
hostname ipsecf-3745b
!
boot-start-marker
boot-end-marker
```

```
!
no logging console
enable password lab
!
no aaa new-model
!
resource policy
!
memory-size iomem 5
clock timezone PST -8
clock summer-time PDT recurring
ip subnet-zero
ip cef
!
!
ip vrf vrf1
 rd 1:101
 context vrf-vrf1-context
 route-target export 1:101
 route-target import 1:101
!
ip vrf vrf2
 rd 2:101
 context vrf-vrf2-context
 route-target export 2:101
 route-target import 2:101
!
no ip domain lookup
!
!
crypto keyring vrf1-1 vrf vrf1
  pre-shared-key address 10.1.1.1 255.255.255.0 key vrf1-1
crypto keyring vrf2-1 vrf vrf2
  pre-shared-key address 10.1.2.1 255.255.255.0 key vrf2-1
!
!
crypto isakmp policy 1
 authentication pre-share
!
crypto isakmp policy 50
 authentication pre-share
crypto isakmp key global1-1 address 10.1.151.1
crypto isakmp key global2-1 address 10.1.152.1
crypto isakmp profile vrf1-1
   keyring vrf1-1
   match identity address 10.1.1.1 255.255.255.255 vrf1
crypto isakmp profile vrf2-1
   keyring vrf2-1
   match identity address 10.1.2.1 255.255.255.255 vrf2
!
crypto ipsec security-association lifetime kilobytes 99000
crypto ipsec security-association lifetime seconds 5000
!
crypto ipsec transform-set tset ah-sha-hmac esp-des esp-sha-hmac
!
crypto map global1-1 10 ipsec-isakmp
 set peer 10.1.151.1
 set transform-set tset
 match address 151
!
crypto map global2-1 10 ipsec-isakmp
 set peer 10.1.152.1
 set transform-set tset
 match address 152
!
crypto map vrf1-1 10 ipsec-isakmp
 set peer 10.1.1.1
 set transform-set tset
 set isakmp-profile vrf1-1
 match address 101
!
crypto map vrf2-1 10 ipsec-isakmp
 set peer 10.1.2.1
 set transform-set tset
 set isakmp-profile vrf2-1
 match address 102
!
!
interface FastEthernet0/0
 ip address 10.1.38.25 255.255.255.0
 no ip mroute-cache
 duplex auto
 speed auto
!
interface Serial0/0
 no ip address
 shutdown
 clock rate 2000000
!
interface FastEthernet0/1
 no ip address
 no ip mroute-cache
 shutdown
 duplex auto
 speed auto
!
interface Serial0/1
 no ip address
 shutdown
 clock rate 2000000
!
interface Serial1/0
 no ip address
 encapsulation frame-relay
 no ip route-cache cef
 no ip route-cache
 no ip mroute-cache
 no keepalive
 serial restart-delay 0
 clock rate 128000
 no frame-relay inverse-arp
!
interface Serial1/0.1 point-to-point
 ip vrf forwarding vrf1
 ip address 10.3.1.1 255.255.255.0
 no ip route-cache
 frame-relay interface-dlci 21
!
interface Serial1/0.2 point-to-point
 ip vrf forwarding vrf2
 ip address 10.3.2.1 255.255.255.0
 no ip route-cache
 frame-relay interface-dlci 22
!
interface Serial1/0.151 point-to-point
 ip address 10.7.151.1 255.255.255.0
 no ip route-cache
 frame-relay interface-dlci 151
!
interface Serial1/0.152 point-to-point
 ip address 10.7.152.1 255.255.255.0
 no ip route-cache
 frame-relay interface-dlci 152
!
interface Serial1/1
 no ip address
 no ip mroute-cache
 shutdown
 serial restart-delay 0
!
interface Serial1/2
 no ip address
 encapsulation frame-relay
 no ip route-cache cef
 no ip route-cache
 no ip mroute-cache
 no keepalive
 serial restart-delay 0
 no frame-relay inverse-arp
!
interface Serial1/2.1 point-to-point
 ip vrf forwarding vrf1
 ip address 10.1.1.2 255.255.255.0
 no ip route-cache
 frame-relay interface-dlci 21
 crypto map vrf1-1
!
interface Serial1/2.2 point-to-point
 ip vrf forwarding vrf2
 ip address 10.1.2.2 255.255.255.0
 no ip route-cache
 frame-relay interface-dlci 22
 crypto map vrf2-1
!
interface Serial1/2.151 point-to-point
 ip address 10.5.151.2 255.255.255.0
 no ip route-cache
 frame-relay interface-dlci 151
 crypto map global1-1
!
interface Serial1/2.152 point-to-point
 ip address 10.5.152.2 255.255.255.0
 no ip route-cache
 frame-relay interface-dlci 152
 crypto map global2-1
!
interface Serial1/3
 no ip address
 no ip mroute-cache
 shutdown
 serial restart-delay 0
!
ip default-gateway 10.1.38.1
ip classless
ip route 10.1.1.6 255.255.255.255 10.1.151.1
ip route 10.2.1.6 255.255.255.255 10.1.152.1
ip route 10.6.2.1 255.255.255.255 10.7.151.2
ip route 10.6.2.2 255.255.255.255 10.7.152.2
ip route 172.19.216.110 255.255.255.255 FastEthernet0/0
ip route vrf vrf1 10.20.1.1 255.255.255.255 10.1.1.1
ip route vrf vrf1 10.22.1.1 255.255.255.255 10.30.1.1
ip route vrf vrf2 10.20.2.1 255.255.255.255 10.1.2.1
ip route vrf vrf2 10.22.2.1 255.255.255.255 10.30.1.2
!
!
ip http server
no ip http secure-server
!
ip access-list standard vrf-vrf1-context
ip access-list standard vrf-vrf2-context
!
access-list 101 permit ip host 10.22.1.1 host 10.20.1.1
access-list 102 permit ip host 10.22.2.1 host 10.20.2.1
access-list 151 permit ip host 10.6.2.1 host 10.1.1.6
access-list 152 permit ip host 10.6.2.2 host 10.2.1.6
snmp-server group abc1 v2c context vrf-vrf1-context read view_vrf1 notify
*tv.FFFFFFFF.FFFFFFFF.FFFFFFFF.F access vrf-vrf1-context
snmp-server group abc2 v2c context vrf-vrf2-context read view_vrf2 notify
*tv.FFFFFFFF.FFFFFFFF.FFFFFFFF.F access vrf-vrf2-context
snmp-server view view_vrf1 iso included
snmp-server view view_vrf2 iso included
snmp-server community abc1 RW
snmp-server community global1 RW
snmp-server community abc2 RW
snmp-server community global2 RW
snmp-server enable traps tty
snmp-server enable traps config
snmp-server host 172.19.216.110 version 2c abc1
snmp-server host 172.19.216.110 vrf vrf1 version 2c abc1 udp-port 2001  ipsec isakmp
```

```
snmp-server host 172.19.216.110 version 2c abc2
snmp-server host 172.19.216.110 vrf vrf2 version 2c abc2 udp-port 2002  ipsec isakmp
snmp-server context vrf-vrf1-context
snmp-server context vrf-vrf2-context
!
!
snmp mib community-map  abc1 context vrf-vrf1-context
snmp mib community-map  abc2 context vrf-vrf2-context
!
!
control-plane
!
!
line con 0
 exec-timeout 0 0
line aux 0
line vty 0 4
 login
!
!
webvpn context Default_context
 ssl authenticate verify all
 !
 no inservice
!
!
end
```

Both VRFs Cleared

The following output, for abc1 and abc2, shows that both VRFs have been “cleared” to ensure that all the counters are initialized to a known value.

The following output shows that VRF abc1 has been cleared:

```
orcas:2> setenv SR_MGR_CONF /users/green1
orcas:3> setenv SR_UTIL_SNMP_VERSION v2c
orcas:5> setenv SR_UTIL_COMMUNITY abc1
orcas:6> setenv SR_MGR_CONF_DIR /users/green1
orcas:7> /auto/sw/packages/snmpr/10.14.2.0/solaris2bin/getmany -v2c 10.1.38.25
cipSecMIBObjects
cipSecMibLevel.0 = 1
cikeGlobalActiveTunnels.0 = 0
cikeGlobalPreviousTunnels.0 = 0
cikeGlobalInOctets.0 = 0
cikeGlobalInPkts.0 = 0
cikeGlobalInDropPkts.0 = 0
cikeGlobalInNotifys.0 = 0
cikeGlobalInP2Exchgs.0 = 0
cikeGlobalInP2ExchgInvalids.0 = 0
cikeGlobalInP2ExchgRejects.0 = 0
cikeGlobalInP2SaDelRequests.0 = 0
cikeGlobalOutOctets.0 = 0
cikeGlobalOutPkts.0 = 0
cikeGlobalOutDropPkts.0 = 0
cikeGlobalOutNotifys.0 = 0
cikeGlobalOutP2Exchgs.0 = 0
cikeGlobalOutP2ExchgInvalids.0 = 0
cikeGlobalOutP2ExchgRejects.0 = 0
cikeGlobalOutP2SaDelRequests.0 = 0
cikeGlobalInitTunnels.0 = 0
cikeGlobalInitTunnelFails.0 = 0
cikeGlobalRespTunnelFails.0 = 0
cikeGlobalSysCapFails.0 = 0
cikeGlobalAuthFails.0 = 0
cikeGlobalDecryptFails.0 = 0
cikeGlobalHashValidFails.0 = 0
cikeGlobalNoSaFails.0 = 0
cipSecGlobalActiveTunnels.0 = 0
cipSecGlobalPreviousTunnels.0 = 0
cipSecGlobalInOctets.0 = 0
cipSecGlobalHcInOctets.0 = 0x00
```

```
cipSecGlobalInOctWraps.0 = 0
cipSecGlobalInDecompOctets.0 = 0
cipSecGlobalHcInDecompOctets.0 = 0x00
cipSecGlobalInDecompOctWraps.0 = 0
cipSecGlobalInPkts.0 = 0
cipSecGlobalInDrops.0 = 0
cipSecGlobalInReplayDrops.0 = 0
cipSecGlobalInAuths.0 = 0
cipSecGlobalInAuthFails.0 = 0
cipSecGlobalInDecrypts.0 = 0
cipSecGlobalInDecryptFails.0 = 0
cipSecGlobalOutOctets.0 = 0
cipSecGlobalHcOutOctets.0 = 0x00
cipSecGlobalOutOctWraps.0 = 0
cipSecGlobalOutUncompOctets.0 = 0
cipSecGlobalHcOutUncompOctets.0 = 0x00
cipSecGlobalOutUncompOctWraps.0 = 0
cipSecGlobalOutPkts.0 = 0
cipSecGlobalOutDrops.0 = 0
cipSecGlobalOutAuths.0 = 0
cipSecGlobalOutAuthFails.0 = 0
cipSecGlobalOutEncrypts.0 = 0
cipSecGlobalOutEncryptFails.0 = 0
cipSecGlobalProtocolUseFails.0 = 0
cipSecGlobalNoSaFails.0 = 0
cipSecGlobalSysCapFails.0 = 0
cipSecHistTableSize.0 = 200
cipSecHistCheckPoint.0 = ready(1)
cipSecFailTableSize.0 = 200
cipSecTrapCntlIkeTunnelStart.0 = enabled(1)
cipSecTrapCntlIkeTunnelStop.0 = enabled(1)
cipSecTrapCntlIkeSysFailure.0 = disabled(2)
cipSecTrapCntlIkeCertCrlFailure.0 = disabled(2)
cipSecTrapCntlIkeProtocolFail.0 = disabled(2)
cipSecTrapCntlIkeNoSa.0 = disabled(2)
cipSecTrapCntlIpSecTunnelStart.0 = enabled(1)
cipSecTrapCntlIpSecTunnelStop.0 = enabled(1)
cipSecTrapCntlIpSecSysFailure.0 = disabled(2)
cipSecTrapCntlIpSecSetUpFailure.0 = disabled(2)
cipSecTrapCntlIpSecEarlyTunTerm.0 = disabled(2)
cipSecTrapCntlIpSecProtocolFail.0 = disabled(2)
cipSecTrapCntlIpSecNoSa.0 = disabled(2)
```

The following output shows that VRF abc2 has been cleared:

```
orcas:8> setenv SR_UTIL_COMMUNITY abc2
orcas:9> /auto/sw/packages/snmpr/14.2.0.0/solaris2bin/getmany -v2c 10.1.38.25
cipSecMIBObjects
cipSecMibLevel.0 = 1
cikeGlobalActiveTunnels.0 = 0
cikeGlobalPreviousTunnels.0 = 0
cikeGlobalInOctets.0 = 0
cikeGlobalInPkts.0 = 0
cikeGlobalInDropPkts.0 = 0
cikeGlobalInNotifys.0 = 0
cikeGlobalInP2Exchgs.0 = 0
cikeGlobalInP2ExchgInvalids.0 = 0
cikeGlobalInP2ExchgRejects.0 = 0
cikeGlobalInP2SaDelRequests.0 = 0
cikeGlobalOutOctets.0 = 0
cikeGlobalOutPkts.0 = 0
cikeGlobalOutDropPkts.0 = 0
cikeGlobalOutNotifys.0 = 0
cikeGlobalOutP2Exchgs.0 = 0
cikeGlobalOutP2ExchgInvalids.0 = 0
cikeGlobalOutP2ExchgRejects.0 = 0
cikeGlobalOutP2SaDelRequests.0 = 0
cikeGlobalInitTunnels.0 = 0
cikeGlobalInitTunnelFails.0 = 0
cikeGlobalRespTunnelFails.0 = 0
cikeGlobalSysCapFails.0 = 0
cikeGlobalAuthFails.0 = 0
cikeGlobalDecryptFails.0 = 0
```

```
cikeGlobalHashValidFails.0 = 0
cikeGlobalNoSaFails.0 = 0
cipSecGlobalActiveTunnels.0 = 0
cipSecGlobalPreviousTunnels.0 = 0
cipSecGlobalInOctets.0 = 0
cipSecGlobalHcInOctets.0 = 0x00
cipSecGlobalInOctWraps.0 = 0
cipSecGlobalInDecompOctets.0 = 0
cipSecGlobalHcInDecompOctets.0 = 0x00
cipSecGlobalInDecompOctWraps.0 = 0
cipSecGlobalInPkts.0 = 0
cipSecGlobalInDrops.0 = 0
cipSecGlobalInReplayDrops.0 = 0
cipSecGlobalInAuths.0 = 0
cipSecGlobalInAuthFails.0 = 0
cipSecGlobalInDecrypts.0 = 0
cipSecGlobalInDecryptFails.0 = 0
cipSecGlobalOutOctets.0 = 0
cipSecGlobalHcOutOctets.0 = 0x00
cipSecGlobalOutOctWraps.0 = 0
cipSecGlobalOutUncompOctets.0 = 0
cipSecGlobalHcOutUncompOctets.0 = 0x00
cipSecGlobalOutUncompOctWraps.0 = 0
cipSecGlobalOutPkts.0 = 0
cipSecGlobalOutDrops.0 = 0
cipSecGlobalOutAuths.0 = 0
cipSecGlobalOutAuthFails.0 = 0
cipSecGlobalOutEncrypts.0 = 0
cipSecGlobalOutEncryptFails.0 = 0
cipSecGlobalProtocolUseFails.0 = 0
cipSecGlobalNoSaFails.0 = 0
cipSecGlobalSysCapFails.0 = 0
cipSecHistTableSize.0 = 200
cipSecHistCheckPoint.0 = ready(1)
cipSecFailTableSize.0 = 200
cipSecTrapCntlIkeTunnelStart.0 = enabled(1)
cipSecTrapCntlIkeTunnelStop.0 = enabled(1)
cipSecTrapCntlIkeSysFailure.0 = disabled(2)
cipSecTrapCntlIkeCertCrlFailure.0 = disabled(2)
cipSecTrapCntlIkeProtocolFail.0 = disabled(2)
cipSecTrapCntlIkeNoSa.0 = disabled(2)
cipSecTrapCntlIpSecTunnelStart.0 = enabled(1)
cipSecTrapCntlIpSecTunnelStop.0 = enabled(1)
cipSecTrapCntlIpSecSysFailure.0 = disabled(2)
cipSecTrapCntlIpSecSetUpFailure.0 = disabled(2)
cipSecTrapCntlIpSecEarlyTunTerm.0 = disabled(2)
cipSecTrapCntlIpSecProtocolFail.0 = disabled(2)
cipSecTrapCntlIpSecNoSa.0 = disabled(2)
orcas:10>
orcas:10>
orcas:10>
```

VRF abc1 Pinged

The following output shows that VRF abc1 has been pinged:

```
Router3745a# ping
Protocol [ip]:
Target IP address: 10.22.1.1
Repeat count [5]:
Datagram size [100]:
Timeout in seconds [2]:
Extended commands [n]: y
Source address or interface: 10.20.1.1
Type of service [0]:
Set DF bit in IP header? [no]:
Validate reply data? [no]:
Data pattern [0xABCD]:
Loose, Strict, Record, Timestamp, Verbose[none]:
Sweep range of sizes [n]:
Type escape sequence to abort.
```

```
Sending 5, 100-byte ICMP Echos to 10.22.1.1, timeout is 2 seconds:
Packet sent with a source address of 10.20.1.1
```

VRF abc1 Polled

Polling VRF abc1 results in the following output:

Note After the ping, the counters should show some nonzero values.

