Mobile IP Home Agent Policy Routing

The Mobile IP Home Agent Policy Routing feature supports route maps on Mobile IP tunnels created at the home agent. This feature allows an Internet Service Provider (ISP) to provide service to multiple customers. While reverse tunneling packets, the home agent looks up where the packet should go. For example, if an address corresponds to a configured network access identifier (NAI) realm name (such as cisco.com), the packet goes out interface 1, which has a connection to the Cisco network. If an address corresponds to another NAI realm name (such as company2.com), the packet goes out interface 2, which has a connection to the Company2 network.

Feature Specifications for Mobile IP Home Agent Policy Routing

Feature History	
Release	Modification
12.2(13)T	This feature was introduced.
Supported Platforms	
Refer to Feature Navigator.	

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see Bug Search Tool and the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the feature information table at the end of this module.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Prerequisites for Mobile IP Home Agent Policy Routing

Reverse tunnelling must be enabled on both the home agent and foreign agent.

Information About Mobile IP Home Agent Policy Routing

Policy Routing

Policy routing is a more flexible mechanism for routing packets than destination routing. Policy routing allows network administrators to implement policies that selectively cause packets to take different paths. The policy can be as simple as not allowing any traffic from a department on a network or as complex as making sure traffic with certain characteristics originating within a network takes path A, while other traffic takes path B.

Policy routing is applied to incoming packets. All packets received on an interface with policy routing enabled are considered for policy routing. The router passes the packets through enhanced packet filters called route maps. The route map determines which packets are routed to which router next. Based on the criteria defined in the route maps, packets are forwarded/routed to the appropriate next hop.

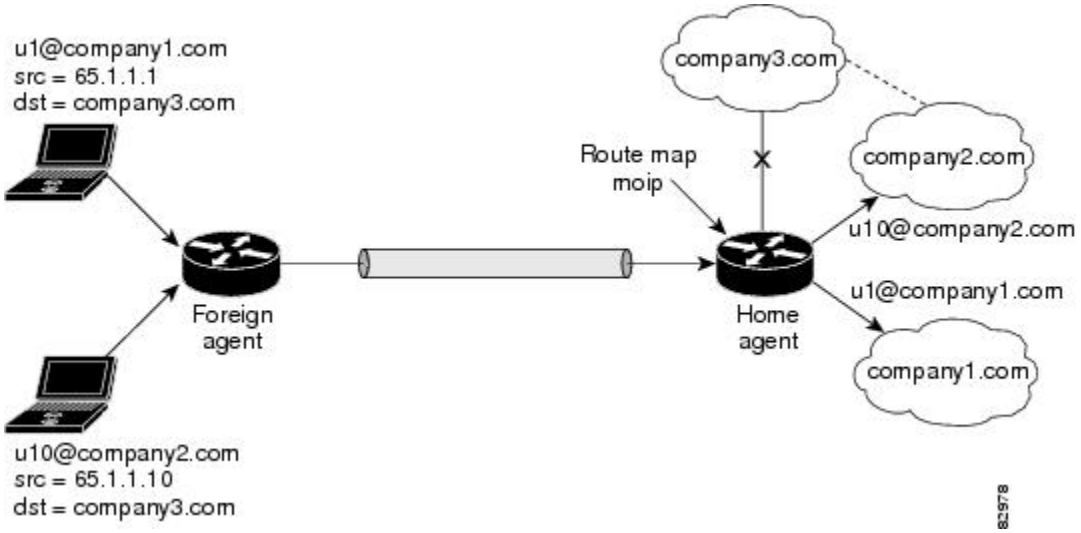
Feature Design of Mobile IP Home Agent Policy Routing

The Mobile IP Home Agent Policy Routing feature allows policy routing for mobile nodes based on the NAI configuration. ISPs can use this feature to route traffic originating from different sets of users, as identified by the NAI realm name, through different Internet connections across the policy routers. When the mobile node registers, entries are added dynamically in the access list pointed to by the route map and the route map is applied to the tunnel interface.

A route map is configured and applied on the Mobile IP tunnel. When a packet arrives on a tunnel interface and policy routing is enabled on that tunnel (route map applied), the packet is checked against the access list configured on the route map.

