Cisco Catalyst IW9167E Heavy Duty Access Point Configuration Guide, Cisco IOS XE Cupertino 17.9.x

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Overview of Supported Access Point Modes

The Cisco Catalyst IW9167E Heavy Duty Access Point provides reliable wireless connectivity for mission-critical applications in a state-of-the art platform. It can operate as Cisco Catalyst Wi-Fi (CAPWAP) mode or Cisco Ultra-Reliable Wireless Backhaul (Cisco URWB) mode. The IW9167EH access point has the flexibility to change the operating mode from Wi-Fi to Cisco URWB, and vice versa.

This document covers configuration of CAPWAP mode specific to the IW9167EH access points. The access points can operate in the following modes:

- Local
- Flexconnect
- Bridge
- Flexconnect + Bridge
- Sniffer
- Monitor

IW9167EH is supported on Cisco Catalyst 9800 Series Wireless Controllers from IOS XE 17.9.3 Software Release. For more information about the configuration on 9800 WLC, see Cisco Catalyst 9800 Series Wireless Controller Software Configuration Guide, Cisco IOS XE Cupertino 17.9.x.

To view all support information for the Cisco Catalyst IW9167E Heavy Duty Access Point, see https://www.cisco.com/c/en/us/support/wireless/catalyst-iw9167-series/series.html.

In addition to the documentation available on the support page, you will need to refer to the following guides:

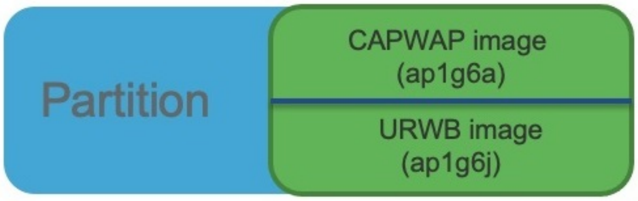
- For information about IW9167EH hardware, see Cisco Catalyst IW9167E Heavy Duty Access Point Hardware Installation Guide.
- A full listing of the AP's features and specifications is provided in Cisco Catalyst IW9167E Heavy Duty Access Point Data Sheet.
- For information about Cisco URWB mode configuration, see the relevant documents at:

  https://www.cisco.com/c/en/us/support/wireless/catalyst-iw9167-series/series.html.
- For more information about Cisco IOS XE, see the relevant documents at:

  http://www.cisco.com/c/en/us/products/ios-nx-os-software/ios-xe/index.html

Determine Image on IW9167EH

Software images are stored under different folders on the same partition on IW9167EH.



You need to choose the image to boot up with according to the mode your AP is runnning: CAPWAP, or Cisco URWB.

Table 1: IW9167EH Software Images

IW9167EH Mode	Software Image
CAPWAP	**ap1g6a-k9w8-xxx.tar**
Cisco URWB **Note** Cisco URWB will be supported from IOS XE Release 17.11.1.	**ap1g6j-k9c1-xxx.tar**

To determine the image that your IW9167EH is running, use the **show version** command.

- If the **show version** output displays **Cisco AP Software, (ap1g6a)** as shown in the following example, it means that AP is running the CAPWAP image **ap1g6a-k9w8-xxx.tar**, which supports the CAPWAP mode.

```
Cisco AP Software, (ap1g6a), C9167, RELEASE SOFTWARE
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2022 by Cisco Systems, Inc.
Compiled Fri Jul 29 01:56:00 PDT 2022

ROM: Bootstrap program is U-Boot boot loader
BOOTLDR: U-Boot boot loader Version 2022010100

APFC58.9A16.E648 uptime is 0 days, 1 hours, 03 minutes
Last reload time   : Mon Sep 19 02:23:13 UTC 2022
Last reload reason : Image Upgrade

cisco IW9167EH-B ARMv8 Processor rev 4 (v8l) with 1757076/1006864K bytes of memory.
```

