

配置 IPsec 路由器动态局域网到局域网对等体和 VPN 客户端

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简介

本配置将显示星型网络环境中两台路由器之间的 LAN 到 LAN 配置。Cisco VPN Client 也连接到这一中心路由器上，并使用扩展身份验证 (Xauth)。

在本方案中，分支路由器通过 DHCP 动态获得 IP 地址。分支路由器通过 DSL 或电缆调制解调器连接到 Internet 时，使用动态主机配置协议 (DHCP) 很常见。这是因为 ISP 通常使用 DHCP 为这些低成本连接动态配置 IP 地址。

如果没有进一步的配置，在这种情况下将无法在中心路由器上使用通配符预共享密钥。这是因为 VPN Client 连接的 Xauth 会断开 LAN 到 LAN 连接。但是，禁用 Xauth 将减弱对 VPN Client 进行身份验证的能力。

Cisco IOS® 软件版本 12.2(15)T 中 [ISAKMP 配置文件](#) 的引入使得这一配置成为可能，因为您可以匹配连接的其他属性（VPN Client 组、对等体 IP 地址、完全限定域名 [FQDN]，等等），而不是仅仅匹配对等体 IP 地址。ISAKMP 配置文件是本配置的对象。

注意：您也可以使用 `no-xauth` 关键字和 `crypto isakmp key` 命令绕过 LAN 到 LAN 对等体的 Xauth。有关详细信息，请参阅[禁用静态 IPsec 对等体 Xauth 的能力](#)和[在两台路由器和 Cisco VPN Client 4.x 之间配置 IPsec](#)。

本文档中的[分支路由器配置](#)可复制到与同一中心路由器相连的其他所有分支路由器上。分支之间的唯一区别是引用待加密数据流的访问列表。

请参阅[同一路由器上 EzVPN 客户端和服务器的配置示例](#)，了解更多可以在同一接口上将路由器配置

为 EzVPN 客户端和服务器的方案。

要配置 Cisco VPN 3000 集中器系列，以便在使用 DHCP 获取其公共接口 IP 地址的远程 Cisco PIX 防火墙上动态创建 IPsec 隧道，请参阅 [VPN 3000 集中器与配置为使用 DHCP 的 PIX 防火墙上的 LAN 到 LAN 隧道](#)。

要配置 VPN 3000 集中器系列，以便在接收其公共接口动态 IP 地址的远程 VPN 设备上动态创建 IPsec 隧道，请参阅 [VPN 3000 集中器与配置为使用 DHCP Cisco IOS 路由器上的 IPsec LAN 到 LAN 隧道示例](#)。

要启用 PIX/ASA 安全设备，接受来自 IOS® 路由器的动态 IPsec 连接，请参阅 [静态 IOS 路由器和使用 NAT 的动态 PIX/ASA 7.x 之间 IPsec 配置示例](#)。

先决条件

要求

本文档没有任何特定的要求。

使用的组件

IPSec 配置文档是在 Cisco IOS 软件版本 12.2(15)T 中引入的。由于 Cisco bug ID [CSCea77140](#) ([仅限注册用户](#))，您需要运行 Cisco IOS 软件版本 12.3(3) 或更高版本，或者 Cisco IOS 软件版本 12.3(2)T 或更高版本才能成功运行本配置。这些配置使用以下软件版本进行了测试：

- 中心路由器上的 Cisco IOS 软件版本 12.3(6a)
- 分支路由器上的 Cisco IOS 软件版本 12.2(23a) (可以是任何加密版本)
- Windows 2000 上的 Cisco VPN Client 版本 4.0(4)

本文档中的信息都是基于特定实验室环境中的设备编写的。本文档中使用的所有设备最初均采用原始 (默认) 配置。如果您使用的是真实网络，请确保您已经了解所有命令的潜在影响。

规则

有关文档规则的详细信息，请参阅 [Cisco 技术提示规则](#)。

配置

本部分提供有关如何配置本文档所述功能的信息。

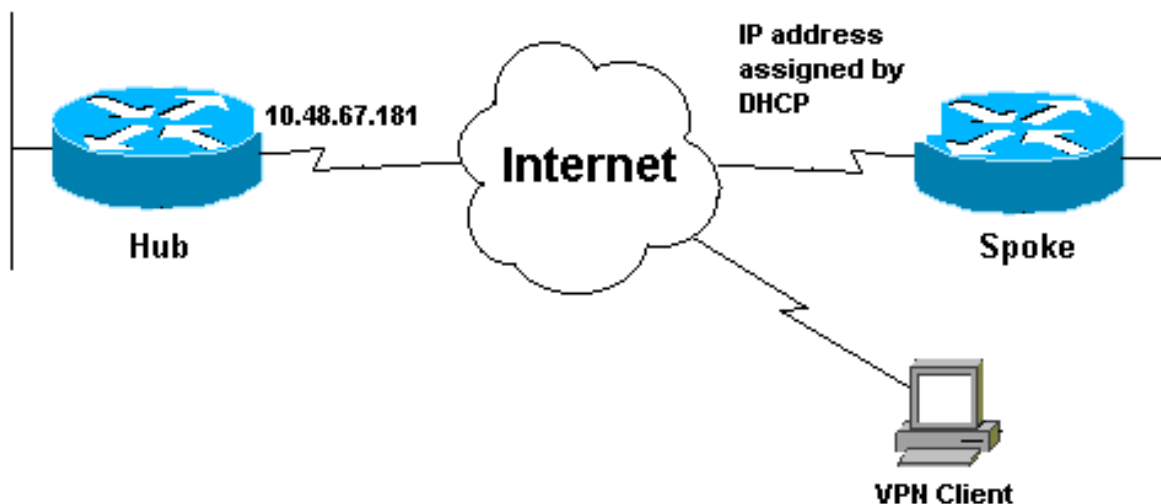
注意： 有关本文档所用命令的详细信息，请使用 [命令查找工具](#) ([仅限注册用户](#))。

网络图

本文档使用此图所示的网络设置。

10.1.1.0/24

10.2.2.0/24



配置

本文档使用以下网络设置：

- [中心配置](#)
- [分支配置](#)

