

IOS IPSec和IKE调试 — IKEv1主模式故障排除

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简介

本文档提供了在使用主模式和预共享密钥(PSK)时了解Cisco IOS®软件调试的信息。

本文档还提供有关如何转换配置中某些调试行的信息。

不讨论以下主题：

- 在建立隧道后传递流量
- IPSec或互联网密钥交换(IKE)的基本概念

核心问题

IKE和IPSec调试往往变得晦涩难懂。思科技术支持中心(TAC)经常使用这些错误来了解IPSec VPN隧道建立问题的位置。

场景

主模式通常用于LAN到LAN隧道之间，或在远程访问(ezvpn)时用于身份验证。

这些调试来自运行15.2(1)T软件版本的Cisco IOS设备。

本文档介绍了两种主要方案：

- IOS启动器端
- IOS响应方端

在本文档中，基于IPv6在两个站点之间建立基于VTI的隧道。

注意：

使用[命令查找工具\(仅注册客户\)](#)可获取有关本文档中使用的命令的详细信息。

使用 **debug 命令**之前，请参阅有关 Debug 命令的重要信息。

使用的调试

- debug crypto isakmp
- debug crypto ipsec
- debug crypto kmi

IOS 路由器配置

加密配置

```
crypto isakmp policy 10
authentication pre-share
```

```
crypto isakmp key cisco address ipv6 ::/0
```

```
crypto ipsec transform-set TRA esp-aes esp-sha-hmac
mode transport
```

```
crypto ipsec profile PRO
set transform-set TRA

interface Tunnel23
ip address 192.168.23.2 255.255.255.0
ipv6 address FE80::23:2 link-local
tunnel source Ethernet0/0
tunnel mode ipsec ipv6
tunnel destination 2001: DB8::3
tunnel protection ipsec profile PRO
```

其他端

```
crypto isakmp policy 10
authentication pre-share

crypto isakmp key cisco address ipv6 ::/0

crypto ipsec transform-set TRA esp-aes esp-sha-hmac
mode transport

crypto ipsec profile PRO
set transform-set TRA

interface Tunnel23
ip address 192.168.23.3 255.255.255.0
ipv6 address FE80::23:3 link-local
tunnel source Ethernet0/0
tunnel mode ipsec ipv6
tunnel destination 2001: DB8::2
tunnel protection ipsec profile PRO
```

调试

IOS响应器端

主模式消息1(MM1)

IKE的初始建议包括：

- 加密
- 散列
- Diffie-Hellman(DH)组
- 生命期

```
*Sep 21 08:33:43.377: ISAKMP (0) : received packet from 2001: DB8::2 dport 500
sport 500 Global (N) NEW SA
*Sep 21 08:33:43.377: ISAKMP: Created a peer struct for 2001: DB8::2, peer port
500
*Sep 21 08:33:43.377: ISAKMP: New peer created peer = 0x8E45588
peer_handle = 0x8000000A
*Sep 21 08:33:43.377: ISAKMP: Locking peer struct 0x8E45588, refcount 1 for
```

```

crypto_isakmp_process_block
*Sep 21 08:33:43.377: ISAKMP: local port 500, remote port 500
*Sep 21 08:33:43.377: ISAKMP: (0):insert sa successfully sa = 6D12A00
*Sep 21 08:33:43.377: ISAKMP: (0):Input = IKE_MESG_FROM_PEER, IKE_MM_EXCH
*Sep 21 08:33:43.377: ISAKMP: (0): Old State = IKE_READY New State = IKE_R_MM1
*Sep 21 08:33:43.377: ISAKMP: (0): processing SA payload. message ID = 0
*Sep 21 08:33:43.377: ISAKMP: (0):found peer pre-shared key matching 2001:
DB8::2
*Sep 21 08:33:43.377: ISAKMP: (0): local preshared key found
*Sep 21 08:33:43.377: ISAKMP: Scanning profiles for xauth ...
*Sep 21 08:33:43.377: ISAKMP: (0):Checking ISAKMP transform 1 against priority
10 policy
*Sep 21 08:33:43.377: ISAKMP:         encryption DES-CBC
*Sep 21 08:33:43.377: ISAKMP:         hash SHA
*Sep 21 08:33:43.377: ISAKMP:         default group 1
*Sep 21 08:33:43.377: ISAKMP:         auth pre-share
*Sep 21 08:33:43.377: ISAKMP:         life type in seconds
*Sep 21 08:33:43.377: ISAKMP:         life duration (VPI) of  0x0 0x1 0x51 0x80
*Sep 21 08:33:43.377: ISAKMP: (0):atts are acceptable. Next payload is 0
*Sep 21 08:33:43.377: ISAKMP: (0):Acceptable atts:actual life: 0
*Sep 21 08:33:43.377: ISAKMP: (0):Acceptable atts:life: 0
*Sep 21 08:33:43.377: ISAKMP: (0):Fill atts in sa vpi_length:4
*Sep 21 08:33:43.377: ISAKMP: (0):Fill atts in sa life_in_seconds:86400
*Sep 21 08:33:43.377: ISAKMP: (0):Returning Actual lifetime: 86400
*Sep 21 08:33:43.377: ISAKMP: (0):: Started lifetime timer: 86400.

*Sep 21 08:33:43.377: ISAKMP: (0):Input = IKE_MESG_INTERNAL,
IKE_PROCESS_MAIN_MODE
*Sep 21 08:33:43.377: ISAKMP: (0): Old State = IKE_R_MM1 New State = IKE_R_MM1

