



Configure and validate radio channel and bandwidth

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4900-4990 MHz frequency support for US and Canada with license enforcement

From UIW Release 17.16.1, the Cisco Catalyst IW9167E, IW9165D, and IW9165E APs introduces additional support 4.9 GHz frequency band in URWB mode for Canada (-A) and -B (United States) domains.

When operating in the 4.9 GHz frequency bands for -A and -B domains, devices use 10 MHz and 20 MHz channel bandwidths with 5 MHz channel spacing.

The 4.9 GHz frequency bands are available on both the radio slot 1 and slot 2 and is disabled by default.



Note The -A and -B domains do not support IEEE 802.11ax rates when operating in 4.9 GHz.

Table 1: 4.9 GHz Frequency Bands Supported for the 10 MHz and 20 MHz Channel Bandwidth

Channel	Channel bandwidth (10 MHz)	Channel bandwidth (20 MHz)
11	4945	NA
19	4985	NA
20	4950	4950
21	4955	4955
22	4960	4960
23	4965	4965
24	4970	4970
25	4975	4975
26	4980	4980

Enable 4900-4990 MHz frequency bands

The IW Service sends the 4.9 GHz frequency band enablement configuration to the AP.

Use this task to enable the 4.9 GHz frequency bands on the AP.

Procedure

-
- Step 1** Configure the 4.9 GHz frequency band enablement using IW Service Cloud-Managed or offline deployment mode. For more information on how to configure the 4.9 GHz band enablement from IW Service, see the [Introduction to Industrial Wireless](#).
- Step 2** Use the **configure dot11Radio interface 4.9G high-throughput enable** command to enable 802.11an/ac rates. When enabled, the radios are allowed to operate at higher rates, limiting the power profile.

```
Device# configure dot11Radio 1 4.9G high-throughput enable
```

Note

You can use the **configure dot11Radio interface 4.9G high-throughput disable** command to disable high-throughput. When disabled, the radio interface operates only at 802.11a rates, unlocking high-power profile.

5855-5935 MHz frequency support

The Intelligent Transport Systems (ITS) frequency band refers to the radio spectrum allocated in Europe to support ITS.

This band spans 5875–5935 MHz and is subdivided for specific applications:

- 5875–5915 MHz is designated for Road ITS applications
- 5915–5935 MHz is allocated for Urban Rail Systems, such as automatic train control systems Communications-Based Train Control (CBTC)

The use of this band is subjected to license approval from the relevant national regulatory authority.

From UIW Release 17.18.1, the Cisco Catalyst IW9167E, IW9165D, and IW9165E APs support the ITS frequency band within the European regulatory domain (-E PID).

New power table for the -E domain

A new power table is introduced for the -E domain. This allows for various frequencies from 5860 MHz to 5930 MHz at 10 MHz intervals. See the table below for channel width, center frequencies, and corresponding channel numbers.

Table 2: 10 MHz channel allocation in the 5.9 GHz band

Channel width	Frequency (MHz)	Channel number
10 MHz	5860	172
10 MHz	5870	174
10 MHz	5880	176
10 MHz	5890	178
10 MHz	5900	180
10 MHz	5910	182
10 MHz	5920	184
10 MHz	5930	186

Restrictions

Here are some unsupported scenarios:

- The 5 MHz channel width option is not supported.
- Using frequencies from 5860 MHz to 5930 MHz is allowed only for customers who have obtained local regulatory approval.
- 5930 MHz is not supported in the IW9165E AP in 17.18.1 release.

Enable 5855-5935 MHz frequency bands

Summary

You can configure the 5.9 GHz frequency band using the IW Service in either Cloud-Managed or Offline Deployment mode. The IW Service sends the 5.9 GHz frequency band enablement configuration to the access point (AP), initiating the activation process. Detailed steps for enabling this frequency band on the AP are provided in the Industrial Wireless documentation.

Workflow

These stages describe the process to configure the 5.9 GHz frequency band using the IW service.

1. Choose one of the two available deployment modes for the IW Service
 - Cloud-Managed Mode
 - Offline Deployment Mode
2. Use the IW Service to enable the 5.9 GHz frequency band based on your selected deployment mode
3. The IW Service transmits the 5.9 GHz enablement configuration to the target AP.

Configure operating channel and bandwidth using CLI

Procedure

Step 1 Use the **configure dot11Radio interface channel channel-id** command to set the operating channel.