The figure below shows a sample topology for home agent policy routing. In the figure, as traffic from u1@company1.com and u10@ company2.com is policy routed, the home agent forwards it per the policy instead of routing directly to the destination address.

Figure 1: Sample Topology for Mobile IP Home Agent Policy Routing



How to Configure Mobile IP Home Agent Policy Routing

Enabling Policy Routing on the Home Agent

This section describes how to enable policy routing on the home agent:

SUMMARY STEPS

1. **enable**
2. **configure** {**terminal** | **memory** | **network**}
3. **router mobile**
4. **exit**
5. **ip mobile home-agent** [**address** *ip-address*]
6. **ip mobile tunnel route-map** *map-tag*
7. **ip mobile vpn-realm** *realm-name* **route-map-sequence** *sequence-number*
8. **ip mobile virtual-network** *addr mask*
9. **ip mobile host nai** *string*
10. **ip mobile secure host nai** *string* **spi** *spi* **key hex** *string*

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables higher privilege levels, such as privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure** {**terminal** | **memory** | **network**} **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**router mobile** **Example:** `Router(config)# router mobile`	Enables Mobile IP on the router.
Step 4	**exit** **Example:** `Router(config-router)# exit`	Returns to global configuration mode.
Step 5	**ip mobile home-agent** [**address** *ip-address*] **Example:** `Router(config)# ip mobile home-agent`	Enables and controls home agent services on the router.
Step 6	**ip mobile tunnel route-map** *map-tag* **Example:** `Router(config)# ip mobile tunnel route-map moipmap`	Applies the route map to the tunnel. • The *map-tag* argument must match that specified in the **route-map** *map-tag* command.
Step 7	**ip mobile vpn-realm** *realm-name* **route-map-sequence** *sequence-number* **Example:** `Router(config)# ip mobile vpn-realm corp.com route-map-sequence 20`	Defines the VPN realms to be used in home agent policy routing. • The *sequence-number* argument must match that configured in the **route-map** *sequence-number* command. The allowed sequence number range is from 0-65535.

	Command or Action	Purpose
Step 8	**ip mobile virtual-network** *addr mask* **Example:** `Router(config)# ip mobile virtual-network 10.2.0.0 255.255.0.0`	Inserts a virtual network for mobile nodes in the routing table. • This command allows the mobile nodes to use the virtual network as their home network.
Step 9	**ip mobile host nai** *string* **Example:** `Router(config)# ip mobile host nai corp.com`	Configures a mobile host, which is identified by the NAI.
Step 10	**ip mobile secure host nai** *string* **spi** *spi* **key hex** *string* **Example:** `Router(config)# ip mobile secure host nai corp.com spi 100 key hex 12345678123456781234567812345678`	Specifies the mobility security associations for the mobile host.

Defining the Route Map

This section describes how to define the route map and define the criteria by which packets are examined to learn if they will be policy-routed.

Note The Mobile IP Home Agent Policy Routing feature supports only standard access lists; named and extended access lists are not supported.

SUMMARY STEPS

1. **enable**
2. **configure** {**terminal** | **memory** | **network**}
3. **route-map** *map-tag* [**permit** | **deny**][*sequence-number*]
4. **match ip address** *access-list-number*
5. **set interface** [*type number*]

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable**	Enables higher privilege levels, such as privileged EXEC mode.

	Command or Action	Purpose
	Example: `Router> enable`	• Enter your password if prompted.
Step 2	**configure** {**terminal** | **memory** | **network**} **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**route-map** *map-tag* [**permit** | **deny**][*sequence-number*] **Example:** `Router(config)# route-map moipmap permit 20`	Enables policy routing and enters route-map configuration mode. • The *map-tag* argument must match that specified in the **ip mobile tunnel route-map** *map-tag* command.
Step 4	**match ip address** *access-list-number* **Example:** `Router(config-route-map)# match ip address 5`	Performs policy routing on the packets. • In the example, access list 5 will be routed to the interface specified by the **set interface** command.
Step 5	**set interface** [*type number*] **Example:** `Router(config-route-map)# set interface ethernet 0`	Indicates where to output packets that pass a match clause of route map for policy routing.