```

相关配置：

```

crypto isakmp policy 10
authentication pre-share

```

主模式消息2(MM2) — 发送回复

```

*Sep 21 08:33:43.377: ISAKMP: (0): sending packet to 2001:DB8::2 my_port 500
peer_port 500 (R) MM_SA_SETUP
*Sep 21 08:33:43.377: ISAKMP: (0): Sending an IKE IPv6 Packet.
*Sep 21 08:33:43.377: ISAKMP: (0):Input = IKE_MESG_INTERNAL,
IKE_PROCESS_COMPLETE
*Sep 21 08:33:43.377: ISAKMP: (0): Old State = IKE_R_MM1 New State = IKE_R_MM2

```

主模式消息3(MM3)

包括：

- 网络地址转换(NAT)发现
- DH交换部分1

```

*Sep 21 08:33:43.381: ISAKMP (0): received packet from 2001:DB8::2 dport 500
sport 500 Global (R) MM_SA_SETUP
*Sep 21 08:33:43.381: ISAKMP: (0):Input = IKE_MESG_FROM_PEER, IKE_MM_EXCH
*Sep 21 08:33:43.381: ISAKMP: (0): Old State = IKE_R_MM2 New State = IKE_R_MM3
*Sep 21 08:33:43.381: ISAKMP: (0): processing KE payload. message ID = 0
*Sep 21 08:33:43.393: ISAKMP: (0): processing NONCE payload. message ID = 0

```

```
*Sep 21 08:33:43.393: ISAKMP: (0):found peer pre-shared key matching 2001:
DB8::2
*Sep 21 08:33:43.393: ISAKMP: (1011): processing vendor id payload
*Sep 21 08:33:43.393: ISAKMP: (1011): vendor ID is DPD
*Sep 21 08:33:43.393: ISAKMP: (1011): processing vendor id payload
*Sep 21 08:33:43.393: ISAKMP: (1011): speaking to another IOS box!
*Sep 21 08:33:43.393: ISAKMP: (1011): processing vendor id payload
*Sep 21 08:33:43.393: ISAKMP: (1011): vendor ID seems Unity/DPD but major 0
mismatch
*Sep 21 08:33:43.393: ISAKMP: (1011): vendor ID is XAUTH
*Sep 21 08:33:43.393: ISAKMP: (1011):Input = IKE_MESG_INTERNAL,
IKE_PROCESS_MAIN_MODE
*Sep 21 08:33:43.393: ISAKMP: (1011): Old State = IKE_R_MM3 New State =
IKE_R_MM3
```

主模式消息4(MM4)

包括：

- NAT检测负载
- DH交换的继续

```
*Sep 21 08:33:43.405: ISAKMP: (1011): sending packet to 2001: DB8::2 my_port
500 peer_port 500 (R) MM_KEY_EXCH
*Sep 21 08:33:43.405: ISAKMP: (1011): Sending an IKE IPv6 Packet.
*Sep 21 08:33:43.405: ISAKMP: (1011):Input = IKE_MESG_INTERNAL,
IKE_PROCESS_COMPLETE
*Sep 21 08:33:43.405: ISAKMP: (1011): Old State = IKE_R_MM3 New State =
IKE_R_MM4
```

主模式消息5(MM5) — 发起方发送其身份

包括：

- 本地身份信息
- 密钥

```
*Sep 21 08:33:43.425: ISAKMP (1011): received packet from 2001: DB8::2 dport
500 sport 500 Global (R) MM_KEY_EXCH
*Sep 21 08:33:43.425: ISAKMP: (1011):Input = IKE_MESG_FROM_PEER, IKE_MM_EXCH
*Sep 21 08:33:43.425: ISAKMP: (1011): Old State = IKE_R_MM4 New State =
IKE_R_MM5

*Sep 21 08:33:43.425: ISAKMP: (1011): processing ID payload. message ID = 0
*Sep 21 08:33:43.425: ISAKMP (1011): ID payload
    next-payload : 8
    type          : 5
    address       : 2001: DB8::2
    protocol      : 17
    port          : 500
    length        : 24
*Sep 21 08:33:43.425: ISAKMP: (0):: peer matches *none* of the profiles
*Sep 21 08:33:43.425: ISAKMP: (1011): processing HASH payload. message ID = 0
*Sep 21 08:33:43.425: ISAKMP: (1011): processing NOTIFY INITIAL_CONTACT
protocol 1 spi 0, message ID = 0, sa = 0x6D12A00
*Sep 21 08:33:43.425: ISAKMP: (1011): SA authentication status: authenticated
*Sep 21 08:33:43.425: ISAKMP: (1011): SA has been authenticated with 2001:
```