Example:

```
Device# configure dot11Radio 1 channel 172
```

Valid *channel-id* range is from 1 to 256.

Step 2 Use the **configure dot11Radio interface band-width bandwidth** command to set the bandwidth.

Example:

```
Device# configure dot11Radio 1 band-width 10
```

Valid *bandwidth* is 10 MHz.

Step 3 Use the **end** command to return to privileged EXEC mode.

Example:

```
Device# end
```

Validate operating channel and bandwidth using CLI

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

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

```
Interface:          enabled

Mode:              fixed infrastructure

Frequency:         5860 MHz
Channel:           172
Channel width:     10 MHz
Antenna number:    2
TX power level:    8
TX power:          2 dBm
Antenna gain:      unselected
Maximum tx mcs:    9
High-efficiency:   disabled
Maximum tx nss:    2
RTS protection:    disabled
guard-interval:    800 ns
ampdu max length: 255
distance:          3000 m
```

```
The ampdu Tx
priority 0:        enabled
priority 1:        enabled
priority 2:        enabled
priority 3:        enabled
priority 4:        enabled
priority 5:        enabled
priority 6:        disabled
priority 7:        disabled
```

```
Enhanced Distributed Channel Access (EDCA) configuration
```

```
vo: aifs=1 cw_min=2 cw_max=3 txop=15
vi: aifs=1 cw_min=3 cw_max=4 txop=31
be: aifs=3 cw_min=4 cw_max=6 txop=31
bk: aifs=7 cw_min=3 cw_max=4 txop=0
```

```
Passphrase:        33322f268bd38d6307fb52ffec9f515fe15303ac62ed375b397716bd810d511c
AES encryption:    disabled
AES key-control:   disabled
Key rotation:      disabled
Key rotation timeout: 0(second)
```

```
DFS region:        E
DFS radar role:    auto
Radar detected:    0
Indoor deployment: disable
Rx-SOP Threshold: 0 dBm(AUTO)
Max packet retries: 32
```

Configure operating channel and bandwidth using GUI

Procedure

- Step 1** Choose **GENERAL SETTINGS > wireless radio** and go to Radio 1 Settings:
- Step 2** From the **Role** drop-down list, select Fixed or Fluidity.
- Step 3** From the **Frequency (MHz)** drop-down list, select the frequency range. See Table 1 for a list of valid frequencies.
- Step 4** From the **Channel Width (MHz)** drop-down list, select 10 MHz.
- Step 5** Click **Save**.
- Step 6** (Optional) Choose **MANAGEMENT SETTINGS > status**. This page displays the status of radio channel, bandwidth configuration, and specific information of each wireless interface.
-

UNII-3 band with DFS support

Dynamic Frequency Selection

Dynamic Frequency Selection (DFS) is a wireless communication feature that

- scans for radar signals in real-time,
- automatically adjusts the frequency on a DFS-enabled radio to avoid interference with radar systems, and
- ensures coexistence with radar systems, especially in the 5 GHz frequency band.

DFS is a regulatory requirement for devices operating in the 5 GHz band to prevent interference with critical radar systems, such as weather or military radars.

UNII-3 frequency band

The Unlicensed National Information Infrastructure (UNII-3) frequency band is part of the radio frequency spectrum ranging from 5725 MHz to 5825 MHz, as defined by the US Federal Communications Commission (FCC).

Support for UNII-3 band in Great Britain

From Cisco UIW Release 17.18.1, the Cisco Catalyst IW9165D and IW9167EH APs support the UNII-3 band with DFS channels. These channels range from channel 149 (5745 MHz) to channel 165 (5825 MHz) under the country code GB in the Rest of the World (ROW) regulatory domain (-ROW PID).

Table 3: UNII-3 band support on Cisco Catalyst IW9165 and 9167 APs (Great Britain)

Cisco UIW Release	Access Points	Regulatory Domain	Country Code	Frequency Range
17.18.1	IW9165D IW9167EH	-ROW	GB	5745 to 5825 MHz

Table 4: Supported UNII-3 band channels (Great Britain)

Channel Number	Center Frequency (MHz)
149	5745
153	5765
157	5785
161	5805
165	5825

Support for UNII-3 band in Egypt

From Cisco UIW Release 26.1.1, the Cisco Catalyst IW9165E and IW9167E APs support the UNII-3 band in Egypt. The supported frequencies range from 5745 MHz to 5825 MHz under the ROW regulatory domain.