Verifying Policy Routing on the Home Agent

To verify the home agent policy routing configuration, use the following commands in privileged EXEC mode, as needed:

SUMMARY STEPS

1. **enable**
2. **show ip mobile binding**
3. **show ip mobile tunnel**
4. **show access-lists**
5. **show ip policy**
6. **show ip mobile vpn-realm**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables higher privilege levels, such as privileged EXEC mode. • Enter your password if prompted.
Step 2	**show ip mobile binding** **Example:** `Router# show ip mobile binding`	Displays the mobility binding table. • See the display output in the Output Examples, on page 7 section.
Step 3	**show ip mobile tunnel** **Example:** `Router# show ip mobile tunnel`	Displays the active tunnels. • See the display output in the Output Examples, on page 7 section.
Step 4	**show access-lists** **Example:** `Router# show access-lists`	Displays the contents of the current access lists. • See the display output in the Output Examples, on page 7 section.
Step 5	**show ip policy** **Example:** `Router# show ip policy`	Displays the route map used for policy routing. • The route maps applied to the tunnels are displayed. See the display output in the Output Examples, on page 7 section.
Step 6	**show ip mobile vpn-realm** **Example:** `Router# show ip mobile vpn-realm`	Displays the Mobile IP VPN realms and sequence numbers. • See the display output in the Output Examples, on page 7 section.

Output Examples

This section provides the following output examples:

Sample Output for the show ip mobile binding Command

The following is example output for a mobile host using the NAI realm of u10@company2.com:

```
Router# show ip mobile binding
Mobility Binding List:
Total 1
```

```
u10@company2.com (Bindings 1):
    Home Addr 65.1.1.10
    Care-of Addr 4.4.4.3, Src Addr 3.3.3.3
    Lifetime granted 00:05:00 (300), remaining 00:03:58
    Flags sBdmgvT, Identification BF7A951C.28FA35AB
    Tunnel1 src 150.150.150.150 dest 4.4.4.3 reverse-allowed
    Routing Options - (T)Reverse-tunnel
```

Sample Output for the show ip mobile tunnel Command

The following example displays the active Mobile IP tunnels and the configured route map:

```
Router# show ip mobile tunnel
Total mobile ip tunnels 1
Tunnel1:
    src 150.150.150.150, dest 4.4.4.3
    encap IP/IP, mode reverse-allowed, tunnel-users 1
    IP MTU 1514 bytes
    Path MTU Discovery, mtu:0, ager:10 mins, expires:never
    outbound interface Mobile0
    HA created, fast switching enabled, ICMP unreachable enabled
    10 packets input, 1000 bytes, 0 drops
    5 packets output, 600 bytes
    Route Map is:moipmap
```

Sample Output for the show access-lists Command

The following example displays the access list:

```
Router# show access-lists
Standard IP access list 5
    permit 65.1.1.10
```

Sample Output for the show ip policy Command

The following example displays the route maps applied to the tunnels:

```
Router# show ip policy
Interface      Route map
Tunnel0        moipmap
Tunnel1        moipmap
```

Sample Output for the show ip mobile vpn-realm Command

The following examples show two VPN realms configured on the router with the corresponding **show** output:

```
ip mobile vpn-realm company1.com route-map-sequence 20
ip mobile vpn-realm company2.com route-map-sequence 10
Router# show ip mobile vpn-realm
IP Mobile VPN realm(s):
    Sequence number: 20      Realm: company1.com
    Sequence number: 10      Realm: company2.com
```

Configuration Examples for Mobile IP Home Agent Policy Routing

Home Agent Policy Routing Example

In the following example, the route map named moipmap is applied to the Mobile IP tunnel and traffic is routed, based on the NAI VPN realm configuration, through different connections across the policy routers:

```
!
router mobile
!
ip mobile home-agent address 150.150.150.150 lifetime 65535 replay 255
ip mobile vpn-realm company2.com route-map-sequence 10
ip mobile virtual-network 65.0.0.0 255.0.0.0
ip mobile host nai u10@company2.com address 65.1.1.10 virtual-network 65.0.0.0 255.0.0.0
ip mobile host nai u9@company2.com address 65.1.1.9 virtual-network 65.0.0.0 255.0.0.0
ip mobile host nai u2@company1.com address 65.1.1.2 virtual-network 65.0.0.0 255.0.0.0
ip mobile host nai u1@company1.com address 65.1.1.1 virtual-network 65.0.0.0 255.0.0.0
ip mobile secure host nai u2@company1.com spi 100 key hex 12345678123456781234567812345678
ip mobile secure host nai u1@company1.com spi 100 key hex 45678123451234567812367812345678
ip mobile secure host nai u9@company2.com spi 100 key hex 81234567812345678123456712345678
ip mobile secure host nai u10@company2.com spi 100 key hex 23456781234567812345678123456781
ip mobile tunnel route-map moipmap
!
access-list 5 permit 65.1.1.10
!
route-map moipmap permit 10
 match ip address 5
 set interface Ethernet4/4
!
```

