



Cisco Ultra-Reliable Wireless Backhaul for Catalyst IW Access Points, Software Configuration Guide, Release 17.14.1

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Americas Headquarters

Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
<http://www.cisco.com>
Tel: 408 526-4000
800 553-NETS (6387)
Fax: 408 527-0883



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Preface

This preface describes this guide and provides information about the configuration of URWB on Cisco Catalyst Industrial Wireless access points, and related documentation.

It includes the following sections:

- [About this Guide, on page vii](#)
- [Related Documentation, on page vii](#)
- [Communications, Services, and Additional Information, on page viii](#)

About this Guide

This guide details the configuration of the URWB mode of operation for the Cisco Catalysts IW9167E, IW9165E, and IW9165D access points. URWB is supported as part of the Unified Industrial Wireless (UIW) software. UIW Release 17.14.1 introduces following new features:

- Dying Gasp functionality for Catalyst IW9165E.
- Support for MPO fast failover.
- Support for Catalyst IW9165 radio 2 channel bandwidth extended to 160 MHz.
- Support for Catalyst IW9167E with Rx-SOP threshold feature.

Related Documentation

Documentation for the access point control and provisioning of wireless access points (CAPWAP) and workgroup bridge (WGB) modes of operation for the Catalysts IW9167 and IW9165 access points are available in the following URLs:

- [Catalyst IW9167 Heavy Duty Access Point](#)
- [Catalyst IW9165E Rugged Access Point](#)
- [Catalyst IW9165D Heavy Duty Access Point](#)

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CHAPTER 1

Overview of Cisco Catalyst IW9167E and IW9165 Access Points

- [Overview of Cisco Catalyst IW9167E and IW9165 Access Points, on page 1](#)

Overview of Cisco Catalyst IW9167E and IW9165 Access Points

Overview of Cisco Catalyst IW9167E

The Catalyst IW9167E access point provides reliable wireless connectivity for mission-critical applications in a state-of-the-art platform to deliver a network that is more reliable and secure, with higher throughput, more capacity, and less device interference. The Catalyst IW9167E is Cisco's first outdoor Wi-Fi 6E ready Access Point supporting tri-radio and tri-band (2.4/5/6 GHz bands). The Catalyst IW9167E can operate in Wi-Fi (control and provisioning of wireless access points (CAPWAP)) mode or Ultra-Reliable Wireless Backhaul (URWB) mode and URWB software on Catalyst IW9167E designed to support the Cisco style parser.

Overview of Cisco Catalyst IW9165

The Catalyst IW9165 supports up to a 3.6 Gbps PHY data rate with two 2x2 multiple input and multiple output (MIMO) and two ethernet ports (2.5 mGig and 1G). The Catalyst IW9165 uses URWB, which offers seamless handoffs, low latency, and high availability. The Catalyst IW9165 is designed to take advantage of the 6 GHz band expansion to deliver a network that is more reliable and secure, with higher throughput, more capacity, and less device interference. The Catalyst IW9165 has the option to switch images by just updating the software to operate the Catalyst IW9165 in workgroup bridge (WGB) or URWB mode without changing the hardware.

The Catalyst IW9165 series is available in two models:

- Catalyst IW9165E Rugged Access Point and Wireless Client
- Catalyst IW9165D Access Point

Cisco Catalyst IW9165E Rugged Access Point and Wireless Client

The Catalyst IW9165E supports a 2x2 Wi-Fi 6E design with external antennas, and it is designed to add ultra-reliable wireless connectivity to moving vehicles and machines. Low power consumption, rugged IP30 design and small form factor make the Catalyst IW9165E very simple to integrate into industrial assets.

From UIW Release 17.14.1, the Catalyst IW9165E supports the Dying Gasp functionality. Once the DC-IN power supply stops, the Dying Gasp functionality allows the device to preserve power for at least 100 ms. During this time, the device sends a message to other devices in the network indicating that it is about to shut down, and this avoids abrupt packet transmission failure. Catalyst IW9165E generates the Dying Gasp messages, and the Catalysts IW9165D, IW9165E, and IW9167E devices process these messages.

Cisco Catalyst IW9165D Access Point

The Catalyst IW9165D supports a 2x2 Wi-Fi 6E design with internal and external antennas, and it is designed to simplify wireless backhaul deployment. The Catalyst IW9165D is designed with heavy-duty IP67 and a built-in directional antenna that enables long-range, high-throughput connectivity when fiber is not an option, so that you can create a fixed wireless infrastructure (point-to-point, point-to-multipoint, and mesh) as well as backhaul traffic from mobile devices along wayside or trackside deployments. The external antenna ports let you quickly extend your network to new places when needed and choose the right antenna based on the use cases and deployment architectures.



CHAPTER 2

Initial Configuration of the Device in Provisioning Mode

Catalyst IW Access Points running in URWB mode support configuration from Cisco IoT Operations Dashboard (IoT OD) or using local management interfaces. An access point (AP) with no configuration defaults to provisioning mode, which allows the initial configuration to be sent to the access point from IoT OD.

Provisioning mode is a special mode where the AP attempts to request network configuration using dynamic host configuration protocol (DHCP) and connect to IoT OD. If network connectivity exists, the AP connects to IoT OD. If there is no network connectivity, the AP can be configured locally using the GUI or CLI, accessible using the console port or SSH.

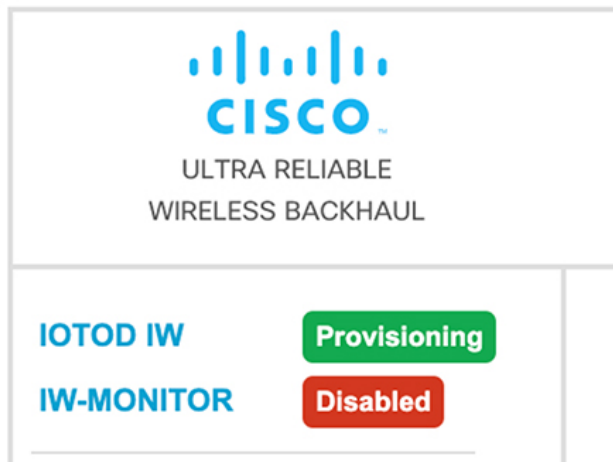
The DHCP server assigns a default gateway and domain name system (DNS) server. IoT OD uses DNS geo-location to direct AP in the United States to the US cluster. Other locations are directed to the EU cluster. Ensure your IoT OD organization is configured to the correct cluster.

DHCP is only used in provisioning mode. A static IP address must be assigned for normal operation. If DHCP is unavailable and configuration through IoT OD is required, the IP address, subnet, default gateway, and DNS can be manually configured.



Note When the device is in provisioning mode, the AP attempts to get an IP address from a DHCP server. If the device fails to receive an IP address through DHCP, the AP reverts to a fallback IP address of 192.168.0.10/24.

- To verify if the device is in provisioning mode, go to the device configurator interface and the status of IoT OD IW is shown as **Provisioning**:



- To verify if the device is in provisioning mode, use the following show command:

```
Device# show iotod-iw status
IOTOD IW mode: Provisioning
Status: Connected
```

- If the status of IoT OD IW is shown as **Online** or **Offline**, choose either of the following options:
 - To configure a new device, revert the wireless device to provisioning mode and reset the device, see [Resetting the Device to Factory Default Using GUI, on page 8](#).
 - To change the connection settings with current configuration, see [Configuring General Settings, on page 11](#).

If the device is in provisioning mode, the device configurator interface is shown:

IOTOD IW Cloud connection info	
Server Host:	IOTOD Industrial Wireless
Status:	Disconnected
Current IP Configuration	
Current IP:	192.168.0.10 (fallback)
Current Netmask:	255.255.255.0

IOTOD IW Cloud connection info	
Server Host:	IOTOD Industrial Wireless
Status:	Disconnected
Current IP Configuration	
Current IP:	192.168.10.2
Current Netmask:	255.255.255.0
Configure DHCP to connect to IOTOD IW	
Use this section to connect the radio to the Internet via DHCP to use IOTOD IW Cloud Management. Set fall-back IP settings if DHCP is not available.	
DHCP fall-back configuration	
Local IP:	<input type="text" value="192.168.10.2"/>
Local Netmask:	<input type="text" value="255.255.255.0"/>
Default Gateway:	<input type="text" value="192.168.10.1"/>
Local Dns 1:	<input type="text" value="192.168.10.200"/>
Local Dns 2:	<input type="text"/>
<input type="button" value="Reset to Provisioning"/>	

The device's status and LEDs blink continuously and LEDs repeat this cycle until the device either enters a fallback condition, or enters **Online**, or **Offline** mode. To know more about LED status, see [LED Pattern for Catalyst IW9165, on page 130](#) or [LED Pattern for Catalyst IW9167, on page 129](#).



Note DHCP is used only in provisioning mode. A static IP address must be assigned for normal operation.

Ensure that the device is connected to a network that supports DHCP. If the connection to IoT OD is successful, the cloud connection info status is shown as **Connected**.

IOTOD IW Cloud connection info	
Server Host:	IOTOD Industrial Wireless
Status:	Connected
Current IP Configuration	
Current IP:	10.115.11.152 (dhcp)
Current Netmask:	255.255.0.0

To configure the fallback address, use the following CLI command:



Note In the provisioning mode, the IP, netmask, default gateway, primary DNS, and secondary DNS configuration (IP command) are allowed.

```
Device# configure ip address ipv4 [ static IP address [ static netmask [ IP address of
default gateway [ dns1 ip [ dns2 ip ] ] ] ] ]
```

For example:

```
Device# configure ip address ipv4 static 192.168.10.2 255.255.255.0 192.168.10.1
192.168.10.200 192.168.10.201
```

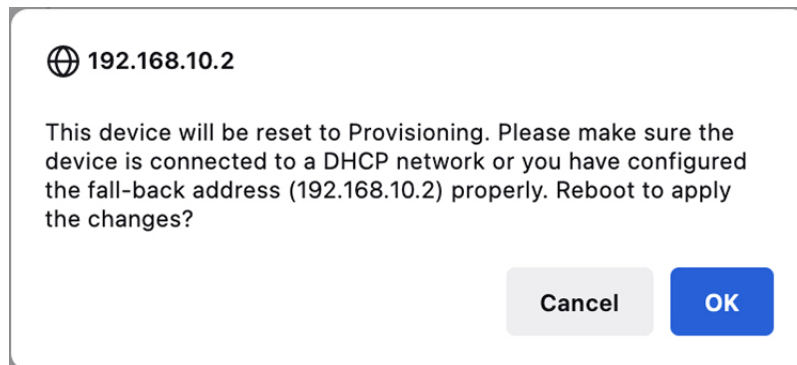
The device sets the fallback address (192.168.0.10 by default) or the configured IP address automatically if it does not receive an address from the DHCP server. If the device fails to connect to IoT OD IW, verify the following to reach IoT OD IW:

1. Check if the ethernet cable leading to the device is connected correctly.
2. Check if the local DNS server can fix the IP address of IoT OD IW cloud server and if the address can be reached.
3. Check if access point uses an outbound HTTPS connection on tcp/443 for the following domains:
 - device.ciscoiot.com
 - us.ciscoiot.com
 - eu.ciscoiot.com
4. If IoT OD IW is still offline, perform a local (offline) configuration using the device's configurator interface.

If the device fails to connect to the network in provisioning mode, follow these steps:

1. Enter alternative **Local IP**, **Local Netmask**, **Default Gateway**, **Local Dns 1**, and **Local Dns 2** values as needed, using IoT OD IW image and click the **Save fallback IP**.

A reboot confirmation pop-up appears:



2. Click **OK** or **Reset** to go back to IoT OD IW and adjust the settings.
 - Once you click **OK**, the device reboots and remains in provisioning mode.
 - The device attempts to connect to the network using the new connection values.
3. If the device fails to connect to the network using the **DHCP** settings, **IoT OD IW Cloud connection Status** is shows as **Disconnected**.

IOTOD IW Cloud connection info	
Server Host:	IOTOD Industrial Wireless
Status:	Disconnected
Current IP Configuration	
Current IP:	192.168.0.10 (fallback)
Current Netmask:	255.255.255.0

4. To verify if the device is in provisioning mode and not connected to IoT OD, use the following CLI command:

```
Device#show iotod-iw status
IOTOD IW mode: Provisioning
Status: Disconnected
```

The following CLI example shows that the device is in provisioning mode and retrieved the IP address from the DHCP server:

```
Device#show ip
IP: 192.168.0.10
Network: 255.255.255.0
Gateway:
Nameservers:

DHCP Address (PROVISIONING Mode):
IP: 10.0.0.2
Network: 255.255.255.0
Gateway: 10.0.0.1
Nameservers: 8.8.8.8

Fallback Address (PROVISIONING Mode):
IP: 169.254.201.72
Network: 255.255.0.0
```

The following CLI example shows the device in provisioning mode fails to retrieve the IP address from the DHCP server and using the default fallback IP address 192.168.0.10:

```
Device#show ip
IP: 192.168.0.10
Network: 255.255.255.0
Gateway:
Nameservers:

DHCP Address (PROVISIONING Mode):
IP: 192.168.0.10
Network: 255.255.255.0
Gateway:
Nameservers: 127.0.0.1

Fallback Address (PROVISIONING Mode):
IP: 169.254.201.72
Network: 255.255.0.0
```

- [Resetting the Device to Factory Default Using GUI, on page 8](#)
- [Rebooting the Device using GUI, on page 9](#)
- [Saving and Restoring the Device Settings, on page 10](#)
- [Configuring General Settings, on page 11](#)
- [Connecting to the Access Point Console Port, on page 12](#)

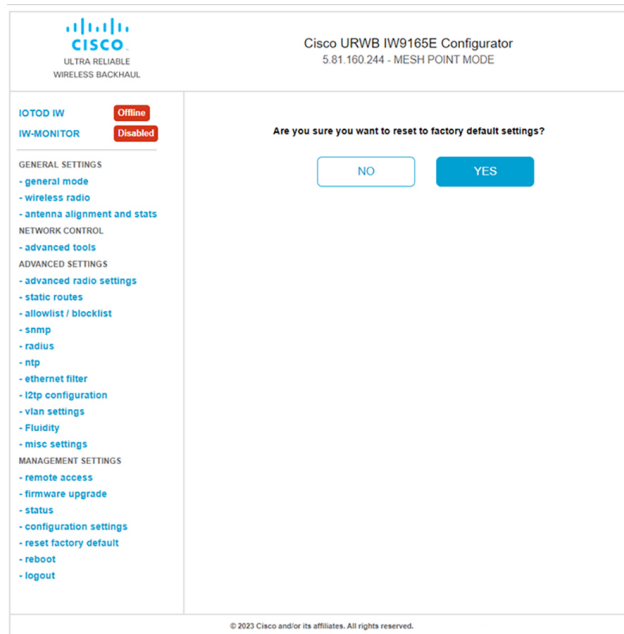
Resetting the Device to Factory Default Using GUI

You can reset the device to factory default either by pressing a reset button for 30 seconds when power is supplied to the access point or through configurator interface. For more information about reset button, see [Using the Reset Button](#).



Note A hard reset reverts all device configuration settings, including the device IP address and administrator password to factory defaults. Instead if you want to reboot the device, see [Rebooting the Device using GUI, on page 9](#).

1. In the **MANAGEMENT SETTINGS**, click **reset factory default**.



2. Click **YES** in the confirmation pop-up window. To abort the factory reset, click **NO**.
3. If you have previously saved a configuration file for the device, you can restore the saved configuration settings to the device, see [Saving and Restoring the Device Settings, on page 10](#).



Note Do not perform a hard reset unless the device requires reconfiguration using its factory configuration as the starting point. Hard reset resets the device's IP address, administrator password, and it disconnects the device from the network.

Resetting the Device to Factory Default Using CLI

To reset of the device configuration, use the following CLI command:


```
device#configure factory reset config
WARNING: "configure factory reset config" will clear config and reboot.
Do you want to proceed? (y/n)
```

Enter `y` in the CLI command to start the device reset process or alternatively enter `n` to abort the process.

To reset the device configuration and data wipe, use the following CLI command:

```
Device#configure factory reset default
WARNING: "configure factory reset default" will take minutes to perform DATA WIPE.
```

The following files are cleared as part of this process:

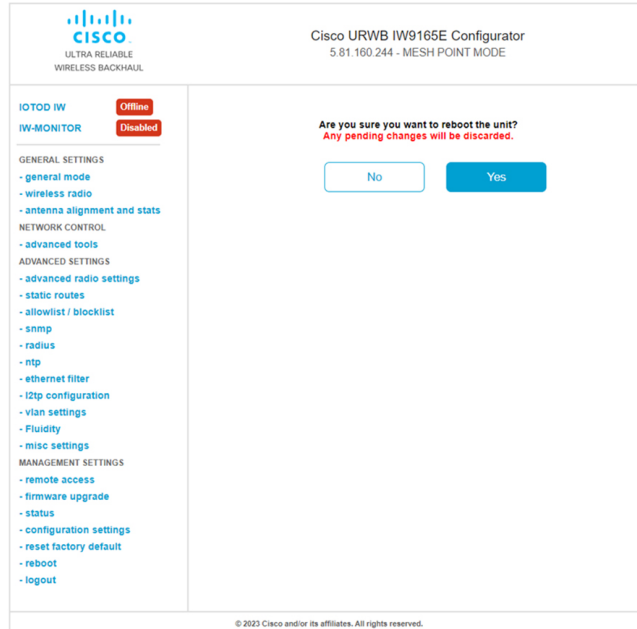
```
1) Config, Bak config files
2) Crashfiles
3) syslogs
4) Boot variables
5) Pktlogs
6) Manually created files
Do you want to proceed? (y/n)
```

Enter `y` in the CLI command to start the device reset of the configuration and data wipe or alternatively enter `n` to abort the process.

Rebooting the Device using GUI

To reboot the device's operating system, follow these steps:

1. In the **MANAGEMENT SETTINGS**, click **reboot**.



2. In the confirmation pop-up window, click **Yes**. To abort the reboot, click **No**.

Rebooting the Device using CLI

To perform reboot, use the following CLI command:

```
Device#reload
Proceed with reload command (cold)? [confirm]
```

Enter `confirm` in the CLI command to start the device reboot process.

Saving and Restoring the Device Settings

The **LOAD OR RESTORE SETTINGS** window allows you to perform the following tasks:

- Save the device's existing software configuration as a configuration (*.conf) file.
- Upload and apply a saved configuration file to the current device.



Note Device software configuration (*.conf) files are not interchangeable with IoT OD configuration setup (*.iwconf) files.



Tip Saved configuration files are reused for all devices of the same type. These saved configuration files act as configuration backup files to speed up redeployment if you need to replace the damaged device with a new device of the same type.

To download the device's existing configuration settings to your computer, follow these steps:

1. In the **MANAGEMENT SETTINGS**, click **configuration settings**.

The **LOAD OR RESTORE SETTINGS** window appears.



2. Click **Save** to download the device configuration (*.conf).

To upload a saved configuration file to the device, follow these steps:

1. Click **Browse** to upload the configuration (*.conf) file to the device.
2. Click **Restore** to apply the configuration settings to the device.

Configuring General Settings

To change the **General Mode** settings, follow these steps:

1. In the **GENERAL SETTINGS**, click **general mode**.

The screenshot shows the Cisco URWB IW9165E Configurator interface. The top header includes the Cisco logo and the text "Cisco URWB IW9165E Configurator 5.81.160.244 - MESH POINT MODE". On the left, there is a navigation menu with categories like "IOTOD IW", "GENERAL SETTINGS", "NETWORK CONTROL", "ADVANCED SETTINGS", and "MANAGEMENT SETTINGS". The "GENERAL SETTINGS" section is expanded, showing "general mode" as the selected option. The main content area is titled "GENERAL MODE" and contains the following settings:

- General Mode:** A sub-header with a note: "Select MESH POINT mode if you are attaching an IP edge device (i.e. network camera, encoder, etc.) to this Cisco IOT IW9165E Series Access Point or if you are using this unit as a relay point in the mesh network." Below this, there are three radio buttons: "mesh point" (selected), "mesh end", and "gateway".
- Radio-off:** A checkbox that is currently unchecked.
- LAN Parameters:** A section with five input fields:
 - Local IP: 10.115.11.180
 - Local Netmask: 255.255.255.0
 - Default Gateway: 10.115.11.1
 - Local Dns 1: 8.8.8.8
 - Local Dns 2: (empty)

At the bottom of the main content area, there are two buttons: "Reset" and "Save". The footer of the page contains the copyright notice: "© 2023 Cisco and/or its affiliates. All rights reserved."

The **General Mode** has the operational mode controls. Devices capable of operating in a mesh radio network are shipped in **mesh point** mode.



Note When designing the required network layout, there must be at least one mesh end device. This device performs control and administrative functions, such as license management. This is necessary for correct network operation, even if the network consists of only two devices.

To change the device's operational mode, select any one of the following mode:

- **Gateway** - This mode is applicable for advanced Layer 3 mobility deployments, and it is not used in most networks.
- **Mesh Point** - This mode is applicable for the remaining access points in the network. These access points establish links to other access points with the same network passphrase configured as mesh end or mesh point using wireless links or wired links. In this scenario, the access point has Layer 2 visibility of other access points.

- **Mesh End** - This mode configures the access point to perform control and administrative network functions. There must be at least one mesh end in each network. This access point is typically installed in the most central point where the wireless and wired networks converge.

Configuring General Settings using CLI

To configure general settings, use the following CLI command:

```
Device#configure modeconfig mode
gateway      layer 3 global gateway mode
meshend      mesh end mode
meshpoint    mesh point mode

Device#configure modeconfig mode meshend
mpls         MPLS support
radio-off    disable radio interfaces
```

Changing the LAN Parameters

The LAN parameters has entry controls for local address setting. Perform the following to change the LAN parameters:

1. Once the **General Mode** window is opened for the first time, the **Local IP** and **Local Netmask** LAN parameters are shown with factory-set default values.
2. If needed, enter the local primary DNS address in the **Dns 1** field, and enter the local secondary DNS address in the **Dns 2** field
3. Click **Save** to save the LAN settings. To clear the settings, click **Reset**.

