CHAPTER 10

Home Agent Security

Security

This chapter discusses the concepts that comprise the Security features in Cisco IOS Mobile Wireless Home Agent software.

This chapter includes the following sections:

3 DES Encryption

The Cisco Home Agent includes 3DES encryption, which supports IPSec on the HA. On the Cisco 7600 platform, the SAMI utilizes the Cisco VPN-SPA IPSec Acceleration Card.

The HA requires you to configure the parameters for each PDSN before a mobile IP data traffic tunnel is established between the PDSN and the HA.

Note This feature is only available with hardware support.

Note This feature is only available on Cisco 7200 and 7301 Router platforms.

Mobile IP IPSec

The Internet Engineering Task Force (IETF) has developed a framework of open standards called IP Security (IPSec) that provides data confidentiality, data integrity, and data authentication between participating peers. IPSec provides these security services at the IP layer; it 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.

The HA uses any statically configured shared secret(s) when processing authentication extension(s) present in mobile IP registration messages.

The HA supports IPSec, IKE, Authentication Header (AH) and IP Encapsulating Security Payload (ESP) as required in IS-835-B.

IS835-B specifies three mechanisms for providing IPSec security:

- Certificates
- Dynamically distributed pre-shared secret
- Statically configured pre-shared secret.

Note The Cisco IOS IPSec feature is available on the Cisco 7600 switch platform. The HA 2.0 (and above) Release only supports statically configured, pre-shared secret for IPSec IKE.

As per IS-835-B, The HA and AAA should be configured with same security level for a PDSN. The PDSN receives a security level from AAA server and initiates IKE, and the HA responds to IKE request for establishing security policy.

The PDSN receives a security level from the AAA server and initiates IKE, and the HA responds to IKE request for establishing a security policy. All traffic specified by the access-list of the crypto configuration will be protected by IPSec tunnel. The access-list will be configured to protect all traffic between the PDSN and HA, and all bindings belonging to a given PDSN-HA pair will be protected.

IPSec is not applicable to mobiles using Co-located COA

Note The Cisco Home Agent Release 2.0 (and above) on the Cisco 7600 platform requires the support of the Cisco IPSec Services Module (VPN-SPA), a blade that runs on the Catalyst 7600 router. VPN-SPA does not have any physical WAN or LAN interfaces, and utilizes VLAN selectors for its VPN policy. For more information on the Cisco 7600 Internet Router visit: http://www.cisco.com/en/US/products/hw/routers/ps368/prod_installation_guides_list.html.

IPSec-based security may be applied on tunnels between the PDSN and the HA depending on parameters received from Home AAA server. A single tunnel may be established between each PDSN-HA pair. It is possible for a single tunnel between the PDSN-HA pair to have three types of traffic streams: Control Messages, Data with IP-in-IP encapsulation, and Data with GRE-in-IP encapsulation. All traffic carried in the tunnel will have same level of protection provided by IPSec.

IS835 defines MobileIP service as described in RFC 2002; the Cisco HA provides Mobile IP service and Proxy Mobile IP service.

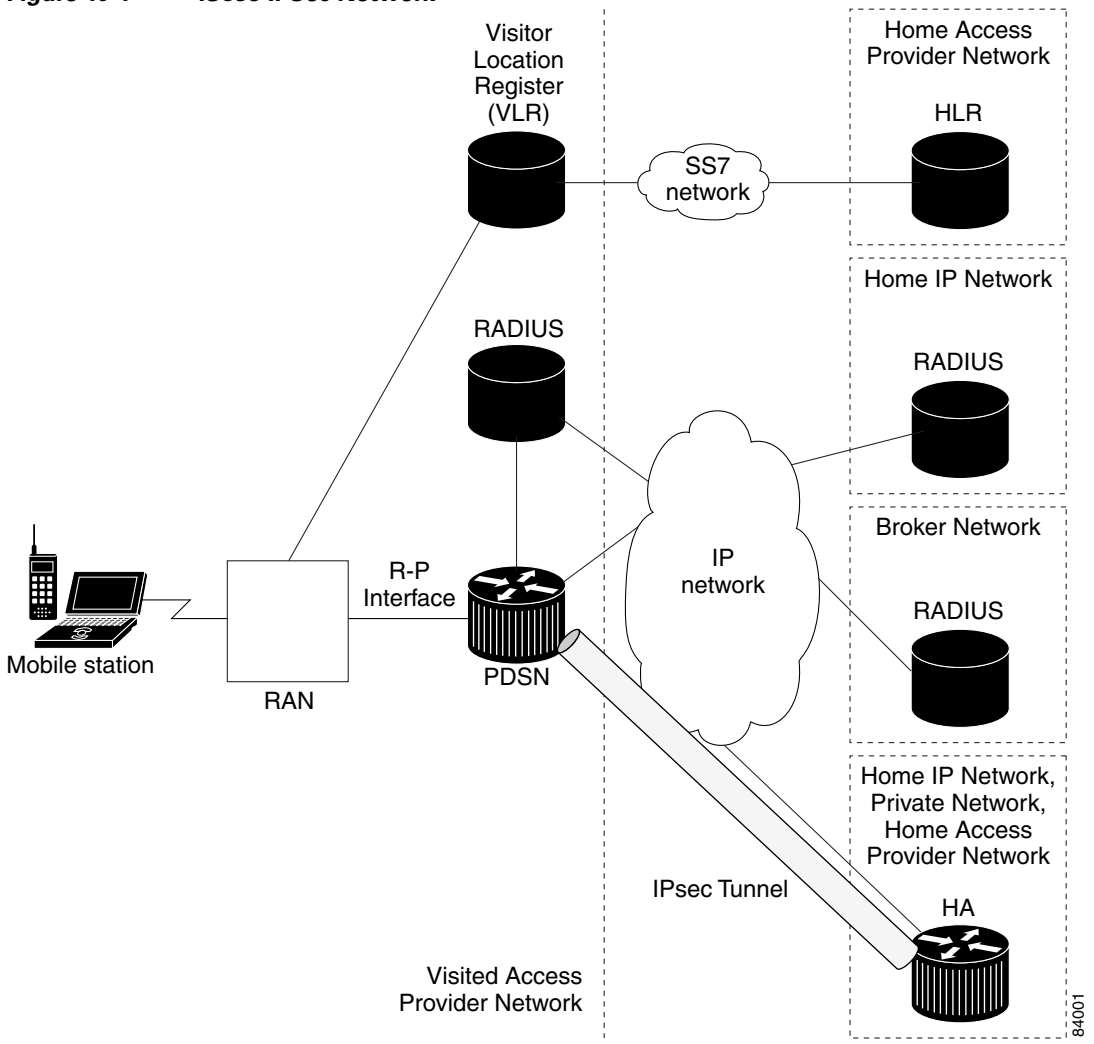
In Proxy Mobile service, the Mobile-Node is connected to the PDSN/FA through Simple IP, and the PDSN/FA acts as Mobile IP Proxy for the MN to the HA.

Once Security Associations (SAs or tunnels) are established, they remain active until there is traffic on the tunnel, or the lifetime of the SAs expire.

Note IPSec does not work with HA redundancy, since the IPSec security associations are not replicated to the standby during failover.

Figure 10-1 illustrates the IS835 IPSec network topology.

Figure 10-1 IS835 IPSec Network



IPSec Interoperability Between the PDSN and HA (IS-835-C)

IPSec rules under IS-835C mandates that connections are always initiated from the PDSN to the Home Agent IP address. Certain PDSNs may not be flexible in their approach to IPSec configuration. These PDSNs do not allow any configuration for Remote IPSec termination points, and hence expect that the remote IPSec termination point is always the Home Agent IP address.

The following section illustrates how to handle IPSec Interoperability between such PDSNs and the HA with Home Agent Release 2.0 and above.

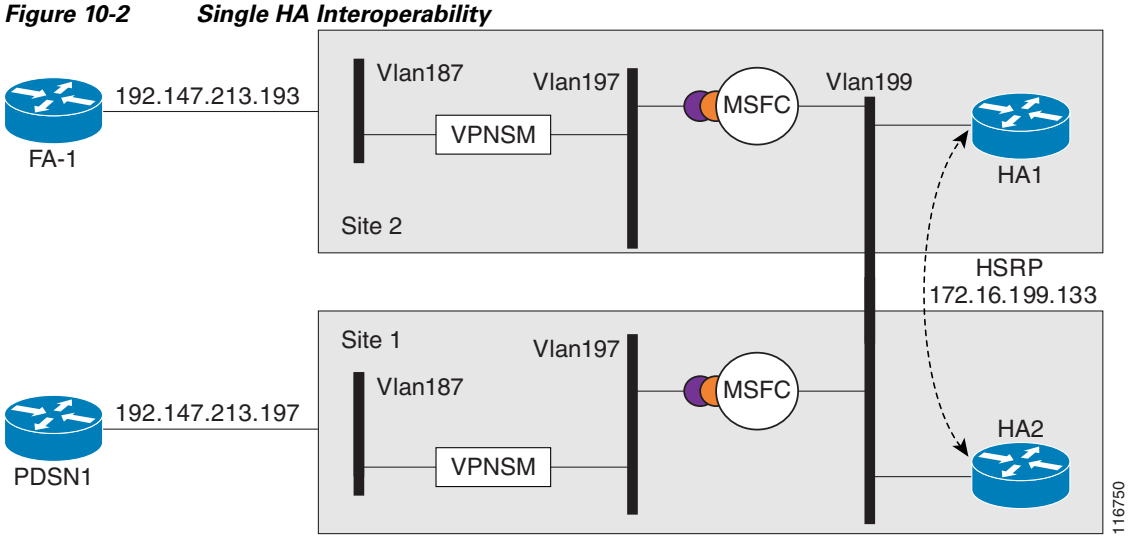
The change in the configuration allows for IPSec connections for the Home Agent IP address but still terminated by the VPNSM.

Handling Single Home Agent Instance

This solution is achieved by letting SUP IOS own the same Home Agent IP address. Traffic to the Home Agent is then policy routed to the correct Home Agent.

