

IP Security Troubleshooting – Understanding and Using debug Commands

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Introduction

This document provides an explanation of common **debug** commands that are used to troubleshoot IPsec issues on both the Cisco IOS® Software and PIX. It is assumed that an attempt to configure IPsec is completed. Refer to Common IPsec Error Messages and Common IPsec Issues for more details.

Prerequisites

Requirements

There are no specific requirements for this document.

Components Used

The information in this document is based on these software and hardware versions:

- **Cisco IOS Software**
 - ◆ IPsec feature set.
 - ◆ 56i – Indicates single Data Encryption Standard (DES) feature (on Cisco IOS Software Release 11.2 and later).
 - ◆ k2 – Indicates triple DES feature (on Cisco IOS Software Release 12.0 and later). Triple DES is available on the Cisco 2600 series and later.
- **PIX** – V5.0 and later. It needs a single or triple DES license key in order to activate.

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, make sure that you understand the potential impact of any command.

Conventions

Refer to Cisco Technical Tips Conventions for more information on document conventions.

Cisco IOS Software Debugs

These sections explain the Cisco IOS Software debugs. Refer to Common IPsec Error Messages and Common IPsec Issues for more details.

show crypto isakmp sa

This command shows the Internet Security Association Management Protocol (ISAKMP) security associations (SAs) built between peers.

dst	src	state	conn-id	slot
12.1.1.2	12.1.1.1	QM_IDLE	1	0

show crypto ipsec sa

This command shows IPsec SAs built between peers. The encrypted tunnel is built between 12.1.1.1 and 12.1.1.2 for traffic that goes between networks 20.1.1.0 and 10.1.1.0. You can see the two Encapsulating

Security Payload (ESP) SAs built inbound and outbound. Authentication Header (AH) is not used since there are no AH SAs.

This output shows an example of the **show crypto ipsec sa** command.

```
interface: FastEthernet0
  Crypto map tag: test, local addr. 12.1.1.1
  local ident (addr/mask/prot/port): (20.1.1.0/255.255.255.0/0/0)
  remote ident (addr/mask/prot/port): (10.1.1.0/255.255.255.0/0/0)
  current_peer: 12.1.1.2
    PERMIT, flags={origin_is_acl,}
    #pkts encaps: 7767918, #pkts encrypt: 7767918, #pkts digest 7767918
    #pkts decaps: 7760382, #pkts decrypt: 7760382, #pkts verify 7760382
    #pkts compressed: 0, #pkts decompressed: 0
    #pkts not compressed: 0, #pkts compr. failed: 0,
    #pkts decompress failed: 0, #send errors 1, #recv errors 0
    local crypto endpt.: 12.1.1.1, remote crypto endpt.: 12.1.1.2
    path mtu 1500, media mtu 1500
    current outbound spi: 3D3
  inbound esp sas:
    spi: 0x136A010F(325714191)
      transform: esp-3des esp-md5-hmac ,
      in use settings ={Tunnel, }
      slot: 0, conn id: 3442, flow_id: 1443, crypto map: test
      sa timing: remaining key lifetime (k/sec): (4608000/52)
      IV size: 8 bytes
      replay detection support: Y
  inbound ah sas:
  inbound pcp sas:
  inbound pcp sas:
  outbound esp sas:
    spi: 0x3D3(979)
      transform: esp-3des esp-md5-hmac ,
      in use settings ={Tunnel, }
      slot: 0, conn id: 3443, flow_id: 1444, crypto map: test
      sa timing: remaining key lifetime (k/sec): (4608000/52)
      IV size: 8 bytes
      replay detection support: Y
  outbound ah sas:
  outbound pcp sas:
```

show crypto engine connection active

This command shows each Phase 2 SA built and the amount of traffic sent. Since Phase 2 SAs are unidirectional, each SA shows traffic in only one direction (encryptions are outbound, decryptions are inbound).

debug crypto isakmp

This output shows an example of the **debug crypto isakmp** command.

```
processing SA payload. message ID = 0
Checking ISAKMP transform against priority 1 policy
  encryption DES-CBC
  hash SHA
  default group 2
  auth pre-share
  life type in seconds
  life duration (basic) of 240
atts are acceptable. Next payload is 0
```

```

processing KE payload. message ID = 0
processing NONCE payload. message ID = 0
processing ID payload. message ID = 0
SKEYID state generated
processing HASH payload. message ID = 0
SA has been authenticated
processing SA payload. message ID = 800032287

```

debug crypto ipsec

This command shows the source and destination of IPsec tunnel endpoints. Src_proxy and dest_proxy are the client subnets. Two "sa created" messages appear with one in each direction. (Four messages appear if you perform ESP and AH.)