- If the **show version** output displays **Cisco AP Software (ap1g6j)** as shown in the following example, it means that AP is running **ap1g6j-k9c1-xxx.tar** image, which supports the Cisco URWB mode.

```
Cisco AP Software, (ap1g6j), C9167, RELEASE SOFTWARE
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2022 by Cisco Systems, Inc.
Compiled Thu Aug 18 01:01:29 PDT 2022

ROM: Bootstrap program is U-Boot boot loader
BOOTLDR: U-Boot boot loader Version 2022010100

APFC58.9A16.E464 uptime is 1 days, 3 hours, 58 minutes
Last reload time   : Wed Sep 7 11:17:00 UTC 2022
Last reload reason : reload command
```

```
    cisco IW9167EH-B ARMv8 Processor rev 4 (v8l) with 1759128/1091316K bytes of memory.
```

Configuring AP to Boot up with Different Image Options

To configure the access point to boot up with CAPWAP or URWB mode, follow these steps:

Note Switching between different modes performs full factory reset. Any configuration and data will be removed completely.

Procedure

Step 1 **enable**

Enables privileged EXEC mode. Enter your password if prompted.

Step 2 **configure boot mode** {**capwap**|**urwb**}

Configures AP to CAPWAP or URWB mode. AP will reboot with specified mode.

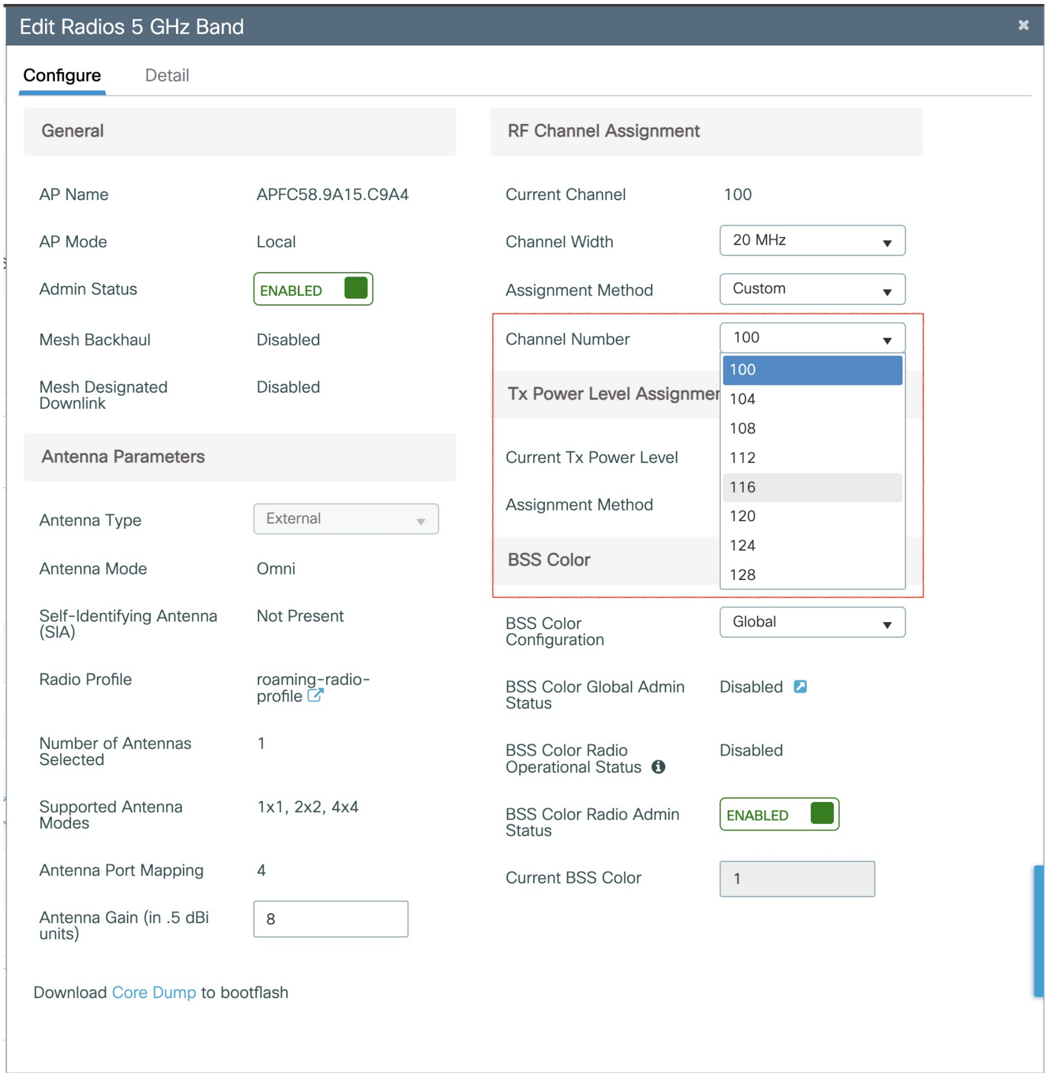
Configuring Indoor Deployment for -E Domain

IW9167EH supports indoor deployment for -E domain.

