



## DHCP for WLANs

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## Information About the Dynamic Host Configuration Protocol

You can configure WLANs to use the same or different Dynamic Host Configuration Protocol (DHCP) servers or no DHCP server. Two types of DHCP servers are available: internal and external.

### Internal DHCP Servers

The controllers contain an internal DHCP server. This server is typically used in branch offices that do not already have a DHCP server. The wireless network generally contains a maximum of 10 access points or fewer, with the access points on the same IP subnet as the controller. The internal server provides DHCP addresses to wireless clients, direct-connect access points, and DHCP requests that are relayed from access points. Only lightweight access points are supported. When you want to use the internal DHCP server, you must set the management interface IP address of the controller as the DHCP server IP address.

DHCP option 43 is not supported on the internal server. Therefore, the access point must use an alternative method to locate the management interface IP address of the controller, such as local subnet broadcast, Domain Name System (DNS), or priming.

An internal DHCP server pool only serves the wireless clients of that controller, not clients of other controllers. Also, an internal DHCP server can serve only wireless clients, not wired clients.

When clients use the internal DHCP server of the controller, IP addresses are not preserved across reboots. As a result, multiple clients can be assigned with the same IP address. To resolve any IP address conflicts, clients must release their existing IP address and request a new one. Wired guest clients are always on a Layer 2 network connected to a local or foreign controller.

**Note**

- VRF is not supported for the internal DHCP server.
- DHCPv6 is not supported in the internal DHCP servers.

**General Guidelines**

## External DHCP Servers

The operating system is designed to appear as a DHCP Relay to the network and as a DHCP server to clients with industry-standard external DHCP servers that support DHCP Relay, which means that each controller appears as a DHCP Relay agent to the DHCP server and as a DHCP server at the virtual IP address to wireless clients.

Because the controller captures the client IP address that is obtained from a DHCP server, it maintains the same IP address for that client during intra controller, inter controller, and inter-subnet client roaming.

**Note**

External DHCP servers can support DHCPv6.

## DHCP Assignments

You can configure DHCP on a per-interface or per-WLAN basis. We recommend that you use the primary DHCP server address that is assigned to a particular interface.

You can assign DHCP servers for individual interfaces. You can configure the management interface, AP-manager interface, and dynamic interface for a primary and secondary DHCP server, and you can configure the service-port interface to enable or disable DHCP servers. You can also define a DHCP server on a WLAN. In this case, the server overrides the DHCP server address on the interface assigned to the WLAN.

**Security Considerations**

For enhanced security, we recommend that you require all clients to obtain their IP addresses from a DHCP server. To enforce this requirement, you can configure all WLANs with a DHCP Addr. Assignment Required setting, which disallows client static IP addresses. If DHCP Addr. Assignment Required is selected, clients must obtain an IP address via DHCP. Any client with a static IP address is not allowed on the network. The controller monitors DHCP traffic because it acts as a DHCP proxy for the clients.

**Note**

- WLANs that support management over wireless must allow management (device-servicing) clients to obtain an IP address from a DHCP server.

If slightly less security is tolerable, you can create WLANs with DHCP Addr. Assignment Required disabled. Clients then have the option of using a static IP address or obtaining an IP address from a designated DHCP server.



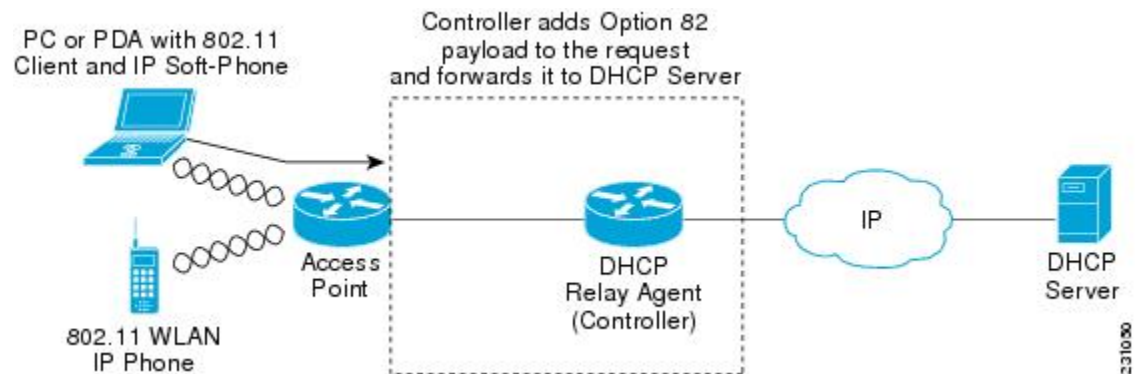
**Note** DHCP Addr. Assignment Required is not supported for wired guest LANs.

You can create separate WLANs with DHCP Addr. Assignment Required configured as disabled. This is applicable only if DHCP proxy is enabled for the controller. You must not define the primary/secondary configuration DHCP server you should disable the DHCP proxy. These WLANs drop all DHCP requests and force clients to use a static IP address. These WLANs do not support management over wireless connections.