This output shows an example of the **debug crypto ipsec** command.

```

Checking IPSec proposal ltransform 1, ESP_DES
attributes in transform:
    encaps is 1
    SA life type in seconds
    SA life duration (basic) of 3600
    SA life type in kilobytes
    SA life duration (VPI) of 0x0 0x46 0x50 0x0
HMAC algorithm is SHA
atts are acceptable.
Invalid attribute combinations between peers will show up as "atts
not acceptable".
IPSEC(validate_proposal_request): proposal part #2,
(key eng. msg.) dest= 12.1.1.2, SRC= 12.1.1.1,
    dest_proxy= 10.1.1.0/0.0.0.0/0/0,
    src_proxy= 20.1.1.0/0.0.0.16/0/0,
    protocol= ESP, transform= esp-des esp-sha-hmac
    lifedur= 0s and 0kb,
    spi= 0x0(0), conn_id= 0, keysize= 0, flags= 0x4
IPSEC(key_engine): got a queue event...
IPSEC(spi_response): getting spi 203563166 for SA
    from 12.1.1.2 to 12.1.1.1 for prot 2
IPSEC(spi_response): getting spi 194838793 for SA
    from 12.1.1.2 to 12.1.1.1 for prot 3
IPSEC(key_engine): got a queue event...
IPSEC(initialize_sas): ,
    (key eng. msg.) dest= 12.1.1.2, SRC= 12.1.1.1,
    dest_proxy= 10.1.1.0/255.255.255.0/0/0,
    src_proxy= 20.1.1.0/255.255.255.0/0/0,
    protocol= ESP, transform= esp-des esp-sha-hmac
    lifedur= 3600s and 4608000kb,
    spi= 0xC22209E(203563166), conn_id= 3,
    keysize=0, flags= 0x4
IPSEC(initialize_sas): ,
    (key eng. msg.) SRC= 12.1.1.2, dest= 12.1.1.1,
    src_proxy= 10.1.1.0/255.255.255.0/0/0,
    dest_proxy= 20.1.1.0/255.255.255.0/0/0,
    protocol= ESP, transform= esp-des esp-sha-hmac
    lifedur= 3600s and 4608000kb,
    spi= 0xDEDOAB4(233638580), conn_id= 6,
    keysize= 0, flags= 0x4
IPSEC(create_sa): sa created,
    (sa) sa_dest= 12.1.1.2, sa_prot= 50,
    sa_spi= 0xB9D0109(194838793),
    sa_trans= esp-des esp-sha-hmac , sa_conn_id= 5
IPSEC(create_sa): sa created,
    (sa) sa_dest= 12.1.1.2, sa_prot= 50,

```

```
sa_spi= 0xDE0AB4(233638580),  
sa_trans= esp-des esp-sha-hmac , sa_conn_id= 6
```

Sample Error Messages

These sample error messages were generated from the **debug** commands listed here.

- **debug crypto ipsec**
- **debug crypto isakmp**
- **debug crypt engine**

Refer to the Error Message Decoder (registered customers only) tool for more information.

Replay Check Failed

This output shows an example of the 'Replay Check Failed' error:

```
"%CRYPTO-4-PKT_REPLAY_ERR: decrypt: replay check failed connection id=#."
```

This error is a result of reordering in transmission medium (especially if parallel paths exist), or unequal paths of packet processing inside Cisco IOS for large versus small packets plus under load. Change the transform-set to reflect this. The reply check is only seen when transform-set esp-md5-hmac is enabled. In order to suppress this error message, disable esp-md5-hmac and do encryption only. Refer to Cisco bug ID CSCdp19680 (registered customers only) .

Invalid Local Address

This output is an example of the error message.

```
IPSEC(validate_proposal): invalid local address 12.2.6.2  
ISAKMP (0:3): atts not acceptable. Next payload is 0  
ISAKMP (0:3): SA not acceptable!
```

This error message is attributed to one of these two common problems.

- The **crypto map map-name local-address interface-id** command causes the router to use an incorrect address as the identity because it forces the router to use a specified address.
- Crypto map is applied to the wrong interface or is not applied at all. Check the configuration in order to ensure that crypto map is applied to the correct interface.