DB8::2

```
*Sep 21 08:33:43.425: ISAKMP: (1011): SA authentication status: authenticated
*Sep 21 08:33:43.425: ISAKMP: (1011): Process initial contact, bring down
existing phase 1 and 2 SA's with local 2001: DB8::3 remote 2001: DB8::2
remote port 500
*Sep 21 08:33:43.425: ISAKMP: Trying to insert a peer 2001: DB8::3/2001:
DB8::2/500/, and inserted successfully 8E45588.
*Sep 21 08:33:43.425: ISAKMP: (1011):Input = IKE_MESG_INTERNAL,
IKE_PROCESS_MAIN_MODE
*Sep 21 08:33:43.425: ISAKMP: (1011): Old State = IKE_R_MM5 New State =
IKE_R_MM5
```

主模式消息6(MM6) — 响应器发送其身份。第1阶段完成。

包括：

- 从对等体发送远程身份
- 有关隧道组的最终选择

```
*Sep 21 08:33:43.425: IPSEC(key_engine): got a queue event with 1 KMI message(s)
*Sep 21 08:33:43.425: ISAKMP: (1011): SA is doing pre-shared key authentication
using id type ID_IPV6_ADDR
*Sep 21 08:33:43.425: ISAKMP (1011): ID payload
    next-payload : 8
    type          : 5
    address       : 2001: DB8::3
    protocol      : 17
    port          : 500
    length        : 24
*Sep 21 08:33:43.425: ISAKMP: (1011):Total payload length: 24
*Sep 21 08:33:43.425: ISAKMP: (1011): sending packet to 2001: DB8::2 my_port
500 peer_port 500 (R) MM_KEY_EXCH
*Sep 21 08:33:43.425: ISAKMP: (1011): Sending an IKE IPv6 Packet.
*Sep 21 08:33:43.425: ISAKMP: (1011):Input = IKE_MESG_INTERNAL,
IKE_PROCESS_COMPLETE
*Sep 21 08:33:43.425: ISAKMP: (1011): Old State = IKE_R_MM5 New State =
IKE_P1_COMPLETE
```

相关配置：

```
crypto isakmp identity ...
```

快速模式消息1(QM1)

```
*Sep 21 08:33:43.433: ISAKMP (1011): received packet from 2001: DB8::2 dport
500 sport 500 Global (R) QM_IDLE
*Sep 21 08:33:43.433: ISAKMP: set new node 1371333358 to QM_IDLE
*Sep 21 08:33:43.433: ISAKMP: (1011): processing HASH payload. message ID =
1371333358
*Sep 21 08:33:43.433: ISAKMP: (1011): processing SA payload. message ID =
1371333358
*Sep 21 08:33:43.433: ISAKMP: (1011):Checking IPsec proposal 1
*Sep 21 08:33:43.433: ISAKMP: transform 1, ESP_AES
*Sep 21 08:33:43.433: ISAKMP: attributes in transform:
*Sep 21 08:33:43.433: ISAKMP: encaps is 1 (Tunnel)
*Sep 21 08:33:43.433: ISAKMP: SA life type in seconds
*Sep 21 08:33:43.433: ISAKMP: SA life duration (basic) of 3600
```

```

*Sep 21 08:33:43.433: ISAKMP: SA life type in kilobytes
*Sep 21 08:33:43.433: ISAKMP: SA life duration (VPI) of 0x0 0x46 0x50 0x0
*Sep 21 08:33:43.433: ISAKMP: authenticator is HMAC-SHA
*Sep 21 08:33:43.433: ISAKMP: key length is 128
*Sep 21 08:33:43.433: ISAKMP: (1011):atts are acceptable.
*Sep 21 08:33:43.433: IPSEC(validate_proposal_request): proposal part #1
*Sep 21 08:33:43.433: IPSEC(validate_proposal_request): proposal part #1,
(key eng. msg.) INBOUND local= 2001: DB8::3:0, remote= 2001: DB8::2:0,
local_proxy= ::/0/256/0,
remote_proxy= ::/0/256/0,
protocol= ESP, transform= NONE (Tunnel),
lifedur= 0s and 0kb,
spi= 0x0(0), conn_id= 0, keysize= 128, flags= 0x0
*Sep 21 08:33:43.433: ISAKMP: (1011): processing NONCE payload. message ID =
1371333358
*Sep 21 08:33:43.433: ISAKMP: (1011): processing ID payload. message ID =
1371333358
*Sep 21 08:33:43.433: ISAKMP: (1011): processing ID payload. message ID =
1371333358
*Sep 21 08:33:43.433: ISAKMP: (1011):QM Responder gets spi
*Sep 21 08:33:43.433: ISAKMP: (1011):Node 1371333358, Input =
IKE_MSG_FROM_PEER, IKE_QM_EXCH
*Sep 21 08:33:43.433: ISAKMP: (1011): Old State = IKE_QM_READY New State =
IKE_QM_SPI_STARVE