中心配置

```
version 12.3
service timestamps debug datetime msec
service timestamps log datetime msec
service password-encryption
!
hostname Hub ! no logging on ! username gfullage
password 7 0201024E070A0E2649 aaa new-model ! ! aaa
authentication login clientauth local aaa authorization
network groupauthor local aaa session-id common ip
subnet-zero ! ! no ip domain lookup ! ! !--- Keyring
that defines wildcard pre-shared key. crypto keyring
spokes pre-shared-key address 0.0.0.0 0.0.0.0 key
cisco123 ! crypto isakmp policy 10 encr 3des
authentication pre-share group 2 ! !--- VPN Client
configuration for group "testgroup" !--- (this name is
configured in the VPN Client). crypto isakmp client
configuration group testgroup key cisco321 dns 1.1.1.1
2.2.2.2 wins 3.3.3.3 4.4.4.4 domain cisco.com pool
ippool ! !--- Profile for LAN-to-LAN connection, that
references !--- the wildcard pre-shared key and a
wildcard !--- identity (this is what is broken in !---
Cisco bug ID CSCea77140) and no Xauth. crypto isakmp
profile L2L description LAN-to-LAN for spoke router(s)
connection keyring spokes match identity address 0.0.0.0
!--- Profile for VPN Client connections, that matches !-
-- the "testgroup" group and defines the Xauth
properties. crypto isakmp profile VPNclient description
VPN clients profile match identity group testgroup
client authentication list clientauth isakmp
authorization list groupauthor client configuration
address respond ! ! crypto ipsec transform-set myset
esp-3des esp-sha-hmac ! !--- Two instances of the
```

```

dynamic crypto map !--- reference the two previous IPsec
profiles. crypto dynamic-map dynmap 5 set transform-set
myset set isakmp-profile VPNclient crypto dynamic-map
dynmap 10 set transform-set myset set isakmp-profile L2L
!! !--- Crypto-map only references the two !---
instances of the previous dynamic crypto map. crypto map
mymap 10 ipsec-isakmp dynamic dynmap !!! interface
FastEthernet0/0 description Outside interface ip address
10.48.67.181 255.255.255.224 no ip mroute-cache duplex
auto speed auto crypto map mymap ! interface
FastEthernet0/1 description Inside interface ip address
10.1.1.1 255.255.254.0 duplex auto speed auto no
keepalive ! ip local pool ippool 10.5.5.1 10.5.5.254 no
ip http server no ip http secure-server ip classless ip
route 0.0.0.0 0.0.0.0 10.48.66.181 !! call rsvp-sync !
! dial-peer cor custom !! line con 0 exec-timeout 0 0
escape-character 27 line aux 0 line vty 0 4 password 7
121A0C041104 !! end

```

分支配置

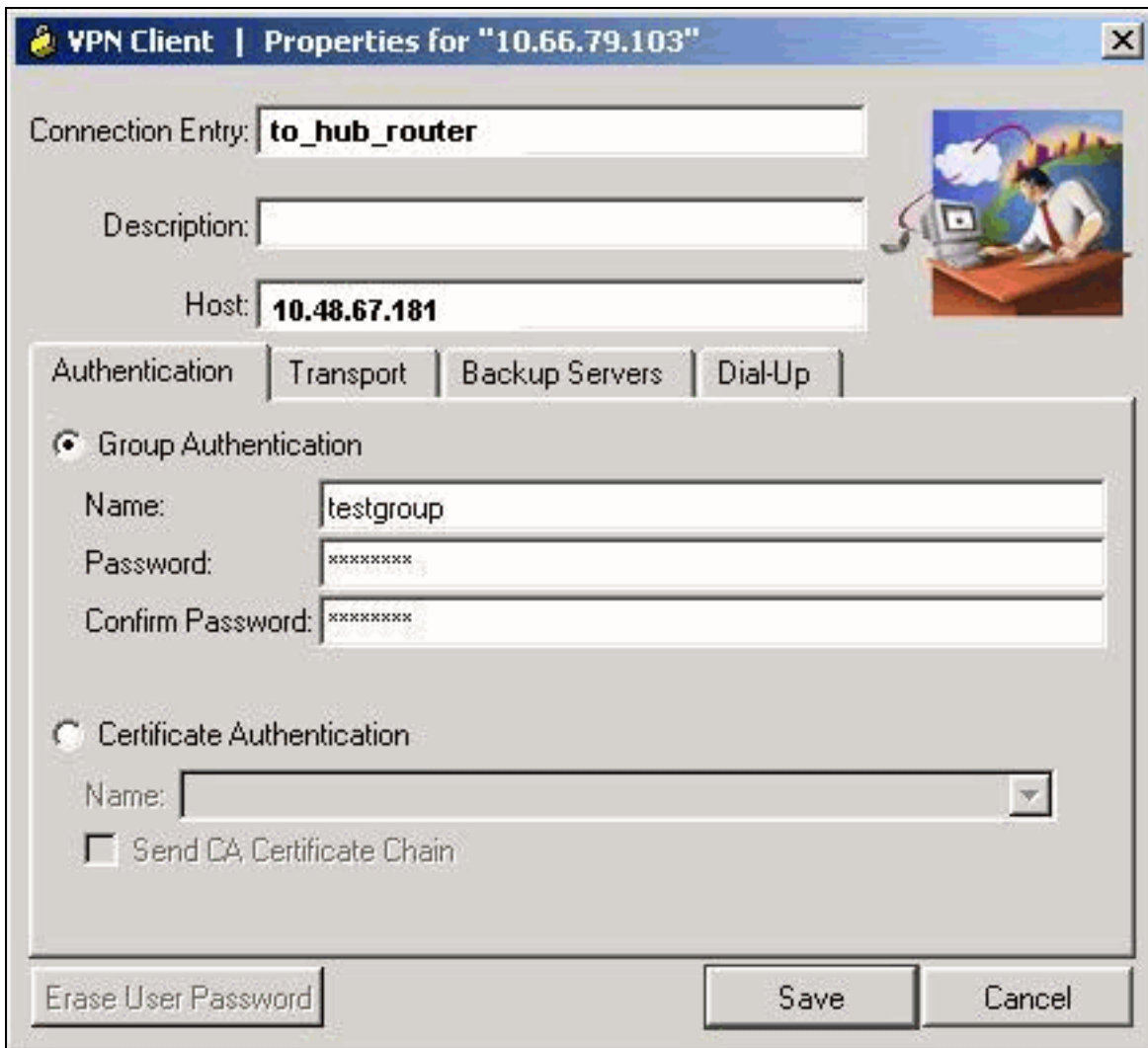
```

version 12.2
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname Spoke ! no logging on ! ip subnet-zero no ip
domain lookup ! ip cef !! crypto isakmp policy 10 encr
3des authentication pre-share group 2 crypto isakmp key
cisco123 address 10.48.67.181 !! crypto ipsec
transform-set myset esp-3des esp-sha-hmac ! !---
Standard crypto map on the spoke router !--- that
references the known hub IP address. crypto map mymap 10
ipsec-isakmp set peer 10.48.67.181 set transform-set
myset match address 100 !! controller ISA 5/1 !!
interface FastEthernet0/0 description Outside interface
ip address dhcp duplex auto speed auto crypto map mymap
! interface FastEthernet0/1 description Inside interface
ip address 10.2.2.2 255.255.255.0 duplex auto speed auto
no keepalive ! interface ATM1/0 no ip address shutdown
no atm ilmi-keepalive ! ip classless ip route 0.0.0.0
0.0.0.0 10.100.2.3 no ip http server no ip http secure-
server !! !--- Standard access-list that references
traffic to be !--- encrypted. This is the only thing
that needs !--- to be changed between different spoke
routers. access-list 100 permit ip 10.2.0.0 0.0.255.255
10.1.0.0 0.0.255.255 !! call rsvp-sync !! mgcp profile
default !! line con 0 exec-timeout 0 0 line aux 0 line
vty 0 4 password cisco login !! end