IKE Message From X.X.X.X Failed Its Sanity Check or Is Malformed

This **debug** error appears if the pre-shared keys on the peers do not match. In order to fix this issue, check the pre-shared keys on both sides.

```
1d00H:%CRPTO-4-IKMP_BAD_MESSAGE: IKE message from 150.150.150.1 failed its  
sanity check or is malformed
```

Processing of Main Mode Failed With Peer

This is an example of the Main Mode error message. The failure of Main Mode suggests that the Phase I policy does not match on both sides.

```

1d00h: ISAKMP (0:1): atts are not acceptable. Next payload is 0
1d00h: ISAKMP (0:1); no offers accepted!
1d00h: ISAKMP (0:1): SA not acceptable!
1d00h: %CRYPTO-6-IKMP_MODE_FAILURE: Processing of Main Mode failed with
peer at 150.150.150.1

```

A **show crypto isakmp sa** command shows the ISAKMP SA to be in MM_NO_STATE. This also means that main mode has failed.

dst	src	state	conn-id	slot
10.1.1.2	10.1.1.1	MM_NO_STATE	1	0

Verify that the Phase I policy is on both peers and ensure that all the attributes match.

```

Encryption DES or 3DES
Hash MD5 or SHA
Diffie-Hellman Group 1 or 2
Authentication {rsa-sig | rsa-encr | pre-share

```

Proxy Identities Not Supported

This message appears in debugs if the access list for IPsec traffic does not match.

```

1d00h: IPSec(validate_transform_proposal): proxy identities not supported
1d00h: ISAKMP: IPSec policy invalidated proposal
1d00h: ISAKMP (0:2): SA not acceptable!

```

The access lists on each peer needs to mirror each other (all entries need to be reversible). This example illustrates this point.

```

Peer A
access-list 150 permit ip 172.21.113.0 0.0.0.255 172.21.114.0 0.0.0.255
access-list 150 permit ip host 15.15.15.1 host 172.21.114.123
Peer B
access-list 150 permit ip 172.21.114.0 0.0.0.255 172.21.113.0 0.0.0.255
access-list 150 permit ip host 172.21.114.123 host 15.15.15.1

```

Transform Proposal Not Supported

This message appears if the Phase II (IPsec) does not match on both sides. This most commonly occurs if there is a mismatch or an incompatibility in the transform set.

```

1d00h: IPSec (validate_proposal): transform proposal
(port 3, trans 2, hmac_alg 2) not supported
1d00h: ISAKMP (0:2) : atts not acceptable. Next payload is 0
1d00h: ISAKMP (0:2) SA not acceptable

```

Verify that the transform set matches on both sides:

```

crypto ipsec transform-set transform-set-name transform1
[transform2 [transform3]]
? ah-md5-hmac
? ah-sha-hmac
? esp-des
? esp-des and esp-md5-hmac
? esp-des and esp-sha-hmac
? esp-3des and esp-md5-hmac
? esp-3des and esp-sha-hmac

```

? comp-lzs

No Cert and No Keys With Remote Peer

This message indicates that the peer address configured on the router is wrong or has changed. Verify that the peer address is correct and that the address can be reached.

```
1d00h: ISAKMP: No cert, and no keys (public or pre-shared) with
remote peer 150.150.150.2
```

Peer Address X.X.X.X Not Found

This error message normally appears with the corresponding VPN 3000 Concentrator error message Message: No proposal chosen(14). This is a result of the connections being host-to-host. The router configuration has the IPsec proposals in an order where the proposal chosen for the router matches the access list, but not the peer. The access list has a larger network that includes the host that intersects traffic. In order to correct this, make the router proposal for this concentrator-to-router connection first in line. This allows it to match the specific host first.

```
20:44:44: IPSEC(validate_proposal_request): proposal part #1,
(key eng. msg.) dest= 194.70.240.150, src= 198.174.236.6,
dest_proxy= 10.0.0.76/255.255.255.255/0/0 (type=1),
src_proxy= 198.174.238.203/255.255.255.255/0/0 (type=1),
protocol= ESP, transform= esp-3des esp-md5-hmac ,
lifedur= 0s and 0kb,
spi= 0x0(0), conn_id= 0, keysize= 0, flags= 0x4
20:44:44: IPSEC(validate_transform_proposal):
peer address 198.174.236.6 not found
```

IPsec Packet has Invalid SPI

This output is an example of the error message:

```
%PIX-4-402101: decaps: recd IPSEC packet has
invalid spi for destaddr=dest_address, prot=protocol, spi=number
```

The received IPsec packet specifies a Security Parameters Index (SPI) that does not exist in the security associations database (SADB). This could be a temporary condition due to:

- Slight differences in the aging of security associations (SAs) between the IPsec peers
- The local SAs have been cleared
- Incorrect packets sent by the IPsec peer

This might also be an attack.

Recommended Action: The peer might not acknowledge that the local SAs have been cleared. If a new connection is established from the local router, the two peers can then reestablish successfully. Otherwise, if the problem occurs for more than a brief period, either attempt to establish a new connection or contact the peer's administrator.

IPSEC(initialize_sas): Invalid Proxy IDs

The error 21:57:57: IPSEC(initialize_sas): invalid proxy IDs indicates that the received proxy identity does not match the configured proxy identity as per the access list. In order to ensure

that they both match, check the output from the **debug** command.