```
orcas:10>
orcas:12> setenv SR_UTIL_COMMUNITY abc1
orcas:13> /auto/sw/packages/snmpr/10.14.2.0/solaris2bin/getmany -v2c 10.1.38.25
cipSecMIBObjects
cipSecMibLevel.0 = 1
cikeGlobalActiveTunnels.0 = 1
cikeGlobalPreviousTunnels.0 = 0
cikeGlobalInOctets.0 = 336
cikeGlobalInPkts.0 = 2
cikeGlobalInDropPkts.0 = 0
cikeGlobalInNotifys.0 = 1
cikeGlobalInP2Exchgs.0 = 2
cikeGlobalInP2ExchgInvalids.0 = 0
cikeGlobalInP2ExchgRejects.0 = 0
cikeGlobalInP2SaDelRequests.0 = 0
cikeGlobalOutOctets.0 = 344
cikeGlobalOutPkts.0 = 2
cikeGlobalOutDropPkts.0 = 0
cikeGlobalOutNotifys.0 = 0
cikeGlobalOutP2Exchgs.0 = 1
cikeGlobalOutP2ExchgInvalids.0 = 0
cikeGlobalOutP2ExchgRejects.0 = 0
cikeGlobalOutP2SaDelRequests.0 = 0
cikeGlobalInitTunnels.0 = 0
cikeGlobalInitTunnelFails.0 = 0
cikeGlobalRespTunnelFails.0 = 0
cikeGlobalSysCapFails.0 = 0
cikeGlobalAuthFails.0 = 0
cikeGlobalDecryptFails.0 = 0
cikeGlobalHashValidFails.0 = 0
cikeGlobalNoSaFails.0 = 0
cikePeerLocalAddr.
1.15.48.49.48.46.48.48.49.46.48.48.49.46.48.48.50.1.15.48.49.48.46.48.48.49.46.48.48.49.46
.48.48.49.1 = 0a 01  01 02
cikePeerRemoteAddr.
1.15.48.49.48.46.48.48.49.46.48.48.49.46.48.48.50.1.15.48.49.48.46.48.48.49.46.48.48.49.46
.48.48.49.1 = 0a 01  01 01
cikePeerActiveTime.
1.15.48.49.48.46.48.48.49.46.48.48.49.46.48.48.50.1.15.48.49.48.46.48.48.49.46.48.48.49.46
.48.48.49.1 = 13743
cikePeerActiveTunnelIndex.
1.15.48.49.48.46.48.48.49.46.48.48.49.46.48.48.50.1.15.48.49.48.46.48.48.49.46.48.48.49.46
.48.48.49.1 = 1
cikeTunLocalType.1 = ipAddrPeer(1)
cikeTunLocalValue.1 = 010.001.001.002
cikeTunLocalAddr.1 = 0a 01  01 02
cikeTunLocalName.1 = ipsecf-3745b
cikeTunRemoteType.1 = ipAddrPeer(1)
cikeTunRemoteValue.1 = 010.001.001.001
cikeTunRemoteAddr.1 = 0a 01  01 01
cikeTunRemoteName.1 =
cikeTunNegoMode.1 = main(1)
cikeTunDiffHellmanGrp.1 = dhGroup1(2)
cikeTunEncryptAlgo.1 = des(2)
cikeTunHashAlgo.1 = sha(3)
cikeTunAuthMethod.1 = preSharedKey(2)
cikeTunLifeTime.1 = 86400
cikeTunActiveTime.1 = 13752
cikeTunSaRefreshThreshold.1 = 0
cikeTunTotalRefreshes.1 = 0
```

```
cikeTunInOctets.1 = 336
cikeTunInPkts.1 = 2
cikeTunInDropPkts.1 = 0
cikeTunInNotifys.1 = 1
cikeTunInP2Exchgs.1 = 2
cikeTunInP2ExchgInvalids.1 = 0
cikeTunInP2ExchgRejects.1 = 0
cikeTunInP2SaDelRequests.1 = 0
cikeTunOutOctets.1 = 344
cikeTunOutPkts.1 = 2
cikeTunOutDropPkts.1 = 0
cikeTunOutNotifys.1 = 0
cikeTunOutP2Exchgs.1 = 1
cikeTunOutP2ExchgInvalids.1 = 0
cikeTunOutP2ExchgRejects.1 = 0
cikeTunOutP2SaDelRequests.1 = 0
cikeTunStatus.1 = active(1)
cikePeerCorrIpSecTunIndex.
1.15.48.49.48.46.48.48.49.46.48.48.49.46.48.48.50.1.15.48.49.48.46.48.48.49.46.48.48.49.46
.48.48.49.1.1 = 1
cipSecGlobalActiveTunnels.0 = 1
cipSecGlobalPreviousTunnels.0 = 0
cipSecGlobalInOctets.0 = 400
cipSecGlobalHcInOctets.0 = 0x0190
cipSecGlobalInOctWraps.0 = 0
cipSecGlobalInDecompOctets.0 = 400
cipSecGlobalHcInDecompOctets.0 = 0x0190
cipSecGlobalInDecompOctWraps.0 = 0
cipSecGlobalInPkts.0 = 4
cipSecGlobalInDrops.0 = 0
cipSecGlobalInReplayDrops.0 = 0
cipSecGlobalInAuths.0 = 4
cipSecGlobalInAuthFails.0 = 0
cipSecGlobalInDecrypts.0 = 4
cipSecGlobalInDecryptFails.0 = 0
cipSecGlobalOutOctets.0 = 704
cipSecGlobalHcOutOctets.0 = 0x02c0
cipSecGlobalOutOctWraps.0 = 0
cipSecGlobalOutUncompOctets.0 = 704
cipSecGlobalHcOutUncompOctets.0 = 0x02c0
cipSecGlobalOutUncompOctWraps.0 = 0
cipSecGlobalOutPkts.0 = 4
cipSecGlobalOutDrops.0 = 0
cipSecGlobalOutAuths.0 = 4
cipSecGlobalOutAuthFails.0 = 0
cipSecGlobalOutEncrypts.0 = 4
cipSecGlobalOutEncryptFails.0 = 0
cipSecGlobalProtocolUseFails.0 = 0
cipSecGlobalNoSaFails.0 = 0
cipSecGlobalSysCapFails.0 = 0
cipSecTunIkeTunnelIndex.1 = 1
cipSecTunIkeTunnelAlive.1 = true(1)
cipSecTunLocalAddr.1 = 0a 01  01 02
cipSecTunRemoteAddr.1 = 0a 01  01 01
cipSecTunKeyType.1 = ike(1)
cipSecTunEncapMode.1 = tunnel(1)
cipSecTunLifeSize.1 = 99000
cipSecTunLifeTime.1 = 5000
cipSecTunActiveTime.1 = 13749
cipSecTunSaLifeSizeThreshold.1 = 64
cipSecTunSaLifeTimeThreshold.1 = 10
cipSecTunTotalRefreshes.1 = 0
cipSecTunExpiredSaInstances.1 = 0
cipSecTunCurrentSaInstances.1 = 4
cipSecTunInSaDiffHellmanGrp.1 = dhGroup1(2)
cipSecTunInSaEncryptAlgo.1 = des(2)
cipSecTunInSaAhAuthAlgo.1 = hmacSha(3)
cipSecTunInSaEspAuthAlgo.1 = hmacSha(3)
cipSecTunInSaDecompAlgo.1 = none(1)
cipSecTunOutSaDiffHellmanGrp.1 = dhGroup1(2)
cipSecTunOutSaEncryptAlgo.1 = des(2)
cipSecTunOutSaAhAuthAlgo.1 = hmacSha(3)
cipSecTunOutSaEspAuthAlgo.1 = hmacSha(3)
```

```
cipSecTunOutSaCompAlgo.1 = none(1)
cipSecTunInOctets.1 = 400
cipSecTunHcInOctets.1 = 0x0190
cipSecTunInOctWraps.1 = 0
cipSecTunInDecompOctets.1 = 400
cipSecTunHcInDecompOctets.1 = 0x0190
cipSecTunInDecompOctWraps.1 = 0
cipSecTunInPkts.1 = 4
cipSecTunInDropPkts.1 = 0
cipSecTunInReplayDropPkts.1 = 0
cipSecTunInAuths.1 = 4
cipSecTunInAuthFails.1 = 0
cipSecTunInDecrypts.1 = 4
cipSecTunInDecryptFails.1 = 0
cipSecTunOutOctets.1 = 704
cipSecTunHcOutOctets.1 = 0x02c0
cipSecTunOutOctWraps.1 = 0
cipSecTunOutUncompOctets.1 = 704
cipSecTunHcOutUncompOctets.1 = 0x02c0
cipSecTunOutUncompOctWraps.1 = 0
cipSecTunOutPkts.1 = 4
cipSecTunOutDropPkts.1 = 0
cipSecTunOutAuths.1 = 4
cipSecTunOutAuthFails.1 = 0
cipSecTunOutEncrypts.1 = 4
cipSecTunOutEncryptFails.1 = 0
cipSecTunStatus.1 = active(1)
cipSecEndPtLocalName.1.1 =
cipSecEndPtLocalType.1.1 = singleIpAddr(1)
cipSecEndPtLocalAddr1.1.1 = 16 01  01 01
cipSecEndPtLocalAddr2.1.1 = 16 01  01 01
cipSecEndPtLocalProtocol.1.1 = 0
cipSecEndPtLocalPort.1.1 = 0
cipSecEndPtRemoteName.1.1 =
cipSecEndPtRemoteType.1.1 = singleIpAddr(1)
cipSecEndPtRemoteAddr1.1.1 = 14 01  01 01
cipSecEndPtRemoteAddr2.1.1 = 14 01  01 01
cipSecEndPtRemoteProtocol.1.1 = 0
cipSecEndPtRemotePort.1.1 = 0
cipSecSpiDirection.1.1 = in(1)
cipSecSpiDirection.1.2 = out(2)
cipSecSpiDirection.1.3 = in(1)
cipSecSpiDirection.1.4 = out(2)
cipSecSpiValue.1.1 = 3891970674
cipSecSpiValue.1.2 = 1963217493
cipSecSpiValue.1.3 = 3691920464
cipSecSpiValue.1.4 = 3458912974
cipSecSpiProtocol.1.1 = ah(1)
cipSecSpiProtocol.1.2 = ah(1)
cipSecSpiProtocol.1.3 = esp(2)
cipSecSpiProtocol.1.4 = esp(2)
cipSecSpiStatus.1.1 = active(1)
cipSecSpiStatus.1.2 = active(1)
cipSecSpiStatus.1.3 = active(1)
cipSecSpiStatus.1.4 = active(1)
cipSecHistTableSize.0 = 200
cipSecHistCheckPoint.0 = ready(1)
cipSecFailTableSize.0 = 200
cipSecTrapCntlIkeTunnelStart.0 = enabled(1)
cipSecTrapCntlIkeTunnelStop.0 = enabled(1)
cipSecTrapCntlIkeSysFailure.0 = disabled(2)
cipSecTrapCntlIkeCertCrlFailure.0 = disabled(2)
cipSecTrapCntlIkeProtocolFail.0 = disabled(2)
cipSecTrapCntlIkeNoSa.0 = disabled(2)
cipSecTrapCntlIpSecTunnelStart.0 = enabled(1)
cipSecTrapCntlIpSecTunnelStop.0 = enabled(1)
cipSecTrapCntlIpSecSysFailure.0 = disabled(2)
cipSecTrapCntlIpSecSetUpFailure.0 = disabled(2)
cipSecTrapCntlIpSecEarlyTunTerm.0 = disabled(2)
cipSecTrapCntlIpSecProtocolFail.0 = disabled(2)
cipSecTrapCntlIpSecNoSa.0 = disabled(2)
orcas:14>
```

```
orcas:14>
orcas:14>
```

VRF abc2 Polled

Polling VRF abc2 results in the following output:

Note The ping was completed for VRF abc1 only. Therefore, the counters of VRF abc2 should remain in the initialized state.

```
setenv SR_UTIL_COMMUNITY abc2
orcas:15>
orcas:15> /auto/sw/packages/snmpr/10.14.2.0/solaris2bin/getmany -v2c 10.1.38.25
cipSecMIBObjects
cipSecMibLevel.0 = 1
cikeGlobalActiveTunnels.0 = 0
cikeGlobalPreviousTunnels.0 = 0
cikeGlobalInOctets.0 = 0
cikeGlobalInPkts.0 = 0
cikeGlobalInDropPkts.0 = 0
cikeGlobalInNotifys.0 = 0
cikeGlobalInP2Exchgs.0 = 0
cikeGlobalInP2ExchgInvalids.0 = 0
cikeGlobalInP2ExchgRejects.0 = 0
cikeGlobalInP2SaDelRequests.0 = 0
cikeGlobalOutOctets.0 = 0
cikeGlobalOutPkts.0 = 0
cikeGlobalOutDropPkts.0 = 0
cikeGlobalOutNotifys.0 = 0
cikeGlobalOutP2Exchgs.0 = 0
cikeGlobalOutP2ExchgInvalids.0 = 0
cikeGlobalOutP2ExchgRejects.0 = 0
cikeGlobalOutP2SaDelRequests.0 = 0
cikeGlobalInitTunnels.0 = 0
cikeGlobalInitTunnelFails.0 = 0
cikeGlobalRespTunnelFails.0 = 0
cikeGlobalSysCapFails.0 = 0
cikeGlobalAuthFails.0 = 0
cikeGlobalDecryptFails.0 = 0
cikeGlobalHashValidFails.0 = 0
cikeGlobalNoSaFails.0 = 0
cipSecGlobalActiveTunnels.0 = 0
cipSecGlobalPreviousTunnels.0 = 0
cipSecGlobalInOctets.0 = 0
cipSecGlobalHcInOctets.0 = 0x00
cipSecGlobalInOctWraps.0 = 0
cipSecGlobalInDecompOctets.0 = 0
cipSecGlobalHcInDecompOctets.0 = 0x00
cipSecGlobalInDecompOctWraps.0 = 0
cipSecGlobalInPkts.0 = 0
cipSecGlobalInDrops.0 = 0
cipSecGlobalInReplayDrops.0 = 0
cipSecGlobalInAuths.0 = 0
cipSecGlobalInAuthFails.0 = 0
cipSecGlobalInDecrypts.0 = 0
cipSecGlobalInDecryptFails.0 = 0
cipSecGlobalOutOctets.0 = 0
cipSecGlobalHcOutOctets.0 = 0x00
cipSecGlobalOutOctWraps.0 = 0
cipSecGlobalOutUncompOctets.0 = 0
cipSecGlobalHcOutUncompOctets.0 = 0x00
cipSecGlobalOutUncompOctWraps.0 = 0
cipSecGlobalOutPkts.0 = 0
cipSecGlobalOutDrops.0 = 0
cipSecGlobalOutAuths.0 = 0
cipSecGlobalOutAuthFails.0 = 0
cipSecGlobalOutEncrypts.0 = 0
cipSecGlobalOutEncryptFails.0 = 0
```

