Configuring the Access Point for the First Time

This chapter describes how to configure basic settings on the wireless device for the first time. The contents of this chapter are similar to the instructions in the quick start guide that shipped with the wireless device. You can configure all the settings described in this chapter using the CLI, but it might be simplest to browse to the wireless device web-browser interface to complete the initial configuration and then use the CLI to enter additional settings for a more detailed configuration.

This chapter contains the following sections:

- Before You Start, page 4-2
- Logging into the Access Point, page 4-4
- Obtaining and Assigning an IP Address, page 4-4
- Connecting to the 1100 Series Access Point Locally, page 4-5
- Connecting to the 1130 Series Access Point Locally, page 4-6
- Connecting to the 1040, 1140, 1200, 1230, 1240, 1250, 1260, and 2600 Series Access Points Locally, page 4-6
- Connecting to the 1300 Series Access Point/Bridge Locally, page 4-7
- Default Radio Settings, page 4-8
- Assigning Basic Settings, page 4-8
- Configuring Basic Security Settings, page 4-16
- Configuring System Power Settings Access Points, page 4-26
- Assigning an IP Address Using the CLI, page 4-28
- Assigning an IP Address Using the CLI, page 4-28
- Using a Telnet Session to Access the CLI, page 4-28
- Configuring the 802.1X Supplicant, page 4-29
- Configuring IPv6, page 4-32

Note: In this release, the access point radio interfaces are disabled by default.
Before You Start

Before you install the wireless device, make sure you are using a computer connected to the same network as the wireless device, and obtain the following information from your network administrator:

- A system name for the wireless device
- The case-sensitive wireless service set identifier (SSID) for your radio network
- If not connected to a DHCP server, a unique IP address for the wireless device (such as 172.17.255.115)
- If the wireless device is not on the same subnet as your PC, a default gateway address and subnet mask
- A Simple Network Management Protocol (SNMP) community name and the SNMP file attribute (if SNMP is in use)
- If you use IPSU to find the wireless device IP address, the access point MAC address. The MAC address can be found on the label on the bottom of the access point (such as 00164625854c).

Resetting the Device to Default Settings

If you need to start over during the initial setup process, you can reset the access point to factory default settings.

Resetting to Default Settings Using the MODE Button

Follow these steps to reset the access point to factory default settings using the access point MODE button:

**Step 1** Disconnect power (the power jack for external power or the Ethernet cable for in-line power) from the access point.

**Step 2** Press and hold the MODE button while you reconnect power to the access point.

**Step 3** Hold the MODE button until the Status LED turns amber (approximately 1 to 2 seconds), and release the button. All access point settings return to factory defaults.

Resetting to Default Settings Using the GUI

Follow these steps to return to the default settings using the access point GUI:

**Step 1** Open your Internet browser. The web-browser interface is fully compatible with Microsoft Internet Explorer Version 6.0 on Windows 98, 2000 and XP platforms, and with Netscape Version 7.0 on Windows 98, 2000, XP, and Solaris platforms.

**Step 2** Enter the wireless device IP address in the browser address line and press **Enter**. An Enter Network Password window appears.

**Step 3** Enter your username in the User Name field. The default username is **Cisco**.

**Step 4** Enter the wireless device password in the Password field and press **Enter**. The default password is **Cisco**. The Summary Status page appears.
Step 5  Click System Software and the System Software screen appears.
Step 6  Click System Configuration and the System Configuration screen appears.
Step 7  Click the Reset to Defaults button to reset all settings, including the IP address, to factory defaults. To reset all settings except the IP address to defaults, click the Reset to Defaults (Except IP) button.

---

**Resetting to Default Settings Using the CLI**

⚠️ **Caution**
You should never delete any of the system files prior to resetting defaults or reloading software.

If you want to reset the access point to its default settings and a static IP address, use the write erase or erase /all nvram command. If you want to erase everything including the static IP address, in addition to the above commands, use the erase and erase boot static-ipaddr static-ipmask command.

From the privileged EXEC mode, you can reset the access point/bridge configuration to factory default values using the CLI by following these steps:

---

Step 1  Enter `erase nvram:` to erase all NVRAM files including the startup configuration.

**Note** The `erase nvram` command does not erase a static IP address.

Step 2  Follow the step below to erase a static IP address and subnet mask. Otherwise, go to step 3.

  a. Enter `write default-config`.

Step 3  Enter `Y` when the following CLI message displays: Erasing the nvram filesystem will remove all configuration files! Continue? [confirm].

Step 4  Enter `reload` when the following CLI message displays: Erase of nvram: complete. This command reloads the operating system.

Step 5  Enter `Y` when the following CLI message displays: Proceed with reload? [confirm].

⚠️ **Caution**
Do not interrupt the boot process to avoid damaging the configuration file. Wait until the access point/bridge Install Mode LED begins to blink green before continuing with CLI configuration changes. You can also see the following CLI message when the load process has finished: Line protocol on Interface Dot11Radio0, changed state to up.

Step 6  After the access point/bridge reboots, you can reconfigure the access point by using the Web-browser interface if you previously assigned a static IP address, or the CLI if you did not.

The access point is configured with the factory default values including the IP address (set to receive an IP address using DHCP). To obtain the new IP address for an access point/bridge, you can use the `show interface bvi1` CLI command.
Logging into the Access Point

A user can login to the access point using one of the following methods:

- graphical user interface (GUI)
- Telnet (if the AP is configured with an IP address)
- console port

**Note**
Not all models of Cisco Aironet Access Points have the console port. If the access point does not have a console port, use either the GUI or the Telnet for access.

For information on logging into the AP through the GUI, refer to Using the Web-Browser Interface for the First Time, page 2-2.

For information on logging into the AP through the CLI refer to Accessing the CLI, page 3-9.

For information on logging into the AP through a console port refer to Connecting to the 1040, 1140, 1200, 1230, 1240, 1250, 1260, and 2600 Series Access Points Locally, page 4-6.

Obtaining and Assigning an IP Address

To browse to the wireless device Express Setup page, you must either obtain or assign the wireless device IP address using one of the following methods:

- If you have a 1040, 1100, 1130AG, 1200, 1240, 1250, 1260 series access point or 1300 series access point/bridge, connect to the access point console port and assign a static IP address. Follow the steps in the appropriate section to connect to the device console port:
  - Connecting to the 1130 Series Access Point Locally, page 4-6
  - Connecting to the 1130 Series Access Point Locally, page 4-6
  - Connecting to the 1040, 1140, 1200, 1230, 1240, 1250, 1260, and 2600 Series Access Points Locally, page 4-6.
  - Connecting to the 1300 Series Access Point/Bridge Locally, page 4-7

**Note**
In some terminal emulator applications you may need to set the Flow control parameter to Xon/Xoff. If you are not able to console into the device with the flow control value set to none, try changing the flow control value to Xon/Xoff.

- Use a DHCP server (if available) to automatically assign an IP address. You can find out the DHCP-assigned IP address using one of the following methods:
  - If you have a 1200 series access point, connect to the wireless device console port and use the `show ip interface brief` command to display the IP address.

If you have a 1040 or 1140 series access point, connect to the wireless device console port and use the `show interface brief` command to display the IP address. Follow the steps in the “Connecting to the 1130 Series Access Point Locally” section on page 4-6 or in the “Connecting
Connecting to the 1100 Series Access Point Locally

If you need to configure the access point locally (without connecting the access point to a wired LAN), you can connect a PC to its Ethernet port using a Category 5 Ethernet cable. You can use a local connection to the Ethernet port much as you would use a serial port connection.