In the **debug** command output of the proposal request, the corresponding access-list 103 permit ip 10.1.1.0 0.0.0.255 20.1.1.0 0.0.0.255 does not match. The access list is network-specific on one end and host-specific on the other.

```
21:57:57: IPSEC(validate_proposal_request): proposal part #1,
(key eng. msg.) dest= 192.1.1.1, src= 192.1.1.2,
dest_proxy= 10.1.1.1/255.255.255.0/0/0 (type=4),
src_proxy= 20.1.1.1/255.255.255.0/0/0 (type=4)
```

Reserved Not Zero on Payload 5

This means that the ISAKMP keys do not match. Rekey/reset in order to ensure accuracy.

Hash Algorithm Offered does not Match Policy

If the configured ISAKMP policies do not match the proposed policy by the remote peer, the router tries the default policy of 65535. If that does not match either, it fails ISAKMP negotiation. A user receives either the Hash algorithm offered does not match policy! or Encryption algorithm offered does not match policy! error message on the routers.

```
=RouterA=
3d01h: ISAKMP (0:1): processing SA payload. message ID = 0
3d01h: ISAKMP (0:1): found peer pre-shared key matching 209.165.200.227
ISAKMP (0:1): Checking ISAKMP transform 1 against priority 1 policy
ISAKMP:      encryption 3DES-CBC
ISAKMP:      hash MD5
ISAKMP:      default group 1
ISAKMP:      auth pre-share
ISAKMP:      life type in seconds
ISAKMP:      life duration (VPI) of 0x0 0x1 0x51 0x80
ISAKMP (0:1): Hash algorithm offered does not match policy!
ISAKMP (0:1): atts are not acceptable. Next payload is 0
=RouterB=
ISAKMP (0:1): Checking ISAKMP transform 1 against priority 65535 policy
ISAKMP:      encryption 3DES-CBC
ISAKMP:      hash MD5
ISAKMP:      default group 1
ISAKMP:      auth pre-share
ISAKMP:      life type in seconds
ISAKMP:      life duration (VPI) of 0x0 0x1 0x51 0x80
ISAKMP (0:1): Encryption algorithm offered does not match policy!
ISAKMP (0:1): atts are not acceptable. Next payload is 0
ISAKMP (0:1): no offers accepted!
ISAKMP (0:1): phase 1 SA not acceptable!
```

HMAC Verification Failed

This error message is reported when there is a failure in the verification of the Hash-based Message Authentication Code (HMAC) on the IPsec packet. This usually happens when the packet is corrupted in any way.

```
Sep 22 11:02:39 131.203.252.166 2435:
Sep 22 11:02:39: %MOTCR-1-ERROR: motcr_crypto_callback() motcr return failure
Sep 22 11:02:39 131.203.252.166 2436:
Sep 22 11:02:39: %MOTCR-1-PKTENGRET_ERROR: MOTCR PktEng Return Value = 0x20000,
PktEngReturn_MACMiscompare
```


If you occasionally encounter this error message you can ignore it. However if this becomes more frequent, then you need to investigate what is actually corrupting the packet. This can be due to a defect in the crypto accelerator.

Remote Peer Not Responding

This error message is encountered when there is a Transform Set mismatch. Ensure that matching Transform Sets are configured on both peers.

PIX Debugs

show crypto isakmp sa

This command shows the ISAKMP SA built between peers.

dst	src	state	conn-id	slot
12.1.1.2	12.1.1.1	QM_IDLE	1	0

In the **show crypto isakmp sa** output, the state should always be QM_IDLE. If the state is MM_KEY_EXCH, it means either the configured pre-shared key is not correct or the peer IP addresses are different.

```
PIX(config)#show crypto isakmp sa
Total      : 2
Embryonic  : 1
           dst      src      state      pending      created
192.168.254.250  10.177.243.187  MM_KEY_EXCH  0              0
```

You can rectify this when you configure the correct IP address or pre-shared key.

show crypto ipsec sa

This command shows IPsec SAs built between peers. An encrypted tunnel is built between 12.1.1.1 and 12.1.1.2 for traffic that goes between networks 20.1.1.0 and 10.1.1.0. You can see the two ESP SAs built inbound and outbound. AH is not used since there are no AH SAs.