```
cipSecGlobalProtocolUseFails.0 = 0
cipSecGlobalNoSaFails.0 = 0
cipSecGlobalSysCapFails.0 = 0
cipSecHistTableSize.0 = 200
cipSecHistCheckPoint.0 = ready(1)
cipSecFailTableSize.0 = 200
cipSecTrapCntlIkeTunnelStart.0 = enabled(1)
cipSecTrapCntlIkeTunnelStop.0 = enabled(1)
cipSecTrapCntlIkeSysFailure.0 = disabled(2)
cipSecTrapCntlIkeCertCrlFailure.0 = disabled(2)
cipSecTrapCntlIkeProtocolFail.0 = disabled(2)
cipSecTrapCntlIkeNoSa.0 = disabled(2)
cipSecTrapCntlIpSecTunnelStart.0 = enabled(1)
cipSecTrapCntlIpSecTunnelStop.0 = enabled(1)
cipSecTrapCntlIpSecSysFailure.0 = disabled(2)
cipSecTrapCntlIpSecSetUpFailure.0 = disabled(2)
cipSecTrapCntlIpSecEarlyTunTerm.0 = disabled(2)
cipSecTrapCntlIpSecProtocolFail.0 = disabled(2)
cipSecTrapCntlIpSecNoSa.0 = disabled(2)
orcas:16>
```

Additional References

Related Documents

Related Topic	Document Title
Cisco IOS commands by technology	*Cisco IOS Release Command References*
Cisco IOS master commands list	Master Command List
Configuring SNMP	The chapter “Configuring SNMP Support” in the *Cisco IOS Network Management Configuration Guide*
Configuring VRF-Aware IPsec	VRF-Aware IPSec
Recommended cryptographic algorithms	*Next Generation Encryption*

MIBs

MIB	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 and IKE MIB Support for Cisco VRF-Aware IPsec

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 2 Feature Information for IPsec and IKE MIB Support for Cisco VRF-Aware IPsec

Feature Name	Releases	Feature Information
IPsec and IKE MIB Support for Cisco VRF-Aware IPsec	12.4(4)T	The IPsec and IKE MIB Support for Cisco VRF-Aware IPsec feature provides manageability of Virtual Private Network routing and forwarding- (VRF-) aware IP security (IPsec) using MIBs. The benefit of this feature is that VRF-aware IPsec MIBs provide the granular details of IPsec statistics and performance metrics on a VRF basis. This feature was introduced in Cisco IOS Release 12.4(4)T. The following sections provide information about this feature: • Information About IPsec and IKE MIB Support forCisco VRF-Aware IPsec, page 10 • How to Configure IPsec and IKE MIB Support for Cisco VRF-Aware IPsec, page 10 The following commands were introduced or modified: **debug crypto mib .**
IPv6 compliance of Cisco IPSec MIBs and IKEv2 extensions to Cisco IPSec MIB	15.2(2)T	The IPv6 compliance of Cisco IPSec MIBs and IKEv2 extensions to Cisco IPSec MIB feature provides IPv6 and IKEv2 support for the Cisco IPsec MIBs. This feature was introduced in Cisco IOS Release 15.2(2)T.

Any Internet Protocol (IP) addresses and phone numbers used in this document are not intended to be actual addresses and phone numbers. Any examples, command display output, network topology diagrams, and other figures included in the document are shown for illustrative purposes only. Any use of actual IP addresses or phone numbers in illustrative content is unintentional and coincidental.

IPsec Diagnostics Enhancement

The Cisco IPsec Diagnostics Enhancement feature adds four sets of event statistics and an error history buffer to the Cisco IOS software for use in troubleshooting a virtual private network (VPN) that encrypts the data path.

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see Bug Search Tool and 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 module.

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 the IPsec Diagnostics Enhancement

- You understand the IP security (IPsec) standard for network security.

Note Contact the Cisco Technical Assistance Center (TAC) before using this feature.

Restrictions for the IPsec Diagnostics Enhancement

- This feature and its commands are available only on Cisco IOS releases that support IPsec encryption.

Memory and Performance Impact

- This feature is enabled by default in the encryption data path and has a negligible impact on memory and performance.

Information About the IPsec Diagnostics Enhancement

Tracking Packet Processing Within a Switch or Router

Standard packet analyzers used for troubleshooting network issues capture packets between devices in the network but they cannot capture packet processing events inside a device, such as a router. Beginning with Cisco IOS Release 12.4(9)T, Cisco IOS software includes four sets of event statistics to track packet processing within a switch or router. These statistics help Cisco TAC engineers diagnose and resolve issues in encrypted networks. Each set of statistics tracks a different aspect of packet processing within a switch or router:

- Error counters track packet processing errors and associated packet drops. When a packet encounters an error, the first 64 bytes of that packet are stored in a buffer, to facilitate troubleshooting.
- Internal counters show the detailed movement of a packet, end to end, across an encryption data path.
- Punt counters track instances when the configured packet processing method failed, and an alternative method was used.
- Success counters record the data path checkpoints where packets are successfully forwarded.

You can view any one set of statistics, or all of them, or only those that have recorded errors. You must choose the display timeframe for the statistics.

How to Use the IPsec Diagnostics Enhancement

Note Contact the Cisco TAC before using this feature.

Displaying the Statistics

You can use the **show crypto datapath**command to display statistics that help troubleshoot an encrypted network.

SUMMARY STEPS

1. **enable**
2. **show crypto datapath {ipv4 | ipv6}** {**snapshot** | **realtime**} **{all | non-zero}**[**error** | **internal** | **punt** | **success**]

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**show crypto datapath {ipv4 | ipv6}** {**snapshot** | **realtime**} **{all | non-zero}**[**error** | **internal** | **punt** | **success**] **Example:** `Router# show crypto datapath snapshot success`	Displays the statistics from one or more specified counters. Use the keywords to specify the IP version used in the network (IPv4 or IPv6) and to specify whether to capture statistics in real time (**realtime**) or as of a single point in time (**snapshot**). You can also choose which statistics to display. The **all**keyword displays the output of all the counters, whether they have recorded events or not. The **non-zero**keyword displays only the output of counters that have recorded at least one event. Each of the other keywords displays one specific set of statistics, as described in the Information About the IPsec Diagnostics Enhancement, page 28.

Displaying the Error History

You can display the contents of the buffer that stores information from error events to diagnose the cause of errors. The **show monitor event-trace** command is updated with the **cfd**(crypto fault detection) keyword as a possible entry for the *component* argument to help with troubleshooting an encryption data path. Additional keywords allow you to specify the time span for which you want to display events. For example, you can display all events for the last 30 minutes.

For detailed information about the **show monitor event-trace** command, see the Master Command List.

SUMMARY STEPS

1. **enable**
2. **show monitor event-trace** [**all-traces**] [*component* **{ all | back** *time* **| clock** *time* **| from-boot** *seconds* **| latest | parameters }]**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. - Enter your password if prompted.
Step 2	**show monitor event-trace** [**all-traces**] [*component* **{ all** | **back** *time* | **clock** *time* | **from-boot** *seconds* | **latest** | **parameters }]** **Example:** `Router# show monitor event-trace cfd all`	Displays the contents of the error trace buffer. - Use the keywords to specify which events to display and whether to display the trace file parameters.

Clearing the Counters or Error History

You can use the **clear crypto datapath** command to clear the counters or error history buffer in an encrypted network. Use the appropriate keywords to clear all counters or one specific counter.

SUMMARY STEPS

1. **enable**
2. **clear crypto datapath** {**ipv4** | **ipv6**} [**error** | **internal** | **punt** | **success**]

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. - Enter your password if prompted.
Step 2	**clear crypto datapath** {**ipv4** | **ipv6**} [**error** | **internal** | **punt** | **success**] **Example:** `Router# clear crypto datapath success`	Clears data for all counters or the specified counter.

Additional References

Related Documents

Related Topic	Document Title
Cisco IOS commands	Cisco IOS Master Commands List, All Releases
Security commands	*Cisco IOS Security Command Reference*
Configuring Security for VPNs with IPsec	Configuring Security for VPNs with IPsec

MIBs

MIB	MIBs Link
None.	To locate and download MIBs for selected platforms, Cisco 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 Diagnostics Enhancement

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 IPsec Diagnostics Enhancement

Feature Name	Releases	Feature Information
IPsec Diagnostics Enhancement	12.4(9)T	This feature adds four sets of event statistics and an error history buffer to the Cisco IOS software for use in troubleshooting a VPN that encrypts the data path The following commands were introduced or modified: **clear crypto datapath , show crypto datapath , show monitor event-trace**

Any Internet Protocol (IP) addresses and phone numbers used in this document are not intended to be actual addresses and phone numbers. Any examples, command display output, network topology diagrams, and other figures included in the document are shown for illustrative purposes only. Any use of actual IP addresses or phone numbers in illustrative content is unintentional and coincidental.

IPsec SNMP Support

The IPsec--SNMP Support feature can be used to learn the IPsec MIB feature version, enable and disable SNMP traps, and monitor and control the size of IPsec history tables.

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see Bug Search Tool and 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 module.

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.

Restrictions for IPsec-SNMP Support

Only the following tunnel setup failure logs are supported with the IPsec - SNMP Support feature:

- NOTIFY_MIB_IPSEC_PROPOSAL_INVALID

"A tunnel could not be established because the peer did not supply an acceptable proposal."

- NOTIFY_MIB_IPSEC_ENCRYPT_FAILURE

"A tunnel could not be established because it failed to encrypt a packet to be sent to a peer."

- NOTIFY_MIB_IPSEC_SYSCAP_FAILURE

"A tunnel could not be established because the system ran out of resources."

- NOTIFY_MIB_IPSEC_LOCAL_FAILURE

"A tunnel could not be established because of an internal error."

Note that these failure notices are recorded in the failure tables, but are not available as SNMP notifications (traps).

The following functions are not supported with the IPsec MIB feature:

- Checkpointing
- The Dynamic Cryptomap table of the CISCO-IPSEC-MIB

Note CISCO-IPSEC-FLOW-MONITOR-MIB notifications are not supported before Cisco IOS Release 12.1(5a)E.

The CISCO-IPSEC-POLICY-MAP-MIB (ciscoIpSecPolMap) defines no notifications (the “IPSec Policy Map Notifications Group” is empty).

Information About IPsec-SNMP Support

IPsec-SNMP Support

The IP Security (IPsec) - SNMP Support feature introduces support for industry-standard IPsec MIBs and Cisco IOS-software specific IPsec MIBs.

The IPsec MIBs allow IPsec configuration monitoring and IPsec status monitoring using SNMP, and can be integrated in a variety of Virtual Private Network (VPN) management solutions.

For example, this feature allows you to specify the desired size of a tunnel history table or a tunnel failure table using the Cisco IOS CLI. The history table archives attribute and statistic information about the tunnel; the failure table archives tunnel failure reasons along with the time failure occurred. A failure history table can be used as a simple method to distinguish between a normal and an abnormal tunnel termination. That is, if a tunnel entry in the tunnel history table has no associated failure record, the tunnel must have terminated normally. However, a tunnel history table does not accompany every failure table because every failure does not correspond to a tunnel. Thus, supported setup failures are recorded in the failure table, but an associated history table is not recorded because a tunnel was never set up.

This feature also provides IPsec Simple Network Management Protocol (SNMP) notifications for use with network management systems.

VPN Device Manager

The IPsec--SNMP Support feature was designed to support the VPN Device Manager (VDM). VDM enables network administrators to manage and configure site-to-site VPNs on a single device from a web browser and to see the effects of changes in real time. VDM implements a wizard-based graphical user interface (GUI) to simplify the process of configuring site-to-site VPNs using the IPsec protocol. VDM software is installed directly on Cisco VPN routers, and is designed for use and compatibility with future Device Manager products.

See the VPN Device Manager Client for Cisco IOS Software (XSM Configuration) feature document for more information on Cisco VDM.

How to Configure IPsec-SNMP Support

Enabling IPsec SNMP Notifications

The following steps are used to enable a router to send IPsec trap or inform notifications to a specified host:

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **snmp-server enable traps ipsec cryptomap** [**add** | **delete** | **attach**| **detach**]
4. Router(config)# **snmp-server enable traps isakmp**[**policy**{**add** | **delete**} | **tunnel**{**start** | **stop**}]
5. **snmp-server host** *host-address* **traps** *community-string* **ipsec**

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	**snmp-server enable traps ipsec cryptomap** [**add** | **delete** | **attach**| **detach**] **Example:** `Router(config)# snmp-server enable traps ipsec cryptomap add`	Enables a router to send IPsec SNMP notifications.

	Command or Action	Purpose
Step 4	Router(config)# **snmp-server enable traps isakmp**[**policy**{**add** | **delete**} | **tunnel**{**start** | **stop**}] **Example:** `Router(config)# snmp-server enable traps isakmp`	Enables a router to send IPsec ISAKMP SNMP notifications.
Step 5	**snmp-server host** *host-address* **traps** *community-string* **ipsec** **Example:** `Router(config)# snmp-server host 10.10.10.1 traps community1 ipsec`	Specifies the recipient of IPsec SNMP notification operations.

Configuring IPsec Failure History Table Size

Use the steps in this section to change the size of the failure history table. The default failure history table size is 200.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **crypto mib ipsec flowmib history failure size** *number*

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.

	Command or Action	Purpose
Step 3	**crypto mib ipsec flowmib history failure size** *number* **Example:** `Router(config)# crypto mib ipsec flowmib history failure size 50`	Changes the size of the IPsec failure history table.

Configuring IPsec Tunnel History Table Size

Follow the steps in this section to change the size of the tunnel history table. The default tunnel history table size is 200.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **crypto mib ipsec flowmib history tunnel size** *number*

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 mib ipsec flowmib history tunnel size** *number* **Example:** `Router(config)# crypto mib ipsec flowmib history tunnel size 50`	Changes the size of the IPsec tunnel history table.

Verifying IPsec MIB Configuration

To verify that the IPsec MIB feature is configured properly, perform the following tasks:

- Enter the **show crypto mib ipsec flowmib history failure size**privileged EXEC commandto display the size of the failure history table:

```
Router# show crypto mib ipsec flowmib history failure size
IPSec Failure Window Size: 140
```

- Enter the **show crypto mib ipsec flowmib history tunnel size** privileged EXEC command to display the size of the tunnel history table**:**

```
Router# show crypto mib ipsec flowmib history tunnel size
IPSec History Window Size: 130
```

- Enter the **show crypto mib ipsec flowmib version**privileged EXEC command to display the MIB version used by the management applications to identify the feature set:

```
Router# show crypto mib ipsec flowmib version
IPSec Flow MIB version: 1
```

- Enter the **debug crypto mib** command to display the IPsec MIB debug message notifications:

```
Router#
debug crypto mib
Crypto IPSec Mgmt Entity debugging is on
```

Monitoring and Maintaining IPsec MIB

Use the steps in this section to monitor the status of IPsec MIB information.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **show crypto mib ipsec flowmib history failure size**
4. **show crypto mib ipsec flowmib history tunnel size**
5. **show crypto mib ipsec flowmib version**

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.

	Command or Action	Purpose
Step 3	**show crypto mib ipsec flowmib history failure size** **Example:** `Router#` **show crypto mib ipsec flowmib history failure size**	Displays the size of the IPsec failure history table.
Step 4	**show crypto mib ipsec flowmib history tunnel size** **Example:** `Router#` **show crypto mib ipsec flowmib history tunnel size**	Displays the size of the IPsec tunnel history table.
Step 5	**show crypto mib ipsec flowmib version** **Example:** `Router#` **show crypto mib ipsec flowmib version**	Displays the IPsec Flow MIB version used by the router.

Configuration Examples for IPsec-SNMP Support

Enabling IPsec Notifications Examples

In the following example, IPsec notifications are enabled:

```
snmp-server enable traps ipsec isakmp
```

In the following example, the router is configured to send IPsec notifications to the host nms1.cisco.com:

```
snmp-server host nms1.cisco.com public ipsec isakmp
Translating "nms1.cisco.com"...domain server (171.00.0.01) [OK]
```

Specifying History Table Size Examples

In the following example, the specified failure history table size is 140:

```
crypto mib ipsec flowmib history failure size 140
```

In the following example, the specified tunnel history table size is 130:

