



# Mobile Router DHCP Support for Dynamic CCoA and Foreign Agent Processing

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The Mobile Router DHCP Support for Dynamic Collocated Care-of Address (DCCoA) and Foreign Agent (FA) Processing feature adds support for mobile router roaming on Ethernet interfaces that acquire an IP address dynamically via the Dynamic Host Configuration Protocol (DHCP). The interface can register using this acquired IP address as a DCCoA or register using a CoA acquired from a foreign agent. This behavior is true for all platforms that support Mobile IP beginning with Cisco IOS Release 12.3(14)T.

This feature adds support for FA processing of advertisements and registrations on DHCP roaming interfaces.

A Simple Network Management Protocol (SNMP) signaling capability is also added to support this feature on the Cisco 3200 Series Mobile Access Router with a Wireless Mobile Interface Card (WMIC). The WMIC uses SNMP trap messages to signal the mobile router that the Layer 2 wireless local-area network (WLAN) is either up or down.

## Feature History for the Mobile Router DHCP Support for Dynamic CCoA and Foreign Agent Processing Feature

Release	Modification
12.3(14)T	This feature was introduced.

## Finding Support Information for Platforms and Cisco IOS Software Images

Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support. Access Cisco Feature Navigator at <http://www.cisco.com/go/fn>. You must have an account on Cisco.com. If you do not have an account or have forgotten your username or password, click **Cancel** at the login dialog box and follow the instructions that appear.

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## Prerequisites for Mobile Router DHCP Support for DCCoA and FA Processing

There are no prerequisites for DHCP support. However, if a Cisco 3200 Series Mobile Access Router is using a WMIC, the WMIC should be configured for SNMP traps. The 802.11 Layer 2 transitions (associations and disassociations) that take place on the WMIC are signaled to the mobile router via SNMP. Specifically, the Interface MIB linkUp and linkDown traps are sent to the mobile router Ethernet or VLAN interface.

See the [Configuration Guide for the Cisco 3200 Series Mobile Access Router](#) for more information on how to configure SNMP traps on the Cisco 3200 Series router.

## Restrictions for Mobile Router DHCP Support for DCCoA and FA Processing

The Mobile IP process will only process SNMP signals from a WMIC. The SNMP signaling functionality for DCCoA is supported on the Cisco 3200 Series Mobile Access Router.

The linkDown and linkUp trap events will not trigger mobile router redundancy.

## Information About Mobile Router DHCP Support for DCCoA and FA Processing

Before you configure this feature, you should understand the following concepts:

- [Care-of Addresses](#), page 3
- [Mobile Router DHCP Support](#), page 3
- [Mobile Router Support for SNMP Traps](#), page 4
- [Benefits of Mobile Router DHCP Support for DCCoA and FA Processing](#), page 5

## Care-of Addresses

If a mobile router determines that it is connected to a foreign network, it acquires a CoA. This CoA is the exit point of the tunnel from the home agent toward the mobile router. The CoA is included in the mobile router's registration request and is used by the home agent to forward packets to the mobile router in its current location. There are two types of CoAs:

- CoA acquired from a foreign agent
- Collocated care-of address (CCoA)

A foreign agent CoA is an IP address on a foreign agent that is advertised on the foreign network being visited by a mobile router. A foreign agent CoA can be shared by other mobile routers.

A CCoA is an IP address assigned to the interface of the mobile router itself. A CCoA represents the current position of the mobile router on the foreign network and can be used by only one mobile router at a time. A CCoA can be static or dynamic. A static CCoA is a fixed IP address configured on an interface. A dynamic CCoA is an IP address dynamically acquired via DHCP on an Ethernet interface or Point-to-Point Protocol (PPP)/IP Control Protocol (IPCP) on a point-to-point serial interface.

An interface enabled for both foreign agent CoA and CCoA registration will always register a foreign agent CoA instead of a CCoA if a foreign agent CoA is available.

## Mobile Router DHCP Support

This feature introduces DCCoA and foreign agent CoA support when IP addresses are obtained via DHCP on a roaming interface. Prior to the introduction of this feature, the mobile router could only support foreign agent CoA registration, static CCoA registration, and DCCoA registration through PPP/IPCP.