The available channel widths are 20, 40, and 80 MHz, except for frequency 5825 MHz, which supports only 20 MHz.



Note To unlock Egypt's extended frequencies, you should enable the configuration file from IW Service. For information on how to activate the license, see the [Enablement of licensed frequencies](#) section in Industrial Wireless documentation.

Table 5: UNII-3 band support on Cisco Catalyst IW9165 and 9167 APs (Egypt)

Cisco UIW Release	Access Points	Regulatory Domain	Country Code	Frequency Range
26.1.1	IW9165E IW9167E	-ROW	EG	5745 to 5825 MHz

Table 6: Supported UNII-3 band channels (Egypt)

Channel Number	20 MHz Center Frequency (MHz)
149	5745
153	5765
157	5785

Channel Number	20 MHz Center Frequency (MHz)
161	5805
165	5825 ¹

¹ Supports only 20 MHz.



Caution The frequencies in the table are available only if you have an explicit authorization from the local regulatory authority to operate with higher transmit (TX) power.

Support for UNII-3 band in Saudi Arabia

From Cisco UIW Release 26.1.1, the Cisco Catalyst IW9165E and IW9167E APs support the UNII-3 band in Saudi Arabia. The supported frequencies range from 5745 MHz to 5825 MHz under the ROW regulatory domain. The frequencies are available to all customers and do not require a license.

The available channel widths are 20, 40, and 80 MHz, except for frequency 5825 MHz, which supports only 20 MHz.

Table 7: UNII-3 band support on Cisco Catalyst IW9165 and 9167 APs (Saudi Arabia)

Cisco UIW Release	Access Points	Regulatory Domain	Country Code	Frequency Range
26.1.1	IW9165E IW9167E	-ROW	SA	5745 to 5825 MHz

Table 8: Supported UNII-3 band channels (Saudi Arabia)

Channel Number	20 MHz Center Frequency (MHz)
149	5745
153	5765
157	5785
161	5805
165	5825 ²

² Supports only 20 MHz.



Caution The frequencies in the table are available only if you have an explicit authorization from the local regulatory authority to operate with higher transmit (TX) power.

How DFS works

Workflow

These stages describe how the DFS process works:

1. **Radar signal scanning:** DFS-enabled radios continuously monitor the operating frequency band for radar signals to ensure compliance with regulatory requirements.
2. **Radar signal detection:** If a radar signal is detected, the device identifies the specific frequency being used by the radar.
3. **Frequency avoidance:** The radio dynamically selects and prepares to switch to a new frequency within the allowed spectrum to avoid interference with the radar.
4. **Channel availability check:** Before switching, the device performs a channel availability check to confirm that the new frequency is clear of radar signals or other interference.
5. **Seamless communication:** Once the new frequency is validated, the device switches to it and resumes normal communication without disrupting network operations.

Benefits

APs operating in the UNII-3 band

- operates within the 5.8 GHz frequency range of 5745 MHz to 5825 MHz
- helps to avoid radar interference by switching frequencies, and
- improves wireless connectivity and performance in radar environments.

Restrictions

These are the restriction for the UNII-3 band with DFS support.

- Supports 10 MHz and 160 MHz channel width only.
- Use of 5.8 GHz frequencies from 5745 MHz to 5825 MHz is permitted only for customers with local regulatory approval.

Configure DFS channel

Use this procedure to configure the DFS channel.

Before you begin

Ensure that the device's regulatory domain is ROW.

Procedure

Step 1 Use the **configure countrycode** *country-code* command to set the country code.

Example:

```
Device# configure countrycode GB
```

Step 2 (Optional) Use the **show controllers dot11Radio** *radio frequency* command to verify the UNII-3 band with DFS support channels.