Configuring LAN Parameters using CLI

To configure LAN parameters, use the following CLI command:

Example:

```
device#configure ip address ipv4 static
192.168.10.2 255.255.255.0 192.168.10.1 192.168.10.200 192.168.10.201
```

Connecting to the Access Point Console Port

To configure the access point locally (without connecting to a wired LAN), connect the computer to the access point's console port using a DB-9 to RJ-45 serial cable and to open the CLI by connecting to the access point's console port, follow these steps:

1. 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.
2. Set up a terminal emulator to communicate with the access point. In the terminal emulator, use the following settings:

Parameter	Value
Baud rate	115200 bps
Data	Eight bits

Parameter	Value
Parity	No
Stop	One stop bit
Flow Control	No

3. There are two available command-prompt modes: standard command prompt (>) and privileged command prompt (#). When logged in for the first time, it directs you to standard command prompt (>) mode to execute unprivileged commands.

To access privileged command-prompt (#) mode, enter the enable command (abbreviated as en) and enter the enable password (the privilege mode login password is different from the standard login password).

Use the following default credentials to log in:

- Username: Cisco
- Password: Cisco



Note Once the initial configuration completes, ensure to remove the serial cable from the access point.



CHAPTER 3

Configuring URWB Operation Mode

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Configuring URWB Operation Mode

Catalyst Industrial Wireless access points support multiple wireless technologies, such as Catalyst Wi-Fi (AP), Cisco Ultra-Reliable Wireless Backhaul (URWB), and Workgroup Bridge (WGB). The modes supported vary by specific access point.

The access point OS supports two different software images: Catalyst Wi-Fi (AP) and Unified Industrial Wireless (UIW). Both URWB and WGB are part of the UIW software. The access point mode is determined at boot time based on the mode the access point is configured to operate in.

Determining from CLI

The access point OS supports two different software images: Catalyst Wi-Fi (AP) and UIW. Use the following show command to determine which software is running and look for the indicated platform code:

```
Device# show version
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
```

If the `show version` displays `ap1g6a` or `ap1g6b`, it means that the access point OS is running. If the `show version` displays `ap1g6j` or `ap1g6m`, it means the UIW software is running.

To check if the access point is running in URWB mode, use the following CLI command:

```
Device# show iotod-iw status
```

If the command exists, then the access point is running in URWB mode, otherwise the access point is running in WGB mode.

Reset Button Settings

The following reset actions are performed in the URWB mode when the LED turns to blinking red (after the boot loader gets the reset signal). Ensure you to press the device's reset button before the device is powering on.

- If you press the reset button for < 20 seconds, it clears the existing configuration.
- If you press the reset button for > 20 seconds and < 60 seconds, it triggers the factory reset.
- If you press the reset button for > 60 seconds, it does not clear the configuration.

Configuring Image Conversion

To convert a Catalyst IW9167E access point either from Wi-Fi mode (CAPWAP AP) to URWB mode or from URWB mode to Wi-Fi mode (CAPWAP AP), follow these steps:

1. To convert from CAPWAP to URWB mode or from WGB/uWGB to URWB mode, use the following CLI command. The access point then reboots and starts up in URWB mode.

```
configure boot mode urwb
```

2. To convert from URWB to CAPWAP mode or from WGB/uWGB to CAPWAP mode, use the following CLI command. The access point then reboots and starts up in CAPWAP mode.

```
configure boot mode capwap
```

3. To convert from CAPWAP to WGB/uWGB mode or from URWB to WGB/uWGB mode, use the following CLI command:

```
configure boot mode wgb
```



Note Image conversion performs a full factory reset which completely erases the configuration and data.

Instructions to Access the GUI

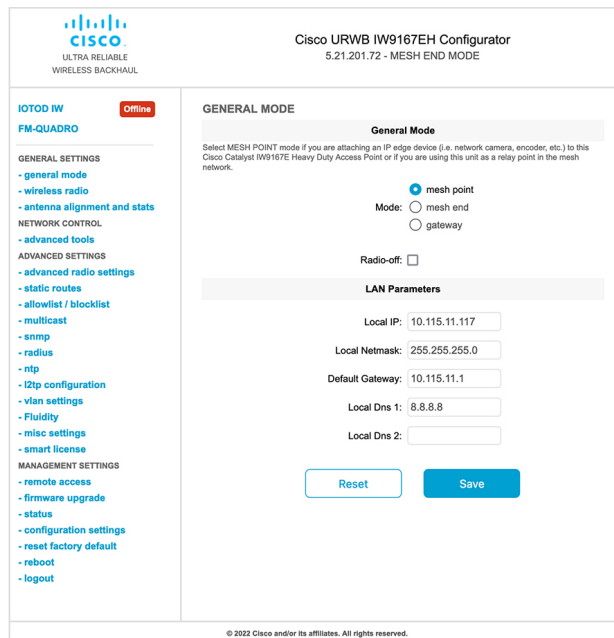
To access the Web UI (Web User Interface), use the following procedure:

1. To access a Web UI, open the web browser and enter the following URL: `https://<IP address of unit>/`
The **IW9167E or IW9165 Configurator** window appears.



The image shows the login page of the Cisco URWB IW9167EH Configurator. The page title is "Cisco URWB IW9167EH Configurator 5.21.201.112 - MESH END MODE". The Cisco logo and "ULTRA RELIABLE WIRELESS BACKHAUL" are in the top left. The "Login" section contains three input fields: "Username:", "Enable Password:", and "Show password:" with a checkbox. A blue "Login" button is centered below the fields. At the bottom, there is a copyright notice: "© 2022 Cisco and/or its affiliates. All rights reserved."

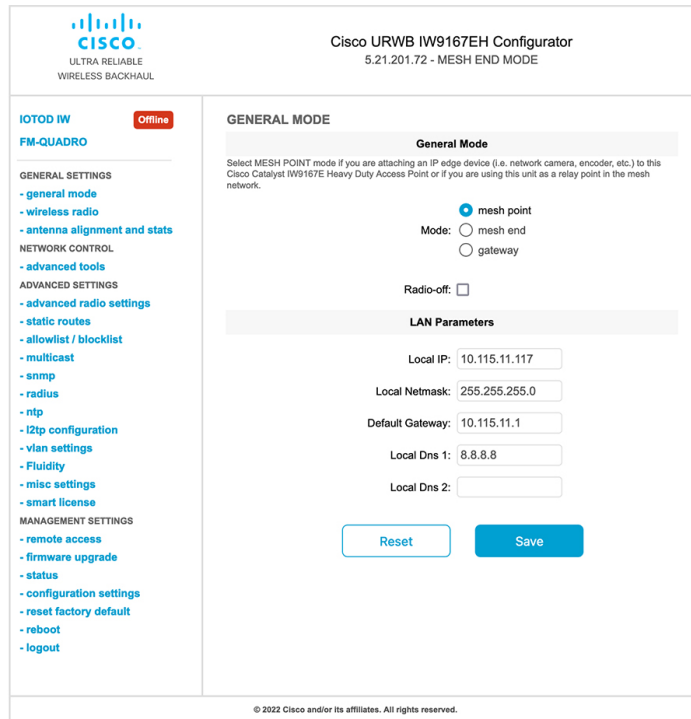
2. To access the configuration page, use the credentials as follows: **Username** and **Enable password**.
3. Once you successfully log into the GUI, the URWB configurator displays:



The image shows the "GENERAL MODE" configuration page of the Cisco URWB IW9167EH Configurator. The page title is "Cisco URWB IW9167EH Configurator 5.21.201.72 - MESH END MODE". The Cisco logo and "ULTRA RELIABLE WIRELESS BACKHAUL" are in the top left. The "IOTOD IW" status is "Offline". The "GENERAL SETTINGS" menu is on the left, with "general mode" selected. The "GENERAL MODE" section includes a "General Mode" heading and a note: "Select MESH POINT mode if you are attaching an IP edge device (i.e. network camera, encoder, etc.) to this Cisco Catalyst IW9167E Heavy Duty Access Point or if you are using this unit as a relay point in the mesh network." The "Mode" section has radio buttons for "mesh point" (selected), "mesh end", and "gateway". The "Radio-off:" checkbox is unchecked. The "LAN Parameters" section includes input fields for "Local IP:" (10.115.11.117), "Local Netmask:" (255.255.255.0), "Default Gateway:" (10.115.11.1), "Local Dns 1:" (8.8.8.8), and "Local Dns 2:". "Reset" and "Save" buttons are at the bottom. A copyright notice is at the very bottom: "© 2022 Cisco and/or its affiliates. All rights reserved."

URWB Catalyst IW9167E Configuration from GUI

The following image shows the configuration of the Catalyst IW9167E configurator:



Committing CLI Configuration

To save the current or running configuration settings to local storage or memory, type `write` CLI command. The modified value is in the cache configuration file, once the `write` command is entered, re-boot the device to take effect of the current configuration. To make the configuration effective, use the following CLI commands:

```
Device# write
```

OR

```
Device# wr
```

`write` or `wr`: commit the current configuration settings to memory.

```
Device# reload
```

`reload`: reload the device.

Example:

```
Device# write
```

```
!!! Please reboot to take effect
```

```
Device# reload
```

```
Proceed with reload? [confirm]
```

(enter to confirm)

Configuring IoT OD Online and Offline Mode from CLI

IoT OD (IoT Operations Dashboard) is the cloud management portal, and the device is connected to the online cloud through the network. In offline mode the device is configured in local mode using CLI and GUI, and it is not connected to the cloud.

When the device is configured in offline mode, choose following options:

- Configure the device manually using CLI and GUI.
- Configure the device on IoT OD cloud service and select the configuration file exported from IoT OD IW and upload the configuration file using upload configuration button at the end of IoT OD IW management page.

To activate or deactivate IoT OD IW (IoT Industrial Wireless) configuration capability, use the following CLI command:

```
Device# configure iotod-iw {offline | online}
```

Online - To set up IoT OD IW mode to online. The device can be managed from IoT OD IW cloud server (if it is connected to the network).

Offline - To set up IoT OD IW mode to offline. The device is disconnected from IoT OD IW and must be manually configured using the CLI, or offline configurator interface.

Configuring Password (after first login) from CLI

Once the device switches to offline mode (after the initial login), you need to set up new login credential. To configure login credentials using GUI or CLI, the login credentials should follow these criteria:

- The username length must be from 1 to 32 characters.
- The password length must be from 8 to 120 characters.
- The password must include the following:
 - At least one uppercase letter
 - At least one lowercase character,
 - At least one digit
 - At least one special character
- The password can contain alphanumeric characters and special characters (ASCII decimal code from 33 to 126), but the following special characters are not allowed:
 - " [double quote]
 - ' [single quote]
 - ? [question mark]
- The password must not contain:
 - Three sequential characters or digits (ABC/ CBA)

- The same three characters or digits consecutively (AAA) or (666)
- Same as the current or existing password
- Same as or the reverse of the username

Example:

Default credentials:

```
username: Cisco
password: Cisco
enable password: Cisco
```

To reset the credentials, use the following sample credentials:

```
username: demouser
password: DemoP@ssw0rd
enable password: DemoE^aP@ssw0rd
```

Example of configuring password using CLI:

```
Device# configure iotod-iw {offline}
Switching to IOTOD IW Offline mode...
Will switch from Provisioning Mode to IOTOD IW offline Mode, device need to reboot:Y/N?
Y
User access verification.
[Device rebooting...]

User Access Verification:
Username: Cisco
Password: Cisco
```

After first login, reset the credentials:

```
Current Password:Cisco
Current Enable Password:Cisco
New User Name:demouser
New Password:DemoP@ssw0rd
Confirm New Password:DemoP@ssw0rd
New Enable Password:DemoE^aP@ssw0rd
Confirm New Enable Password:DemoE^aP@ssw0rd
```

Once the credentials are changed, re-login:

```
User access verification
Username: demouser
Password: DemoP@ssw0rd
Device> enable
```

Password: DemoE^aP@ssw0rd

Device#



Note In the above example, all passwords are in plain text. This is for demo purposes (sample credential). In the real scenario, they are hidden behind asterisks (*).

Configuring IoT OD IW from GUI

The following image shows the configuration of IoT OD IW:

IOTOD IW Management

IOTOD IW Configuration Mode

Provisioning: initial radio configuration phase. The radio MUST be configured using the Centralized Web Interface ([IOTOD Industrial Wireless US](#), [IOTOD Industrial Wireless EU](#)) if connection is successful or manually if *Offline* configuration is selected.

Offline Configuration: it supports local parameter changes through the radio Web UI / CLI or upload of a single file downloaded from IOTOD IW section in IOTOD Industrial Wireless ([IOTOD Industrial Wireless US](#), [IOTOD Industrial Wireless EU](#)).

Online Cloud-Managed Configuration: the radio can be configured from the Centralized Web Interface (IOTOD IW section in [IOTOD Industrial Wireless US](#) or [IOTOD Industrial Wireless EU](#)) if it is connected to the Internet and can access IOTOD IW Cloud Server. Radio Web UI and CLI are read-only.

Online Cloud-Managed Offline

UPLOAD IOTOD IW CONFIGURATION FILE

Upload Configuration File

Select configuration file exported from IOTOD Industrial Wireless: No file selected

Last configuration ID 34



CHAPTER 4

Configuring URWB Radio Mode

- [Configuring URWB Radio Mode, on page 23](#)
- [Configuring Radio-off Mode from CLI, on page 24](#)
- [Configuring Radio Mode for URWB from CLI, on page 25](#)
- [Configuring AMPDU using CLI, on page 25](#)
- [Configuring Frequency from CLI, on page 26](#)
- [Configuring Maximum Modulation Coding Scheme Index from CLI, on page 26](#)
- [Configuring Maximum Number of Spatial Streams Index from CLI, on page 27](#)
- [Configuring Rx-SOP Threshold from CLI, on page 27](#)
- [Configuring RTS Mode from CLI, on page 27](#)
- [Configuring WMM Mode from CLI, on page 27](#)
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- [Configuring Radio Mode from GUI, on page 30](#)

Configuring URWB Radio Mode

The wireless interfaces are configured to operate in a specific mode, or you can disable it. Once you configure the Radio mode, the device starts working as a Fluidity or Fixed infrastructure.

The following table shows the configuration of Radio mode on the device:

Table 1: Radio Mode Configuration

Radio Role	Radio Mode	Description
Fixed Infrastructure	Fixed	P2P mode (point to point)
	Fluidmax primary	P2MP (point to multipoint) mode (Fluidmax) and P2MP
	Fluidmax secondary	P2MP mode (Fluidmax) and P2MP
Mobility AP	Fluidity	Mobility mode
Mobility Client	Fluidity	Mobility mode

Following table shows the Fluidity status and it is derived from operating mode of enabled radio interfaces:

Table 2: Operating Mode of Radio Interface

Radio 1 / Radio 2	Fixed Infrastructure	Fluidity
Fixed Infrastructure	Fluidity disabled	Fluidity enabled
Fluidity	Fluidity enabled	Fluidity enabled

Multiple and dual radio interfaces are possible based on the following table:

Table 3: Configuration of Multiple Radio interfaces

Radio 1 / Radio 2	Fixed Infrastructure / Mesh	Mobility AP	Mobility client
Fixed Infrastructure / Mesh	ME/MP relay, P2MP (mesh)	Yes, trailer use case (Mining trailer)	Supported but no specific use case
Mobility AP	Yes, trailer use case (Mining trailer)	Standard Fluidity (multiple clients on each radio)	Not supported, use V2V or Fixed + AP
Mobility client	Supported but no specific use case	Not supported, use V2V or Fixed + AP	Standard Fluidity (multiple clients on each radio)

Configuring Radio-off Mode from CLI

To configure Radio-off mode when both radios (Fluidity and fixed) are disabled, use the following CLI commands and procedure:



Note If you specify radio-off, the device disables all the wireless interfaces.

1. Set the device's current operating mode. Mode could be mesh end, mesh point or global gateway (L3).

```
Device# configure modeconfig mode {meshpoint | meshend | gateway}
```

2. Set the device's selected Multi-Protocol Label Switching (MPLS) OSI layer and the possible value of layer is 2 (OSI Layer-2) or 3 (OSI Layer-3).

```
Device# configure modeconfig mode {meshpoint | meshend | gateway}[layer {2|3}]
```

3. To set the radio-off mode.

```
Device# configure modeconfig mode { meshpoint | meshend | gateway } [layer {2|3}] [radio-off {fluidity | fixed}]
```

4. To end the current configuration, use the following CLI command:

```
Device# (configure modeconfig mode { meshpoint | meshend | gateway } [layer {2|3}] [radio-off {fluidity | fixed}])# end
```



```
Device# wr
```

Example:

```
Configure modeconfig mode meshend radio-off fluidity
```

```
Configure modeconfig mode meshend radio-off fixed
```

Configuring Radio Mode for URWB from CLI

To configure Radio mode for URWB, use the following CLI commands:

To select the operating function of the wireless interface, use these CLI commands. Device allows mixed Fluidity and fixed infrastructure combinations for different interfaces.

1. Configure the wireless with radio interface number <1 or 2>.

```
Device# configure dot11Radio <interface>
```

2. Configure an operating mode for the specified interface.

```
Device# configure dot11Radio <interface> mode {fixed|fluidity|fluidmax}
```

Fluidity - This interface operates the device in Fluidity, either as a mobility infrastructure or as a vehicle mode.

Fixed - This interface operates in fixed infrastructure mode (no Fluidity).

Fluidmax - This interface operates in Fluidmax P2MP mode. More parameters can be specified to configure the Fluidmax operating features, for example: Primary/Secondary role and cluster ID.

3. Set Fluidmax role for Fluidmax interface mode.

```
Device# configure dot11Radio <interface>mode {fixed|fluidity|fluidmax} {primary | secondary}
```

Primary - set Fluidmax role to primary

Secondary - set Fluidmax role to secondary

4. To end the current configuration, use the following CLI command:

```
Device (configure dot11Radio <interface>mode{fixed|fluidity|fluidmax}) # end
```

```
Device# wr
```



Note When at least one interface is set to Fluidity mode, the device operates globally in Fluidity mode. If all interfaces are set to fixed, Fluidity is disabled.

Configuring AMPDU using CLI

To configure an Aggregated MAC Protocol Data Unit's (AMPDU) length and priority, use the following CLI commands:

```
Device# configure dot11radio <interface> ampdu length <length>
```

length: <0-255> integer number – microseconds

```
Device# configure dot11radio <interface> ampdu priority {enable | disable}
```

enable: enable ampdu tx priority

disable: disable ampdu tx priority

```
Device# configure dot11radio <interface> ampdu priority [enable]
```

0: ampdu tx priority for index 0

1: ampdu tx priority for index 1

2: ampdu tx priority for index 2

3: ampdu tx priority for index 3

4: ampdu tx priority for index 4

5: ampdu tx priority for index 5

6: ampdu tx priority for index 6

7: ampdu tx priority for index 7

all: ampdu tx priority for all indexes (index 0 to 7)

Configuring Frequency from CLI

To configure an operating frequency, use the following CLI command:

```
Device# configure dot11radio <interface> frequency <frequency>
```

frequency: <0-7125> operating frequency in MHz

Configuring Maximum Modulation Coding Scheme Index from CLI

To configure maximum modulation coding scheme (MCS) index, use the following CLI command:

```
Device# configure dot11radio <interface> mcs <maxmcs>
```

Set maximum MCS index in integer or string AUTO. For AUTO, the background process automatically configures the maxmcs.

Maxmcs values:

<0-11 > Maximum mcs index 0 to 11.

Word AUTO



Note If High Efficiency mode is disabled, set the MCS index value ranging from zero to nine. If High Efficiency mode is enabled, set the MCS index value as 10 or 11.

Configuring Maximum Number of Spatial Streams Index from CLI

To configure maximum number of spatial streams (NSS) index, use the following CLI command:

```
Device# configure dot11radio <interface> spatial-stream <maxnss>
```

Set maximum spatial stream number in integer or string AUTO. For AUTO, the background process automatically configures the maxnss.

Maxnss values:

< 1-4 > Maximum nss index 1 to 4.

Word AUTO



Note Catalyst IW9165 supports up to two spatial streams and Catalyst IW9167 supports up to four spatial streams. The maximum number of spatial streams configured must be same or less than the number of antennas enabled.

Configuring Rx-SOP Threshold from CLI

To configure receiver start of packet (Rx-SOP) threshold, use the following CLI command:

```
Device# configure dot11radio <interface> rx-sop-threshold
```

<0 - 91> Enter rx-sop- threshold (0: AUTO, VALUE: -VALUE dBi).

Configuring RTS Mode from CLI

To disable ready to send (RTS) mode, use the following CLI command:

```
Device# configure dot11radio <interface> rts <disable>
```

Disable: Disables the RTS protection.

To enable RTS with threshold value, use the following CLI command:

```
Device# configure dot11radio <interface> rts enable <threshold>
```

Threshold: Threshold range <0 - 2346>.

Configuring WMM Mode from CLI

To configure wireless multimedia (WMM) mode, use the following CLI command:

```
Device# configure dot11radio <interface> wmm [bk|be|vi|vo]
```

[bk|be|vi|vo]: Represents the class-of-service (CoS) parameters.

be: Best-effort traffic queue (CS0 and CS3).

bk: Background traffic queue (CS1 and CS2).

vi: Video traffic queue (CS4 and CS5).

vo: Voice traffic queue (CS6 and CS7).

To clear wireless stats counters, use the following CLI command:

```
Device# configure dot11Radio <interface> wifistats <clear>
```

Clear: Clear wireless stats counters.

Configuring NTP from CLI

To configure the NTP server address, use the following CLI command:

```
Device# configure ntp server <string>
```

String - IP address or domain name.

Example:

```
Device# configure ntp server 192.168.216.201
```

To configure the NTP authentication, use the following CLI command:

```
Device# configure ntp authentication none
Device# configure ntp authentication md5 <password> <keyid>
Device# configure ntp authentication sha1 <password> <keyid>
```

none - disable the NTP authentication md5/sha1 - authentication method.

Example:

```
Device# configure ntp authentication md5 test1234 65535
```



Note Optional, the md5 password and keyid should match NTP server's md5 password and keyid.