```

VPN 客户

创建一个引用中心路由器 IP 地址的新连接条目。本示例中的组名称为“testgroup”，口令为“cisco321”。该信息可在[中心路由器配置](#)中查看。



验证

使用本部分可确认配置能否正常运行。

在中心路由器上运行的调试命令可以确认分支和 VPN Client 连接的参数正确匹配。

[命令输出解释程序 \(仅限注册用户 \)](#) (OIT) 支持某些 **show** 命令。使用 OIT 可查看对 **show** 命令输出的分析。

注意： 使用 **debug** 命令之前，请参阅[有关 Debug 命令的重要信息](#)。

- **show ip interface** - 显示分配给分支路由器的 IP 地址。
- **show crypto isakmp sa detail** - 显示 IPsec 发起方之间已建立的 IKE SA。例如，分支路由器和 VPN Client 与中心路由器之间。
- **show crypto ipsec sa** - 显示 IPsec 发起方之间已建立的 IPsec SA。例如，分支路由器和 VPN Client 与中心路由器之间。
- **debug crypto isakmp** — 显示有关 Internet 密钥交换 (IKE) 事件的消息。
- **debug crypto ipsec** — 显示 IPsec 事件。
- **debug crypto engine** — 显示加密引擎事件。

以下是 **show ip interface f0/0** 命令的输出。

```
spoke#show ip interface f0/0 FastEthernet0/1 is up, line protocol is up Internet address is 10.100.2.102/24 Broadcast address is 255.255.255.255 Address determined by DHCP
```

以下是 show crypto isakmp sa detail 命令的输出。

```
hub#show crypto isakmp sa detail Codes: C - IKE configuration mode, D - Dead Peer Detection K -
Keepalives, N - NAT-traversal X - IKE Extended Authentication psk - Preshared key, rsig - RSA
signature renc - RSA encryption C-id Local Remote I-VRF Encr Hash Auth DH Lifetime Cap. 1
10.48.67.181 10.100.2.102 3des sha psk 2 04:15:43 2 10.48.67.181 10.51.82.100 3des sha 2
05:31:58 CX
```

以下是 show crypto ipsec sa 命令的输出。

```
hub#show crypto ipsec sa interface: FastEthernet0/0 Crypto map tag: mymap, local addr.
10.48.67.181 protected vrf: local ident (addr/mask/prot/port): (0.0.0.0/0.0.0.0/0/0) remote
ident (addr/mask/prot/port): (10.5.5.1/255.255.255.255/0/0) current_peer: 10.51.82.100:500
PERMIT, flags={} #pkts encaps: 8, #pkts encrypt: 8, #pkts digest 8 #pkts decaps: 189, #pkts
decrypt: 189, #pkts verify 189 #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.: 10.48.67.181, remote crypto endpt.: 10.51.82.100 path mtu
1500, ip mtu 1500 current outbound spi: B0C0F4AC inbound esp sas: spi: 0x7A1AB8F3(2048571635)
transform: esp-3des esp-sha-hmac , in use settings = {Tunnel, } slot: 0, conn id: 2004, flow_id:
5, crypto map: mymap sa timing: remaining key lifetime (k/sec): (4602415/3169) IV size: 8 bytes
replay detection support: Y inbound ah sas: inbound pcp sas: outbound esp sas: spi:
0xB0C0F4AC(2965435564) transform: esp-3des esp-sha-hmac , in use settings = {Tunnel, } slot: 0,
conn id: 2005, flow_id: 6, crypto map: mymap sa timing: remaining key lifetime (k/sec):
(4602445/3169) IV size: 8 bytes replay detection support: Y outbound ah sas: outbound pcp sas:
protected vrf: local ident (addr/mask/prot/port): (10.1.0.0/255.255.0.0/0/0) remote ident
(addr/mask/prot/port): (10.2.0.0/255.255.0.0/0/0) current_peer: 10.100.2.102:500 PERMIT,
flags={} #pkts encaps: 19, #pkts encrypt: 19, #pkts digest 19 #pkts decaps: 19, #pkts decrypt:
19, #pkts verify 19 #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.: 10.48.67.181, remote crypto endpt.: 10.100.2.102 path mtu 1500, ip
mtu 1500 current outbound spi: 5FBE5408 inbound esp sas: spi: 0x9CD7288C(2631346316) transform:
esp-3des esp-sha-hmac , in use settings = {Tunnel, } slot: 0, conn id: 2002, flow_id: 3, crypto
map: mymap sa timing: remaining key lifetime (k/sec): (4569060/2071) IV size: 8 bytes replay
detection support: Y inbound ah sas: inbound pcp sas: outbound esp sas: spi:
0x5FBE5408(1606308872) transform: esp-3des esp-sha-hmac , in use settings = {Tunnel, } slot: 0,
conn id: 2003, flow_id: 4, crypto map: mymap sa timing: remaining key lifetime (k/sec):
(4569060/2070) IV size: 8 bytes replay detection support: Y outbound ah sas: outbound pcp sas:
```

