Introduction

When a Cisco Wireless Unified architecture is deployed, the lightweight Cisco Aironet access points (AP) can use a vendor-specific Dynamic Host Control Protocol (DHCP) Option 43 to join specific Wireless LAN Controllers (WLCs) when the WLC is in a different subnet than the LAP. This document describes how to use DHCP Option 43 and provides sample configurations for DHCP Option 43 for lightweight Cisco Aironet (APs) for these DHCP servers:

- Microsoft Windows 2008 Enterprise DHCP Server
- Cisco IOS DHCP Server
- Linux ISC DHCP Server
- Cisco Network Registrar DHCP Server
- Lucent QIP DHCP Server
- Verify
- Troubleshoot
- Cisco Support Community - Featured Conversations

Prerequisites

Cisco recommends that you have knowledge of these topics:

- Basic knowledge on Cisco Unified Wireless Network (CUWN)
- Basic knowledge of DHCP

Components Used

This document is not restricted to specific software and hardware versions.
The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, make sure that you understand the potential impact of any command.

Conventions

Refer to Cisco Technical Tips Conventions for more information on document conventions.

Vendor Specific DHCP Options

RFC 2132 defines two DHCP Options that are relevant to vendor specific options. They are Option 60 and Option 43. DHCP Option 60 is the Vendor Class Identifier (VCI). The VCI is a text string that uniquely identifies a type of vendor device. This table lists the VCIs used by Cisco access points:

<table>
<thead>
<tr>
<th>Access Point</th>
<th>Vendor Class Identifier (VCI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco Aironet 1000 series</td>
<td>Airespace.AP1200</td>
</tr>
<tr>
<td>Cisco Aironet 1040 series</td>
<td>Cisco AP c1040</td>
</tr>
<tr>
<td>Cisco Aironet 1100 series</td>
<td>Cisco AP c1100</td>
</tr>
<tr>
<td>Cisco Aironet 1130 series</td>
<td>Cisco AP c1130</td>
</tr>
<tr>
<td>Cisco Aironet 1140 series</td>
<td>Cisco AP c1140</td>
</tr>
<tr>
<td>Cisco Aironet 1200 series</td>
<td>Cisco AP c1200</td>
</tr>
<tr>
<td>Cisco Aironet 1230 series</td>
<td>Cisco AP c1200</td>
</tr>
<tr>
<td>Cisco Aironet 1240 series</td>
<td>Cisco AP c1240</td>
</tr>
<tr>
<td>Cisco Aironet 1250 series</td>
<td>Cisco AP c1250</td>
</tr>
<tr>
<td>Cisco Aironet 1260 series</td>
<td>Cisco AP c1260</td>
</tr>
<tr>
<td>Cisco Aironet 1300 series</td>
<td>Cisco AP c1310</td>
</tr>
<tr>
<td>Cisco Aironet 1500 series</td>
<td>Cisco AP c1500$^1$ Cisco AP.OAP1500$^2$ Cisco AP.LAP1505$^3$ Cisco AP.LAP1510$^4$ Airespace.AP1200$^5$</td>
</tr>
<tr>
<td>Cisco Aironet 1520 series</td>
<td>Cisco AP c1520</td>
</tr>
<tr>
<td>Cisco Aironet 1550 series</td>
<td>Cisco AP c1550</td>
</tr>
<tr>
<td>Cisco 3201 Lightweight Access Point</td>
<td>Cisco Bridge/AP/WGB c3201</td>
</tr>
<tr>
<td>Cisco 521 Wireless Express Access Point</td>
<td>Cisco AP c520</td>
</tr>
<tr>
<td>AP801 (embedded in 86x/88x series ISRs)</td>
<td>Cisco AP801</td>
</tr>
</tbody>
</table>
DHCP OPTION 43 for Lightweight Cisco Aironet Access Points Configuration Example ...

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco Aironet 3500</td>
<td>Cisco AP c3500</td>
</tr>
<tr>
<td>Series</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Cisco Aironet 3600</td>
<td>Cisco AP c3600</td>
</tr>
<tr>
<td>Series</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>AP802 (embedded in</td>
<td>Cisco AP802</td>
</tr>
<tr>
<td>88x series ISRs</td>
<td></td>
</tr>
</tbody>
</table>

1 Any 1500 Series AP that runs 4.1 software
2 1500 OAP AP that runs 4.0 software
3 1505 Model AP that runs 4.0 software
4 1510 Model AP that runs 4.0 software
5 Any 1500 Series AP that runs 3.2 software

Option 60 is included in the initial DHCP 
discover message that a DHCP client broadcasts in search of an IP 
address. Option 60 is used by DHCP clients (LAPs in this case) in order to identify itself to the DHCP server.