Note This configuration example shows mobile hosts configured with static IP addresses. Mobile IP policy routing can also be used with dynamically assigned IP addresses. For example, hosts from two different NAI realms can be assigned addresses from the same address pool.

Additional References

For additional information related to Mobile IP home agent policy routing, refer to the following references:

Related Documents

Related Topic	Document Title
Mobile IP configuration tasks	"Configuring Mobile IP" chapter in the *Cisco IOS IP Configuration Guide,* Release 12.2
Mobile IP commands: complete command syntax, command mode, defaults, usage guidelines, and examples	"Mobile IP Commands" chapter in the*Cisco IOS IP Command Reference, Volume 1 of 3: Addressing and Services,* Release 12.2

Related Topic	Document Title
Policy routing configuration tasks	"Configuring IP Routing Protocol-Independent Features" chapter in the *Cisco IOS IP Configuration Guide,* Release 12.2
Policy routing commands: complete command syntax, command mode, defaults, usage guidelines, and examples	"IP Routing Protocol-Independent Commands" chapter in the *Cisco IOS IP Command Reference, Volume 2 of 3: Routing Protocols,* Release 12.2
Mobile IP commands related to NAI	"Mobile IP--Generic NAI Support and Home Address Allocation" feature document, Release 12.2(13)T

Standards

Standards	Title
No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature.	--

MIBs

MIBs	MIBs Link
No new or modified MIBs are supported by this feature, and support for existing MIBs has not been modified by this feature.	To obtain lists of supported MIBs by platform and Cisco IOS release, and to download MIB modules, go to the Cisco MIB website on Cisco.com at the following URL: http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml

To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL:

http://tools.cisco.com/ITDIT/MIBS/servlet/index

If Cisco MIB Locator does not support the MIB information that you need, you can also obtain a list of supported MIBs and download MIBs from the Cisco MIBs page at the following URL:

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

To access Cisco MIB Locator, you must have an account on Cisco.com. If you have forgotten or lost your account information, send a blank e-mail to cco-locksmith@cisco.com. An automatic check will verify that your e-mail address is registered with Cisco.com. If the check is successful, account details with a new random password will be e-mailed to you. Qualified users can establish an account on Cisco.com by following the directions found at this URL:

http://www.cisco.com/register

RFCs

RFCs	Title
No new or modified RFCs are supported by this feature, and support for existing RFCs has not been modified by this feature.	--

Technical Assistance

Description	Link
Technical Assistance Center (TAC) home page, containing 30,000 pages of searchable technical content, including links to products, technologies, solutions, technical tips, tools, and lots more. Registered Cisco.com users can log in from this page to access even more content.	http://www.cisco.com/public/support/tac/home.shtml

Command Reference

The following commands are introduced or modified in the feature or features documented in this module. For information about these commands, see the *Cisco IOS IP Mobility Command Reference* at http://www.cisco.com/en/US/docs/ios/ipmobility/command/reference/imo_book.html. For information about all Cisco IOS commands, go to the Command Lookup Tool at http://tools.cisco.com/Support/CLILookup or to the *Cisco IOS Master Commands List* .

- **ip mobile tunnel**
- **ip mobile vpn-realm**
- **show ip mobile tunnel**
- **show ip mobile vpn-realm**

Glossary

home agent --A router that forwards to mobile node or that tunnels packets to the mobile node or mobile router while they are away from home. It keeps current location information for registered mobile nodes called a mobility binding.

NAI --network access identifier. The user ID submitted by the mobile node during registration to identify the user for authentication. The NAI may help route the registration request to the right Home Agent.

Note Refer to the Internetworking Terms and Acronyms for terms not included in this glossary.