You do not need a special crossover cable to connect your PC to the access point; you can use either a straight-through cable or a crossover cable.

If the access point is configured with default values and it does not receive an IP address from the DHCP server, it defaults to IP address 10.0.0.1 for five minutes. During that five minutes, you can browse to that IP address to configure the unit. If after five minutes the unit has not been reconfigured, it discards the 10.0.0.1 address and reverts to requesting an address from the DHCP server. If it does not receive an address, it sends requests indefinitely. If you miss the five-minute window for browsing to the access point at 10.0.0.1, you can power-cycle the access point to repeat the process.

Follow these steps to connect to the access point locally:

Step 1 Make sure that the PC you intend to use to configure the access point is configured with an IP address from 10.0.0.2 to 10.0.0.10.
Connecting to the 1130 Series Access Point Locally

If you need to configure the access point locally (without connecting the access point to a wired LAN), you can connect a PC to its console port using a DB-9 to RJ-45 serial cable. Follow these steps to open the CLI by connecting to the access point console port:

**Step 1** Open the access point cover.

**Step 2** Connect a nine-pin, female DB-9 to RJ-45 serial cable to the RJ-45 serial port on the access point and to the COM port on a computer. The Cisco part number for the DB-9 to RJ-45 serial cable is AIR-CONCAB1200. Browse to [http://www.cisco.com/go/marketplace](http://www.cisco.com/go/marketplace) to order a serial cable.

**Step 3** Set up a terminal emulator to communicate with the access point. Use the following settings for the terminal emulator connection: 9600 baud, 8 data bits, no parity, 1 stop bit, and no flow control.

**Note** If xon/xoff flow control does not work, use no flow control.

**Step 4** When connected, press `enter` or type `en` to access the command prompt. Pressing `enter` takes you to the user exec mode. Entering `en` prompts you for a password, then takes you to the privileged exec mode. The default password is `Cisco` and is case-sensitive.

Connecting to the 1040, 1140,1200, 1230, 1240, 1250, 1260, and 2600 Series Access Points Locally

If you need to configure the access point locally (without connecting the access point to a wired LAN), you can connect a PC to its console port using a DB-9 to RJ-45 serial cable. Follow these steps to open the CLI by connecting to the access point console port:
### Chapter 4  Configuring the Access Point for the First Time

#### Connecting to the 1300 Series Access Point/Bridge Locally

If you need to configure the access point/bridge locally (without connecting the access point/bridge to a wired LAN), you can connect a PC to the Ethernet port on the long-reach power injector using a Category 5 Ethernet cable. You can use a local connection to the power injector Ethernet port the same as you would use a serial port connection.

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Make sure that the PC you intend to use is configured to obtain an IP address automatically, or manually assign it an IP address within the same subnet as the access point/bridge IP address. For example, if you assigned the access point/bridge an IP address of 10.0.0.1, assign the PC an IP address of 10.0.0.20.</td>
</tr>
<tr>
<td>2</td>
<td>With the power cable disconnected from the power injector, connect your PC to the power injector using a Category 5 Ethernet cable. You can use either a crossover cable or a straight-through cable.</td>
</tr>
<tr>
<td>3</td>
<td>Connect the power injector to the access point/bridge using dual coaxial cables.</td>
</tr>
<tr>
<td>4</td>
<td>Connect the power injector power cable and power on the access point/bridge.</td>
</tr>
<tr>
<td>5</td>
<td>Follow the steps in the “Assigning Basic Settings” section on page 4-8. If you make a mistake and need to start over, follow the steps in the “Resetting the Device to Default Settings” procedure on page 4-2.</td>
</tr>
<tr>
<td>6</td>
<td>After configuring the access point/bridge, remove the Ethernet cable from your PC and connect the power injector to your wired LAN.</td>
</tr>
</tbody>
</table>
Chapter 4  Configuring the Access Point for the First Time

Default Radio Settings

Beginning with Cisco IOS Release 12.3(8)JA, access point radios are disabled and no default SSID is assigned. This was done in order to prevent unauthorized users to access a customer wireless network through an access point having a default SSID and no security settings. You must create an SSID before you can enable the access point radio interfaces.

See Chapter 6, “Configuring Radio Settings” for additional information.

Assigning Basic Settings

After you determine or assign the wireless device IP address, you can browse to the wireless device Express Setup page and perform an initial configuration:

Step 1  Open your Internet browser. The wireless device web-browser interface is fully compatible with Microsoft Internet Explorer Version 6.0 on Windows 98, 2000, XP platforms, and with Netscape Version 7.0 on Windows 98, 2000, XP, and Solaris platforms.

Step 2  Enter the wireless device IP address in the browser address line and press Enter. An Enter Network Password screen appears.

Step 3  Press Tab to bypass the Username field and advance to the Password field.

Step 4  Enter the case-sensitive password Cisco and press Enter. The Summary Status page appears. A typical Summary Status page is shown in Figure 4-1. Your page may differ depending on the access point model you are using.
Figure 4-1  Summary Status Page

![Summary Status Page](image)

**Step 5** Click **Express Setup**. The Express Setup screen appears. **Figure 4-2** and **Figure 4-3** shows the Express Setup page for the 1100 series access points. Your pages may differ depending on the access point model you are using.
Figure 4-2

Express Setup Page for 1100 Series Access Points

Figure 4-3

Express Setup Page for 1130, 1200, and 1240 Series Access Points

Note

Figure 4-3 shows the Express Setup page for an 1130 series access point. The 1200 series is similar, but does not support the universal workgroup bridge role.
### Figure 4-4
**Express Setup Page for 1040, 1140, 1260 and 1260 Series Access Points**

<table>
<thead>
<tr>
<th>Hostname</th>
<th>ap</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAC Address</td>
<td>0017.94.cc.00</td>
</tr>
<tr>
<td>Configuration Server Protocol</td>
<td>DHCP, Static IP</td>
</tr>
<tr>
<td>IP Address</td>
<td>10.0.91</td>
</tr>
<tr>
<td>IP Subnet Mask</td>
<td>255.255.255.0</td>
</tr>
<tr>
<td>Default Gateway</td>
<td>0.0.0.0</td>
</tr>
<tr>
<td>SNMP Community</td>
<td>defaultCommunity, Read-Only, Read-Write</td>
</tr>
</tbody>
</table>

#### Radio 2.4 GHz
- **Role in Radio Network**: Access Point, Repeater, Root Bridge, Non-Root Bridge, Workgroup Bridge, Universal Workgroup Bridge, Client MAC, Scanner
- **Optimize Radio Network for**: Throughput, Range, Defect, Custom
- **Aironet Extensions**: Enable, Disable

#### Radio 5 GHz
- **Role in Radio Network**: Access Point, Repeater, Root Bridge, Non-Root Bridge, Workgroup Bridge, Universal Workgroup Bridge, Client MAC, Scanner
- **Optimize Radio Network for**: Throughput, Range, Defect, Custom
- **Aironet Extensions**: Enable, Disable
Figure 4-5  Express Setup Page for the 1300 Series Access Point/Bridge

Step 6 Enter the configuration settings you obtained from your system administrator. The configurable settings include:

- **Host Name**—The host name, while not an essential setting, helps identify the wireless device on your network. The host name appears in the titles of the management system pages.