If the access point is ordered with the Service Provider option (AIR-OPT60-DHCP selected), the VCI string for that 
access point is different than those listed above. The VCI string includes the ServiceProvider option. For example, 
a 1260 with this option returns this VCI string: Cisco AP c1260-ServiceProvider.

If the Cisco AP runs 7.0.116.0 or above (12.4 (23c) JA2 or above) and if a bootloader environmental variable 
(env_vars) named DHCP_OPTION_60 exists in flash, the value is appended to the VCI. If you order a Cisco AP 
with the Service Provider option, it will (by default) include the -ServiceProvider suffix; however, you can include 
other values into DHCP_OPTION_60 as well.

In order to facilitate AP discovery of WLAN controllers that use DHCP Option 43, the DHCP server must be 
programmed in order to return one or more WLAN controller management interface IP addresses based on the 
VCI of the AP. In order to do this, program the DHCP server in order to recognize the VCI for each access point 
type, and then define the vendor specific information.

On the DHCP server, the vendor specific information is mapped to VCI text strings. When the DHCP server sees a 
recognizable VCI in a DHCP discover from a DHCP client, it returns the mapped vendor specific information in its 
DHCP offer to the client as DHCP Option 43. On the DHCP server, option 43 is defined in each DHCP pool 
(Scope) that offers IP address to the LAPs.

RFC 2132 defines that DHCP servers must return vendor specific information as DHCP Option 43. The RFC 
allows vendors to define encapsulated vendor-specific sub-option codes between 0 and 255. The sub-options are 
all included in the DHCP offer as type-length-value (TLV) blocks embedded within Option 43. The definition of the 
sub-option codes and their related message format is left to the vendors.

When DHCP servers are programmed to offer WLAN Controller IP addresses as Option 43 for Cisco 1000 series 
APs the sub-option TLV block is defined in this way:

- **Type**—0x66 (decimal 102)
- **Length**—A count of the characters of the ASCII string in the Value field. Length must include the commas 
  if there is more than one controller specified, but not a zero-terminator.
- **Value**—A non-zero terminated ASCII string that is a comma-separated list of controllers. No spaces 
  should be embedded in the list.

When DHCP servers are programmed to offer WLAN Controller IP addresses as Option 43 for other Cisco Aironet 
LAPs, the sub-option TLV block is defined in this way:

- **Type**—0xf1 (decimal 241)
- **Length**—Number of controller IP addresses * 4
• **Value**—List of the WLC management interfaces, typically translated to hexadecimal values

The semantics of DHCP server configuration vary based on the DHCP server vendor. This document contains specific instructions on the Microsoft DHCP server, Cisco IOS DHCP server, Linux ISC DHCP Server, Cisco Network Registrar DHCP server and Lucent QIP DHCP Server. For other DHCP server products, consult the vendor documentation for instructions on vendor specific options.

**Microsoft DHCP Server**

This section describes the configurations necessary on the Microsoft DHCP server in order to use DHCP Option 43 for WLAN Controller discovery.

**Cisco 1000 Series APs**

This section describes how a Windows 2008 DHCP server is configured in order to return vendor specific information to Cisco 1000 APs. You need to know this key information:

- Vendor Class Identifier (VCI)
- Option 43 sub-option code
- Management IP address(es) of WLAN controller(s)

The VCI for a Cisco 1000 series AP is always **Airespace.AP1200**. As stated, the Option 43 sub-option code for the Cisco 1000 series access points is type 102 (0x66).

1. Create a new vendor class in order to program the DHCP server to recognize the VCI **Airespace.AP1200**. In the Server Manager window, right-click the **IPv4** icon, and choose **Define Vendor Classes**.