Figure 10-2 illustrates a possible configuration:

Figure 10-2 Single HA Interoperability



Here is a sample configuration for the Supervisor. The PDSN IP Address is 14.0.0.1, HA3 address is 13.0.0.50, and HA4 is 13.0.0.51

Single HA Instance - Interoperability

```
crypto isakmp policy 1
 hash md5
 authentication pre-share
 lifetime 60000
crypto isakmp key cisco address 10.0.0.0 0.0.0.0
!
crypto ipsec transform-set mobile-set1 esp-3des

# Comment: testmap is used for HA3

crypto map testmap local-address Loopback21
crypto map testmap 20 ipsec-isakmp
 set peer 10.0.0.1
 set transform-set mobile-set1
 match address 131
!

interface Loopback21
 description corresponds to ha-on-proc3
 ip address 10.0.0.50 255.255.255.255
!
```

```
interface GigabitEthernet4/1
description encrypt traffic from vlan 151 to vlan 201& 136 to 139
 no ip address
 flowcontrol receive on
 flowcontrol send off
 switchport
 switchport trunk encapsulation dot1q
 switchport trunk allowed vlan 1,136,146,151,1002-1005
 switchport mode trunk
 cdp enable
!
interface GigabitEthernet4/2
 description decrypts traffic from vlan 201 to 151, 139 to 136
 no ip address
 flowcontrol receive on
 flowcontrol send off
 switchport
 switchport trunk encapsulation dot1q
 switchport trunk allowed vlan 1,139,149,201,1002-1005
 switchport mode trunk
 cdp enable

interface Vlan136
 description secure vlan
 ip address 10.0.0.1 255.255.255.0
 no ip redirects
 no ip unreachables
 ip policy route-map RRQ-HA3
 no mop enabled
 crypto map testmap
!
interface Vlan137
 description internal vlan to HA3
 ip address 10.0.0.1 255.255.0.0
!
interface Vlan139
 no ip address
 crypto connect vlan 136
!

access-list 131 permit ip host 10.0.0.1 host 10.0.0.50
access-list 131 permit ip host 10.0.0.50 host 10.0.0.1
access-list 131 permit ip 10.0.0.0 0.0.0.255 10.0.0.0 0.0.0.255

access-list 2000 permit udp any any eq mobile-ip
access-list 2000 permit ipinip any any

route-map RRQ-HA3 permit 10
 match ip address 2000
 set ip next-hop 10.0.0.2
!
```

IPSec Support on the Cisco 7600 with 6 CPUs of SAMI

An IPSec tunnel may be required to be established over the mobile IP tunnel between the PDSN and the HA. The PDSN resides in the foreign network and the HA in the home network. As per IS-835B specification, IPSec connections are always initiated from the PDSN towards the HA. The IPSec tunnel endpoints are thus, the PDSN IP address and the HA IP address.

In Cisco's 7600 HA solution, IPSec is terminated at the SUP, while the actual HA application resides on the SAMI card(s). Each SAMI card has 6 CPUs, each running one HA instance. Each HA has its own IP address. If different IP addresses are used in the SUP as IPSec endpoints, and in SAMI for HA endpoints, IKE messages generated from the PDSN with HA IP addresses are dropped at the SUP.

To avoid this issue, the above requirement is achieved by letting the SUP own the same IP address that is configured as the HA IP address on SAMI. The requirement is to split the IPSec traffic for different HA IP addresses across separate IPSec VLANs so that each PDSN-HA pair is handled appropriately. This configuration will allow the SUP to support all the 6 CPUs on the SAMI card running the HA application, each owning an IP address that is the IPSec endpoint.

The VRF IPSec feature on the SUP720 is used in this case. All traffic coming from the PDSN will be put on different VLANs based on the HA IP address. Each VLAN corresponds to one VRF and one VRF exists per HA instance on the SUP. Thus, the VRF mode of IPSec is used in this case to split traffic between the 6 different HA instances present on the SAMI. Once the packets are decrypted by the crypto VLAN, packets are then policy routed using an internal VLAN that corresponds to the particular HA to the correct HA CPU on SAMI.

IPSec redundancy across chassis and within a single chassis is supported for this.

The following call flow describes this behavior:

1. IPSec security association (SA) is opened between each PDSN and HA IP address pair on the SUP. IKE messages are sent from the PDSN with its IP address and peer IP address as the particular HA IP address. Based on the PDSN IP address and the HA IP address in the IKE message, the correct ISAKMP profile is selected for the PDSN-HA pair that indicates the VRF for the pair. This establishes different SPIs corresponding to the PDSN-HA pair.
2. One VLAN per HA IP address is defined and it belongs to a VRF that is defined for that IP address on the SUP. Thus, the SUP owns the HA IP address and it is the IPSec terminating point for PDSN.
3. Once an IPSec SA is established between each PDSN-HA IP address pair, encrypted packets are put on to the correct VRF based on the SPI of the incoming packet.
4. Once the encrypted packets are decrypted at the IPSec VLAN corresponding to the HA address, the packets are then policy routed to the corresponding CPU on the MWAM card that hosts the HA IP address using the internal VLAN present between SUP and the HA instance on MWAM.
5. In the return path, packets from HA instances on SAMI are placed on the internal VLAN and put on to the corresponding IPSec VLAN for the HA. This enables the packet to get encrypted and then send out to PDSN via the outgoing interface.

Restrictions

Simultaneous Bindings

The Cisco Home Agent does not support simultaneous bindings. When multiple flows are established for the same NAI, a different IP address is assigned to each flow. This means that simultaneous binding is not required, because it is used to maintain more than one flow to the same IP address.

Security

The HA supports IPSec, IKE, IPSec Authentication Header (AH) and IP Encapsulating Security Payload (ESP) as required in IS-835-B. The Home Agent does not support security for control or user traffic independently. Either both are secured, or neither.

The Home Agent does not support dynamically assigned keys or shared secrets as defined in IS-835-B.

Configuring Mobile IP Security Associations

To configure security associations for mobile hosts, FAs, and HAs, use one of the following commands in global configuration mode:

	Command	Purpose
Step 1	`Router(config)# ip mobile secure {host | visitor | home-agent | foreign-agent | proxy-host} {lower-address [upper-address] | nai string} {inbound-spi spi-in outbound-spi spi-out | spi spi} key {hex | ascii} string [replay timestamp [number] algorithm md5 mode prefix-suffix]`	Specifies the security associations for IP mobile users.

Configuring IPSec for the HA

To configure IPSec for the HA, use the following commands in global configuration mode:

	Command	Purpose

Step 1	`Router(config)# crypto map map-name seq-num ipsec-isakmp`
	
	`set peer ip address of ha`
	`set transform-set transform-set-name`
	`match address acl name`
	
	`crypto map map name local-address interface`
		Creates a a crypto map entry for one HA in one Crypto-map set.
		
		The Crypto Map definition is not complete until:
		1. ACL associated with it is defined, and
		2. The Crypto-Map is applied on the interface. You can configure Crypto MAP for different HAs by using a different sequence number for each HA in one crypto-map set.
		
		Specifies and names an identifying interface to be used by the crypto map for IPSec traffic.

Step 2	`Router# access-list acl-name deny udp host HA IP addr eq mobile-ip host PDSN IP addr eq mobile-ip`
	
	`access-list acl-name permit ip host PDSN IP addr host HA IP addr`
	
	`access-list acl-name deny ip any any`
		Defines the access list.
		
		The ACL name “acl-name” is same as in the crypto-map configuration.

Step 3	`Router# Interface Physical-Interface of PI interface`
	
	`crypto map Crypto-Map set`
		Applies the Crypto-Map on Pi Interface, as the HA sends/receives Mobile IP traffic to/from PDSN on this interface.

Creating Active Standby Home Agent Security Associations

The following IOS command displays active standby Home Agent security associations:

	Command	Purpose
Step 1	`Router(config)#`**`show ip mobile secure ?`** **`foreign-agent`** **`home-agent`** **`host`** **`summary`**	Displays the active and standby Home Agent Security associations. Displays Foreign agent security associations. Displays Home agent security associations. Displays Mobile host security associations. Displays a summary of security associations.

Here is an example of the command:

```
Router# show ip mobile secure home-agent
Security Associations (algorithm,mode,replay protection,key):
30.0.0.30:
   SPI 100,  MD5, Prefix-suffix, Timestamp +/- 7,
   Key 'red'
HA#
```

Configuration Examples

Home Agent IPSec Configuration

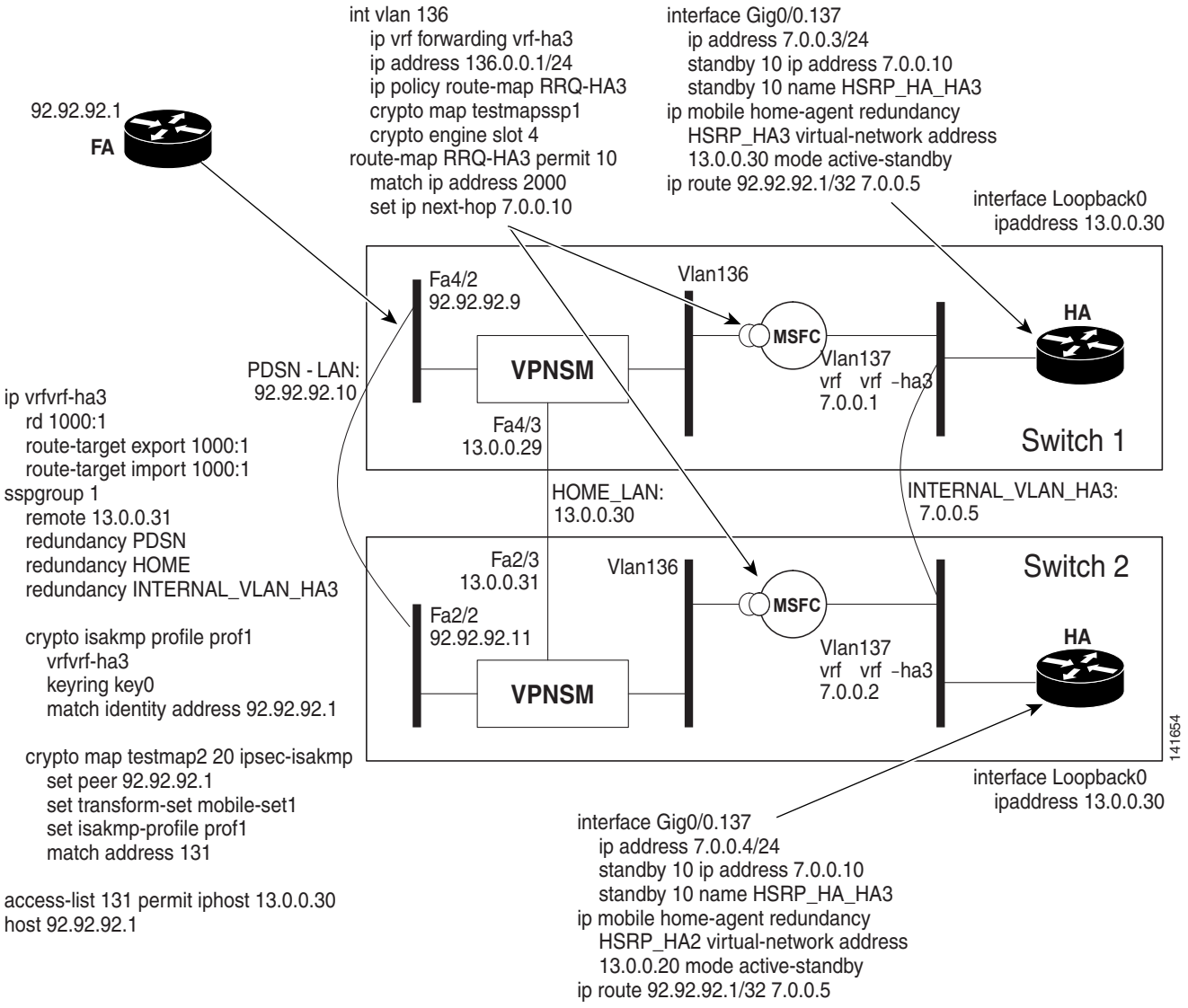
Note Once you permit the hosts/subnets you want encrypted, ensure that you put in an explicit deny statement. The deny statement states do not encrypt any other packets.

