Overview

The Cisco Aironet 1530 Series Outdoor Access Point (hereafter called the *access point* or *AP*) is a wireless outdoor access point which is designed for use in a variety of network configurations. The access point supports wireless client access, point-to-point bridging, point-to-multipoint bridging, and point-to-multipoint mesh wireless connectivity.

About the 1532 Access Point

The 1532 access point supports two radios (2.4-GHz and 5-GHz) and provides client access using the unlicensed RF Wi-Fi spectrum. The 2.4 GHz radio is used for client access and the 5 GHz radio can be dedicated for backhaul traffic or can used for both backhaul and client access. Depending on the radio, the access point can support 1 to 300 Mb/s data rates (for specific data rates, refer to Appendix D, “Access Point Data Sheet”).

The access point is a standalone unit that can be wall, pole or tower mounted. The access point can also operate as a relay node for other access points not directly connected to a wired network. Intelligent wireless routing is provided by the patented Adaptive Wireless Path Protocol (AWPP). This enables each access point to identify its neighbors and intelligently choose the optimal path to the wired network by calculating the cost of each path in terms of signal strength and the number of hops required to get to a controller.

The access point can be configured, monitored, and operated through a Cisco wireless LAN controller (hereafter called a *controller*) as described in the *Cisco Wireless LAN Controller Configuration Guide.* The *Cisco Wireless Mesh Access Points, Design and Deployment Guide, Release 7.6* describes how to plan and initially configure the Cisco mesh network, which supports wireless point-to-point, point-to-multipoint, and mesh deployments. The controllers use a browser-based management system, a command-line interface (CLI), or the Cisco Prime Infrastructure (PI) network management system to manage the controller and the associated access points. The access point supports hardware-based advanced encryption standard (AES) encryption between wireless nodes to provide end-to-end security. The access point can also be deployed in an autonomous mode and be configured via the CLI.

This chapter provides information on the following topics:

Hardware Models

The model numbers (or part numbers) and configuration for the Cisco Aironet 1532 Outdoor Access Points are described in Table 1-1.

For a detailed description of the declarations of conformity and regulatory information for the 1532 access points refer to Appendix B, "Declarations of Conformity and Regulatory Information."

Table 1-1 1532 Access Point Model Numbers and Descriptions

Model (or part number)	Configuration
AIR-CAP1532I-*x*-K9	The AP 1532I has integrated antennas and contains a 2.4 GHz and 5 GHz radio with an option to configure in centralized, Flexconnect, or mesh mode. This is a stand alone unit that can be wall, pole or tower mounted. It can also operate as a relay node for other access points that are not directly connected to a wired network.
AIR-CAP1532E-*x*-K9	The AP 1532E has 4 external antenna ports and contains a 2.4 GHz and 5 GHz radio with an option to configure in centralized, Flexconnect, or mesh mode. This is a stand alone unit that can be wall, pole or tower mounted. It can also operate as a relay node for other access points that are not directly connected to a wired network.

Regulatory Domains

The "-*x*" in the 1532 model numbers represent the domain. For example, in AIR-CAP1532I-*x*-K9, the -*x* represents a regulatory domain for a specific country. For specific regulatory domains supported by each 1532 access point model, refer to the Wireless LAN Compliance Status at the following URL:

http://www.cisco.com/en/US/prod/collateral/wireless/ps5679/ps5861/product_data_sheet0900aecd80537b6a.html

Hardware Features

This section describes the hardware features of the 1532 access point models. The following hardware features are described in this section:

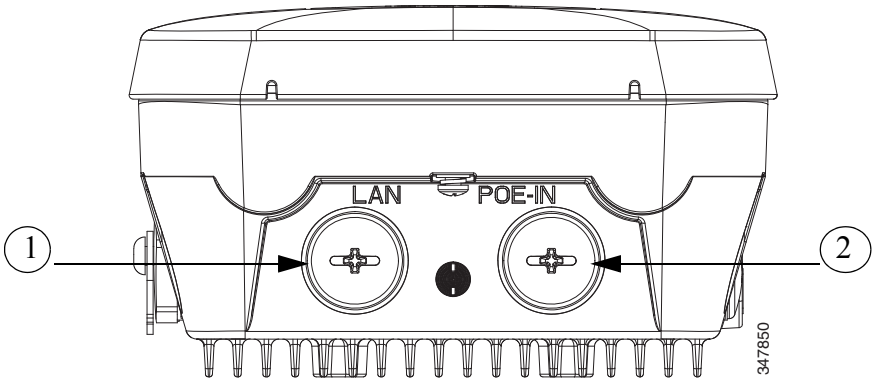
Connectors

Figure 1-4 and Figure 1-5 show the access point connectors for all models. Figure 1-1 shows the bottom connectors for internal antenna model, and Figure 1-2 and Figure 1-3 show the external antenna Type-N connectors.