2. Click **Add** in order to create the new class.
3. Enter a value for the **Display Name**. In this example, **Airespace** is used as the Display Name. Also, add a short description of the vendor class in the **Description** field. Add the Vendor Class Identifier string. In order to do this, click the ASCII field, and type in the appropriate value, in this case **Airespace.AP1200**. Click **OK**.
4. The new class is created. Click Close.

5. Add an entry for the WLAN controller sub-option in the Predefined Options for the newly created Vendor Class. This is where you define the sub-option code type and the data format that is used to deliver the vendor specific information to the APs. In order to create a Predefined Option, right click the IPv4 icon, and choose Set Predefined Options.
6. A new window opens. Set the Option class to the value you configured for the vendor class. In this example, it is **Airespace**. Click **OK** in order to define the option code.

7. The Option Type box appears. In the Name field, enter a descriptive string value, for example, **Airespace IP provision**. Choose **Binary** as the Data Type. In the Code field, enter the sub-option value **102**. Enter a Description, if desired. Click **OK**.
8. The new Predefined Option appears. Click OK. This completes the creation of the Vendor class and sub-option type needed in order to support controller discovery.

9. Right-click the Server Options folder under the DHCP scope, and choose Configure Options.

10. The Scope Options box appears. Click the Advanced tab. Choose the Vendor Class that you plan to use, in this case, Airespace.

11. Choose the predefined 102 sub-option to assign to this scope. In the Data Entry area, enter the controller management IP address(es) to return to the APs in the ASCII section. This is a comma delimited list. There is a period (.) in the initial empty Data Entry area. Make sure you remove this period from the list of IP addresses added in the data entry area.

http://kbase/paws/servlet/ViewFile/97066/dhcp-option-43.xml?convertPaths=1

6/12/2012
12. This is an example of the results.
Once you complete this step, the DHCP Option 43 is configured. This DHCP option is available for all the DHCP scopes that are configured in the DHCP server. So when the LAPs request for an IP address, the DHCP server sends the option 43 as well as to the LAPs.

13. Other Cisco Lightweight Access Points (LAPs)

The method described in the previous section can be used if you have multiple device types on the same scope and you want them to receive different WLC IP addresses via Option 43. But, if all of the DHCP clients in the scope are IOS APs, you can use this procedure to define DHCP Option 43.

Before you begin, you must know this information:

- Option 43 sub-option code
• Management IP address(es) of WLAN controller(s)

Complete these steps in order to define DHCP Option 43 on the Windows DHCP server:

1. In the DHCP Server scope, right-click **Server Options**, and choose **Configure Options**.

2. On the General tab, scroll to Option 43, and check the **Option 43** check box.
3. Enter the Option 43 sub-option in hex.

   **Note:** TLV values for the Option 43 suboption: Type + Length + Value. Type is always the suboption code 0xf1. Length is the number of controller management IP addresses times 4 in hex. Value is the IP address of the controller listed sequentially in hex. For example, suppose there are two controllers with management interface IP addresses, 192.168.10.5 and 192.168.10.20. The type is 0xf1. The length is 2 * 4 = 8 = 0x08. The IP addresses translates to c0a80a05 (192.168.10.5) and c0a80a14 (192.168.10.20). When the string is assembled, it yields f108c0a80a05c0a80a14. The Cisco IOS command that is added to the DHCP scope is: **option 43 hex f108c0a80a05c0a80a14**

4. Click **Apply**, and then click **OK**.

   Once you complete this step, the DHCP Option 43 is configured, and the **DHCP server sends the option 43 to the LAPs**.

---

**Cisco IOS DHCP Server**

**Cisco Aironet 1000 Series APs**

Complete these steps in order to configure DHCP Option 43 for lightweight Cisco Aironet access points in the embedded Cisco IOS DHCP server:

1. Enter configuration mode at the Cisco IOS CLI.

2. Create the DHCP pool, which includes the necessary parameters, such as default router and server name. This is an example DHCP scope:

   ```
   ip dhcp pool <pool name>
   network <ip network> <netmask>
   ```
default-router <default-router IP address>
dns-server <dns server IP address>

3. Add the Option 43 line with this syntax:

    option 43 ascii "Comma separated IP address list"

**Note:** The quotation marks must be included. No sub-option value needs to be defined in the Cisco IOS DHCP server for Cisco 1000 series access points.