Note IPSec on the Cisco Catalyst 6500 amd the 7600 is configured on the Supervisor, rather than on the Home Agent.

Configuration - SUP720 / VRF-IPSec for 6 HA Instances

The following example provides detail of the SUP720 / VRF-IPSec configuration, as illustrated in Figure 10-3.

Figure 10-3 SUP720 / VRF-IPSec Configuration



SUP Configuration - Switch 1:

```
ip vrf vrf-ha2
 rd 2000:1
 route-target export 2000:1
 route-target import 2000:1
!
ip vrf vrf-ha3
 rd 1000:1
 route-target export 1000:1
 route-target import 1000:1
!
ip vrf vrf-ha4
 rd 4000:1
 route-target export 4000:1
 route-target import 4000:1
!
```

```
ip vrf vrf-ha5
 rd 5000:1
 route-target export 5000:1
 route-target import 5000:1
!
ip vrf vrf-ha6
 rd 6000:1
 route-target export 6000:1
 route-target import 6000:1
!
ssp group 1
 remote 13.0.0.31
 redundancy PDSN-LAN
 redundancy HOME-LAN
 redundancy INTERNAL_VLAN_HA3
 redundancy HOME-LAN-2
 redundancy INTERNAL_VLAN_HA2
 redundancy HOME-LAN-4
 redundancy HOME-LAN-5
 redundancy HOME-LAN-6
 redundancy INTERNAL_VLAN_HA4
 redundancy INTERNAL_VLAN_HA5
 redundancy INTERNAL_VLAN_HA6
 port 4098
!
crypto keyring key0
  pre-shared-key address 92.92.92.1 key cisco
!
crypto isakmp policy 1
 authentication pre-share
 lifetime 60000
crypto isakmp ssp 1
!
crypto isakmp profile prof1
   vrf vrf-ha2
   keyring key0
   match identity address 92.92.92.1 255.255.255.255
   local-address 12.0.0.30
crypto isakmp profile prof2
   vrf vrf-ha3
   keyring key0
   match identity address 92.92.92.1 255.255.255.255
   local-address 13.0.0.30
crypto isakmp profile prof4
   vrf vrf-ha4
   keyring key0
   match identity address 92.92.92.1 255.255.255.255
   local-address 14.0.0.30
crypto isakmp profile prof5
   vrf vrf-ha5
   keyring key0
   match identity address 92.92.92.1 255.255.255.255
   local-address 15.0.0.30
crypto isakmp profile prof6
   vrf vrf-ha6
   keyring key0
   match identity address 92.92.92.1 255.255.255.255
   local-address 16.0.0.30
!
crypto ipsec transform-set mobile-set1 esp-des esp-sha-hmac
!
crypto map testmap local-address FastEthernet4/3
crypto map testmap 20 ipsec-isakmp
 set peer 92.92.92.1
```

```
 set transform-set mobile-set1
 set isakmp-profile prof2
 match address 131
!
crypto map testmap1 local-address FastEthernet4/4
crypto map testmap1 20 ipsec-isakmp
 set peer 92.92.92.1
 set transform-set mobile-set1
 set isakmp-profile prof1
 match address 121
!
crypto map testmap4 local-address FastEthernet4/7
crypto map testmap4 20 ipsec-isakmp
 set peer 92.92.92.1
 set transform-set mobile-set1
 set isakmp-profile prof4
 match address 141
!
crypto map testmap5 local-address FastEthernet4/9
crypto map testmap5 20 ipsec-isakmp
 set peer 92.92.92.1
 set transform-set mobile-set1
 set isakmp-profile prof5
 match address 151
!
crypto map testmap6 local-address FastEthernet4/11
crypto map testmap6 20 ipsec-isakmp
 set peer 92.92.92.1
 set transform-set mobile-set1
 set isakmp-profile prof6
 match address 161
!
crypto engine mode vrf
!
interface FastEthernet4/2
 ip address 92.92.92.9 255.255.0.0
 ip policy route-map RRQ-HA10
 speed 100
 duplex half
 standby delay minimum 30 reload 60
 standby 1 ip 92.92.92.10
 standby 1 preempt
 standby 1 name PDSN-LAN
 standby 1 track FastEthernet4/2
 standby 1 track FastEthernet4/3
 standby 1 track FastEthernet4/4
 standby 1 track FastEthernet4/7
 standby 1 track FastEthernet4/9
 standby 1 track FastEthernet4/11
 standby 1 track GigabitEthernet6/1
 standby 1 track Vlan136
 standby 1 track Vlan137
 standby 1 track Vlan127
 standby 1 track Vlan126
 standby 1 track Vlan146
 standby 1 track Vlan147
 standby 1 track Vlan156
 standby 1 track Vlan157
 standby 1 track Vlan166
 standby 1 track Vlan167
 standby 1 track Vlan200
 crypto engine slot 6
!
interface FastEthernet4/3
```

```
 ip address 13.0.0.29 255.255.0.0
 standby delay minimum 30 reload 60
 standby 3 ip 13.0.0.30
 standby 3 preempt
 standby 3 name HOME-LAN
 standby 3 track FastEthernet4/2
 standby 3 track FastEthernet4/3
 standby 3 track FastEthernet4/4
 standby 3 track FastEthernet4/7
 standby 3 track FastEthernet4/9
 standby 3 track FastEthernet4/11
 standby 3 track GigabitEthernet6/1
 standby 3 track Vlan136
 standby 3 track Vlan137
 standby 3 track Vlan127
 standby 3 track Vlan126
 standby 3 track Vlan146
 standby 3 track Vlan147
 standby 3 track Vlan156
 standby 3 track Vlan157
 standby 3 track Vlan166
 standby 3 track Vlan167
 standby 3 track Vlan200
crypto engine slot 6
!
interface FastEthernet4/4
 ip address 12.0.0.29 255.255.255.0
 duplex half
 standby delay minimum 30 reload 60
 standby 2 ip 12.0.0.30
 standby 2 preempt
 standby 2 name HOME-LAN-2
 standby 2 track FastEthernet4/2
 standby 2 track FastEthernet4/3
 standby 2 track FastEthernet4/4
 standby 2 track FastEthernet4/7
 standby 2 track FastEthernet4/9
 standby 2 track FastEthernet4/11
 standby 2 track GigabitEthernet6/1
 standby 2 track Vlan136
 standby 2 track Vlan137
 standby 2 track Vlan127
 standby 2 track Vlan126
 standby 2 track Vlan146
 standby 2 track Vlan147
 standby 2 track Vlan156
 standby 2 track Vlan157
 standby 2 track Vlan166
 standby 2 track Vlan167
 standby 2 track Vlan200
crypto engine slot 6
!
interface FastEthernet4/5
 switchport
 switchport access vlan 137
 switchport mode access
 no ip address
!
interface FastEthernet4/6
 switchport
 switchport access vlan 127
 switchport mode access
 no ip address
 speed 100
```

```
 duplex half
!
interface FastEthernet4/7
 ip address 14.0.0.29 255.255.255.0
 standby delay minimum 30 reload 60
 standby 4 ip 14.0.0.30
 standby 4 preempt
 standby 4 name HOME-LAN-4
 standby 4 track FastEthernet4/2
 standby 4 track FastEthernet4/3
 standby 4 track FastEthernet4/4
 standby 4 track FastEthernet4/7
 standby 4 track FastEthernet4/9
 standby 4 track FastEthernet4/11
 standby 4 track Vlan136
 standby 4 track Vlan137
 standby 4 track Vlan127
 standby 4 track Vlan126
 standby 4 track GigabitEthernet6/1
 standby 4 track Vlan146
 standby 4 track Vlan147
 standby 4 track Vlan156
 standby 4 track Vlan157
 standby 4 track Vlan166
 standby 4 track Vlan167
 standby 4 track Vlan200
crypto engine slot 6
!
interface FastEthernet4/8
 switchport
 switchport access vlan 147
 switchport mode access
 no ip address
!
interface FastEthernet4/9
 ip address 15.0.0.29 255.255.255.0
 standby delay minimum 30 reload 60
 standby 5 ip 15.0.0.30
 standby 5 preempt
 standby 5 name HOME-LAN-5
 standby 5 track FastEthernet4/2
 standby 5 track FastEthernet4/3
 standby 5 track FastEthernet4/4
 standby 5 track FastEthernet4/7
 standby 5 track FastEthernet4/9
 standby 5 track FastEthernet4/11
 standby 5 track Vlan136
 standby 5 track Vlan137
 standby 5 track Vlan127
 standby 5 track Vlan126
 standby 5 track GigabitEthernet6/1
 standby 5 track Vlan146
 standby 5 track Vlan147
 standby 5 track Vlan156
 standby 5 track Vlan157
 standby 5 track Vlan166
 standby 5 track Vlan167
 standby 5 track Vlan200
crypto engine slot 6
!
interface FastEthernet4/10
 switchport
 switchport access vlan 157
 switchport mode access
```

```
 no ip address
!
interface FastEthernet4/11
 ip address 16.0.0.29 255.255.255.0
 standby delay minimum 30 reload 60
 standby 6 ip 16.0.0.30
 standby 6 preempt
 standby 6 name HOME-LAN-6
 standby 6 track FastEthernet4/2
 standby 6 track FastEthernet4/3
 standby 6 track FastEthernet4/4
 standby 6 track FastEthernet4/7
 standby 6 track FastEthernet4/9
 standby 6 track FastEthernet4/11
 standby 6 track Vlan136
 standby 6 track Vlan137
 standby 6 track Vlan127
 standby 6 track Vlan126
 standby 6 track GigabitEthernet6/1
 standby 6 track Vlan146
 standby 6 track Vlan147
 standby 6 track Vlan156
 standby 6 track Vlan157
 standby 6 track Vlan166
 standby 6 track Vlan167
 standby 6 track Vlan200
crypto engine slot 6
!
interface FastEthernet4/12
 switchport
 switchport access vlan 167
 switchport mode access
 no ip address
!
interface GigabitEthernet6/1
 switchport
 switchport trunk encapsulation dot1q
 switchport trunk allowed vlan 126,136,146,156,166
 switchport mode trunk
 no ip address
 flowcontrol receive on
 flowcontrol send off
 spanning-tree portfast trunk
!
interface GigabitEthernet6/2
 switchport