当分支路由器启动 IKE 和 IPsec SA 时，在中心路由器上收集到以下调试输出。

```
ISAKMP (0:0): received packet from 10.100.2.102 dport 500 sport 500
Global (N) NEW SA
ISAKMP: local port 500, remote port 500
ISAKMP: insert sa successfully sa = 63D5BE0C
ISAKMP (0:1): Input = IKE_MSG_FROM_PEER, IKE_MM_EXCH
ISAKMP (0:1): Old State = IKE_READY New State = IKE_R_MM1

ISAKMP (0:1): processing SA payload. message ID = 0
ISAKMP: Looking for a matching key for 10.100.2.102 in default
ISAKMP: Looking for a matching key for 10.100.2.102 in spokes : success ISAKMP (0:1): found peer
pre-shared key matching 10.100.2.102 ISAKMP (0:1) local preshared key found ISAKMP : Scanning
profiles for xauth ... L2L VPNclient ISAKMP (0:1) Authentication by xauth preshared ISAKMP
(0:1): Checking ISAKMP transform 1 against priority 10 policy ISAKMP: encryption 3DES-CBC
ISAKMP: hash SHA ISAKMP: default group 2 ISAKMP: auth pre-share ISAKMP: life type in seconds
ISAKMP: life duration (VPI) of 0x0 0x1 0x51 0x80 ISAKMP (0:1): atts are acceptable. Next payload
is 0 CryptoEngine0: generate alg parameter CRYPTO_ENGINE: Dh phase 1 status: 0 CRYPTO_ENGINE: Dh
phase 1 status: 0 ISAKMP (0:1): Input = IKE_MSG_INTERNAL, IKE_PROCESS_MAIN_MODE ISAKMP (0:1):
Old State = IKE_R_MM1 New State = IKE_R_MM1 ISAKMP (0:1): sending packet to 10.100.2.102 my_port
500 peer_port 500 (R) MM_SA_SETUP ISAKMP (0:1): Input = IKE_MSG_INTERNAL, IKE_PROCESS_COMPLETE
ISAKMP (0:1): Old State = IKE_R_MM1 New State = IKE_R_MM2 ISAKMP (0:1): received packet from
10.100.2.102 dport 500 sport 500 Global (R) MM_SA_SETUP ISAKMP (0:1): Input =
IKE_MSG_FROM_PEER, IKE_MM_EXCH ISAKMP (0:1): Old State = IKE_R_MM2 New State = IKE_R_MM3 ISAKMP
(0:1): processing KE payload. message ID = 0 CryptoEngine0: generate alg parameter ISAKMP (0:1):
processing NONCE payload. message ID = 0 ISAKMP: Looking for a matching key for 10.100.2.102 in
```