```

相关配置：

```
tunnel mode ipsec ipv6
```

快速模式消息2(QM2)

包括：

- 远程端发送参数
- 选择了两个建议的相2寿命中较短的一个

```

*Sep 21 08:33:43.433: ISAKMP: (1011): sending packet to 2001: DB8::2 my_port
500 peer_port 500 (R) QM_IDLE
*Sep 21 08:33:43.433: ISAKMP: (1011): Sending an IKE IPv6 Packet.
*Sep 21 08:33:43.433: ISAKMP: (1011):Node 1371333358, Input =
IKE_MSG_INTERNAL, IKE_GOT_SPI
*Sep 21 08:33:43.433: ISAKMP: (1011): Old State = IKE_QM_SPI_STARVE New
State = IKE_QM_R_QM2
*Sep 21 08:33:43.437: IPSEC(key_engine): got a queue event with 1 KMI message(s)
R3(config-if)#
*Sep 21 08:33:43.437: IPSEC(crypto_ipsec_create_ipsec_sas): Map found
Tunnel23-head-0
*Sep 21 08:33:43.437: IPSEC(crypto_ipsec_sa_find_ident_head): reconnecting
with the same proxies and peer 2001: DB8::2
*Sep 21 08:33:43.437: IPSEC(create_sa): sa created,
(sa) sa_dest= 2001: DB8::3, sa_proto= 50,
sa_spi= 0x221A7153(572158291),
sa_trans= esp-aes esp-sha-hmac , sa_conn_id= 305
sa_lifetime(k/sec)= (4608000/3532)
*Sep 21 08:33:43.437: IPSEC(create_sa): sa created,
(sa) sa_dest= 2001: DB8::2, sa_proto= 50,
sa_spi= 0x45F16A9A(1173449370),
sa_trans= esp-aes esp-sha-hmac , sa_conn_id= 306
sa_lifetime(k/sec)= (4608000/3532)

```

相关配置：

```
crypto ipsec transform-set TRA esp-aes esp-sha-hmac
mode transport
crypto ipsec profile PRO
set transform-set TRA
interface tunnel23
tunnel mode ipsec ipv6
tunnel protection ipsec profile PRO
```

快速模式消息3(QM3) — 第2阶段应完成并启用隧道接口

```
*Sep 21 08:33:43.437: %LINEPROTO-5-UPDOWN: Line protocol on Interface Tunnel23,
changed state to up
*Sep 21 08:33:43.437: ISAKMP (1011): received packet from 2001: DB8::2 dport
500 sport 500 Global (R) QM_IDLE
*Sep 21 08:33:43.437: ISAKMP: (1011): deleting node 1371333358 error FALSE
reason "QM done (await)"
*Sep 21 08:33:43.437: ISAKMP: (1011):Node 1371333358, Input =
IKE_MSG_FROM_PEER, IKE_QM_EXCH
*Sep 21 08:33:43.437: ISAKMP: (1011): Old State = IKE_QM_R_QM2 New State =
IKE_QM_PHASE2_COMPLETE
*Sep 21 08:33:43.437: IPSEC(key_engine): got a queue event with 1 KMI message(s)
*Sep 21 08:33:43.437: IPSEC(key_engine_enable_outbound): rec'd enable notify
from ISAKMP
```