```
crypto mib ipsec flowmib history tunnel size 130
```

Additional References

Related Documents

Related Topic	Document Title
Cisco IOS commands	Cisco IOS Master Commands List, All Releases
Security commands	*Cisco IOS Security Command Reference*
IPsec	Configuring Security for VPNs with IPsec
SNMP	*Cisco IOS Configuration Fundamentals Configuration Guide* and *Cisco IOS Configuration Fundamentals Command Reference*

MIBs

MIB	MIBs Link
• CISCO-IPSEC-FLOW-MONITOR- MIB • CISCO-IPSEC-MIB • CISCO-IPSEC-POLICY-MAP-MIB	To locate and download MIBs for selected platforms, Cisco 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-SNMP Support

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 4 Feature Information for IPsec-SNMP Support

Feature Name	Releases	Feature Information
IPsec-SNMP Support	12.1(4)E 12.1(5a)E 12.2(4)T 12.2(8)T 12.1(11b)E 12.2(14)S	The IPsec--SNMP Support feature can be used to learn the IPsec MIB feature version, enable and disable SNMP traps, and monitor and control the size of IPsec history tables. This feature was introduced on the Cisco 7100, 7200, and 7500 series platforms in Cisco Release12.1(4)E. Support for CISCO-IPSEC-FLOW-MONITOR-MIB notifications was added in Cisco IOS Release 12.1(5a)E. This feature was integrated into Cisco IOS Release 12.2(4)T. In Cisco IOS Releases 12.2(8)T, 12.1(11b)E, the following commands were added to enable and disable IP Security (IPsec) MIB notifications: • **snmp-server enable traps ipsec** • **snmp-server enable traps isakmp** This feature was integrated into Cisco IOS Release 12.2(14)S. The following commands were introduced or modified: **crypto mib ipsec flowmib history failure size, crypto mib ipsec flowmib history tunnel size, debug crypto mib, show crypto mib ipsec flowmib history failure size, show crypto mib ipsec flowmib history tunnel size, show crypto mib ipsec flowmib version, snmp-server enable traps ipsec, snmp-server enable traps isakmp, snmp-server host.**

Glossary

CA --certificate authority. A certificate authority (CA) is an entity in a network that issues and manages security credentials and public keys (in the form of X509v3 certificates) for message encryption. As part of a public key infrastructure (PKI), a CA checks with a registration authority (RA) to verify information provided by the requestor of a digital certificate. If the RA verifies the requestor's information, the CA can then issue a certificate. Certificates generally include the owner's public key, the expiration date of the certificate, the owner's name, and other information about the public key owner.

IP Security --See IPsec.

IPsec --Internet Protocol Security. A framework of open standards that provides data confidentiality, data integrity, and data authentication between participating peers. IPsec provides these security services at the IP layer. IPsec uses Internet Key Exchange (IKE) to handle negotiation of protocols and algorithms based on local policy and to generate the encryption and authentication keys to be used by IPsec. IPsec can be used to protect one or more data flows between a pair of hosts, between a pair of security gateways, or between a security gateway and a host.

Management Information Base --See MIB.

MIB --Management Information Base. Database of network management information that is used and maintained by a network management protocol such as Simple Network Management Protocol (SNMP) or Common Management Information Protocol (MIP). The value of a MIB object can be changed or retrieved using SNMP or CMIP commands, usually through a graphical user interface (GUI) network management system (NMS). MIB objects are organized in a tree structure that includes public (standard) and private (proprietary) branches.

Simple Network Management Protocol --See SNMP.

SNMP --Simple Network Management Protocol. An application-layer protocol that provides a message format for communication between SNMP managers and agents.

trap --Message sent by an SNMP agent to a network management system, console, or terminal to indicate the occurrence of a significant event, such as a specifically defined condition or a threshold that was reached.

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IPsec VPN Accounting

The IPsec VPN Accounting feature allows a session to be accounted by indicating when the session starts and stops. A VPN session is defined as an Internet Key Exchange (IKE) security association (SA) and the one or more SA pairs that are created by the IKE SA. The session starts when the first IP Security (IPsec) pair is created and stops when all IPsec SAs are deleted. Session identifying information and session usage information is passed to the Remote Authentication Dial-In User Service (RADIUS) server through standard RADIUS attributes and vendor-specific attributes (VSAs).

Note Security threats, as well as the cryptographic technologies to help protect against them, are constantly changing. For more information about the latest Cisco cryptographic recommendations, see the *Next Generation Encryption* (NGE) white paper.

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see Bug Search Tool and 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 module.

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 IPsec VPN Accounting

- You should understand how to configure RADIUS and authentication, authorization, and accounting (AAA) accounting.
- You should know how to configure IPsec accounting.

Information About IPsec VPN Accounting

RADIUS Accounting

For many large networks, it is required that user activity be recorded for auditing purposes. The method that is used most is RADIUS accounting.

RADIUS accounting allows for a session to be accounted for by indicating when the session starts and when it stops. Additionally, session identifying information and session usage information is passed to the RADIUS server through RADIUS attributes and VSAs.

RADIUS Start Accounting

The RADIUS Start packet contains many attributes that generally identify who is requesting the service and of what the property of that service consists. The table below represents the attributes required for the start.

Table 5 RADIUS Accounting Start Packet Attributes

RADIUS Attributes Value	Attribute	Description
1	user-name	Username used in extended authentication (XAUTH).The username may be NULL when XAUTH is not used.
4	nas-ip-address	Identifying IP address of the network access server (NAS) that serves the user. It should be unique to the NAS within the scope of the RADIUS server.
5	nas-port	Physical port number of the NAS that serves the user.
8	framed-ip-address	Private address allocated for the IP Security (IPsec) session.

RADIUS Attributes Value	Attribute	Description
40	acct-status-type	Status type. This attribute indicates whether this accounting request marks the beginning (start), the end (stop), or an update of the session.
41	acct-delay-time	Number of seconds the client has been trying to send a particular record.
44	acct-session-id	Unique accounting identifier that makes it easy to match start and stop records in a log file.
26	vrf-id	String that represents the name of the Virtual Route Forwarder (VRF).
26	isakmp-initiator-ip	Endpoint IP address of the remote Internet Key Exchange (IKE) initiator (V4).
26	isakmp-group-id	Name of the VPN group profile used for accounting.
26	isakmp-phase1-id	Phase 1 identification (ID) used by IKE (for example, domain name [DN], fully qualified domain name [FQDN], IP address) to help identify the session initiator.

RADIUS Stop Accounting

The RADIUS Stop packet contains many attributes that identify the usage of the session. Table 2 represents the additional attributes required for the RADIUS stop packet. It is possible that only the stop packet is sent without the start if configured to do so. If only the stop packet is sent, this allows an easy way to reduce the number of records going to the AAA server.

Table 6 RADIUS Accounting Stop Packet Attributes

RADIUS Attributes Value	Attribute	Description
42	acct-input-octets	Number of octets that have been received from the Unity client over the course of the service that is being provided.

RADIUS Attributes Value	Attribute	Description
43	acct-output-octets	Number of octets that have been sent to the Unity client in the course of delivering this service.
46	acct-session-time	Length of time (in seconds) that the Unity client has received service.
47	acct-input-packets	Quantity of packets that have been received from the Unity client in the course of delivering this service.
48	acct-output-packets	Quantity of packets that have been sent to the Unity client in the course of delivering this service.
49	acct-terminate-cause	For future use.
52	acct-input-gigawords	How many times the Acct-Input-Octets counter has wrapped around the 232 (2 to the 32nd power) over the course of this service.
52	acct-output-gigawords	How many times the Acct-Input-Octets counter has wrapped around the 232 (2 to the 32nd power) over the course of this service.

RADIUS Update Accounting

RADIUS accounting updates are supported. Packet and octet counts are shown in the updates.

IKE and IPsec Subsystem Interaction

Accounting Start

If IPsec accounting is configured, after IKE phases are complete, an accounting start record is generated for the session. New accounting records are not generated during a rekeying.

The following is an account start record that was generated on a router and that is to be sent to the AAA server that is defined:

```
*Aug 23 04:06:20.131: RADIUS(00000002): sending
*Aug 23 04:06:20.131: RADIUS(00000002): Send Accounting-Request to 10.1.1.4:1646 id 4,
len 220
*Aug 23 04:06:20.131: RADIUS:  authenticator 38 F5 EB 46 4D BE 4A 6F - 45 EB EF 7D B7 19
FB 3F
*Aug 23 04:06:20.135: RADIUS:  Acct-Session-Id     [44]  10  "00000001"
*Aug 23 04:06:20.135: RADIUS:  Vendor, Cisco       [26]  31
*Aug 23 04:06:20.135: RADIUS:   Cisco AVpair       [1]   25  "isakmp-group-id=cclient"
*Aug 23 04:06:20.135: RADIUS:  Framed-IP-Address   [8]   6   10.13.13.1
*Aug 23 04:06:20.135: RADIUS:  Vendor, Cisco       [26]  20
*Aug 23 04:06:20.135: RADIUS:   Cisco AVpair       [1]   14  "vrf-id=cisco"
*Aug 23 04:06:20.135: RADIUS:  Vendor, Cisco       [26]  35
*Aug 23 04:06:20.135: RADIUS:   Cisco AVpair       [1]   29  "isakmp-initator-ip=11.1.2.2"
*Aug 23 04:06:20.135: RADIUS:  Vendor, Cisco       [26]  36
*Aug 23 04:06:20.135: RADIUS:   Cisco AVpair       [1]   30  "connect-progress=No
Progress"
*Aug 23 04:06:20.135: RADIUS:  User-Name           [1]   13  "joe@cclient"
*Aug 23 04:06:20.135: RADIUS:  Acct-Status-Type    [40]  6   Start                     [1]
*Aug 23 04:06:20.135: RADIUS:  Vendor, Cisco       [26]  25
*Aug 23 04:06:20.135: RADIUS:   cisco-nas-port     [2]   19  "FastEthernet0/0.1"
*Aug 23 04:06:20.135: RADIUS:  NAS-Port            [5]   6   0
*Aug 23 04:06:20.135: RADIUS:  NAS-IP-Address      [4]   6   10.1.1.147
*Aug 23 04:06:20.135: RADIUS:  Acct-Delay-Time     [41]  6   0
*Aug 23 04:06:20.139: RADIUS: Received from id 21645/4 10.1.1.4:1646, Accounting-
response, len 20
*Aug 23 04:06:20.139: RADIUS:  authenticator B7 E3 D0 F5 61 9A 89 D8 - 99 A6 8A 8A 98 79
9D 5D
```

Accounting Stop

An accounting stop packet is generated when there are no more flows (IPsec SA pairs) with the remote peer.

The accounting stop records contain the following information:

- Packets out
- Packets in
- Octets out
- Gigawords in
- Gigawords out

Below is an account start record that was generated on a router. The account start record is to be sent to the AAA server that is defined.

```
*Aug 23 04:20:16.519: RADIUS(00000003): Using existing nas_port 0
*Aug 23 04:20:16.519: RADIUS(00000003): Config NAS IP: 100.1.1.147
*Aug 23 04:20:16.519: RADIUS(00000003): sending
*Aug 23 04:20:16.519: RADIUS(00000003): Send Accounting-Request to 100.1.1.4:1646 id 19,
len 238
*Aug 23 04:20:16.519: RADIUS:  authenticator 82 65 5B 42 F0 3F 17 C3 - 23 F3 4C 35 A2 8A
3E E6
*Aug 23 04:20:16.519: RADIUS:  Acct-Session-Id     [44]  10  "00000002"
*Aug 23 04:20:16.519: RADIUS:  Vendor, Cisco       [26]  20
*Aug 23 04:20:16.519: RADIUS:   Cisco AVpair       [1]   14  "vrf-id=cisco"
*Aug 23 04:20:16.519: RADIUS:  Vendor, Cisco       [26]  35
*Aug 23 04:20:16.519: RADIUS:   Cisco AVpair       [1]   29  "isakmp-initator-ip=11.1.1.2"
*Aug 23 04:20:16.519: RADIUS:  Vendor, Cisco       [26]  36
*Aug 23 04:20:16.519: RADIUS:   Cisco AVpair       [1]   30  "connect-progress=No
Progress"
*Aug 23 04:20:16.519: RADIUS:  Acct-Session-Time   [46]  6   709
*Aug 23 04:20:16.519: RADIUS:  Acct-Input-Octets   [42]  6   152608
*Aug 23 04:20:16.519: RADIUS:  Acct-Output-Octets  [43]  6   152608
*Aug 23 04:20:16.519: RADIUS:  Acct-Input-Packets  [47]  6   1004
```

```
*Aug 23 04:20:16.519: RADIUS:  Acct-Output-Packets [48]  6   1004
*Apr 23 04:20:16.519: RADIUS:  Acct-Input-Giga-Word[52]  6   0
*Apr 23 04:20:16.519: RADIUS:  Acct-Output-Giga-Wor[53]  6
0
*Aug 23 04:20:16.519: RADIUS:  Acct-Terminate-Cause[49]  6   none                      [0]
*Aug 23 04:20:16.519: RADIUS:  Vendor, Cisco       [26]  32
*Aug 23 04:20:16.519: RADIUS:   Cisco AVpair       [1]   26  "disc-cause-ext=No Reason"
*Aug 23 04:20:16.519: RADIUS:  Acct-Status-Type    [40]  6   Stop                      [2]
*Aug 23 04:20:16.519: RADIUS:  Vendor, Cisco       [26]  25
*Aug 23 04:20:16.519: RADIUS:   cisco-nas-port     [2]   19  "FastEthernet0/0.1"
*Aug 23 04:20:16.519: RADIUS:  NAS-Port            [5]   6   0
*Aug 23 04:20:16.519: RADIUS:  NAS-IP-Address      [4]   6   100.1.1.147
*Aug 23 04:20:16.519: RADIUS:  Acct-Delay-Time     [41]  6   0
*Aug 23 04:20:16.523: RADIUS: Received from id 21645/19 100.1.1.4:1646, Accounting-
response, len 20
*Aug 23 04:20:16.523: RADIUS:  authenticator F1 CA C1 28 CE A0 26 C9 - 3E 22 C9 DA EA B8
22 A0
```

Accounting Updates

If accounting updates are enabled, accounting updates are sent while a session is “up.” The update interval can be configured. To enable the accounting updates, use the **aaa accounting update** command.

The following is an accounting update record that is being sent from the router:

```
Router#
*Aug 23 21:46:05.263: RADIUS(00000004): Using existing nas_port 0
*Aug 23 21:46:05.263: RADIUS(00000004): Config NAS IP: 100.1.1.147
*Aug 23 21:46:05.263: RADIUS(00000004): sending
*Aug 23 21:46:05.263: RADIUS(00000004): Send Accounting-Request to 100.1.1.4:1646 id 22,
len 200
*Aug 23 21:46:05.263: RADIUS:  authenticator 30 FA 48 86 8E 43 8E 4B - F9 09 71 04 4A F1
52 25
*Aug 23 21:46:05.263: RADIUS:  Acct-Session-Id     [44]  10  "00000003"
*Aug 23 21:46:05.263: RADIUS:  Vendor, Cisco       [26]  20
*Aug 23 21:46:05.263: RADIUS:   Cisco AVpair       [1]   14  "vrf-id=cisco"
*Aug 23 21:46:05.263: RADIUS:  Vendor, Cisco       [26]  35
*Aug 23 21:46:05.263: RADIUS:   Cisco AVpair       [1]   29  "isakmp-initator-ip=11.1.1.2"
*Aug 23 21:46:05.263: RADIUS:  Vendor, Cisco       [26]  36
*Aug 23 21:46:05.263: RADIUS:   Cisco AVpair       [1]   30  "connect-progress=No
Progress"
*Aug 23 21:46:05.263: RADIUS:  Acct-Session-Time   [46]  6   109
*Aug 23 21:46:05.263: RADIUS:  Acct-Input-Octets   [42]  6   608
*Aug 23 21:46:05.263: RADIUS:  Acct-Output-Octets  [43]  6   608
*Aug 23 21:46:05.263: RADIUS:  Acct-Input-Packets  [47]  6   4
*Aug 23 21:46:05.263: RADIUS:  Acct-Output-Packets [48]  6   4
*Aug 23 21:46:05.263: RADIUS:  Acct-Status-Type    [40]  6   Watchdog                  [3]
*Aug 23 21:46:05.263: RADIUS:  Vendor, Cisco       [26]  25
*Aug 23 21:46:05.263: RADIUS:   cisco-nas-port     [2]   19  "FastEthernet0/0.1"
*Aug 23 21:46:05.263: RADIUS:  NAS-Port            [5]   6   0
*Aug 23 21:46:05.263: RADIUS:  NAS-IP-Address      [4]   6   100.1.1.147
*Aug 23 21:46:05.263: RADIUS:  Acct-Delay-Time     [41]  6   0
*Aug 23 21:46:05.267: RADIUS: Received from id 21645/22 100.1.1.4:1646, Accounting-
response, len 20
*Aug 23 21:46:05.267: RADIUS:  authenticator 51 6B BB 27 A4 F5 D7 61 - A7 03 73 D3 0A AC
1C
```

How to Configure IPsec VPN Accounting

- Configuring IPsec VPN Accounting, page 49
- Configuring Accounting Updates, page 53
- Troubleshooting for IPsec VPN Accounting, page 54

Configuring IPsec VPN Accounting

To enable IPsec VPN Accounting, you need to perform the following required task:

Before configuring IPsec VPN accounting, you must first configure IPsec.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **aaa new-model**
4. **aaa authentication login** *list-name method*
5. **aaa authorization network** *list-name method*
6. **aaa accounting network list-name start-stop [broadcast] group** *group-name*
7. **aaa session-id common**
8. **crypto isakmp profile** *profile-name*
9. **vrf** *ivrf*
10. **match identity group** *group-name*
11. **client authentication list** *list-name*
12. **isakmp authorization list** *list-name*
13. **client configuration address [initiate | respond]**
14. **accounting** *list-name*
15. **exit**
16. **crypto dynamic-map** *dynamic-map-name dynamic-seq-num*
17. **set transform-set** *transform-set-name*
18. **set isakmp-profile** *profile-name*
19. **reverse-route [remote-peer]**
20. **exit**
21. crypto map *map-name* ipsec-isakmp dynamic *dynamic-template-name*
22. **radius-server hos** t *ip-address* [**auth-port***port-number]*[**acct-port***port-number*]
23. **radius-server key** *string*
24. **radius-server vsa send accounting**
25. **interface** *type slot* /*port*
26. **crypto map** *map-name*

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	**aaa new-model** **Example:** `Router (config)# aaa new-model`	Enables periodic interim accounting records to be sent to the accounting server.
Step 4	**aaa authentication login** *list-name method* **Example:** `Router (config)# aaa authentication login cisco-client group radius`	Enforces authentication, authorization, and accounting (AAA) authentication for extended authorization (XAUTH) through RADIUS or local.
Step 5	**aaa authorization network** *list-name method* **Example:** `Router (config)# aaa authorization network cisco-client group radius`	Sets AAA authorization parameters on the remote client from RADIUS or local.
Step 6	**aaa accounting network list-name start-stop [broadcast] group** *group-name* **Example:** `Router (config)# aaa accounting network acc start-stop broadcast group radius`	Enables AAA accounting of requested services for billing or security purposes when you use RADIUS or TACACS +.
Step 7	**aaa session-id common** **Example:** `Router (config)# aaa session-id common`	Specifies whether the same session ID is used for each AAA accounting service type within a call or whether a different session ID is assigned to each accounting service type.
Step 8	**crypto isakmp profile** *profile-name* **Example:** `Route (config)# crypto isakmp profile cisco`	Audits IP security (IPsec) user sessions and enters isakmp-profile submode.

	Command or Action	Purpose
Step 9	**vrf** *ivrf* **Example:** `Router (conf-isa-prof)# vrf cisco`	Associates the on-demand address pool with a Virtual Private Network (VPN) routing and forwarding (VRF) instance name.
Step 10	**match identity group** *group-name* **Example:** `Router(conf-isa-prof)# match identity group cisco`	Matches an identity from a peer in an ISAKMP profile.
Step 11	**client authentication list** *list-name* **Example:** `Router(conf-isa-prof)# client authentication list cisco`	Configures Internet Key Exchange (IKE) extended authentication (XAUTH) in an Internet Security Association and Key Management Protocol (ISAKMP) profile.
Step 12	**isakmp authorization list** *list-name* **Example:** `Router(conf-isa-prof)#` **isakmp authorization list cisco-client**	Configures an IKE shared secret and other parameters using the AAA server in an ISAKMP profile. The shared secret and other parameters are generally pushed to the remote peer through mode configuration (MODECFG).
Step 13	**client configuration address [initiate | respond]** **Example:** `Router(conf-isa-prof)# client configuration address respond`	Configures IKE mode configuration (MODECFG) in the ISAKMP profile.
Step 14	**accounting** *list-name* **Example:** `Router(conf-isa-prof)# accounting acc`	Enables AAA accounting services for all peers that connect through this ISAKMP profile.
Step 15	**exit** **Example:** `Router(conf-isa-prof)# exit`	Exits isakmp-profile submode.

	Command or Action	Purpose
Step 16	**crypto dynamic-map** *dynamic-map-name dynamic-seq-num* **Example:** `Router(config)# crypto dynamic-map mymap 10 ipsec-isakmp`	Creates a dynamic crypto map template and enters the crypto map configuration command mode.
Step 17	**set transform-set** *transform-set-name* **Example:** `Router(config-crypto-map)# set transform-set aswan`	Specifies which transform sets can be used with the crypto map template.
Step 18	**set isakmp-profile** *profile-name* **Example:** `Router(config-crypto-map)# set isakmp-profile cisco`	Sets the ISAKMP profile name.
Step 19	**reverse-route [remote-peer]** **Example:** `Router(config-crypto-map)# reverse-route`	Allows routes (ip addresses) to be injected for destinations behind the VPN remote tunnel endpoint and may include a route to the tunnel endpoint itself (using the **remote-peer** keyword for the crypto map.
Step 20	**exit** **Example:** `Router(config-crypto-map)# exit`	Exits dynamic crypto map configuration mode.
Step 21	crypto map *map-name* ipsec-isakmp dynamic *dynamic-template-name* **Example:** `Router(config)# crypto map mymap ipsec-isakmp dynamic dmap`	Enters crypto map configuration mode
Step 22	**radius-server hos** t *ip-address* [**auth-port***port-number]* [**acct-port***port-number*] **Example:** `Router(config)# radius-server host 172.16.1.4`	Specifies a RADIUS server host.

	Command or Action	Purpose
Step 23	**radius-server key** *string* **Example:** `Router(config)# radius-server key nsite`	Sets the authentication and encryption key for all RADIUS communications between the router and the RADIUS daemon.
Step 24	**radius-server vsa send accounting** **Example:** `Router(config)# radius-server vsa send accounting`	Configures the network access server to recognize and use vendor-specific attributes.
Step 25	**interface** *type slot* /*port* **Example:** `Router(config)# interface FastEthernet 1/0`	Configures an interface type and enters interface configuration mode.
Step 26	**crypto map** *map-name* **Example:** `Router(config-if)# crypto map mymap`	Applies a previously defined crypto map set to an interface.

Configuring Accounting Updates

To send accounting updates while a session is “up,” perform the following optional task:

Before you configure accounting updates, you must first configure IPsec VPN accounting. See the section “Configuring IPsec VPN Accounting, page 49.”

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **aaa accounting update periodic** *number*

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	**aaa accounting update periodic** *number* **Example:** `Router (config)# aaa accounting update periodic 1-2147483647`	(Optional) Enables periodic interim accounting records to be sent to the accounting server.

Troubleshooting for IPsec VPN Accounting

To display messages about IPsec accounting events, perform the following optional task:

SUMMARY STEPS

1. **enable**
2. **debug crypto isakmp aaa**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**debug crypto isakmp aaa** **Example:** `Router# debug crypto isakmp aaa`	Displays messages about Internet Key Exchange (IKE) events. • The **aaa** keyword specifies accounting events.

Configuration Examples for IPsec VPN Accounting

- Accounting and ISAKMP-Profile Example, page 55
- Accounting Without ISAKMP Profiles Example, page 56

Accounting and ISAKMP-Profile Example

The following example shows a configuration for supporting remote access clients with accounting and ISAKMP profiles:

```
version 12.2
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname sheep
!
aaa new-model
!
!
aaa accounting network ipsecaaa start-stop group radius
aaa accounting update periodic 1
aaa session-id common
ip subnet-zero
ip cef
!
!
no ip domain lookup
ip domain name cisco.com
ip name-server 172.29.2.133
ip name-server 172.29.11.48
!
!
crypto isakmp policy 1
 encr aes
 authentication pre-share
 group 14
!
crypto isakmp key cisco address 172.31.100.2

crypto-isakmp profile groupA
 vrf cisco
 match identity group cclient
 client authentication list cisco-client
 isakmp authorization list cisco-client
 client configuration address respond
 accounting acc
!
!
crypto ipsec transform-set my_transform_set esp-aes esp-sha-hmac
!
crypto dynamic-map remotes 1
set peer 172.31.100.2
set security-association lifetime seconds 120
set transform-set my_transform_set
reverse-route
!
crypto map test 10 ipsec-isakmp dynamic remotes
!
voice call carrier capacity active
!
interface Loopback0
ip address 10.20.20.20 255.255.255.0
no ip route-cache
no ip mroute-cache
!
interface FastEthernet0/0
ip address 10.2.80.203 255.255.255.0
no ip mroute-cache
load-interval 30
duplex full
!
interface FastEthernet1/0
ip address 192.168.219.2 255.255.255.0
no ip mroute-cache
```

```
duplex auto
speed auto
!
interface FastEthernet1/1
ip address 172.28.100.1 255.255.255.0
no ip mroute-cache
duplex auto
speed auto
crypto map test
!
no fair-queue
ip default-gateway 10.2.80.1
ip classless
ip route 10.0.0.0 0.0.0.0 10.2.80.1
ip route 10.20.0.0 255.0.0.0 10.2.80.56
ip route 10.10.10.0 255.255.255.0 172.31.100.2
ip route 10.0.0.2 255.255.255.255 10.2.80.73
ip local pool addressA 192.168.1.1 192.168.1.253
no ip http server
ip pim bidir-enable
!
!
ip access-list extended encrypt
permit ip host 10.0.0.1 host 10.5.0.1
!
access-list 101 permit ip host 10.20.20.20 host 10.10.10.10
!
!
radius-server host 172.27.162.206 auth-port 1645 acct-port 1646 key cisco123
radius-server retransmit 3
radius-server authorization permit missing Service-Type
radius-server vsa send accounting
call rsvp-sync
!
!
mgcp profile default
!
dial-peer cor custom
!
!
gatekeeper
shutdown
!
!
line con 0
exec-timeout 0 0
exec prompt timestamp
line aux 0
line vty 5 15
 ntp server 172.31.150.52
end
```

Accounting Without ISAKMP Profiles Example

The following example shows a full Cisco IOS configuration that supports accounting remote access peers when ISAKMP profiles are not used:

```
version 12.2
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname sheep
!
aaa new-model
!
!
aaa accounting network ipsecaaa start-stop group radius
aaa accounting update periodic 1
aaa session-id common
ip subnet-zero
ip cef
!
!
no ip domain lookup
ip domain name cisco.com
ip name-server 172.29.2.133
ip name-server 172.29.11.48
!
!
crypto isakmp policy 1
 encr aes
 authentication pre-share
 group 14
!
crypto isakmp key cisco address 172.31.100.2
!
!
crypto ipsec transform-set my_transform_set esp-aes esp-sha-hmac
!
crypto map test client accounting list ipsecaaa
crypto map test 10 ipsec-isakmp
 set peer 172.31.100.2
 set security-association lifetime seconds 120
 set transform-set my_transform_set
 match address 101
!
voice call carrier capacity active
!
interface Loopback0
 ip address 10.20.20.20 255.255.255.0
 no ip route-cache
 no ip mroute-cache
!
interface FastEthernet0/0
 ip address 10.2.80.203 255.255.255.0
 no ip mroute-cache
 load-interval 30
 duplex full
!
interface FastEthernet1/0
 ip address 192.168.219.2 255.255.255.0
 no ip mroute-cache
 duplex auto
 speed auto
!
interface FastEthernet1/1
 ip address 172.28.100.1 255.255.255.0
 no ip mroute-cache
 duplex auto
 speed auto
 crypto map test
!
no fair-queue
ip default-gateway 10.2.80.1
ip classless
ip route 10.0.0.0 0.0.0.0 10.2.80.1
ip route 10.30.0.0 255.0.0.0 10.2.80.56
ip route 10.10.10.0 255.255.255.0 172.31.100.2
ip route 10.0.0.2 255.255.255.255 10.2.80.73
no ip http server
ip pim bidir-enable
!
!
ip access-list extended encrypt
 permit ip host 10.0.0.1 host 10.5.0.1
!
access-list 101 permit ip host 10.20.20.20 host 10.10.10.10
!
!
radius-server host 172.27.162.206 auth-port 1645 acct-port 1646 key cisco123
radius-server retransmit 3
radius-server authorization permit missing Service-Type
radius-server vsa send accounting
```

```
call rsvp-sync
!
!
mgcp profile default
!
dial-peer cor custom
!
!
gatekeeper
 shutdown
!
!
line con 0
 exec-timeout 0 0
 exec prompt timestamp
line aux 0
line vty 5 15
!
exception core-file ioscrypto/core/sheep-core
exception dump 172.25.1.129
ntp clock-period 17208229
ntp server 172.71.150.52
!
end
```

Additional References

Related Documents

Related Topic	Document Title
Configuring AAA accounting	• Configuring Accounting
Configuring IPsec VPN accounting	• Configuring Security for VPNs with IPsec
Configuring basic AAA RADIUS	• The section “Configuring RADIUS” in the *Cisco IOS Security Configuration Guide: User Services* on Cisco.com
Configuring ISAKMP profiles	VRF Aware IPsec
Privilege levels with TACACS+ and RADIUS	• Configuring TACACS+ • “Configuring RADIUS” section of the *Cisco IOS Security Configuration Guide: User Services on Cisco.com*
IP security, RADIUS, and AAA commands	*Cisco IOS Security Command Reference*
Recommended cryptographic algorithms	*Next Generation Encryption*

MIBs

MIBs	MIBs Link
None	To locate and download MIBs for selected platforms, Cisco IOS 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 VPN Accounting

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 7 Feature Information for <Phrase Based on Module Title>

Feature Name	Releases	Feature Information
IPsec VPN Accounting	12.2(15)T	The IPsec VPN Accounting feature allows a session to be accounted by indicating when the session starts and stops. A VPN session is defined as an Internet Key Exchange (IKE) security association (SA) and the one or more SA pairs that are created by the IKE SA. The session starts when the first IP Security (IPsec) pair is created and stops when all IPsec SAs are deleted. Session identifying information and session usage information is passed to the Remote Authentication Dial-In User Service (RADIUS) server through standard RADIUS attributes and vendor-specific attributes (VSAs). This feature was introduced in Cisco IOS Release 12.2(15)T The following commands were introduced or modified: **client authentication list, client configuration address, crypto isakmp profile, crypto map (global IPsec), debug crypto isakmp, isakmp authorization list, match identity, set isakmp-profile, vrf**

Glossary

IKE --Internet Key Exchange. IKE establishes a shared security policy and authenticates keys for services (such as IP security [IPsec]) that require keys. Before any IPsec traffic can be passed, each router, firewall, and host must verify the identity of its peer. This can be done by manually entering preshared keys into both hosts or by a certification authority (CA) service.

IPsec --IP security. IPsec is A framework of open standards that provides data confidentiality, data integrity, and data authentication between participating peers. IPsec provides these security services at the IP layer. IPsec uses IKE to handle the negotiation of protocols and algorithms based on local policy and to generate the encryption and authentication keys to be used by IPsec. IPsec can protect one or more data flows between a pair of hosts, between a pair of security gateways, or between a security gateway and a host.

ISAKMP --Internet Security Association and Key Management Protocol. ISAKMP is an Internet IPsec protocol (RFC 2408) that negotiates, establishes, modifies, and deletes security associations. It also exchanges key generation and authentication data (independent of the details of any specific key generation technique), key establishment protocol, encryption algorithm, or authentication mechanism.

L2TP session --Layer 2 Transport Protocol. L2TP are communications transactions between the L2TP access concentrator (LAC) and the L2TP network server (LNS) that support tunneling of a single PPP connection. There is a one-to-one relationship among the PPP connection, L2TP session, and L2TP call.

NAS --network access server. A NAS is a Cisco platform (or collection of platforms, such as an AccessPath system) that interfaces between the packet world (for example, the Internet) and the circuit world (for example, the public switched telephone network [PSTN]).

PFS --perfect forward secrecy. PFS is a cryptographic characteristic associated with a derived shared secret value. With PFS, if one key is compromised, previous and subsequent keys are not compromised because subsequent keys are not derived from previous keys.

QM --Queue Manager. The Cisco IP Queue Manager (IP QM) is an intelligent, IP-based, call-treatment and routing solution that provides powerful call-treatment options as part of the Cisco IP Contact Center (IPCC) solution.

RADIUS --Remote Authentication Dial-In User Service. RADIUS is a database for authenticating modem and ISDN connections and for tracking connection time.

RSA --Rivest, Shamir, and Adelman. Rivest, Shamir, and Adelman are the inventors of the Public-key cryptographic system that can be used for encryption and authentication.

SA --security association. A SA is an instance of security policy and keying material that is applied to a data flow.

TACACS+ --Terminal Access Controller Access Control System Plus. TACACS+ is a security application that provides centralized validation of users attempting to gain access to a router or network access server.

TED --Tunnel Endpoint Discovery. TED is a Cisco IOS software feature that allows routers to discover IPsec endpoints.

VPN --Virtual Private Network. A VPN enables IP traffic to travel securely over a public TCP/IP network by encrypting all traffic from one network to another. A VPN uses "tunneling" to encrypt all information at the IP level.

VRF --A VPN routing/forwarding instance. A VRF consists of an IP routing table, a derived forwarding table, a set of interfaces that use the forwarding table, and a set of rules and routing protocols that determine what goes into the forwarding table. In general, a VRF includes the routing information that defines a customer VPN site that is attached to a PE router.

VSA --vendor-specific attribute. A VSA is an attribute that has been implemented by a particular vendor. It uses the attribute Vendor-Specific to encapsulate the resulting AV pair: essentially, Vendor-Specific = protocol:attribute = value.

XAUTH --Extended authentication. XAUTH is an optional exchange between IKE Phase 1 and IKE Phase 2, in which the router demands additional authentication information in an attempt to authenticate the actual user (as opposed to authenticating the peer).

IPsec Usability Enhancements

The IPsec Usability Enhancements feature introduces functionality that eases the configuration and monitoring of your IPsec virtual private network (VPN). Benefits of this feature include intelligent defaults for IPsec and Internet Key Exchange (IKE) and the ability to easily verify and troubleshoot IPsec VPNs.

Note Security threats, as well as the cryptographic technologies to help protect against them, are constantly changing. For more information about the latest Cisco cryptographic recommendations, see the *Next Generation Encryption* (NGE) white paper.

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see Bug Search Tool and 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 module.

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 IPsec Usability Enhancements

- You must be familiar with IPsec, IKE, and encryption.
- You must have configured IPsec and enabled IKE on your router.
- You must be running Cisco IOS k9 crypto image on your router.

Information About IPsec Usability Enhancements

- IPsec Overview, page 64

IPsec Overview

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

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

- IPsecOperation, page 64

IPsecOperation

An IPsec operation involves five basic steps: identifying interesting traffic, IKE phase-1, IKE phase-2, establishing the tunnel or IPsec session, and finally tearing down the tunnel.

Step 1: Identifying Interesting Traffic

The VPN devices recognize the traffic, or sensitive packets, to detect. IPsec is either applied to the sensitive packet, the packet is bypassed, or the packet is dropped. Based on the traffic type, if IPsec is applied then IKE phase-1 is initiated.

Step 2: IKE Phase-1

There are three exchanges between the VPN devices to negotiate an IKE security policy and establish a secure channel.

During the first exchange, the VPN devices negotiate matching IKE transform sets to protect the IKE exchange resulting in establishing an Internet Security Association and Key Management Protocol (ISAKMP) policy to utilize. The ISAKMP policy consists of an encryption algorithm, a hash algorithm, an authentication algorithm, a Diffie-Hellman (DH) group, and a lifetime parameter.

There are eight default ISAKMP policies supported. For more information on default ISAKMP policies, see the section "Verifying IKE Phase-1 ISAKMP Default Policies, page 65."

The second exchange consists of a Diffie-Hellman exchange, which establishes a shared secret.

The third exchange authenticates peer identity. After the peers are authenticated, IKE phase-2 begins.

Step 3: IKE Phase-2

The VPN devices negotiate the IPsec security policy used to protect the IPsec data. IPsec transform sets are negotiated.

A transform set is a combination of algorithms and protocols that enact a security policy for network traffic. For more information on default transform sets, see the section "Verifying Default IPsec Transform-Sets, page 69." A VPN tunnel is ready to be established.

Step 4: Establishing the Tunnel--IPsec Session

The VPN devices apply security services to IPsec traffic and then transmit the IPsec data. Security associations (SAs) are exchanged between peers. The negotiated security services are applied to the tunnel traffic while the IPsec session is active.

Step 5: Terminating the Tunnel

The tunnel is torn down when an IPsec SA lifetime time-out occurs or if the packet counter is exceeded. The IPsec SA is removed.

How to Utilize IPsec Usability Enhancements

- Verifying IKE Phase-1 ISAKMP Default Policies, page 65
- Verifying Default IPsec Transform-Sets, page 69
- Verifying and Troubleshooting IPsec VPNs, page 71

Verifying IKE Phase-1 ISAKMP Default Policies

When IKE negotiation begins, the peers try to find a common policy, starting with the highest priority policy as specified on the remote peer. The peers negotiate the policy sets until there is a match. If peers have more than one policy set in common, the lowest priority number is used.

There are three groups of IKE phase-1, ISAKMP, policies as defined by policy priority ranges and behavior:

- Default ISAKMP policies, which are automatically enabled.
- User configured ISAKMP policies, which you may configure with the **crypto isakmp policy** command.
- Easy VPN (EzVPN) ISAKMP policies, which are made available during EzVPN configuration.

This section describes the three groups of ISAKMP policies, how they behave in relationship to one another, how to determine which policies are in use with the appropriate **show** command, and how to disable the default ISAKMP policies.

- Default IKE Phase-1 Policies, page 65
- User Configured IKE Policies, page 66
- EzVPN ISAKMP Policies, page 67

Default IKE Phase-1 Policies

There are eight default IKE phase-1, ISAKMP, policies supported (see the table below) that are enabled automatically. If you have neither manually configured IKE policies with the **crypto isakmp policy** command nor disabled the default IKE policies with the **no crypto isakmp default policy** command, the default IKE policies will be used during peer IKE negotiations. You can verify that the default IKE policies are in use by issuing either the **show crypto isakmp policy** command or the **show crypto isakmp default policy** command.

Note Security threats, as well as the cryptographic technologies to help protect against them, are constantly changing. For more information about the latest Cisco cryptographic recommendations, see the *Next Generation Encryption* (NGE) white paper.

The default IKE policies define the following policy set parameters:

- The priority, 65507-65514, where 65507 is the highest priority and 65514 is the lowest priority.
- The authentication method, Rivest, Shamir, and Adelman (RSA) or preshared keys (PSK).
- The encryption method, Advanced Encryption Standard (AES) or Triple Data Encryption Standard (3DES).
- The hash function, Secure Hash Algorithm (SHA-1) or Message-Digest algorithm 5 (MD5).
- The DH group specification DH2 or DH5
    - DH2 specifies the 768-bit DH group.
    - DH5 specifies the 1536-bit DH group.

Note Cisco no longer recommends using 3DES, MD5 and DH groups 1, 2 and 5. For more information about the latest Cisco cryptographic recommendations, see the *Next Generation Encryption* (NGE) white paper. To learn more about IKE configuration, read the chapter “Configuring Internet Key Exchange for IPsec VPNs” in *Internet Key Exchange for IPsec VPNs Configuration Guide*.

Table 8 Default IKE Phase-1, ISAKMP, Policies

Priority	Authentication	Encryption	Hash	Diffie-Hellman
65507	RSA	AES	SHA	DH5
65508	PSK	AES	SHA	DH5
65509	RSA	AES	MD5	DH5
65510	PSK	AES	MD5	DH5
65511	RSA	3DES	SHA	DH2
65512	PSK	3DES	SHA	DH2
65513	RSA	3DES	MD5	DH2
65514	PSK	3DES	MD5	DH2

User Configured IKE Policies

You may configure IKE policies with the **crypto isakmp policy** command. User configured IKE policies are uniquely identified and configured with a priority number ranging from 1-10000, where 1 is the highest priority and 10000 the lowest priority.

Once you have configured one or more IKE policies with a priority of 1-10000:

- The user configured policies will be used during peer IKE negotiations.

- The default IKE policies will no longer used during peer IKE negotiations.
- The user configured policies may be displayed by issuing the **show crypto isakmp policy** command.

EzVPN ISAKMP Policies

If you have configured EzVPN (see EzVPN ISAKMP Policies, page 67), the default EzVPN ISAKMP policies in use are uniquely identified with a priority number ranging from 65515-65535, where 65515 is the highest priority and 65535 is the lowest priority.

Once a user has configured EzVPN:

- The default EzVPN ISAKMP policies and the default IKE policies will be used during peer IKE negotiations.
- The EzVPN IKAKMP policies and the default IKE policies will be displayed by issuing the **show crypto isakmp policy** command.
- Default ISAKMP policies will be displayed by issuing the **show crypto isakmp default policy** command unless they have been disabled by issuing the **no crypto isakmp default policy** command.

SUMMARY STEPS

1. **enable**
2. **show crypto isakmp default policy**
3. **configure terminal**
4. **no crypto isakmp default policy**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**show crypto isakmp default policy** **Example:** `Router# show crypto isakmp default policy`	(Optional) Displays default ISAKMP policies if no policy with a priority of 1-10000 is configured.
Step 3	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.

	Command or Action	Purpose
Step 4	**no crypto isakmp default policy** **Example:** `Router(config)# no crypto isakmp default policy`	(Optional) Turns off default ISAKMP policies with priorities 65507-65514.

Examples

The following is sample output of the **show crypto isakmp default policy** command. The default policies are displayed because the default policies have not been disabled.