 switchport trunk encapsulation dot1q
 switchport trunk allowed vlan none
 switchport mode trunk
 no ip address
 flowcontrol receive on
 flowcontrol send off
 spanning-tree portfast trunk
!
interface Vlan126
 description secure vlan
 ethernet point-to-point
 ip vrf forwarding vrf-ha2
 ip address 126.0.0.1 255.255.255.0
 no ip redirects
 no ip unreachables
 ip policy route-map RRQ-HA2
 no mop enabled
 crypto map testmap1 ssp 1
```

```
 crypto engine slot 6
!
interface Vlan127
 description internal vlan to HA2
 ip vrf forwarding vrf-ha2
 ip address 6.0.0.1 255.255.0.0
 standby 12 ip 6.0.0.5
 standby 12 preempt
 standby 12 name INTERNAL_VLAN_HA2
 standby 12 track FastEthernet4/2
 standby 12 track FastEthernet4/3
 standby 12 track FastEthernet4/4
 standby 12 track FastEthernet4/7
 standby 12 track FastEthernet4/9
 standby 12 track FastEthernet4/11
 standby 12 track Vlan136
 standby 12 track Vlan137
 standby 12 track Vlan127
 standby 12 track Vlan126
 standby 12 track GigabitEthernet6/1
 standby 12 track Vlan146
 standby 12 track Vlan147
 standby 12 track Vlan156
 standby 12 track Vlan157
 standby 12 track Vlan166
 standby 12 track Vlan167
 standby 12 track Vlan200
!
interface Vlan136
 description secure vlan
 ethernet point-to-point
 ip vrf forwarding vrf-ha3
 ip address 136.0.0.1 255.255.255.0
 no ip redirects
 no ip unreachables
 ip policy route-map RRQ-HA3
 no mop enabled
 crypto map testmap ssp 1
 crypto engine slot 6
!
interface Vlan137
 description internal vlan to HA3
 ip vrf forwarding vrf-ha3
 ip address 7.0.0.1 255.255.0.0
 standby 13 ip 7.0.0.5
 standby 13 preempt
 standby 13 name INTERNAL_VLAN_HA3
 standby 13 track FastEthernet4/2
 standby 13 track FastEthernet4/3
 standby 13 track FastEthernet4/4
 standby 13 track FastEthernet4/7
 standby 13 track FastEthernet4/9
 standby 13 track FastEthernet4/11
 standby 13 track Vlan136
 standby 13 track Vlan137
 standby 13 track Vlan127
 standby 13 track Vlan126
 standby 13 track GigabitEthernet6/1
 standby 13 track Vlan146
 standby 13 track Vlan147
 standby 13 track Vlan156
 standby 13 track Vlan157
 standby 13 track Vlan166
 standby 13 track Vlan167
```

```
 standby 13 track Vlan200
!
interface Vlan146
 description secure vlan
 ethernet point-to-point
 ip vrf forwarding vrf-ha4
 ip address 146.0.0.1 255.255.255.0
 no ip redirects
 no ip unreachables
 ip policy route-map RRQ-HA4
 no mop enabled
 crypto map testmap4 ssp 1
 crypto engine slot 6
!
interface Vlan147
 description internal vlan to HA4
 ip vrf forwarding vrf-ha4
 ip address 8.0.0.1 255.255.0.0
 standby 14 ip 8.0.0.5
 standby 14 preempt
 standby 14 name INTERNAL_VLAN_HA4
 standby 14 track FastEthernet4/2
 standby 14 track FastEthernet4/3
 standby 14 track FastEthernet4/4
 standby 14 track FastEthernet4/7
 standby 14 track FastEthernet4/9
 standby 14 track FastEthernet4/11
 standby 14 track Vlan136
 standby 14 track Vlan137
 standby 14 track Vlan127
 standby 14 track Vlan126
 standby 14 track GigabitEthernet6/1
 standby 14 track Vlan146
 standby 14 track Vlan147
 standby 14 track Vlan156
 standby 14 track Vlan157
 standby 14 track Vlan166
 standby 14 track Vlan167
 standby 14 track Vlan200
!
interface Vlan156
 description secure vlan
 ethernet point-to-point
 ip vrf forwarding vrf-ha5
 ip address 156.0.0.1 255.255.255.0
 no ip redirects
 no ip unreachables
 ip policy route-map RRQ-HA5
 no mop enabled
 crypto map testmap5 ssp 1
 crypto engine slot 6
!
interface Vlan157
 description internal vlan to HA5
 ip vrf forwarding vrf-ha5
 ip address 9.0.0.1 255.255.0.0
 standby 15 ip 9.0.0.5
 standby 15 preempt
 standby 15 name INTERNAL_VLAN_HA5
 standby 15 track FastEthernet4/2
 standby 15 track FastEthernet4/3
 standby 15 track FastEthernet4/4
 standby 15 track FastEthernet4/7
 standby 15 track FastEthernet4/9
```

```
 standby 15 track FastEthernet4/11
 standby 15 track Vlan136
 standby 15 track Vlan137
 standby 15 track Vlan127
 standby 15 track Vlan126
 standby 15 track GigabitEthernet6/1
 standby 15 track Vlan146
 standby 15 track Vlan147
 standby 15 track Vlan156
 standby 15 track Vlan157
 standby 15 track Vlan166
 standby 15 track Vlan167
 standby 15 track Vlan200
!
interface Vlan166
 description secure vlan
 ethernet point-to-point
 ip vrf forwarding vrf-ha6
 ip address 166.0.0.1 255.255.255.0
 no ip redirects
 no ip unreachables
 ip policy route-map RRQ-HA6
 no mop enabled
 crypto map testmap6 ssp 1
 crypto engine slot 6
!
interface Vlan167
 description internal vlan to HA6
 ip vrf forwarding vrf-ha6
 ip address 10.0.0.1 255.255.0.0
 standby 16 ip 10.0.0.5
 standby 16 preempt
 standby 16 name INTERNAL_VLAN_HA6
 standby 16 track FastEthernet4/2
 standby 16 track FastEthernet4/3
 standby 16 track FastEthernet4/4
 standby 16 track FastEthernet4/7
 standby 16 track FastEthernet4/9
 standby 16 track FastEthernet4/11
 standby 16 track Vlan136
 standby 16 track Vlan137
 standby 16 track Vlan127
 standby 16 track Vlan126
 standby 16 track GigabitEthernet6/1
 standby 16 track Vlan146
 standby 16 track Vlan147
 standby 16 track Vlan156
 standby 16 track Vlan157
 standby 16 track Vlan166
 standby 16 track Vlan167
 standby 16 track Vlan200
!
interface vlan 200
 ip address 200.0.0.2 255.0.0.0
 standby 250 ip 200.0.0.3
 standby 250 preempt
 standby 250 name NON_IPSEC_VLAN
 standby 250 track FastEthernet4/2
 standby 250 track FastEthernet4/3
 standby 250 track FastEthernet4/4
 standby 250 track FastEthernet4/7
 standby 250 track FastEthernet4/9
 standby 250 track FastEthernet4/11
 standby 250 track Vlan136
```

```
 standby 250 track Vlan137
 standby 250 track Vlan127
 standby 250 track Vlan126
 standby 250 track GigabitEthernet6/1
 standby 250 track Vlan146
 standby 250 track Vlan147
 standby 250 track Vlan156
 standby 250 track Vlan157
 standby 250 track Vlan166
 standby 250 track Vlan167
!
ip route vrf vrf-ha2 92.92.92.0 255.255.255.0 Vlan126 92.92.92.1 global
ip route vrf vrf-ha3 92.92.92.0 255.255.255.0 Vlan136 92.92.92.1 global
ip route vrf vrf-ha4 92.92.92.0 255.255.255.0 Vlan146 92.92.92.1 global
ip route vrf vrf-ha5 92.92.92.0 255.255.255.0 Vlan156 92.92.92.1 global
ip route vrf vrf-ha6 92.92.92.0 255.255.255.0 Vlan166 92.92.92.1 global
!
access-list 121 permit ip host 12.0.0.30 host 92.92.92.1
access-list 121 remark Access List for HA2
access-list 131 permit ip host 13.0.0.30 host 92.92.92.1
access-list 131 remark Access List for HA3
access-list 141 permit ip host 14.0.0.30 host 92.92.92.1
access-list 141 remark Access List for HA4
access-list 151 permit ip host 15.0.0.30 host 92.92.92.1
access-list 151 remark Access List for HA5
access-list 161 permit ip host 16.0.0.30 host 92.92.92.1
access-list 161 remark Access List for HA6
access-list 2000 permit udp any any eq mobile-ip
access-list 2000 permit ipinip any any
access-list 2001 permit ip 95.95.95.0 0.0.0.255 host 120.0.0.30
access-list 2002 permit ip 96.96.96.0 0.0.0.255 host 130.0.0.30
access-list 2003 permit ip 97.97.97.0 0.0.0.255 host 140.0.0.30
access-list 2004 permit ip 98.98.98.0 0.0.0.255 host 150.0.0.30
access-list 2005 permit ip 99.99.99.0 0.0.0.255 host 160.0.0.30
!
arp vrf vrf-ha6 10.0.0.10 0000.0c07.ac32 ARPA
arp vrf vrf-ha4 8.0.0.10 0000.0c07.ac1e ARPA
arp vrf vrf-ha5 9.0.0.10 0000.0c07.ac28 ARPA
arp vrf vrf-ha2 6.0.0.10 0000.0c07.ac0a ARPA
arp vrf vrf-ha3 7.0.0.10 0000.0c07.ac14 ARPA
!
route-map RRQ-HA5 permit 10
 match ip address 2000
 set ip next-hop 9.0.0.10
!
route-map RRQ-HA4 permit 10
 match ip address 2000
 set ip next-hop 8.0.0.10
!
route-map RRQ-HA6 permit 10
 match ip address 2000
 set ip next-hop 10.0.0.10
!
route-map RRQ-HA3 permit 10
 match ip address 2000
 set ip next-hop 7.0.0.10
!
route-map RRQ-HA2 permit 10
 match ip address 2000
 set ip next-hop 6.0.0.10
!
route-map RRQ-HA10 permit 10
 match ip address 2001
 continue 11
```

```
 set ip next-hop 200.0.0.5
!
route-map RRQ-HA10 permit 11
 match ip address 2002
 continue 12
 set ip next-hop 200.0.0.15
!
route-map RRQ-HA10 permit 12
 match ip address 2003
 continue 13
 set ip next-hop 200.0.0.25
!
route-map RRQ-HA10 permit 13
 match ip address 2004
 continue 14
 set ip next-hop 200.0.0.35
!
route-map RRQ-HA10 permit 14
 match ip address 2005
 set ip next-hop 200.0.0.45
```