  **Note** You can enter up to 32 characters for the system name. However, when the wireless device identifies itself to client devices, it uses only the first 15 characters in the system name. If it is important for client users to distinguish between wireless devices, make sure that a unique portion of the system name appears in the first 15 characters.

  **Note** When you change the system name, the wireless device resets the radios, causing associated client devices to disassociate and quickly reassociate.

- **Configuration Server Protocol**—Click the radio button that matches the network method of IP address assignment.
  - **DHCP**—IP addresses are automatically assigned by your network DHCP server.
  - **Static IP**—The wireless device uses a static IP address that you enter in the IP address field.
• **IP Address**—Use this setting to assign or change the wireless device IP address. If DHCP is enabled for your network, leave this field blank.

**Note**

If the wireless device IP address changes while you are configuring the wireless device using the web-browser interface or a Telnet session over the wired LAN, you lose your connection to the wireless device. If you lose your connection, reconnect to the wireless device using its new IP address. Follow the steps in the “Resetting the Device to Default Settings” section on page 4-2 if you need to start over.

• **IP Subnet Mask**—Enter the IP subnet mask provided by your network administrator so the IP address can be recognized on the LAN. If DHCP is enabled, leave this field blank.

• **Default Gateway**—Enter the default gateway IP address provided by your network administrator. If DHCP is enabled, leave this field blank.

• **SNMP Community**—If your network is using SNMP, enter the SNMP Community name provided by your network administrator and select the attributes of the SNMP data (also provided by your network administrator).

• **Role in Radio Network**—Click the button that describes the role of the wireless device on your network. Select **Access Point (Root)** if the wireless device is connected to the wired LAN. Select **Repeater (Non-Root)** if it is not connected to the wired LAN.

  – **Access Point**—A root device; accepts associations from clients and bridges wireless traffic from the clients to the wireless LAN. This setting can be applied to any access point.

  – **Repeater**—A non-root device; accepts associations from clients and bridges wireless traffic from the clients to root access point connected to the wireless LAN. This setting can be applied to any access point.

  – **Root Bridge**—Establishes a link with a non-root bridge. In this mode, the device also accepts associations from clients. This setting is available only for the 1200 and 1240 series access points.

  – **Non-Root Bridge**—In this mode, the device establishes a link with a root bridge. This setting is available only for the 1200 and 1240 series access points.

  – **Install Mode**—Places the 1300 series access point/bridge in auto installation mode so you can align and adjust a bridge link for optimum efficiency.

  – **Workgroup Bridge**—Emulates a Cisco Aironet 350 Series Workgroup Bridge. In the Workgroup bridge mode, the access point functions as a client device that associates with a Cisco Aironet access point or bridge. A workgroup bridge can have a maximum of 254 clients, presuming that no other wireless clients are associated to the root bridge or access point. This setting is available for the 1040, 1100, 1200, and 1300 series access points.

  – **Universal Workgroup Bridge**—Configures the access point as a workgroup bridge capable of associating with non-Cisco access points. This setting is available on 1130, and 1240 series access points and 1300 series access point/bridges.

  – **Client MAC:**—The Ethernet MAC address of the client connected to the universal workgroup bridge.

  – **Scanner**—Functions as a network monitoring device. In the Scanner mode, the access point does not accept associations from clients. It continuously scans and reports wireless traffic it detects from other wireless devices on the wireless LAN. All access points can be configured as a scanner.
**Optimize Radio Network for**—Use this setting to select either preconfigured settings for the wireless device radio or customized settings for the wireless device radio.

- **Throughput**—Maximizes the data volume handled by the wireless device, but might reduce its range.
- **Range**—Maximizes the wireless device range but might reduce throughput.
- **Default**—Sets the default values for the access point.
- **Custom**—The wireless device uses the settings you enter on the Network Interfaces. Clicking **Custom** takes you to the Network Interfaces: Radio-802.11b Settings page. Radio-802.11b Settings page. Radio-802.11n Settings page (1250 and 1260). Radio-802.11n Settings page (1250 and 1260).

**Aironet Extensions**—Enable this setting if there are only Cisco Aironet devices on your wireless LAN.

**Step 7**
Click **Apply** to save your settings.

**Step 8**
Click **Network Interfaces** to browse to the Network Interfaces Summary page.

**Step 9**
Click the radio interface to browse to the Network Interfaces: Radio Status page.

**Step 10**
Click the **Settings** tab to browse to the Settings page for the radio interface.

**Step 11**
Click **Enable** to enable the radio.

**Step 12**
Click **Apply**.

Your wireless device is now running but probably requires additional configuring to conform to your network operational and security requirements. Consult the chapters in this manual for the information you need to complete the configuration.

**Note**
You can restore 1040, 1100, 1140, 1200, 1240, 1250 and 1260 series access points to factory defaults by unplugging the power jack and plugging it back in while holding down the Mode button for a few seconds, or until the Status LED turns amber.

---

### Default Settings on the Express Setup Page

Table 4-1 lists the default settings for the settings on the Express Setup page.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>Host Name</td>
<td>ap</td>
</tr>
<tr>
<td>Configuration Server Protocol</td>
<td>DHCP</td>
</tr>
<tr>
<td>IP Address</td>
<td>Assigned by DHCP by default; see the “Default IP Address Behavior” section on page 4-5 for a description of default IP address behavior on the access point</td>
</tr>
</tbody>
</table>
### Table 4-1  Default Settings on the Express Setup Page (continued)

<table>
<thead>
<tr>
<th>Setting</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP Subnet Mask</td>
<td>Assigned by DHCP by default; if DHCP is disabled, the default setting is 255.255.255.224</td>
</tr>
<tr>
<td>Default Gateway</td>
<td>Assigned by DHCP by default; if DHCP is disabled, the default setting is 0.0.0.0</td>
</tr>
<tr>
<td>SNMP Community</td>
<td>defaultCommunity (Read-only)</td>
</tr>
<tr>
<td>Role in Radio Network (for each radio installed)</td>
<td>Access point</td>
</tr>
<tr>
<td>Optimize Radio Network for Throughput</td>
<td></td>
</tr>
<tr>
<td>Aironet Extensions</td>
<td>Enable</td>
</tr>
</tbody>
</table>
Configuring Basic Security Settings

After you assign basic settings to the wireless device, you must configure security settings to prevent unauthorized access to your network. Because it is a radio device, the wireless device can communicate beyond the physical boundaries of your worksite.

Just as you use the Express Setup page to assign basic settings, you can use the Express Security page to create unique SSIDs and assign one of four security types to them. Figure 4-6 shows a typical Express Security page.

![Express Security Page]

The Express Security page helps you configure basic security settings. You can use the web-browser interface main Security pages to configure more advanced security settings.
Understanding Express Security Settings

The SSIDs that you create using the Express security page appear in the SSID table at the bottom of the page. You can create up to 16 SSIDs on the wireless device. On dual-radio wireless devices, the SSIDs that you create are enabled on both radio interfaces.

**Note** In Cisco IOS Release 12.4(23c)JA and 12.xxx, there is no default SSID. You must configure an SSID before client devices can associate to the access point.

The SSID can consist of up to 32 alphanumeric, case-sensitive, characters.