To configure a new password using a GUI or CLI, the password should match the following criteria:

- The password length range is from 8 to 20 characters.
- The following special characters are not allowed:
 - ' (apex)
 - " [double apex]
 - ` [backtick]
 - \$ [dollar]
 - = [equal]
 - \ [backslash]
 - # [number sign]
 - whitespace

To enable or disable the NTP service, use the following CLI command:

```
Device# configure ntp { enable|disable }
```

To configure the NTP timezone, use the following CLI command:

```
Device# configure ntp timezone <string>
```

Example:

```
Device# configure ntp timezone Asia/Shanghai
```

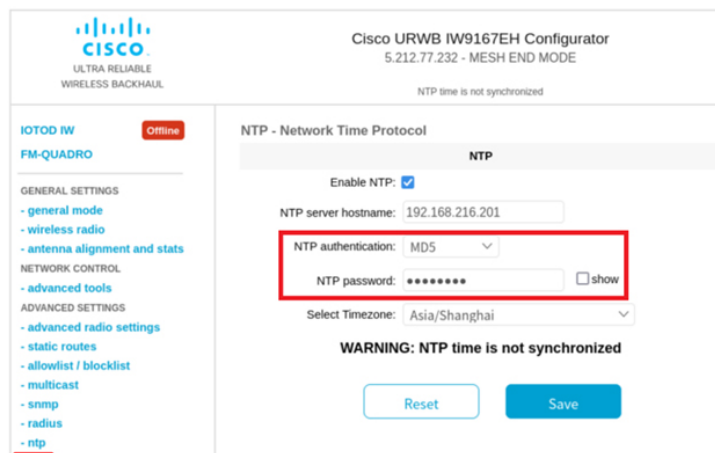
To validate the NTP configuration and status, use the following show commands:

```
Device# show ntp config
NTP status: enabled
NTP server: 192.168.216.201
authentication: MD5
password: test123
keyid: 5
timezone: Asia/Shanghai
```

```
Device# #show ntp (Using this command to check if device can sync up time with NTP server)
Stratum Version Last Received Delay Offset Jitter NTP server
1 4 9sec ago 1.840ms -0.845ms 0.124ms 192.168.216.201
```

Configuring NTP from GUI

The following image shows the GUI of NTP:



Validating Radio Mode for URWB

To validate Radio mode, use the following show commands:

```
Device# show dot11Radio <interface> config
```

Example:

```
Device# show dot11Radio 1 config
Interface : enabled
Mode : fluidity
Frequency : 5785 MHz
```

```

Channel : 157
Channel width : 40 MHz

Device# show dot11Radio 2 config
Interface : enabled
Mode : fluidmax secondary
Frequency : 5180 MHz
Channel : 36
Channel width : 40 MHz

```

To change the Radio mode of vehicle access point (mobility client) to Fixed or Fluidmax, configure Fluidity role as infrastructure using CLI:

```
Device# configure fluidity id infrastructure
```

Configuring Radio-off Mode from GUI

To configure a Radio-off mode, choose fixed or Fluidity mode as shown in the following image. Select a **mesh end** mode if you are installing the Catalyst IW9167E access point at the head end and connecting this device to a wired network such as LAN.

The screenshot shows the Cisco URWB IW9167EH Configurator GUI. The title is "Cisco URWB IW9167EH Configurator 5.21.201.72 - MESH END MODE". The left sidebar lists various configuration sections: IOTOD IW (Offline), FM-QUADRO, GENERAL SETTINGS (general mode, wireless radio, antenna alignment and stats), NETWORK CONTROL (advanced tools), ADVANCED SETTINGS (advanced radio settings, static routes, allowlist/blocklist, multicast, snmp, radius, ntp, I2tp configuration, vlan settings, Fluidity, misc settings, smart license), and MANAGEMENT SETTINGS (remote access, firmware upgrade, status, configuration settings, reset factory default, reboot, logout). The main panel is titled "GENERAL MODE" and contains a "General Mode" section with a note: "Select MESH END mode if you are installing this Cisco Catalyst IW9167E Heavy Duty Access Point at the head end and connecting this unit to a wired network (i.e. LAN)." Below this are three radio button options: "mesh point", "mesh end" (selected), and "gateway". A "Radio-off:" dropdown menu is set to "Fixed". Below this is the "LAN Parameters" section with input fields for "Local IP: 10.115.11.117", "Local Netmask: 255.255.255.0", "Default Gateway: 10.115.11.1", "Local Dns 1: 8.8.8.8", and "Local Dns 2:". At the bottom are "Reset" and "Save" buttons. A copyright notice "© 2022 Cisco and/or its affiliates. All rights reserved." is at the very bottom.

Configuring Radio Mode from GUI

To establish a wireless connection the operating frequency should be same between the devices.

To configure a Radio mode using GUI, follow these steps:

1. Set the operating mode for specified radio (Radio1 and Radio2) interface.

The screenshot shows the Cisco URWB IW9167EH Configurator interface. The left sidebar contains a navigation menu with categories: IOTOD IW (Offline), FM-QUADRO, GENERAL SETTINGS (general mode, wireless radio, antenna alignment and stats), NETWORK CONTROL (advanced tools), ADVANCED SETTINGS (advanced radio settings, static routes, allowlist / blocklist, multicast, snmp, radius, ntp, I2tp configuration, vian settings, Fluidity, misc settings, smart license), and MANAGEMENT SETTINGS (remote access, firmware upgrade, status, configuration settings, reset factory default, reboot, logout). The main content area is titled 'WIRELESS RADIO' and contains 'Wireless Settings' (Shared Passphrase: PASSWORD), 'Radio 1 Settings' (Role: Fixed, Frequency (MHz): 5180, Channel Width (MHz): 80), and 'Radio 2 Settings' (Role: Disabled). There are 'Reset' and 'Save' buttons at the bottom.

- In the **WIRELESS RADIO** section, choose Radio 1 Role as **Fluidmax Primary** with FluidMAX Cluster ID. In this scenario, the frequency selection for the Primary is enabled and Secondary is disabled. In the **ADVANCED RADIO SETTINGS** window, go to **Max TX Power** section, and choose power level as 1 from the **Select TX Max Power** drop-down list and URWB transmission power control (TPC) automatically selects the optimum transmission power.

The screenshot shows the Cisco URWB IW9167EH Configurator interface with the 'ADVANCED RADIO SETTINGS' section selected. The left sidebar is the same as in the previous screenshot. The main content area is titled 'ADVANCED RADIO SETTINGS' and contains 'Radio 1' settings: 'FluidMAX Management' (Radio Mode: PRIMARY, FluidMAX Cluster ID: CLUSTER_ID), 'Max TX Power' (Select TX Max Power: 1), 'Antenna Configuration' (Select Antenna Gain: UNSELECTED, Antenna number: ab-antenna), 'Data Packet Encryption' (Enable AES: Disabled), and 'Maximum link length'. There are 'Back' and 'Next' buttons at the bottom.



Note In Europe TPC is automatically enabled.

3. In the **WIRELESS RADIO** section, choose Radio 1 Role as **Fluidmax Secondary** with FluidMAX Cluster ID. In the **ADVANCED RADIO SETTINGS**, if you check the **FluidMAX Autoscan** check box, the secondary devices scan the frequencies to associate with the Primary with the same Cluster ID. In this case the frequency selection on the Secondary is in disable mode. In the **Max TX Power** section, and choose power level as 1 from the **Select TX Max Power** drop-down list and URWB TPC automatically selects the optimum transmission power.

The screenshot shows the Cisco URWB IW9167EH Configurator interface. The main content area is titled "ADVANCED RADIO SETTINGS" and is for "Radio 1".


- FluidMAX Management:** Radio Mode is set to "SECONDARY". FluidMAX Cluster ID is "CiscoURWB". FluidMAX Autoscan is checked.
- Max TX Power:** Select TX Max Power is set to "1".
- Antenna Configuration:** Select Antenna Gain is "UNSELECTED". Antenna number is "ab-antenna".
- Data Packet Encryption:** Enable AES is "Disabled".
- Maximum link length:** This section is visible but not fully detailed in the image.

On the left side, there is a navigation menu with categories like "GENERAL SETTINGS", "NETWORK CONTROL", "ADVANCED SETTINGS", "MANAGEMENT SETTINGS", and "IOTOD IW". The "ADVANCED SETTINGS" section is expanded to show "advanced radio settings".



Note In Europe TPC is automatically enabled.

4. In the **Fluidity Settings** section, choose **Unit Role** as **Infrastructure** from the drop-down list, When the device acts as the entry point of the infrastructure for the mobile vehicles or choose unit role as **Infrastructure (wireless relay)** only when it used as a wireless relay agent to other infrastructure unit or choose unit role as a **Vehicle** when it is mobile.
5. Choose network type based on the to the general network architecture:
 - a. Choose **Flat** mode from **Network Type** drop-down list, if the network belongs to single layer-2 broadcast domain.
 - or
 - b. Choose **Multiple subnets** if the network belongs to single layer-3 broadcast domain.



Cisco URWB IW9167EH Configurator
5.21.201.72 - MESH END MODE

IOTOD IW Offline

FM-QUADRO

GENERAL SETTINGS

- general mode
- wireless radio
- antenna alignment and stats

NETWORK CONTROL

- advanced tools

ADVANCED SETTINGS

- advanced radio settings
- static routes
- allowlist / blocklist
- multicast
- snmp
- radius
- ntp
- l2tp configuration
- vlan settings
- fluidity
- misc settings
- smart license

MANAGEMENT SETTINGS

- remote access
- firmware upgrade
- status
- configuration settings
- reset factory default
- reboot
- logout

WIRELESS RADIO

Wireless Settings

"Shared Passphrase" is an alphanumeric string or special characters excluding [apex] [double apex] [backtick] [dollar] [equal] [backslash] and whitespace (e.g. "myssecurecamet") that identifies your network. It MUST be the same for all the Cisco URWB units belonging to the same network.

Shared Passphrase:

In order to establish a wireless connection between Cisco URWB units, they need to be operating on the same frequency.

Radio 1 Settings

Role:


Frequency (MHz):

Channel Width (MHz):

Radio 2 Settings

Role:

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Cisco URWB IW9167EH Configurator
5.21.201.72 - MESH END MODE

IOTOD IW Offline

FM-QUADRO

GENERAL SETTINGS

- general mode
- wireless radio
- antenna alignment and stats

NETWORK CONTROL

- advanced tools

ADVANCED SETTINGS

- advanced radio settings
- static routes
- allowlist / blocklist
- multicast
- snmp
- radius
- ntp
- l2tp configuration
- vlan settings
- fluidity
- misc settings
- smart license

MANAGEMENT SETTINGS

- remote access
- firmware upgrade
- status
- configuration settings
- reset factory default
- reboot
- logout

FLUIDITY

Fluidity Settings

The unit can operate in 3 modes: Infrastructure, Infrastructure (wireless relay), Vehicle. The unit must be set as Infrastructure when it acts as the entry point of the infrastructure for the mobile vehicles and it is connected to a wired network (backbone) which possibly includes other Infrastructure nodes. The unit must be set as Infrastructure (wireless relay) ONLY when it is used as a wireless relay agent to other Infrastructure units. In this operating mode, the unit MUST NOT be connected to the wired network backbone as it will use the wireless connection to relay the data coming from the mobile units. The unit must be set as Vehicle when it is mobile. Vehicle ID must be set ONLY when the unit is configured as Vehicle. Specifically, Vehicle ID must be a unique among all the mobile units installed on the same vehicle. Unit installed on different vehicles must use different Vehicle IDs. The Network Type field must be set according to the general network architecture. Choose Flat if the mesh and the Infrastructure networks belong to a single layer-2 broadcast domain. Use Multiple Subnets if they are organized as different layer-3 routing domains.

Unit Role:

Network Type:

The following advanced settings allow to fine-tune the performance of the system depending on the specific environment. Please do not alter this settings unless you have read the manual first and you know what you are doing. The Handoff Logic controls the algorithm used by a mobile radio to select the best infrastructure point to connect to. In Normal mode, the point providing the strongest signal is selected. In Load Balancing mode, the mobile radio prefers the point which provides the best balance between signal strength and amount of traffic carried.

Handoff Logic:

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CHAPTER 5

Configuring Radio Antenna Settings

- [Configuring Radio Antenna Settings, on page 35](#)

Configuring Radio Antenna Settings

The Catalyst IW9167E supports eight external antennas with eight N-type female connectors to support multiple antenna options. The antenna ports 1, 4, and 5 can support self-identifying antennas (SIA). Radio 1 connects to ports 1 to 4, and Radio 2 connects to ports 5 to 8. For more information on antennas, see [Antennas and Radios](#).

The Catalyst IW9165E supports four external antennas with Reverse-polarity SMA (RP-SMA) (f) connectors. Radio 1 connects to antenna ports 1 and 2, Radio 2 connects to antenna ports 3 and 4, and antenna ports 1 and 3 can support SIA antennas.

The Catalyst IW9165D has a built-in directional antenna and supports two external antennas with N-type (f) connectors. Radio 1 connects to the internal antenna. Radio 2 connects to antenna ports 1 and 3. Antenna port 3 can support SIA antenna.

The following sections describe the CLI commands to manage antenna port and gain on each antenna for different Radio mode:

Configuring Antenna Gain

To configure an antenna gain, use the following CLI command:

Set the maximum antenna gain value in integer or string UNSELECTED.

For UNSELECTED, the background process automatically configures the minimum supported antenna gain.



Note Once the SIA is connected, gain sets automatically without any input.

```
Device# configure dot11radio <interface> antenna gain <gain>
gain:
<1-19> antenna gain in dBi
WORD UNSELECTED
Device# write
```

Configuring Transmit and Receive Antennas

To configure a transmission chain, use the following CLI command:



Note Catalyst IW9165 does not support abcd-antenna mode.

```
Device# configure dot11radio <interface> antenna < A >
configure antenna chains (A) in use as follows
a-antenna - configure dot11 antenna a
ab-antenna - configure dot11 antenna ab
abcd-antenna - configure dot11 antenna abcd
Device# write
```

Configuring Transmission Power

To configure a transmission power, use the following CLI command:

Set the maximum transmission power level. For AUTO, the background process automatically configures the maximum allowed power level one.



Note Eight is the lowest power level and one is the highest power level.

```
Device# configure dot11radio <interface> txpower-level <level>
txpower level:
<1-8> tx power level value
WORD AUTO
Device# write
```



CHAPTER 6

Configuring Wired Interface

- [Enabling and Disabling Wired Interface, on page 37](#)
- [Configuring Maximum Transmission Unit Settings, on page 38](#)

Enabling and Disabling Wired Interface

Configuring the wired interface is introduced from UIW Release 17.12.1 and this feature allows wire interfaces to be disabled. It is not possible to disable both wire interfaces at the same time. You can enable the wired interface using the CLI.

Enabling or disabling wired interface using CLI

To enable or disable specific wired interface, use the following CLI command:

```
Device# configure wired <0-1>
                disabled disable wired interface
                enabled enable wired interface
```

Example:

```
Device# configure wired 0 disabled
Device# configure wired 1 enabled
Device# write
Device# reload
```

Error handling configuration

The following CLI command shows the error when both the interfaces are configured as disable mode:

```
Device # configure wired 0 disabled
Device# configure wired 1 disabled
ERROR: Interface wired0 is disabled, cannot disable both interfaces
```

Verifying enabling and disabling wired interface using CLI

To verify enable or disable state of wired interface, use the following show command:

```
Device# #show wired <0-1> config
```

Example:

```
Device# show wired 0 config
WIRE0 status: enabled
```

```
Device# show wired 1 config
      WIREd1 status: disabled
```

Configuring Maximum Transmission Unit Settings

The maximum frame size that can be transported across the URWB network can be configured. This setting must be configured on every access point in the URWB network.

Configuring MTU setting using CLI

To change the MTU value for wired interfaces, use the following CLI command:

```
Device# configure wired mtu
      <1530-1600> Unsigned integer set wired mtu
```

Example:

```
Device# configure wired mtu 1600
Device# write
Device# reload
```

Verifying MTU setting using CLI

To verify the MTU value for wired interfaces, use the following show command:

```
Device# show wired mtu
```

Example:

```
Device# show wired mtu
      Configured MTU: 1600
```



CHAPTER 7

Configuring and Validating Radio Channel and Bandwidth

- [Configure Operating Channel from CLI, on page 39](#)
- [Configure Channel Bandwidth from CLI, on page 39](#)
- [Validating Operating Channel and Bandwidth from CLI, on page 40](#)
- [Configuring Radio Channel and Bandwidth from GUI, on page 40](#)
- [Configuring VLAN Settings, on page 41](#)
- [Rules for Packet Management, on page 42](#)
- [Configuring Fluidity using GUI, on page 43](#)
- [Configuring Fluidity using CLI, on page 47](#)
- [Configuring Fluidity Coloring, on page 48](#)

Configure Operating Channel from CLI

Step 1 Configure the wireless device with radio interface number < 1 or 2 >.

```
Device# configure dot11Radio <interface>
```

Step 2 Set the operating channel id.

```
Device# configure dot11Radio [1|2] channel <1 to 256>
```

Step 3 Returns to privileged EXEC mode.

```
Device(configure dot11Radio [1|2] channel <1 to 256>)# end
```

Configure Channel Bandwidth from CLI

1. Configure the wireless device with radio interface number <1 or 2>.

```
Device# configure dot11Radio <interface>
```

2. Set channel bandwidth in MHz.

- Radio 1 supports 20, 40, and 80 MHz bandwidths.
- Radio 2 supports 20, 40, 80, and 160 MHz bandwidths.

```
Device# configure dot11Radio [1|2] band-width [20|40|80|160]
```

3. Returns to privileged EXEC mode.

```
Device (configure dot11Radio [1|2] band-width [20|40|80|160])# end
```

Validating Operating Channel and Bandwidth from CLI

To validate radio channel and bandwidth, use the following show command:

```
Device# show dot11Radio <interface> config
```

Example:

```
Device# show dot11Radio 1 config
Interface : enabled
Mode : fluidmax secondary
Frequency : 5180 MHz
Channel : 36
Channel width : 40 MHz
```

```
Device# show dot11Radio 2 config
Interface : enabled
Mode : fluidity
Frequency : 5785 MHz
Channel : 157
Channel width : 40 MHz
```

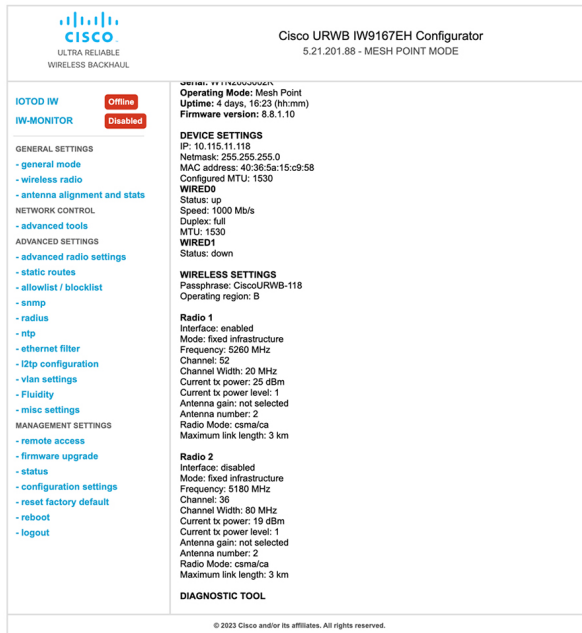
Configuring Radio Channel and Bandwidth from GUI

To configure Radio channel and bandwidth using GUI, set the operating channel ID, Radio mode as Fluidity or fixed infrastructure and set the Radio frequency range and bandwidth.

Following image shows the configuration of Radio channel and bandwidth:



Following image shows the status of Radio channel and bandwidth configuration and specific information of each wireless interface.



Configuring VLAN Settings

Default VLAN configuration parameters for the access point are:

Parameter	Default value
Management VLAN ID (MVID)	1
Native VLAN ID (NVID)	1

To connect the access point to a VLAN that is part of the local wireless network, follow these steps:

Step 1 In the **ADVANCED SETTINGS**, click **vlan settings**.

The **VLAN SETTINGS** window appears.

VLAN SETTINGS

When the Native VLAN is enabled (VID != 0), untagged packets received on the trunk port will be assigned to the specified VLAN ID. When disabled (VID = 0), VLAN trunking will operate according to the IEEE 802.1Q standard, i.e. only tagged packets will be allowed on the port (including those of the management VLAN).

VLAN Settings

Enable VLANs:

Management VLAN ID:

Native VLAN ID:

Step 2 Check the **Enable VLANs** checkbox to connect the access point to a VLAN that is part of the local wireless network.

Step 3 Enter the management identification number of the VLAN in the **Management VLAN ID** field. For detailed info about vlan settings and packet management, see [Rules for Packet Management](#).

Note The same **Management VLAN ID** must be used on all the access points that are part of the same mesh network.

Step 4 Enter the native identification number of the VLAN in the **Native VLAN ID** field.

Step 5 Click **Save**.

Rules for Packet Management

Traffic Management

The incoming data packets are classified based on the following parameter values:

Access port rules management for incoming packets with an access point in smart mode	
Untagged packet	<p>If native VLAN is ON, then the packet is allowed (tagged with NVID)</p> <p>If native VLAN is OFF, then the packet is dropped</p>

Access port rules management for incoming packets with an access point in smart mode	
Tagged packet (any VID without any check)	Packet allowed with original tag
Access port rules management for outgoing packets with an access point in smart mode	
Packets from the access points (for example: IoT OD IW interface)	Packet tagged with MVID
Signaling traffic	Packet tagged with MVID
Tagged with valid VID (1–4094), but not with NVID	Packet allowed (tagged)
Tagged with null VID (0) or NVID	Packet allowed (untagged)



Note The packets transmitted through the Cisco VIC SFP+ interface is always tagged with a VLAN header. The interface transmits outgoing packets are classified as untagged with an IEEE 802.1p header with a VLAN ID tag of 0.

Configuring Fluidity using GUI

To configure a Fluidity mode using GUI, follow these scenarios:

1. In the **GENERAL SETTINGS**, click **wireless radio**.
The **WIRELESS RADIO** window appears.
2. Choose Radio mode as **Fluidity** from the **Role** drop-down list.

The screenshot shows the Cisco URWB IW9167EH Configurator interface. The main title is "Cisco URWB IW9167EH Configurator" with the version "5.21.201.72 - MESH END MODE". The left sidebar contains a navigation menu with categories like "GENERAL SETTINGS", "NETWORK CONTROL", "ADVANCED SETTINGS", and "MANAGEMENT SETTINGS". The "WIRELESS RADIO" section is selected, showing "Wireless Settings" with a "Shared Passphrase" field containing "PASSWORD". Below this, "Radio 1 Settings" are visible, with "Role" set to "Fluidity", "Frequency (MHz)" set to "5180", and "Channel Width (MHz)" set to "80". "Radio 2 Settings" are shown as "Disabled". "Reset" and "Save" buttons are at the bottom of the settings area.