By default, indoor deployment is disabled, and the 5G radio supports channels 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140. After factory reset, indoor deployment configuration is reset to default, which is disabled.

You can check AP mode by using the **show ap name <ap-name> config general | section Indoor** command. In the command output, "Enabled" means AP is in indoor mode, and "Disabled" means AP is in outdoor mode, as shown in the following example.

```
#show ap name APFC58.9A15.C9A4 config general | inc Indoor
    AP Indoor Mode                                   : Disabled
```



Edit Radios 5 GHz Band

Configure | Detail

General

AP Name: APFC58.9A15.C9A4

AP Mode: Local

Admin Status: ENABLED

Mesh Backhaul: Disabled

Mesh Designated Downlink: Disabled

Antenna Parameters

Antenna Type: External

Antenna Mode: Omni

Self-Identifying Antenna (SIA): Not Present

Radio Profile: roaming-radio-profile

Number of Antennas Selected: 1

Supported Antenna Modes: 1x1, 2x2, 4x4

Antenna Port Mapping: 4

Antenna Gain (in .5 dBi units): 8

Download Core Dump to bootflash

RF Channel Assignment

Current Channel: 100

Channel Width: 20 MHz

Assignment Method: Custom

Channel Number: 100

Tx Power Level Assignmer

Current Tx Power Level

Assignment Method

BSS Color

BSS Color Configuration: Global

BSS Color Global Admin Status: Disabled

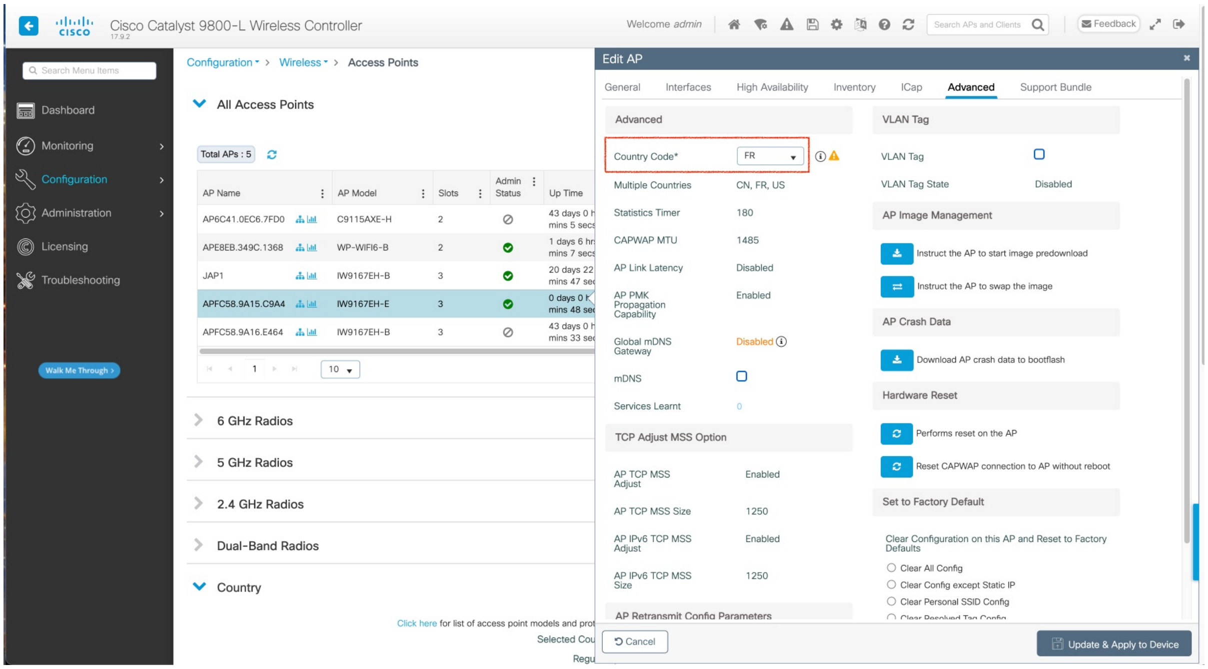
BSS Color Radio Operational Status: Disabled