The first character can not contain the following characters:

- Exclamation point (!)
- Pound sign (#)
- Semicolon (;)

The following characters are invalid and cannot be used in an SSID:

- Plus sign (+)
- Right bracket (])
- Front slash (/)
- Quotation mark (")
- Tab
- Trailing spaces

**Using VLANs**

If you use VLANs on your wireless LAN and assign SSIDs to VLANs, you can create multiple SSIDs using any of the four security settings on the Express Security page. However, if you do not use VLANs on your wireless LAN, the security options that you can assign to SSIDs are limited because on the Express Security page encryption settings and authentication types are linked. Without VLANs, encryption settings (WEP and ciphers) apply to an interface, such as the 2.4-GHz radio, and you cannot use more than one encryption setting on an interface. For example, when you create an SSID with static WEP with VLANs disabled, you cannot create additional SSIDs with WPA authentication because they use different encryption settings. If you find that the security setting for an SSID conflicts with another SSID, you can delete one or more SSIDs to eliminate the conflict.
Express Security Types

Table 4-2 describes the four security types that you can assign to an SSID.

<table>
<thead>
<tr>
<th>Security Type</th>
<th>Description</th>
<th>Security Features Enabled</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Security</td>
<td>This is the least secure option. You should use this option only for SSIDs</td>
<td>None.</td>
</tr>
<tr>
<td></td>
<td>used in a public space and assign it to a VLAN that restricts access to your</td>
<td></td>
</tr>
<tr>
<td></td>
<td>network.</td>
<td></td>
</tr>
<tr>
<td>Static WEP Key</td>
<td>This option is more secure than no security. However, static WEP keys</td>
<td>Mandatory WEP. Client devices cannot associate using this SSID</td>
</tr>
<tr>
<td></td>
<td>are vulnerable to attack. If you configure this setting, you should consider</td>
<td>without a WEP key that matches the wireless device key.</td>
</tr>
<tr>
<td></td>
<td>limiting association to the wireless device based on MAC address (see the</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chapter 16, “Using MAC Address ACLs to Block or Allow Client Association to</td>
<td></td>
</tr>
<tr>
<td></td>
<td>the Access Point” or, if your network does not have a RADIUS server,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>consider using an access point as a local authentication server (see Chapter</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9, “Configuring an Access Point as a Local Authenticator”).</td>
<td></td>
</tr>
</tbody>
</table>
### EAP Authentication

This option enables 802.1X authentication (such as LEAP, PEAP, EAP-TLS, EAP-FAST, EAP-TTLS, EAP-GTC, EAP-SIM, and other 802.1X/EAP based products). This setting uses mandatory encryption, WEP, open authentication + EAP, network EAP authentication, no key management, RADIUS server authentication port 1645.

You are required to enter the IP address and shared secret for an authentication server on your network (server authentication port 1645). Because 802.1X authentication provides dynamic encryption keys, you do not need to enter a WEP key.

Mandatory 802.1X authentication. Client devices that associate using this SSID must perform 802.1X authentication.

If radio clients are configured to authenticate using EAP-FAST, open authentication with EAP should also be configured. If you do not configure open authentication with EAP, the following GUI warning message appears:

**WARNING:**

Network EAP is used for LEAP authentication only. If radio clients are configured to authenticate using EAP-FAST, Open Authentication with EAP should also be configured.

If you are using the CLI, this warning message appears:

**SSID CONFIG WARNING:** [SSID]: If radio clients are using EAP-FAST, AUTH OPEN with EAP should also be configured.

### WPA

Wi-Fi Protected Access (WPA) permits wireless access to users authenticated against a database through the services of an authentication server, then encrypts their IP traffic with stronger algorithms than those used in WEP.

This setting uses encryption ciphers, TKIP, open authentication + EAP, network EAP authentication, key management WPA mandatory, and RADIUS server authentication port 1645.

As with EAP authentication, you must enter the IP address and shared secret for an authentication server on your network (server authentication port 1645).

Mandatory WPA authentication. Client devices that associate using this SSID must be WPA-capable.

If radio clients are configured to authenticate using EAP-FAST, open authentication with EAP should also be configured. If you do not configure open authentication with EAP, the following GUI warning message appears:

**WARNING:**

Network EAP is used for LEAP authentication only. If radio clients are configured to authenticate using EAP-FAST, Open Authentication with EAP should also be configured.

If you are using the CLI, this warning message appears:

**SSID CONFIG WARNING:** [SSID]: If radio clients are using EAP-FAST, AUTH OPEN with EAP should also be configured.
Express Security Limitations

Because the Express Security page is designed for simple configuration of basic security, the options available are a subset of the wireless device security capabilities. Keep these limitations in mind when using the Express Security page:

- If the **No VLAN** option is selected, the static WEP key can be configured once. If you select **Enable VLAN**, the static WEP key should be disabled.
- You cannot edit SSIDs. However, you can delete SSIDs and re-create them.
- You cannot assign SSIDs to specific radio interfaces. The SSIDs that you create are enabled on all radio interfaces. To assign SSIDs to specific radio interfaces, use the Security SSID Manager page.
- You cannot configure multiple authentication servers. To configure multiple authentication servers, use the Security Server Manager page.
- You cannot configure multiple WEP keys. To configure multiple WEP keys, use the Security Encryption Manager page.
- You cannot assign an SSID to a VLAN that is already configured on the wireless device. To assign an SSID to an existing VLAN, use the Security SSID Manager page.
- You cannot configure combinations of authentication types on the same SSID (for example, MAC address authentication and EAP authentication). To configure combinations of authentication types, use the Security SSID Manager page.

Using the Express Security Page

Follow these steps to create an SSID using the Express Security page:

Step 1  Type the SSID in the SSID entry field. The SSID can contain up to 32 alphanumeric characters.

Step 2  To broadcast the SSID in the wireless device beacon, check the Broadcast SSID in Beacon check box. When you broadcast the SSID, devices that do not specify an SSID can associate to the wireless device. This is a useful option for an SSID used by guests or by client devices in a public space. If you do not broadcast the SSID, client devices cannot associate to the wireless device unless their SSID matches this SSID. Only one SSID can be included in the wireless device beacon.

Step 3  (Optional) Check the Enable VLAN ID check box and enter a VLAN number (1 through 4095) to assign the SSID to a VLAN. You cannot assign an SSID to an existing VLAN.

Step 4  (Optional) Check the Native VLAN check box to mark the VLAN as the native VLAN.

Step 5  Select the security setting for the SSID. The settings are listed in order of robustness, from No Security to WPA, which is the most secure setting. If you select EAP Authentication or WPA, enter the IP address and shared secret for the authentication server on your network.

Note  If you do not use VLANs on your wireless LAN, the security options that you can assign to multiple SSIDs are limited. See the “Using VLANs” section on page 4-17 for details.