For both static and dynamic CCoA, the interface can be configured to exclusively use the CCoA for registration or to use a foreign agent CoA if one is available. An interface enabled for both foreign agent CoA and CCoA registration will always register a foreign agent CoA instead of a CCoA if a foreign agent CoA is available.

In the foreign agent case, when an interface first comes up, it will attempt to discover foreign agents on the link by soliciting and listening for agent advertisements. If a foreign agent is found, the mobile router will register using the advertised CoA. The interface will continue to register using a CoA as long as a foreign agent is heard. When foreign agents are not heard, CCoA processing is enabled and the interface registers its CCoA. The CCoA is the interface's statically configured or dynamically acquired primary IP address. If a foreign agent is heard again, the interface will again register using the foreign agent CoA.

In previous releases of CCoA support, the CCoA registration would begin only after a number of solicits were sent or no advertisements were heard. For faster roaming, this delay is now eliminated. Now the interface registers a foreign agent CoA if an agent advertisement is heard or it registers a CCoA if an address is acquired, depending on which event occurs first. In the case where the interface registers a CCoA first, a subsequent receipt of an agent advertisement will then cause the interface to register with the foreign agent.

To support CCoA on Ethernet interfaces, a default gateway address is required. This gateway address is used as the default gateway for CCoA registration and as a default route after the interface is registered. For static CCoA on an Ethernet interface, a default gateway address must be provided through the roaming interface CCoA configuration. See the Cisco IOS Release 12.2(15)T [Mobile Networks Static Collocated Care-of Address](#) feature documentation for configuration details.

When an interface is configured for DCCoA via DHCP, a configured gateway address is not required and the option to configure a gateway address is not offered through the command line interface (CLI). For DHCP interfaces, DCCoA registration uses the DHCP default router address and, once the interface is registered, the address is also used for the mobile router default route and gateway.

## Mobile Router Support for SNMP Traps

On a Cisco 3200 Series Mobile Access Router with a WMIC, SNMP traps allow the roaming interface to determine when the connected WLAN link status changes. Without this signaling, a CCoA-registered interface would not be aware of link status changes. The mobile router must be configured to receive SNMP linkUp and linkDown traps from the WMIC and can then make roaming decisions based on the type of trap received.

## Mobile Router Processing of linkUp Traps

When a linkUp trap is received on a DHCP roaming interface, the mobile router interface will either renew the current IP address or acquire a new IP address as quickly as possible. If the interface already has a DHCP-acquired IP address, the mobile router will attempt to renew it first. If renewal fails, the interface will attempt to acquire a new IP address.

If a DHCP interface is without an IP address, DHCP address acquisition begins. Address “discovery” attempts are repeated at increasing intervals (up to 60 seconds) and continue until an address is acquired. During address discovery, the interface is “IP-enabled” and IP packets can be processed. This means that foreign agent CoA advertisements can be heard and Mobile IP registration can take place, even though the interface does not have an IP address.

The new **ip dhcp client mobile renew** command allows you to configure the number of renewal attempts and the interval between attempts for renewing the current IP address that was acquired through DHCP. The configured values override any default values.

For roaming purposes, the roaming interface treats a linkUp trap event the same as if the roaming interface just came up. For example, solicits are sent, if foreign agent CoA-enabled, and the mobile router determines if this interface, compared to other roaming interfaces, should register. Dynamic address acquisition can trigger a DCCoA registration.

If the interface is already registered when the linkUp trap arrives and nothing else has changed that affects the registration decision, the mobile router will retain the existing registration.

## Mobile Router Processing of linkDown Traps

Receipt of a valid linkDown trap starts a new, configurable reassociation hold-down timer. The purpose of this timer is to delay the mobile router’s response to the trap, which is typically an attempt to register on the next best interface, for a period of time long enough for the WMIC to reassociate with another bridge or access point (AP). The mobile router remains registered during this hold-down period, foreign agent data is retained, and the mobile router interface keeps any DHCP-acquired IP address. The hold-down timer should be set to the maximum time it should take the WMIC to re-establish wireless connectivity while roaming between adjacent bridges or APs.