BSS Color Radio Admin Status: ENABLED

Current BSS Color: 1

To configure the AP to indoor mode, use the **ap name** <*ap-name*> **indoor** command from wireless LAN controller. This command triggers an AP rebooting. After AP registers to the wireless LAN controller after rebooting, you need to assign corresponding country code to the AP. When indoor deployment is enabled, 5G radio supports channels 36, 40, 44, 48, 52, 56, 60, 64, 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140.

Note To disable indoor deployment, use the **ap name** <*ap-name*> **no indoor** command.



Cisco Catalyst 9800-L Wireless Controller 17.9.2

Welcome *admin*

Configuration > Wireless > Access Points

All Access Points

Total APs : 5

AP Name	AP Model	Slots	Admin Status	Up Time
AP6C41.0EC6.7FD0	C9115AXE-H	2	⊘	43 days 0 h mins 5 secs
APE8EB.349C.1368	WP-WIFI6-B	2	✓	1 days 6 hrs mins 7 secs
JAP1	IW9167EH-B	3	✓	20 days 22 mins 47 sec
APFC58.9A15.C9A4	IW9167EH-E	3	✓	0 days 0 h mins 48 sec
APFC58.9A16.E464	IW9167EH-B	3	⊘	43 days 0 h mins 33 sec

6 GHz Radios

5 GHz Radios

2.4 GHz Radios

Dual-Band Radios

Country

Click here for list of access point models and prot

Selected Cou

Regu

Edit AP

General | Interfaces | High Availability | Inventory | ICap | **Advanced** | Support Bundle

Advanced

Country Code* FR

Multiple Countries CN, FR, US

Statistics Timer 180

CAPWAP MTU 1485

AP Link Latency Disabled

AP PMK Propagation Capability Enabled

Global mDNS Gateway Disabled

mDNS □

Services Learnt 0

TCP Adjust MSS Option

AP TCP MSS Adjust Enabled

AP TCP MSS Size 1250

AP IPv6 TCP MSS Adjust Enabled

AP IPv6 TCP MSS Size 1250

AP Retransmit Config Parameters

VLAN Tag

VLAN Tag □

VLAN Tag State Disabled

AP Image Management

Instruct the AP to start image predownload

Instruct the AP to swap the image

AP Crash Data

Download AP crash data to bootflash

Hardware Reset

Performs reset on the AP

Reset CAPWAP connection to AP without reboot

Set to Factory Default

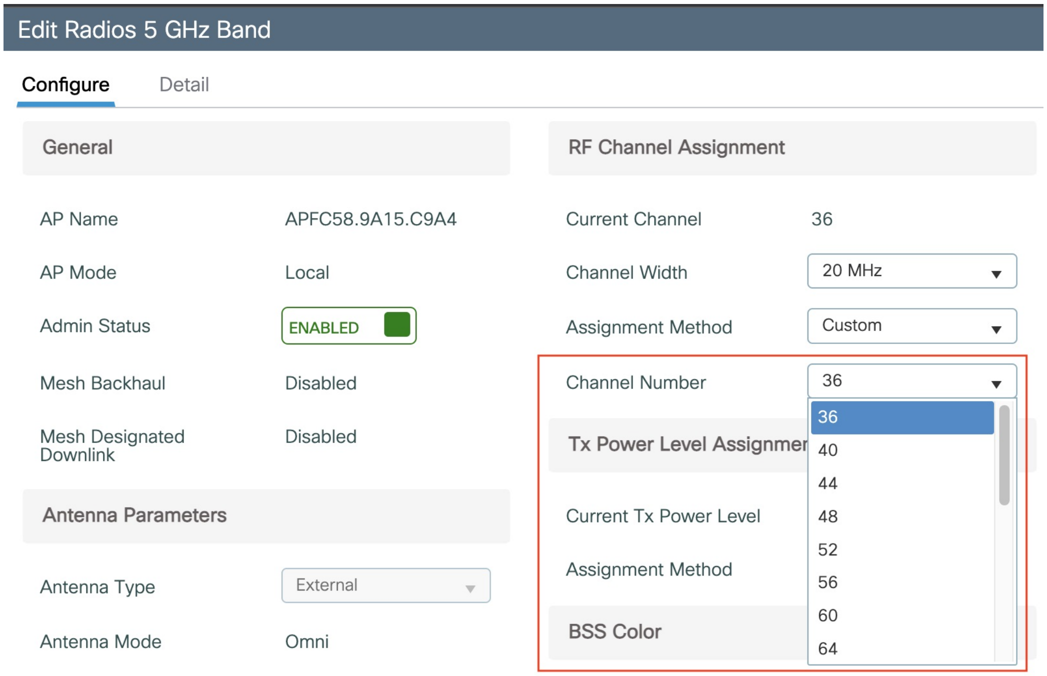
Clear Configuration on this AP and Reset to Factory Defaults