For example, if you configure Option 43 for Cisco 1000 series APs with the controller IP Management IP addresses 192.168.10.5 and 192.168.10.20 add this line to the DHCP pool in the Cisco IOS CLI:

    option 43 ascii "192.168.10.5,192.168.10.20"

**Note:** You must use the management interface of the WLAN controller.

**Other Cisco Lightweight Access Points (LAPs)**

Complete these steps in order to configure DHCP Option 43 for lightweight Cisco Aironet access points in the embedded Cisco IOS DHCP server:

1. Enter configuration mode at the Cisco IOS CLI.

2. Create the DHCP pool, which includes the necessary parameters, such as the default router and server name. This is an example DHCP scope:

    ip dhcp pool <pool name>
    network <ip network> <netmask>
    default-router <default-router IP address>
    dns-server <dns server IP address>

3. Add the Option 43 line with this syntax:

    option 43 hex <hexadecimal string>

The hexadecimal string in step 3 is assembled as a sequence of the TLV values for the Option 43 suboption: Type + Length + Value. **Type** is always the suboption code 0xf1. **Length** is the number of controller management IP addresses times 4 in hex. **Value** is the IP address of the controller listed sequentially in hex.

For example, suppose there are two controllers with management interface IP addresses, 192.168.10.5 and 192.168.10.20. The type is 0xf1. The length is 2 * 4 = 8 = 0x08. The IP addresses translate to c0a80a05 (192.168.10.5) and c0a80a14 (192.168.10.20). When the string is assembled, it yields f108c0a80a05c0a80a14. The Cisco IOS command that is added to the DHCP scope is:

    option 43 hex f108c0a80a05c0a80a14

This video describes how to configure DHCP Option 43 on Cisco IOS DHCP Server: [DHCP Option 43 on Cisco IOS DHCP Server](#)

**Linux ISC DHCP Server**

The information in this section describes how the Linux ISC server is configured in order to return vendor specific information to lightweight Cisco Aironet series APs. This example configures the Linux ISC server to return vendor specific information to the 1140, 1200, 1130 and 1240 series Lightweight APs. This configuration can be modified and applied to other series of LAPs.

```
 ddns-update-style interim;
 allow bootp;
```
option space Cisco_LWAPP_AP;
option Cisco_LWAPP_AP.server-address code 241 = array of ip-
subnet 192.168.247.0 netmask 255.255.255.0 {
  authoritative;
  option routers 192.168.247.1;
  option subnet-mask 255.255.255.0;
  option domain-name "cisco.com";
  option domain-name-servers 192.168.247.2, 192.168.247.3;
  default-lease-time 300;
}

class "Cisco-AP-c1140" {
  match if option vendor-class-identifier = "Cisco AP c1140"
  option vendor-class-identifier "Cisco AP c1140";
  vendor-option-space Cisco_LWAPP_AP;
  option Cisco_LWAPP_AP.server-address 192.168.247.5; }

class "Cisco AP c1200" {
  match if option vendor-class-identifier = "Cisco AP c1200"
  option vendor-class-identifier "Cisco AP c1200";
  vendor-option-space Cisco_LWAPP_AP;
  option Cisco_LWAPP_AP.server-address 192.168.247.55; }

class "Cisco AP c1130" {
  match if option vendor-class-identifier = "Cisco AP c1130"
  option vendor-class-identifier "Cisco AP c1130";
  vendor-option-space Cisco_LWAPP_AP;
  option Cisco_LWAPP_AP.server-address 192.168.247.5; }

class "Cisco AP c1240" {
  match if option vendor-class-identifier = "Cisco AP c1240"
  option vendor-class-identifier "Cisco AP c1240";
  vendor-option-space Cisco_LWAPP_AP;
  option Cisco_LWAPP_AP.server-address 192.168.247.5; }

**Cisco Network Registrar DHCP Server**

The Cisco Network Registrar DHCP server supports Vendor Specific attributes. However, the configuration of these attributes is not possible with the graphical interface. The CLI must be used.