If a linkUp trap arrives before the hold-down timer expires, the mobile router remains registered and foreign agent data is retained. Solicits are sent to find foreign agents and the DHCP IP address renewal and discovery process begins. If the WMIC has roamed to an AP on the same subnet, address renewal should succeed.

If the hold-down timer expires or the hold-down delay was set to 0, mobile router processing proceeds as if the interface just went down. Any foreign agents heard on this interface are deleted from the foreign agent list and, if registered on the interface, the mobile router deletes the current registration and tries to register by using the next best roaming interface. Solicits are sent to find foreign agents and the DHCP IP address renewal and discovery process begins.

## Benefits of Mobile Router DHCP Support for DCCoA and FA Processing

This feature allows a mobile router to roam to foreign networks where foreign agents may or may not be deployed and where IP addresses are obtained dynamically via DHCP. The SNMP trap capability permits the Cisco 3200 Series Mobile Access Router with a WMIC to respond to changes in the WLAN link status.

## How to Configure Mobile Router DHCP Support for DCCoA

This section contains the following procedures:

- [Enabling DHCP Support for DCCoA Processing on a Mobile Router Interface, page 5](#) (required)
- [Configuring SNMP on the Mobile Router, page 7](#) (optional)
- [Verifying the Dynamic CCoA Configuration, page 8](#) (optional)

## Enabling DHCP Support for DCCoA Processing on a Mobile Router Interface

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **ip address dhcp**
5. **ip dhcp client mobile renew count** *number interval msec*
6. **ip mobile router-service roam**
7. **ip mobile router-service collocated** [*ccoa-only*]
8. **ip mobile router-service hold-down reassociate** *msec*

## DETAILED STEPS

	Command or Action	Purpose
Step 1	<p><b>enable</b></p> <p><b>Example:</b> Router&gt; enable</p>	<p>Enables privileged EXEC mode.</p> <ul style="list-style-type: none"> <li>Enter your password if prompted.</li> </ul>
Step 2	<p><b>configure terminal</b></p> <p><b>Example:</b> Router# configure terminal</p>	<p>Enters global configuration mode.</p>
Step 3	<p><b>interface</b> <i>type number</i></p> <p><b>Example:</b> Router(config)# interface FastEthernet 1</p>	<p>Configures an interface type and enters interface configuration mode.</p>
Step 4	<p><b>ip address dhcp</b></p> <p><b>Example:</b> Router(config-if)# ip address dhcp</p>	<p>Acquires an IP address on an interface from DHCP.</p> <ul style="list-style-type: none"> <li>DHCP address acquisition time can be reduced by turning off the pings normally sent out by the DHCP server to verify that the IP address is not in use. If using a Cisco IOS router as a DHCP server, use the <b>ip dhcp ping packets</b> <i>number</i> command and set the <i>number</i> argument to 0 (zero).</li> </ul>
Step 5	<p><b>ip dhcp client mobile renew count</b> <i>number</i> <b>interval</b> <i>msec</i></p> <p><b>Example:</b> Router(config-if)# ip dhcp client mobile renew count 4 interval 25</p>	<p>(Optional) Configures the number of renewal attempts and the interval between attempts for renewing the current IP address acquired by DHCP.</p> <ul style="list-style-type: none"> <li>By default the interface will attempt to renew its address twice and wait 50 milliseconds between attempts. You only need to use this command if you want to adjust the number of attempts or the interval between attempts.</li> </ul>
Step 6	<p><b>ip mobile router-service roam</b></p> <p><b>Example:</b> Router(config-if)# ip mobile router-service roam</p>	<p>Enables roaming on an interface.</p>