default ISAKMP: Looking for a matching key for 10.100.2.102 in spokes : success ISAKMP (0:1): found peer pre-shared key matching 10.100.2.102 CryptoEngine0: create ISAKMP SKEYID for conn id 1 ISAKMP (0:1): SKEYID state generated ISAKMP (0:1): processing vendor id payload ISAKMP (0:1): speaking to another IOS box! ISAKMP (0:1): Input = IKE_MSG_INTERNAL, IKE_PROCESS_MAIN_MODE ISAKMP (0:1): Old State = IKE_R_MM3 New State = IKE_R_MM3 ISAKMP (0:1): sending packet to 10.100.2.102 my_port 500 peer_port 500 (R) MM_KEY_EXCH ISAKMP (0:1): Input = IKE_MSG_INTERNAL, IKE_PROCESS_COMPLETE ISAKMP (0:1): Old State = IKE_R_MM3 New State = IKE_R_MM4 ISAKMP (0:1): received packet from 10.100.2.102 dport 500 sport 500 Global (R) MM_KEY_EXCH ISAKMP (0:1): Input = IKE_MSG_FROM_PEER, IKE_MM_EXCH ISAKMP (0:1): Old State = IKE_R_MM4 New State = IKE_R_MM5 ISAKMP (0:1): processing ID payload. message ID = 0 ISAKMP (0:1): ID payload next-payload : 8 type : 1 address : 10.100.2.102 protocol : 17 port : 500 length : 12 **ISAKMP (0:1): peer matches L2L profile** ISAKMP: Looking for a matching key for 10.100.2.102 in default ISAKMP: Looking for a matching key for 10.100.2.102 in spokes : success **ISAKMP (0:1): Found ADDRESS key in keyring spokes** ISAKMP (0:1): processing HASH payload. message ID = 0 CryptoEngine0: generate hmac context for conn id 1 **ISAKMP (0:1): SA authentication status: authenticated ISAKMP (0:1): SA has been authenticated with 10.100.2.102** ISAKMP (0:1): Input = IKE_MSG_INTERNAL, IKE_PROCESS_MAIN_MODE ISAKMP (0:1): Old State = IKE_R_MM5 New State = IKE_R_MM5 ISAKMP (0:1): SA is doing pre-shared key authentication using id type ID_IPV4_ADDR ISAKMP (0:1): ID payload next-payload : 8 type : 1 address : 10.48.67.181 protocol : 17 port : 500 length : 12 ISAKMP (1): Total payload length: 12 CryptoEngine0: generate hmac context for conn id 1 CryptoEngine0: clear dh number for conn id 1 ISAKMP (0:1): sending packet to 10.100.2.102 my_port 500 peer_port 500 (R) MM_KEY_EXCH ISAKMP (0:1): Input = IKE_MSG_INTERNAL, IKE_PROCESS_COMPLETE ISAKMP (0:1): Old State = IKE_R_MM5 New State = IKE_P1_COMPLETE ISAKMP (0:1): Input = IKE_MSG_INTERNAL, IKE_PHASE1_COMPLETE ISAKMP (0:1): Old State = IKE_P1_COMPLETE New State = IKE_P1_COMPLETE **!--- IKE phase 1 is complete.** ISAKMP (0:1): received packet from 10.100.2.102 dport 500 sport 500 Global (R) QM_IDLE ISAKMP: set new node 904613356 to QM_IDLE CryptoEngine0: generate hmac context for conn id 1 ISAKMP (0:1): processing HASH payload. message ID = 904613356 ISAKMP (0:1): processing SA payload. message ID = 904613356 ISAKMP (0:1): Checking IPsec proposal 1 ISAKMP: transform 1, ESP_3DES ISAKMP: attributes in transform: ISAKMP: encaps is 1 (Tunnel) ISAKMP: SA life type in seconds ISAKMP: SA life duration (basic) of 3600 ISAKMP: SA life type in kilobytes ISAKMP: SA life duration (VPI) of 0x0 0x46 0x50 0x0 ISAKMP: authenticator is HMAC-SHA CryptoEngine0: validate proposal **ISAKMP (0:1): atts are acceptable.** IPSEC(validate_proposal_request): proposal part #1, (key eng. msg.) INBOUND local= 10.48.67.181, remote= 10.100.2.102, **local_proxy= 10.1.0.0/255.255.0.0/0/0 (type=4), remote_proxy= 10.2.0.0/255.255.0.0/0/0 (type=4), protocol= ESP, transform= esp-3des esp-sha-hmac (Tunnel),** lifedur= 0s and 0kb, spi= 0x0(0), conn_id= 0, keysize= 0, flags= 0x2 CryptoEngine0: validate proposal request IPSEC(kei_proxy): head = mymap, map->ivrf = , kei->ivrf = IPSEC(kei_proxy): head = mymap, map->ivrf = , kei->ivrf = ISAKMP (0:1): processing NONCE payload. message ID = 904613356 ISAKMP (0:1): processing ID payload. message ID = 904613356 ISAKMP (0:1): processing ID payload. message ID = 904613356 ISAKMP (0:1): asking for 1 spis from ipsec ISAKMP (0:1): Node 904613356, Input = IKE_MSG_FROM_PEER, IKE_QM_EXCH ISAKMP (0:1): Old State = IKE_QM_READY New State = IKE_QM_SPI_STARVE IPSEC(key_engine): got a queue event... IPSEC(spi_response): **getting spi 4172528328 for SA from 10.48.67.181 to 10.100.2.102 for prot 3** ISAKMP: received ke message (2/1) CryptoEngine0: generate hmac context for conn id 1 ISAKMP (0:1): sending packet to 10.100.2.102 my_port 500 peer_port 500 (R) QM_IDLE ISAKMP (0:1): Node 904613356, Input = IKE_MSG_FROM_IPSEC, IKE_SPI_REPLY ISAKMP (0:1): Old State = IKE_QM_SPI_STARVE New State = IKE_QM_R_QM2 ISAKMP (0:1): received packet from 10.100.2.102 dport 500 sport 500 Global (R) QM_IDLE CryptoEngine0: generate hmac context for conn id 1 CryptoEngine0: ipsec allocate flow CryptoEngine0: ipsec allocate flow **ISAKMP (0:1): Creating IPsec SAs inbound SA from 10.100.2.102 to 10.48.67.181 (f/i) 0/ 0 (proxy 10.2.0.0 to 10.1.0.0) has spi 0xF8B3BAC8 and conn_id 2000 and flags 2 lifetime of 3600 seconds lifetime of 4608000 kilobytes has client flags 0x0 outbound SA from 10.48.67.181 to 10.100.2.102 (f/i) 0/ 0 (proxy 10.1.0.0 to 10.2.0.0) has spi 1757151497 and conn_id 2001 and flags A lifetime of 3600 seconds lifetime of 4608000 kilobytes has client flags 0x0** ISAKMP (0:1): deleting node 904613356 error FALSE reason "quick mode done (await)" ISAKMP (0:1): Node 904613356, Input = IKE_MSG_FROM_PEER, IKE_QM_EXCH ISAKMP (0:1): Old State = IKE_QM_R_QM2 New State = IKE_QM_PHASE2_COMPLETE IPSEC(key_engine): got a queue event... IPSEC(initialize_sas): , (key eng. msg.) INBOUND local= 10.48.67.181, remote= 10.100.2.102, **local_proxy= 10.1.0.0/255.255.0.0/0/0 (type=4), remote_proxy= 10.2.0.0/255.255.0.0/0/0 (type=4), protocol= ESP, transform= esp-3des esp-sha-hmac (Tunnel), lifedur= 3600s and 4608000kb, spi= 0xF8B3BAC8(4172528328), conn_id= 2000, keysize= 0, flags= 0x2** IPSEC(initialize_sas): , (key eng. msg.) OUTBOUND local= 10.48.67.181, remote= 10.100.2.102, **local_proxy= 10.1.0.0/255.255.0.0/0/0 (type=4), remote_proxy= 10.2.0.0/255.255.0.0/0/0 (type=4), protocol= ESP, transform= esp-3des esp-sha-hmac (Tunnel), lifedur= 3600s and 4608000kb, spi= 0x68BC0109(1757151497), conn_id= 2001, keysize= 0, flags= 0xA** IPSEC(kei_proxy): head = mymap, map->ivrf = , kei->ivrf =

```
IPSEC(kei_proxy): head = mymap, map->ivrf = , kei->ivrf = IPSEC(add mtree): src 10.1.0.0, dest
10.2.0.0, dest_port 0 IPSEC(create_sa): sa created, (sa) sa_dest= 10.48.67.181, sa_prot= 50,
sa_spi= 0xF8B3BAC8(4172528328), sa_trans= esp-3des esp-sha-hmac , sa_conn_id= 2000
IPSEC(create_sa): sa created, (sa) sa_dest= 10.100.2.102, sa_prot= 50, sa_spi=
0x68BC0109(1757151497), sa_trans= esp-3des esp-sha-hmac , sa_conn_id= 2001
```