Step 6  Click Apply. The SSID appears in the SSID table at the bottom of the page.
**CLI Configuration Examples**

The examples in this section show the CLI commands that are equivalent to creating SSIDs using each security type on the Express Security page. This section contains these example configurations:

- **Example: No Security, page 4-21**
- **Example: Static WEP, page 4-21**
- **Example: EAP Authentication, page 4-23**
- **Example: WPA, page 4-24**

**Example: No Security**

This example shows part of the configuration that results from using the Express Security page to create an SSID called `no_security_ssid`, including the SSID in the beacon, assigning it to VLAN 10, and selecting VLAN 10 as the native VLAN:

```plaintext
! dot11 ssid no_security_ssid
    authentication open
    vlan 10
! interface Dot11Radio0.10
    encapsulation dot1Q 10 native
    no ip route-cache
    bridge-group 1
    bridge-group 1 subscriber-loop-control
    bridge-group 1 block-unknown-source
    no bridge-group 1 source-learning
    no bridge-group 1 unicast-flooding
    bridge-group 1 spanning-disabled
!
! interface Dot11Radio1
    no ip address
    no ip route-cache
! ssid no_security_ssid
!
! speed basic-6.0 9.0 basic-12.0 18.0 basic-24.0 36.0 48.0 54.0
    rts threshold 2312
    station-role root
!
! interface Dot11Radio1.10
    encapsulation dot1Q 10 native
    no ip route-cache
    bridge-group 1
    bridge-group 1 subscriber-loop-control
    bridge-group 1 block-unknown-source
    no bridge-group 1 source-learning
    no bridge-group 1 unicast-flooding
    bridge-group 1 spanning-disabled
```

**Example: Static WEP**

This example shows part of the configuration that results from using the Express Security page to create an SSID called `static_wep_ssid`, excluding the SSID from the beacon, assigning the SSID to VLAN 20, selecting 3 as the key slot, and entering a 128-bit key:

```plaintext
ssid static_wep_ssid
    vlan 20
    authentication open
```
Configuring Basic Security Settings

! interface Dot11Radio0
no ip address
no ip route-cache
!
encryption vlan 20 key 3 size 128bit 7 FFDS18A21653687A4251AAE1230C transmit-key
encryption vlan 20 mode wep mandatory
!
speed basic-1.0 basic-2.0 basic-5.5 basic-11.0
rts threshold 2312
station-role root
bridge-group 1
bridge-group 1 subscriber-loop-control
bridge-group 1 block-unknown-source
no bridge-group 1 source-learning
no bridge-group 1 unicast-flooding
bridge-group 1 spanning-disabled

ssid statuc_wep_ssid
!
interface Dot11Radio0.20
encapsulation dot1Q 20
no ip route-cache
bridge-group 20
bridge-group 20 subscriber-loop-control
bridge-group 20 block-unknown-source
no bridge-group 20 source-learning
no bridge-group 20 unicast-flooding
bridge-group 20 spanning-disabled
!
interface Dot11Radio1
no ip address
no ip route-cache
!
encryption vlan 20 key 3 size 128bit 7 741F07447BA1D4382450CB68F37A transmit-key
encryption vlan 20 mode wep mandatory
!
ssid static_wep_ssid
!
speed basic-6.0 9.0 basic-12.0 18.0 basic-24.0 36.0 48.0 54.0
rts threshold 2312
station-role root
bridge-group 1
bridge-group 1 subscriber-loop-control
bridge-group 1 block-unknown-source
no bridge-group 1 source-learning
no bridge-group 1 unicast-flooding
bridge-group 1 spanning-disabled
!
interface Dot11Radio1.20
encapsulation dot1Q 20
no ip route-cache
bridge-group 20
bridge-group 20 subscriber-loop-control
bridge-group 20 block-unknown-source
no bridge-group 20 source-learning
no bridge-group 20 unicast-flooding
bridge-group 20 spanning-disabled
Example: EAP Authentication

This example shows part of the configuration that results from using the Express Security page to create an SSID called eap_ssid, excluding the SSID from the beacon, and assigning the SSID to VLAN 30:

```
dot11 ssid eap_ssid
  vlan 30
  authentication open eap eap_methods
  authentication network-eap eap_methods
!
interface Dot11Radio0/1
  no ip address
  no ip route-cache
  !
  encryption vlan 30 mode wep mandatory
  !
  ssid eap_ssid
  !
  speed basic-1.0 basic-2.0 basic-5.5 basic-11.0
  rts threshold 2312
  station-role root
  bridge-group 1
  bridge-group 1 subscriber-loop-control
  bridge-group 1 block-unknown-source
  no bridge-group 1 source-learning
  no bridge-group 1 unicast-flooding
  bridge-group 1 spanning-disabled
!
interface Dot11Radio0/1.30
  encapsulation dot1Q 30
  no ip route-cache
  bridge-group 30
  bridge-group 30 subscriber-loop-control
  bridge-group 30 block-unknown-source
  no bridge-group 30 source-learning
  no bridge-group 30 unicast-flooding
  bridge-group 30 spanning-disabled
!
interface Dot11Radio0/1
  no ip address
  no ip route-cache
  !
  encryption vlan 30 mode wep mandatory
  !
  ssid eap_ssid
  !
  speed basic-6.0 9.0 basic-12.0 18.0 basic-24.0 36.0 48.0 54.0
  rts threshold 2312
  station-role root
  bridge-group 1
  bridge-group 1 subscriber-loop-control
  bridge-group 1 block-unknown-source
  no bridge-group 1 source-learning
  no bridge-group 1 unicast-flooding
  bridge-group 1 spanning-disabled
```

Note

The following warning message appears if your radio clients are using EAP-FAST and you do not include open authentication with EAP as part of the configuration:

```
SSID CONFIG WARNING: [SSID]: If radio clients are using EAP-FAST, AUTH OPEN with EAP should also be configured.
```
Configuring Basic Security Settings

interface Dot11Radio0/1.30
capsulation dot1Q 30
no ip route-cache
bridge-group 30
bridge-group 30 subscriber-loop-control
bridge-group 30 block-unknown-source
no bridge-group 30 source-learning
no bridge-group 30 unicast-flooding
bridge-group 30 spanning-disabled

interface FastEthernet0
mtu 1500
no ip address
ip mtu 1564
no ip route-cache
duplex auto
speed auto
bridge-group 1
no bridge-group 1 source-learning
bridge-group 1 spanning-disabled

interface FastEthernet0.30
mtu 1500
capsulation dot1Q 30
no ip route-cache
bridge-group 30
no bridge-group 30 source-learning
bridge-group 30 spanning-disabled

interface BVI1
ip address 10.91.104.91 255.255.255.192
no ip route-cache

ip http server
ip http help-path
ip radius source-interface BVI1
radius-server attribute 32 include-in-access-req format %h
radius-server host 10.91.104.92 auth-port 1645 acct-port 1646 key 7 091D1C5A4D5041
radius-server authorization permit missing Service-Type
radius-server vsa send accounting
bridge 1 route ip

Example: WPA
This example shows part of the configuration that results from using the Express Security page to create an SSID called wpaSSID, excluding the SSID from the beacon, and assigning the SSID to VLAN 40:

ssid wpaSSID
vlan 40
  authentication open eap eap_methods
  authentication network-eap eap_methods
  authentication key-management wpa
aaa new-model
!
aaa group server radius rad_eap
    server 10.91.104.92 auth-port 1645 acct-port 1646
!
aaa group server radius rad_mac
!
aaa group server radius rad_acct
!
aaa group server radius rad_admin
!
aaa group server tacacs+ tac_admin
!
aaa group server radius rad_pmip
!
aaa group server radius dummy
!
aaa authentication login eap_methods group rad_eap
aaa authentication login mac_methods local
aaa authorization exec default local
aaa authorization ipmobile default group rad_pmip
aaa accounting network acct_methods start-stop group rad_acct
aaa session-id common
!
bridge irb
!
interface Dot11Radio0/1
    no ip address
    no ip route-cache
!
    encryption vlan 40 mode ciphers tkip
!
    ssid wpa_ssid
!
speed basic-1.0 basic-2.0 basic-5.5 basic-11.0
rts threshold 2312
station-role root
bridge-group 1
bridge-group 1 subscriber-loop-control
bridge-group 1 block-unknown-source
no bridge-group 1 source-learning
no bridge-group 1 unicast-flooding
bridge-group 1 spanning-disabled
!
interface Dot11Radio0/1.40
    encapsulation dot1Q 40
    no ip route-cache
    bridge-group 40
    bridge-group 40 subscriber-loop-control
    bridge-group 40 block-unknown-source
    no bridge-group 40 source-learning
    no bridge-group 40 unicast-flooding
    bridge-group 40 spanning-disabled
!
    ssid wpa_ssid
!
interface FastEthernet0
    no ip address
    no ip route-cache
duplex auto
speed auto
bridge-group 1
no bridge-group 1 source-learning
bridge-group 1 spanning-disabled
!
interface FastEthernet0.40
encapsulation dot1Q 40
no ip route-cache
bridge-group 40
no bridge-group 40 source-learning
bridge-group 40 spanning-disabled

