IPv6 NEMO

The network mobility (NEMO) basic support protocol enables mobile IPv6 networks to attach to different points in the Internet. This protocol is an extension of Mobile IPv6 and allows session continuity for every node in the mobile network as the network moves.

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.

Restrictions for IPv6 NEMO

When using the network mobility (NEMO) basic support protocol feature, users should not enable any IPv6 routing protocols on any of the roaming interfaces.

Information About IPv6 NEMO

IPv6 NEMO

The NEMO basic support protocol enables mobile IPv6 networks to attach to different points in the Internet. This protocol is an extension of Mobile IPv6 and allows session continuity for every node in the mobile network as the network moves. NEMO also allows every node in the mobile network to be reachable while the user is moving. The mobile router, which connects the network to the Internet, runs the NEMO basic support protocol with its home agent (HA). NEMO allows network mobility to be transparent to the nodes inside the mobile network.

The NEMO router maintains a mobile route, which is the default route for IPv6 over the roaming interface.

NEMO-Compliant Home Agent

Protocol extensions to Mobile IPv6 are used to enable support for network mobility. The extensions are backward-compatible with existing Mobile IPv6 functionality. A NEMO-compliant home agent can operate as a Mobile IPv6 home agent.

The dynamic home agent address discovery (DHAAD) mechanism allows a mobile node to discover the address of the home agent on its home link. The following list describes DHAAD functionality and features:

- The mobile router sends Internet Control Message Protocol (ICMP) home agent address discovery requests to the Mobile IPv6 home agent's anycast address for the home subnet prefix.
- A new flag (R) is introduced in the DHAAD request message, indicating the desire to discover home agents that support mobile routers. This flag is added to the DHAAD reply message as well.
- On receiving the home agent address discovery reply message, the mobile router discovers the home agents operating on the home link.
- The mobile router attempts home registration to each of the home agents until its registration is accepted. The mobile router waits for the recommended length of time between its home registration attempts with each of its home registration attempts.

Implicit Prefix Registration

When using implicit prefix registration, the mobile router does not register any prefixes as part of the binding update with its home agent. This function requires a static configuration at the home agent, and the home agent must have the information of the associated prefixes with the given mobile router for it to set up route forwarding.

Explicit Prefix Registration

When using explicit prefix registration, the mobile router presents a list of prefixes to the home agent as part of the binding update procedure. If the home agent determines that the mobile router is authorized to use these prefixes, it sends a bind acknowledgment message.

IPv6 Neighbor Discovery Duplicate Address Detection in NEMO

IPv6 routers are required to run duplicate address detection (DAD) on all IPv6 addresses obtained in stateless and stateful autoconfiguration modes before assigning them to any of its interfaces. Whenever an mobile router roams and obtains an IPv6 address, the mobile router must perform DAD on the newly obtained care-of address and on its link-local address in order to avoid address collisions.

However, the DAD feature adds significant handoff delays in certain Layer 2 environments. These delays may be avoided by using optimistic DAD techniques. NEMO supports optimization options for omitting DAD on care-of address or on both the care-of address and link-local address.

For further information on IPv6 neighbor discovery, refer to the *Implementing IPv6 Addressing and Basic Connectivity* module.

How to Enable IPv6 NEMO

Enabling and Configuring NEMO on the IPv6 Mobile Router

The NEMO basic support protocol enables mobile IPv6 networks to attach to different points in the Internet.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ipv6 mobile router**
4. **eui-interface** *interface-type interface-number*
5. **home-network** *ipv6-prefix*
6. **home-address** {**home-network** | *ipv6-address-identifier* | *interface*
7. **explicit-prefix**
8. **register** {**extend expire** *seconds* **retry** *number* **interval** *seconds* | **lifetime** *seconds* | **retransmit initial** *milliseconds* **maximum** *milliseconds* **retry** *number*}
9. **exit**
10. **exit**
11. **show ipv6 mobile router running-config** | **status**]

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.