当 VPN Client 启动 IKE 和 IPsec SA 时，在中心路由器上收集到以下调试输出。

```
ISAKMP (0:0): received packet from 10.51.82.100 dport 500 sport 500 Global
(N) NEW SA
ISAKMP: local port 500, remote port 500
ISAKMP: insert sa successfully sa = 63D3D804
ISAKMP (0:2): processing SA payload. message ID = 0
ISAKMP (0:2): processing ID payload. message ID = 0
ISAKMP (0:2): ID payload
next-payload : 13
type : 11
group id : testgroup
protocol : 17
port : 500
length : 17
ISAKMP (0:2): peer matches VPNclient profile ISAKMP: Looking for a matching key for 10.51.82.100
in default ISAKMP: Looking for a matching key for 10.51.82.100 in spokes : success ISAKMP:
Created a peer struct for 10.51.82.100, peer port 500 ISAKMP: Locking peer struct 0x644AFC7C,
IKE refcount 1 for crypto_ikmp_config_initialize_sa ISAKMP (0:2): Setting client config settings
644AFCF8 ISAKMP (0:2): (Re)Setting client xauth list and state ISAKMP (0:2): processing vendor
id payload ISAKMP (0:2): vendor ID seems Unity/DPD but major 215 mismatch ISAKMP (0:2): vendor
ID is Xauth ISAKMP (0:2): processing vendor id payload ISAKMP (0:2): vendor ID is DPD ISAKMP
(0:2): processing vendor id payload ISAKMP (0:2): vendor ID seems Unity/DPD but major 123
mismatch ISAKMP (0:2): vendor ID is NAT-T v2 ISAKMP (0:2): processing vendor id payload ISAKMP
(0:2): vendor ID seems Unity/DPD but major 194 mismatch ISAKMP (0:2): processing vendor id
payload ISAKMP (0:2): vendor ID is Unity ISAKMP (0:2) Authentication by xauth preshared !---
Check of ISAKMP transforms against the configured ISAKMP policy. ISAKMP (0:2): Checking ISAKMP
transform 9 against priority 10 policy ISAKMP: encryption 3DES-CBC ISAKMP: hash SHA ISAKMP:
default group 2 ISAKMP: auth XAUTHInitPreShared ISAKMP: life type in seconds ISAKMP: life
duration (VPI) of 0x0 0x20 0xC4 0x9B ISAKMP (0:2): atts are acceptable. Next payload is 3
CryptoEngine0: generate alg parameter CRYPTO_ENGINE: Dh phase 1 status: 0 CRYPTO_ENGINE: Dh
phase 1 status: 0 ISAKMP (0:2): processing KE payload. message ID = 0 CryptoEngine0: generate
alg parameter ISAKMP (0:2): processing NONCE payload. message ID = 0 ISAKMP (0:2): vendor ID is
NAT-T v2 ISAKMP (0:2): Input = IKE_MSG_FROM_PEER, IKE_AM_EXCH ISAKMP (0:2): Old State =
IKE_READY New State = IKE_R_AM_AAA_AWAIT ISAKMP: got callback 1 CryptoEngine0: create ISAKMP
SKEYID for conn id 2 ISAKMP (0:2): SKEYID state generated ISAKMP (0:2): constructed NAT-T
vendor-02 ID ISAKMP (0:2): SA is doing pre-shared key authentication plus XAUTH using id type
ID_IPV4_ADDR ISAKMP (0:2): ID payload next-payload : 10 type : 1 address : 10.48.67.181 protocol
: 17 port : 0 length : 12 ISAKMP (2): Total payload length: 12 CryptoEngine0: generate hmac
context for conn id 2 ISAKMP (0:2): sending packet to 10.51.82.100 my_port 500 peer_port 500 (R)
AG_INIT_EXCH ISAKMP (0:2): Input = IKE_MSG_FROM_AAA, PRESHARED_KEY_REPLY ISAKMP (0:2): Old
State = IKE_R_AM_AAA_AWAIT New State = IKE_R_AM2 ISAKMP (0:2): received packet from 10.51.82.100
dport 500 sport 500 Global (R) AG_INIT_EXCH ISAKMP (0:2): processing HASH payload. message ID =
0 CryptoEngine0: generate hmac context for conn id 2 ISAKMP (0:2): processing NOTIFY
INITIAL_CONTACT protocol 1 spi 0, message ID = 0, sa = 63D3D804 ISAKMP (0:2): SA authentication
status: authenticated ISAKMP (0:2): Process initial contact, bring down existing phase 1 and 2
SA's with local 10.48.67.181 remote 10.51.82.100 remote port 500 ISAKMP (0:2): returning IP addr
to the address pool IPSEC(key_engine): got a queue event... ISAKMP:received payload type 17
ISAKMP:received payload type 17 ISAKMP (0:2): SA authentication status: authenticated ISAKMP
(0:2): SA has been authenticated with 10.51.82.100 CryptoEngine0: clear dh number for conn id 1
ISAKMP: Trying to insert a peer 10.48.67.181/10.51.82.100/500/, and inserted successfully.
ISAKMP: set new node 1257790711 to CONF_XAUTH CryptoEngine0: generate hmac context for conn id 2
ISAKMP (0:2): sending packet to 10.51.82.100 my_port 500 peer_port 500 (R) QM_IDLE ISAKMP (0:2):
purging node 1257790711 ISAKMP: Sending phase 1 responder lifetime 86400 ISAKMP (0:2): Input =
IKE_MSG_FROM_PEER, IKE_AM_EXCH ISAKMP (0:2): Old State = IKE_R_AM2 New State = IKE_P1_COMPLETE
ISAKMP (0:2): Need XAUTH ISAKMP (0:2): Input = IKE_MSG_INTERNAL, IKE_PHASE1_COMPLETE ISAKMP
(0:2): Old State = IKE_P1_COMPLETE New State = IKE_XAUTH_AAA_START_LOGIN_AWAIT ISAKMP: got
callback 1 ISAKMP: set new node 955647754 to CONF_XAUTH !--- Extended authentication begins.
```