## Information About DHCP Option 82

DHCP option 82 provides additional security when DHCP is used to allocate network addresses. It enables the controller to act as a DHCP relay agent to prevent DHCP client requests from untrusted sources. You can configure the controller to add option 82 information to DHCP requests from clients before forwarding the requests to the DHCP server.

**Figure 1: DHCP Option 82**



The access point forwards all DHCP requests from a client to the controller. The controller adds the DHCP option 82 payload and forwards the request to the DHCP server. The payload can contain the MAC address or the MAC address and SSID of the access point, depending on how you configure this option.



**Note** Any DHCP packets that already include a relay agent option are dropped at the controller.

For DHCP option 82 to operate correctly, DHCP proxy must be enabled.

## Configuring DHCP Scopes

### Information About Internal DHCP Server

Controllers have built-in DHCP relay agents. However, when you desire network segments that do not have a separate DHCP server, the controllers can have built-in internal DHCP server that assign IP addresses and subnet masks to wireless clients. Typically, one controller can have one or more internal DHCP server that each provide a range of IP addresses.

Internal DHCP server are needed for internal DHCP to work. Once DHCP is defined on the controller, you can then point the primary DHCP server IP address on the management, AP-manager, and dynamic interfaces to the controller's management interface.

**Note**

The controller has the ability to provide internal DHCP server. This feature is very limited and considered as convenience that is often used simple demonstration or proof-of-concept, for example in a lab environment. The best practice is NOT to use this feature in an enterprise production network.

Read more about this at: <http://www.cisco.com/c/en/us/support/docs/wireless/4400-series-wireless-lan-controllers/110865-dhcp-wlc.html#anc16>

## Prerequisites for Configuring DHCP for WLANs

- To be able to use the DHCP option 82, you must configure DHCP on Cisco IOS software. By default, DHCP option 82 is enabled for all clients. You can control the wireless client behavior using the WLAN suboptions.
- The Cisco converged access platforms support internal DHCP server functionality. However, as a general deployment guideline to build large enterprise-class networks, we recommend that you use external DHCP server to provide dynamic IP addressing to wireless clients. Such distributed function reduces processing and configuration load on network devices and allows them to operate efficiently in large scale deployments.
- DHCP Snooping Configuration—DHCP snooping configuration is the required best practices configuration on controller for rapid client join function. DHCP snooping needs to be enabled on each client VLAN including the override VLAN if override is applied on the WLAN.

### Example of DHCP snooping configuration

#### 1. Global DHCP snooping configuration:

```
1. Controller(config)#ip dhcp snooping
```

```
Controller(config)#ip dhcp snooping vlan 100
```

#### 2. Enable `bootp-broadcast` command. This is required for clients that send DHCP messages with broadcast addresses and broadcast bit is set in the DHCP message:

```
Controller(config)#ip dhcp snooping wireless bootp-broadcast enable
```

#### 3. To not append DHCP Option information, enter this command:

```
Controller(config)#no ip dhcp snooping information option
```

#### 2. On the interface:

**Note**

IP DHCP snooping trust is required on Port-Channel interface in addition to member link of the Port-Channel interface.

```
Controller(config)#interface range TenGigabitEthernet 1/0/1 - 2
```

```
Controller(config-if)#switchport mode trunk
Controller(config-if)#switchport trunk allowed vlan 100
Controller(config-if)#ip dhcp snooping trust

Controller(config)#interface port-channel 1
Controller(config-if)#switchport mode trunk
Controller(config-if)#switchport trunk allowed vlan 100
Controller(config-if)#ip dhcp snooping trust
```



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**Note** DHCP snooping must be configured on the Guest Anchor controller for guest access similar to the Config above.

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## Restrictions for Configuring DHCP for WLANs

- If you override the DHCP server in a WLAN, you must ensure that you configure the underlying Cisco IOS configuration to make sure that the DHCP server is reachable.
- WLAN DHCP override works only if DHCP service is enabled on the controller.

You can configure DHCP service in the following ways:

- Configuring the DHCP pool on the controller.
- Configuring a DHCP relay agent on the SVI. Note: the VLAN of the SVI must be mapped to the WLAN where DHCP override is configured.

## How to Configure DHCP for WLANs

### Configuring DHCP for WLANs (CLI)

Use this procedure to configure the following DHCP parameters on a WLAN:

- DHCP Option 82 Payload
- DHCP Required
- DHCP Override

#### Before you begin

- You must have admin privileges for configuring the WLAN.

- To configure the DHCP override, you must have the IP address of the DHCP server.