Example:

```
Device# show controllers dot11Radio 1 frequency
wifil  Link encap:Ethernet  HWaddr 8C:84:42:92:EA:C0
        BROADCAST MULTICAST  MTU:1500  Metric:1
        RX packets:0 errors:0 dropped:0 overruns:0 frame:0
        TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:2699
        RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

Configured Frequency: 5745Mhz Channel: 149 20MHz (DFS enabled)
Serving Frequency: 5745Mhz Channel: 149 20MHz
Allowed Frequency: * Dynamic Frequency Selection (DFS) only
    *5500MHz (100) *5520MHz (104) *5540MHz (108) *5560MHz (112) *5580MHz (116) *5600MHz (120) *5620MHz (124)
    *5640MHz (128)
    *5660MHz (132) *5680MHz (136) *5700MHz (140) *5745MHz (149) *5765MHz (153) *5785MHz (157) *5805MHz (161)
    *5825MHz (165)
```

Configure operating channel using CLI

From UIW Release 17.15.1, the Cisco Catalyst IW9167E, IW9165D, and IW9165E AP supports 4.9 GHz frequency band in URWB mode for -Q domain (Japan). When operating at 4.9 GHz frequency band, the device supports only 20 MHz channel bandwidth.

The -Q domain supports 802.11ax rates when operating in 4.9 GHz.

Table 9: Supported channels and frequencies for the 4.9 GHz band

Channel number	Frequency (MHz)
184	4920
188	4940
192	4960
196	4980

To configure the operating channel, use the commands given here:

Procedure

Step 1 Configure the wireless device with radio interface number.

```
Device# configure dot11Radio 1
```

The valid values are 1 and 2.

Step 2 Set the operating channel id.

```
Device# configure dot11Radio 1 channel 192
```

The valid range for the channel is 1 to 256.

Step 3 Returns to privileged EXEC mode.

```
Device# end
```

Configure channel bandwidth from CLI

1. Use the **configure dot11Radio interface** command to configure the radio interface number.

```
Device# configure dot11Radio 1
```

The valid values are 1 and 2.

2. Use the **configure dot11Radio interface band-width bandwidth** command to set channel bandwidth.

```
Device# configure dot11Radio 1 band-width 20
```

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

3. Use the **end** command to return to privileged EXEC mode.

```
Device# 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

```

Configure 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:

The screenshot displays the Cisco URWB IW9167EH Configurator interface. The top header shows the Cisco logo and the device model. The main content area is divided into a left sidebar with navigation options and a main configuration panel. The sidebar includes sections for 'IW Service' (Offline), 'IW Monitor' (Disabled), 'GENERAL SETTINGS' (with sub-items like general mode, wireless radio, antenna alignment and stats), 'NETWORK CONTROL' (with sub-items like advanced tools), 'ADVANCED SETTINGS' (with sub-items like advanced radio settings, static routes, allowlist/blocklist, snmp, radius, ntp, ethernet filter, i2tp configuration, vlan settings, Fluidity, misc settings), and 'MANAGEMENT SETTINGS' (with sub-items like remote access, firmware upgrade, status, configuration settings, reset factory default, reboot, logout). The main configuration panel is titled 'WIRELESS RADIO' and contains the following sections:

- Wireless Settings:** A text input field for 'Shared Passphrase' is set to 'CiscoURWB'. Below it, a note states: 'In order to establish a wireless connection between Cisco URWB units, they need to be operating on the same frequency.'
- Radio 1 Settings:**
 - Role: Fixed
 - Frequency (MHz): 5260
 - Channel Width (MHz): 20
- Radio 2 Settings:**
 - Role: Fixed
 - Frequency (MHz): 5180
 - Channel Width (MHz): 80

At the bottom of the configuration panel, there are 'Reset' and 'Save' buttons. The footer of the page reads '© 2023 Cisco and/or its affiliates. All rights reserved.'

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

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 vln 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	If native VLAN is ON, then the packet is allowed (tagged with NVID) If native VLAN is OFF, then the packet is dropped
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: IW Service interface)	Packet tagged with MVID
Signaling traffic	Packet tagged with MVID
Tagged with valid VID (1–4094), but not with NVID	Packet allowed (tagged)

Access port rules management for outgoing packets with an access point in smart mode

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.

Configure 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 title bar indicates the device is in MESH END MODE. The left sidebar contains a navigation menu with categories like GENERAL SETTINGS, NETWORK CONTROL, and MANAGEMENT SETTINGS. The 'wireless radio' option is selected. The main panel displays the 'WIRELESS RADIO' configuration page. Under 'Wireless Settings', there is a 'Shared Passphrase' field containing 'PASSWORD'. Below this, a note explains the purpose of the shared passphrase. The 'Radio 1 Settings' section shows the 'Role' dropdown set to 'Fluidity', 'Frequency (MHz)' set to 5180, and 'Channel Width (MHz)' set to 80. The 'Radio 2 Settings' section shows the 'Role' dropdown set to 'Disabled'. At the bottom of the settings area, there are 'Reset' and 'Save' buttons. The footer of the page contains the copyright notice: © 2022 Cisco and/or its affiliates. All rights reserved.