ISAKMP/xauth: request attribute XAUTH_USER_NAME_V2 ISAKMP/xauth: request attribute XAUTH_USER_PASSWORD_V2 CryptoEngine0: generate hmac context for conn id 2 ISAKMP (0:2): initiating peer config to 10.51.82.100. ID = 955647754 ISAKMP (0:2): sending packet to 10.51.82.100 my_port 500 peer_port 500 (R) CONF_XAUTH ISAKMP (0:2): Input = IKE_MESG_FROM_AAA, IKE_AAA_START_LOGIN ISAKMP (0:2): Old State = IKE_XAUTH_AAA_START_LOGIN_AWAIT New State = IKE_XAUTH_REQ_SENT ISAKMP (0:2): received packet from 10.51.82.100 dport 500 sport 500 Global (R) CONF_XAUTH ISAKMP (0:2): processing transaction payload from 10.51.82.100. message ID = 955647754 CryptoEngine0: generate hmac context for conn id 2 ISAKMP: Config payload REPLY *!--- Username/password received from the VPN Client.* **ISAKMP/xauth: reply attribute XAUTH_USER_NAME_V2 ISAKMP/xauth: reply attribute XAUTH_USER_PASSWORD_V2** ISAKMP (0:2): deleting node 955647754 error FALSE reason "done with xauth request/reply exchange" ISAKMP (0:2): Input = IKE_MESG_FROM_PEER, IKE_CFG_REPLY ISAKMP (0:2): Old State = IKE_XAUTH_REQ_SENT New State = IKE_XAUTH_AAA_CONT_LOGIN_AWAIT ISAKMP: got callback 1 ISAKMP: set new node -1118110738 to CONF_XAUTH CryptoEngine0: generate hmac context for conn id 2 ISAKMP (0:2): initiating peer config to 10.51.82.100. ID = -1118110738 ISAKMP (0:2): sending packet to 10.51.82.100 my_port 500 peer_port 500 (R) CONF_XAUTH ISAKMP (0:2): Input = IKE_MESG_FROM_AAA, IKE_AAA_CONT_LOGIN ISAKMP (0:2): Old State = IKE_XAUTH_AAA_CONT_LOGIN_AWAIT New State = IKE_XAUTH_SET_SENT ISAKMP (0:2): received packet from 10.51.82.100 dport 500 sport 500 Global (R) CONF_XAUTH ISAKMP (0:2): processing transaction payload from 10.51.82.100. message ID = -1118110738 CryptoEngine0: generate hmac context for conn id 2 *!--- Success* ISAKMP: Config payload ACK **ISAKMP (0:2): XAUTH ACK Processed** ISAKMP (0:2): deleting node -1118110738 error FALSE reason "done with transaction" ISAKMP (0:2): Input = IKE_MESG_FROM_PEER, IKE_CFG_ACK ISAKMP (0:2): Old State = IKE_XAUTH_SET_SENT New State = IKE_P1_COMPLETE ISAKMP (0:2): Input = IKE_MESG_INTERNAL, IKE_PHASE1_COMPLETE ISAKMP (0:2): Old State = IKE_P1_COMPLETE New State = IKE_P1_COMPLETE ISAKMP (0:2): received packet from 10.51.82.100 dport 500 sport 500 Global (R) QM_IDLE ISAKMP: set new node -798495444 to QM_IDLE ISAKMP (0:2): processing transaction payload from 10.51.82.100. message ID = -798495444 CryptoEngine0: generate hmac context for conn id 2 ISAKMP: Config payload REQUEST ISAKMP (0:2): checking request: ISAKMP: IP4_ADDRESS ISAKMP: IP4_NETMASK ISAKMP: IP4_DNS ISAKMP: IP4_NBNS ISAKMP: ADDRESS_EXPIRY ISAKMP: UNKNOWN Unknown Attr: 0x7000 ISAKMP: UNKNOWN Unknown Attr: 0x7001 ISAKMP: DEFAULT_DOMAIN ISAKMP: SPLIT_INCLUDE ISAKMP: UNKNOWN Unknown Attr: 0x7003 ISAKMP: UNKNOWN Unknown Attr: 0x7007 ISAKMP: UNKNOWN Unknown Attr: 0x7009 ISAKMP: APPLICATION_VERSION ISAKMP: UNKNOWN Unknown Attr: 0x7008 ISAKMP: UNKNOWN Unknown Attr: 0x700A ISAKMP: UNKNOWN Unknown Attr: 0x7005 ISAKMP (0:2): Input = IKE_MESG_FROM_PEER, IKE_CFG_REQUEST ISAKMP (0:2): Old State = IKE_P1_COMPLETE New State = IKE_CONFIG_AUTHOR_AAA_AWAIT ISAKMP: got callback 1 ISAKMP (0:2): attributes sent in message: Address: 0.2.0.0 **ISAKMP (0:2): allocating address 10.5.5.1 ISAKMP: Sending private address: 10.5.5.1 ISAKMP: Sending IP4_DNS server address: 1.1.1.1 ISAKMP: Sending IP4_DNS server address: 2.2.2.2 ISAKMP: Sending IP4_NBNS server address: 3.3.3.3 ISAKMP: Sending IP4_NBNS server address: 4.4.4.4** ISAKMP: Sending ADDRESS_EXPIRY seconds left to use the address: 86386 ISAKMP (0/2): Unknown Attr: UNKNOWN (0x7000) ISAKMP (0/2): Unknown Attr: UNKNOWN (0x7001) ISAKMP: Sending DEFAULT_DOMAIN default domain name: cisco.com ISAKMP (0/2): Unknown Attr: UNKNOWN (0x7003) ISAKMP (0/2): Unknown Attr: UNKNOWN (0x7007) ISAKMP (0/2): Unknown Attr: UNKNOWN (0x7009) ISAKMP: Sending APPLICATION_VERSION string: Cisco Internetwork Operating System Software IOS (tm) 7200 Software (C7200-IK9S-M), Version 12.3(6a), RELEASE SOFTWARE (fc4) Copyright (c) 1986-2004 by cisco Systems, Inc. Compiled Fri 02-Apr-04 15:52 by kellythw ISAKMP (0/2): Unknown Attr: UNKNOWN (0x7008) ISAKMP (0/2): Unknown Attr: UNKNOWN (0x700A) ISAKMP (0/2): Unknown Attr: UNKNOWN (0x7005) CryptoEngine0: generate hmac context for conn id 2 ISAKMP (0:2): responding to peer config from 10.51.82.100. ID = -798495444 ISAKMP (0:2): sending packet to 10.51.82.100 my_port 500 peer_port 500 (R) CONF_ADDR ISAKMP (0:2): deleting node -798495444 error FALSE reason "" ISAKMP (0:2): Input = IKE_MESG_FROM_AAA, IKE_AAA_GROUP_ATTR ISAKMP (0:2): Old State = IKE_CONFIG_AUTHOR_AAA_AWAIT New State = IKE_P1_COMPLETE ISAKMP (0:2): Input = IKE_MESG_INTERNAL, IKE_PHASE1_COMPLETE ISAKMP (0:2): Old State = IKE_P1_COMPLETE New State = IKE_P1_COMPLETE *!