## SUMMARY STEPS

1. **configure terminal**
2. **shutdown**
3. **wlan *profile-name***
4. **ip dhcp opt82 {ascii | format {*add-ssid* | *ap-ethmac*} | rid}**
5. **ip dhcp required**
6. **ip dhcp server *ip-address***
7. **no shutdown**
8. **end**
9. **show wlan *wlan-name***

## DETAILED STEPS

	Command or Action	Purpose
<b>Step 1</b>	<b>configure terminal</b>  <b>Example:</b> Controller# <b>configure terminal</b>	Enters global configuration mode.
<b>Step 2</b>	<b>shutdown</b>  <b>Example:</b> Controller(config)# <b>shutdown</b>	Shut down the WLAN.
<b>Step 3</b>	<b>wlan <i>profile-name</i></b>  <b>Example:</b> Controller# <b>wlan test4</b>	Enters WLAN configuration submode. The <i>profile-name</i> is the profile name of the configured WLAN.
<b>Step 4</b>	<b>ip dhcp opt82 {ascii   format {<i>add-ssid</i>   <i>ap-ethmac</i>}   rid}</b>  <b>Example:</b> Controller(config)# <b>ip dhcp opt82 format add-ssid</b>	Specifies the DHCP82 payload on the WLAN. The keyword and arguments are as follows: <ul style="list-style-type: none"> <li>• <b>ascii</b>—Configures ASCII for DHCP Option 82. If this is not configured, the option 82 format is set to ASCII format.</li> <li>• <b>format</b>—Specifies the DHCP option 82 format. The following options are available: <ul style="list-style-type: none"> <li>• <i>add-ssid</i>—Set RemoteID format that is the AP radio MAC address and SSID.</li> <li>• <i>ap-ethmac</i>—Set RemoteID format that is the AP Ethernet MAC address.</li> </ul> </li> </ul> <p><b>Note</b> If the format option is not configured, only the AP radio MAC address is used.</p> <ul style="list-style-type: none"> <li>• <b>rid</b>—Adds the Cisco 2 byte RID for DHCP option 82.</li> </ul>

	Command or Action	Purpose
<b>Step 5</b>	<b>ip dhcp required</b> <b>Example:</b> <code>Controller(config-wlan)# ip dhcp required</code>	Makes it mandatory for clients to get their IP address from the DHCP server. Static clients are not allowed.
<b>Step 6</b>	<b>ip dhcp server <i>ip-address</i></b> <b>Example:</b> <code>Controller(config-wlan)# ip dhcp server 200.1.1.2</code>	Defines a DHCP server on the WLAN that overrides the DHCP server address on the interface assigned to the WLAN.
<b>Step 7</b>	<b>no shutdown</b> <b>Example:</b> <code>Controller(config-wlan)# no shutdown</code>	Restarts the WLAN.
<b>Step 8</b>	<b>end</b> <b>Example:</b> <code>Controller(config)# end</code>	Returns to privileged EXEC mode. Alternatively, you can also press <b>Ctrl-Z</b> to exit global configuration mode.
<b>Step 9</b>	<b>show wlan <i>wlan-name</i></b> <b>Example:</b> <code>Controller(config-wlan)# show wlan test-wlan</code>	Verifies the DHCP configuration.

## Configuring DHCP Scopes (CLI)

### SUMMARY STEPS

1. **configure terminal**
2. **ip dhcp pool *pool-name***
3. **network *network-name mask-address***
4. **dns-server *hostname***
5. **end**

### DETAILED STEPS

	Command or Action	Purpose
<b>Step 1</b>	<b>configure terminal</b> <b>Example:</b> <code>Controller# configure terminal</code>	Enters global configuration mode.
<b>Step 2</b>	<b>ip dhcp pool <i>pool-name</i></b> <b>Example:</b> <code>Controller(config)#ip dhcp pool test-pool</code>	Configures the DHCP pool address.
<b>Step 3</b>	<b>network <i>network-name mask-address</i></b> <b>Example:</b>	Specifies the network number in dotted-decimal notation and the mask address.

	Command or Action	Purpose
	<code>Controller(dhcp-config) #network 209.165.200.224 255.255.255.0</code>	
<b>Step 4</b>	<b>dns-server</b> <i>hostname</i> <b>Example:</b> <code>Controller(dhcp-config) #dns-server example.com</code>	Specifies the DNS name server. You can specify an IP address or a hostname.
<b>Step 5</b>	<b>end</b> <b>Example:</b> <code>Controller(config) # end</code>	Returns to privileged EXEC mode. Alternatively, you can also press <b>Ctrl-Z</b> to exit global configuration mode.

## Additional References

### Related Documents

Related Topic	Document Title
System Management	<i>System Management Configuration Guide (Catalyst 3850 Switches)</i> <i>System Management Configuration Guide (Cisco WLC 5700 Series)</i> <i>System Management Configuration Guide (Catalyst 3650 Switches)</i>

### Error Message Decoder

Description	Link
To help you research and resolve system error messages in this release, use the Error Message Decoder tool.	<a href="https://www.cisco.com/cgi-bin/Support/Errordecoder/index.cgi">https://www.cisco.com/cgi-bin/Support/Errordecoder/index.cgi</a>

### MIBs

MIB	MIBs Link
All the supported MIBs for this release.	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://cisco.com/go/mibs">http://cisco.com/go/mibs</a>



**Technical Assistance**

Description	Link
<p>The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies.</p> <p>To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds.</p> <p>Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.</p>	<a href="http://www.cisco.com/support">http://www.cisco.com/support</a>

## Feature Information for DHCP for WLANs

Feature Name	Release	Feature Information
DHCP functionality for WLAN	Cisco IOS XE 3.3SE Cisco IOS XE 3.2SE Cisco IOS XE 3.3SE	This feature was introduced.