SUP Configuration - Switch 2:

```
ip vrf vrf-ha2
 rd 2000:1
 route-target export 2000:1
 route-target import 2000:1
!
ip vrf vrf-ha3
 rd 1000:1
 route-target export 1000:1
 route-target import 1000:1
!
ip vrf vrf-ha4
 rd 4000:1
 route-target export 4000:1
 route-target import 4000:1
!
ip vrf vrf-ha5
 rd 5000:1
 route-target export 5000:1
 route-target import 5000:1
!
ip vrf vrf-ha6
 rd 6000:1
 route-target export 6000:1
 route-target import 6000:1
!
ssp group 1
 remote 13.0.0.29
 redundancy PDSN-LAN
 redundancy HOME-LAN
 redundancy INTERNAL_VLAN_HA3
 redundancy HOME-LAN-2
 redundancy INTERNAL_VLAN_HA2
 redundancy HOME-LAN-4
 redundancy HOME-LAN-5
 redundancy HOME-LAN-6
 redundancy INTERNAL_VLAN_HA4
 redundancy INTERNAL_VLAN_HA5
 redundancy INTERNAL_VLAN_HA6
 port 4098
```

```
!
crypto keyring key0
  pre-shared-key address 92.92.92.1 key cisco
!
crypto isakmp policy 1
 authentication pre-share
 lifetime 60000
crypto isakmp ssp 1
!
crypto isakmp profile prof1
   vrf vrf-ha2
   keyring key0
   match identity address 92.92.92.1 255.255.255.255
   local-address 12.0.0.30
crypto isakmp profile prof2
   vrf vrf-ha3
   keyring key0
   match identity address 92.92.92.1 255.255.255.255
   local-address 13.0.0.30
crypto isakmp profile prof4
   vrf vrf-ha4
   keyring key0
   match identity address 92.92.92.1 255.255.255.255
   local-address 14.0.0.30
crypto isakmp profile prof5
   vrf vrf-ha5
   keyring key0
   match identity address 92.92.92.1 255.255.255.255
   local-address 15.0.0.30
crypto isakmp profile prof6
   vrf vrf-ha6
   keyring key0
   match identity address 92.92.92.1 255.255.255.255
   local-address 16.0.0.30
!
crypto ipsec transform-set mobile-set1 esp-des esp-sha-hmac
!
crypto map testmap local-address FastEthernet2/3
crypto map testmap 20 ipsec-isakmp
 set peer 92.92.92.1
 set transform-set mobile-set1
 set isakmp-profile prof2
 match address 131
!
crypto map testmap1 local-address FastEthernet2/5
crypto map testmap1 20 ipsec-isakmp
 set peer 92.92.92.1
 set transform-set mobile-set1
 set isakmp-profile prof1
 match address 121
!
crypto map testmap4 local-address FastEthernet2/7
crypto map testmap4 20 ipsec-isakmp
 set peer 92.92.92.1
 set transform-set mobile-set1
 set isakmp-profile prof4
 match address 141
!
crypto map testmap5 local-address FastEthernet2/9
crypto map testmap5 20 ipsec-isakmp
 set peer 92.92.92.1
 set transform-set mobile-set1
 set isakmp-profile prof5
 match address 151
```

```
!
crypto map testmap6 local-address FastEthernet2/11
crypto map testmap6 20 ipsec-isakmp
 set peer 92.92.92.1
 set transform-set mobile-set1
 set isakmp-profile prof6
 match address 161
!
crypto engine mode vrf
!
interface FastEthernet2/2
 ip address 92.92.92.11 255.255.0.0
 ip policy route-map RRQ-HA10
 speed 100
 duplex full
 standby delay minimum 30 reload 60
 standby 1 ip 92.92.92.10
 standby 1 preempt
 standby 1 name PDSN-LAN
 standby 1 track FastEthernet2/2
 standby 1 track FastEthernet2/3
 standby 1 track FastEthernet2/5
 standby 1 track FastEthernet2/7
 standby 1 track FastEthernet2/9
 standby 1 track FastEthernet2/11
 standby 1 track GigabitEthernet4/1
 standby 1 track Vlan136
 standby 1 track Vlan137
 standby 1 track Vlan127
 standby 1 track Vlan126
 standby 1 track Vlan146
 standby 1 track Vlan156
 standby 1 track Vlan157
 standby 1 track Vlan166
 standby 1 track Vlan167
 standby 1 track Vlan147
 standby 1 track Vlan200
 crypto engine slot 4
!
interface FastEthernet2/3
 ip address 13.0.0.31 255.255.0.0
 standby delay minimum 30 reload 60
 standby 3 ip 13.0.0.30
 standby 3 preempt
 standby 3 name HOME-LAN
 standby 3 track FastEthernet2/2
 standby 3 track FastEthernet2/3
 standby 3 track FastEthernet2/5
 standby 3 track FastEthernet2/7
 standby 3 track FastEthernet2/9
 standby 3 track FastEthernet2/11
 standby 3 track GigabitEthernet4/1
 standby 3 track Vlan136
 standby 3 track Vlan137
 standby 3 track Vlan127
 standby 3 track Vlan126
 standby 3 track Vlan146
 standby 3 track Vlan156
 standby 3 track Vlan157
 standby 3 track Vlan166
 standby 3 track Vlan167
 standby 3 track Vlan147
 standby 3 track Vlan200
crypto engine slot 4
```

```
!
interface FastEthernet2/4
 switchport
 switchport access vlan 137
 switchport mode access
 no ip address
!
interface FastEthernet2/5
 ip address 12.0.0.31 255.255.0.0
 standby delay minimum 30 reload 60
 standby 2 ip 12.0.0.30
 standby 2 preempt
 standby 2 name HOME-LAN-2
 standby 2 track FastEthernet2/2
 standby 2 track FastEthernet2/3
 standby 2 track FastEthernet2/5
 standby 2 track FastEthernet2/7
 standby 2 track FastEthernet2/9
 standby 2 track FastEthernet2/11
 standby 2 track GigabitEthernet4/1
 standby 2 track Vlan136
 standby 2 track Vlan137
 standby 2 track Vlan127
 standby 2 track Vlan126
 standby 2 track Vlan146
 standby 2 track Vlan156
 standby 2 track Vlan157
 standby 2 track Vlan166
 standby 2 track Vlan167
 standby 2 track Vlan147
 standby 2 track Vlan200
 crypto engine slot 4
!
interface FastEthernet2/6
 switchport
 switchport access vlan 127
 switchport mode access
 no ip address
!
interface FastEthernet2/7
 ip address 14.0.0.31 255.255.0.0
 standby delay minimum 30 reload 60
 standby 4 ip 14.0.0.30
 standby 4 preempt
 standby 4 name HOME-LAN-4
 standby 4 track FastEthernet2/2
 standby 4 track FastEthernet2/3
 standby 4 track FastEthernet2/5
 standby 4 track FastEthernet2/7
 standby 4 track FastEthernet2/9
 standby 4 track FastEthernet2/11
 standby 4 track Vlan136
 standby 4 track Vlan137
 standby 4 track Vlan127
 standby 4 track Vlan126
 standby 4 track GigabitEthernet4/1
 standby 4 track Vlan146
 standby 4 track Vlan156
 standby 4 track Vlan157
 standby 4 track Vlan166
 standby 4 track Vlan167
 standby 4 track Vlan147
 standby 4 track Vlan200
crypto engine slot 4
```

```
!
interface FastEthernet2/8
 switchport
 switchport access vlan 147
 switchport mode access
 no ip address
!
interface FastEthernet2/9
 ip address 15.0.0.31 255.255.0.0
 standby delay minimum 30 reload 60
 standby 5 ip 15.0.0.30
 standby 5 preempt
 standby 5 name HOME-LAN-5
 standby 5 track FastEthernet2/2
 standby 5 track FastEthernet2/3
 standby 5 track FastEthernet2/5
 standby 5 track FastEthernet2/7
 standby 5 track FastEthernet2/9
 standby 5 track FastEthernet2/11
 standby 5 track Vlan136
 standby 5 track Vlan137
 standby 5 track Vlan127
 standby 5 track Vlan126
 standby 5 track GigabitEthernet4/1
 standby 5 track Vlan146
 standby 5 track Vlan156
 standby 5 track Vlan157
 standby 5 track Vlan166
 standby 5 track Vlan167
 standby 5 track Vlan147
 standby 5 track Vlan200
crypto engine slot 4
!
interface FastEthernet2/10
 switchport
 switchport access vlan 157
 switchport mode access
 no ip address
!
interface FastEthernet2/11
 ip address 16.0.0.31 255.255.0.0
 standby delay minimum 30 reload 60
 standby 6 ip 16.0.0.30
 standby 6 preempt
 standby 6 name HOME-LAN-6
 standby 6 track FastEthernet2/2
 standby 6 track FastEthernet2/3
 standby 6 track FastEthernet2/5
 standby 6 track FastEthernet2/7
 standby 6 track FastEthernet2/9
 standby 6 track FastEthernet2/11
 standby 6 track Vlan136
 standby 6 track Vlan137
 standby 6 track Vlan127
 standby 6 track Vlan126
 standby 6 track GigabitEthernet4/1
 standby 6 track Vlan146
 standby 6 track Vlan156
 standby 6 track Vlan157
 standby 6 track Vlan166
 standby 6 track Vlan167
 standby 6 track Vlan147
 standby 6 track Vlan200
 crypto engine slot 4
```

```
!
interface FastEthernet2/12
 switchport
 switchport access vlan 167
 switchport mode access
 no ip address
!
interface GigabitEthernet4/1
 switchport
 switchport trunk encapsulation dot1q
 switchport trunk allowed vlan 126,136,146,156,166
 switchport mode trunk
 no ip address
 flowcontrol receive on
 flowcontrol send off
 spanning-tree portfast trunk
!
interface GigabitEthernet4/2
 switchport
 switchport trunk encapsulation dot1q
 switchport trunk allowed vlan none
 switchport mode trunk
 no ip address
 flowcontrol receive on
 flowcontrol send off
 spanning-tree portfast trunk
!