IOS路由器 — 启动器

主模式消息1(MM1) — 初始联系人

包括：

- 供应商ID(VID)
- 容量
- 第1阶段建议
- IKE安全关联(SA)
- IPSec已为SA创建模板

```
*Sep 21 08:33:43.245: %CRYPTO-6-ISAKMP_ON_OFF: ISAKMP is ON
*Sep 21 08:33:43.245: IPSEC(sa ident sadb root initialize created IPv6 ACL %s)
: Tunnel23-head-0-65537-Tunnel23-head-0-ACL-6-IPSECV6-ACL
*Sep 21 08:33:43.245: IPSEC(recalculate_mtu) : reset sadb_root 79E82A8 mtu to
1500
*Sep 21 08:33:43.245: IPSEC(adjust_mtu) : adjusting ident ip mtu from 1460 to
1500,
(identity) local= 2001: DB8::2:0, remote= 2001: DB8::3:0,
local_proxy= ::/0/256/0,
remote_proxy= ::/0/256/0
*Sep 21 08:33:43.245: IPSEC(adjust_mtu): adjusting path mtu from 1460 to 1500,
(identity) local= 2001: DB8::2:0, remote= 2001: DB8::3:0,
local_proxy= ::/0/256/0,
remote_proxy= ::/0/256/0
*Sep 21 08:33:43.245: IPSEC(sa_request): ,
```



```

(key eng. msg.) OUTBOUND local= 2001: DB8::2:500, remote= 2001: DB8::3:500,
  local_proxy= ::/0/256/0,
  remote_proxy= ::/0/256/0,
  protocol= ESP, transform= esp-aes esp-sha-hmac (Tunnel),
  lifedur= 3600s and 4608000kb,
  spi= 0x0(0), conn_id= 0, keysize= 128, flags= 0x0
*Sep 21 08:33:43.245: ISAKMP: (0): SA request profile is (NULL)
*Sep 21 08:33:43.245: ISAKMP: Created a peer struct for 2001: DB8::3, peer port
500
*Sep 21 08:33:43.245: ISAKMP: New peer created peer = 0x9344BE8 peer_handle =
0x80000008
*Sep 21 08:33:43.245: ISAKMP: Locking peer struct 0x9344BE8, refcount 1 for
isakmp_initiator
*Sep 21 08:33:43.245: ISAKMP: local port 500, remote port 500
*Sep 21 08:33:43.245: ISAKMP: set new node 0 to QM_IDLE
*Sep 21 08:33:43.245: ISAKMP: (0):insert sa successfully sa = 944C840
*Sep 21 08:33:43.245: ISAKMP: (0):Can not start Aggressive mode, trying Main
mode.
*Sep 21 08:33:43.245: ISAKMP: (0):found peer pre-shared key matching 2001:
DB8::3
*Sep 21 08:33:43.245: ISAKMP: (0):Input = IKE_MESG_FROM_IPSEC, IKE_SA_REQ_MM
*Sep 21 08:33:43.245: ISAKMP: (0): Old State = IKE_READY New State = IKE_I_MM1
*Sep 21 08:33:43.245: ISAKMP: (0): beginning Main Mode exchange
*Sep 21 08:33:43.245: ISAKMP: (0): sending packet to 2001: DB8::3 my_port 500
peer_port 500 (I) MM_NO_STATE
*Sep 21 08:33:43.245: ISAKMP: (0): Sending an IKE IPv6 Packet.

```

相关配置：

```

crypto isakmp policy 10
authentication pre-share

```

主模式消息2(MM2) — 回复初始联系人

包括：

- 对等体选择要使用的互联网安全关联和密钥管理协议(ISAKMP)策略
- IKE SA

```

*Sep 21 08:33:43.249: ISAKMP (0): received packet from 2001: DB8::3 dport 500
sport 500 Global (I) MM_NO_STATE
*Sep 21 08:33:43.249: ISAKMP: (0):Input = IKE_MESG_FROM_PEER, IKE_MM_EXCH
*Sep 21 08:33:43.249: ISAKMP: (0): Old State = IKE_I_MM1 New State = IKE_I_MM2

*Sep 21 08:33:43.249: ISAKMP: (0): processing SA payload. message ID = 0
*Sep 21 08:33:43.249: ISAKMP: (0):found peer pre-shared key matching 2001:
DB8::3
*Sep 21 08:33:43.249: ISAKMP: (0): local preshared key found
*Sep 21 08:33:43.249: ISAKMP : Scanning profiles for xauth ...
*Sep 21 08:33:43.249: ISAKMP: (0):Checking ISAKMP transform 1 against priority
10 policy
*Sep 21 08:33:43.249: ISAKMP:          encryption DES-CBC
*Sep 21 08:33:43.249: ISAKMP:          hash SHA
*Sep 21 08:33:43.249: ISAKMP:          default group 1
*Sep 21 08:33:43.249: ISAKMP:          auth pre-share
*Sep 21 08:33:43.249: ISAKMP:          life type in seconds
*Sep 21 08:33:43.249: ISAKMP:          life duration (VPI) of 0x0 0x1 0x51 0x80
*Sep 21 08:33:43.249: ISAKMP: (0):atts are acceptable. Next payload is 0
*Sep 21 08:33:43.249: ISAKMP: (0):Acceptable atts:actual life: 0

```

```
*Sep 21 08:33:43.249: ISAKMP: (0):Acceptable atts:life: 0
*Sep 21 08:33:43.249: ISAKMP: (0):Fill atts in sa vpi_length:4
*Sep 21 08:33:43.249: ISAKMP: (0):Fill atts in sa life_in_seconds:86400
*Sep 21 08:33:43.249: ISAKMP: (0):Returning Actual lifetime: 86400
*Sep 21 08:33:43.249: ISAKMP: (0):: Started lifetime timer: 86400.

*Sep 21 08:33:43.249: ISAKMP: (0):Input = IKE_MESG_INTERNAL,
IKE_PROCESS_MAIN_MODE
*Sep 21 08:33:43.249: ISAKMP: (0): Old State = IKE_I_MM2 New State =
IKE_I_MM2
```