An example of the **show crypto ipsec sa** command is shown in this output.

```
interface: outside
  Crypto map tag: vpn, local addr. 12.1.1.1
  local  ident (addr/mask/prot/port): (20.1.1.0/255.255.255.0/0/0)
  remote ident (addr/mask/prot/port): (12.1.1.2/255.255.255.255/0/0)
  current_peer: 10.2.1.1
  dynamic allocated peer ip: 12.1.1.2
    PERMIT, flags={}
    #pkts encaps: 345, #pkts encrypt: 345, #pkts digest 0
    #pkts decaps: 366, #pkts decrypt: 366, #pkts verify 0
    #pkts compressed: 0, #pkts decompressed: 0
    #pkts not compressed: 0, #pkts compr. failed: 0,
    #pkts decompress failed: 0, #send errors 0, #recv errors 0
    local crypto endpt.: 12.1.1.1, remote crypto endpt.: 12.1.1.2
    path mtu 1500, ipsec overhead 56, media mtu 1500
    current outbound spi: 9a46ecae
    inbound esp sas:
      spi: 0x50b98b5(84646069)
        transform: esp-3des esp-md5-hmac ,
        in use settings ={Tunnel, }
```

```

    slot: 0, conn id: 1, crypto map: vpn
    sa timing: remaining key lifetime (k/sec): (460800/21)
    IV size: 8 bytes
    replay detection support: Y
inbound ah sas:

inbound pcp sas:

outbound esp sas:
    spi: 0x9a46ecae(2588339374)
    transform: esp-3des esp-md5-hmac ,
    in use settings ={Tunnel, }
    slot: 0, conn id: 2, crypto map: vpn
    sa timing: remaining key lifetime (k/sec): (460800/21)
    IV size: 8 bytes
    replay detection support: Y
outbound ah sas:

```

debug crypto isakmp

This command displays debug information about IPsec connections and shows the first set of attributes that are denied because of incompatibilities on both ends. The second attempt to match (to try 3DES instead of DES and the Secure Hash Algorithm [SHA]) is acceptable, and the ISAKMP SA is built. This debug is also from a dial-up client which accepts an IP address (10.32.8.1) out of a local pool. Once the ISAKMP SA is built, the IPsec attributes are negotiated and are found acceptable. The PIX then sets up the IPsec SAs as seen here.

This output shows an example of the **debug crypto isakmp** command.

```

crypto_isakmp_process_block: src 12.1.1.1, dest 12.1.1.2
OAK_AG exchange
ISAKMP (0): processing SA payload. message ID = 0
ISAKMP (0): Checking ISAKMP transform 1 against priority 1 policy
ISAKMP:      encryption DES-CBC
ISAKMP:      hash MD5
ISAKMP:      default group 1
ISAKMP:      auth pre-share
ISAKMP (0): atts are not acceptable. Next payload is 3
ISAKMP (0): Checking ISAKMP transform 3 against priority 1 policy
ISAKMP:      encryption 3DES-CBC
ISAKMP:      hash SHA
ISAKMP:      default group 1
ISAKMP:      auth pre-share
ISAKMP (0): atts are acceptable. Next payload is 3
ISAKMP (0): processing KE payload. message ID = 0
ISAKMP: Created a peer node for 12.1.1.2
OAK_QM exchange
ISAKMP (0:0): Need config/address
ISAKMP (0:0): initiating peer config to 12.1.1.2. ID = 2607270170 (0x9b67c91a)
return status is IKMP_NO_ERROR
crypto_isakmp_process_block: src 12.1.1.2, dest 12.1.1.1
ISAKMP_TRANSACTION exchange
ISAKMP (0:0): processing transaction payload from 12.1.1.2.
    message ID = 2156506360
ISAKMP: Config payload CFG_ACK
ISAKMP (0:0): peer accepted the address!
ISAKMP (0:0): processing saved QM.
oakley_process_quick_mode:
OAK_QM_IDLE
ISAKMP (0): processing SA payload. message ID = 818324052
ISAKMP : Checking IPsec proposal 1

```

```

ISAKMP: transform 1, ESP_DES
ISAKMP:   attributes in transform:
ISAKMP:     authenticator is HMAC-MD5
ISAKMP:     encaps is 1
IPSEC(validate_proposal): transform proposal
    (prot 3, trans 2, hmac_alg 1) not supported
ISAKMP (0): atts not acceptable. Next payload is 0
ISAKMP : Checking IPsec proposal 2
ISAKMP: transform 1, ESP_3DES
ISAKMP:   attributes in transform:
ISAKMP:     authenticator is HMAC-MD5
ISAKMP:     encaps is 1
ISAKMP (0): atts are acceptable.
ISAKMP (0): processing NONCE payload. message ID = 818324052
ISAKMP (0): processing ID payload. message ID = 81
ISAKMP (0): ID_IPV4_ADDR src 10.32.8.1 prot 0 port 0
ISAKMP (0): processing ID payload. message ID = 81
ISAKMP (0): ID_IPV4_ADDR dst 12.1.1.1 prot 0 port 0
INITIAL_CONTACTIPSEC(key_engine): got a queue event...