	Command or Action	Purpose
Step 7	<pre>ip mobile router-service collocated [ccoa-only]</pre> <p><b>Example:</b> Router(config-if)# ip mobile router-service collocated</p>	<p>Enables CCoA processing on a mobile router interface.</p> <ul style="list-style-type: none"> <li>The interface will first solicit foreign agent advertisements and register with a foreign agent CoA if an advertisement is heard. If no advertisements are received, CCoA registration is attempted.</li> <li>The <b>ccoa-only</b> keyword enables the interface to use CCoA processing only.</li> </ul>
Step 8	<pre>ip mobile router-service hold-down reassociate msec</pre> <p><b>Example:</b> Router(config-if)# ip mobile router-service hold-down reassociate 2000</p>	<p>(Optional) Specifies the delay, after receiving a linkDown trap, that the mobile router waits for a linkUp trap.</p> <ul style="list-style-type: none"> <li>The default is 1000 msec. The range is from 0 to 5000 seconds.</li> <li>This reassociate hold-down period is the interval of time (in milliseconds) that the mobile router will wait, after receiving an SNMP linkDown trap, for a linkUp trap from the WMIC indicating that the wireless link is available for use.</li> </ul>

## Configuring SNMP on the Mobile Router

If a Cisco 3200 Series Mobile Access Router is using a WMIC, the router must be configured for SNMP. The WMIC uses SNMP trap messages to signal the mobile router that the WLAN is either up or down. See the [Configuration Guide for the Cisco 3200 Series Mobile Access Router](#) for additional information on how to configure SNMP traps.

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **snmp-server engineID remote** *remote-ip-address remote-engineID-string*
4. **snmp-server user** *username group-name remote remote-ip-address v3*

**DETAILED STEPS**

	<b>Command or Action</b>	<b>Purpose</b>
<b>Step 1</b>	<b>enable</b>  <b>Example:</b> Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"><li>• Enter your password if prompted.</li></ul>
<b>Step 2</b>	<b>configure terminal</b>  <b>Example:</b> Router# configure terminal	Enters global configuration mode.
<b>Step 3</b>	<b>snmp-server engineID remote</b> <i>remote-ip-address</i> <i>remote-engineID-string</i>  <b>Example:</b> Router(config)# snmp-server engineID remote 172.21.58.1 800000090300000F23AD8F30	Specifies the SNMP engine ID of a remote SNMP device.
<b>Step 4</b>	<b>snmp-server user</b> <i>username group-name remote</i> <i>remote-ip-address v3</i>  <b>Example:</b> Router(config)# snmp-server user labusr labgrp remote 172.21.58.1 v3	Configures a new user to an SNMP group.

**Verifying the Dynamic CCoA Configuration**

To verify the dynamic CCoA configuration, perform the following steps.

**SUMMARY STEPS**

1. **show ip mobile router interface**
2. **show ip mobile router agent**
3. **show ip mobile router registration**
4. **show ip mobile router**
5. **show ip mobile binding**

## DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>show ip mobile router interface</b>  <b>Example:</b> Mobilerouter# show ip mobile router interface	Displays information about the interface that the mobile router is using for roaming. <ul style="list-style-type: none"> <li>• If the interface is configured for CCoA, the CCoA (IP address) is displayed even if the interface is down.</li> <li>• If the interface is configured for DCCoA via DHCP, the Layer 2 linkDown hold-down value and the most recently processed link state trap will be displayed.</li> </ul>
Step 2	<b>show ip mobile router agent</b>  <b>Example:</b> Mobilerouter# show ip mobile router agent	Displays information about the agents for the mobile router. <ul style="list-style-type: none"> <li>• If the interface configured for CCoA is up, an entry is shown.</li> </ul>
Step 3	<b>show ip mobile router registration</b>  <b>Example:</b> Mobilerouter# show ip mobile router registration	Displays the pending and accepted registrations of the mobile router.
Step 4	<b>show ip mobile router</b>  <b>Example:</b> Mobilerouter# show ip mobile router	Displays configuration information and monitoring statistics about the mobile router.
Step 5	<b>show ip mobile binding</b>  <b>Example:</b> Homeagent# show ip mobile router	Displays the mobility binding table. <ul style="list-style-type: none"> <li>• If a CCoA is registered with the home agent, (D) direct-to-mobile node is displayed in the Routing Options field.</li> </ul>

## Configuration Examples for Mobile Router DHCP Support for DCCoA

This section provides the following configuration example:

- [Mobile Router DCCoA Acquired Through DHCP: Example, page 9](#)