interface Vlan126
 description secure vlan
 ethernet point-to-point
 ip vrf forwarding vrf-ha2
 ip address 126.0.0.2 255.255.255.0
 no ip redirects
 no ip unreachables
 ip policy route-map RRQ-HA2
 no mop enabled
 crypto map testmap1 ssp 1
 crypto engine slot 4
!
interface Vlan127
 description internal vlan to HA2
 ip vrf forwarding vrf-ha2
 ip address 6.0.0.2 255.255.0.0
 standby 12 ip 6.0.0.5
 standby 12 preempt
 standby 12 name INTERNAL_VLAN_HA2
 standby 12 track FastEthernet2/2
 standby 12 track FastEthernet2/3
 standby 12 track FastEthernet2/5
 standby 12 track FastEthernet2/7
 standby 12 track FastEthernet2/9
 standby 12 track FastEthernet2/11
 standby 12 track Vlan136
 standby 12 track Vlan137
 standby 12 track Vlan127
 standby 12 track Vlan126
 standby 12 track GigabitEthernet4/1
 standby 12 track Vlan146
 standby 12 track Vlan156
 standby 12 track Vlan157
 standby 12 track Vlan166
 standby 12 track Vlan167
 standby 12 track Vlan147
 standby 12 track Vlan200
```

```
!
interface Vlan136
 description secure vlan
 ethernet point-to-point
 ip vrf forwarding vrf-ha3
 ip address 136.0.0.2 255.255.255.0
 no ip redirects
 no ip unreachables
 ip policy route-map RRQ-HA3
 no mop enabled
 crypto map testmap ssp 1
 crypto engine slot 4
!
interface Vlan137
 description internal vlan to HA3
 ip vrf forwarding vrf-ha3
 ip address 7.0.0.2 255.255.0.0
 standby 13 ip 7.0.0.5
 standby 13 preempt
 standby 13 name INTERNAL_VLAN_HA3
 standby 13 track FastEthernet2/2
 standby 13 track FastEthernet2/3
 standby 13 track FastEthernet2/5
 standby 13 track FastEthernet2/7
 standby 13 track FastEthernet2/9
 standby 13 track FastEthernet2/11
 standby 13 track Vlan136
 standby 13 track Vlan137
 standby 13 track Vlan127
 standby 13 track Vlan126
 standby 13 track GigabitEthernet4/1
 standby 13 track Vlan146
 standby 13 track Vlan156
 standby 13 track Vlan157
 standby 13 track Vlan166
 standby 13 track Vlan167
 standby 13 track Vlan147
 standby 13 track Vlan200
!
interface Vlan146
 description secure vlan
 ethernet point-to-point
 ip vrf forwarding vrf-ha4
 ip address 146.0.0.2 255.0.0.0
 no ip redirects
 no ip unreachables
 ip policy route-map RRQ-HA4
 no mop enabled
 crypto map testmap4 ssp 1
 crypto engine slot 4
!
interface Vlan147
 description internal vlan to HA4
 ip vrf forwarding vrf-ha4
 ip address 8.0.0.2 255.255.0.0
 standby 14 ip 8.0.0.5
 standby 14 preempt
 standby 14 name INTERNAL_VLAN_HA4
 standby 14 track FastEthernet2/2
 standby 14 track FastEthernet2/3
 standby 14 track FastEthernet2/5
 standby 14 track FastEthernet2/7
 standby 14 track FastEthernet2/9
 standby 14 track FastEthernet2/11
```

```
 standby 14 track Vlan136
 standby 14 track Vlan137
 standby 14 track Vlan127
 standby 14 track Vlan126
 standby 14 track GigabitEthernet4/1
 standby 14 track Vlan146
 standby 14 track Vlan156
 standby 14 track Vlan157
 standby 14 track Vlan166
 standby 14 track Vlan167
 standby 14 track Vlan147
 standby 14 track Vlan200
!
interface Vlan156
 description secure vlan
 ethernet point-to-point
 ip vrf forwarding vrf-ha5
 ip address 156.0.0.2 255.255.255.0
 no ip redirects
 no ip unreachables
 ip policy route-map RRQ-HA5
 no mop enabled
 crypto map testmap5 ssp 1
 crypto engine slot 4
!
interface Vlan157
 description internal vlan to HA5
 ip vrf forwarding vrf-ha5
 ip address 9.0.0.2 255.255.0.0
 standby 15 ip 9.0.0.5
 standby 15 preempt
 standby 15 name INTERNAL_VLAN_HA5
 standby 15 track FastEthernet2/2
 standby 15 track FastEthernet2/3
 standby 15 track FastEthernet2/5
 standby 15 track FastEthernet2/7
 standby 15 track FastEthernet2/9
 standby 15 track FastEthernet2/11
 standby 15 track Vlan136
 standby 15 track Vlan137
 standby 15 track Vlan127
 standby 15 track Vlan126
 standby 15 track GigabitEthernet4/1
 standby 15 track Vlan146
 standby 15 track Vlan156
 standby 15 track Vlan157
 standby 15 track Vlan166
 standby 15 track Vlan167
 standby 15 track Vlan147
 standby 15 track Vlan200
!
interface Vlan166
 description secure vlan
 ethernet point-to-point
 ip vrf forwarding vrf-ha6
 ip address 166.0.0.2 255.255.255.0
 no ip redirects
 no ip unreachables
 ip policy route-map RRQ-HA6
 no mop enabled
 crypto map testmap6 ssp 1
 crypto engine slot 4
!
interface Vlan167
```

```
 description internal vlan to HA2
 ip vrf forwarding vrf-ha6
 ip address 10.0.0.2 255.255.0.0
 standby 16 ip 10.0.0.5
 standby 16 preempt
 standby 16 name INTERNAL_VLAN_HA6
 standby 16 track FastEthernet2/2
 standby 16 track FastEthernet2/3
 standby 16 track FastEthernet2/5
 standby 16 track FastEthernet2/7
 standby 16 track FastEthernet2/9
 standby 16 track FastEthernet2/11
 standby 16 track Vlan136
 standby 16 track Vlan137
 standby 16 track Vlan127
 standby 16 track Vlan126
 standby 16 track GigabitEthernet4/1
 standby 16 track Vlan146
 standby 16 track Vlan156
 standby 16 track Vlan157
 standby 16 track Vlan166
 standby 16 track Vlan167
 standby 16 track Vlan147
 standby 16 track Vlan200
!
interface vlan 200
 ip address 200.0.0.1 255.0.0.0
 standby 250 ip 200.0.0.3
 standby 250 preempt
 standby 250 name NON_IPSEC_VLAN
 standby 250 track FastEthernet2/2
 standby 250 track FastEthernet2/3
 standby 250 track FastEthernet2/5
 standby 250 track FastEthernet2/7
 standby 250 track FastEthernet2/9
 standby 250 track FastEthernet2/11
 standby 250 track Vlan136
 standby 250 track Vlan137
 standby 250 track Vlan127
 standby 250 track Vlan126
 standby 250 track GigabitEthernet4/1
 standby 250 track Vlan146
 standby 250 track Vlan156
 standby 250 track Vlan157
 standby 250 track Vlan166
 standby 250 track Vlan167
 standby 250 track Vlan147

ip route vrf vrf-ha2 92.92.92.0 255.255.255.0 Vlan126 92.92.92.1 global
ip route vrf vrf-ha3 92.92.92.0 255.255.255.0 Vlan136 92.92.92.1 global
ip route vrf vrf-ha4 92.92.92.0 255.255.255.0 Vlan146 92.92.92.1 global
ip route vrf vrf-ha5 92.92.92.0 255.255.255.0 Vlan156 92.92.92.1 global
ip route vrf vrf-ha6 92.92.92.0 255.255.255.0 Vlan166 92.92.92.1 global
!
access-list 121 permit ip host 12.0.0.30 host 92.92.92.1
access-list 121 remark Access List for HA2
access-list 131 permit ip host 13.0.0.30 host 92.92.92.1
access-list 131 remark Access List for HA3
access-list 141 permit ip host 14.0.0.30 host 92.92.92.1
access-list 141 remark Access List for HA4
access-list 151 permit ip host 15.0.0.30 host 92.92.92.1
access-list 151 remark Access List for HA5
access-list 161 permit ip host 16.0.0.30 host 92.92.92.1
access-list 161 remark Access List for HA6
```

```
access-list 2000 permit udp any any eq mobile-ip
access-list 2000 permit ipinip any any
access-list 2001 permit ip 95.95.95.0 0.0.0.255 host 120.0.0.30
access-list 2002 permit ip 96.96.96.0 0.0.0.255 host 130.0.0.30
access-list 2003 permit ip 97.97.97.0 0.0.0.255 host 140.0.0.30
access-list 2004 permit ip 98.98.98.0 0.0.0.255 host 150.0.0.30
access-list 2005 permit ip 99.99.99.0 0.0.0.255 host 160.0.0.30
!
arp vrf vrf-ha6 10.0.0.10 0000.0c07.ac32 ARPA
arp vrf vrf-ha4 8.0.0.10 0000.0c07.ac1e ARPA
arp vrf vrf-ha5 9.0.0.10 0000.0c07.ac28 ARPA
arp vrf vrf-ha2 6.0.0.10 0000.0c07.ac0a ARPA
arp vrf vrf-ha3 7.0.0.10 0000.0c07.ac14 ARPA
!
route-map RRQ-HA5 permit 10
 match ip address 2000
 set ip next-hop 9.0.0.10
!
route-map RRQ-HA4 permit 10
 match ip address 2000
 set ip next-hop 8.0.0.10
!
route-map RRQ-HA6 permit 10
 match ip address 2000
 set ip next-hop 10.0.0.10
!
route-map RRQ-HA3 permit 10
 match ip address 2000
 set ip next-hop 7.0.0.10
!
route-map RRQ-HA2 permit 10
 match ip address 2000
 set ip next-hop 6.0.0.10
!
route-map RRQ-HA10 permit 10
 match ip address 2001
 continue 11
 set ip next-hop 200.0.0.5
!
route-map RRQ-HA10 permit 11
 match ip address 2002
 continue 12
 set ip next-hop 200.0.0.15
!
route-map RRQ-HA10 permit 12
 match ip address 2003
 continue 13
 set ip next-hop 200.0.0.25
!
route-map RRQ-HA10 permit 13
 match ip address 2004
 continue 14
 set ip next-hop 200.0.0.35
!
route-map RRQ-HA10 permit 14
 match ip address 2005
 set ip next-hop 200.0.0.45
```