Once you choose Radio role as **Fluidity**, go to **Fluidity** settings. To go to Fluidity, follow these steps:

1. In the **ADVANCED SETTINGS**, click **Fluidity**.

The **FLUIDITY** window appears.

2. In the **Fluidity Settings**, choose **Unit Role** from the drop-down list. Make device role as any one of following mode:
 - Infrastructure
 - Infrastructure (wireless relay)
 - Vehicle



Note

- Vehicle ID must be unique among all the mobile devices installed on the same vehicle.
- If the device installed on different vehicles must use different Vehicles IDs'.

3. Check the **Automatic Vehicle ID** check box to automatically set Vehicle ID for mobile units.

Cisco URWB IW9167EH Configurator
5.21.201.72 - MESH END MODE

IOTOD IW Offline

FM-QUADRO

GENERAL SETTINGS

- general mode
- wireless radio
- antenna alignment and stats

NETWORK CONTROL

- advanced tools

ADVANCED SETTINGS

- advanced radio settings
- static routes
- allowlist / blocklist
- multicast
- snmp
- radius
- ntp
- i2tp configuration
- vlan settings
- Fluidity
- misc settings
- smart license

MANAGEMENT SETTINGS

- remote access
- firmware upgrade
- status
- configuration settings
- reset factory default
- reboot
- logout

FLUIDITY

Fluidity Settings

The unit can operate in 3 modes: Infrastructure, Infrastructure (wireless relay), Vehicle.
The unit must be set as Infrastructure when it acts as the entry point of the infrastructure for the mobile vehicles and it is connected to a wired network (backbone) which possibly includes other Infrastructure nodes. The unit must be set as Infrastructure (wireless relay) ONLY when it is used as a wireless relay agent to other Infrastructure units. In this operating mode, the unit MUST NOT be connected to the wired network backbone as it will use the wireless connection to relay the data coming from the mobile units.
The unit must be set as Vehicle when it is mobile. Vehicle ID must be set ONLY when the unit is configured as Vehicle. Specifically, Vehicle ID must be a unique among all the mobile units installed on the same vehicle. Unit installed on different vehicles must use different Vehicle IDs.
The Network Type field must be set according to the general network architecture. Choose Flat if the mesh and the infrastructure networks belong to a single layer-2 broadcast domain. Use Multiple Subnets if they are organized as different layer-3 routing domains.

Unit Role:

Automatic Vehicle ID: Enable

Vehicle ID:

Network Type:

The following advanced settings allow to fine-tune the performance of the system depending on the specific environment. Please do not alter this settings unless you have read the manual first and you know what you are doing.
The Handoff Logic controls the algorithm used by a mobile radio to select the best infrastructure point to connect to. In Normal mode, the point providing the strongest signal is selected. In Load Balancing mode, the mobile radio prefers the point which provides the best balance between signal strength and amount of traffic carried.

Handoff Logic:

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Cisco URWB IW9167EH Configurator
5.21.201.72 - MESH END MODE

IOTOD IW Offline

FM-QUADRO

GENERAL SETTINGS

- general mode
- wireless radio
- antenna alignment and stats

NETWORK CONTROL

- advanced tools

ADVANCED SETTINGS

- advanced radio settings
- static routes
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MANAGEMENT SETTINGS

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FLUIDITY

Fluidity Settings

The unit can operate in 3 modes: Infrastructure, Infrastructure (wireless relay), Vehicle.
The unit must be set as Infrastructure when it acts as the entry point of the infrastructure for the mobile vehicles and it is connected to a wired network (backbone) which possibly includes other Infrastructure nodes. The unit must be set as Infrastructure (wireless relay) ONLY when it is used as a wireless relay agent to other Infrastructure units. In this operating mode, the unit MUST NOT be connected to the wired network backbone as it will use the wireless connection to relay the data coming from the mobile units.
The unit must be set as Vehicle when it is mobile. Vehicle ID must be set ONLY when the unit is configured as Vehicle. Specifically, Vehicle ID must be a unique among all the mobile units installed on the same vehicle. Unit installed on different vehicles must use different Vehicle IDs.
The Network Type field must be set according to the general network architecture. Choose Flat if the mesh and the infrastructure networks belong to a single layer-2 broadcast domain. Use Multiple Subnets if they are organized as different layer-3 routing domains.

Unit Role:

Automatic Vehicle ID: Enable

Network Type:

The following advanced settings allow to fine-tune the performance of the system depending on the specific environment. Please do not alter this settings unless you have read the manual first and you know what you are doing.
The Handoff Logic controls the algorithm used by a mobile radio to select the best infrastructure point to connect to. In Normal mode, the point providing the strongest signal is selected. In Load Balancing mode, the mobile radio prefers the point which provides the best balance between signal strength and amount of traffic carried.

Handoff Logic:

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Following Fluidity configuration shows wireless interface device role configured as infrastructure mode:

The following image shows, both radios must be configured as Fluidity for role Vehicle. if one wireless interface is configured in fixed mode and the other one is configured in Fluidity mode then unit role Vehicle cannot be selected.

Configuring Fluidity using CLI

To enable Fluidity, use the following CLI commands:



Note At least one radio interface should be in Fluidity mode.

```
Device# configure dot11Radio <interface> mode fluidity
```

Example to enable Fluidity for radio 1:

```
configure dot11Radio 1 mode fluidity
```

If the desired Fluidity role is Vehicle both radios should be in Fluidity mode:

```
configure dot11Radio 1 mode fluidity
configure dot11Radio 2 mode fluidity
```

Configuring Fluidity Role using CLI

To configure Fluidity role (infra or client), use the following CLI commands:

1. Configure the Fluidity role (infrastructure or mobile).

```
Device# configure fluidity id
```

2. Configure Fluidity id mode.

```
Device# configure fluidity id {mode}
Mode is one of the following values
vehicle-auto - vehicle mode with automatic vehicle ID selection
vehicle ID - (alphanumeric) vehicle mode with manual ID.
infrastructure - infrastructure mode
wireless-relay - wireless infrastructure with no ethernet connection to the backhaul
```

3. To end this configuration, use the following CLI command:

```
Device (configure fluidity id {mode}) # end
```

```
Device# wr
```

Example:

```
Device# configure fluidity id [vehicle-auto | infrastructure | vehicle-id |
wireless-relay]
```

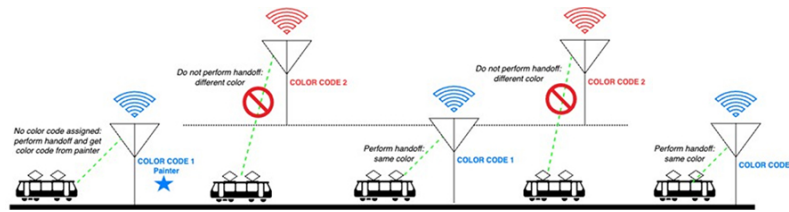
Configuring Fluidity Coloring

Fluidity Coloring is introduced from UIW Release 17.12.1. It enables wayside or outside devices (Fluidity infrastructure devices) to be given specific color codes to enhance or drive the handoff process, and with the standard configuration handoff decision is made based on received signal strength indication (RSSI).

Typical use case: When a train is travelling on one side of the track in one direction (metro line with single tunnel for both track directions) and does not need to connect to the access point located on the opposite side of the tunnel, so mark the access point on each side with a different color to prevent occasional handovers to infrastructure devices on the opposite track.

Fluidity Coloring Logic

The following image explains the Fluidity coloring logic and painter is a key role for wayside or outside device (Fluidity infrastructure device):



The process of Fluidity coloring as follows:

- Based on the color code, painter notifies the Fluidity vehicle device which Fluidity infrastructure devices are suitable for the handoff.
- The Fluidity vehicle device ignores the color settings and continues to use the standard handoff mechanism (based on RSSI level) until it detects a painter.
- Once the Fluidity vehicle device completes the handoff on a Fluidity infrastructure device with the painter configuration, it starts considering only Fluidity infrastructure devices with the same color code or other painters Fluidity infrastructure devices.
- Multiple Fluidity infrastructure devices acting as painters are allowed.

The following table explains the Fluidity color role and its corresponding options:

Table 4: Fluidity Coloring Role

Fluidity Coloring Role	Options
Wayside painter (Fluidity infrastructure device)	Only one color code can be assigned to a Fluidity infrastructure device configured as a painter
Wayside standard (Fluidity infrastructure device)	A non-painter Fluidity infrastructure device can be configured with multiple color codes
Fluidity vehicle	Only one color can be assigned to Fluidity vehicle device

Configuring Fluidity Coloring using CLI

To configure a Fluidity color mode, use the following CLI commands:

```
Device# configure fluidity color mode
        Disabled: disable coloring
        Enabled: enable coloring

Device# configure fluidity color value
WORD quoted list of colors from 1 to 7 or "p X" for painter (for example: "1 2 6","4", "p 1"). "clear" to reset
```

Example (painter):

```
Device# configure fluidity color mode enabled
Device# configure fluidity color value "p 1"
Device# write
Device# reload
```

Example (non-painter):

```
Device# configure fluidity color mode enabled
Device# configure fluidity color value "3 4 5"
```

```
Device# write
Device# reload
```

Example (clear):

```
Device# configure fluidity color value clear
Device# write
Device# reload
```

Verifying Fluidity Coloring using CLI

To verify a Fluidity color mode, use the following show commands:

```
Device# #show fluidity config
```

Example (painter):

```
Device# show fluidity config
...
Color: enabled, current: p 1
...
```

Example (non-painter):

```
Device# show fluidity config
...
Color: enabled, current: 3 4 5
...
```

Example (clear):

```
Device# show fluidity config
...
Color: enabled, current: 0
...
```

Configuring Fluidity Coloring RSSI Threshold

The Fluidity vehicle device temporarily ignore the Fluidity coloring settings if there is a coverage hole and the current RSSI is less than the configured RSSI threshold. In this case, the Fluidity vehicle device retain it's Fluidity coloring settings and ignores them until it receives a handoff from a Fluidity infrastructure device that has the current color code. The Fluidity vehicle device resets its Fluidity coloring settings to the default value (no color) after four consecutive handoffs on a Fluidity infrastructure device with color codes differs from the present value.

Configuring Fluidity Coloring RSSI Threshold using CLI

```
Device# configure fluidity color rssi-threshold
<0-96> COLOR_RSSI_THRESHOLD
```

Example:

```
Device# configure fluidity color rssi-threshold 55
Device# write
Device# reload
```

Verifying Fluidity Coloring RSSI Threshold using CLI

```
Device# show fluidity config
```

Example:

```
Device# show fluidity config
...
```

```
Color: enabled, current: 0  
Color min RSSI threshold: 55
```




CHAPTER 8

Configuring and Validating High Efficiency (802.11 ax)

- [Configuring and Validating High Efficiency, on page 53](#)
- [Configuring Global Gateway from GUI, on page 54](#)

Configuring and Validating High Efficiency

When High Efficiency (HE) is enabled, it is backward compatible with 802.11ac. To enable or disable 802.11ax HE, the following list is supported:

- URWB HE supports 20,40, and 80 MHz bandwidth for slot 1
- URWB HE supports 20,40,80, and 160 MHz bandwidth for slot 2
- URWB HE default setting is disabled
- HE negotiation is only supported between the devices with HE enabled

To enable HE mode, use the following CLI command:

```
Device# configure dot11Radio [1|2] high-efficiency enable
```

To configure maxmcs as 11, use the following CLI command:

```
Device# configure dot11Radio [1|2] mcs maxmcs 11 <mcs index in integer or string>
```



Note The default maxmcs is Nine.

To disable HE mode, use the following CLI command:

```
Device# configure dot11Radio [1|2] high-efficiency disable  
default maxmcs is 9.
```

To validate HE mode, use the following show command:

```
Device# show dot11Radio 1 config  
Maximum tx mcs : 9  
High-Efficiency : Enabled  
Maximum tx nss : 2  
RTS Protection : disabled  
guard-interval : 800ns
```

```
Device# show dot11Radio 2 config
Maximum tx mcs : 9
High-Efficiency : Enabled
Maximum tx nss : 2
RTS Protection : disabled
guard-interval : 800ns
```

```
Device# show eng-stats
```

WLAN1 Rx:

```
FC:58:9A:16F8:52 rate 1201 MCS 11/2 HE80/G1(800ns) ssn 48 rssi-48 received
```

WLAN1 Tx:

```
FC:58:9A:16F8:52 rate 1201 MCS 11/2 HE80/G1(800ns) sent 195612 failed 0
```

WLAN2 Rx:

```
FC:58:9A:16F8:13 rate 1201 MCS 11/2 HE80/G1(800ns) ssn 50 rssi-46 received
```

WLAN2 Tx:

```
FC:58:9A:16F8:13 rate 864 MCS 11/2 HE80/G1(800ns) sent 390797 failed 1
```

Configuring Global Gateway from GUI

Global gateway mode automatically enforces the MPLS Layer 3. In this mode, Radio-off and Radio status cannot be changed.

1. In the **GENERAL SETTINGS**, click **general mode**.

The **GENERAL MODE** window appears.

2. Click **gateway** from **Mode**.

Following images shows the GUI configuration of global gateway mode:

The screenshot shows the Cisco URWB IW9167EH Configurator interface. The top header includes the Cisco logo and the text "Cisco URWB IW9167EH Configurator 5.21.201.72 - MESH END MODE". On the left, there is a navigation menu with categories like "GENERAL SETTINGS", "NETWORK CONTROL", "ADVANCED SETTINGS", and "MANAGEMENT SETTINGS". The main content area is titled "GENERAL MODE" and contains the following sections:

- General Mode:** A note states "Global Gateway mode automatically enforces MPLS layer 3 and radio-off. Radio status cannot be changed in Global Gateway mode." Below this, there are radio buttons for "mesh point", "mesh end", and "gateway", with "gateway" selected.
- Radio-off:** A dropdown menu is set to "Fluidity".
- LAN Parameters:** Fields for "Local IP" (10.115.11.117), "Local Netmask" (255.255.255.0), "Default Gateway" (10.115.11.1), "Local Dns 1" (8.8.8.8), and "Local Dns 2" (empty).

At the bottom of the main content area are "Reset" and "Save" buttons. A copyright notice "© 2022 Cisco and/or its affiliates. All rights reserved." is at the very bottom.

WIRELESS RADIO

The screenshot shows the "Wireless Settings" configuration page. It includes the following elements:

- Wireless Settings:** A note explaining that the "Shared Passphrase" is an alphanumeric string or special characters (excluding [apex], [double apex], [backtick], [dollar], [equal], [backslash], and whitespace) that identifies the network. It must be the same for all Cisco URWB units on the same network.
- Shared Passphrase:** A text input field containing "CiscoURWB".
- Frequency Note:** A note stating "In order to establish a wireless connection between Cisco URWB units, they need to be operating on the same frequency."
- Radio 1 Settings:** A dropdown menu for "Role" set to "Disabled".
- Radio 2 Settings:** A dropdown menu for "Role" set to "Disabled".

At the bottom are "Reset" and "Save" buttons.

FLUIDITY

Fluidity Settings

The unit can operate in 3 modes: Infrastructure, Infrastructure (wireless relay), Vehicle.
The unit must be set as Infrastructure when it acts as the entry point of the infrastructure for the mobile vehicles and it is connected to a wired network (backbone) which possibly includes other Infrastructure nodes. The unit must be set as Infrastructure (wireless relay) ONLY when it is used as a wireless relay agent to other Infrastructure units. In this operating mode, the unit MUST NOT be connected to the wired network backbone as it will use the wireless connection to relay the data coming from the mobile units.
The unit must be set as Vehicle when it is mobile. Vehicle ID must be set ONLY when the unit is configured as Vehicle. Specifically, Vehicle ID must be a unique among all the mobile units installed on the same vehicle. Unit installed on different vehicles must use different Vehicle IDs.
The Network Type field must be set according to the general network architecture. Choose Flat if the mesh and the infrastructure networks belong to a single layer-2 broadcast domain. Use Multiple Subnets if they are organized as different layer-3 routing domains.

Unit Role: Infrastructure ▾

Network Type: Multiple subnets ▾

The following advanced settings allow to fine-tune the performance of the system depending on the specific environment. Please do not alter this settings unless you have read the manual first and you know what you are doing.

The Handoff Logic controls the algorithm used by a mobile radio to select the best infrastructure point to connect to. In Normal mode, the point providing the strongest signal is selected. In Load Balancing mode, the mobile radio prefers the point which provides the best balance between signal strength and amount of traffic carried.

Handoff Logic: Standard ▾

Reset

Save



CHAPTER 9

Configuring Guard Interval for HE (High Efficiency)

- [Configuring Guard Interval for HE \(High Efficiency\), on page 57](#)

Configuring Guard Interval for HE (High Efficiency)

Longer guard intervals improve link reliability for long range outdoor deployments and the feature like guard interval supports URWB stacks.

To configure a guard interval, use the following CLI command:

```
Device# configure dot11Radio [interface] guard-interval [gi]
```

gi - Guard interval values are:

1600 - To configure 1600 ns guard interval (supported only in HE mode)

3200 - To configure 3200 ns guard interval (supported only in HE mode)

400 - To configure 400 ns guard interval (supported in HT and VHT modes)

800 - To configure 800 ns guard interval (default guard interval mode and disable mode in HT, VHT, and HE)

Example:

```
Device# configure dot11Radio 1 high-efficiency enable
```

```
Device# configure dot11Radio 1 guard-interval 1600
```

```
Device# configure dot11Radio 1 guard-interval 3200
```

```
Device# wr
```

To validate a guard interval, use the following show commands:

```
Device# show dot11Radio 1 config
```

```
Maximum tx mcs: 9  
High-efficiency : enabled  
Maximum tx nss : 2  
RTS protection : disabled  
guard-interval : 1600 ns
```

```
Device# show dot11Radio 2 config
```

```
Maximum tx mcs: 9  
High-efficiency : enabled
```

```
Maximum tx nss : 2  
RTS protection : disabled  
guard-interval : 3200 ns
```



CHAPTER 10

Configuring and Validating SNMP

- [Configuring and Validating SNMP, on page 59](#)

Configuring and Validating SNMP

Simple network management protocol (SNMP) applications are used in URWB software for network management functionalities.

The SNMP client sends a request to the SNMP agent. The SNMP agent passes the request to the subagent. The subagent responds to the SNMP agent. The SNMP agent creates an SNMP response packet and sends it to the remote network management station that initiates the request.

Figure 1: SNMP Process



Configuring SNMP from CLI

To configure SNMP, use the following CLI commands:



- Note**
- SNMP CLI logic modified for SNMP configuration, before enabling the SNMP feature using CLI, you must configure all SNMP parameters.
 - Disabling the SNMP feature automatically removes all related configurations.

To enable or disable SNMP functionality, use the following CLI command:

```
Device#configure snmp [enable | disable]
```

To specify the SNMP protocol version, use the following CLI command:

```
Device#configure snmp version {v2c | v3}
```

To specify the SNMP v2c community ID number (SNMP v2c only), use the following CLI command:

```
Device#configure snmp v2c community-id <length 1-64>
```

To specify the SNMP v3 username (SNMP v3 only), use the following CLI command:

```
Device#configure snmp v3 username <length 32>
```

To specify the SNMP v3 user password (SNMP v3 only), use the following CLI command:

```
Device#configure snmp v3 password <length 8-64>
```

To specify the SNMP v3 authentication protocol (SNMP v3 only), use the following CLI command:

```
Device#configure snmp auth-method <md5|sha>
```

To specify the SNMP v3 encryption protocol (SNMP v3 only), use the following CLI command:

```
Device#configure snmp encryption {des | aes | none}
```

Possible encryption values are des or aes. Alternatively, enter none if a v3 encryption protocol is not needed.

To specify the SNMP v3 encryption passphrase (SNMP v3 only), use the following CLI command:

```
Device#configure snmp secret <length 8-64>
```

To specify the SNMP periodic trap settings, use the following CLI command:

```
Device#configure snmp periodic-trap {enable | disable}
```

To specify the notification trap period for periodic SNMP traps, use the following CLI command:

```
Device#configure snmp trap-period <1-2147483647>
```

Notification value trap period measured in minutes.

To enable or disable SNMP event traps, use the following CLI command:

```
Device#configure snmp event-trap {enable | disable}
```

To specify the SNMP NMS hostname or IP address, use the following CLI command:

```
Device#configure snmp nms-hostname {hostname | Ip Address}
```

To disable SNMP configuration, use the following CLI command:

```
Device#configure snmp disabled
```

Once you disable SNMP, it clears all the sensitive information including credentials. You have to re-specify all the valid values again to enable SNMP.

Example of SNMP configuration:

CLI for SNMP v2:

```
Device#configure snmp v2 community-id <length 1-64>
Device#configure snmp nms-hostname hostname/Ip Address
Device#configure snmp trap-period <1-2147483647>
Device#configure snmp periodic-trap enable/disable
Device#configure snmp event-trap enable/disable
Device#configure snmp version v2c
Device#configure snmp enabled
```

CLI for SNMP v3:

```
Device #configure snmp nms-hostname hostname/Ip Address
Device#configure snmp trap-period <1-2147483647>
Device#configure snmp v3 username <length 32>
Device#configure snmp v3 password <length 8-64>
Device#configure snmp auth-method <md5|sha>
Device#configure snmp encryption <aes|des|none>
Device#configure snmp secret <length 8-64>
Device#configure snmp periodic-trap enable/disable
Device#configure snmp event-trap enable/disable
Device#configure snmp version v3
Device#configure snmp enabled
```

Validating SNMP from CLI

To validate the SNMP, use the following show command:

```
Device# show snmp
SNMP: enabled
Version: v3
Username: username
Password: password
Authentication method: SHA
Encryption: AES
Encryption Passphrase: passphrase
Engine ID: 0x8000000903c0f87fe5f314
Periodic Trap: enabled
Notification Period (minutes): 5
Event Trap: enabled
NMS hostname: 192.168.116.11
Device# show snmp
SNMP: enabled
Version: v2c
Community ID: test
Periodic Trap: enabled
Notification Period (minutes): 5
Event Trap: enabled
NMS hostname: 192.168.116.11
Device# show system status snmpd
Service Status
Service Name : snmpd
Loaded : loaded
Active : active (running)
Main ProcessID : 6437
Running Since : Mon 2022-09-19 14:45:27 UTC; 3h 34min ago
Service Restart : 0
```

Configuring SNMP Version v2c using GUI

By default, the access points are shipped from the factory with SNMP in disabled mode.