Note The illustrations in this document show all available connections for the access point. Unused connections are capped with a connector plug to ensure the watertight integrity of the access point. Liquid-tight adapters are provided for connector openings, which can be installed before or after deploying the access point.

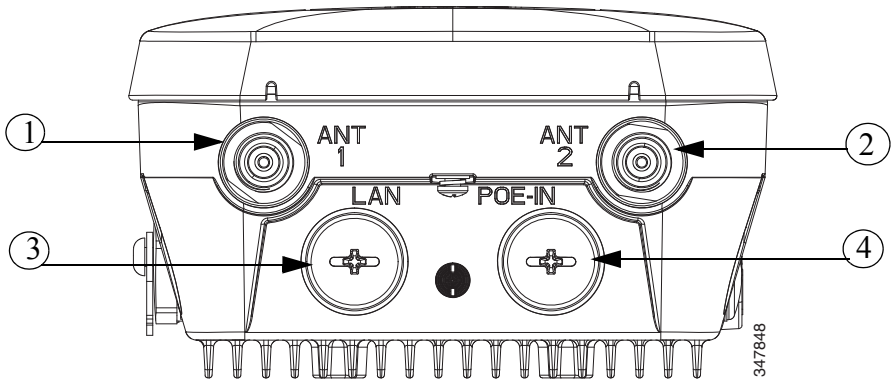
1532I/1532E Connectors

Figure 1-1 Access Point Models AIR-CAP1532I-x-K9 Bottom Connectors



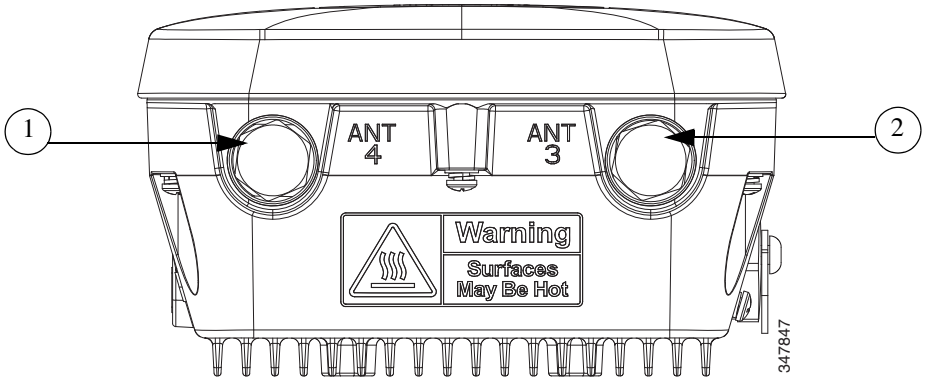
1	LAN port. If the port is not in use, then the covering plug must be tightened to 12.5 lbf-in torque. Otherwise, it may lead to water leaking into the access point.	**2**	POE-in port. If the port is not in use, then the covering plug must be tightened to 12.5 lbf-in torque. Otherwise, it may lead to water leaking into the access point.

Figure 1-2 Access Point Models AIR-CAP1532E-x-K9 Bottom Connectors



1	Antenna 1 port.	**2**	Antenna 2 port.
3	LAN port. If the port is not in use, then the covering plug must be tightened to 12.5 lbf-in torque. Otherwise, it may lead to water leaking into the access point.	**4**	POE-in port. If the port is not in use, then the covering plug must be tightened to 12.5 lbf-in torque. Otherwise, it may lead to water leaking into the access point.