Configuring System Power Settings Access Points

The AP 1040, AP 801, AP 802, AP 1140, AP 1550, AP 1600, AP 2600, AP 3500, AP 3600 and AP 1260 disable the radio interfaces when the unit senses that the power source to which it is connected does not provide enough power. Depending on your power source, you might need to enter the power source type in the access point configuration. Use the System Software: System Configuration page on the web-browser interface to select a power option. Figure 4-7 shows the System Power Settings section of the System Configuration page.

Using the AC Power Adapter

If you use the AC power adapter to provide power access point, you do not need to adjust the access point configuration.

Using a Switch Capable of IEEE 802.3af Power Negotiation

If you use a switch to provide Power over Ethernet (PoE) to the 1040, 1130, 1140, 1240, 1250, and 1260 access point, and the switch supports the IEEE 802.3af power negotiation standard, select Power Negotiation on the System Software: System Configuration page.

Using a Switch That Does Not Support IEEE 802.3af Power Negotiation

If you use a switch to provide Power over Ethernet (PoE) to the 1040, 1130, or 1140 access point, and the switch does not support the IEEE 802.3af power negotiation standard, select Pre-Standard Compatibility on the System Software: System Configuration page.
Using a Power Injector

If you use a power injector to provide power to the 1040, 1130, 1140, 1240, 1250, or 1260 access point, select **Power Injector** on the System Software: System Configuration page and enter the MAC address of the switch port to which the access point is connected.

**dot11 extension power native Command**

When enabled, the **dot11 extension power native** shifts the power tables the radio uses from the IEEE 802.11 tables to the native power tables. The radio derives the values for this table from the NativePowerTable and NativePowerSupportedTable of the CISCO-DOT11-1F-MIB. The Native Power tables were designed specifically to configure powers as low as -1dBm for Cisco Aironet radios that support these levels.

**Support for 802.11n Performance on 1250 Series Access Points with Standard 802.3af PoE**

The Cisco Aironet 1250 Series access points requires 20W of power for optimum performance of 802.11n on both the 2.4- and 5-GHz bands. This allows you to configure one radio to operate using 802.3af. This allows full functionality under 802.3af on one radio while the other radio is disabled. Once you upgrade to a powering solution that provides 20W of power to the access point, you can configure the second radio so that both radios are fully functional with 2x3 multiple input multiple output (MIMO) technology.

**1250 Series Power Modes**

The 1250 series access point can be powered by either inline power or by an optional AC/DC power adapter. Certain radio configurations may require more power than can be provided by the inline power source. When insufficient inline power is available, you can select several options (based upon your access point radio configuration) as shown in Table 4-2.

**Table 4-3 Inline Power Options based on Access Point Radio Configuration**

<table>
<thead>
<tr>
<th>Radio Band</th>
<th>Data Rate</th>
<th>Number of Transmitters</th>
<th>Cyclic Shift Diversity (CSD)</th>
<th>Maximum Transmit Power (dBm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>802.11b</td>
<td>1</td>
<td>N/A</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>802.11g</td>
<td>1</td>
<td>N/A</td>
<td>17</td>
<td>17</td>
</tr>
<tr>
<td>802.11n (MCS 0-7)</td>
<td>1</td>
<td>Disabled</td>
<td>17</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Enabled (default)</td>
<td>14 (17 per Tx)</td>
<td>20 (17 per Tx)</td>
</tr>
<tr>
<td>802.11n (MCS 8-15)</td>
<td>2</td>
<td>N/A</td>
<td>14 (17 per Tx)</td>
<td>20 (17 per Tx)</td>
</tr>
</tbody>
</table>
Assigning an IP Address Using the CLI

When you connect the wireless device to the wired LAN, the wireless device links to the network using a bridge virtual interface (BVI) that it creates automatically. Instead of tracking separate IP addresses for the wireless device Ethernet and radio ports, the network uses the BVI.

When you assign an IP address to the wireless device using the CLI, you must assign the address to the BVI. Beginning in privileged EXEC mode, follow these steps to assign an IP address to the wireless device BVI:

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>configure terminal</td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td>interface bvi1</td>
<td>Enters interface configuration mode for the BVI.</td>
</tr>
<tr>
<td>ip address address mask</td>
<td>Assigns an IP address and address mask to the BVI.</td>
</tr>
</tbody>
</table>

Note: If you are connected to the wireless device using a Telnet session, you lose your connection to the wireless device when you assign a new IP address to the BVI. If you need to continue configuring the wireless device using Telnet, use the new IP address to open another Telnet session to the wireless device.

Using a Telnet Session to Access the CLI

Follow these steps to access the CLI by using a Telnet session. These steps are for a PC running Microsoft Windows with a Telnet terminal application. Check your PC operating instructions for detailed instructions for your operating system.

Step 1  Choose Start > Programs > Accessories > Telnet.
Configuring the Access Point for the First Time

Chapter 4

Configuring the 802.1X Supplicant

If Telnet is not listed in your Accessories menu, select Start > Run, type Telnet in the entry field, and press Enter.

Step 2

When the Telnet window appears, click Connect and select Remote System.

---

Note

In Windows 2000, the Telnet window does not contain drop-down lists. To start the Telnet session in Windows 2000, type open followed by the wireless device IP address.

Step 3

In the Host Name field, type the wireless device IP address and click Connect.

---

Configuring the 802.1X Supplicant

Traditionally, the dot1x authenticator/client relationship has always been a network device and a PC client respectively, as it was the PC user that had to authenticate to gain access to the network. However, wireless networks introduce unique challenges to the traditional authenticator/client relationship. First, access points can be placed in public places, inviting the possibility that they could be unplugged and their network connection used by an outsider. Second, when a repeater access point is incorporated into a wireless network, the repeater access point must authenticate to the root access point in the same way as a client does.

---

Note

The 802.1X supplicant is available on 1040, 1130AG, 1140, 1240AG, 1250, 1260, and 1300 series access points. It is not available on 1100 and 1200 series access points.

The supplicant is configured in two phases:

- Create and configure a credentials profile
- Apply the credentials to an interface or SSID

You can complete the phases in any order, but they must be completed before the supplicant becomes operational.

Creating a Credentials Profile

Beginning in privileged EXEC mode, follow these steps to create an 802.1X credentials profile:

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1 configure terminal</td>
<td>Enter global configuration mode.</td>
</tr>
<tr>
<td>Step 2 dot1x credentials profile</td>
<td>Creates a dot1x credentials profile and enters the dot1x credentials configuration submode.</td>
</tr>
<tr>
<td>Step 3 anonymous-id description</td>
<td>(Optional)—Enter the anonymous identity to be used.</td>
</tr>
<tr>
<td>Step 4 description description</td>
<td>(Optional)—Enter a description for the credentials profile</td>
</tr>
<tr>
<td>Step 5 username username</td>
<td>Enter the authentication user id.</td>
</tr>
</tbody>
</table>
Configuring the 802.1X Supplicant

Use the no form of the dot1x credentials command to negate a parameter.