To change the access point's SNMP mode to version **v2c** and configure the access point, follow these steps:

-
- Step 1** Choose the version **v2c** from the **SNMP mode** drop-down list.
The **SNMP** window appears.

Step 2 Enter the community identity value in the **Community ID** field.

Important The same community identity value must be set for all the access points in the network.

Step 3 Check the **Enable SNMP event trap** check box to enable SNMP event traps for significant system-related events, and then enter the network management station (NMS) host name in the **NMS hostname** field.

Important The NMS host to which traps are sent must have an SNMP agent that is configured to collect SNMP v2c traps.

Step 4 Check the **Enable SNMP periodic trap** check box to enable periodic SNMP traps to send SNMP traps at defined periodic intervals and then enter the host name of NMS in the **NMS hostname** field. Enter the notification period (minutes) in the **Notification period**.

Step 5 Click **Save**.

Configuring SNMP Version v3 using GUI

By default, the access points are shipped from the factory with SNMP in disabled mode.

To change the access point's SNMP mode to version **v3** and then configure the access point, follow these steps:

Step 1 Choose the version **v3** from the **SNMP mode** drop-down list. The **SNMP** window appears.

Step 2 Enter the SNMP v3 username in the **SNMP v3 username** field.

Note The same SNMP v3 username must be set for all the access points in the network.

Step 3 To change the current SNMP v3 password, enter the new password in the **SNMP v3 password** field.

Step 4 Choose the authentication type from the **SNMP v3 authentication proto** drop-down list. The available options are:

- MD5
- SHA

Important The same SNMP authentication protocol must be set for all the access points in the network.

Step 5 Choose the appropriate encryption protocol from the **SNMP v3 encryption** drop-down list. The available options are:

- No Encryption
- DES (Data Encryption Standard)
- AES (Advanced Encryption Standard)

Note The same encryption protocol must be set for all the access points in the network.

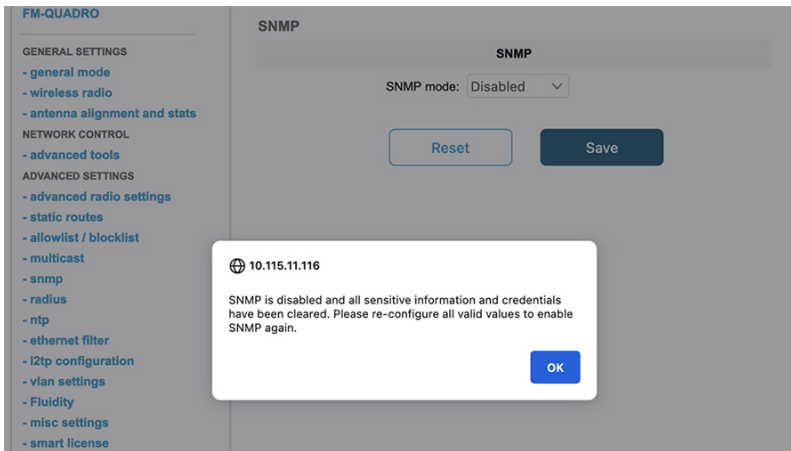
Step 6 To change the encryption passphrase, enter a new passphrase in the **SNMP v3 encryption passphrase** field.

Step 7 Check the **Enable SNMP periodic trap** check box to enable the periodic SNMP traps to send SNMP traps at defined periodic intervals and then enter the host name of NMS in the **NMS hostname** field. Enter the notification period (minutes) in the **Notification period**.

Step 8 Check the **Enable SNMP event trap** check box to enable the SNMP event traps for significant system-related events and then enter the host name of NMS in the **NMS hostname** field.

Note The NMS host to which traps are sent must have an SNMP agent configured to collect v3 traps.

- Step 9** Click **Save**.
If you disable the SNMP, the following pop-up appears:





CHAPTER 11

Configuring and Validating Key Controller (Wireless Security)

- [Configuring and Validating Key Controller \(Wireless Security\)](#), on page 65

Configuring and Validating Key Controller (Wireless Security)

To support wireless security to standard Wi-Fi Protected Access (WPA) protocols, a key rotation strategy is implemented for Catalyst IW9167E. The key controller protocol is a packet exchange between two devices, in which different stages of the process correspond to different states of each device. The algorithm flow is controlled by a set of timers scheduled periodically to generate new Pairwise Transient Key/Group Transient Key for packet encryption. The more frequently keys are updated, the lesser amount of information is leaked in the event of an attack.

Configuring Key Controller from CLI

To configure a key controller, use the following CLI commands:

1. To enable Advanced Encryption Standard (AES) on Radio, use the following CLI command:

```
Device# configure dot11Radio <interface> crypto aes enable
```

2. To enable key controller, use the following CLI command:

```
Device #configure dot11Radio <interface> crypto key-control enable
```

3. To enable key rotation, use the following CLI command:

```
Device# configure dot11Radio <interface> crypto key-control key-rotation enable
```

4. To set key rotation timer, use the following CLI command:

```
Device# configure dot11Radio <interface> crypto key-control key-rotation 3600
```



Note By default, AES mode is disabled. Configuration should be same on all devices.

Validating Key Controller from CLI

To validate a key controller, use the following show command:

```
Device# show dot11Radio X crypto
AES encryption: enabled
AES key-control: enabled
Key rotation: enabled
Key rotation timeout: 3600(second)
```



CHAPTER 12

Configuring, Supporting the Fixed Domains and Country Codes (ROW)

- [Configuring and Verifying Country Code using CLI, on page 67](#)
- [Configuring Country Code using GUI, on page 68](#)
- [Supporting Fixed Domains and Country Codes \(ROW\), on page 71](#)

Configuring and Verifying Country Code using CLI

To configure country code for the Rest of the World (ROW) domain, use the following CLI command:

```
Device# configure countrycode [countrycode]
```

Example:

```
Configure countrycode GB
```

The above CLI reports an error if the configured country code is not included in the ROW and the wireless interface does not work correctly if the country code is not configured.



Note Reboot the device before configuring other wireless parameters such as frequency, channel width, and after configuring country code. Setting the country code is only applicable for access points with the ROW domain, such as IW9167EH-ROW.

To verify status of country code, use the following show command:

```
Device# show version | in Product  
Product/Model Number: IW9167EH-ROW
```

To verify status of ROW country code, use the following show command:

```
Device# show dot11Radio <interface> config
```

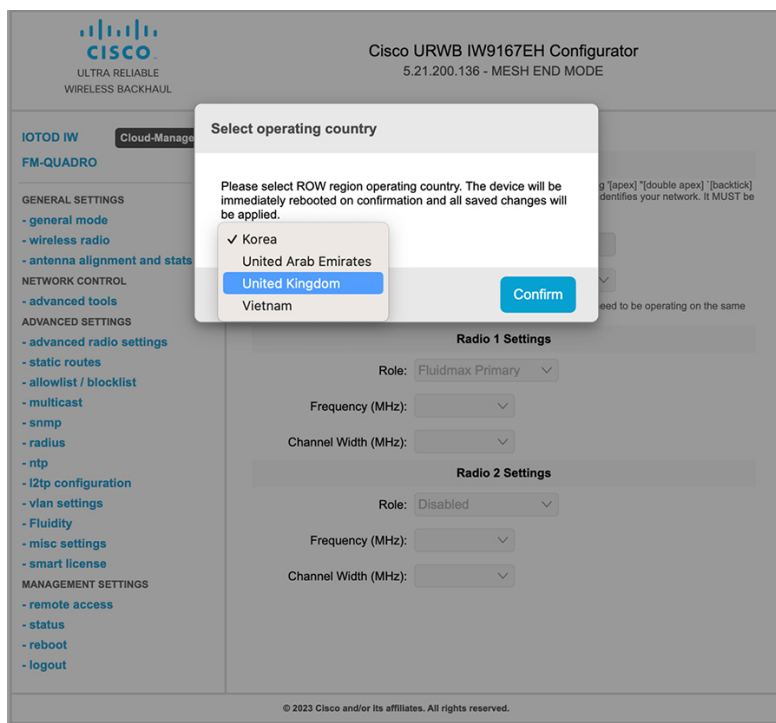
Example:

```
Device# show dot11Radio 1 config  
.....  
DFS region : GB  
DFS radar role : auto  
Radar Detected : 0  
Indoor deployment: disable
```

Configuring Country Code using GUI

Wireless interfaces fail to work if country code is not configured. To configure the country code:

1. In the **GENERAL SETTINGS**, click **wireless radio**.
2. For ROW domain, if the country code is not selected, the following pop-up appears:



3. To select a country code, click the pop-up in the above image then it redirects to the **Wireless Settings** section. In the **Wireless Settings** section, choose country from the drop-down list.

A confirmation pop-up appears.

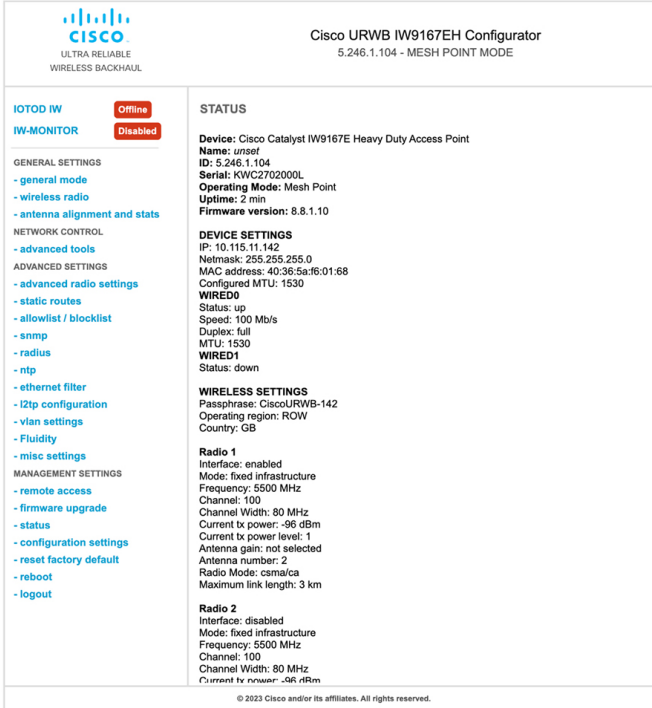
4. Click **Confirm**.

A reboot confirmation screen appears.

5. Click **Yes**.

6. In the **MANAGEMENT SETTINGS**, click **status**.

In the **STATUS** page, check the details of operating region and country for confirmation.

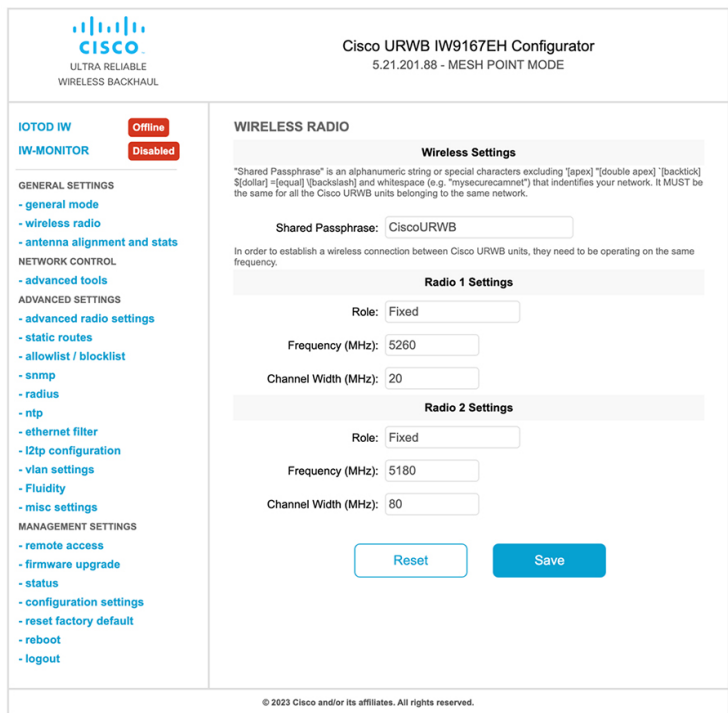


The screenshot displays the Cisco URWB IW9167EH Configurator interface. The top left shows the Cisco logo and 'ULTRA-RELIABLE WIRELESS BACKHAUL'. The top right identifies the device as 'Cisco URWB IW9167EH Configurator' in '5.246.1.104 - MESH POINT MODE'. The main content is divided into two columns. The left column contains a navigation menu with categories like 'IOTOD IW' (Online), 'IW-MONITOR' (Disabled), 'GENERAL SETTINGS', 'NETWORK CONTROL', 'ADVANCED SETTINGS', 'MANAGEMENT SETTINGS', and 'LOGOUT'. The right column shows the 'STATUS' page, which includes device information (Name: unset, ID: 5.246.1.104, Serial: KWC2702000L, Operating Mode: Mesh Point, Uptime: 2 min, Firmware version: 8.8.1.10), 'DEVICE SETTINGS' (IP: 10.115.11.142, Netmask: 255.255.255.0, MAC address: 40:36:5a:f6:01:68, Configured MTU: 1530, WIREDO status: up, Speed: 100 Mb/s, Duplex: full, MTU: 1530, WIREDD status: down), and 'WIRELESS SETTINGS' (Passphrase: CiscoURWB-142, Operating region: ROW, Country: GB). It also details 'Radio 1' (enabled, 5500 MHz, 80 MHz channel, -96 dBm power) and 'Radio 2' (disabled, 5500 MHz, 80 MHz channel, -96 dBm power). A copyright notice for 2023 Cisco is at the bottom.

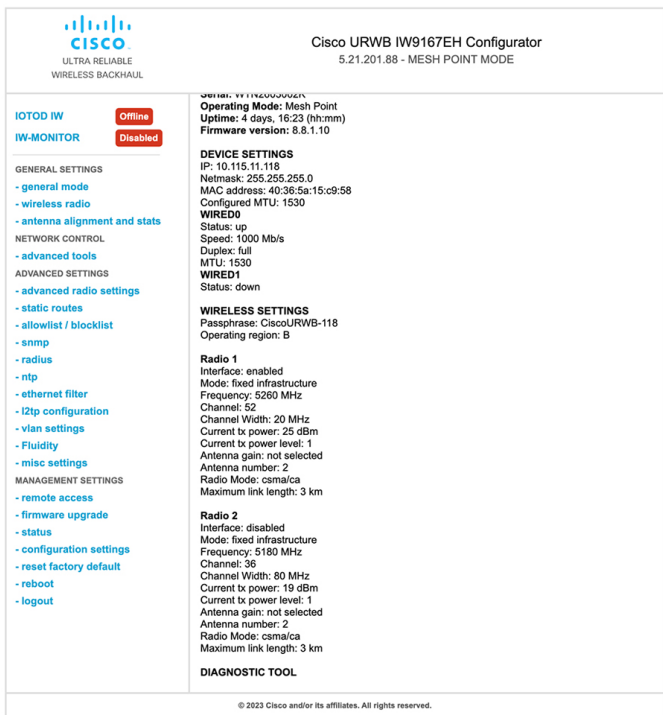
- To establish a wireless connection between devices, set the same operating frequency in radio devices.



Note Shared Passphrase must be same for all the devices belonging to the same network.



Following image shows the configuration of country code using GUI:



Supporting Fixed Domains and Country Codes (ROW)

The ROW reg domain simplifies the domain management of the manufacturing process for all the country codes that do not have a specific domain mapped. The fixed domain and country code support for the Catalysts IW9167E, IW9165E, and IW9165D access points are described in this section.

Catalyst IW9167E Supported Fixed Domains

Domain	Indoor Deployment Support
A	No
B	N/A
E	Yes
F	No
Q	No
Z	No



Note Outdoor and indoor frequencies are same for the B domain.

Catalyst IW9167E Supported Country Codes (ROW)

Domain ROW Country Code	Indoor Deployment Support
KR (Korea)	No
VN (Vietnam)	N/A
GB (Great Britain)	Yes
IN (India)	No
PE (Peru)	No
PH (Philippines)	No
ZA (South Africa)	No
AR (Argentina)	No
HK (Hong Kong)	No
PK (Pakistan)	No
UY (Uruguay)	No



Note You can select only the listed country codes using CLI or GUI.
For ROW domain, select the country code for the device to work.
IS (Iceland) and MC (Monaco) are supported using EU domain.

Catalyst IW9165E Supported Fixed Domains

Domain	Indoor Deployment Support
A	Yes
B	N/A
E	Yes
Z	Yes
Q	Yes
F	Yes



Note Outdoor and indoor frequencies are same for B domain.

Catalyst IW9165E Supported Country Codes (ROW)

Domain ROW Country Code	Indoor Deployment Support
GB (Great Britain)	Yes
ZA (South Africa)	Yes
IN (India)	Yes
KR (Korea)	Yes
PE (Peru)	Yes
AE (UAE)	Yes
MX (Mexico)	Yes
BR (Brazil)	Yes
CL (Chile)	Yes
SA (Saudi Arabia)	Yes



Note You can select only the listed country codes using CLI or GUI.
For ROW domain, select the country code for the device to work.

Catalyst IW9165D Supported Fixed Domains

Domain	Indoor Deployment Support
A	No
B	N/A
E	Yes
Z	No
Q	No
F	No



Note Outdoor and indoor frequencies are same for the B domain.

Catalyst IW9165DH Supported Country Codes (ROW)

Domain ROW Country Code	Indoor Deployment Support
GB (Great Britain)	Yes
ZA (South Africa)	No
IN (India)	No
KR (Korea)	No
PE (Peru)	No
AE (UAE)	No
MX (Mexico)	No
BR (Brazil)	No
CL (Chile)	No
SA (Saudi Arabia)	No



Note You can select only the listed country codes using CLI or GUI.
For ROW domain, select the country code for the device to work.



CHAPTER 13

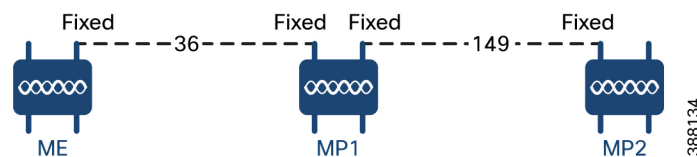
Configuring and Validating of Point-to-Point Relay Topology

- [Configuring and Validating of Point-to-Point Relay Topology, on page 75](#)
- [Configuring Point to Point Relay Topology from CLI, on page 75](#)
- [Validating Point to Point Relay Topology from CLI, on page 76](#)

Configuring and Validating of Point-to-Point Relay Topology

The following image shows two radio interfaces on a single device (MP1) to implement a point-to-point relay topology:

Figure 2: point to point relay topology



To configure point-to-point relay topology, follow these scenarios:

1. Configure Mesh End (ME), MP1 on channel 36 and MP2 on the default channel 149.
2. Continue from step 1 configuration.
3. Enable the second slot interface on Mesh Point (MP2) again and wait 30 seconds to implement the point-to-point relay topology for two radio interfaces on a single device.

Configuring Point to Point Relay Topology from CLI

To configure a point-to-point relay topology, use the following CLI commands:

1. Configure the wireless device with radio interface number <1 or 2>.

```
Device# configure dot11Radio <interface>
```
2. Set wireless interface admin state to enable or disable mode.

```
Device# configure dot11Radio <interface> > {enable | disable}
```

3. Configure an operating mode for the specified interface (fixed or Fluidity or Fluidmax).

```
Device# configure dot11Radio <interface> > [enable | disable] mode { fluidity | fixed | fluidmax }
```

4. Set the operating channel for the specified interface and the operating channel id valid range is between 1 to 256.

```
Device# configure dot11Radio <interface> > [enable | disable] mode [fluidity | fixed | fluidmax] channel <channel id>
```

5. To end this configuration, use the following CLI command:

```
Device (configure dot11Radio <interface> > {enable | disable} mode {fluidity | fixed | fluidmax} channel <channel id>) #end
```

Example:

```
Device#configure dot11Radio <2> {enable | disable} mode {fluidity} channel <36>
```

Example for point-to-point relay topology configuration:

Mesh End (ME) Configuration

```
Device#configure dot11Radio 2 enable
Device#configure dot11Radio 2 mode fixed
Device#configure dot11Radio 2 channel 36
```

Mesh Point (MP1) Configuration

```
Device#configure fluidity id infrastructure
Device#configure dot11Radio 1 enable
Device#configure dot11Radio 1 mode fixed
Device#configure dot11Radio 1 channel 36
Device#configure dot11Radio 2 enable
Device#configure dot11Radio 2 mode fixed
Device#configure dot11Radio 2 channel 149
```

MP2 Configuration

```
Device#configure fluidity id infrastructure
Device#configure dot11Radio 1 enable
Device#configure dot11Radio 1 mode fixed
Device#configure dot11Radio 1 channel 149
```

Validating Point to Point Relay Topology from CLI

To validate point-to-point relay topology configuration, use the following show commands:

```
Device# show dot11Radio <interface> config
```

Mesh End (ME) Statistics

```
Device#show dot11Radio 2 config
Interface : enabled
Mode : fixed infrastructure
Frequency : 5180 MHz
Channel : 36
.....
Passphrase : Cisco
AES encryption : enabled
AES key-control : enabled
```

Mesh Point (MP1) Statistics

```
Device# show dot11Radio 1 config
Interface : enabled
Mode : fixed infrastructure
Frequency : 5180 MHz
Channel : 36
.....
Passphrase : Cisco
AES encryption : enabled
AES key-control : enabled
Device# show dot11Radio 2 config
Interface : enabled
Mode : fixed infrastructure
Frequency : 5745 MHz
Channel : 149
.....
Passphrase : Cisco
AES encryption : enabled
AES key-control : enabled
```

MP2 Statistics

```
Device# show dot11Radio 1 config
Interface : enabled
Mode : fixed infrastructure
Frequency : 5745 MHz
Channel : 149
.....
Passphrase : Cisco
AES encryption : enabled
```




CHAPTER 14

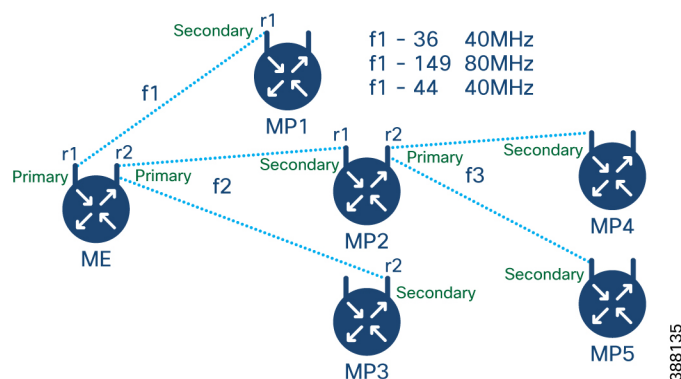
Configure and Validate Fluidmax Topology

- [Configure and Validate Fluidmax \(point to multipoint\) Topology, on page 79](#)

Configure and Validate Fluidmax (point to multipoint) Topology

For fixed infrastructure, any wireless interface can be configured to operate in Fluidmax mode to implement point-to-multipoint connections. Each interface uses an independent set of Fluidmax parameters, allowing for great flexibility in the network topologies that can be implemented. As an example, the below image explains two cascaded point-to-multipoint clusters where the ME (Mesh End) node uses both radios in Fluidmax Primary mode to serve several secondary clients (MP1 (Mesh Point), MP2, and MP3) on two different frequencies. For MP2, the first radio operates in Fluidmax secondary mode to connect to the ME, while the second interface is configured as Fluidmax Primary to serve more downstream clients (MP4 and MP5).