Complete these configuration steps in order to support L3-LWAPP Discovery with DHCP Option 43:

**Note:** The CLI Command tool can be found in the Network registrar directory: **C:\Program Files\Network RegistrarBIN\ncmd.bat**

1. Log into the DHCP server. Complete these steps:

   username: admin
   password: 100 Ok
   session:
     cluster = localhost
default-format = user
     user-name = admin
     visibility = 5
   nrcmd>

2. Create the Vendor Class Identifier for Cisco AP1000 Series APs:

   nrcmd> vendor-option airespace create Airespace.AP1200
   100 Ok
   airespace:
     name = airespace
     read-only = disabled
     vendor-class-id = Airespace.AP1200

Create the Vendor Class Identifier for Cisco AP1200 Series APs:

   nrcmd> vendor-option aironet1200 create "Cisco AP c1200"
   100 Ok
   aironet1200:
     name = aironet
     read-only = disabled
     vendor-class-id = "Cisco AP c1200"

   **Note:** For other models of LAP, replace the vendor-class-id parameter with the specific VCI string from Table 1.

3. Associate the values that can be sent in the DHCP Offer by the server when it receives a request with Option 60 set to Airespace.AP1200. The DHCP Option 43 can support multiple values in the same Option 43 field. These options need to be identified individually by a subtype.

   In this case, only one value is required, without any subtype. However, the CNR configuration requires that you create a subtype option:

   For Cisco AP1000 Series APs:

   nrcmd>**vendor-option** airespace definesuboption controller_ip 1
   no-suboption-opcode,no-suboption-len
   100 Ok
   controller_ip(1) : byte_array(no-suboption-opcode,no-suboption-len)

   For Cisco AP1200 Series APs:

   nrcmd>**vendor-option** aironet1200 definesuboption controller_ip 1
   100 Ok
   Controller_ip(241) : ipaddr_array
   100 Ok
   vendor-option aironet1200 enable read-only
However, in order to hide the subtype feature and send only a row string (BYTE_ARRAY) with the IP values, CNR supports specific flags in order to remove the subtype ids and length. These are no-suboption-opcode and no-suboption-len flags.

For Cisco AP1000 Series APs:

```
nrcmd> vendor-option list
100 Ok
airespace:
   name = airespace
   read-only = disabled
   vendor-class-id = Airespace.AP1200
```

```
nrcmd> vendor-option airespace listsuboptions
100 Ok
   controller_ip(241) : byte_array(no-suboption-opcode,no-suboption-len)
```

For Cisco AP1200 Series APs:

```
nrcmd> vendor-option list
100 Ok
airespace:
   name = aironet1200
   read-only = enabled
   vendor-class-id = aironet1200
```

```
nrcmd> vendor-option aironet1200 listsuboptions
100 Ok
   controller_ip(241) : ipaddr_array(no-suboption-opcode,no-suboption-len)
```

5. Associate values based on the DHCP pools:

For Cisco AP1000 Series APs:

```
100 Ok
airespace controller_ip[0](1) BYTE_ARRAY(1) = 31:30:2E:31:35:30:2E:31:35:2C:31:30:2E:31:35:30:2E:35:3
```

For Cisco AP1200 Series APs:

```
nrcmd> policy system_default_policy setVendorOption aironet120 controller_ip 1.2.3.4,2.3.4.5
100 Ok
aironet1200 controller_ip[0](241) IPADDR_ARRAY(1) = 1.2.3.4,2
In this example, the DHCP Pool named VLAN-52, which is already defined in CNR by the graphical interface, is configured with Option 43 \texttt{10.150.1.15,10.150.50.15} when it receives a request from an Airespace.AP1200 device.

**Note:** \texttt{31:30:2e:31:35:30:2e:31:2e:31:35:2c:31:30:2e:31:35:30:2e:35:30:2e:31:35:2c} is the hexadecimal representation of the string \texttt{10.150.1.15,10.150.50.15}.

6. Finally, save the DHCP configuration and reload.

```
nrcmd> save
100 Ok
```
```
nrcmd> dhcp reload
100 Ok
```
```
nrcmd> exit
```

Refer to \texttt{Managing Advanced DHCP Server Properties} for more information on Vendor-Options configurations on a Cisco CNR DHCP server.

**Lucent QIP DHCP Server**

This section provides a few tips for how to configure the Lucent QIP DHCP server in order to return vendor specific information to lightweight Cisco Aironet series APs.

**Note:** For complete information and the steps involved, refer to the documentation provided by the vendor.

The DHCP Option 43 can contain any vendor specific information. The DHCP server passes this information in the form of a hex string to the clients that receive the DHCP offer.

On the Lucent QIP DHCP server, the vendor-specific information can be provided on the DHCP Option Template-Modify page. In the Active Options area, choose \texttt{Vendor Specific Information}, and enter the information in the Value field.