```
Router# show crypto isakmp default policy

Default IKE policy
Default protection suite of priority 65507
        encryption algorithm:   AES - Advanced Encryption Standard (128 bit key.
        hash algorithm:         Secure Hash Standard
        authentication method:  Rivest-Shamir-Adleman Signature
        Diffie-Hellman group:   #5 (1536 bit)
        lifetime:               86400 seconds, no volume limit
Default protection suite of priority 65508
        encryption algorithm:   AES - Advanced Encryption Standard (128 bit key.
        hash algorithm:         Secure Hash Standard
        authentication method:  Pre-Shared Key
        Diffie-Hellman group:   #5 (1536 bit)
        lifetime:               86400 seconds, no volume limit
Default protection suite of priority 65509
        encryption algorithm:   AES - Advanced Encryption Standard (128 bit key.
        hash algorithm:         Message Digest 5
        authentication method:  Rivest-Shamir-Adleman Signature
        Diffie-Hellman group:   #5 (1536 bit)
        lifetime:               86400 seconds, no volume limit
Default protection suite of priority 65510
        encryption algorithm:   AES - Advanced Encryption Standard (128 bit key.
        hash algorithm:         Message Digest 5
        authentication method:  Pre-Shared Key
        Diffie-Hellman group:   #5 (1536 bit)
        lifetime:               86400 seconds, no volume limit
Default protection suite of priority 65511
        encryption algorithm:   Three key triple DES
        hash algorithm:         Secure Hash Standard
        authentication method:  Rivest-Shamir-Adleman Signature
        Diffie-Hellman group:   #2 (1024 bit)
        lifetime:               86400 seconds, no volume limit
Default protection suite of priority 65512
        encryption algorithm:   Three key triple DES
        hash algorithm:         Secure Hash Standard
        authentication method:  Pre-Shared Key
        Diffie-Hellman group:   #2 (1024 bit)
        lifetime:               86400 seconds, no volume limit
Default protection suite of priority 65513
        encryption algorithm:   Three key triple DES
        hash algorithm:         Message Digest 5
        authentication method:  Rivest-Shamir-Adleman Signature
        Diffie-Hellman group:   #2 (1024 bit)
        lifetime:               86400 seconds, no volume limit
Default protection suite of priority 65514
        encryption algorithm:   Three key triple DES
        hash algorithm:         Message Digest 5
        authentication method:  Pre-Shared Key
        Diffie-Hellman group:   #2 (1024 bit)
        lifetime:               86400 seconds, no volume limit
```

The following example disables the default IKE policies then shows the resulting output of the **show crypto isakmp default policy** command, which is blank:

```
Router# configure terminal
Router(config)# no crypto isakmp default policy
Router(config)# exit
Router# show crypto isakmp default policy
Router#
!There is no output since the default IKE policies have been disabled.
```

The following is an example system log message that is generated whenever the default ISAKMP policies are in use:

```
%CRYPTO-6-IKMP_POLICY_DEFAULT: Using ISAKMP Default policies
```

Verifying Default IPsec Transform-Sets

A transform set represents a certain combination of security protocols and algorithms. During the IPsec SA negotiation, the peers agree to use a particular transform set for protecting a particular data flow.

During IPsec SA negotiations with IKE, the peers search for a transform set that is the same at both peers. When such a transform set is found, it is selected and is applied to the protected traffic as part of the IPsec SAs of both peers.

Default Transform Sets

A default transform set will be used by any crypto map or IPsec profile where no other transform set has been configured and if the following is true:

- The default transform sets have not been disabled with the **no crypto ipsec default transform-set** command.
- The crypto engine in use supports the encryption algorithm.

The two default transform sets each define an Encapsulation Security Protocol (ESP) encryption transform type and an ESP authentication transform type as shown in the table below.

Table 9 Default Transform Sets and Parameters

Default Transform Name	ESP Encryption Transform and Description	ESP Authentication Transform and Description
#$!default_transform_set_0	esp-3des (ESP with the 168-bit 3DES or Triple DES encryption algorithm)	esp-sha-hmac
#$!default_transform_set_1	esp-aes (ESP with the 128-bit AES encryption algorithm)	esp-sha-hmac (ESP with the SHA-1, hash message authentication code [HMAC] variant authentication algorithm)

SUMMARY STEPS

1. **enable**
2. **show crypto ipsec default transform-set**
3. **configure terminal**
4. **no crypto ipsec default transform-set**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**show crypto ipsec default transform-set** **Example:** `Router# show crypto ipsec default transform-set`	(Optional) Displays the default IPsec transform sets currently in use by IKE.
Step 3	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 4	**no crypto ipsec default transform-set** **Example:** `Router(config)# no crypto ipsec default transform-set`	(Optional) Disables the default IPsec transform sets.

Examples

```
The following example displays output from the show crypto ipsec default transform-set
 command when the default transform sets are enabled, the default setting:
Router# show crypto ipsec default transform-set
Transform set #$!default_transform_set_1: { esp-aes esp-sha-hmac  }
   will negotiate = { Transport,  },

Transform set #$!default_transform_set_0: { esp-3des esp-sha-hmac  }
   will negotiate = { Transport,  },
```

The following example displays output from the **show crypto ipsec default transform-set** command when the default transform sets have been disabled with the **no crypto ipsec default transform-set**command.

```
Router(config)# no crypto ipsec default transform-set
Router(config)# exit
Router#
```

```
Router# show crypto ipsec default transform-set
! There is no output.
Router#
```

The following is an example system log message that is generated whenever IPsec SAs have negotiated with a default transform set:

```
%CRYPTO-5-IPSEC_DEFAULT_TRANSFORM: Using Default IPsec transform-set
```

Verifying and Troubleshooting IPsec VPNs

Perform one of the following optional tasks in this section, depending on whether you want to verify IKE phase-1 or IKE phase-2 tunnels or troubleshoot your IPsec VPN:

- Verifying IKE Phase-1 ISAKMP, page 71
- Verifying IKE Phase-2, page 74
- Troubleshooting IPsec VPNs, page 78

Verifying IKE Phase-1 ISAKMP

To display statistics for ISAKMP tunnels, use the following optional commands.

SUMMARY STEPS

1. **show crypto mib isakmp flowmib failure [vrf** *vrf-name* **]**
2. **show crypto mib isakmp flowmib global [vrf** *vrf-name* **]**
3. **show crypto mib isakmp flowmib history [vrf** *vrf-name* **]**
4. **show crypto mib isakmp flowmib peer [index** *peer-mib-index* **] [vrf** *vrf-name* **]**
5. **show crypto mib isakmp flowmib tunnel [index** *tunnel-mib-index* **] [vrf** *vrf-name* **]**

DETAILED STEPS

Step 1 **show crypto mib isakmp flowmib failure [vrf** *vrf-name* **]**
For ISAKMP tunnel failures, this command displays event information. The following is sample output for this command:

Example:

```
Router# show crypto mib isakmp flowmib failure
 vrf Global
  Index:                        1
  Reason:                       peer lost
  Failure time since reset:     00:07:27
  Local type:                   ID_IPV4_ADDR
  Local value:                 192.0.2.1
  Remote type:                  ID_IPV4_ADDR
  Remote Value:                 192.0.2.2
  Local Address:                192.0.2.1
  Remote Address:               192.0.2.2
  Index:                        2
  Reason:                       peer lost
  Failure time since reset:     00:07:27
  Local type:                   ID_IPV4_ADDR
  Local value:                 192.0.3.1
  Remote type:                  ID_IPV4_ADDR
  Remote Value:                192.0.3.2
  Local Address:               192.0.3.1
  Remote Address:              192.0.3.2
  Index:                       3
  Reason:                      peer lost
  Failure time since reset:    00:07:32
  Local type:                  ID_IPV4_ADDR
  Remote type:                 ID_IPV4_ADDR
  Remote Value:                192.0.2.2
  Local Address:               192.0.2.1
  Remote Address:              192.0.2.2
```

Step 2 **show crypto mib isakmp flowmib global [vrf** *vrf-name* **]**

Global ISAKMP tunnel statistics are displayed by issuing this command. The following is sample output for this command:

Example:

```
Router# show crypto mib isakmp flowmib global
vrf Global
  Active Tunnels:                          3
  Previous Tunnels:                        0
  In octets:                               2856
  Out octets:                              3396
  In packets:                              16
  Out packets:                             19
  In packets drop:                         0
  Out packets drop:                        0
  In notifys:                              4
  Out notifys:                             7
  In P2 exchg:                             3
  Out P2 exchg:                            6
  In P2 exchg invalids:                    0
  Out P2 exchg invalids:                   0
  In P2 exchg rejects:                     0
  Out P2 exchg rejects:                    0
  In IPSEC delete:                         0
  Out IPSEC delete:                        0
  SAs locally initiated:                   3
  SAs locally initiated failed:            0
  SAs remotely initiated failed:           0
  System capacity failures:                0
  Authentication failures:                 0
  Decrypt failures:                        0
  Hash failures:                           0
  Invalid SPI:                             0
```

Step 3 **show crypto mib isakmp flowmib history [vrf** *vrf-name* **]**

For information about ISAKMP tunnels that are no longer active, this command displays event information including the reason that the tunnel was terminated. The following is sample output for this command:

Example:

```
Router# show crypto mib isakmp flowmib history
vrf Global
  Reason:                             peer lost
  Index:                              2
  Local type:                         ID_IPV4_ADDR
  Local address:                      192.0.2.1
  Remote type:                        ID_IPV4_ADDR
  Remote address:                     192.0.2.2
  Negotiation mode:                   Main Mode
  Diffie Hellman Grp:                 14
  Encryption algo:                    aes
  Hash algo:                          sha
  Auth method:                        psk
  Lifetime:                           86400
  Active time:                        00:06:30
  Policy priority:                    1
  Keepalive enabled:                  Yes
  In octets:                          3024
  In packets:                         22
  In drops:                           0
  In notifys:                         18
  In P2 exchanges:                    1
  In P2 exchg invalids:               0
  In P2 exchg rejected:                 0
  In P2 SA delete reqs:                 0
  Out octets:                           4188
  Out packets:                          33
  Out drops:                            0
  Out notifys:                          28
  Out P2 exchgs:                        2
  Out P2 exchg invalids:                0
  Out P2 exchg rejects:                 0
  Out P2 Sa delete requests:            0
  Reason:                               peer lost
  Index:                                3
  Local type:                           ID_IPV4_ADDR
  Local address:                        192.0.3.1
  Remote type:                          ID_IPV4_ADDR
  Remote address:                       192.0.3.2
  Negotiation mode:                     Main Mode
  Diffie Hellman Grp:                   14
  Encryption algo:                      aes
  Hash algo:                            sha
  Auth method:                          psk
  Lifetime:                             86400
  Active time:                          00:06:25
  Policy priority:                      1
  Keepalive enabled:                    Yes
  In octets:                            3140
  In packets:                           23
  In drops:                             0
  In notifys:                           19
  In P2 exchanges:                      1
  In P2 exchg invalids:                 0
  In P2 exchg rejected:                 0
  In P2 SA delete reqs:                 0
  Out octets:                           4304
  Out packets:                          34
  Out drops:                            0
  Out notifys:                          29
  Out P2 exchgs:                        2
  Out P2 exchg invalids:                0
  Out P2 exchg rejects:                 0
  Out P2 Sa delete requests:            0
```

Step 4 **show crypto mib isakmp flowmib peer [index** *peer-mib-index* **] [vrf** *vrf-name* **]**

For active ISAKMP peer associations, this command displays information including indexes, type of connection, and IP addresses. The following is sample output for this command:

Example:

```
Router# show crypto mib isakmp flowmib peer
vrf Global
  Index:              1
  Local type:         ID_IPV4_ADDR
  Local address:      192.0.2.1
  Remote type:        ID_IPV4_ADDR
  Remote address:     192.0.2.2
  Index:              2
  Local type:         ID_IPV4_ADDR
  Local address:      192.0.3.1
  Remote type:        ID_IPV4_ADDR
  Remote address:     192.0.3.1
  Index:              3
  Local type:         ID_IPV4_ADDR
  Local address:      192.0.4.1
  Remote type:        ID_IPV4_ADDR
  Remote address:     192.0.4.1
```

Step 5 **show crypto mib isakmp flowmib tunnel [index** *tunnel-mib-index* **] [vrf** *vrf-name* **]**

For active ISAKMP tunnels, this command displays tunnel statistics. The following is sample output for this command:

Example:

```
Router# show crypto mib isakmp flowmib tunnel
vrf Global
  Index:                      1
  Local type:                 ID_IPV4_ADDR
  Local address:              192.0.2.1
  Remote type:                ID_IPV4_ADDR
  Remote address:             192.0.2.2
  Negotiation mode:           Main Mode
  Diffie Hellman Grp:         14
  Encryption algo:            aes
  Hash algo:                  sha
  Auth method:                psk
  Lifetime:                   86400
  Active time:                00:03:08
  Policy priority:            1
  Keepalive enabled:          Yes
  In octets:                  2148
  In packets:                 15
  In drops:                   0
  In notifys:                 11
  In P2 exchanges:            1
  In P2 exchg invalids:       0
  In P2 exchg rejected:       0
  In P2 SA delete reqs:       0
  Out octets:                 2328
  Out packets:                16
  Out drops:                  0
  Out notifys:                12
  Out P2 exchgs:              2
  Out P2 exchg invalids:      0
  Out P2 exchg rejects:       0
  Out P2 Sa delete requests:  0
```

Verifying IKE Phase-2

To display statistics for IPsec phase-2 tunnels, use the following optional commands.

SUMMARY STEPS

1. **show crypto mib ipsec flowmib endpoint [vrf** *vrf-name* **]**
2. **show crypto mib ipsec flowmib failure [vrf** *vrf-name* **]**
3. **show crypto mib ipsec flowmib global [vrf** *vrf-name* **]**
4. **show crypto mib ipsec flowmib history [vrf** *vrf-name* **]**
5. **show crypto mib ipsec flowmib spi [vrf** *vrf-name* **]**
6. **show crypto mib ipsec flowmib tunnel** [**index** *tunnel-mib-index*] **[vrf** *vrf-name* **]**

DETAILED STEPS

Step 1 **show crypto mib ipsec flowmib endpoint [vrf** *vrf-name* **]**

Information for each active endpoint, local or remote device, associated with an IPsec phase-2 tunnel is displayed by issuing this command. The following is sample output for this command:

Example:

```
Router#  show crypto mib ipsec flowmib endpoint
vrf Global
  Index:                1
  Local type:           Single IP address
  Local address:        192.1.2.1
  Protocol:             0
  Local port:           0
  Remote type:          Single IP address
  Remote address:       192.1.2.2
  Remote port:          0
  Index:                2
  Local type:           Subnet
  Local address:        192.1.3.0 255.255.255.0
  Protocol:             0
  Local port:           0
  Remote type:          Subnet
  Remote address:       192.1.3.0 255.255.255.0
  Remote port:          0
```

Step 2 **show crypto mib ipsec flowmib failure [vrf** *vrf-name* **]**

For ISAKMP tunnel failures, this command displays event information. The following is sample output for this command:

Example:

```
Router# show crypto mib ipsec flowmib failure
vrf Global
  Index:                        1
  Reason:                       Operation request
  Failure time since reset:     00:25:18
  Src address:                  192.1.2.1
  Destination address:          192.1.2.2
  SPI:                          0
```

Step 3 **show crypto mib ipsec flowmib global [vrf** *vrf-name* **]**

Global IKE phase-2 tunnel statistics are displayed by issuing this command. The following is sample output for this command:

Example:

```
Router# show crypto mib ipsec flowmib global
 vrf Global
  Active Tunnels:                     2
  Previous Tunnels:                   0
  In octets:                          800
  Out octets:                         1408
  In packets:                         8
  Out packets:                        8
  Uncompressed encrypted bytes:    1408
  In packets drops:                   0
  Out packets drops:                  2
  In replay drops:                    0
  In authentications:                 8
  Out authentications:                8
  In decrypts:                        8
  Out encrypts:                       8
  Compressed bytes:                   0
  Uncompressed bytes:                 0
  In uncompressed bytes:              0
  Out uncompressed bytes:             0
  In decrypt failures:                0
  Out encrypt failures:               0
  No SA failures:                     0
! Number of SA Failures.
  Protocol use failures:              0
  System capacity failures:           0
  In authentication failures:         0
  Out authentication failures:        0
```

Step 4 **show crypto mib ipsec flowmib history [vrf** *vrf-name* **]**

For information about IKE phase-2 tunnels that are no longer active, this command displays event information including the reason that the tunnel was terminated. The following is sample output for this command:

Example:

```
Router# show crypto mib ipsec flowmib history
vrf Global
  Reason:                      Operation request
  Index:                       1
  Local address:               192.1.2.1
  Remote address:              192.1.2.2
  IPSEC keying:                IKE
  Encapsulation mode:          1
  Lifetime (KB):               4608000
  Lifetime (Sec):              3600
  Active time:                 00:24:32
  Lifetime threshold (KB):     423559168
  Lifetime threshold (Sec):    3590000
  Total number of refreshes:   0
  Expired SA instances:        4
  Current SA instances:        4
  In SA DH group:              14
  In sa encrypt algorithm      aes
  In SA auth algorithm:        rsig
  In SA ESP auth algo:         ESP_HMAC_SHA
  In SA uncompress algorithm:  None
  Out SA DH group:             14
  Out SA encryption algorithm: aes
  Out SA auth algorithm:       ESP_HMAC_SHA
  Out SA ESP auth algorithm:   ESP_HMAC_SHA
  Out SA uncompress algorithm: None
  In octets:                   400
  Decompressed octets:         400
  In packets:                  4
  In drops:                        0
  In replay drops:                 0
  In authentications:              4
  In authentication failures:      0
  In decrypts:                     4
  In decrypt failures:             0
  Out octets:                      704
  Out uncompressed octets:         704
  Out packets:                     4
  Out drops:                       1
  Out authentications:             4
  Out authentication failures:     0
  Out encryptions:                 4
  Out encryption failures:         0
  Compressed octets:               0
  Decompressed octets:             0
  Out uncompressed octets:         704
```

Step 5 **show crypto mib ipsec flowmib spi [vrf** *vrf-name* **]**

The security protection index (SPI) table contains an entry for each active and expiring security IKE phase-2 association. The following is sample output for this command, which displays the SPI table:

Example:

```
Router# show crypto mib ipsec flowmib spi
vrf Global
  Tunnel Index:          1
  SPI Index:            1
  SPI Value:            0xCC57D053
  SPI Direction:        In
  SPI Protocol:         AH
  SPI Status:           Active
  SPI Index:            2
  SPI Value:            0x68612DF
  SPI Direction:        Out
  SPI Protocol:         AH
  SPI Status:           Active
  SPI Index:            3
  SPI Value:            0x56947526
  SPI Direction:        In
  SPI Protocol:         ESP
  SPI Status:           Active
  SPI Index:            4
  SPI Value:            0x8D7C2204
  SPI Direction:        Out
  SPI Protocol:         ESP
  SPI Status:           Active
```

Step 6 **show crypto mib ipsec flowmib tunnel** [**index** *tunnel-mib-index*] **[vrf** *vrf-name* **]**

For active IKE phase-2 tunnels, this command displays tunnel statistics. The following is sample output for this command:

Example:

```
Router# show crypto mib ipsec flowmib tunnel
vrf Global
  Index:                              1
  Local address:                      192.0.2.1
  Remote address:                     192.0.2.2
  IPSEC keying:                       IKE
  Encapsulation mode:                 1
  Lifetime (KB):                      4608000
  Lifetime (Sec):                     3600
  Active time:                        00:05:46
  Lifetime threshold (KB):            64
  Lifetime threshold (Sec):           10
  Total number of refreshes:          0
  Expired SA instances:               0
  Current SA instances:               4
  In SA DH group:                     14
  In sa encrypt algorithm:            aes
  In SA auth algorithm:               rsig
  In SA ESP auth algo:                ESP_HMAC_SHA
  In SA uncompress algorithm:         None
  Out SA DH group:                    14
  Out SA encryption algorithm:        aes
  Out SA auth algorithm:              ESP_HMAC_SHA
  Out SA ESP auth algorithm:          ESP_HMAC_SHA
  Out SA uncompress algorithm:        None
  In octets:                             400
  Decompressed octets:                   400
  In packets:                            4
  In drops:                              0
  In replay drops:                       0
  In authentications:                    4
  In authentication failures:            0
  In decrypts:                           4
  In decrypt failures:                   0
  Out octets:                            704
  Out uncompressed octets:               704
  Out packets:                           4
  Out drops:                             1
  Out authentications:                   4
  Out authentication failures:           0
  Out encryptions:                       4
  Out encryption failures:               0
  Compressed octets:                     0
  Decompressed octets:                   0
  Out uncompressed octets:               704
```

Troubleshooting IPsec VPNs

The **show tech-support ipsec** command simplifies the collection of the IPsec related information if you are troubleshooting a problem.

SUMMARY STEPS

1. **show tech-support ipsec**

DETAILED STEPS

show tech-support ipsec

There are three variations of the **show tech-support ipsec**command:

- **show tech-support ipsec**
- **show tech-support ipsec peer** *ipv4address*
- **show tech-support ipsec vrf** *vrf-name*

For a sample display of the output from the **show tech-support ipsec** command for the individual **show** commands listed below for each variation see the “Troubleshooting IPsec VPNs, page 78” section.

Output of the show tech-support ipsec Command

If you enter the **show tech-support ipsec**command without any keywords, the command output displays the following **show** commands, in order of output:

- **show version**

- **show running-config**
- **show crypto isakmp sa count**
- **show crypto ipsec sa count**
- **show crypto session summary**
- **show crypto session detail**
- **show crypto isakmp sa detail**
- **show crypto ipsec sa detail**
- **show crypto isakmp peers**
- **show crypto ruleset detail**
- **show processes memory | include Crypto IKMP**
- **show processes cpu | include Crypto IKMP**
- **show crypto eli**
- **show crypto engine accelerator statistic**

Output of the show tech-support ipsec peer Command

If you enter the **show tech-support ipsec**command with the **peer** keyword and the *ipv4address* argument, the output displays the following **show** commands, in order of output for the specified peer:

- **show version**
- **show running-config**
- **show crypto session remote** *ipv4address* **detail**
- **show crypto isakmp sa peer** *ipv4address* **detail**
- **show crypto ipsec sa peer** *ipv4address* **detail**
- **show crypto isakmp peers** *ipv4address*
- **show crypto ruleset detail**
- **show processes memory | include Crypto IKMP**

- **show processes cpu | include Crypto IKMP**
- **show crypto eli**
- **show crypto engine accelerator statistic**

Output of the show tech-support ipsec vrf Command

If you enter the **show tech-support ipsec**command with the **vrf** keyword and the *vrf-name*argument, the output displays the following **show** commands, in order of output for the specified Virtual Routing and Forwarding (VRF):

- **show version**
- **show running-config**
- **show crypto isakmp sa count vrf** *vrf-name*
- **show crypto ipsec sa count vrf** *vrf-name*
- **show crypto session ivrf** *ivrf-name* **detail**
- **show crypto session fvrf** *fvrf-name* **detail**
- **show crypto isakmp sa vrf** *vrf-name* **detail**
- **show crypto ipsec sa vrf** *vrf-name* **detail**
- **show crypto ruleset detail**
- **show processes memory | include Crypto IKMP**
- **show processes cpu | include Crypto IKMP**
- **show crypto eli**

- **show crypto engine accelerator statistic**

Example:

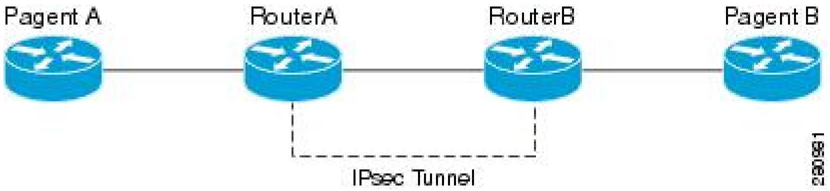
Configuration Examples for IPsec Usability Enhancements

- IKE Default Policies Example, page 80
- Default Transform Sets Example, page 81

IKE Default Policies Example

In the following example, crypto maps are configured on RouterA and RouterB and default IKE policies are in use. Traffic is routed from Pagent A to Pagent B. Checking the system log on Peer A and Peer B confirms that the default IKE policies are in use on both peers (see the figure below).

Figure 1 Example Site to Site Topology



```
! Configuring RouterA.
RouterA(config)# crypto isakmp key identity address 209.165.200.226
RouterA(config)# crypto map testmap 10 ipsec-isakmp
% NOTE: This new crypto map will remain disabled until a peer
    and a valid access list have been configured.
RouterA(config-crypto-map)# set peer 209.165.200.226
RouterA(config-crypto-map)# match address 101
RouterA(config-crypto-map)# exit
RouterA(config)# ip route 209.165.200.225 255.255.255.224 209.165.200.226
RouterA(config)# access-list 101 permit ip host 209.165.200.227 host 209.165.200.225
RouterA(config)# end
RouterA(config)# interface Ethernet1/2
RouterA(config-if)# crypto map testmap
RouterA(config-if)# end
RouterA(config)# crypto ipsec transform test_transf esp-aes esp-sha-hmac
RouterA(cfg-crypto-trans)# mode tunnel
RouterA(cfg-crypto-trans)# end
RouterA(config)# crypto map testmap 10
RouterA(config-crypto-map)# set transform-set test_transf
RouterA(config-crypto-map)# end
! Configuring RouterB.
RouterB(config)# crypto isakmp key identity address 209.165.200.228
RouterB(config)# crypto dynamic-map dyn_testmap 10
RouterB(config-crypto-map)# crypto map testmap 10 ipsec-isakmp dynamic dyn_testmap
RouterB(config)# ip route 209.165.200.227 255.255.255.224 209.165.200.228
RouterB(config)# end
RouterB(config)# interface GigabitEthernet0/1
RouterB(config-if)# crypto map testmap
RouterB(config-if)# end
RouterB(config)# crypto ipsec transform test_transf esp-aes esp-sha-hmac
RouterB(cfg-crypto-trans)# mode tunnel
RouterB(cfg-crypto-trans)# end
RouterB(config)# crypto dynamic-map dyn_testmap 10
RouterB(config-crypto-map)# set transform-set test_transf
RouterB(config-crypto-map)# end
! Routing traffic from PagentA to PagentB.
PagentA(config)# ip route 209.165.200.225 255.255.255.224 209.165.200.229
PagentA(config)# end
! Routing traffic from PagentB to PagentA.
PagentB(config)# ip route 209.165.200.227 255.255.255.224 209.165.200.230
PagentB(config)# end
! Checking the system log on RouterA confirms that the default IKE policies are in use.
RouterA# show log | include %CRYPTO-6-IKMP_POLICY_DEFAULT*
Jun  5 09:17:59.251 PDT: %CRYPTO-6-IKMP_POLICY_DEFAULT: Using ISAKMP Default policies
! Checking the system log on RouterB confirms that the default IKE policies are in use.
RouterB# show log | include %CRYPTO-6-IKMP_POLICY_DEFAULT*
Jun  5 09:17:59.979 PDT: %CRYPTO-6-IKMP_POLICY_DEFAULT: Using ISAKMP Default policies
```

Default Transform Sets Example

In the following example, static crypto maps are configured on RouterA and dynamic crypto maps are configured on RouterB. Traffic is routed from Pagent A to Pagent B. The IPsec SAs negotiate with default transform sets and the traffic is encrypted. Executing the **show crypto map** command on both peers verifies that the default transform sets are in use (see Default Transform Sets Example, page 81).