```

debug crypto ipsec

This command displays **debug** information about IPsec connections.

```

IPSEC(key_engine): got a queue event...
IPSEC(spi_response): getting spi 0xd532efbd(3576885181) for SA
    from 12.1.1.2 to 12.1.1.1 for prot 3
return status is IKMP_NO_ERROR
crypto_isakmp_process_block: src 12.1.1.2, dest 12.1.1.1
OAK_QM exchange
oakley_process_quick_mode:
OAK_QM_AUTH_AWAIT
ISAKMP (0): Creating IPsec SAs
    inbound SA from 12.1.1.2 to 12.1.1.1
        (proxy 10.32.8.1 to 12.1.1.1.)
    has spi 3576885181 and conn_id 2 and flags 4
    outbound SA from 12.1.1.1 to 12.1.1.2
        (proxy 12.1.1.1 to 10.32.8.1)
    has spi 2749108168 and conn_id 1 and flags 4IPSEC(key_engine):
    got a queue event...
IPSEC(initialize_sas): ,
    (key eng. msg.) dest= 12.1.1.1, src= 12.1.1.2,
    dest_proxy= 12.1.1.1/0.0.0.0/0/0 (type=1),
    src_proxy= 10.32.8.1/0.0.0.0/0/0 (type=1),
    protocol= ESP, transform= esp-3des esp-md5-hmac ,
    lifedur= 0s and 0kb,
    spi= 0xd532efbd(3576885181), conn_id= 2, keysize= 0, flags= 0x4
IPSEC(initialize_sas): ,
    (key eng. msg.) src= 12.1.1.1, dest= 12.1.1.2,
    src_proxy= 12.1.1.1/0.0.0.0/0/0 (type=1),
    dest_proxy= 10.32.8.1/0.0.0.0/0/0 (type=1),
    protocol= ESP, transform= esp-3des esp-md5-hmac ,
    lifedur= 0s and 0kb,
    spi= 0xa3dc0fc8(2749108168), conn_id= 1, keysize= 0, flags= 0x4
return status is IKMP_NO_ERROR

```

Common Router-to-VPN Client Issues

Inability to Access Subnets Outside the VPN Tunnel – Split Tunneling

This router configuration excerpt shows how to enable split tunneling for the VPN connections. The **access list 150** command is associated with the group as configured in the **crypto isakmp client configuration group hw-client-groupname** command. This allows the Cisco VPN Client to use the router in order to access an additional subnet that is not a part of the VPN tunnel. This is done without compromising the security of the IPsec connection. The tunnel is formed on the 172.168.0.128 network. Traffic flows unencrypted to devices not defined in the **access list 150** command, such as the Internet.

```
!  
crypto isakmp client configuration group hw-client-groupname  
  key hw-client-password  
  dns 172.168.0.250 172.168.0.251  
  wins 172.168.0.252 172.168.0.253  
  domain cisco.com  
  pool dynpool  
  acl 150  
!  
!  
access-list 150 permit ip 172.168.0.128 0.0.0.127 any  
!
```

Common PIX-to-VPN Client Issues

These sections address common problems that you encounter when you configure PIX to IPsec with the help of VPN Client 3.x. The sample configurations for the PIX are based on version 6.x.

Traffic Does Not Flow After the Tunnel Is Established – Cannot Ping Inside the Network Behind PIX

This is a common problem associated with routing. Ensure that the PIX has a route for networks which are on the inside and not directly connected to the same subnet. Also, the inside network needs to have a route back to the PIX for the addresses in the client address pool.

This output shows an example.

```
!--- Address of PIX inside interface.  
  
ip address inside 10.1.1.1 255.255.255.240  
  
!--- Route to the networks that are on the inside segment.  
!--- The next hop is the router on the inside.  
  
route inside 172.16.0.0 255.255.0.0 10.1.1.2 1  
  
!--- Pool of addresses defined on PIX from which it assigns addresses  
!--- to the VPN Client for the IPsec session.  
  
ip local pool mypool 10.1.2.1-10.1.2.254  
  
!--- On the internal router, if the default gateway is not  
!--- the PIX inside interface, then the router needs to have route  
!--- for 10.1.2.0/24 network with next hop as the PIX inside interface  
!--- (as in Cisco IOS routers).  
  
ip route 10.1.2.0 255.255.255.0 10.1.1.1
```

After the Tunnel Is Up, User Is Unable to Browse the Internet – Split Tunneling

The most common reason for this problem is that, with the IPsec tunnel from the VPN Client to PIX, all the traffic is sent through the tunnel to the PIX firewall. The PIX functionality does not allow traffic to be sent back to the interface where it was received. Therefore the traffic destined to the Internet does not work. In order to fix this problem, use the **split tunneling** command. The idea behind this fix is that one only sends specific traffic through the tunnel and rest of the traffic goes directly to the Internet, not through the tunnel.

```
vpngroup vpn3000 split-tunnel 90
access-list 90 permit ip 10.1.1.0 255.255.255.0 10.1.2.0 255.255.255.0
access-list 90 permit ip 172.16.0.0 255.255.0.0 10.1.2.0 255.255.255.0
```

Note: The **vpngroup vpn3000 split-tunnel 90** command enables the split tunneling with **access-list number 90**. The **access-list 90** command defines which traffic flows through the tunnel, the rest of which is denied at the end of the access list. The access list needs to be the same for denying Network Address Translation (NAT) on PIX.