The following example creates a credentials profile named test with the username Cisco and a the unencrypted password Cisco:

```
ap1240AG> enable
Password: xxxxxxxx
ap1240AG# config terminal
Enter configuration commands, one per line. End with CTRL-Z.
ap1240AG(config)# dot1x credentials test
ap1240AG(config-dot1x-creden)# username Cisco
ap1240AG(config-dot1x-creden)# password Cisco
ap1240AG(config-dot1x-creden)# exit
ap1240AG(config)#
```

Applying the Credentials to an Interface or SSID

Credential profiles are applied to an interface or an SSID in the same way.

Applying the Credentials Profile to the Wired Port

Beginning in the privileged EXEC mode, follow these steps to apply the credentials to the access point wired port:

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>configure terminal</td>
</tr>
<tr>
<td>Step 2</td>
<td>interface fastethernet 0</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 3</td>
<td>dot1x credentials profile name</td>
</tr>
</tbody>
</table>
The following example applies the credentials profile test to the access point Fast Ethernet port:

```
ap1240AG> enable
Password: xxxxxxxx
ap1240AG# config terminal
Enter configuration commands, one per line. End with CTRL-Z.
ap1240AG(config)# interface fa0
ap1240AG(config-if)# dot1x credentials test
ap1240AG(config-if)# end
ap1240AG#
```

### Applying the Credentials Profile to an SSID Used For the Uplink

If you have a repeater access point in your wireless network and are using the 802.1X supplicant on the root access point, you must apply the 802.1X supplicant credentials to the SSID the repeater uses to associate with and authenticate to the root access point.

Beginning in the privileged EXEC mode, follow these steps to apply the credentials to an SSID used for the uplink:

<table>
<thead>
<tr>
<th>Step</th>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>configure terminal</td>
<td>Enter global configuration mode.</td>
</tr>
<tr>
<td>2</td>
<td>dot11 ssid ssid</td>
<td>Enter the 802.11 SSID. The SSID can consist of up to 32 alphanumeric characters. SSIDs are case sensitive. <strong>Note</strong>: The first character cannot contain the !, #, or; character. +,], /, “, TAB, and trailing spaces are invalid characters for SSIDs.</td>
</tr>
<tr>
<td>3</td>
<td>dot1x credentials profile</td>
<td>Enter the name of a preconfigured credentials profile.</td>
</tr>
<tr>
<td>4</td>
<td>end</td>
<td>Exits the dot1x credentials configuration submode</td>
</tr>
<tr>
<td>5</td>
<td>copy running config startup-config</td>
<td>(Optional) Save your entries in the configuration file.</td>
</tr>
</tbody>
</table>

The following example applies the credentials profile test to the ssid testap1 on a repeater access point.

```
repeater-ap> enable
Password: xxxxxxxx
repeater-ap# config terminal
Enter configuration commands, one per line. End with CTRL-Z.
repeater-ap(config)# dot11 ssid testap1
repeater-ap(config-if)# dot1x credentials test
repeater-ap(config-ssid)# end
repeater-ap(config)
```
Creating and Applying EAP Method Profiles

You can optionally configure an EAP method list to enable the supplicant to recognize a particular EAP method. See the “Creating and Applying EAP Method Profiles for the 802.1X Supplicant” section on page 11-17.

Configuring IPv6

IPv6 is the latest Internet protocol for IPv, developed to provide an extremely large number of addresses. It uses 128 bit addresses instead of the 32 bit addresses that are used in IPv4.

As deployments in wireless networks use greater number of IP wireless devices and smart phones, IPv6 with its 128-bit address format can support 3.4 x 1038 address space.

IPv6 addresses are represented as a series of 16-bit hexadecimal fields separated by colons (:). In the format: x:x:x:x:x:x:x.

There are three types of IPv6 address types:

- **Unicast**
  The Cisco IOS software supports these IPv6 unicast address types:
  - Aggregatable Global Address
    Aggregatable global unicast addresses are globally routable and reachable on the IPv6 portion of the Internet. These global addresses are identified by the format prefix of 001.
  - Link-Local Address
    Link-Local Addresses are automatically configured on interface using link-local prefix FE80::/10 (1111 1110 10). The interface identifier is in the modified EUI-64 format.

- **Anycast** can be used only by a router and not the host. Anycast addresses must not be used as the source address of an IPv6 packet.

- **Multicast address** is a logical identifier for a group of hosts that process frames intended to be multicast for a designated network service. Multicast addresses in IPv6 use a prefix of FF00::/8 (1111 1111)

  IPv6 configuration uses these multicast groups:
  - Solicited-node multicast group FF02:0:0:0:0:1:FF00::/104
  - All-nodes link-local multicast group FF02::1
  - All-routers link-local multicast group FF02::2

  Table 4-4 lists the IPv6 address types and formats.

<table>
<thead>
<tr>
<th>IPv6 Address Type</th>
<th>Preferred Format</th>
<th>Compressed Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unicast</td>
<td>2001:0:0:0:DB8:800:200C:417A</td>
<td>2001::DB8:800:200C:417A</td>
</tr>
<tr>
<td>Multicast</td>
<td>FF01:0:0:0:0:0:0:101</td>
<td>FF01::101</td>
</tr>
<tr>
<td>Loopback</td>
<td>0:0:0:0:0:0:0:1</td>
<td>::1</td>
</tr>
<tr>
<td>Unspecified</td>
<td>0:0:0:0:0:0:0:0</td>
<td>::</td>
</tr>
</tbody>
</table>
Table 4-1  IPv6 Address Formats

<table>
<thead>
<tr>
<th>IPv6 Address Type</th>
<th>Preferred Format</th>
<th>Compressed Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unicast</td>
<td>2001:0:0:0:DB8:800:200C:417A</td>
<td>2001::DB8:800:200C:417A</td>
</tr>
<tr>
<td>Multicast</td>
<td>FF01:0:0:0:0:0:101</td>
<td>FF01::101</td>
</tr>
<tr>
<td>Loopback</td>
<td>0:0:0:0:0:0:1</td>
<td>::1</td>
</tr>
<tr>
<td>Unspecified</td>
<td>0:0:0:0:0:0:0</td>
<td>::</td>
</tr>
</tbody>
</table>

These modes are supported:

- Root
- Root bridge
- Non Root bridge
- Repeater
- WGB

These modes are not supported:

- Spectrum mode
- Monitor mode

These are also not supported in IPv6:

- SNMPv6
- Multiple BVI interfaces on an access point
- Enabling IPv6 on any interface other than BVI

Beginning in privileged EXEC mode, use these commands to enable the ipv6 address:

- \texttt{ap(config)# int bv1}
- \texttt{ap(config-if)# ipv6 address}

A link-local address, based on the Modified EUI-64 interface ID, is automatically generated for the interface when stateless autoconfiguration is enabled.

Beginning in privileged EXEC mode, use this command to enable stateless autoconfiguration:

\texttt{ap(config-if)# ipv6 address autoconfig}

Beginning in privileged EXEC mode, use this command to configure a link local address without assigning any other IPv6 addresses to the interface:

\texttt{ap(config-if)# ipv6 address ipv6-address link-local}

Beginning in privileged EXEC mode, use this command to assign a site-local or global address to the interface:

\texttt{ap(config-if)# ipv6 address ipv6-address [eui-64]}

\textbf{Note}

The optional eui-64 keyword is used to utilize the Modified EUI-64 interface ID in the low order 64 bits of the address.