○ Clear All Config

○ Clear Config except Static IP

○ Clear Personal SSID Config

○ Clear Resolved Tag Config



Edit Radios 5 GHz Band

Configure | Detail

General

AP Name APFC58.9A15.C9A4

AP Mode Local

Admin Status ENABLED

Mesh Backhaul Disabled

Mesh Designated Downlink Disabled

Antenna Parameters

Antenna Type External

Antenna Mode Omni

RF Channel Assignment

Current Channel 36

Channel Width 20 MHz

Assignment Method Custom

Channel Number 36

Tx Power Level Assignmer

Current Tx Power Level

Assignment Method

BSS Color

Note Channel list extends from U-NII-2c to U-NII-1, U-NII-2a, U-NII-2c (channel 144 is excluded).

802.11ax 1600ns and 3200ns Guard Interval Support

802.11ac has two Guard Interval (GI) options – long GI (800ns) and short GI (400ns). 802.11ax introduces new guard interval options. It has three types of GI – 800ns, 1600ns, and 3200ns. Longer guard intervals provide improved performance in environments with multi-path and delay spread. It improves link reliability for longer-range outdoor deployments and helps to prevent inter-symbol interference in outdoor environments and therefore improve coverage and performance.

The following table compares 802.11ax to the previous two standards.

Table 2: 802.11ax Guard Interval Comparing With Previous Standards

Capabilities	**802.11n**	**802.11ac**	**802.11ax**
Physical Layer (PHY)	High Throughput (HT)	Very High Throughput (VHT)	High-Efficiency (HE)
Guard Interval	800/400 ns	800/400 ns	800/1600/3200 ns

Configuring 802.11ax Long Guard Interval

HE mode guard intervals should be configured in RF profiles.

Procedure

Step 1 Enters global configuration mode.

```
Device#configure terminal
```

Example:

```
Device#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
```

Step 2 Configures RF profile and enters RF profile configuration mode

```
ap dot11 {24ghz|5ghz} rf-profile <profile-name>
```

Example:

```
Device(config)#ap dot11 24ghz rf-profile 24G-RF-profile
```

Step 3 Configures guard interval for the RF profile.

```
guard-interval {GUARD_INTERVAL_1600NS | GUARD_INTERVAL_3200NS | GUARD_INTERVAL_400NS
 | GUARD_INTERVAL_800NS}
```

Example:

```
Device(config-rf-profile)#guard-interval GUARD_INTERVAL_1600NS
```

- GUARD_INTERVAL_1600NS—Set 1600 ns guard interval (only in HE mode)
- GUARD_INTERVAL_3200NS—Set 3200 ns guard interval (only in HE mode)
- GUARD_INTERVAL_400NS—Set 400 ns guard interval (HT VHT mode)
- GUARD_INTERVAL_800NS—Set 800 ns guard interval

Note Valid guard interval values are 800, 1600, and 3200 ns for HE mode. By default, GI is 800 ns.