Figure 3: Two cascaded Fluidmax Topology



Configure Point to Multipoint Topology from CLI

Use these commands to configure a Fluidmax (point-to-multipoint) topology.

```
Device#configure dot11Radio <interface>
```

```
Interface - <0-3> dot11Radio interface number
```

```
Device#configure dot11Radio <interface> {enable | disable}
```

Enable or disable - Set wireless interface admin state to enable or disable at runtime

```
Device#configure dot11Radio <interface> mode {fluidity | fixed | fluidmax } { primary | secondary }
```

Mode - Operating mode for the specified interface (Fluidity or Fixed or Fluidmax)

Primary | secondary - Fluidmax role for the device, either primary or secondary

```
Device#configure dot11Radio <interface> channel <channel id>
```

Channel - Set the operating channel id <1 – 256>

```
Device#configure dot11Radio <interface> band-width <channel bandwidth>
```

Bandwidth - channel bandwidth in MHz and currently supported values are 20, 40, 80, and 160.

```
Device#wr
```

Example of point to multipoint (Fluidmax) topology configuration:

ME (Mesh End) Configuration

```
Device#configure dot11Radio 1 enable
Device#configure dot11Radio 1 mode fluidmax primary
Device#configure dot11Radio 1 channel 36
Device#configure dot11Radio 1 band-width 40
Device#configure dot11Radio 2 enable
Device#configure dot11Radio 2 mode fluidmax primary
Device#configure dot11Radio 2 channel 149
Device#configure dot11Radio 2 band-width 80
```

MP1 (Mesh point) Configuration

```
Device#configure dot11Radio 1 enable
Device#configure dot11Radio 1 mode fluidmax secondary
Device#configure dot11Radio 1 channel 36
Device#configure dot11Radio 1 band-width 40
```

MP2 Configuration

```
Device#configure dot11Radio 1 enable
Device#configure dot11Radio 1 mode fluidmax secondary
Device#configure dot11Radio 1 channel 149
Device#configure dot11Radio 1 band-width 80
Device#configure dot11Radio 2 enable
Device#configure dot11Radio 2 mode fluidmax primary
Device#configure dot11Radio 2 channel 44
Device#configure dot11Radio 2 band-width 40
```

MP3 Configuration

```
Device#configure dot11Radio 1 enable
Device#configure dot11Radio 1 mode fluidmax secondary
Device#configure dot11Radio 1 channel 149
Device#configure dot11Radio 1 band-width 80
```

MP4 Configuration

```
Device#configure dot11Radio 1 enable
Device#configure dot11Radio 1 mode fluidmax secondary
Device#configure dot11Radio 1 channel 44
Device#configure dot11Radio 1 band-width 40
```

MP5 Configuration

```
Device#configure dot11Radio 1 enable
Device#configure dot11Radio 1 mode fluidmax secondary
Device#configure dot11Radio 1 channel 44
Device#configure dot11Radio 1 band-width 40
```


Cluster ID: This is an ID assigned to an interface when it is set in Fluidmax mode. This ID should be the same for primary and backup primary nodes. It helps in identifying and grouping devices that belong to the same cluster.

Tower ID: This is used to enable or disable the Fluidmax Tower ID for a specified interface.



Note Tower ID is used in configurations where there is a Gateway + Mesh Point (MP) – MP with the same tower ID.

Use these commands to configure the interface, cluster id, and tower id in Fluidmax mode.

```
Fluidmax - Set the interface in Fluidmax mode.
Primary | Secondary - Fluidmax role for the device, either primary or secondary.
Device# configure dot11Radio [1|2] mode fluidmax cluster id fluidmesh
Cluster id - Set Fluidmax Cluster ID assigned to the interface.
Device# configure dot11Radio [1|2] mode fluidmax tower [enable|disable]
Tower - Enable or disable Fluidmax Tower ID for specified interface.
```

Validate Point to Multipoint Topology using CLI

Use this command to validate the point-to-multipoint (Fluidmax) topology configuration.

```
Device# show dot11Radio <interface> config
```

Example:

ME (Mesh End) radio2

```
Device# show dot11Radio 2 config
Interface : enabled
Mode : fluidmax primary
Frequency : 5745 MHz
Channel : 149
.....
Fluidmax Configuration
Tower ID : disabled
Cluster ID : fluidmesh
Automatic scan : enabled
Automatic scan threshold : disabled
```

MP2 (Mesh Point)

```
Device# show dot11Radio 1 config
Interface : enabled
Mode : fluidmax secondary
Frequency : 5745 MHz
Channel : 149
.....
Fluidmax Configuration
Tower ID : disabled
Cluster ID : fluidmesh
Automatic scan : enabled
Automatic scan threshold : disabled
Device# show dot11Radio 2 config
Interface : enabled
Mode : fluidmax primary
Frequency : 5220 MHz
Channel : 44
Channel width : 40
.....
```

```
Fluidmax Configuration
Tower ID : 100
Cluster ID : fluidmesh
Automatic scan : enabled
Automatic scan threshold : disabled
```

MP4 radio1

```
Device# show dot11Radio 1 config
Interface : enabled
Mode : fluidmax secondary
Frequency : 5220 MHz
Channel : 44
Fluidmax Configuration
Tower ID : disabled
Cluster ID : fluidmesh
Automatic scan : enabled
Automatic scan threshold : disabled
```



CHAPTER 15

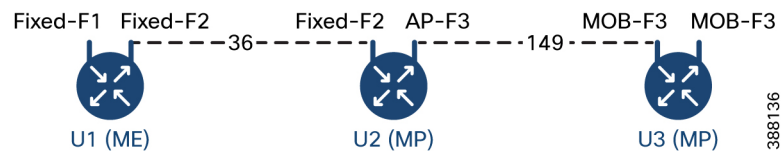
Configuring and Validating Mixed Mode (Fixed Infrastructure + Fluidity) Topology

- [Configuring and Validating Mixed Mode \(Fixed Infrastructure + Fluidity\) Topology, on page 83](#)
- [Configuring Mixed Mode Topology from CLI, on page 83](#)

Configuring and Validating Mixed Mode (Fixed Infrastructure + Fluidity) Topology

The mixed mode configuration provides flexibility of configuration on multi-radio device with different frequencies. From the image, U2 is configured with one radio as fixed infrastructure and the second radio as a Fluidity access point to accept vehicle connections simultaneously. Both radio interfaces on U1 configured as fixed infrastructure when U3 has both radio interfaces configured as Fluidity. The wireless interface can also operate in Fluidmax mode without any restriction of the P2MP (Point-to-MultiPoint) role (Primary or Secondary) if fixed infrastructure role is suitable.

Figure 4: Mixed Mode Topologies



Configuring Mixed Mode Topology from CLI

To configure a mixed mode topology, use the following CLI command:

```
Device# configure fluidity id {vehicle-auto | vehicle ID | infrastructure | wireless-relay}
```

Fluidity id – Configure Fluidity role for the device

Vehicle-auto - Vehicle mode with automatic vehicle ID selection

Vehicle ID (alphanumeric) - Vehicle mode with manual ID

Infrastructure - Configure Infrastructure mode for the device

Wireless-relay - Wireless infrastructure with no ethernet connection to the backhaul

```
Device# configure dot11Radio <interface>
```

Interface - <0-3> dot11Radio interface number

```
Device# configure dot11Radio <interface> {enable | disable}
```

Enable or disable - Set wireless interface admin state to enable or disable at runtime

```
Device# configure dot11Radio <interface> mode {fluidity | fixed | fluidmax}
```

Mode - Operating mode for the specified interface (Fluidity or fixed or Fluidmax)

```
Device# configure dot11Radio <interface> channel <channel id>
```

Channel - Set the operating channel id <1 – 256>

```
Device# wr
```

Example:

U1 Configuration

```
Device# configure dot11Radio 2 enable
Device# configure dot11Radio 2 mode fixed
Device# configure dot11Radio 2 channel 36
```

U2 Configuration

```
Device# configure dot11Radio 1 enable
Device# configure dot11Radio 1 mode fixed
Device# configure dot11Radio 1 channel 36
Device# configure dot11Radio 2 enable
Device# configure dot11Radio 2 mode fluidity
Device# configure dot11Radio 2 channel 149
Device# configure fluidity id infrastructure
```

U3 Configuration

```
Device# configure fluidity id vehicle-auto
Device# configure dot11Radio 1 enable
Device# configure dot11Radio 1 mode fluidity
Device# configure dot11Radio 1 channel 149
```

Validating Mixed Mode Topology from CLI

To validate a mixed mode topology, use the following show commands:

```
Device# show dot11Radio <interface>config
```

U1 Statistics:

```
Device# show dot11Radio 2 config
Interface : enabled
Mode : fixed infrastructure
Frequency : 5180 MHz
Channel : 36
.....
Passphrase : Cisco
AES encryption : enabled
AES key-control : enabled
```

U2 Statistics:

```
Device# show dot11Radio 1 config
Interface : enabled
Mode : fixed infrastructure
```

```
Frequency : 5180 MHz
Channel : 36
.....
Passphrase : Cisco
AES encryption : enabled
AES key-control : enabled
Device# show dot11Radio 2 config
Interface : enabled
Mode : fluidity
Frequency : 5745 MHz
Channel : 149
.....
Passphrase : Cisco
AES encryption : enabled
AES key-control : enabled
```

U3 Statistics:

```
Device# show dot11Radio 1 config
Interface : enabled
Mode : fluidity
Frequency : 5745 MHz
Channel : 149
.....
Passphrase : Cisco
AES encryption : enabled
AES key-control : enabled
```




CHAPTER 16

Configure and Validate Fast Failover

- [Overview of Fast Failover, on page 87](#)
- [Configure and Validate Fast Failover, on page 87](#)
- [Configure Fast Failover from CLI, on page 88](#)
- [Validate Fast Failover from CLI, on page 88](#)

Overview of Fast Failover

Fast failover is a specific type of failover configuration, where the system monitors server health and can quickly switch over when needed.

Fast Failover mechanism:

- Provides hardware redundancy and carrier-grade availability within URWB-based networks.
- In case of hardware failure, Fast Failover allows network to recover again within:
 - less than 30 seconds (varies as per network size) when Fluidmax is used.
 - less than 500 milliseconds when Fluidity is used.



Note Fast Failover is included in all the Network Licenses

Configure and Validate Fast Failover



Note Configure and validate fast failover is applicable for both the Fluidmax and Fluidity modes.

Before you configure the fast failover, use the following pre-conditions:

1. Ensure that both the primary and the backup primary node should have same configuration. This includes the same channel's parameters: frequency, channel width, and mode. If Fluidmax is enabled, ensure that the Cluster ID is the same for both nodes.

2. Enable fast failover on all devices in the network.



Note Fluidmax Fast failover is supported only on MP to MP or ME to ME with Ethernet backhaul.

Configure Fast Failover from CLI

Use this command to configure fast failover.

```
Device# configure modeconfig mode meshpoint
```

Modeconfig – Configure current operating mode of device. Mode could be mesh end(ME), mesh point(MP), or global gateway (L3).

```
Device# configure mpls fastfail status [enable | disable]
```

Mpls - Configure mpls data frame packets for specified device.

Fastfail - Configure the fast failover feature status (enable or disable).

```
Device# configure mpls fastfail timeout <0 - 65535>
```

Fastfail timeout - Set the fast failover timeout for device failure detection.

Use this command to set the preempt delay.

```
Device# configure mpls preempt-delay <0- 65535>
```

By default the preemption delay time is 70 seconds. During this period, the primary device actively gathers updates from the secondary device. This allows it to fully understand the network's current preemption delay status.



Note Radio interface setting must be same on both ME point to Multi point primaries.

Validate Fast Failover from CLI

Use this command to validate fast failover.

```
Device# show mpls config
```

```
Device# show dot11Radio <interface> fluidmax (check Fluidmax Primary ID and working state)
```

Example:

```
Device# show mpls config
```

```
layer 2
```

```
unicast-fllod
```

```
arp-unicast:
```

```
reduce-broadcast:
```

```
cluster ID
```

```
MPLS fast failover: enabled
```

```
Node failover timeout: 100 ms
```

```
.....
```

```
MPLS tunnels:
```



```
Idp_id 381877266 debug 0 auto_pw 1  
Local_gw 5.21.201.116 global_gw 0.0.0.0 pwlis {}
```




CHAPTER 17

Configuring Indoor Deployment

- [Configuring Indoor Deployment, on page 91](#)

Configuring Indoor Deployment

The Catalysts IW9167E and IW9165 support enabling and disabling of indoor deployment using CLI.



Note Before you enable the indoor deployment setting, ensure that the Catalyst IW9167E or IW9165 is set to indoor mode. As you can use the outdoor mode for indoors, but whereas the indoor mode is not suitable for outdoor because 5150–5350 MHz channels are indoor-related countries.

By default, the devices are set to outdoor mode.

To enable indoor deployment, use the following CLI command:

```
Device# configure wireless indoor-deployment enable
```

To disable indoor deployment, use the following CLI command:

```
Device# configure wireless indoor-deployment disable
```

To verify E indoor deployment, use the following show command:

For enabled indoor deployment

```
Device# show Dot11Radio {1|2} config
DFS region : E
DFS radar role : auto
Radar detected : 0
Indoor deployment : enable

Device# show controllers Dot11Radio {1|2}
Radio info summary:
=====
Radio : 5.0 GHz
Carrier set : (-Ei) GB
Base radio MAC : FC:58:9A:15:B7:C0
Supported channels:
36 40 44 48 52 56 60 64 100 104 108 112 116 120 124 128 132 136 140
```

For disabled indoor deployment

```
Device# show Dot11Radio {1|2} config
DFS region : E
```

```
DFS radar role : auto
Radar detected : 0
Indoor deployment : disable

Device# show controllers Dot11Radio {1|2}
Radio info summary:
=====
Radio : 5.0 GHz
Carrier set : (-E) GB
Base radio MAC : FC:58:9A:15:B7:C0
Supported channels:
100 104 108 112 116 120 124 128 132 136 140
```



CHAPTER 18

Configuring and Validating Smart Licensing

- [Overview of Smart Licensing Support, on page 93](#)
- [Configuring and Validating Smart Licensing from CLI, on page 95](#)
- [Configuring Smart Licensing from GUI, on page 97](#)
- [Configuring Smart License Seats Management using CLI, on page 99](#)
- [Configuring Smart License Seats Management using GUI, on page 99](#)
- [Configuring Running License Level using CLI, on page 100](#)

Overview of Smart Licensing Support

Smart licensing for access point running in URWB mode supports the following scenarios:

- Smart license management provides a seamless experience with the various aspects of licensing.
- License level controls the features by essential, advantage, and premier mode.
- IoT specific seats will cache a device list in the mobility scenario and seats reserves some license usage which is the expected maximum number of devices in the managed network.
- Smart transport mode connects to smart software manager (SSM) (formerly it was CSSM) directly to sync license usage.
- Airgap mode uses the downloaded file to sync with SSM manually.
- You should configure same license level on both primary and secondary Layer 2 ME (Mesh End) or Layer 3 Global Gateway (GGW).



Note Ensure you to sync up the device for correct time with NTP server to establish connection with SSM successfully.

From release 17.12.1, the smart licensing supports the following enhancements:

- Seats and license level management for both Catalysts IW9165 and IW9167
- CLI command to check configured and current seats values
- CLI command to check running license level

License level and seats configuration are available for the following device roles:

- ME (Mesh End) fixed infrastructure network
- ME Fluidity Layer 2 network
- Global Gateways (GGW) Fluidity Layer 3 network

A Resource Utilisation Measurement (RUM) report counts the number of devices using license seats for a specific feature to configure seats for each entitlement tag.

Smart license level for Catalysts IW9167 and IW9165 control the feature list using the following tables:

Table 5: Smart license level for Catalyst IW9167

License Type	Features
Essentials	<ul style="list-style-type: none"> • Unlimited fixed throughput • Unlimited AP mobility throughput • 0.5 Mbps Mobility client throughput
Advantage	<ul style="list-style-type: none"> • Unlimited fixed throughput • Unlimited AP mobility throughput • 50 Mbps vehicle mobility throughput • Multipath Operation (MPO)
Premier	<ul style="list-style-type: none"> • Unlimited fixed throughput • Unlimited AP mobility throughput • Unlimited vehicle mobility throughput • MPO

Table 6: Smart license level for Catalyst IW9165

License Type	Features
Essentials	<ul style="list-style-type: none"> • Unlimited fixed throughput • 15 Mbps AP mobility throughput • 5 Mbps vehicle mobility throughput
Advantage	<ul style="list-style-type: none"> • Unlimited fixed throughput • 50 Mbps AP mobility throughput • 50 Mbps vehicle mobility throughput • MPO

License Type	Features
Premier	<ul style="list-style-type: none"> • Unlimited fixed throughput • Unlimited AP mobility throughput • Unlimited vehicle mobility throughput • MPO

Configuring and Validating Smart Licensing from CLI

To configure smart license, use the following CLI command:

```
Device# configure license iw-level [advantage | essentials | premier]

      advantage: Network Advantage for Radios
      essentials: Network Essentials for Radios
      premier:   Network Premier for Radios
```

To configure smart license device number, use the following CLI command:

```
Device# configure license iw-network seats 6
```

To configure smart license online deployment, use the following CLI command:

```
Device# configure license smart transport smart
Device# configure license
Device# configure license smart proxy address 192.168.1.1 (Optional)
Device# configure license smart proxy port 3128 (Optional)
Device# license smart trust idtoken <id_token_generate_from_SSM> local
Device# configure license smart usage interval 50 (Optional)
```

To configure smart license offline deployment, use the following CLI command:

```
Device# configure license smart transport off
Device# license smart save usage all tftp://192.168.216.201/rum_report_all.xml
Device# license smart import tftp://192.168.216.201/rum_report_ack.xml
```

To configure reset license configuration as default, use the following CLI command:

```
Device# license smart factory reset
```



Note Note: Use reload command to clear all license configurations, do not use the write command.

To validate smart license type, use the following show command:

```
Device# show license usage
License Authorization Status: Not Applicable
IW9167_URWB_NW_A(IW9167_URWB_NW_A);
Description: Network Advantage for Catalyst Industrial Wireless CURWB Radios
Count: 1
Version: 0.1
Status: IN USE
Export Status: NOT RESTRICTED
Feature Name: IW9167_URWB_NW_A
```

To validate smart license device number, use the following show command:

```
Device# show license iw seats
6
```

To validate smart license usage count, use the following show command:

```
Device# show license summary
Account information:
Smart account <none>
Virtual account <none>
License Usage:
License : IW9167_URWB_NW_A
Entitlement Tag : (IW9167_URWB_NW_A)
Count Status : 6 IN USE
```



Note License usage count = max (configured license seats and active devices).

When the device is offline, its record paging time is two days.

When active devices are more than configured license seats, ME sends the license usage report to SSM once in eight days.

To validate smart license HA (High Availability) role, use the following show command:

```
Primary_ME# show license tech support
License Usage
=====
Handle 1
.....
Measurements:
ENTITLEMENT:
Interval: 00: 15: 00
Current value: 0
Application Name: UrwbSLP
Application id: UrwbHA
Application Role: Active
Peer info:
Application Name: UrwbSLP
Application id: UrwbHA
Application Role: Standby
PID: 'nullPtr'
UDI: P: IW9167EH-B, S: KWC26330HMR
Smart Account Name: 'nullPtr'
Virtual Account Name: 'nullPtr'

Standby_ME# show license tech support
License Usage
=====
Handle 1
.....
Measurements:
ENTITLEMENT:
Interval: 00: 15: 00
Current value: 0
Application Name: UrwbSLP
Application id: UrwbHA
Application Role: Standby
Peer info:
Application Name: UrwbSLP
Application id: UrwbHA
Application Role: Active
PID: 'nullPtr'
UDI: P: IW9167EH-B, S: KWC26330HLF
```



```
Smart Account Name: 'nullPtr'  
Virtual Account Name: 'nullPtr'
```

To validate smart license SSM connection, use the following show command:

```
Device# show license status  
.....  
Account information  
Smart Account SA-IOT-Polaris As of Sep 28 2022 11: 04:03 CST  
Virtual Account: CURWB  
Transport:  
Type: Smart  
Proxy:  
Address: 192.168.216.201  
Port: 3128  
.....  
Policy  
Policy in use: Installed on Sep 28 2022 11: 04:03 CST  
Policy name: Test policy  
Reporting ACK required: no (Customer Policy)  
First report requirement (days): 94 (Customer Policy)  
Report on change (days): 100 (Customer Policy)
```

Configuring Smart Licensing from GUI

To configure smart licensing using GUI, follow these steps:

1. Select the network license level for the URWB network.
2. Verify that the licence level is controlled by SSM and is connected to software features.
3. Set the network seats to consume usage for particular license level (example: Network Essentials for Radios).
4. To download a usage, go to **Download Usage** section, choose an option **ALL** from the **Usage range** drop-down list and then click **Download**.
 - Save all RUM reports (license usage information) using an option **All**.
 - Save RUM report for the last n number of days (excluding the current day) use an option in the **Days** field.
5. In the **Upload CSSM Ack** section, for sync license usage, click **BROWSE** to import the ACK (Acknowledge) that downloaded from SSM on the production instance when smart agent is in Airgap (Offline) Mode.