HA Configuration - Switch 1:

HA1:

```
interface Loopback0
 description Advertised Home Agent Virtual IP Address
 ip address 12.0.0.30 255.255.255.255
!
interface GigabitEthernet0/0.126
 encapsulation dot1Q 126
 ip address 126.0.0.82 255.255.255.0
!
interface GigabitEthernet0/0.127
 description MWAM Processor interface to SUP (Private HSRP VLAN)
 encapsulation dot1Q 127
 ip address 6.0.0.3 255.255.255.0
 standby 10 ip 6.0.0.10
 standby 10 preempt
 standby 10 name HSRP_HA_HA2
 standby 10 track GigabitEthernet0/0.200
!
interface GigabitEthernet0/0.200
 description interface for non-ipsec pkts
 encapsulation dot1Q 200
 ip address 200.0.0.4 255.0.0.0
 no snmp trap link-status
 standby 200 ip 200.0.0.5
 standby 200 preempt
 standby 200 track GigabitEthernet0/0.127
!
router mobile
!
ip local pool ha-pool2 10.1.2.1 10.1.2.255
ip route 92.92.92.1 255.255.255.255 6.0.0.5
ip route 95.95.95.0 255.255.255.0 200.0.0.3
!
ip mobile home-agent unknown-ha accept
ip mobile home-agent redundancy HSRP_HA_HA2 virtual-network address 12.0.0.30 mode
active-standby
ip mobile virtual-network 12.0.0.10 255.255.255.255
ip mobile host nai @cisco.com address pool local ha-pool2 virtual-network 12.0.0.10
255.255.255.255
ip mobile secure host nai @cisco.com spi 100 key ascii cisco algorithm md5 mode
prefix-suffix
ip mobile secure home-agent 6.0.0.4 spi 100 key ascii cisco algorithm md5 mode
prefix-suffix
```

HA2:

```
interface Loopback0
 description Advertised Home Agent Virtual IP Address
 ip address 13.0.0.30 255.255.255.255
!
interface GigabitEthernet0/0.136
 encapsulation dot1Q 136
 ip address 136.0.0.83 255.255.255.0
!
interface GigabitEthernet0/0.137
 description MWAM Processor interface to SUP (Private HSRP VLAN)
 encapsulation dot1Q 137
 ip address 7.0.0.3 255.255.255.0
 standby 20 ip 7.0.0.10
```

```
 standby 20 preempt
 standby 20 name HSRP_HA_HA3
 standby 20 name GigabitEthernet0/0.200
!
interface GigabitEthernet0/0.200
 description interface for non-ipsec pkts
 encapsulation dot1Q 200
 ip address 200.0.0.14 255.0.0.0
 no snmp trap link-status
 standby 201 ip 200.0.0.15
 standby 201 preempt
 standby 201 track GigabitEthernet0/0.137
!
router mobile
!
ip local pool ha-pool3 10.1.3.1 10.1.3.255
ip route 92.92.92.1 255.255.255.255 7.0.0.5
ip route 96.96.96.0 255.255.255.0 200.0.0.3
!
ip mobile home-agent unknown-ha accept
ip mobile home-agent redundancy HSRP_HA_HA3 virtual-network address 13.0.0.30 mode
active-standby
ip mobile virtual-network 13.0.0.10 255.255.255.255
ip mobile host nai @cisco.com address pool local ha-pool3 virtual-network 13.0.0.10
255.255.255.255
ip mobile secure host nai @cisco.com spi 100 key ascii cisco algorithm md5 mode
prefix-suffix
ip mobile secure home-agent 7.0.0.4 spi 100 key ascii cisco algorithm md5 mode
prefix-suffix
```

HA3:

```
interface Loopback0
 description Advertised Home Agent Virtual IP Address
 ip address 14.0.0.30 255.255.255.255
!
interface GigabitEthernet0/0.146
 encapsulation dot1Q 146
 ip address 146.0.0.82 255.255.255.0
!
interface GigabitEthernet0/0.147
 description MWAM Processor interface to SUP (Private HSRP VLAN)
 encapsulation dot1Q 147
 ip address 8.0.0.3 255.255.255.0
 standby 30 ip 8.0.0.10
 standby 30 preempt
 standby 30 name HSRP_HA_HA4
 standby 30 name GigabitEthernet0/0.200
!
interface GigabitEthernet0/0.200
 description interface for non-ipsec pkts
 encapsulation dot1Q 200
 ip address 200.0.0.24 255.0.0.0
 no snmp trap link-status
 standby 202 ip 200.0.0.25
 standby 202 preempt
 standby 202 track GigabitEthernet0/0.147
!
router mobile
!
ip local pool ha-pool4 10.1.4.1 10.1.4.255
ip route 92.92.92.1 255.255.255.255 8.0.0.5
ip route 97.97.97.0 255.255.255.0 200.0.0.3
```

```
!
ip mobile home-agent unknown-ha accept
ip mobile home-agent redundancy HSRP_HA_HA4 virtual-network address 14.0.0.30 mode
active-standby
ip mobile virtual-network 13.0.0.10 255.255.255.255
ip mobile virtual-network 14.0.0.10 255.255.255.255
ip mobile host nai @cisco.com address pool local ha-pool4 virtual-network 14.0.0.10
255.255.255.255
ip mobile secure host nai @cisco.com spi 100 key ascii cisco algorithm md5 mode
prefix-suffix
ip mobile secure home-agent 8.0.0.4 spi 100 key ascii cisco algorithm md5 mode
prefix-suffix
```

HA4:

```
interface Loopback0
 description Advertised Home Agent Virtual IP Address
 ip address 15.0.0.30 255.255.255.255
!
interface GigabitEthernet0/0.156
 encapsulation dot1Q 156
 ip address 156.0.0.82 255.255.255.0
!
interface GigabitEthernet0/0.157
 description MWAM Processor interface to SUP (Private HSRP VLAN)
 encapsulation dot1Q 157
 ip address 9.0.0.3 255.255.255.0
 standby 40 ip 9.0.0.10
 standby 40 preempt
 standby 40 name HSRP_HA_HA5
 standby 40 name GigabitEthernet0/0.200
!
interface GigabitEthernet0/0.200
 description interface for non-ipsec pkts
 encapsulation dot1Q 200
 ip address 200.0.0.34 255.0.0.0
 no snmp trap link-status
 standby 203 ip 200.0.0.35
 standby 203 preempt
 standby 203 track GigabitEthernet0/0.157
!
router mobile
!
ip local pool ha-pool5 10.1.5.1 10.1.5.255
ip route 92.92.92.1 255.255.255.255 9.0.0.5
ip route 98.98.98.0 255.255.255.0 200.0.0.3
!
ip mobile home-agent unknown-ha accept
ip mobile home-agent redundancy HSRP_HA_HA5 virtual-network address 15.0.0.30 mode
active-standby
ip mobile virtual-network 15.0.0.10 255.255.255.255
ip mobile host nai @cisco.com address pool local ha-pool5 virtual-network 15.0.0.10
255.255.255.255
ip mobile secure host nai @cisco.com spi 100 key ascii cisco algorithm md5 mode
prefix-suffix
ip mobile secure home-agent 9.0.0.4 spi 100 key ascii cisco algorithm md5 mode
prefix-suffix
```