After the Tunnel Is Up, Certain Applications Do Not Work ---- MTU Adjustment on Client

Sometimes after the tunnel is established, a user finds they are able to ping the machines on the network behind the PIX firewall, but are unable to use certain applications like Microsoft Outlook. A common problem is the maximum transfer unit (MTU) size of the packets. The IPsec header can be up to 50 to 60 bytes, which is added to the original packet. If the size of the packet becomes more than 1500 (the default for Internet), then the devices need to fragment it. This way, after it adds the IPsec header, the size is still under 1496. This is the maximum for IPsec.

The **show interface** command shows the MTU of that particular interface on the routers that are accessible or on the routers in your own premises. In order to determine the MTU of the whole path from source to destination, the datagrams of various sizes are sent with DF bit set so that if the datagram sent is more than the MTU, this error message is sent back to the source:

```
frag. needed and DF set
```

This example output shows an example of finding the MTU of the path between the hosts with IP addresses 10.1.1.2 and 172.16.1.56.

```
Router#debug ip icmp
ICMP packet debugging is on
```

```
!--- Perform an extended ping.
```

```
Router#ping
Protocol [ip]:
Target IP address: 172.16.1.56
Repeat count [5]:
Datagram size [100]: 1550
Timeout in seconds [2]:
```

```
!--- Make sure you enter y for extended commands.
```

```
Extended commands [n]: y
```

Source address or interface: **10.1.1.2**
Type of service [0]:

!--- Set the DF bit as shown.

Set DF bit in IP header? [no]: **y**
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, 1550-byte ICMP Echos to 172.16.1.56, timeout is 2 seconds:

2w5d: ICMP: dst (172.16.1.56): frag. needed and DF set.
2w5d: ICMP: dst (172.16.1.56): frag. needed and DF set.
2w5d: ICMP: dst (172.16.1.56): frag. needed and DF set.
2w5d: ICMP: dst (172.16.1.56): frag. needed and DF set.
2w5d: ICMP: dst (172.16.1.56): frag. needed and DF set.
Success rate is 0 percent (0/5)

!--- Reduce the datagram size further and perform extended ping again.

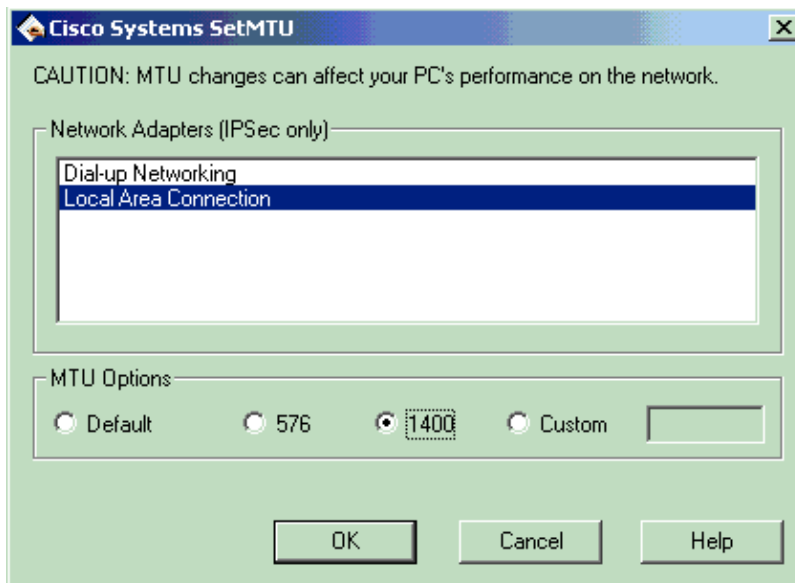
Router#**ping**
Protocol [ip]:
Target IP address: **172.16.1.56**
Repeat count [5]:
Datagram size [100]: **1500**
Timeout in seconds [2]:
Extended commands [n]: **y**
Source address or interface: **10.1.1.2**
Type of service [0]:
Set DF bit in IP header? [no]: **y**
Validate reply data? [no]:
Data pattern [0xABCD]:
Loose, Strict, Record, Timestamp, Verbose[none]:
Sweep range of sizes [n]:
Type escape sequence to abort.
Sending 5, 1500-byte ICMP Echos to 172.16.1.56, timeout is 2 seconds:
!!!!
2w5d: ICMP: echo reply rcvd, src 172.16.1.56, dst 10.1.1.2
2w5d: ICMP: echo reply rcvd, src 172.16.1.56, dst 10.1.1.2
2w5d: ICMP: echo reply rcvd, src 172.16.1.56, dst 10.1.1.2
2w5d: ICMP: echo reply rcvd, src 172.16.1.56, dst 10.1.1.2
2w5d: ICMP: echo reply rcvd, src 172.16.1.56, dst 10.1.1.2