主模式消息3(MM3)- NAT发现和Diffie-Hellman交换

包括：

- NAT发现负载和散列
- DH交换启动
- 失效对等体检测(DPD)支持

```
*Sep 21 08:33:43.249: ISAKMP: (0): sending packet to 2001: DB8::3 my_port 500
peer_port 500 (I) MM_SA_SETUP
*Sep 21 08:33:43.249: ISAKMP: (0): Sending an IKE IPv6 Packet.
*Sep 21 08:33:43.249: ISAKMP: (0):Input = IKE_MESG_INTERNAL,
IKE_PROCESS_COMPLETE
*Sep 21 08:33:43.249: ISAKMP: (0): Old State = IKE_I_MM2 New State = IKE_I_MM3
```

主模式消息4(MM4)- NAT发现和Diffie-Hellman交换

包括：

- NAT发现负载
- DH交换启动
- 其他VID (DPD、Unity支持)
- 了解与其他IOS设备通话

```
*Sep 21 08:33:43.273: ISAKMP (0): received packet from 2001: DB8::3 dport 500
sport 500 Global (I) MM_SA_SETUP
*Sep 21 08:33:43.273: ISAKMP: (0):Input = IKE_MESG_FROM_PEER, IKE_MM_EXCH
*Sep 21 08:33:43.273: ISAKMP: (0): Old State = IKE_I_MM3 New State = IKE_I_MM4

*Sep 21 08:33:43.273: ISAKMP: (0): processing KE payload. message ID = 0
*Sep 21 08:33:43.281: ISAKMP: (0): processing NONCE payload. message ID = 0
*Sep 21 08:33:43.281: ISAKMP: (0):found peer pre-shared key matching 2001:
DB8::3
*Sep 21 08:33:43.281: ISAKMP: (1011): processing vendor id payload
*Sep 21 08:33:43.281: ISAKMP: (1011): vendor ID is Unity
*Sep 21 08:33:43.281: ISAKMP: (1011): processing vendor id payload
*Sep 21 08:33:43.281: ISAKMP: (1011): vendor ID is DPD
*Sep 21 08:33:43.281: ISAKMP: (1011): processing vendor id payload
*Sep 21 08:33:43.281: ISAKMP: (1011): speaking to another IOS box!
*Sep 21 08:33:43.281: ISAKMP: (1011):Input = IKE_MESG_INTERNAL,
IKE_PROCESS_MAIN_MODE
*Sep 21 08:33:43.281: ISAKMP: (1011): Old State = IKE_I_MM4 New State =
IKE_I_MM4
```

主模式消息5(MM5) — 发送身份

包括：

- 远程对等体身份(ID)

```
*Sep 21 08:33:43.293: ISAKMP: (1011): Send initial contact
*Sep 21 08:33:43.293: ISAKMP: (1011): SA is doing pre-shared key authentication
using id type ID_IPV6_ADDR
*Sep 21 08:33:43.293: ISAKMP (1011): ID payload
    next-payload : 8
    type          : 5
    address       : 2001: DB8::2
    protocol      : 17
    port          : 500
    length        : 24
*Sep 21 08:33:43.293: ISAKMP: (1011):Total payload length: 24
*Sep 21 08:33:43.293: ISAKMP: (1011): sending packet to 2001: DB8::3 my_port
500 peer_port 500 (I) MM_KEY_EXCH
*Sep 21 08:33:43.293: ISAKMP: (1011): Sending an IKE IPv6 Packet.
*Sep 21 08:33:43.293: ISAKMP: (1011):Input = IKE_MESG_INTERNAL,
IKE_PROCESS_COMPLETE
*Sep 21 08:33:43.293: ISAKMP: (1011): Old State = IKE_I_MM4  New State =
IKE_I_MM5
```

相关配置：

```
crypto isakmp identity ...
```

主模式消息6(MM6) — 远程对等体身份，已建立第1阶段

包括：

- 重新键入时间开始
- 远程身份 (本例中为地址)
- 决定降落在简档上

```
*Sep 21 08:33:43.297: ISAKMP (1011): received packet from 2001: DB8::3 dport
500 sport 500 Global (I) MM_KEY_EXCH
*Sep 21 08:33:43.297: ISAKMP: (1011): processing ID payload. message ID = 0
*Sep 21 08:33:43.297: ISAKMP (1011): ID payload
    next-payload : 8
    type          : 5
    address       : 2001: DB8::3
    protocol      : 17
    port          : 500
    length        : 24
*Sep 21 08:33:43.297: ISAKMP: (0):: peer matches *none* of the profiles
*Sep 21 08:33:43.297: ISAKMP: (1011): processing HASH payload. message ID = 0
*Sep 21 08:33:43.297: ISAKMP: (1011): SA authentication status: authenticated
*Sep 21 08:33:43.297: ISAKMP: (1011): SA has been authenticated with 2001:
DB8::3
*Sep 21 08:33:43.297: ISAKMP: Trying to insert a peer 2001: DB8::2/2001:
DB8::3/500/, and inserted successfully 9344BE8.
*Sep 21 08:33:43.297: ISAKMP: (1011):Input = IKE_MESG_FROM_PEER, IKE_MM_EXCH
*Sep 21 08:33:43.297: ISAKMP: (1011): Old State = IKE_I_MM5  New State =
```