Figure 1-3 Access Point Model AIR-CAP1532E-x-K9 Top Connectors

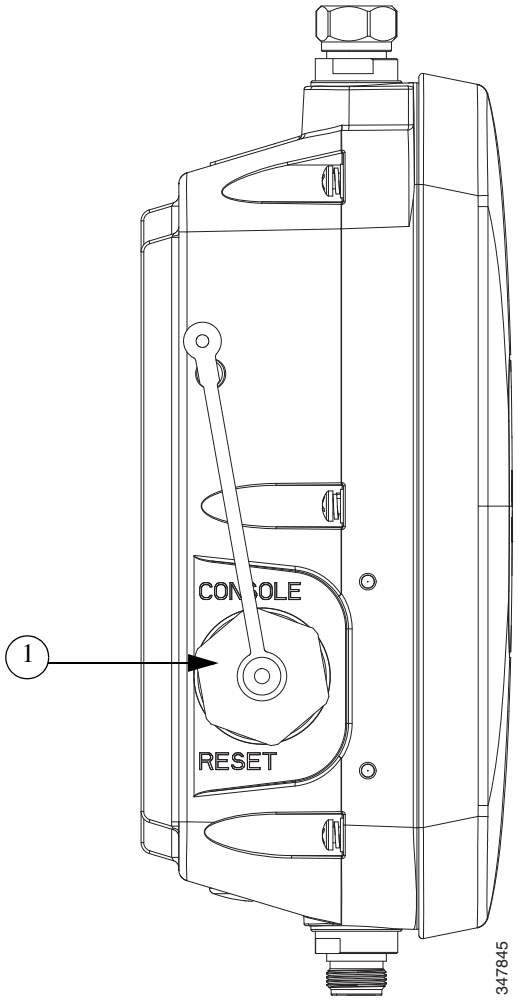


1	Antenna port 4	**2**	Antenna port 3

Note The AIR-CAP1532I-x-K9 does not have any top connectors.

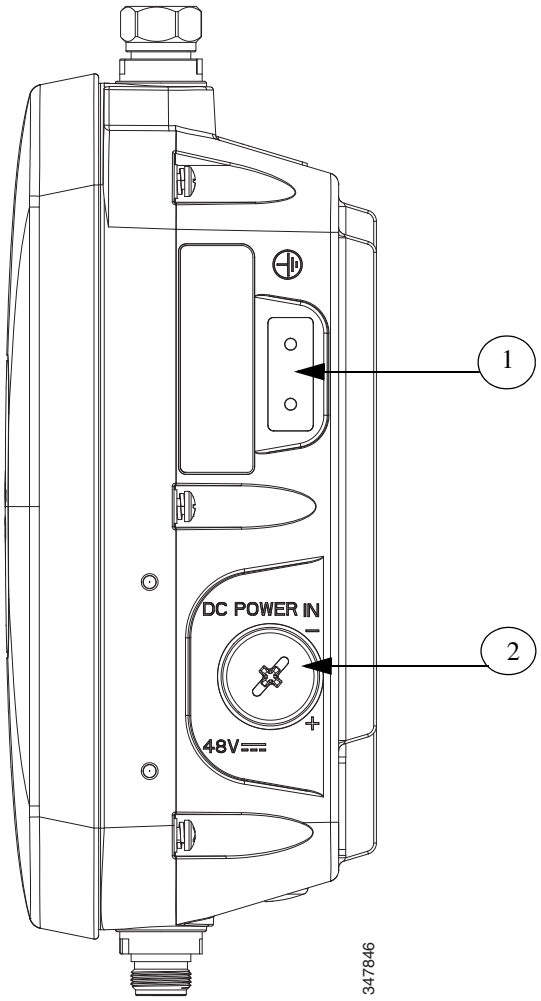
1532I/E Connectors

Figure 1-4 Access Point Model AIR-CAP1532I-x-K9 and AIR-CAP1532E-x-K9 Left Side Connectors



1	Console port and Reset button (covered) The console port and the reset button are under a hex-shaped sealed plug. Inspect the seal of the plug and properly tighten it at the time of installation, and also every time the plug is removed and replaced. Tighten the plug to 15 lbf-in. If you do not tighten the plug properly, it will not meet IP67 criteria, and may lead to water leaking into the unit.