This section contains:

- Configuring DHCPv6 address, page 4-33
normal four-message exchange (solicit, advertise, request, reply). By default, the four-message exchange is used. When the rapid-commit option is enabled by both client and server, the two-message exchange is used.

Beginning in privileged EXEC mode, use these commands to enable the DHCPv6 client in an Access Point:

- ap# conf t
- ap(config)# int bv1
- ap(config)# ipv6 address dhcp rapid-commit(optional)

Autonomous AP supports both Dhcpv6 stateful and stateless addressing.

**Stateful addressing**

Stateful addressing uses a DHCP server. DHCP clients use stateful DHCPv6 addressing to obtain an IP address.

Beginning in privileged EXEC mode, use this command to configure stateful addressing:

ap(config)# ipv6 address dhcp

**Stateless addressing**

Stateless addressing does not use a DHCP server to obtain IP addresses. The DHCP clients autoconfigure their own IP addresses based on router advertisements.

Beginning in privileged EXEC mode, use this command to configure stateless addressing:

ap(config)# ipv6 address autoconfig

### IPv6 Neighbor Discovery

The IPv6 neighbor discovery process uses ICMP messages and solicited-node multicast addresses to determine the link-layer address of a neighbor on the same network.

Beginning in privileged EXEC mode, use these commands to configure IPv6 neighbor discovery:

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>ipv6 nd ?</td>
<td>Configures neighbor discovery protocol.</td>
</tr>
<tr>
<td>ipv6 nd ns-interval value</td>
<td>Sets the interval between IPv6 neighbor solicitation retransmissions on an interface.</td>
</tr>
<tr>
<td>ipv6 nd reachable-time value</td>
<td>Sets the amount of time that a remote IPv6 node is reachable.</td>
</tr>
<tr>
<td>ipv6 nd dad attempts value</td>
<td>Configures the number of consecutive neighbor solicitation messages sent when duplicate address detection is performed on the unicast IPv6 addresses.</td>
</tr>
<tr>
<td>ipv6 nd dad time value</td>
<td>Configures the interval between IPv6 neighbor solicit transmissions for duplicate address detection.</td>
</tr>
<tr>
<td>ipv6 nd autoconfig default-router</td>
<td>Configures a default route to the Neighbor Discovery-derived default router.</td>
</tr>
<tr>
<td>ipv6 nd autoconfig prefix</td>
<td>Configures router solicitation message to solicit a router advertisement to eliminate any delay in waiting for the next periodic router advertisement.</td>
</tr>
</tbody>
</table>
Chapter 4  Configuring the Access Point for the First Time

### Configuring IPv6

IPv6 access lists (ACL) are used to filter traffic and restrict access to the router. IPv6 prefix lists are used to filter routing protocol updates.

Beginning in privileged EXEC mode, use these commands to configure the access list globally and assign it to interface:

- `ap(config)# ipv6 access-list acl-name`
- `ap(config-ipv6-acl)# deny/permit protocol`

Beginning in privileged EXEC mode, use this command to deny or permit access:

- `ap(config)# deny/permit ?`

This filter is based on the IPv6 address irrespective of the higher layer protocols.

Beginning in privileged EXEC mode, use these commands to assign the globally configured ACL to the outbound and inbound traffic on layer3 interface:

- `ap(config)# interface interface`
- `ap(config)# ipv6 traffic-filter acl-name in/out`

### RADIUS Configuration

RADIUS iserver is a background process serving three functions:

- authenticate users before granting them access to the network
- authorize users for certain network services
- account for the usage of certain networkservices

Beginning in privileged EXEC mode, use these commands to configure the radius server in the Access Point:

- `ap(config)# radius server server name`
- `ap(config-radius-server)# address ipv6 ipv6 address`

### IPv6 WDS Support

The WDS and the infrastructure access points communicate over a multicast protocol called WLAN Context Control Protocol (WLCCP).

Cisco IOS Release 15.2(4)JA supports communication between the WDS and Access Point through IPv6 addresses. The WDS works on a Dual Stack; that is, it accepts both IPv4 and IPv6 registration.

---

**Command | Purpose**
---

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>ipv6 nd cache expire expire-time-in-seconds</code></td>
<td>Configures the length of time before the IPv6 neighbor discovery cache entry expires.</td>
</tr>
<tr>
<td><code>ipv6 nd cache interface-limit size [log rate]</code></td>
<td>Configures a neighbor discovery cache limit on a specified interface.</td>
</tr>
<tr>
<td><code>ipv6 nd na glean</code></td>
<td>Configures neighbor discovery to glean an entry from an unsolicited neighbor advertisement.</td>
</tr>
</tbody>
</table>
IPv6 WDS AP registration

The first active IPv6 address is used to register the WDS. Table 4-5 shows different scenarios in the IPv6 WDS AP registration process.

Table 4-5  IPv6 WDS–AP Registration

<table>
<thead>
<tr>
<th>Scenario</th>
<th>WDS Dual</th>
<th>IPv6</th>
<th>IPv4</th>
<th>AP Dual</th>
<th>IPv6</th>
<th>IPv4</th>
<th>Mode of Communication</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Yes</td>
<td></td>
<td></td>
<td>yes</td>
<td></td>
<td></td>
<td>IPv6</td>
</tr>
<tr>
<td>2</td>
<td>Yes</td>
<td></td>
<td></td>
<td>yes</td>
<td></td>
<td></td>
<td>IPv6</td>
</tr>
<tr>
<td>3</td>
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<td></td>
<td></td>
<td></td>
<td>yes</td>
<td></td>
<td>IPv4</td>
</tr>
<tr>
<td>4</td>
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<td>yes</td>
<td></td>
<td></td>
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<td></td>
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</tr>
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<td>yes</td>
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<td></td>
<td>IPv6</td>
</tr>
<tr>
<td>6</td>
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<td></td>
<td></td>
<td>yes</td>
<td></td>
<td>Fails</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>yes</td>
<td>yes</td>
<td></td>
<td></td>
<td></td>
<td>IPv4</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>yes</td>
<td></td>
<td></td>
<td>yes</td>
<td></td>
<td>Fails</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>yes</td>
<td></td>
<td></td>
<td>yes</td>
<td></td>
<td>IPv4</td>
</tr>
</tbody>
</table>

**Note**

11r roaming between IPv4 and IPv6 access points is not supported because the MDIE is different. Both AP and WDS use the first active IPv6 address in BV1 to register and advertise. Link-local is not used for registration.

CDPv6 Support:

CDP is a layer2 protocol used to get information on the immediate neighbor’s device-ID, capabilities, mac address, ip address or duplex. Each CDP enabled device sends information about itself to its immediate neighbor. As part of native IPv6, the access point sends its IPv6 address as well as part of the address TLV in the cdp message; it also parses the IPv6 address information it gets from the neighboring switch.

This command shows the connected IPv6 neighbor:

ap# show cdp neighbors detail
RA filtering

RA filtering increases the security of the IPv6 network by dropping RAs coming from wireless clients. RA filtering prevents misconfigured or malicious IPv6 clients from connecting to the network, often with a high priority that takes precedence over legitimate IPv6 routers. In all cases, the IPv6 RA is dropped at some point, protecting other wireless devices and upstream wired network from malicious or misconfigured IPv6 devices.

However, RA filtering is not supported in the uplink direction.