IKE_I_MM6

*Sep 21 08:33:43.297: ISAKMP: (1011):Input = IKE_MESG_INTERNAL,
IKE_PROCESS_MAIN_MODE

*Sep 21 08:33:43.297: ISAKMP: (1011): Old State = IKE_I_MM6 New State =
IKE_I_MM6

*Sep 21 08:33:43.301: ISAKMP: (1011):Input = IKE_MESG_INTERNAL,
IKE_PROCESS_COMPLETE

***Sep 21 08:33:43.301: ISAKMP: (1011): Old State = IKE_I_MM6 New State =
IKE_P1_COMPLETE**

相关配置：

```
crypto isakmp identity ...
```

快速模式消息1(QM1) — 对等体启动阶段2

包括：

- 远程和本地代理ID
- 转换集

*Sep 21 08:33:43.301: ISAKMP: (1011):beginning Quick Mode exchange, M-ID of
1371333358*Sep 21 08:33:43.301: ISAKMP: (1011):QM Initiator gets spi

*Sep 21 08:33:43.301: ISAKMP: (1011): sending packet to 2001: DB8::3 my_port
500 peer_port 500 (I) QM_IDLE

*Sep 21 08:33:43.301: ISAKMP: (1011): Sending an IKE IPv6 Packet.

*Sep 21 08:33:43.301: ISAKMP: (1011):Node 1371333358, Input =
IKE_MESG_INTERNAL, IKE_INIT_QM

*Sep 21 08:33:43.301: ISAKMP: (1011): Old State = IKE_QM_READY New State =
IKE_QM_I_QM1

*Sep 21 08:33:43.301: ISAKMP: (1011):Input = IKE_MESG_INTERNAL,
IKE_PHASE1_COMPLETE

*Sep 21 08:33:43.301: ISAKMP: (1011): Old State = IKE_P1_COMPLETE New State =
IKE_P1_COMPLETE

相关配置：

```
crypto ipsec transform-set TRA esp-aes esp-sha-hmac  
mode transport
```

```
crypto ipsec profile PRO  
set transform-set TRA
```

快速模式消息2(QM2)

包括：

- 确认代理身份
- 隧道类型
- 完全转发保密(PFS)设置

*Sep 21 08:33:43.305: ISAKMP (1011): received packet from 2001: DB8::3 dport
500 sport 500 Global (I) QM_IDLE

```

*Sep 21 08:33:43.305: ISAKMP: (1011): processing HASH payload. message ID =
1371333358
*Sep 21 08:33:43.305: ISAKMP: (1011): processing SA payload. message ID =
1371333358
*Sep 21 08:33:43.305: ISAKMP: (1011):Checking IPsec proposal 1
*Sep 21 08:33:43.305: ISAKMP: transform 1, ESP_AES
*Sep 21 08:33:43.305: ISAKMP:   attributes in transform:
*Sep 21 08:33:43.305: ISAKMP:     encaps is 1 (Tunnel)
*Sep 21 08:33:43.305: ISAKMP:     SA life type in seconds
*Sep 21 08:33:43.305: ISAKMP:     SA life duration (basic) of 3600
*Sep 21 08:33:43.305: ISAKMP:     SA life type in kilobytes
*Sep 21 08:33:43.305: ISAKMP:     SA life duration (VPI) of 0x0 0x46 0x50 0x0
*Sep 21 08:33:43.305: ISAKMP:     authenticator is HMAC-SHA
*Sep 21 08:33:43.305: ISAKMP:     key length is 128
*Sep 21 08:33:43.305: ISAKMP: (1011):atts are acceptable.
*Sep 21 08:33:43.305: IPSEC(validate_proposal_request): proposal part #1
*Sep 21 08:33:43.305: IPSEC(validate_proposal_request): proposal part #1,
(key eng. msg.) INBOUND local= 2001: DB8::2:0, remote= 2001: DB8::3:0,
  local_proxy= ::/0/256/0,
  remote_proxy= ::/0/256/0,
  protocol= ESP, transform= NONE (Tunnel),
  lifedur= 0s and 0kb,
  spi= 0x0(0), conn_id= 0, keysize= 128, flags= 0x0
*Sep 21 08:33:43.305: ISAKMP: (1011): processing NONCE payload. message ID =
1371333358
*Sep 21 08:33:43.305: ISAKMP: (1011): processing ID payload. message ID =
1371333358
*Sep 21 08:33:43.305: ISAKMP: (1011): processing ID payload. message ID =
1371333358

```

相关配置：

```

crypto ipsec transform-set TRA esp-aes esp-sha-hmac
mode transport

```

```

crypto ipsec profile PRO
set transform-set TRA

```

```

interface tunnel23
tunnel mode ipsec ipv6
tunnel protection ipsec profile PRO