Step 4 Exit global configuration mode.

end

Example:

```
Device(config)#end
```

Use the following command to verify the configuration on wireless controller:

```
#show ap rf-profile name Demo-24G-RF-profile detail | inc Guard
Guard Interval        : 1600ns
#show ap rf-profile name Demo-5G-RF-profile detail | inc Guard
Guard Interval        : 3200ns
```

Example

1. Define GI in RF profile

```
ap dot11 24ghz rf-profile Demo-24G-RF-profile
shutdown
guard-interval GUARD_INTERVAL_1600NS
no shutdown
ap dot11 5ghz rf-profile Demo-5G-RF-profile
shutdown
guard-interval GUARD_INTERVAL_3200NS
no shutdown
```

2. Associate RF profile to RF tag

```
wireless tag rf Demo-Guard-Interval-RF-tag
24ghz-rf-policy Demo-24G-RF-profile
5ghz-rf-policy Demo-5G-RF-profile
```

3. Associate RF tag to AP

```
ap fc58.9a15.c83c
rf-tag Demo-Guard-Interval-RF-tag
```

RAP Ethernet Daisy Chain

The RAP Ethernet Daisy Chain feature enhances the existing Ethernet bridging functionality by configuring strict wired uplink on each access point. It forces the bridge AP to stick to the Ethernet link, and block the selecting of wireless link for uplink backhaul. Even the Ethernet link failure happens, the access point will never select a parent over wireless backhaul.

The following figure shows an example of RAP Ethernet Daisy Chain topology. Standalone DC power source is provided to each RAP.

Figure 1: RAP Ethernet Daisy Chain Topology

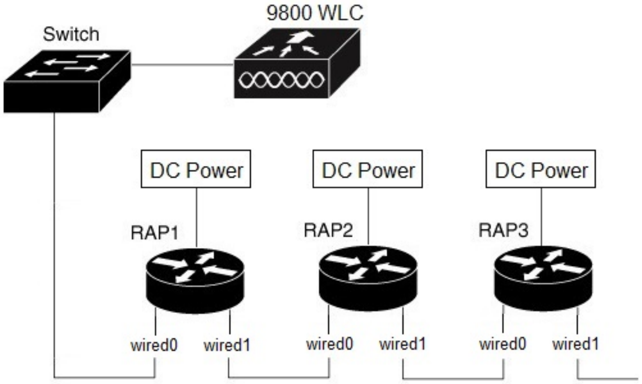


Table 3: Port Mapping

Panel Label	SW Interface
mGig POE-IN port	wired 0
SFP	wired 1

Note The supported SFP module for this feature is the 1000BASE-T rugged SFP (Cisco PID: GLC-T-RGD).

Follow these guidelines when you configure this feature:

- All APs in daisy chain is operating in mesh bridge mode or Flex+Bridge mode with Root AP role. The PoE-IN (wired0) and SFP (wired1) port can be used as uplink port and the PoE-IN (wired0) port has the higher priority than SFP (wired1).
- VLAN transparency should be disabled on all daisy-chained RAPs.
- To enable VLAN support on each root AP:
  - For bridge mode APs, use the **ap name name-of-rap mesh vlan-trunking [native] vlan-id** command to configure a trunk VLAN on the corresponding RAP.
  - For Flex+Bridge APs, you must configure the native VLAN ID under the corresponding flex profile.
- Strict wired uplink should be enabled to prevent RAP in daisy chain from switching to wireless backhaul when the wired uplink path fails, so that the RAP can recover quickly when the uplink wired path is recovered.

RAP Ethernet Daisy Chain Configuration

This section provides procedures of the RAP Ethernet daisy chain configuration.

Configuring Ethernet Bridging (CLI)

The Ethernet port on the MAPs are disabled by default. It can be enabled only by configuring Ethernet bridging on the Root AP and the other respective MAPs. Follow these steps to enable Ethernet bridging on the AP.

Procedure

Step 1 Enters global configuration mode.

```
Device#configure terminal
```

Step 2 Creates a mesh profile.

wireless profile mesh *profile-name*

Example:

```
(config)#wireless profile mesh rap-eth-daisy
```

Step 3 **ethernet-bridging**

Example:

```
(config-wireless-mesh-profile)#ethernet-bridging
```

Connects remote wired networks to each other.