Figure 1-5 Access Point Model AIR-CAP1532I-x-K9 and AIR-CAP1532E-x-K9 Right Side Connectors

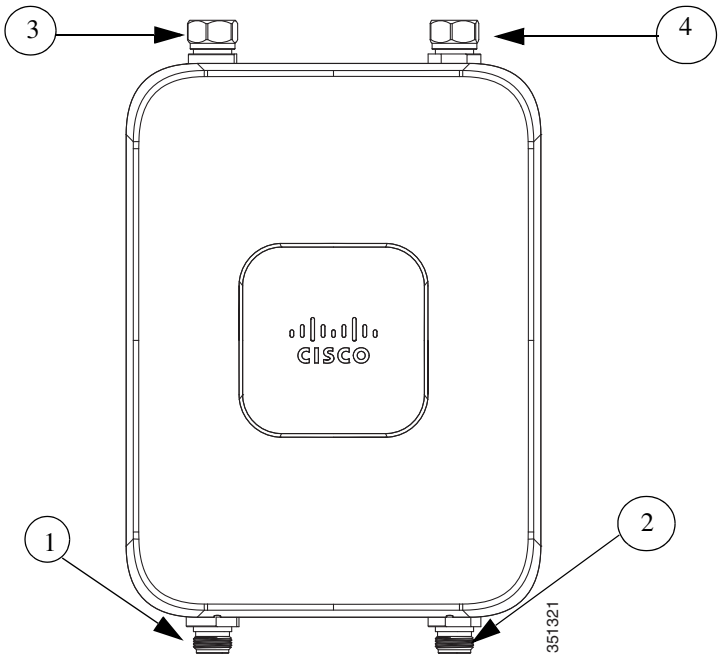


1	Ground Pad.	**2**	DC Power-In (covered). If the port is not in use, then the covering plug must be tightened to 12.5 lbf-in torque. Otherwise, it may lead to water leaking into the access point.

Antenna Port Locations

Figure 1-6 shows the antenna port locations for model AIR-CAP1532E-*x*-K9. The ports used depend on the optional antennas ordered.

Figure 1-6 External Antenna Port Locations for Access Point Models AIR-CAP1532E-x-K9



1	Antenna port 1 – Type N connector	**2**	Antenna port 2- Type N connector
3	Antenna port 3– Type N connector (with cap)	**4**	Antenna port 4- Type N connector (with cap)

Radio Operation

Warning **In order to comply with radio frequency (RF) exposure limits, the antennas should be placed no less than 20 cm (8”) from your body or nearby persons.** Statement 339

Warning **Do not locate the antenna near overhead power lines or other electric light or power circuits, or where it can come into contact with such circuits. When installing the antenna, take extreme care not to come into contact with such circuits, because they may cause serious injury or death. For proper installation and grounding of the antenna, please refer to national and local codes (for example, U.S.: NFPA 70, National Electric Code, Article 180, Canada: Canadian Electrical Code, Section 54).** Statement 1052

Warning **Only trained and qualified personnel should be allowed to install, replace, or service this equipment.** Statement 1030

AP1532I (Internal Antenna)

The 1532I access point 802.11b/g/n radio is used primarily for local access and its 802.11a/n radio for wireless backhaul in the Mesh.

The 2 GHz b/g/n radio operates in 2.4 GHz ISM band. It supports channels 1-11 in the US, 1-13 in Europe, and 1-13 in Japan. It has 3 transmitters with a maximum total output power of 29 dBm for 802.11b/g/n operation. Output power is configurable for 8 levels in 3 dB steps. It has three receivers that enable maximum-ratio combining (MRC).

The 5 GHz a/n radio operates in the UNII-2 band (5.25 - 5.35 GHz), UNII-2 Extended/ETSI band (5.47 - 5.725 GHz), and the upper ISM band (5.725 - 5.850 GHz). It has two transmitters with a maximum total output power of 27 dBm depending on the regulatory domain. The total maximum output power for the upper ISM band is 27 dBm for A-domain. Tx power settings will change depending on the regulatory domain. Output power is configurable in 3 dB steps. Its three receivers enable maximum-ratio combining (MRC).

The 1532I access point is equipped with three integrated dual-band antennas with 3 dBi gain at 2 GHz and 5 dBi gain at 5 GHz.