```
! Configuring RouterA.
RouterA(config)# crypto isakmp key identify address 209.165.200.225
RouterA(config)# crypto map testmap 10 ipsec-isakmp
% NOTE: This new crypto map will remain disabled until a peer
    and a valid access list have been configured.
RouterA(config-crypto-map)# set peer 209.165.200.225
RouterA(config-crypto-map)# match address 101
RouterA(config-crypto-map)# exit
RouterA(config)# ip route 209.165.200.226 255.255.255.255 209.165.200.225
RouterA(config)# access-list 101 permit ip host 209.165.200.227 host 209.165.200.226
RouterA(config)# end
RouterA(config)# interface Ethernet1/2
RouterA(config-if)# crypto map testmap
RouterA(config-if)# end
RouterA(config)# crypto isakmp policy 10
RouterA(config-isakmp)# encryption aes
RouterA(config-isakmp)# authentication pre-share
RouterA(config-isakmp)# hash sha
RouterA(config-isakmp)# group 14
RouterA(config-isakmp)# end
! Configuring RouterB.
RouterB(config)# crypto isakmp key identity address 209.165.200.229
RouterB(config)# crypto dynamic-map dyn_testmap 10
RouterB(config-crypto-map)# crypto map testmap 10 ipsec-isakmp dynamic dyn_testmap
RouterB(config)# ip route 209.165.200.227 255.255.255.255 209.165.200.229
RouterB(config)# end
RouterB(config)# interface GigabitEthernet0/1
RouterB(config-if)# crypto map testmap
RouterB(config-if)# end
RouterB(config)# crypto isakmp policy 10
RouterB(config-isakmp)# encryption aes
RouterB(config-isakmp)# authentication pre-share
RouterB(config-isakmp)# hash sha
RouterB(config-isakmp)# group 14
RouterB(config-isakmp)# end
! The SA is using the default transform set and traffic is encrypted on RouterA.
RouterA# show crypto isakmp sa detail | include 209.165.200.229.*209.165.200.225.*ACTIVE
13007  209.165.200.229     209.165.200.225     ACTIVE aes  sha  psk  14  23:59:56
13006  209.165.200.229     209.165.200.225     ACTIVE aes  sha  psk  14  0
13005  209.165.200.229     209.165.200.225     ACTIVE aes  sha  psk  14  0
! The SA is using the default transform set and traffic is encrypted on RouterB.
RouterB# show crypto isakmp sa detail | include 209.165.200.225.*209.165.200.229.*ACTIVE
```

```
7007  209.165.200.225      209.165.200.229      ACTIVE aes  sha  psk  14  23:59:55
7006  209.165.200.225      209.165.200.229      ACTIVE aes  sha  psk  14  0
7005  209.165.200.225      209.165.200.229      ACTIVE aes  sha  psk  14  0
! Verifying that the default transform sets are in use on RouterA.
RouterA# show crypto map
Crypto Map "testmap" 10 ipsec-isakmp
    Peer = 209.165.200.225
    Extended IP access list 101
        access-list 101 permit ip host 209.165.200.227 host 209.165.200.226
    Current peer: 209.165.200.225
    Security association lifetime: 4608000 kilobytes/3600 seconds
    PFS (Y/N): N
    Transform sets={
        #$!default_transform_set_1:  { esp-aes esp-sha-hmac  } ,
        #$!default_transform_set_0:  { esp-3des esp-sha-hmac  } ,
    }
    Interfaces using crypto map testmap:
        Ethernet1/2
! Verifying that the default transform sets are in use on RouterB.
RouterB# show crypto map
Crypto Map "testmap" 10 ipsec-isakmp
    Dynamic map template tag: dyn_testmap
Crypto Map "testmap" 65536 ipsec-isakmp
    Peer = 209.165.200.229
    Extended IP access list
        access-list permit ip host 209.165.200.226 host 209.165.200.227
        dynamic (created from dynamic map dyn_testmap/10)
    Current peer: 209.165.200.229
    Security association lifetime: 4608000 kilobytes/3600 seconds
    PFS (Y/N): N
    Transform sets={
        #$!default_transform_set_1:  { esp-aes esp-sha-hmac  } ,
    }
    Interfaces using crypto map testmap:
        GigabitEthernet0/1
```

Additional References

Related Documents

Related Topic	Document Title
IKE configuration	Configuring Internet Key Exchange for IPsec VPNs
IPsec configuration	Configuring Security for VPNs with IPsec
EzVPN server	Easy VPN Server
Cisco IOS security commands	*Cisco IOS Security Command Reference*
Recommended cryptographic algorithms	*Next Generation Encryption*

MIBs

MIB	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 Usability Enhancements

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 10 Feature Information for IPsec Usability Enhancements

Feature Name	Releases	Feature Information
IPsec Usability Enhancements	12.4(20)T Cisco IOS XE Release 2.4	The IPsec Usability Enhancements feature introduces functionality that eases the configuration and monitoring of your IPsec virtual private network (VPN). Benefits of this feature include intelligent defaults for IPsec and Internet Key Exchange (IKE) and the ability to easily verify and troubleshoot IPsec VPNs. In Cisco IOS Release XE 2.4, this feature was implemented on the Cisco ASR 1000 series routers. The following commands were introduced or modified: **crypto ipsec default transform-set**, **crypto isakmp default policy**, **crypto isakmp policy**, **show crypto ipsec default transform-set**, **show crypto ipsec transform-set**, **show crypto isakmp default policy**, **show crypto isakmp policy**, **show crypto map (IPsec)**, **show crypto mib ipsec flowmib endpoint**, **show crypto mib ipsec flowmib failure**, **show crypto mib ipsec flowmib global**, **show crypto mib ipsec flowmib history**, **show crypto mib ipsec flowmib spi**, **show crypto mib ipsec flowmib tunnel**, **show crypto mib isakmp flowmib failure**, **show crypto mib isakmp flowmib global**, **show crypto mib isakmp flowmib history**, **show crypto mib isakmp flowmib peer**, **show crypto mib isakmp flowmib tunnel**, **show tech-support ipsec**.

Glossary

peer--In the context of this module, a router or other device that participates in IPsec.

SA --security association. Description of how two or more entities use security services in the context of a particular security protocol (AH or ESP) to communicate securely on behalf of a particular data flow. The transform and the shared secret keys are used for protecting the traffic.

transform --List of operations performed on a dataflow to provide data authentication, data confidentiality, and data compression. For example, one transform is the ESP protocol with the HMAC-MD5 authentication algorithm; another transform is the AH protocol with the 56-bit DES encryption algorithm and the ESP protocol with the HMAC-SHA authentication algorithm.

tunnel --In the context of this module, a secure communication path between two peers, such as two routers. It does not refer to using IPsec in tunnel mode.

Any Internet Protocol (IP) addresses and phone numbers used in this document are not intended to be actual addresses and phone numbers. Any examples, command display output, network topology diagrams, and other figures included in the document are shown for illustrative purposes only. Any use of actual IP addresses or phone numbers in illustrative content is unintentional and coincidental.

VPN Device Manager Client for Cisco IOS Software XSM Configuration

This document describes the command-line interface (CLI) Cisco IOS commands required to activate the VPN Device Manager (VDM) client and includes the following sections:

Note For the primary documentation of the latest version of the VPN Device Manager (version 1.2), see the "Installation Guide and Release Notes for VPN Device Manager 1.2" at http://www.cisco.com/univercd/cc/td/doc/product/rtrmgmt/vdm/vdm12rn.htm .

Feature Overview

VDM software is installed directly onto Cisco VPN devices. It allows network administrators to use a web browser to manage and configure site-to-site VPNs on a single device. VDM implements a wizard-based GUI that allows simplified VPN configuration of the device on which it resides and peer-to-peer interfaces from that device to remote devices. VDM requires configuration of some Cisco IOS commands before it can be fully operational.

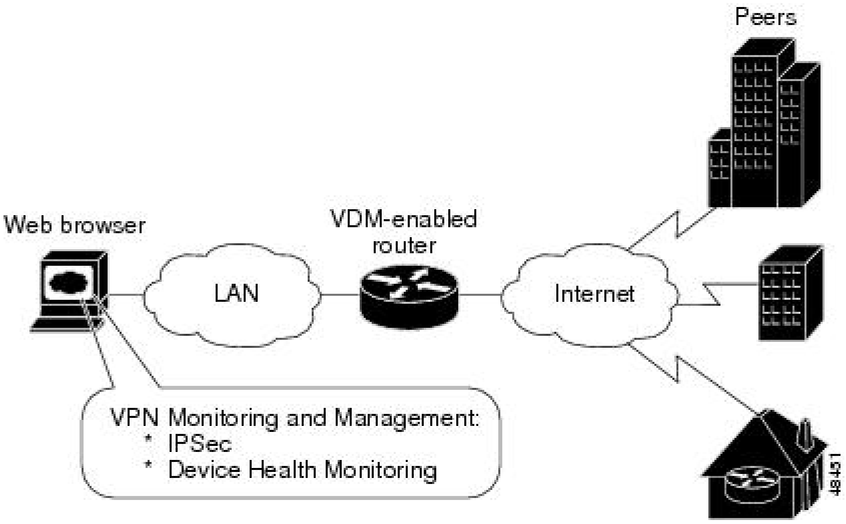
Note In addition to having the relevant Cisco IOS image installed on your device, make sure the VDM client software has been preinstalled in the device Flash memory. If it has not been, you must download it from Cisco.com. See the Installation and Release Notes for VPN Device Manager for the product version you are using for details on completing this task. See the *Cisco VPN Device Manager* index (http://www.cisco.com/warp/public/cc/pd/nemnsw/vpdvmn) for further information.

VDM also monitors general system statistics and VPN-specific information such as tunnel throughput and errors. The graphing capability allows comparison of such parameters as traffic volume, tunnel counts, and system utilization. VDM supports site-to-site VPNs. Its step-by-step wizards simplify the configuration of common VPN setups, interfaces, and policies, including:

- IPSec tunnels
- Preshared keys and Internet Key Exchange (IKE) policies

The figure below shows a simplified VDM deployment within a VPN.

Figure 2 Simplified VDM Deployment



- XML Subscription Manager, page 88
- CLI Commands for VDM, page 88
- Related Features and Technologies, page 89
- Related Documents, page 89

XML Subscription Manager

XML Subscription Manager (XSM) is an HTTP-based service for retrieving information from a Cisco device. Once remote applications (such as VDM) are connected to the XSM server, they can subscribe to data sets called XML Request Descriptors (XRDs). These are XML-formatted messages describing configuration (access-control lists (ACLs), interfaces, crypto-maps, and others) and monitoring information (CPU, memory usage, interface statistics, and others).

XSM provides remote applications such as VDM with a constantly updated stream of data about Cisco device status by supplying real-time data without repeated device polling.

CLI Commands for VDM

This document gives details about Cisco IOS commands specific to VDM functionality. These commands are not related to general VPN functions but are designed to manage VDM itself via the XSM server. By using the Java-enabled VDM application, you can perform all VPN-related configuration and monitoring tasks within the application.

These commands are designed to complement VDM. The following tasks are performed by specific Cisco IOS XSM commands (command name in parentheses):

- Enabling VDM to receive data from the XSM feature set on the device (**xsm**)
- Enabling basic device monitoring, configuration, and data delivery for VDM (**xsm edm**)
- Enabling VPN-specific monitoring, configuration, and data delivery for VDM (**xsm vdm**)
- Enabling access to switch operations (for example, configuring switch ports and VLANs) when running VDM on a switch (**xsm dvdm**)
- Enabling collection of selected statistics generic to embedded devices on the XSM server (**xsm history edm**)
- Enabling collection of specific selected VPN statistics on the XSM server (**xsm history vdm**)
- Clearing VDM client sessions (**clear xsm**)
- Displaying information about the XSM server and VDM (**show xsm status**)
- Displaying all XRDs available to VDM (**show xsm xrd-list**)
- Setting user privilege levels for viewing VDM monitoring and configuration data (**xsm privilege monitor level** and **xsm privilege configuration level**)

For more information on VDM, the Installation and Release Notes for VPN Device Manager for the product version you are using. See the *Cisco VPN Device Manager* index (http://www.cisco.com/warp/public/cc/pd/nemnsw/vpdvmn) for further information.

Related Features and Technologies

- Virtual Private Networks (VPNs)
- Security

Related Documents

- Access VPN Solutions Using Tunneling Technology
- *Access VPDN Dial-in Using L2TP*
- Access VPDN Dial-in Using IPSec Over L2TP
- Cisco IOS Dial Technologies Command Reference
- Cisco IOS Security Command Reference
- Configuring Virtual Private Networks " chapter in the "Virtual Templates, Profiles, and Networks" part of the *Cisco IOS Dial Technologies Configuration Guide*
- Installation and Release Notes for VPN Device Manager
- VDM chapter in the *Cisco Enterprise VPN Configuration Guide*
- Cisco VPN Device Manager
- IPsec VPN Acceleration Services Module Installation and Configuration Note

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see Bug Search Tool and 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 module.

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.

Supported Standards MIBs and RFCs

Standards

No new or modified standards are supported by this feature.

MIBs

No new or modified MIBs are supported by this feature.

To obtain lists of supported MIBs by platform and Cisco IOS release, and to download MIB modules, go to the Cisco MIB website on Cisco.com at the following URL:

http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml

RFCs

No new or modified RFCs are supported by this feature.

Prerequisites

The VDM client software must be installed on your device. It might already have been installed if you chose the VPN option at the time of configuration.

Configuring VDM

See the following sections for configuration tasks for this feature. Each task in the list is identified as either required or optional.

- Enabling the XSM Server for VDM, page 90
- Configuring XSM Privilege Levels for XRDs, page 91
- Disabling the XSM Server for VDM, page 91
- Verifying VDM Status on the XSM Server, page 91
- Clearing XSM Client Sessions, page 92
- Configuring XSM Statistics Collection, page 92

Enabling the XSM Server for VDM

Use the **xsm** command in global configuration mode to activate XSM clients (such as VDM) on your device. Enabling this command also enables the **xsm vdm** and **xsm edm** global configuration commands, so there is no need to enable them separately.

Command	Purpose
`Router(config)#` **xsm**	Enables XSM client access to the device.

Configuring XSM Privilege Levels for XRDs

To set the minimum required privilege levels and grant appropriate access to view, monitor, or configure the XSM client (such as VDM), use the following commands in global configuration mode. Privilege levels set on the device determine which access level users possess (configuration and monitoring, monitoring only, or neither).

Users with privilege levels lower than the required monitoring privilege level will not have access to either the configuration or monitoring data required for subscription to XML Request Descriptors (XRDs). The higher the number, the higher the privilege level. The privilege level for the **xsm privilege configuration level**command must be greater than or equal to that of the **xsm privilege monitor level**command.

Command	Purpose
`Router(config)#` **xsm privilege configuration level** *number*	Enables configuration privilege level to subscribe to XRDs. • *number* --Privilege level (1-15). Privilege level 15 is the default.
`Router(config)#` **xsm privilege monitor level** *number*	Enables monitor privilege level to subscribe to XRDs. • *number* --Privilege level (1-15). Privilege level 15 is the default.

Disabling the XSM Server for VDM

To disable the XSM server, use the command below in global configuration mode. Disabling this command also disables the **xsm vdm** and **xsm edm** global configuration commands.

Command	Purpose
`Router(config)#` **no xsm**	Disables XSM server.

Verifying VDM Status on the XSM Server

Use the **show xsm status**command to verify the status of clients (such as VDM) on the XSM server.

Command	Purpose
`Router#` **show xsm status**	Displays information and status about clients subscribed to the XSM server.

Use the **show xsm xrd-list** command to verify all XML Request Descriptors (XRDs) for XSM clients (such as VDM) made available by subscription to the XSM server.

Command	Purpose
`Router#` **show xsm xrd-list**	Displays all XRDs for clients subscribed to the XSM server.

Clearing XSM Client Sessions

Use the **clear xsm** command to clear data from XSM clients (such as VDM) on the XSM server. To disconnect a specific client, you must identify the session number. Use the **show xsm status** command to obtain specific session numbers.

Command	Purpose
`Router#` **clear xsm** `[`**session** `number]`	Clears XSM client sessions. • **session** --XSM session ID. • *number* --Number of the specific XSM client session you are clearing.

Configuring XSM Statistics Collection

To configure the XSM server and its related clients (such as VDM) for Embedded Device Manager (EDM) or VPN-specific statistics collection of up to 5 days of data, use the following commands in global configuration mode.

Command	Purpose
`Router(config)#` **xsm history edm**	Enables statistics collection for the EDM on the XSM server.
`Router(config)#` **xsm history vdm**	Enables specific VPN statistics collection on the XSM server.

Configuration Examples for VDM

Enabling the XSM Server for VDM Example

The following example shows how to enable the XSM client on the device:

```
xsm
```

Configuring XSM Privilege Levels for XRDs Example

The following example shows how to set a privilege level of 11, for subscription to XRDs:

```
xsm privilege monitor level 11
```

Disabling the XSM Server for VDM Example

The following example shows how to enable and then disable the XSM client on the device to troubleshoot VDM:

```
no xsm
xsm
```

Configuring XSM Statistics Collection Example

The following example shows how to configure the XSM server and its related clients (such as VDM) for Embedded Device Manager (EDM) or VPN-specific statistics collection of up to 5 days of data:

```
xsm history edm

xsm history vdm
```

Feature Information for VPN Device Manager Client

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 11 Feature Information for VPN Device Manager Client

Feature Name	Releases	Feature Information
VPN Device Manager Client	12.1(6)E 12.2(9)YE, 12.2(9)YO1, 12.2(13)T, 12.2(14)S	VDM software is installed directly onto Cisco VPN devices. The following commands were introduced or modified: • **clear xsm** • **crypto mib topn** • **show xsm status** • **show xsm xrd-list** • **xsm** • **xsm dvdm** • **xsm edm** • **xsm history edm** • **xsm history vdm** • **xsm privilege configuration level** • **xsm privilege monitor level** • **xsm vdm** .

Glossary

Internet Key Exchange (IKE) --A key management protocol standard used in conjunction with IPSec and other standards. IPSec can be configured without IKE, but IKE enhances IPSec by providing additional features, flexibility, and ease of configuration for the IPSec standard. IKE authenticates the IPSec peers, negotiates IPSec keys, and negotiates IPSec security associations. Before any IPSec traffic can be passed, each router/firewall/host must be able to verify the identity of its peer. This can be done by manually entering preshared keys into both hosts or by a CA service.

IP security (IPSec) --A framework of open standards that provides data confidentiality, data integrity, and data authentication between participating peers. IPSec provides these security services at the IP layer.

Virtual Private Network (VPN) --A virtual network that uses advanced encryption and tunneling to permit organizations to establish secure, end-to-end, private network connections over public IP infrastructure networks, such as the Internet or extranets.

VPN Device Manager (VDM) --A browser-based tool for configuring and monitoring VPNs on a VPN-enabled device. VDM allows users to configure and monitor advanced VPN functionality within Cisco devices.

XML Subscription Manager (XSM) -- A Cisco IOS subsystem that allows embedded device managers such as VDM to receive XML-based configuration and monitoring information for managing network devices.

XML Request Descriptor (XRD) --A specific requested type of data from XSM.

Embedded Device Manager (EDM) --An XSM adapter that publishes general network device configuration and monitoring information for device managers such as VDM.

Any Internet Protocol (IP) addresses and phone numbers used in this document are not intended to be actual addresses and phone numbers. Any examples, command display output, network topology diagrams, and other figures included in the document are shown for illustrative purposes only. Any use of actual IP addresses or phone numbers in illustrative content is unintentional and coincidental.