Step 4 Disables VLAN transparency to ensure that the bridge is VLAN aware.

no ethernet-vlan-transparent

Example:

```
(config-wireless-mesh-profile)#no ethernet-vlan-transparent
```

Step 5 Exit global configuration mode.

end

Example:

```
(config-wireless-mesh-profile)#end
```

Example

Use the following command to verify the configuration:

```
#show wireless profile mesh detailed rap-eth-daisy

Mesh Profile Name            : rap-eth-daisy
-------------------------------------------
Description                  :
Bridge Group Name            : unconfigured
Strict match BGN             : DISABLED
Amsdu                        : ENABLED
Background Scan              : DISABLED
Channel Change Notification : DISABLED
Backhaul client access       : DISABLED
Ethernet Bridging            : ENABLED
Ethernet Vlan Transparent    : DISABLED
Daisy Chain SP Redundancy    : DISABLED
Full Sector DFS              : ENABLED
```

Configuring Ethernet Bridging (GUI)

Follow these steps to configure Ethernet Bridging from wireless controller GUI:

Procedure

Step 1 Choose **Configuration** > **Wireless** > **Mesh** > **Profiles**

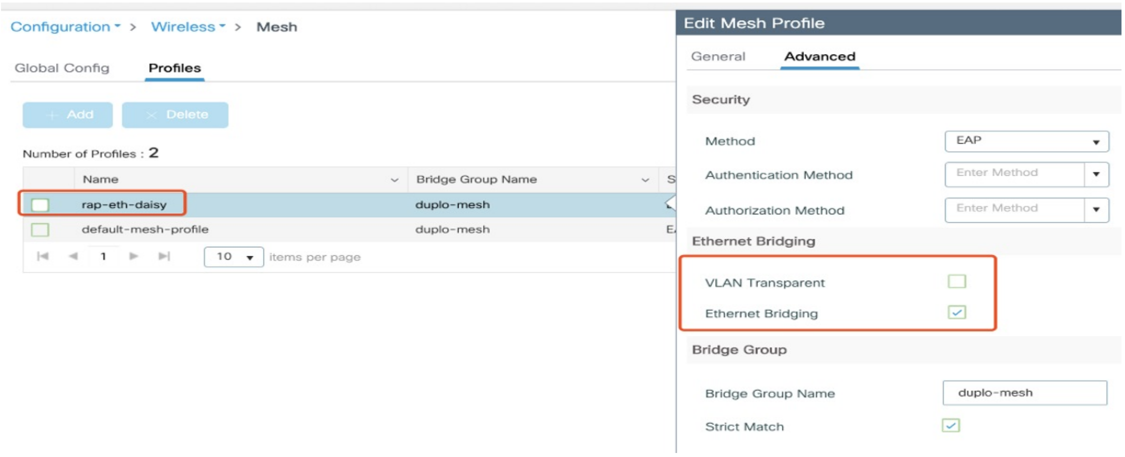
Step 2 Click **Add**.

Step 3 In **General** tab, enter the **Name** of the mesh profile.

Step 4 In **Advanced** tab, uncheck the **VLAN Transparent** check box to disable VLAN transparency.

Step 5 In **Advanced** tab, check the **Ethernet Bridging** check box.

Step 6 Click **Apply to Device**.



Number of Profiles : 2

	Name	Bridge Group Name
☐	rap-eth-daisy	duplo-mesh
☐	default-mesh-profile	duplo-mesh

Security

Method: EAP

Authentication Method: Enter Method

Authorization Method: Enter Method

Ethernet Bridging

VLAN Transparent ☐

Ethernet Bridging ☑

Bridge Group

Bridge Group Name: duplo-mesh

Strict Match ☑

Configuring Strict Wired Uplink

Follow these steps to configure persistent SSID broadcast and ensures strict wired uplink. RAP will not switch to wireless backhaul when you configure this command.

Note You can only use CLI to configure and show status of ssid-broadcast-persist. It's not supported on the GUI.

Procedure

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `#configure terminal`	Enters global configuration mode.
Step 2	**ap profile** *profile-name* **Example:**	Specifies an AP profile.

	Command or Action	Purpose
	`(config)#`**`ap profile rap-ssid-join-profile`**	
Step 3	[**no**] **ssid broadcast persistent** **Example:** `(config-ap-profile)#`**`ssid broadcast persistent`**	Enables persistent SSID broadcast and ensures strict wired uplink. Use the **no** form of the command to disable persistent SSID broadcast.

Step 4	**end**
	Example:
	`(config-ap-profile)#`**`end`**
		Returns to privileged EXEC mode.