	Command or Action	Purpose
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**ipv6 mobile router** **Example:** `Router(config)# ipv6 mobile router`	Enables IPv6 NEMO functionality on a router, and places the router in IPv6 mobile router configuration mode.
Step 4	**eui-interface** *interface-type interface-number* **Example:** `Router(IPv6-mobile-router)# eui-interface Ethernet0/0`	Uses the Media Access Control (MAC) address from a specified interface for deriving the IPv6 mobile home address.
Step 5	**home-network** *ipv6-prefix* **Example:** `Router(IPv6-mobile-router)# home-network 2001:0DB1:1/64`	Specifies the home network's IPv6 prefix on the mobile router. • Users can configure up to 10 home-network entries, and they are used in order of priority. The prefix identifies the home network of the mobile router and is used to discover when the mobile router is at home.
Step 6	**home-address** {**home-network** | *ipv6-address-identifier* | *interface* **Example:** `Router(IPv6-mobile-router)# home-address home-network eui-64`	Specifies the mobile router home address using an IPv6 address or interface identifier. • When multiple home networks have been configured, we recommend that you use the **home-address home-network** command syntax, so that the mobile router builds a home address that matches the home network to which it registers.
Step 7	**explicit-prefix** **Example:** `Router(IPv6-mobile-router)# explicit-prefix`	Registers IPv6 prefixes connected to the IPv6 mobile router.
Step 8	**register** {**extend expire** *seconds* **retry** *number* **interval** *seconds* | **lifetime** *seconds* | **retransmit initial** *milliseconds* **maximum** *milliseconds* **retry** *number*} **Example:** `Router(IPv6-mobile-router)# register lifetime 600`	Controls the registration parameters of the IPv6 mobile router.

	Command or Action	Purpose
Step 9	**exit** **Example:** `Router(IPv6-mobile-router)# exit`	Exits IPv6 mobile router configuration mode, and returns the router to global configuration mode.
Step 10	**exit** **Example:** `Router(config)# exit`	Exits global configuration mode, and returns the router to privileged EXEC mode.
Step 11	**show ipv6 mobile router** [**running-config** | **status**] **Example:** `Router# show ipv6 mobile router`	Displays configuration information and monitoring statistics about the IPv6 mobile router.

Enabling NEMO on the IPv6 Mobile Router Home Agent

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ipv6 router nemo**
4. **distance** [*mobile-distance*]

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.

	Command or Action	Purpose
Step 3	**ipv6 router nemo** **Example:** `Router(config)# ipv6 router nemo`	Enables the NEMO routing process on the home agent and place the router in router configuration mode.
Step 4	**distance** [*mobile-distance*] **Example:** `Router(config-rtr)# distance 10`	Defines an administrative distance for NEMO routes.

Enabling Roaming on the IPv6 Mobile Router Interface

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **ipv6 mobile router-service roam** [**bandwidth-efficient** | **cost-efficient** | **priority** *value*]

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**interface** *type number* **Example:** `Router(config)# interface ethernet 0/0`	Specifies the interface type and number, and enters interface configuration mode.
Step 4	**ipv6 mobile router-service roam** [**bandwidth-efficient** | **cost-efficient** | **priority** *value*]	Enables the IPv6 mobile router interface to roam.

	Command or Action	Purpose
	Example: `Router(config-if)# ipv6 mobile router-service roam`	