The following images are the examples of configuring smart licensing (both online and offline mode):

Cisco URWB IW9167EH Configurator
5.21.201.88 - MESH END MODE

SMART LICENSE

Smart License Settings

Select the network license level for Cisco URWB stack. The license level is bound to software features and monitored by the CSSM. Set the network seats to consume usage for particular license level.

License Level: Network Essentials for Radios

Platform IW9165 License Seats: 0

Platform IW9167 License Seats: 0

Reset Save

Smart Agent is set to Online Mode

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Cisco URWB IW9167EH Configurator
5.21.201.88 - MESH END MODE

SMART LICENSE

Smart License Settings

Select the network license level for Cisco URWB stack. The license level is bound to software features and monitored by the CSSM. Set the network seats to consume usage for particular license level.

License Level: Network Advantage for Radios

Platform IW9165 License Seats: 0

Platform IW9167 License Seats: 0

Reset Save

Smart Agent is set to Online Mode

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Configuring Smart License Seats Management using CLI

To configure a smart license seats, use the following show command:

```
Device# configure license iw-network seats platform
      iw9165 iw9167
      WORD Select one above platform (case sensitive) to configure seats.
```

Example:

```
Device# configure license iw-network seats platform iw9165 12
Device# configure license iw-network seats platform iw9167 15
```

Verifying license iw-seats using CLI

To verify the license seats, use the following show command:

```
Device# show license iw seats
      Platform Configured Current
      IW9167      0      15
      IW9165      0      12

Device# write
Device# reload

Device# show license iw seats
      Platform Configured Current
      IW9167      15      15
      IW9165      12      12
```

Configuring Smart License Seats Management using GUI

To select the network license level for URWB stack, follow these steps:

1. In the **Advanced Settings**, click **smart license**.
2. In the **Smart License Settings**, choose **License level**.
3. Enter **Platform IW9165 License Seats** value.
4. Enter **Platform IW9167 License Seats** value.
5. Click **Save**.

Configuring Running License Level using CLI

The license level is configured by the primary ME or GGW device (based on network configuration) then the license level is distributed and applied to all the devices connected to the network.

To configure a license level for ME and GGW (license distributor), use the following CLI command:

```
Device# configure license iw-level
      Advantage: Network Advantage for Radios
      essentials: Network Essentials for Radios
      premier: Network Premier for Radios
```

Example:

```
Device# configure license iw-level [ premier | essentials | Advantage ]
```

To verify the license level for ME and GGW, use the following show command:

```
Device# show license iw level
      Configured IW Network License: ESSENTIALS
      Running IW Network License: PREMIER
Device# write
Device# reload

Device# show license iw level
      Configured IW Network License: PREMIER
      Running IW Network License: PREMIER
```

To verify the license level for MP (license receiver), use the following show command:

```
Device# show license iw level
      Running IW Network License: PREMIER
```



Note License level configuration is not allowed.



CHAPTER 19

Configuring Layer 2 Mesh Transparency

- [Configuring Layer 2 Mesh Transparency, on page 101](#)
- [Configuring and Verifying Layer-2 Protocols Forwarding Using CLI, on page 102](#)
- [Configuring Layer-2 Protocol Forwarding using GUI, on page 104](#)

Configuring Layer 2 Mesh Transparency

Layer 2 mesh transparency feature allows you to select the ether type for a specific protocol. To forward the ether-types, use CLI or GUI to enable or disable the network. The following list of reserved ether-types cannot be configured:

Table 7: List of reserved ether-types

Ether-type (range)	Forwardable	Additional information
0x0000 – 0x05FF	User-configurable	Ethernet-I frames. STP and CDP are subject to other configuration options
0x0800	Yes	IPv4
0x0806	Yes	ARP (IPv4)
0x0900 – 0x09FF	No	URWB signaling protocols
0x8100	Yes	IEEE 802.1Q VLAN encapsulation
0x8847 – 0x8848	No	MPLS
0xFFFF	No	IANA reserved

The following functionalities are supported using the URWB data plane mesh network when used in MPLS Layer 2 mode.

- The Layer 2 mesh transparency feature forwards non-IPv4 Layer 2 protocols across the URWB network by selectively filtering which ether-types are permitted.
- Ether-types present in URWB network are detected and reported automatically.
- Ability to add and remove ether-types from the allowlist.

- Ability to configure full transparency (enable all Layer 2 protocols) in a convenient manner.
- Both CLI and GUI are supported.

Configuring and Verifying Layer-2 Protocols Forwarding Using CLI

To configure a Layer 2 protocol forwarding, use the following CLI command:

To add an ethernet type to allowlist, use the following CLI command:

```
Device# configure mpls ether-filter allow-list add
<0x0-0xffff> ether-type value
    all allow all ether-types
```

Example:

```
Device# configure mpls ether-filter allow-list add 0x86DD
Device# write
Device# reload

Device# show mpls config
...
Ethernet Filter allow-list: 0x8892 0x8204 0x86dd, ethernet-I block
...
```

To delete an ethernet type from allowlist, use the following CLI command:

```
Device# configure mpls ether-filter allow-list delete
<0x0-0xffff> ether-type value
```

Example:

```
Device# configure mpls ether-filter allow-list delete 0x86DD
Device# write
Device# reload

Device# show mpls config
...
Ethernet Filter allow-list: 0x8892 0x8204, ethernet-I block
...
```

To clear all ethernet types from allowlist, use the following CLI command:

```
Device# configure mpls ether-filter allow-list clear
```

Example:

```
Device# show mpls config
...
Ethernet Filter allow-list: 0x8892 0x8204 0x86dd, ethernet-I block
...
Device# configure mpls ether-filter allow-list clear
Device# write
Device# reload

Device# show mpls config
...
Ethernet Filter allow-list: none, ethernet-I block
...
```

To add all ethernet types to allowlist, use the following CLI command:

```
Device# configure mpls ether-filter allow-list add all
```

Example:

```
Device# configure mpls ether-filter allow-list add all
Device# write
Device# reload

Device# show mpls config
...
Ethernet Filter allow-list: all, ethernet-I block
```



Note The **all** keyword is used to set the ether filter in all-pass mode (fill allowlist with single entry 0x0000).

To clear list of detected ether-types, use the following CLI command:

```
Device# configure mpls ether-filter table clear
```

Example:

```
Device# show mpls ether-filter
Ether-type Direction Description
0x8899      INGRESS   ---
0x86DD      INGRESS   IPv6
Device# configure mpls ether-filter table clear
Cisco-81.160.136#show mpls ether-filter
Ether-type Direction Description
0x8899      INGRESS   ---
```



Note The detection process works in background after clearing the detected ethernet types.

To configure Ethernet – I protocol, use the following CLI command:

```
Device# configure mpls ether-filter ethernet-I forward
```

Example:

```
Device# configure mpls ether-filter ethernet-I forward
Device# write
Device# reload

Deive# show mpls config
...
Ethernet Filter allow-list: 0x88F8 0x891D, ethernet-I forward
...
```

```
Device# configure mpls ether-filter ethernet-I block
```

Example:

```
Device# configure mpls ether-filter ethernet-I block
Device#write
Device# reboot

Device# show mpls config
...
Ethernet Filter allow-list: 0x88F8 0x891D, ethernet-I block
```

To verify list of allowed ether-types, use the following show command:

```
Device# show mpls config
```

Example:

```
Device# show mpls config
...
Ethernet Filter allow-list: 0x8892 0x8204 0x86dd, ethernet-I block
...
```

To verify list of detected ether-types, use the following show command:

```
Device# show mpls ether-filter table
```

Example:

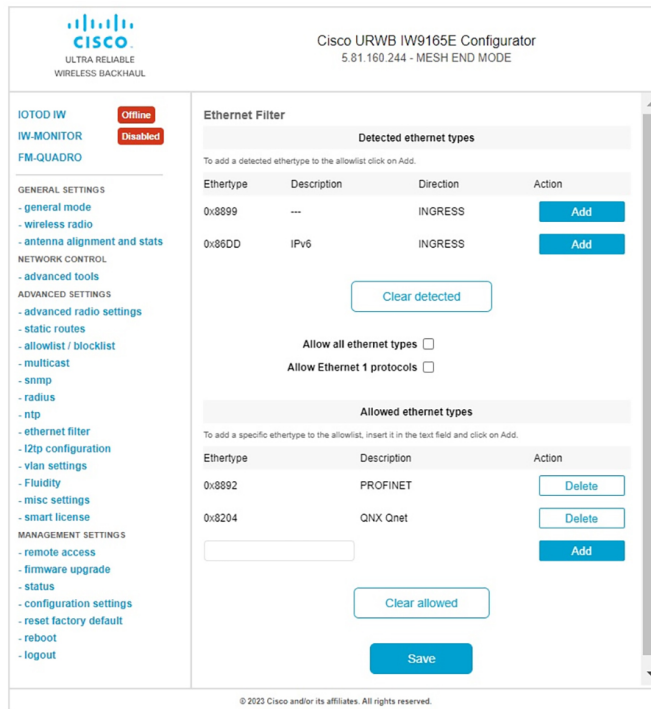
```
Device# show mpls ether-filter table
Ether-type  Direction  Description
0x8899      INGRESS   ---
0x86DD      INGRESS   IPv6
```

Configuring Layer-2 Protocol Forwarding using GUI

To add specific and detected ether types to the allowlist, follow these steps:

1. In the **ADVANCED SETTINGS**, click **ethernet filter**.
The **Ethernet Filter** window appears.
2. Click **Add** to add an ether types to the allowlist in the **Detected ethernet types** section.
3. Once it is added, you can see the added ether types reflected in the **Allowed Ethernet type** section.
4. In the **Allowed ethernet types** section, to add a specific ether type to the allowlist, enter the **Ethertype** name in the text box and click **Add**.

The following images show the specific and detected ether types added to the allowlist:



Cisco URWB IW9165E Configurator
5.81.160.244 - MESH END MODE

Ethernet Filter

Detected ethernet types

To add a detected ethernet type to the allowlist click on Add.

Ethertype	Description	Direction	Action
0x8899	---	INGRESS	Add
0x86DD	IPv6	INGRESS	Add

Clear detected

Allow all ethernet types

Allow Ethernet 1 protocols

Allowed ethernet types

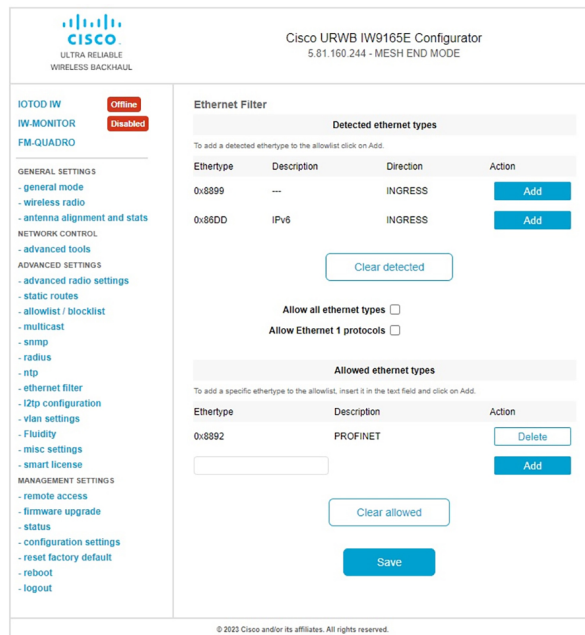
To add a specific ethernet type to the allowlist, insert it in the text field and click on Add.

Ethertype	Description	Action
0x8892	PROFINET	Delete
0x8204	QNX Qnet	Delete

Clear allowed

Save

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Cisco URWB IW9165E Configurator
5.81.160.244 - MESH END MODE

Ethernet Filter

Detected ethernet types

To add a detected ethernet type to the allowlist click on Add.

Ethertype	Description	Direction	Action
0x8899	---	INGRESS	Add
0x86DD	IPv6	INGRESS	Add

Clear detected

Allow all ethernet types

Allow Ethernet 1 protocols

Allowed ethernet types

To add a specific ethernet type to the allowlist, insert it in the text field and click on Add.

Ethertype	Description	Action
0x8892	PROFINET	Delete

Clear allowed

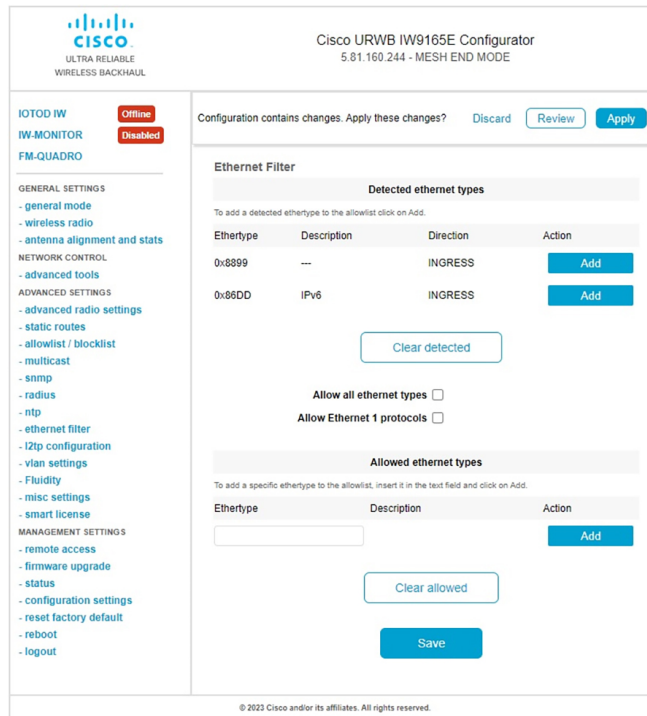
Save

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To clear all allowed ethernet types from the allowlist, follow these steps:

1. In the **ADVANCED SETTINGS**, click **ethernet filter**.
The **Ethernet Filter** window appears.
2. Click **Clear allowed** in the **Allowed ethernet types** section to clear all the ethernet types from the allowlist.
3. Once you click **Clear allowed**, you can see all ethernet types cleared from allowlist.

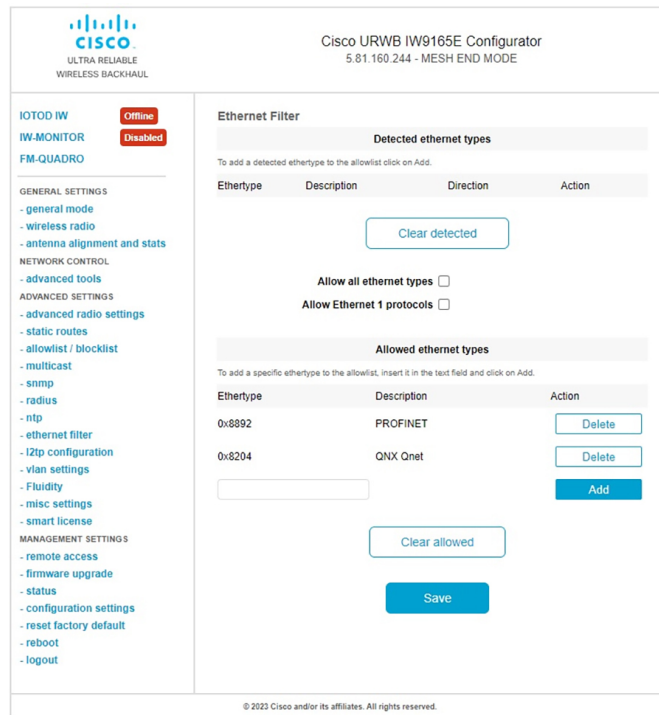
The following image shows all allowed ethernet types cleared from the allowlist:



To clear all detected ethernet types from the allowlist, follow these steps:

1. In the **ADVANCED SETTINGS**, click **ethernet filter**.
The **Ethernet Filter** window appears.
2. Click **Clear detected** in the **Detected ethernet types** section to clear the detected ethernet types from allowlist.
3. Once you click **Clear detected**, you can see ethernet types cleared in the **Detected ethernet types** section.

The following image shows all detected ethernet types cleared from the allowlist:



To add or allow all ethernet types to the allowlist, follow these steps:

1. In the **ADVANCED SETTINGS**, click **ethernet filter**.

The **Ethernet Filter** window appears.

2. Check the **Allow all ethernet types** check box in the **Ethernet Filter** section to allow all ethernet type to allowlist.
3. Click **Save** and then **Apply** to change the configuration.

The following image shows adding of all ethernet types to the allowlist:

The screenshot shows the Cisco URWB IW9165E Configurator interface. The top header includes the Cisco logo and the text 'Cisco URWB IW9165E Configurator 5.81.160.244 - MESH END MODE'. On the left, there is a navigation menu with sections like 'IOTOD IW', 'IW-MONITOR', 'FM-QUADRO', 'GENERAL SETTINGS', 'NETWORK CONTROL', 'ADVANCED SETTINGS', and 'MANAGEMENT SETTINGS'. The 'ADVANCED SETTINGS' section is expanded to show 'ethernet filter'. The main content area is titled 'Ethernet Filter' and contains a table of detected ethernet types. Below the table, there are checkboxes for 'Allow all ethernet types' (checked) and 'Allow Ethernet 1 protocols' (unchecked), along with a 'Save' button.


Ethertype	Description	Direction	Action
0x8899	---	INGRESS	Add
0x86DD	IPv6	INGRESS	Add

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To configure an ethernet 1 protocol, follow these steps:

1. In the **ADVANCED SETTINGS**, click **ethernet filter**.
The **Ethernet Filter** window appears.
2. Check the **Allow Ethernet 1 protocols** check box in the **Ethernet Filter** section to enable ethernet 1 protocol mode.
3. Click **Save** and then **Apply** to change the configuration.

The following image shows the configuration of allowing an ethernet 1 protocol:



CISCO
ULTRA RELIABLE
WIRELESS BACKHAUL

Cisco URWB IW9165E Configurator
5.81.160.244 - MESH END MODE

IOTOD IW Offline

IW-MONITOR Disabled

FM-QUADRO

GENERAL SETTINGS

- general mode
- wireless radio
- antenna alignment and stats

NETWORK CONTROL

- advanced tools

ADVANCED SETTINGS

- advanced radio settings
- static routes
- allowlist / blocklist
- multicast
- snmp
- radius
- ntp
- ethernet filter
- l2tp configuration
- vlan settings
- Fluidity
- misc settings
- smart license

MANAGEMENT SETTINGS

- remote access
- firmware upgrade
- status
- configuration settings
- reset factory default
- reboot
- logout

Ethernet Filter

Detected ethernet types

To add a detected ethertype to the allowlist click on Add.

Ethertype	Description	Direction	Action
0x8999	---	INGRESS	Add
0x86DD	IPv6	INGRESS	Add

[Clear detected](#)

Allow all ethernet types

Allow Ethernet 1 protocols

Allowed ethernet types

To add a specific ethertype to the allowlist, insert it in the text field and click on Add.

Ethertype	Description	Action
0x8892	PROFINET	Delete
0x8204	QNX Qnet	Delete
<input style="width: 80%;" type="text"/>		Add

[Clear allowed](#)

[Save](#)

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CHAPTER 20

Configuring Multipath Operation

- [Overview of MPO, on page 111](#)
- [Working Functionality of MPO, on page 111](#)
- [MPO Packet Duplication and Deduplication, on page 111](#)
- [Configuring MPO Features Using CLI, on page 112](#)
- [Verifying MPO Features Using CLI \(MPO Monitoring\), on page 113](#)
- [MPO Limitations, on page 115](#)

Overview of MPO

Fast-moving mobile systems expect high-speed connectivity onboard, which implies reliable wireless ground-to-vehicle communication without any interruptions. However, the dynamic nature of the network, the environmental radio frequency conditions and roaming under the various Wi-Fi standards lead to packet losses. Multipath Operation (MPO) enhances reliability by sending duplicate copies of packets across multiple wireless paths. This patented technology duplicates your high priority traffic up to 4x and it reduces hardware failures to increase availability, reduce latency, and lower the effects of interference.

MPO introduce an approach to establish multiple label switched paths (LSPs) between a mobile system and the backend infrastructure of a wireless network. The multiple LSPs enables high priority packets to be sent through redundant paths to reduce packet loss.

Working Functionality of MPO

By default, an MPLS establishes a single tunnel using a single wireless link between the vehicle and infrastructure for data transmission. You can set up four MPLS tunnels to send MPO-protected traffic when you use two radio interfaces on two vehicle radios. When configuring MPO to utilize multiple links for protected traffic, it creates an MPLS tunnel over each available wireless link. Each wireless link replicates MPO-protected traffic. Even if one wireless link fails, the other links replicate the traffic. As of UIW Release 17.14.1, Fast Failover is supported with MPO.

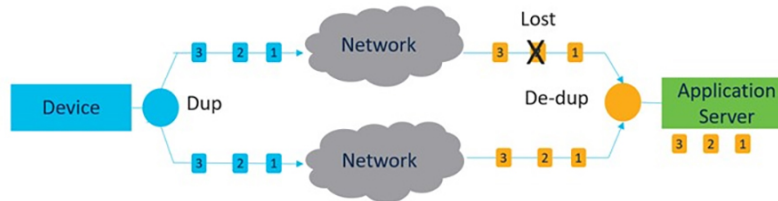
MPO Packet Duplication and Deduplication

For MPO, a duplicate packet is sent through several wireless channels (to various access points). This helps to ensure reliability, and the spatial diversity of the receiving access points greatly increases the chances of

at least one of the copies to be received correctly. Deduplication is another aspect of MPO to remove any duplicates of a packet that are received along the different wireless paths.

As a result, the delivered packets currently have sequence numbers assigned to them, thereby allowing the deduplication algorithm to eliminate copies of any packets that it has already received.

The process of Duplication and Deduplication as shown:



Duplication and Deduplication algorithm performs the following:

- Address packet loss and asymmetric high/variable delay paths.
- Remove additional packet delays created by buffering.
- Remove duplicate and out of sequence packets.
- Improve CPU, resource, and memory efficiency.