--- IKE phase 1 and Config Mode complete. !--- Check of IPsec proposals against configured transform set(s).* ISAKMP (0:2): Checking IPsec proposal 12 ISAKMP: transform 1, ESP_3DES ISAKMP: attributes in transform: ISAKMP: authenticator is HMAC-SHA ISAKMP: encaps is 1 (Tunnel) ISAKMP: SA life type in seconds ISAKMP: SA life duration (VPI) of 0x0 0x20 0xC4 0x9B CryptoEngine0: validate proposal ISAKMP (0:2): atts are acceptable. IPSEC(validate_proposal_request): proposal part #1, (key eng. msg.) INBOUND local= 10.48.67.181, remote= 10.51.82.100, local_proxy= 0.0.0.0/0.0.0.0/0/0 (type=4), remote_proxy= 10.5.5.1/255.255.255.255/0/0 (type=1), protocol= ESP, transform= esp-3des esp-sha-hmac (Tunnel), lifedur= 0s and 0kb, spi= 0x0(0), conn_id= 0, keysize= 0, flags= 0x2 CryptoEngine0: validate proposal request IPSEC(kei_proxy): head = mymap, map->ivrf = , kei->ivrf = IPSEC(kei_proxy): head = mymap, map->ivrf = , kei->ivrf = ISAKMP (0:2): processing NONCE payload. message ID = 381726614 ISAKMP (0:2): processing ID payload. message ID = 381726614 ISAKMP (0:2): processing

```
ID payload. message ID = 381726614 ISAKMP (0:2): asking for 1 spis from ipsec ISAKMP (0:2): Node
381726614, Input = IKE_MSG_FROM_PEER, IKE_QM_EXCH ISAKMP (0:2): Old State = IKE_QM_READY New
State = IKE_QM_SPI_STARVE IPSEC(key_engine): got a queue event... IPSEC(spi_response): getting
spi 2048571635 for SA from 10.48.67.181 to 10.51.82.100 for prot 3 ISAKMP: received ke message
(2/1) CryptoEngine0: generate hmac context for conn id 2 ISAKMP (0:2): sending packet to
10.51.82.100 my_port 500 peer_port 500 (R) QM_IDLE ISAKMP (0:2): Node 381726614, Input =
IKE_MSG_FROM_IPSEC, IKE_SPI_REPLY ISAKMP (0:2): Old State = IKE_QM_SPI_STARVE New State =
IKE_QM_R_QM2 ISAKMP (0:2): received packet from 10.51.82.100 dport 500 sport 500 Global (R)
QM_IDLE CryptoEngine0: generate hmac context for conn id 2 CryptoEngine0: ipsec allocate flow
CryptoEngine0: ipsec allocate flow ISAKMP: Locking peer struct 0x644AFC7C, IPSEC refcount 1 for
for stuff_ke ISAKMP (0:2): Creating IPsec SAs inbound SA from 10.51.82.100 to 10.48.67.181 (f/i)
0/ 0 (proxy 10.5.5.1 to 0.0.0.0) has spi 0x7A1AB8F3 and conn_id 2004 and flags 2 lifetime of
2147483 seconds has client flags 0x0 outbound SA from 10.48.67.181 to 10.51.82.100 (f/i) 0/ 0
(proxy 0.0.0.0 to 10.5.5.1 ) has spi -1329531732 and conn_id 2005 and flags A lifetime of
2147483 seconds has client flags 0x0 ISAKMP (0:2): deleting node 381726614 error FALSE reason
"quick mode done (await)" ISAKMP (0:2): Node 381726614, Input = IKE_MSG_FROM_PEER, IKE_QM_EXCH
ISAKMP (0:2): Old State = IKE_QM_R_QM2 New State = IKE_QM_PHASE2_COMPLETE IPSEC(key_engine): got
a queue event... IPSEC(initialize_sas): , (key eng. msg.) INBOUND local= 10.48.67.181, remote=
10.51.82.100, local_proxy= 0.0.0.0/0.0.0.0/0/0 (type=4), remote_proxy= 10.5.5.1/0.0.0.0/0/0
(type=1), protocol= ESP, transform= esp-3des esp-sha-hmac (Tunnel), lifedur= 2147483s and 0kb,
spi= 0x7A1AB8F3(2048571635), conn_id= 2004, keysize= 0, flags= 0x2 IPSEC(initialize_sas): , (key
eng. msg.) OUTBOUND local= 10.48.67.181, remote= 10.51.82.100, local_proxy= 0.0.0.0/0.0.0.0/0/0
(type=4), remote_proxy= 10.5.5.1/0.0.0.0/0/0 (type=1), protocol= ESP, transform= esp-3des esp-
sha-hmac (Tunnel), lifedur= 2147483s and 0kb, spi= 0xB0C0F4AC(2965435564), conn_id= 2005,
keysize= 0, flags= 0xA IPSEC(kei_proxy): head = mymap, map->ivrf = , kei->ivrf =
IPSEC(kei_proxy): head = mymap, map->ivrf = , kei->ivrf = IPSEC(addmtree): src 0.0.0.0, dest
10.5.5.1, dest_port 0 IPSEC(create_sa): sa created, (sa) sa_dest= 10.48.67.181, sa_prot= 50,
sa_spi= 0x7A1AB8F3(2048571635), sa_trans= esp-3des esp-sha-hmac , sa_conn_id= 2004
IPSEC(create_sa): sa created, (sa) sa_dest= 10.51.82.100, sa_prot= 50, sa_spi=
0xB0C0F4AC(2965435564), sa_trans= esp-3des esp-sha-hmac , sa_conn_id= 2005
```

[验证加密映射序列号](#)

如果在同一加密映射中配置了静态和动态对等体，则加密映射条目的顺序非常重要。动态加密映射条目的序列号**必须**高于其他所有静态加密映射条目。如果静态条目编号高于动态条目，则与这些对等体的连接将发生故障。

以下是一个正确编号的加密映射示例，其中包含一个静态条目和一个动态条目。请注意，动态条目具有最高的序列号，并且已留下空间以便添加其他静态条目：

```
crypto dynamic-map dynmap 20
set transform-set myset
crypto map mymap 10 ipsec-isakmp
match address 100
set peer 172.16.77.10
set transform-set myset
crypto map mymap 60000 ipsec-isakmp dynamic dynmap
```

[故障排除](#)

目前没有针对此配置的故障排除信息。

[相关信息](#)

- [IPSec 配置文件配置](#)
- [Cisco IOS 软件版本 12.2\(15\)T 新功能](#)
- [IPsec 协商/IKE 协议支持页](#)
- [技术支持和文档 - Cisco Systems](#)