```
<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subnet Mask (1.sm)</td>
<td>Same as in Subnet Profile</td>
</tr>
<tr>
<td>Router (3gw)</td>
<td>Same as in Subnet Profile</td>
</tr>
<tr>
<td>Domain Name Server (6.ds)</td>
<td>User Defined</td>
</tr>
<tr>
<td>Domain Name (15.da)</td>
<td>User Defined</td>
</tr>
<tr>
<td>Vendor Specific Information (43.xc)</td>
<td>9108e0a80a05c0a80a14</td>
</tr>
</tbody>
</table>
```

In order to include the controller IP addresses in the DHCP option 43 message, enter the information to the DHCP Option template in QIP as a single hex value: \texttt{[ip hex]}

In order to send more than one IP address with DHCP Option 43, enter the information to the DHCP Option template in QIP as a single hex value: \texttt{[ip hex ip hex]} and \texttt{not [ip hex],[ip hex]}. In this case, the comma in the middle causes problems for DHCP to parse the string passed from QIP.
For example, suppose there are two controllers with management interface IP addresses, 192.168.10.5 and 192.168.10.20. The type is 0xf1. The length is $2 \times 4 = 8 = 0x08$. The IP addresses translate to c0a80a05 (192.168.10.5) and c0a80a14 (192.168.10.20). When the string is assembled, it yields f108c0a80a05c0a80a14.

On the Lucent QIP DHCP server, the hex string that needs to be added to the DHCP scope is:

\[
[f108c0a80a05c0a80a14]
\]

The hex string must be given within square brackets. The square brackets are mandatory. Once the DHCP option 43 is modified to reflect this value, the LAPs are able to find and register with the controller.

Verify

Use this section in order to verify your configuration.

If you use 1130 /1200/1230/1240 series LAPs, which have a console port, you can check that the WLC IP addresses are provided to the LAPs during DHCP IP address assignment. This is a sample output from a Cisco 1230 series LAP:

*Mar 1 00:00:17.497: %LINEPROTO-5-UPDOWN: Line protocol on Interface Dot11Radio1, changed state to down
*Mar 1 00:00:17.898: %LINEPROTO-5-UPDOWN: Line protocol on Interface Dot11Radio0, changed state to down
*Mar 1 00:00:25.352: %DOT11-6-FREQ_USED: Interface Dot11Radio0, 2447 selected
*Mar 1 00:00:25.353: %LINK-3-UPDOWN: Interface Dot11Radio0, changed state to up
*Mar 1 00:00:26.352: %LINEPROTO-5-UPDOWN: Line protocol on Interface Dot11Radio0, changed state to up
*Mar 1 00:00:29.440: %LWAPP-5-CHANGED: LWAPP changed state to DOWN
*Mar 1 00:00:29.475: %LINK-5-CHANGED: Interface Dot11Radio0, changed state to reset
*Mar 1 00:00:29.704: %LINK-3-UPDOWN: Interface Dot11Radio1, changed state to up
*Mar 1 00:00:30.121: Logging LWAPP message to 255.255.255.255.

%SYS-6-LOGGINGHOST_STARTSTOP: Logging to host 255.255.255.255 started
%LINK-3-UPDOWN: Interface Dot11Radio0, changed state to up
%LINK-5-CHANGED: Interface Dot11Radio1, changed state to reset
%LINK-3-UPDOWN: Interface Dot11Radio1, changed state to up
%LINK-5-CHANGED: Interface Dot11Radio0, changed state to reset
%LINK-3-UPDOWN: Interface Dot11Radio0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Dot11Radio1, changed state to up

Translating "CISCO-LWAPP-CONTROLLER"...domain server (255.255.255.255)

%DHCP-6-ADDRESS_ASSIGN: Interface FastEthernet0 assigned DHCP address 20.0.0.6, mask 255.0.0.0, hostname AP001b.d4e3.a81b
%LWAPP-3-CLIENTEVENTLOG: Controller address 192.168.10.5 obtained
%LWAPP-3-CLIENTEVENTLOG: Controller address 192.168.10.5 obtained

If you use a Cisco IOS DHCP server, issue the `show ip dhcp binding` command in order to view the list of the DHCP addresses assigned to DHCP clients. Here is an example:

If you use a Cisco IOS DHCP server, issue the `show ip dhcp binding` command in order to view the list of the DHCP addresses assigned to DHCP clients. Here is an example:
2800-ISR-TSWEB#show ip dhcp binding

Bindings from all pools not associated with VRF:

<table>
<thead>
<tr>
<th>IP address</th>
<th>Client-ID/ Hardware address/</th>
<th>Lease expiration</th>
<th>User name</th>
</tr>
</thead>
<tbody>
<tr>
<td>192.168.25.1</td>
<td>000b.855b.fbd0</td>
<td>Jun 29 2007 11:49 AM</td>
<td></td>
</tr>
</tbody>
</table>

On the WLC CLI, you can issue the `show ap summary` command in order to verify that the APs registered with the WLC. Here is an example:

```plaintext
((Cisco Controller) > show ap summary

AP Name        Slots  AP Model   Ethernet MAC       Location
-------------  -----  ---------  -----------------  --------
ap:5b:fb:d0    2      AP1010     00:0b:85:5b:fb:d0  default_1
```

If you have Wireless LANs configured, you can issue the `show client summary` command in order to see the clients that are registered with the WLC:

```plaintext
(Cisco Controller) > show client summary

Number of Clients................................ 1

<table>
<thead>
<tr>
<th>MAC Address</th>
<th>AP Name</th>
<th>Status</th>
<th>WLAN</th>
<th>Auth</th>
</tr>
</thead>
<tbody>
<tr>
<td>00:40:96:a1:45:42</td>
<td>ap:64:a3:a0</td>
<td>Associated</td>
<td>4</td>
<td>Yes</td>
</tr>
</tbody>
</table>
```

**Troubleshoot**

Use this section in order to troubleshoot your configuration.

Issue the `debug dhcp message enable` command on the WLC in order to view the sequence of events that occur between the DHCP server and client. Here is an example:

```plaintext
(Cisco Controller) > Thu Jun 28 17:07:53 2007: 00:0b:85:5b:fb:d0 dhcp option len, including the magic cookie = 38
Thu Jun 28 17:07:53 2007: 00:0b:85:5b:fb:d0 dhcp option: received DHCP DISCOVER msg
Thu Jun 28 17:07:53 2007: 00:0b:85:5b:fb:d0 dhcp option: skipping option 57, len 2
Thu Jun 28 17:07:53 2007: 00:0b:85:5b:fb:d0 dhcp option: skipping option 55, len 6
Thu Jun 28 17:07:53 2007: 00:0b:85:5b:fb:d0 dhcp option: vendor class id = Airespace.AP1200 (len 16)
Thu Jun 28 17:07:53 2007: 00:0b:85:5b:fb:d0 dhcpParseOptions: opt len 38, actual 64
Thu Jun 28 17:07:53 2007: dhcpd: sending 300 bytes raw 0.0.0.0:68 -> 10.77.244.212:1067
Thu Jun 28 17:07:53 2007: dhcpd: Received 300 byte dhcp packet from 0 xd4f44d0a 10.77.244.212:68
```
Thu Jun 28 17:07:58 2007: 00:0b:85:5b:fb:d0 dhcp option len, incl
the magic cookie = 50
Thu Jun 28 17:07:58 2007: 00:0b:85:5b:fb:d0 dhcp option: received
REQUEST msg
Thu Jun 28 17:07:58 2007: 00:0b:85:5b:fb:d0 dhcp option: request
192.168.25.1
Thu Jun 28 17:07:58 2007: 00:0b:85:5b:fb:d0 dhcp option: server i
192.168.25.10
Thu Jun 28 17:07:58 2007: 00:0b:85:5b:fb:d0 dhcp option: skipping
len 2
Thu Jun 28 17:07:58 2007: 00:0b:85:5b:fb:d0 dhcp option: skipping
len 6

This is the debug lwapp packet enable command output from the WLC that indicates that DHCP option 43 is used as the discovery method in order to discover WLC IP addresses:

Thu Jun 28 17:51:47 2007: Received LWAPP DISCOVERY REQUEST from A
00:0b:85:5b:fb:d0
to 00:0b:85:33:84:a0 on port '1'
Thu Jun 28 17:51:47 2007: Successful transmission of LWAPP Discov
to AP 00:0b:85:5b:fb:d0 on Port 1
Thu Jun 28 19:22:39 2007: Ethernet Source MAC (LRAD): 00:D0:
Thu Jun 28 19:22:39 2007:
IE : UNKNOWN IE 58
Thu Jun 28 19:22:39 2007:

The value of the IE 58 parameter indicates the discovery type. For DCHP Option 43 it is 3.

If you use the Cisco IOS DHCP server on the router, you can issue the debug dhcp detail command and the debug ip dhcp server events command in order to view the DHCP client and server activity. Here is an example from the debug ip dhcp server events command:

*Jun 28 11:49:33.107: DHCPD: Sending notification of DISCOVER:
*Jun 28 11:49:33.107: DHCPD: htype 1 chaddr 000b.855b.fbd0
*Jun 28 11:49:33.107: DHCPD: remote id 020a0000c08190a01000000
*Jun 28 11:49:33.107: DHCPD: Seeing if there is an internally spe
pool class:
*Jun 28 11:49:33.107: DHCPD: htype 1 chaddr 000b.855b.fbd0
*Jun 28 11:49:33.107: DHCPD: remote id 020a0000c08190a01000000
*Jun 28 11:49:38.603: DHCPD: Sending notification of ASSIGNMENT:
*Jun 28 11:49:38.603: DHCPD: address 192.168.25.1 mask 255.255.2
*Jun 28 11:49:38.603: DHCPD: htype 1 chaddr 000b.855b.fbd0
Issue the `show ip dhcp binding` command in order to view the list of the DHCP addresses assigned to DHCP clients.