Configuration Examples for IPv6 NEMO

Example Enabling and Configuring NEMO on the IPv6 Mobile Router

The following example shows how to enable and configure NEMO on the IPv6 mobile router. The /128 subnet must be used; otherwise, the IPv6 mobile router will fail to register because it will believe the home network is locally connected:

```
ipv6 unicast-routing
!
interface ethernet0/0
no ip address
ipv6 address 2001:DB8:2000::1111/128
ipv6 nd ra mtu suppress
!
interface ethernet0/1
no ip address
ipv6 address 2001:DB8:1000::1111/128
ipv6 nd ra mtu suppress
!
interface Ethernet0/0
description Roaming Interface to AR2
no ip address
ipv6 address autoconfig
ipv6 enable
ipv6 nd ns-interval 5000
ipv6 mobile router-service roam
ipv6 rip home enable
!
interface Ethernet0/1
description Mobile Network Interface
no ip address
ipv6 address 2001:DB8:8000::8001/64
ipv6 enable
ipv6 nd advertisement-interval
ipv6 nd ra interval msec 1000
ipv6 rip home enable
!
interface Ethernet1/1
description Roaming Interface to AR1
no ip address
ipv6 address autoconfig
ipv6 enable
ipv6 nd ns-interval 5000
ipv6 mobile router-service roam priority 99
ipv6 rip home enable
!
ipv6 router rip home
!
ipv6 mobile router
```

```
host group mr-host-group
nai mr1@cisco.com
address 2001:DB8:2000::1112/128
authentication spi hex 100 key ascii hi
exit
home-network 2001:DB8:2000::/64 discover priority 127
home-network 2001:DB8:1000::/64 discover
home-address home-network eui-64
explicit-prefix
register lifetime 60
register retransmit initial 1000 maximum 1000 retry 1
register extend expire 20 retry 1 interval 1
```

Example Enabling NEMO on the IPv6 Mobile Router Home Agent

The following example shows how to enable and configure NEMO on the IPv6 mobile router home agent. The anycast address is needed for DHAAD to work. The **redistribute nemo** command redistributes NEMO routes into the routing protocol:

```
ipv6 unicast-routing
!
interface Ethernet0/2
description To Network
no ip address
no ipv6 address
ipv6 address 2001:DB8:2000::2001/64
ipv6 address 2001:DB8:2000::FDFF:FFFF:FFFF:FFFE/64 anycast
ipv6 enable
ipv6 nd advertisement-interval
ipv6 nd ra lifetime 2
ipv6 nd ra interval msec 1000
ipv6 mobile home-agent preference 100
ipv6 mobile home-agent
ipv6 rip home enable
!
interface Ethernet2/2
description To CN2
no ip address
no ipv6 address
ipv6 address 2001:DB8:3000::3001/64
ipv6 enable
ipv6 rip home enable
!
ipv6 router nemo
!
ipv6 router rip home
redistribute nemo
poison-reverse
!
ipv6 mobile home-agent
host group mr-host-group
nai mr1@cisco.com
address 2001:DB8:2000::1112/64
authentication spi hex 100 key ascii hi
exit
host group mr2-host-group
nai mr2@cisco.com
address 2001:DB8:2000::2222
authentication spi decimal 512 key hex 12345678123456781234567812345678
exit
```

Example Enabling Roaming on the IPv6 Mobile Router Interface

The following example shows how to enable roaming on the IPv6 mobile router interface:

```
Router(config)# interface ethernet 0/0
Router(config-if)# ipv6 mobile router-service roam
```

Additional References

Related Documents

Related Topic	Document Title
IPv6 addressing and connectivity	*IPv6 Configuration Guide*
Cisco IOS commands	Cisco IOS Master Commands List, All Releases
IPv6 commands	*Cisco IOS IPv6 Command Reference*
Cisco IOS IPv6 features	*Cisco IOS IPv6 Feature Mapping*

Standards and RFCs

Standard/RFC	Title
RFCs for IPv6	IPv6 RFCs

MIBs

MIB	MIBs Link
	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

Technical Assistance

Description	Link
The Cisco Support and Documentation website provides online resources to download documentation, software, and tools. Use these resources to install and configure the software and to troubleshoot and resolve technical issues with Cisco products and technologies. Access to most tools on the Cisco Support and Documentation website requires a Cisco.com user ID and password.	http://www.cisco.com/cisco/web/support/index.html

Feature Information for IPv6 NEMO

Table 1: Feature Information for IPv6 NEMO

Feature Name	Releases	Feature Information
Mobile IP - Mobile Networks v6 - Basic NEMO	12.4(20)T	The NEMO basic support protocol enables mobile IPv6 networks to attach to different points in the Internet. The following commands were introduced or modified: **distance**, **eui-interface**, **explicit-prefix**, **home-address**, **home-network**, **ipv6 mobile router**, **ipv6 mobile router-service roam**, **ipv6 router nemo**, **register**, **show ipv6 mobile router**.