Example

Use the following command to verify the configuration:

```
#show ap profile name rap-ssid-join-profile detailed | in SSID
Persistent SSID Broadcast                : ENABLED
```

Configuring Ethernet Port (CLI)

RAP Ethernet secondary port supports Access mode and Trunk mode. Follow these steps to configure Ethernet port mode.

- Use the following command to configure access mode.

  #**ap name** *ap-name* **mesh ethernet 1 mode access** *Vlan-ID*

- Use the following commands to configure trunk mode. VLAN support must be enabled in advance, and VLAN transparent should be disabled in your mesh profile.

  - Configure a trunk VLAN on the corresponding RAP.

    #**ap name** *ap-name* **mesh vlan-trunking native** *Vlan-ID*

  - Configure the native VLAN for the trunk port.

    #**ap name** *ap-name* **mesh ethernet 1 mode trunk vlan native** *Vlan-ID*

  - Configure the allowed VLANs for the trunk port. Permits VLAN filtering on an ethernet port of any Mesh or Root Access Point. Active only when VLAN transparency is disabled in the mesh profile.

    #**ap name** *ap-name* **mesh ethernet 1 mode trunk allowed** *Vlan-ID*

Configuring Ethernet Port (GUI)

Follow these steps to configure Ethernet port from wireless controller GUI:

Procedure

Step 1 Choose **Configuration** > **Wireless** > **Access Points**.

The **All Access Points** section, which lists all the configured APs in the network, is displayed with their corresponding details.

Step 2 Click the configured mesh AP.

The **Edit AP** window is displayed.

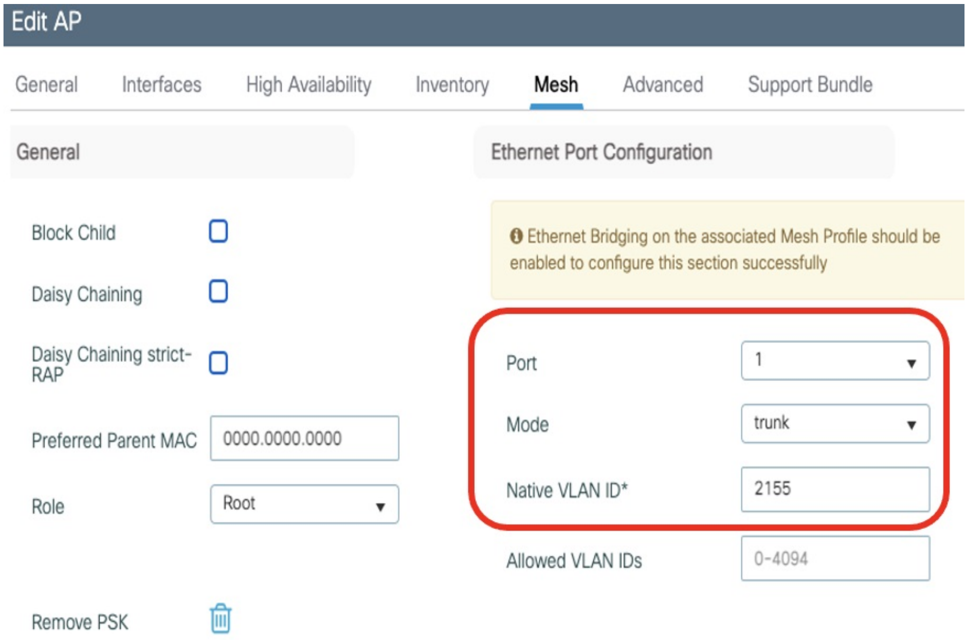
Step 3 Choose the **Mesh** tab.

Step 4 In the **Ethernet Port Configuration** section, from the **Port** drop-down list, choose the port to configure.

Step 5 From the **Mode** drop-down list, choose access mode or trunk mode.

Step 6 In the **Native VLAN ID** field, enter the native VLAN for the trunk port.

Step 7 Click **Update and Apply to Device**.



Block Child □

Daisy Chaining □

Daisy Chaining strict-RAP □

Preferred Parent MAC: 0000.0000.0000

Role: Root

Remove PSK

Ethernet Bridging on the associated Mesh Profile should be enabled to configure this section successfully

Port: 1

Mode: trunk

Native VLAN ID*: 2155

Allowed VLAN IDs: 0-4094

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