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.



ULTRA RELIABLE
WIRELESS BACKHAUL

Cisco URWB IW9167EH Configurator
5.21.201.72 - MESH END MODE

IW Service Offline

IW Monitor Disabled

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: Vehicle

Automatic Vehicle ID: Enable

Vehicle ID:

Network Type: Flat

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

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The screenshot shows the Cisco URWB IW9167EH Configurator interface. The 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: IW Service (Offline), IW Monitor (Disabled), 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), and MANAGEMENT SETTINGS (remote access, firmware upgrade, status, configuration settings, reset factory default, reboot, logout). The main content area is titled "FLUIDITY" and contains "Fluidity Settings". A text block explains that the unit can operate in three modes: Infrastructure, Infrastructure (wireless relay), and Vehicle. It states that the unit must be set as Infrastructure when it acts as the entry point of the infrastructure for mobile vehicles and is connected to a wired network backbone. The unit must be set as Infrastructure (wireless relay) ONLY when used as a wireless relay agent. In Infrastructure mode, the unit must NOT be connected to the wired network backbone as it will use the wireless connection to relay data. The unit must be set as Vehicle when it is mobile, and Vehicle ID must be set ONLY when configured as a Vehicle. The Network Type field is set to "Flat". The Handoff Logic field is set to "Standard". There are "Reset" and "Save" buttons at the bottom of the settings area.

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

The screenshot shows the Cisco URWB IW9167EH Configurator interface. The title is "Cisco URWB IW9167EH Configurator" with the version "5.21.201.72 - MESH END MODE". The left sidebar is identical to the previous screenshot. The main content area is titled "WIRELESS RADIO" and contains "Wireless Settings". A text block explains that the "Shared Passphrase" is an alphanumeric string or special characters that identifies the network. The Shared Passphrase field is set to "PASSWORD". Below this, there is a note that units need to be on the same frequency. The "Radio 1 Settings" section shows the Role set to "Fluidity", Frequency (MHz) set to "5180", and Channel Width (MHz) set to "80". The "Radio 2 Settings" section shows the Role set to "Disabled". There are "Reset" and "Save" buttons at the bottom of the settings area.

Cisco URWB IW9167EH Configurator
5.21.201.72 - MESH END MODE

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: Flat

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

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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.

Cisco URWB IW9167EH Configurator
5.21.201.88 - MESH POINT MODE

WIRELESS RADIO

Wireless Settings

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

Shared Passphrase: CiscoURWB

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

Radio 1 Settings

Role: Fixed

Frequency (MHz): 5260

Channel Width (MHz): 20

Radio 2 Settings

Role: Fluidity

Frequency (MHz): 5500

Channel Width (MHz): 80

Reset Save

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10.115.11.118 says
Error: unit role vehicle is not compatible with radio configuration.
Both radios must be configured as fluidity for role vehicle.

OK

Configuration contains changes. Apply these changes? Discard Review Apply

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: Vehicle

Automatic Vehicle ID: Enable

Network Type: Flat

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

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Configure 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]
```

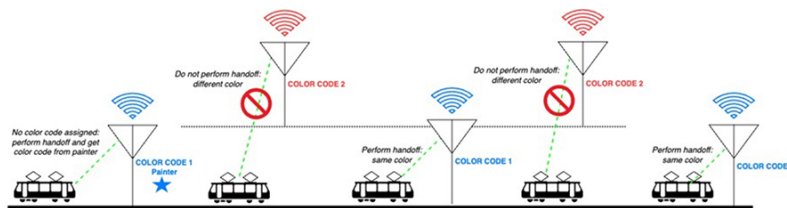
Configure fluidity coloring

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 10: 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

Configure 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
```

Verify 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
...
```

Configure 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.

Configure 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
```

Verify fluidity coloring RSSI threshold using CLI

```
Device# show fluidity config
```

Example:

```
Device# show fluidity config
...
Color: enabled, current: 0
Color min RSSI threshold: 55
```