HA5:

```
interface Loopback0
```

```
 description Advertised Home Agent Virtual IP Address
 ip address 16.0.0.30 255.255.255.255
!
interface GigabitEthernet0/0.166
 encapsulation dot1Q 166
 ip address 166.0.0.82 255.255.255.0
!
interface GigabitEthernet0/0.167
 description MWAM Processor interface to SUP (Private HSRP VLAN)
 encapsulation dot1Q 167
 ip address 10.0.0.3 255.255.255.0
 standby 50 ip 10.0.0.10
 standby 50 preempt
 standby 50 name HSRP_HA_HA6
 standby 50 GigabitEthernet0/0.200
!
interface GigabitEthernet0/0.200
 description interface for non-ipsec pkts
 encapsulation dot1Q 200
 ip address 200.0.0.44 255.0.0.0
 no snmp trap link-status
 standby 204 ip 200.0.0.45
 standby 204 preempt
 standby 204 track GigabitEthernet0/0.167
!
router mobile
!
ip local pool ha-pool6 10.1.6.1 10.1.6.255
ip route 92.92.92.1 255.255.255.255 10.0.0.5
ip route 99.99.99.0 255.255.255.0 200.0.0.3
!
ip mobile home-agent unknown-ha accept
ip mobile home-agent redundancy HSRP_HA_HA6 virtual-network address 16.0.0.30 mode
active-standby
ip mobile virtual-network 16.0.0.10 255.255.255.255
ip mobile host nai @cisco.com address pool local ha-pool6 virtual-network 16.0.0.10
255.255.255.255
ip mobile secure host nai @cisco.com spi 100 key ascii cisco algorithm md5 mode
prefix-suffix
ip mobile secure home-agent 10.0.0.4 spi 100 key ascii cisco algorithm md5 mode
prefix-suffix
```

HA Configuration - Switch 2:

HA1:

```
interface Loopback0
 description Advertised Home Agent Virtual IP Address
 ip address 12.0.0.30 255.255.255.255
!
interface GigabitEthernet0/0.126
 encapsulation dot1Q 126
 ip address 126.0.0.32 255.255.255.0
!
interface GigabitEthernet0/0.127
 description MWAM Processor interface to SUP (Private HSRP VLAN)
 encapsulation dot1Q 127
 ip address 6.0.0.4 255.255.255.0
 standby 10 ip 6.0.0.10
 standby 10 preempt
 standby 10 name HSRP_HA_HA2
```

```
 standby 10 GigabitEthernet0/0.200
!
interface GigabitEthernet0/0.200
 description interface for non-ipsec pkts
 encapsulation dot1Q 200
 ip address 200.0.0.6 255.0.0.0
 no snmp trap link-status
 standby 200 ip 200.0.0.5
 standby 200 preempt
 standby 200 track GigabitEthernet0/0.127
!
router mobile
!
ip local pool ha-pool2 10.1.2.1 10.1.2.255
ip route 92.92.92.1 255.255.255.255 6.0.0.5
ip route 95.95.95.0 255.255.255.0 200.0.0.3
!
ip mobile home-agent unknown-ha accept
ip mobile home-agent redundancy HSRP_HA_HA2 virtual-network address 12.0.0.30 mode
active-standby
ip mobile virtual-network 12.0.0.10 255.255.255.255
ip mobile host nai @cisco.com address pool local ha-pool2 virtual-network 12.0.0.10
255.255.255.255
ip mobile secure host nai @cisco.com spi 100 key ascii cisco algorithm md5 mode
prefix-suffix
ip mobile secure home-agent 6.0.0.3 spi 100 key ascii cisco algorithm md5 mode
prefix-suffix
```

HA2:

```
interface Loopback0
 description Advertised Home Agent Virtual IP Address
 ip address 13.0.0.30 255.255.255.255
!
interface GigabitEthernet0/0.136
 encapsulation dot1Q 136
 ip address 136.0.0.33 255.255.255.0
!
interface GigabitEthernet0/0.137
 description MWAM Processor interface to SUP (Private HSRP VLAN)
 encapsulation dot1Q 137
 ip address 7.0.0.4 255.255.255.0
 standby 20 ip 7.0.0.10
 standby 20 preempt
 standby 20 name HSRP_HA_HA3
 standby 20 GigabitEthernet0/0.200
!
interface GigabitEthernet0/0.200
 description interface for non-ipsec pkts
 encapsulation dot1Q 200
 ip address 200.0.0.16 255.0.0.0
 no snmp trap link-status
 standby 201 ip 200.0.0.15
 standby 201 preempt
 standby 201 track GigabitEthernet0/0.137
!
router mobile
!
ip local pool ha-pool3 10.1.3.1 10.1.3.255
ip route 92.92.92.1 255.255.255.255 7.0.0.5
ip route 96.96.96.0 255.255.255.0 200.0.0.3
!
ip mobile home-agent unknown-ha accept
```

```
ip mobile home-agent redundancy HSRP_HA_HA3 virtual-network address 13.0.0.30 mode
active-standby
ip mobile virtual-network 13.0.0.10 255.255.255.255
ip mobile host nai @cisco.com address pool local ha-pool3 virtual-network 13.0.0.10
255.255.255.255
ip mobile secure host nai @cisco.com spi 100 key ascii cisco algorithm md5 mode
prefix-suffix
ip mobile secure home-agent 7.0.0.3 spi 100 key ascii cisco algorithm md5 mode
prefix-suffix
```

HA3:

```
interface Loopback0
 description Advertised Home Agent Virtual IP Address
 ip address 14.0.0.30 255.255.255.255
!
interface GigabitEthernet0/0.146
 encapsulation dot1Q 146
 ip address 146.0.0.32 255.255.255.0
!
interface GigabitEthernet0/0.147
 description MWAM Processor interface to SUP (Private HSRP VLAN)
 encapsulation dot1Q 147
 ip address 8.0.0.4 255.255.255.0
 standby 30 ip 8.0.0.10
 standby 30 preempt
 standby 30 name HSRP_HA_HA4
 standby 30 GigabitEthernet0/0.200
!
interface GigabitEthernet0/0.200
 description interface for non-ipsec pkts
 encapsulation dot1Q 200
 ip address 200.0.0.26 255.0.0.0
 no snmp trap link-status
 standby 202 ip 200.0.0.25
 standby 202 preempt
 standby 202 track GigabitEthernet0/0.147
!
router mobile
!
ip local pool ha-pool4 10.1.4.1 10.1.4.255
ip route 92.92.92.1 255.255.255.255 8.0.0.5
ip route 97.97.97.0 255.255.255.0 200.0.0.3
!
ip mobile home-agent unknown-ha accept
ip mobile home-agent redundancy HSRP_HA_HA4 virtual-network address 14.0.0.30 mode
active-standby
ip mobile virtual-network 14.0.0.10 255.255.255.255
ip mobile host nai @cisco.com address pool local ha-pool4 virtual-network 14.0.0.10
255.255.255.255
ip mobile secure host nai @cisco.com spi 100 key ascii cisco algorithm md5 mode
prefix-suffix
ip mobile secure home-agent 8.0.0.3 spi 100 key ascii cisco algorithm md5 mode
prefix-suffix
```

HA4:

```
interface Loopback0
 description Advertised Home Agent Virtual IP Address
 ip address 15.0.0.30 255.255.255.255
!
interface GigabitEthernet0/0.156
```

```
 encapsulation dot1Q 156
 ip address 156.0.0.32 255.255.255.0
!
interface GigabitEthernet0/0.157
 description MWAM Processor interface to SUP (Private HSRP VLAN)
 encapsulation dot1Q 157
 ip address 9.0.0.4 255.255.255.0
 standby 40 ip 9.0.0.10
 standby 40 preempt
 standby 40 name HSRP_HA_HA5
 standby 40 GigabitEthernet0/0.200
!
interface GigabitEthernet0/0.200
 description interface for non-ipsec pkts
 encapsulation dot1Q 200
 ip address 200.0.0.36 255.0.0.0
 no snmp trap link-status
 standby 203 ip 200.0.0.35
 standby 203 preempt
 standby 203 track GigabitEthernet0/0.157
!
router mobile
!
ip local pool ha-pool5 10.1.5.1 10.1.5.255
ip route 92.92.92.1 255.255.255.255 9.0.0.5
ip route 98.98.98.0 255.255.255.0 200.0.0.3
!
ip mobile home-agent unknown-ha accept
ip mobile home-agent redundancy HSRP_HA_HA5 virtual-network address 15.0.0.30 mode
active-standby
ip mobile virtual-network 15.0.0.10 255.255.255.255
ip mobile host nai @cisco.com address pool local ha-pool5 virtual-network 15.0.0.10
255.255.255.255
ip mobile secure host nai @cisco.com spi 100 key ascii cisco algorithm md5 mode
prefix-suffix
ip mobile secure home-agent 9.0.0.3 spi 100 key ascii cisco algorithm md5 mode
prefix-suffix
```

HA5:

```
interface Loopback0
 description Advertised Home Agent Virtual IP Address
 ip address 16.0.0.30 255.255.255.255
!
interface GigabitEthernet0/0.166
 encapsulation dot1Q 166
 ip address 166.0.0.32 255.255.255.0
!
interface GigabitEthernet0/0.167
 description MWAM Processor interface to SUP (Private HSRP VLAN)
 encapsulation dot1Q 167
 ip address 10.0.0.4 255.255.255.0
 standby 50 ip 10.0.0.10
 standby 50 preempt
 standby 50 name HSRP_HA_HA6
 standby 50 GigabitEthernet0/0.200
!
interface GigabitEthernet0/0.200
 description interface for non-ipsec pkts
 encapsulation dot1Q 200
 ip address 200.0.0.46 255.0.0.0
 no snmp trap link-status
 standby 204 ip 200.0.0.45
```

```
 standby 204 preempt
 standby 204 track GigabitEthernet0/0.167
!
router mobile
!
ip local pool ha-pool6 10.1.6.1 10.1.6.255
ip route 92.92.92.1 255.255.255.255 10.0.0.5
ip route 98.98.98.0 255.255.255.0 200.0.0.3
!
ip mobile home-agent unknown-ha accept
ip mobile home-agent redundancy HSRP_HA_HA6 virtual-network address 16.0.0.30 mode
active-standby
ip mobile virtual-network 16.0.0.10 255.255.255.255
ip mobile host nai @cisco.com address pool local ha-pool6 virtual-network 16.0.0.10
255.255.255.255
ip mobile secure host nai @cisco.com spi 100 key ascii cisco algorithm md5 mode
prefix-suffix
ip mobile secure home-agent 10.0.0.3 spi 100 key ascii cisco algorithm md5 mode
prefix-suffix
```