AP1532E (External Antenna)

The 1532E access point is equipped with four N-type RF connectors. The 1532E can be configured via software to support dual band or single band antennas. When configured for dual band antennas, antenna ports 1 and 2 on the bottom of the unit (Figure 1-2) are used to support multiple input/multiple output (MIMO) operation on both 2.4 and 5 GHz radios. When using the Cisco Aironet AIR-ANT2547V-N or AIR-ANT2547VG-N omindirectional antennas, the antenna can be connected directly to the access point (Figure 2-16). If the antennas are remotely located, an appropriate low loss RF cable should be used.

Note Ensure that the antenna band mode is configured before the 1532E access point is installed.

When configured for single band antennas, antenna port 1 and antenna port 2 support MIMO operation for the 2.4 GHz radio, and antenna ports 3 and 4 (Figure 1-3) support MIMO on the 5 GHz radio. See the *Cisco Wireless LAN Controller Configuration Guide* for information on the software configuration.

Multiple Power Sources

The 1530 series access point supports these power sources:

- DC power – 24-57 VDC
- Power over Ethernet (PoE) – For more information, see "Powering the Access Point" section on page 2-40.

Warning **Installation of the equipment must comply with local and national electrical codes.** Statement 1074

Warning **This equipment must be externally grounded using a customer-supplied ground wire before power is applied. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available.** Statement 366

Warning **Do not work on the system or connect or disconnect cables during periods of lightning activity.** Statement 1001

Warning **Connect the unit only to DC power source that complies with the safety extra-low voltage (SELV) requirements in IEC 60950 based safety standards.** Statement 1033

Warning **To reduce the risk of fire, use only No. 26 AWG or larger telecommunication line cord.** Statement 1023

Caution Several forms of PoE are supported. See Table Table 2-7 for the PoE options and their corresponding modes of operation.

Caution Do not place the power injector in an unprotected outdoor environment because water could get into the power injector and cause a short circuit and possible fire.

Caution When the access point is installed outdoors or in a wet or damp location, the AC branch circuit that is powering the access point should be provided with ground fault protection (GFCI), as required by Article 210 of the National Electrical Code (NEC).

Power injectors

The 1530 series access points support the following power injectors:

- AIR-PWRINJ1500-2= – 100-240 VAC input, indoor use only
- AIR-PWRINJ-30= – 100-240 VAC input, indoor use only

Warning **To reduce the risk of fire, use only No. 26 AWG or larger telecommunications line cord.** Statement 1023

Caution The power injector (AIR-PWRINJR4- and AIR-PWRINJ1500-2=) must be used in an indoor environment only.

Caution When the access point is installed outdoors, or in a wet or damp location, the AC branch circuit that is powering the access point should be provided with ground fault protection (GFCI), as required by Article 210 of the National Electrical Code (NEC).

Ethernet (PoE) Ports

The access point supports an Ethernet uplink port (PoE-In). The access point Ethernet uplink port uses an RJ-45 connector (with weatherproofing) to link the access point to the 10BASE-T, 100BASE-T or 1000BASE-T network. The Ethernet cable is used to send and receive Ethernet data and to optionally supply inline power from the power injector or a suitably powered switch port.

Tip The access point senses the Ethernet and power signals and automatically switches internal circuitry to match the cable connections.

Warning **To reduce the risk of fire, use only No. 26 AWG or larger telecommunication line cord.** Statement 1023

The Ethernet cable must be a shielded outdoor rated Category 5e (CAT5e) or better cable. The access point senses the Ethernet and power signals and automatically switches internal circuitry to match the cable connections.

Optional Hardware

Depending on what you ordered, the following optional access point hardware may be part of your shipment:

- External antennas, depending on which ones you purchased (See "AP1532E (External Antenna)" section on page 1-8 for information on available external antennas.)
- Wall/Pole mount bracket (AIR-ACC1530-PMK1 [=])
- Wall/Pole mount bracket with tilt mechanism, spare only (AIR-ACC1530-PMK2=)
- Street light power tap (AIR-PWR-ST-LT-R3P=), works only with the AC/DC power adapter.
- Power injector (AIR-PWRINJ1500-2=, AIR-PWRINJ-30=)
- AP cover / Solar Shield for 1532, spare only (AIR-ACC1530-CVR=)
- AC/DC power adapter, spare only (AIR-PWRADPT-1530=)
- Spare Parts kit containing extra cable glands, power connector, ground lug, etc. (AIR-ACC1530-KIT1=)

Network Deployment Examples

The access point is a wireless device designed for wireless client access and point-to-point bridging, point-to-multipoint bridging, and point-to-multipoint mesh wireless connectivity. The access point provides 5-GHz backhaul capability to link with another access point to reach a wired network connection or to provide repeater operations for other access points.