```

快速模式消息3(QM3) — 第2阶段建立

包括：

- 设置安全策略索引(SPI)以传递流量

```

*Sep 21 08:33:43.305: ISAKMP: (1011): Sending an IKE IPv6 Packet.
*Sep 21 08:33:43.305: ISAKMP: (1011): deleting node 1371333358 error FALSE
reason "No Error"
*Sep 21 08:33:43.305: ISAKMP: (1011):Node 1371333358, Input =
IKE_MSG_FROM_PEER, IKE_QM_EXCH
*Sep 21 08:33:43.305: ISAKMP: (1011): Old State = IKE_QM_I_QM1 New State =
IKE_QM_PHASE2_COMPLETE
*Sep 21 08:33:43.305: IPSEC(key_engine): got a queue event with 1 KMI message(s)
*Sep 21 08:33:43.305: IPSEC(crypto_ipsec_create_ipsec_sas): Map found
Tunnel23-head-0
*Sep 21 08:33:43.305: IPSEC(crypto_ipsec_sa_find_ident_head): reconnecting
with the same proxies and peer 2001: DB8::3

```

```
*Sep 21 08:33:43.305: IPSEC(create_sa): sa created,
(sa) sa_dest= 2001: DB8::2, sa_proto= 50,
sa_spi= 0x45F16A9A(1173449370),
sa_trans= esp-aes esp-sha-hmac , sa_conn_id= 305
sa_lifetime(k/sec)= (4608000/3439)
*Sep 21 08:33:43.305: IPSEC(create_sa): sa created,
(sa) sa_dest= 2001: DB8::3, sa_proto= 50,
sa_spi= 0x221A7153(572158291),
sa_trans= esp-aes esp-sha-hmac , sa_conn_id= 306
sa_lifetime(k/sec)= (4608000/3439)
R2(config-if)#
*Sep 21 08:33:43.309: %LINEPROTO-5-UPDOWN: Line protocol on Interface
Tunnel23, changed state to up
```

隧道验证

```
sh crypto ipsec sa

interface: Tunnel23
  Crypto map tag: Tunnel23-head-0, local addr 2001: DB8::2

protected vrf: (none)
local ident (addr/mask/prot/port): (::/0/0/0)
remote ident (addr/mask/prot/port): (::/0/0/0)
current_peer 2001: DB8::3 port 500
  PERMIT, flags={origin_is_acl,}
  #pkts encaps: 4, #pkts encrypt: 4, #pkts digest: 4
  #pkts decaps: 4, #pkts decrypt: 4, #pkts verify: 4
  #pkts compressed: 0, #pkts decompressed: 0
  #pkts not compressed: 0, #pkts compr. failed: 0
  #pkts not decompressed: 0, #pkts decompress failed: 0
  #send errors 0, #recv errors 0

local crypto endpt.: 2001: DB8::2,
remote crypto endpt.: 2001: DB8::3
path mtu 1500, ipv6 mtu 1500, ipv6 mtu idb Ethernet0/0
current outbound spi: 0x221A7153(572158291)
PFS (Y/N): N, DH group: none

inbound esp sas:
  spi: 0x45F16A9A(1173449370)
  transform: esp-aes esp-sha-hmac ,
  in use settings ={Tunnel, }
  conn id: 305, flow_id: SW:305, sibling_flags 80000041, crypto map:
Tunnel23-head-0
  sa timing: remaining key lifetime (k/sec): (4183789/3408)
  IV size: 16 bytes
  replay detection support: Y
  Status: ACTIVE

inbound ah sas:

inbound pcp sas:

outbound esp sas:
  spi: 0x221A7153(572158291)
  transform: esp-aes esp-sha-hmac ,
  in use settings ={Tunnel, }
  conn id: 306, flow_id: SW:306, sibling_flags 80000041, crypto map:
Tunnel23-head-0
  sa timing: remaining key lifetime (k/sec): (4183790/3408)
```

```
IV size: 16 bytes
replay detection support: Y
Status: ACTIVE
```

```
R2(config-if)#do ping fe80::23:3
Output Interface: tunnel23
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to FE80::23:3, timeout is 2 seconds:
Packet sent with a source address of FE80::23:2%Tunnel23
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 8/11/20 ms
R2(config-if)#do sh crypto ipsec sa | i caps|ident
  local ident (addr/mask/prot/port): (::/0/0/0)
  remote ident (addr/mask/prot/port): (::/0/0/0)
    #pkts encaps: 9, #pkts encrypt: 9, #pkts digest: 9
    #pkts decaps: 9, #pkts decrypt: 9, #pkts verify: 9
```

隧道已启用并正在传递流量。

相关信息

- [关于IPSec的维基百科文章](#) ;标准和引用包含许多有用的信息。
- [ASA IPsec和IKE调试 \(IKEv1主动模式 \) 故障排除技术说明](#)
- [ASA IPsec和IKE调试 \(IKEv1主模式 \) 故障排除技术说明](#)
- [技术支持和文档 - Cisco Systems](#)