### Mobile Router DCCoA Acquired Through DHCP: Example

The following example shows a mobile router configured to obtain a CCoA dynamically through DHCP:

#### Mobile Router

```
! This is the roaming interface using DCCoA
interface FastEthernet0
 ip address dhcp
 ip dhcp client mobile renew count 3 interval 20
 ip mobile router-service roam
 ip mobile router-service collocated
 ip mobile router-service hold-down reassociate 2000
```

```

!
! Receive v1 or v2 traps
snmp-server community public RO
snmp-server enable traps tty
!

! Receive v3 traps
snmp-server engineID remote 85.85.85.3 1234
snmp-server user labusr labgrp remote 85.85.85.2 v3 auth md5 <SNMP user password on WGB>
snmp-server group labgrp v3 auth

```

## Additional References

The following sections provide references related to the Mobile Router DHCP Support for DCCoA and FA Processing feature.

## Related Documents

Related Topic	Document Title
Cisco 3200 Series Mobile Access Router documentation	<a href="#">Configuration Guide for the Cisco 3200 Series Mobile Access Router</a>
Mobile IP commands: complete command syntax, command mode, defaults, usage guidelines, and examples	<a href="#">Cisco IOS IP Command Reference, Volume 4 of 4: IP Mobility, Release 12.3T</a>
Mobile IP commands and configuration tasks related to mobile networks	<a href="#">Cisco Mobile Networks</a> feature document, Release 12.2(4)T and 12.2(13)T
Static CCoA documentation	<a href="#">Mobile Networks Static Collocated Care-of Address</a> feature document, Release 12.2(15)T
Dynamic CCoA documentation	<a href="#">Mobile Networks Dynamic Collocated Care-of Address</a> feature document, Release 12.3(4)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 locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: <a href="http://www.cisco.com/go/mibs">http://www.cisco.com/go/mibs</a>

## 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, and tools. Registered Cisco.com users can log in from this page to access even more content.	<a href="http://www.cisco.com/public/support/tac/home.shtml">http://www.cisco.com/public/support/tac/home.shtml</a>

## 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](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 dhcp client mobile renew**
- **ip mobile router-service**
- **show ip mobile router agent**
- **show ip mobile router interface**

# Glossary

**care-of address**—The termination point of the tunnel to a mobile node or mobile router. This can be a collocated care-of address, by which the mobile node or mobile router acquires a local address and detunnels its own packets, or a foreign agent care-of address, by which a foreign agent detunnels packets and forwards them to the mobile node or mobile router.

**collocated care-of address**—The termination point of a tunnel toward a mobile node or mobile router. A CCoA is a local address that the mobile node or mobile router associated with one of its own network interfaces.

**DHCP**—Dynamic Host Configuration Protocol. Provides a mechanism for allocating IP addresses and other configuration parameters dynamically so that addresses can be reused when hosts no longer need them.

**foreign agent**—A router on the visited network of a foreign network that provides routing services to the mobile node or mobile router while registered. The foreign agent detunnels and delivers packets to the mobile node or mobile router that were tunneled by the home agent of the mobile node. For packets sent by a mobile node, the foreign agent may serve as a default router for registered mobile nodes.

**home agent**—A router on a home network of the 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.

**IPCP**—IP Control Protocol. The protocol used to establish and configure IP over PPP.

**PPP**—Point-to-Point Protocol. Provides router-to-router and host-to-network connections over synchronous and asynchronous circuits. PPP is most commonly used for dial-up Internet access. Its features include address notification, authentication via CHAP or PAP, support for multiple protocols, and link monitoring.

**trap**—Message sent by an SNMP agent to an NMS console, or terminal to indicate the occurrence of a significant event, such as a specifically defined condition or a threshold that was reached.

**Note**

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Refer to [Internetworking Terms and Acronyms](#) for terms not included in this glossary.

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Any Internet Protocol (IP) addresses used in this document are not intended to be actual addresses. Any examples, command display output, and figures included in the document are shown for illustrative purposes only. Any use of actual IP addresses in illustrative content is unintentional and coincidental.

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