```bash
2800-ISR-TSWEB#show ip dhcp binding

Bindings from all pools not associated with VRF:
IP address   Client-ID/ Hardware address/ User name Lease expiration
192.168.25.1 000b.855b.fbd0          Jun 29 2007 11:49 AM
```

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<table>
<thead>
<tr>
<th>Topic</th>
<th>Author</th>
<th>Replies</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>WLC4404 &amp; WLC5508</td>
<td>bm_5789</td>
<td>2</td>
<td>11 months, 1 week ago</td>
</tr>
<tr>
<td>Microsoft DHCP Server - Option 43 Setup</td>
<td>raun.williams</td>
<td>4</td>
<td>4 years, 5 months ago</td>
</tr>
<tr>
<td>Assign an controller IP address to...</td>
<td>ocardiel</td>
<td>2</td>
<td>3 years, 2 months ago</td>
</tr>
<tr>
<td>Mobility Groups WLC</td>
<td>timsandhop</td>
<td>4</td>
<td>3 years, 2 months ago</td>
</tr>
<tr>
<td>CNR, Lightweight Access Points, and...</td>
<td>ddarryl</td>
<td>2</td>
<td>5 years, 8 months ago</td>
</tr>
<tr>
<td>controller discovery process</td>
<td>c.fuller</td>
<td>31</td>
<td>3 years, 4 months ago</td>
</tr>
<tr>
<td>VCI String for LAP1232AG</td>
<td>benjamin.heron</td>
<td>6</td>
<td>5 years, 9 months ago</td>
</tr>
<tr>
<td>WAP 521 FLASH error</td>
<td>fcrumpler_at_cityofsunrise.org</td>
<td>10</td>
<td>4 years, 7 months ago</td>
</tr>
<tr>
<td>Relevance of Mgmt i/f DHCP server on WLC</td>
<td>maheuzenroede</td>
<td>4</td>
<td>4 years, 7 months ago</td>
</tr>
<tr>
<td>dhcp option 43 and Windows server 2008...</td>
<td>dersch_at_infgen.com</td>
<td>15</td>
<td>5 months, 1 week ago</td>
</tr>
<tr>
<td>WLC controller</td>
<td>ciscomoderator</td>
<td>2</td>
<td>1 year, 4 months ago</td>
</tr>
</tbody>
</table>
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- Upgrading Autonomous Cisco Aironet Access Points to Lightweight Mode
- Deploying Cisco 440X Series Wireless LAN Controllers
- How to configure the Lightweight Access Point in order to join the respective Wireless LAN Controller
- Wireless Product Support
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