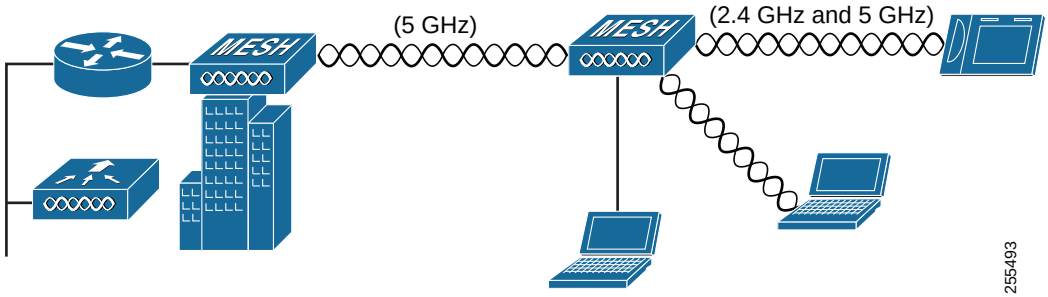
The access point plays two primary radio roles: a root access point (hereafter called a RAP) or a mesh (non-root) access point (hereafter called a MAP), which is the default role of all access points. When the access point has a fiber or wired Ethernet connection to the controller (through a switch), the radio role is called a RAP. In order to be considered a RAP, the access point must be configured as a RAP. A RAP is a parent node to any bridging or mesh network. A controller can support one or more RAPs, each one parenting the same or different wireless networks. There can be more than one RAP for the same mesh network for redundancy. RAPs and MAPs can support wireless clients on the 2.4-GHz and 5-GHz band. Client access on 5-GHz is called universal client access.

When the access point does not have a wired Ethernet connection to the controller (through a switch), the radio role is called a MAP. The MAPs have a wireless connection (through the backhaul interface) to other MAPs and finally to a RAP which has an Ethernet connection through a switch to the controller. MAPs may also have a wired Ethernet connection to a local LAN and serve as a bridge endpoint for that LAN (using a point-to-point or point-to-multipoint bridge connection).

Wireless Backhaul

The access point supports wireless backhaul capability using the 5 GHz radio to bridge to another access point to reach a wired network connection to a controller (see Figure 1-7). The access point connected to the wired network is considered a RAP in this configuration. The remote access point is considered a MAP and transfers wireless client traffic to the RAP for transfer to the wired network. Control And Provisioning of Wireless Access Points (CAPWAP) control traffic is also transferred over this bridged link.

Figure 1-7 Access Point Backhaul Example

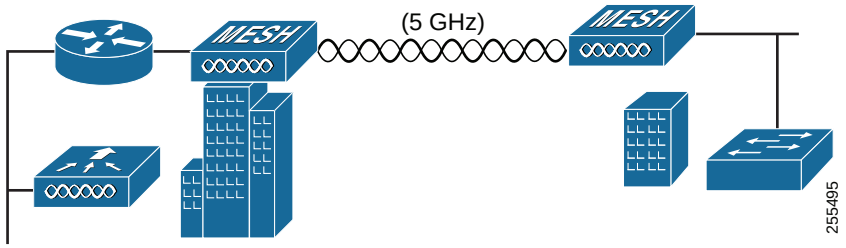


Point-to-Point Bridging

The access points can be used to extend a remote network by using the 5 GHz backhaul radio to bridge the two network segments as shown in Figure 1-8. To support Ethernet bridging, you must enable bridging on the controller for each access point. By default this capability is turned-off for all access points.