Success rate is 100 percent (5/5), round-trip min/avg/max = 380/383/384 ms

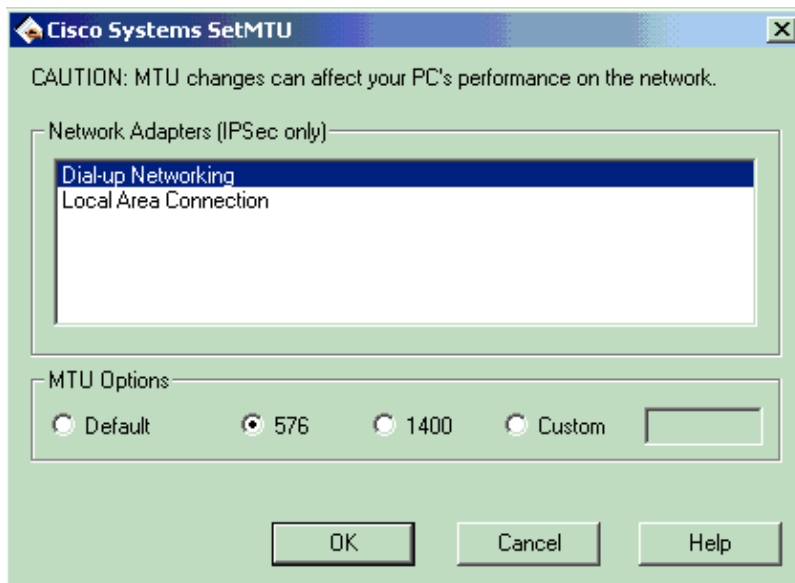
Note: The VPN Client comes with an MTU adjust utility that allows the user to adjust MTU for the Cisco VPN Client. In the case of PPP over Ethernet (PPPoE) client users, adjust MTU for the PPPoE adapter.

Note: Complete these steps in order to adjust the MTU utility for the VPN Client.

1. Select **Start > Programs > Cisco System VPN Client > Set MTU**.
2. Select **Local Area Connection** and choose **1400**. Click **OK**.



3. Repeat step 1, select **Dial-up Networking** and choose **576**. Click **OK**.



Miss the sysopt Command

Use the **sysopt connection permit-ipsec** command in IPsec configurations on the PIX in order to permit IPsec traffic to pass through the PIX Firewall without a check of **conduit** or **access-list** command statements. By default, any inbound session must be explicitly permitted by a **conduit** or **access-list** command statement. With IPsec protected traffic, the secondary access list check can be redundant. In order to enable IPsec authenticated/cipher inbound sessions to always be permitted, use the **sysopt connection permit-ipsec** command.

Verify Access Control Lists (ACLs)

There are two access lists used in a typical IPsec VPN configuration. One access list is used to exempt traffic that is destined for the VPN tunnel from the NAT process. The other access list defines what traffic to encrypt. This includes a crypto ACL in a LAN-to-LAN setup or a split-tunneling ACL in a remote access configuration. When these ACLs are incorrectly configured or missing, traffic might only flow in one

direction across the VPN tunnel, or it might not be sent across the tunnel at all.

Be sure that you have configured all of the access lists necessary to complete your IPsec VPN configuration and that those access lists define the correct traffic. This list contains simple things to check when you suspect that an ACL is the cause of problems with your IPsec VPN.

- Make sure that your NAT exemption and crypto ACLs specify the correct traffic.
- If you have multiple VPN tunnels and multiple crypto ACLs, make sure that those ACLs do not overlap.
- Do not use ACLs twice. Even if your NAT exemption ACL and crypto ACL specify the same traffic, use two different access lists.
- Make sure that your device is configured to use the NAT exemption ACL. On a router, this means that you use the **route-map** command. On the PIX or ASA, this means that you use the **nat (0)** command. A NAT exemption ACL is required for both LAN-to-LAN and remote access configurations.

In order to learn more about how to verify the ACL statements, refer to the Verify that ACLs are Correct section in Most Common L2L and Remote Access IPsec VPN Troubleshooting Solutions.

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Related Information

- [IPsec Negotiation/IKE Protocol Support Page](#)
- [An Introduction to IP Security \(IPSec\) Encryption](#)
- [PIX Support Page](#)
- [Documentation for PIX Firewall](#)
- [PIX Command Reference](#)
- [Error Message Decoder \(registered customers only\)](#)
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