Configuring MPO Features Using CLI

To configure the MPO features, use the following CLI commands:

```
Device# configure fluidity mpo
```

cos - Configure class-of-service (CoS) of traffic to protect with MPO redundancy (only one CoS at a time) and the valid cos range is from zero to seven and the default value is six.

path - Configure max number of simultaneous redundant path established by only mobile devices. Maximum path link valid range is from one to four and the default value is one.

rsssi - Configure min RSSI threshold for a wireless link to be eligible as a redundant path(dB) (mobile devices only). Minimum rsssi value valid range is from 0 to 96 and the default value is 20.

telemetry – Configure enable/disable specific MPO telemetry. Telemetry value one of the following: enabled: M=1 or disabled: M=0 (default).

```
Device# configure fluidity mpo status
```

disabled: Disable MPO duplication/deduplication.

rx-only: Set mpo status as rx-only. Deduplicate incoming MPLS traffic and do not duplicate outgoing traffic.

enabled: Enable MPO. Duplicate outgoing traffic and de-duplicate incoming MPLS traffic.

Example:

```
Device# configure fluidity mpo cos C ( C value from 0 to 7 (default 6))
Device# configure fluidity mpo path max N ( N value from 1 to 4 ( default 1))
Device# configure fluidity mpo rsssi min R ( R value from 0 to 96 ( default 20))
Device# configure fluidity mpo telemetry T (T can be one of: enabled: M=1
                                         Disabled: M=0 (default))
Device# configure fluidity mpo status S ( S can be one of:
```



```

enabled: E=1 F=1
rx-only: E=1 F=0
disabled: E=0 F=1 (default))

```

The following example shows the UDP Telemetry stream with MPO counters:

```

Device# configure fluidity mpo telemetry <enabled | disabled>
Device# configure telemetry server 192.168.0.200
Device# configure telemetry export enable
Device# configure fluidity mpo telemetry enabled

```

To verify an MPO configuration parameter, use the following show command:

```
Device# show fluidity mpo config
```

Example:

```

Device# show fluidity mpo config
      Status: enabled
      Path max links: 2
      RSSI min: 20
      CoS: 6

```

Verifying MPO Features Using CLI (MPO Monitoring)

The output of the **show mpls config** command:

```

Device# show mpls config
      5.42.42.43:
      path_id : 0
      ilm : 136000
      nhlfe : 16:
      lbr : 5.42.42.42
      age : 6.980000028 { 5.42.42.42 5.42.42.43 }

      path_id : 1
      ilm : 136001
      nhlfe : 18:
      lbr : 5.42.42.42
      age : 6.970000026 { 5.42.42.42 5.42.42.43 }

```

The output of the **show fluidity mpo statistics** command:

```

Device# show fluidity mpo statistics (on Mesh End)
table-size 2:

      MAC address : 40:36:5A:15:C8:50          8C:89:A5:83:EB:71
      Tx-1          : 0                        208
      Tx-2          : 0                        208
      Rx-Accept-1   : 178                      0
      Rx-Accept-2   : 30                       0
      Rx-Drop-1     : 30                       0
      Rx-Drop-2     : 178                      0
      Lost-1-only   : 0                        0
      Lost          : 0                        0

Device# show fluidity mpo statistics (on Mobile Primary unit)
table-size 2:

      MAC address : 40:36:5A:15:C8:50          8C:89:A5:83:EB:71
      Tx-1          : 208                      0
      Tx-2          : 208                      0
      Rx-Accept-1   : 0                        182
      Rx-Accept-2   : 0                        26

```

```

Rx-Drop-1      : 0                26
Rx-Drop-2      : 0                182
Lost-1-only    : 0                0
Lost           : 0                0

```

MAC address: Source L2 address of the external network device which is sending packets.

Tx-1 and Tx-2: These counters represent, respectively, the number of packets transmitted on the primary path and secondary paths (cumulative sum for all available secondary paths, that is path IDs 1 to 3).

Rx-Accept-1 and Rx-Accept-2: These counters represent, respectively, the number of packets received and dropped in the de-duplication process either on the primary path or secondary paths.

Lost-1-only: Number of packets received and accepted in the de-duplication process on the secondary paths but not on the primary path.

Lost: The cumulative number of packets lost on both primary path and secondary paths.

The output of the `show fluidity network` command:

```

Device# show fluidity network (on Mesh End and Mobile Primary)

      unit 5.21.201.60  infrastructure meshend primary
      vehicles 4  total_mobiles 5
      infrastructure 1  backbone 0  meshend 5.21.201.60

      Vehicle ID : + 85313616
      Path : 0
      Infrastr.ID : 5.21.201.60
      Via : R1
      Mobile ID : 5.21.200.80
      Via : R2
      H/O seq : 5710
      H/O age : 36.597
      #M: 2
      Primary ID : 5.21.200.80
      Secondary IDs : 5.21.201.204

      Vehicle ID : + 85313616
      Path : 1
      Infrastr.ID : 5.21.201.60
      Via : R2
      Mobile ID : 5.21.201.204
      Via : R2
      H/O seq : 5711
      H/O age : 5.909
      #M: 2
      Primary ID : 5.21.200.80
      Secondary IDs : 5.21.201.204

```



Note Intermediate nodes (MP and mobile secondaries) have only a subset of paths.
MPO path ID 0: primary path, others: redundant paths.

The output of the `show eng-stats` command:

```

Device# show eng-stats (on mobile primary unit)
....
Fluidity role : primary

```

```
vehicle id : 0
static : 3.21.201.60 [FC:58:9A:15:C7:D2]
mobile : 4.21.200.80 [FC:58:9A:15:B9:13]
snr : 42
rssi : -54
dop : 40
chan : 132/40
handoff: 21.518258794
time : 2
Current:
ho_seq: 7 pending: false age: 21.518303221 primary: 5.21.200.80
[0] - <3.21.201.60 - 4.21.200.80> status SUCCESS seq 6 id 0 age 59.469266332 rssi 42
[1] - <4.21.201.60 - 4.21.201.204> status SUCCESS seq 7 id 1 age 21.518317752 rssi 41
last primary: <3.21.201.60 - 4.21.200.80>
free ids: 7 6 5 4 3 2
current missing path mask: 1111110

HO Table
static : 3.21.201.60 [FC:58:9A:15:C7:D2]
mobile : 4.21.200.80 [FC:58:9A:15:B9:13]
rssi : 42
dop : 40
chan : 132/40
updated : 74
skip : 0

static : 4.21.201.60 [FC:58:9A:15:C7:D3]
mobile : 4.21.201.204 [FC:58:9A:15:E4:D3]
rssi : 41
dop : 40
chan : 100/40
updated : 18
skip : 0
rssi_delta : 6 3
threshold : 35
```

MPO Limitations

If MPO is enabled, the following handoff features are not available:

- Pole Ban and Pole Proximity
- Coloring
- Load balancing



CHAPTER 21

Configuring URWB Telemetry Protocol

- [Configuring URWB Telemetry Protocol, on page 117](#)

Configuring URWB Telemetry Protocol

The URWB Telemetry Protocol is introduced from UIW Release 17.12.1 and it allows for custom external monitoring of real-time wireless performance. Third-party and custom applications can use this data. Pre-defined structured UDP packets sent at regular intervals contain various network metrics.

Each access point exports data for its radios. This data can be interpreted live by the receiving application or captured and processed later.

For more information about the protocol format, contact [Cisco Support](#) to request URWB Telemetry Protocol reference document.

The telemetry UDP packet contains the following information:

- Signal strength of packet
- Packet throughput and migration rate
- Number of transmission and retransmission
- Modulation rate
- Details of packet loss
- Operating frequency of each radio
- Information about the events that recording the network

Configuration of URWB Telemetry Protocol using CLI

By default, the telemetry data is disabled. To generate the telemetry packet, use the following CLI command:

To set the IP address and UDP port of the receiver, use the following CLI command (multicast addresses are supported):

```
Device# configure telemetry server <dest IP [port]>
```

To enable or disable the URWB Telemetry Protocol transmission to the configured receiver, use the following CLI command (multicast addresses are supported):

```
Device# configure telemetry server <dest IP [port]>
```

To enable or disable raw UDP telemetry transmission to the configured server, use the following CLI command:

```
Device# configure telemetry export [ enable | disable ]
```

Example:

```
Device# configure telemetry export enable
Device# configure telemetry server 10.115.11.56 1234
Device# write
Device# reload
```



-
- Note**
- Ensure the IP address is configured before you execute the **export enable** CLI command. If not, the command rejects with an error please configure the telemetry server IP first.
 - The IP server is simultaneously set to 0.0.0.0 (the port value is unchanged) when you execute the **export disable** CLI command.
-

To verify telemetry configuration, use the following show command:

```
Device# show telemetry config
Telemetry export: enabled, current (live): disabled
Telemetry server: 10.115.11.56 1234, current (live): 0.0.0.0 30000
```

Live Configuration of URWB Telemetry Protocol using CLI

```
Device# configure telemetry live
Export : enable/disable telemetry export
Server : set telemetry server IP address (and port)
```



-
- Note** Server configuration is mandatory before you enable the live telemetry export.
-

Example:

```
Device# configure telemetry live export enable
Error: please configure the telemetry server IP first
```

Example (telemetry export after server configuration):

```
Device# configure telemetry live server 10.115.11.56 1234
Device# configure telemetry live export enable
Device# show telemetry config
Telemetry export: enabled, current (live): enabled
Telemetry server: 10.115.11.56 1234, current (live): 10.115.11.56 1234
```



-
- Note** The command immediately affects the current configuration when the live modifier is specified. Only the configuration file is changed if the live modifier is not used.
-

Configuration of GNSS Telemetry Protocol using CLI

To enable GNSS telemetry, use the following CLI command:

```
Device# configure gnss telemetry enable
```

To disable GNSS telemetry, use the following CLI command:

```
Device# configure gnss telemetry disable
```

To show GNSS telemetry, use the following CLI command:

```
Device# show gnss telemetry
```




CHAPTER 22

Configuring IW Monitor Management

- [Configuring IW Monitor Management, on page 121](#)

Configuring IW Monitor Management

The UIW Release 17.12.1 introduces support for IW Monitor. It is a standalone on-premise monitoring application supporting the following features:

Table 8: IW Monitor features support from UIW Release 17.12.1 onwards.

Feature	Description
IW Monitor log for RADIUS (Remote Authentication Dial-In User Service)	Radius authentication attempts by mobile units are logged to IW Monitor
IW Monitor log CLI SSH access	SSH connections attempts are logged to IW Monitor
IW Monitor log GUI access	GUI logins are logged to IW Monitor
IW Monitor log ethernet link change	Physical link changes of LAN ports are buffered and logged to IW Monitor
IW Monitor log configuration change	Changes applied to the unit configuration through CLI or GUI are logged to Monitor

The on-premises IW Monitor supports the following primary capabilities:

- Dashboard to monitor network status
- Topology view of the network
- Real time and history charts for wireless Key Performance Indicators (KPIs)
- Real time performance monitoring
- Process the telemetry data sent by IW devices
- Network events logging

UIW Release 17.12.1 provides following support for IW Monitor dashboard:

- Attach and detach functions.
- Telemetry protocol support.
- CLI and GUI management.

Detaching IW Monitor Management using CLI

IW Monitor doesn't require any configuration, and access points are added to the IW Monitor. Use the following CLI to detach the device from the IW Monitor server and troubleshoot the connection.

```
Device# configure monitor
      detach : detach MONITOR action
```

Example:

```
Device# configure monitor detach
```

Verifying IW Monitor Management using CLI

To verify the IW Monitor management, use the following show command:

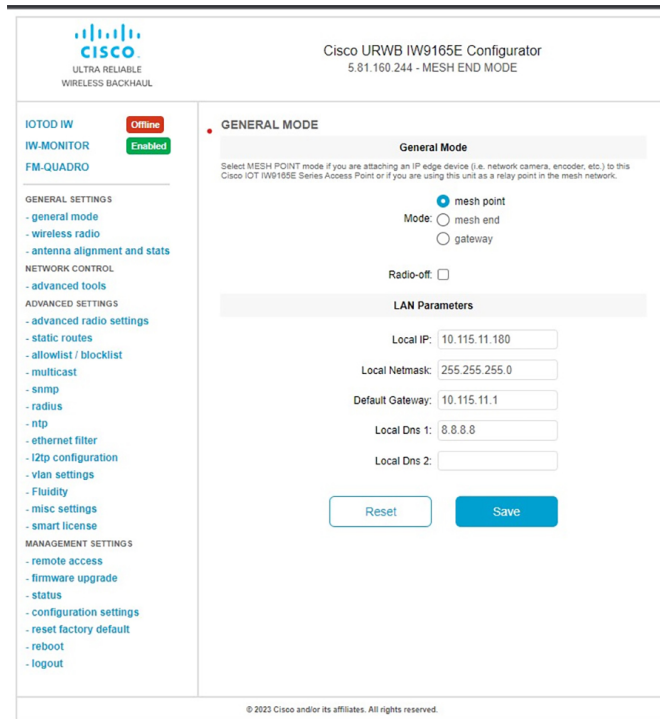
```
Device# show monitor
```

Example:

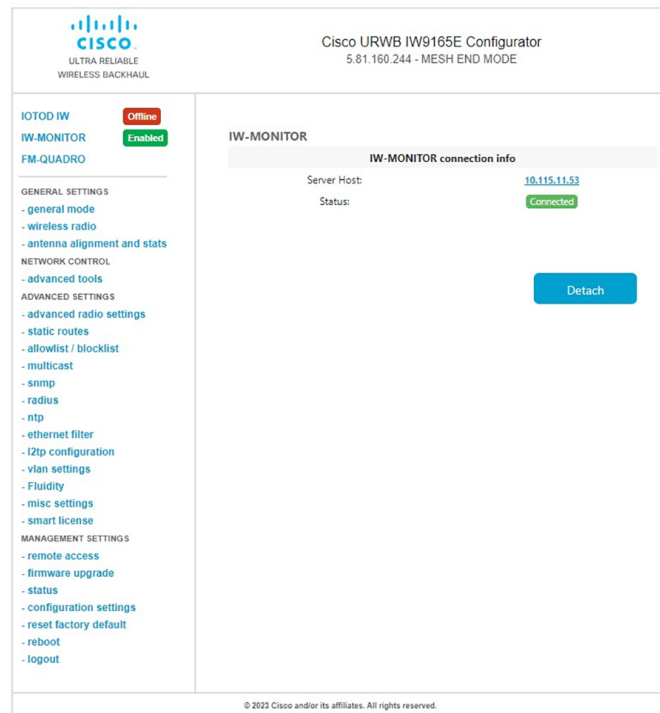
```
Device# show monitor
IW MONITOR: enabled
Status: Connected
```

Configuring IW Monitor Management using GUI

The following image shows the **IW MONITOR** is enabled in the **Cisco URWB IW9165E or IW9167E Configurator** window:



Once **IW-MONITOR** option is enabled, **IW-MONITOR connection info** appears as follows:





CHAPTER 23

Upgrading the Device using TFTP

To upgrade the device using trivial file transfer protocol (TFTP), follow these conditions:

- The device must be connected to the network.
- The device must be configured to communicate with the local TFTP server.
- The target device image must be uploaded to the root directory of the local TFTP server.
- [Device Upgrade using TFTP, on page 125](#)
- [Automatic Device Upgrade using TFTP, on page 125](#)
- [Direct Device Upgrade using TFTP, on page 126](#)
- [TFTP Device Upgrade using CLI, on page 127](#)

Device Upgrade using TFTP

The TFTP device upgrade feature enables you to perform an automatic device upgrade or a direct device upgrade. In an automatic device upgrade, the device periodically checks for the availability of new device using the manifest file and initiates the upgrading process. In a direct device upgrade, the device retrieves the specified device image from the TFTP server and initiates the upgrading process. You can choose either of the following methods:

- [Automatic Device Upgrade using TFTP](#)
- [Direct Device Upgrade using TFTP](#)

Automatic Device Upgrade using TFTP

Before you begin

This method enables the device to connect to the local TFTP server at user-determined intervals to check for the availability of new device image. The device detects the device image file and performs the upgrade.

-
- Step 1** Create *device.manifest* file and upload to the same TFTP server root directory where the device image is stored.
 - Step 2** Before enabling the TFTP automatic upgrade, configure the TFTP server and time interval.

Note The time interval must be specified in the hours format.

Caution Do not disconnect or reboot the device until the device download completes. Based on the image file size, the device upgrade may take some time.

Configuring Manifest File on the TFTP Server

At first, the device retrieves the manifest file from the TFTP server. Based on the information in the manifest file, the device then retrieves the device image from the TFTP server. Once the conditions are satisfied, the device initiates the device upgrade process.

Manifest File Format

The manifest file must be hosted on the TFTP server. It contains information related to the device image intended for the device upgrade. The manifest file holds the following information:

- Device image filename
- MD5 checksum of the device image file
- Device image version

The manifest file name must be specified based on the IW device model:

Device Type	Manifest File Name
IW9167EH	IW9167EH.manifest
IW9165E	IW9165E.manifest
IW9165DH	IW9165DH.manifest

Example format of manifest file:

```
image_name=ap1g6m-k9c1-tar.202307110910
image_md5=376e15acd4e82a49a81d42add904f5b0
image_version=8.8.1.101
```

Direct Device Upgrade using TFTP

The device obtains the specified device image from the TFTP server. To start the direct device upgrade process, use the following CLI commands:

Purpose	Command or Action
To configure the TFTP server with IP address	Device#configure tftp server A.B.C.D A.B.C.D: IP address of the TFTP server

Purpose	Command or Action
To configure the TFTP upgrade image	Device#configure tftp upgrade <image file> Device#write Device#reload Configure TFTP upgrade image <image file bin>

The device immediately starts the upgrade process.



Caution Do not disconnect or reboot the device until the device download completes. Based on the image file size, the device upgrade may take some time.

TFTP Device Upgrade using CLI

Purpose	Command or Action
To perform a device upgrade using the TFTP server	Device#configure tftp server A.B.C.D A.B.C.D: IP address of the tftp server
To disable automatic TFTP device upgrade	Device#configure tftp upgrade automatic disable
To enable automatic TFTP device upgrade	Device#configure tftp upgrade automatic enable Device#write Device#reload
To check immediately for the manifest file without waiting for the check period	Device#configure tftp upgrade check now
To check TFTP device upgrade periodically	Device#configure tftp upgrade check period 3 Device#write Note The check period must be specified in the hours format.
To check TFTP configuration	Device#show tftp config

Example of show TFTP configuration:

```
Device#show tftp config
Automatic TFTP Upgrade settings:
Status: enabled
Server: A.B.C.D
Check period (hours): 3
```

Example of automatic TFTP upgrade:

```
Device#configure tftp server A.B.C.D
Device#configure tftp upgrade check period 3
Device#write
Device#configure tftp upgrade automatic enable
Device#write
Device#reload
```

The device upgrade procedure fails to start:

- If the MD5 checksum reported in the manifest file does not match the MD5 checksum calculated on the device image file (*image_name*).
- If the device image version reported in the manifest file matches the current device version running on the device.



CHAPTER 24

LED Pattern for Catalysts IW9167 and IW9165

- [LED Pattern for Catalyst IW9167, on page 129](#)
- [LED Pattern for Catalyst IW9165, on page 130](#)

LED Pattern for Catalyst IW9167

The Catalyst IW9167E follows the below LED pattern during booting process (Blinking green) during a normal booting process:

Table 9: Definition of Booting LED Pattern

Events	LED State
Boot loader status sequence: DRAM memory test in progress DRAM memory test OK Board initialization in progress Initialization FLASH file system FLASH memory test OK Initializing Ethernet Ethernet OK Starting AP OS Initialization Successful	Blinking green
When you press the reset button for less than 20 seconds	Blinking red
When you press the reset button for more than 20 seconds	Solid red

Events	LED State
When reset button is released Or When you press the reset button for more than 60 seconds	Blinking green

Once the access point boots up, the Catalyst IW9167E follows these below LED patterns:

Table 10: Definition of URWB OS LED Pattern

AP State	LED State
General warning: Insufficient inline power	Cycling through red, green, and amber
Provisioning mode: Fallback	Blinking amber
Provisioning mode: DHCP	Amber
SNR(Signal to Noise Ratio) Excellent (≥ 25 dB)	Blinking green
SNR Good ($15 \leq X < 25$ dB)	Fade-in green
SNR Bad ($10 \leq X < 15$ dB)	Fade-in amber
SNR Unbearable (< 10 dB)	Fade-in red

LED Pattern for Catalyst IW9165

The Catalyst IW9165E has tri-color red, green, and blue LED. The Catalyst IW9165D has red, green, and amber LED with three brightness levels. The access point is flexible with brightness levels. The controller CLI or GUI controls the brightness with eight different settings.

System LED's in the URWB stack have following patterns to indicate URWB states:

Table 11: LED pattern for URWB states

AP State	LED State
Fallback	Blinking amber or blue
DHCP	Amber or blue

RSSI LED

The Catalyst IW9165 supports a bi-color green and amber LED to show the RF Receive Signal Strength Indicator (RSSI). The RSSI LED does not have different brightness level.

Table 12: RSSI LEDs

Yellow LED	Green LED	Description
Blink	Off	RSSI < - 86 dBm
On	Off	RSSI is - 86 to - 81 dBm
Off	Blink	RSSI is - 81 to - 71 dBm
Off	On	RSSI > - 71 dBm

The following table shows the LED functionalities for the Catalyst IW9165E:

Table 13: URWB LED function for the Catalyst IW9165E

LED Function Label	Color/State	Description (Default = off)
System Status	Tricolor RGB	Indicates varies system status
RSSI	Yellow or Green	RSSI < - 86 dBm: yellow - 86 dBm =< RSSI =< - 81 dBM: blinking green RSSI > - 81 dBm: green
WAN GE	Green	Port is up with link
	Blinking Green	Link with activity
	Off	No link or port is Off
LAN GE	Green	Port is up with link
	Blinking Green	Link with activity
	Off	No link or port is Off
Digital IO 1-2	Yellow	Active as digital input or output
	Off	Inactive as digital input or output

The following table shows the LED functionalities for the Catalyst IW9165D:

Table 14: URWB LED function for the Catalyst IW9165D

LED Function Label	Color/State	Description (Default = off)
System Status	Tricolor RGA	Indicates varies system status
RSSI	Yellow or Green	RSSI < - 86 dBm: yellow - 86 dBm =< RSSI =< - 81 dBM: blinking green RSSI > - 81 dBm: green

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