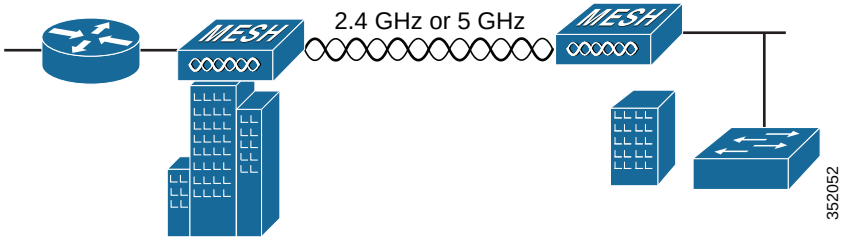
Wireless client access is supported; however, if bridging between tall buildings, the 2.4-GHz wireless coverage area may be limited and possibly not suitable for direct wireless client access.

Figure 1-8 Access Point Point-to-Point Bridging Example



The access points can also support point-to-point bridging under autonomous mode. In this autonomous mode, the bridging can be done on the 2.4 or 5 GHz radio, but not both. In this mode, one access point is designated as the root and the other end is designated as the non-root bridge.

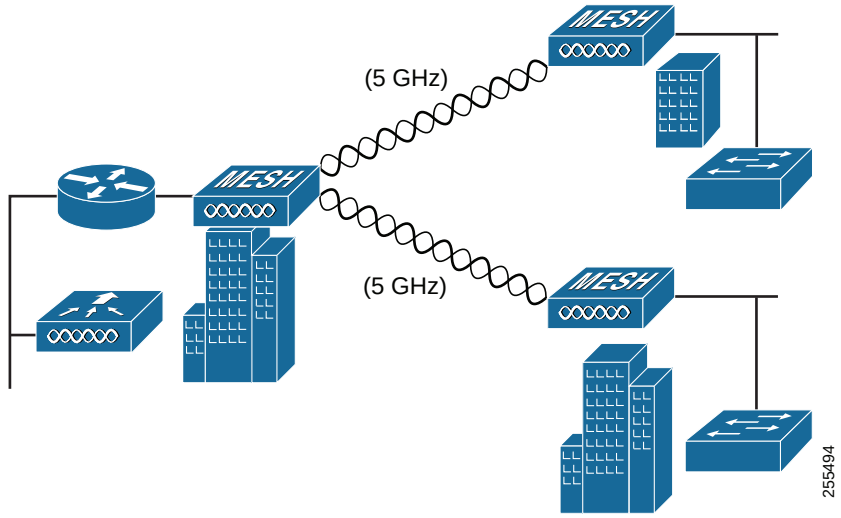
Figure 1-9 Access Point Point-to-Point Bridging in Autonomous Mode



Point-to-Multipoint Bridging

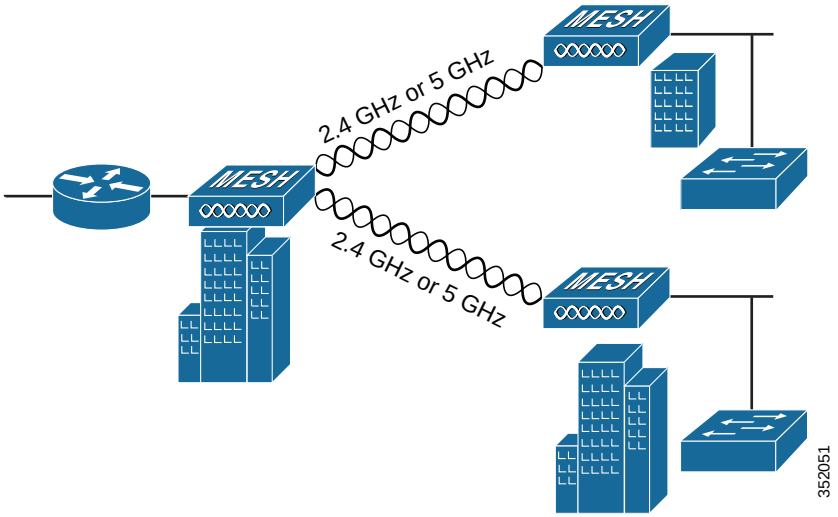
The access points can be used as a RAP to connect multiple remote MAPs with their associated wired networks. By default this capability is turned-off for all access points. To support Ethernet bridging, you must enable bridging on the controller for each access point. Wireless client access can be provided over the bridging link; however, if bridging between tall buildings, the 2.4-GHz wireless coverage area may be limited and possibly not suitable for direct wireless client access. Figure 1-10 illustrates an example of access point-to-multipoint bridging.

Figure 1-10 Access Point to Multipoint Bridging Example



The access points can also support point-to-multipoint bridging under autonomous mode. In this autonomous mode, the bridging can be done on the 2.4 or 5 GHz radio, but not both. In this mode, one access point is designated as the root and the other end is designated as the non-root bridge.

Figure 1-11 Access Point to Multipoint Bridging in Autonomous Mode



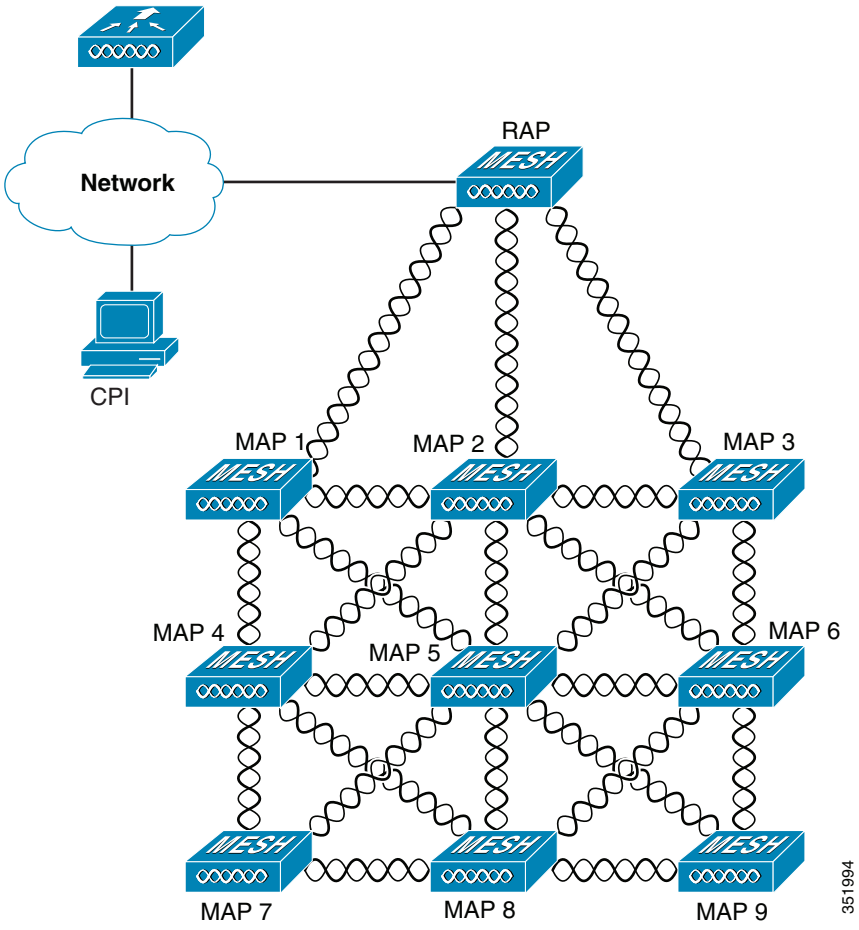
Point-to-Multipoint Mesh Network

The access point is typically deployed in a mesh network configuration. In a typical mesh deployment, one or more RAPs have a wired network connection through a switch to a controller. Other remote MAPs without wired network connections use the backhaul feature to optimally link to a RAP that is connected to the wired network. In the mesh network, the links between the access points are referred to as the *backhaul links*.

Intelligent wireless routing is provided by the Adaptive Wireless Path protocol (AWPP). This enables each MAP to identify its neighbors and intelligently choose the optimal path to the RAP with the wired network connection by calculating the cost of each path in terms of signal strength and the number of hops required to get to a controller with signal strength given priority since signal strength determines the data rate available for backhaul.

Figure 1-12 illustrates a typical mesh configuration using MAPs and RAPs.

Figure 1-12 Typical Mesh Configuration Using Access Points



Layer 3 Network Operation

The access points support Layer 3 network operation. Access points and controllers in Layer 3 configurations use IP addresses and UDP packets, which can be routed through large networks. Layer 3 operation is scalable and recommended by Cisco.

Figure 1-13 illustrates a typical Layer-3 wireless network configuration containing access points and a controller.

Figure 1-13 Typical Layer 3 Access Point Network Configuration Example