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

Channel	Channel bandwidth (10 MHz)	Channel bandwidth (20 MHz)
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

Configure the 4.9 GHz frequency band enablement using IW Service online 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.

Configure operating channel from CLI

Note 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 2: Supported channels and frequencies for the 4.9 GHz band

Channel	Frequency (MHz)
184	4920
188	4940

Channel	Frequency (MHz)
192	4960
196	4980

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

Procedure

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
```

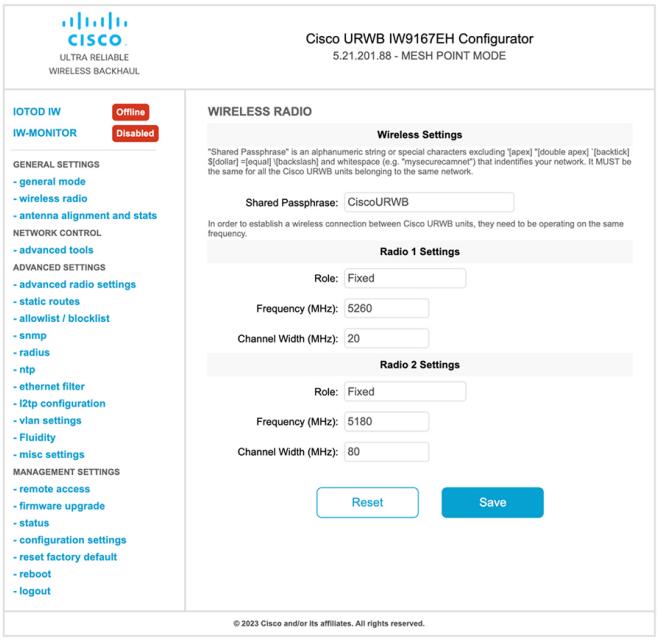
```
Channel : 36
Channel width : 40 MHz

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

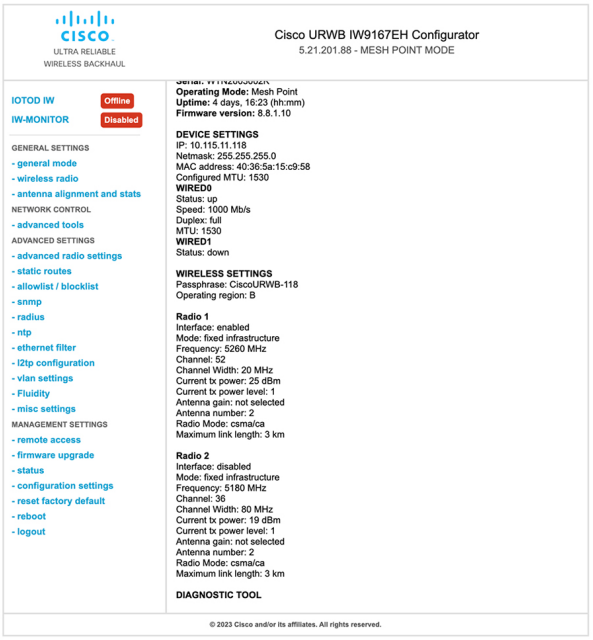
Configure radio channel and bandwidth from GUI

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:



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



Configure VLAN settings

Default VLAN configuration parameters for the access point are:

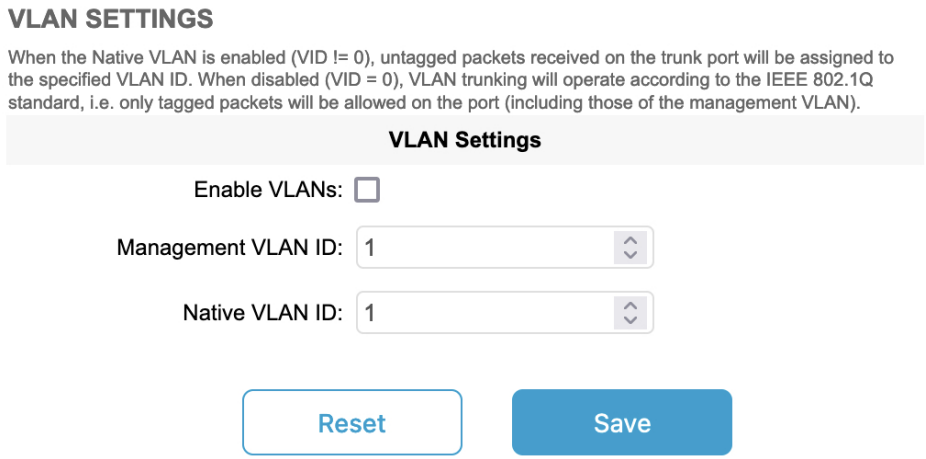
Parameter	Default value
Management VLAN ID (MVID)	1
Native VLAN ID (NVID)	1

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

Procedure

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

The **VLAN SETTINGS** window appears.



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	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.

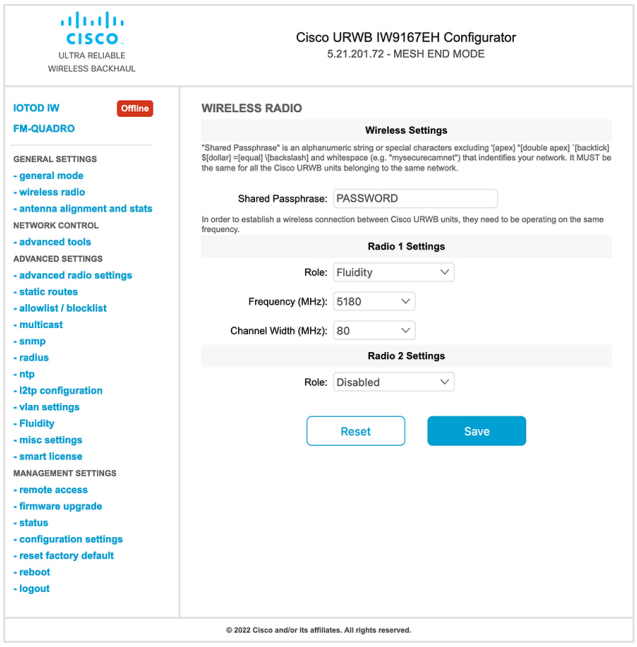
Configure fluidity using GUI

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.



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

1. In the **ADVACED 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:

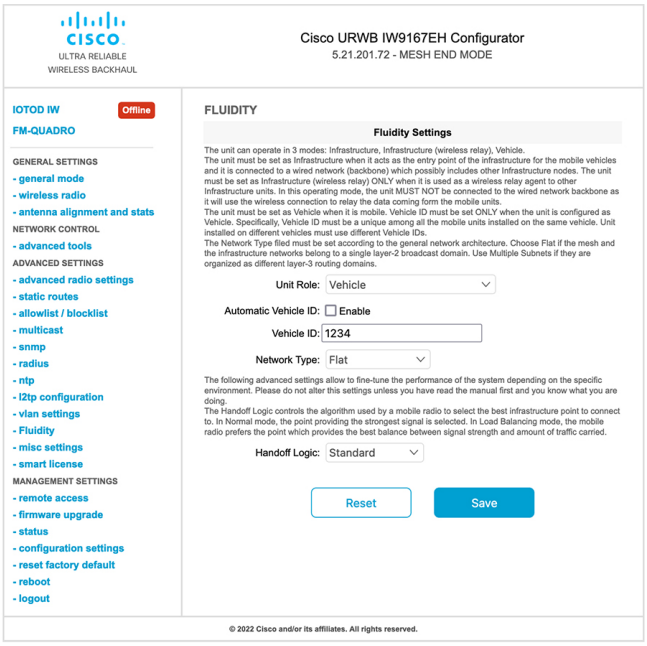
   - Infrastructure
   - Infrastructure (wireless relay)

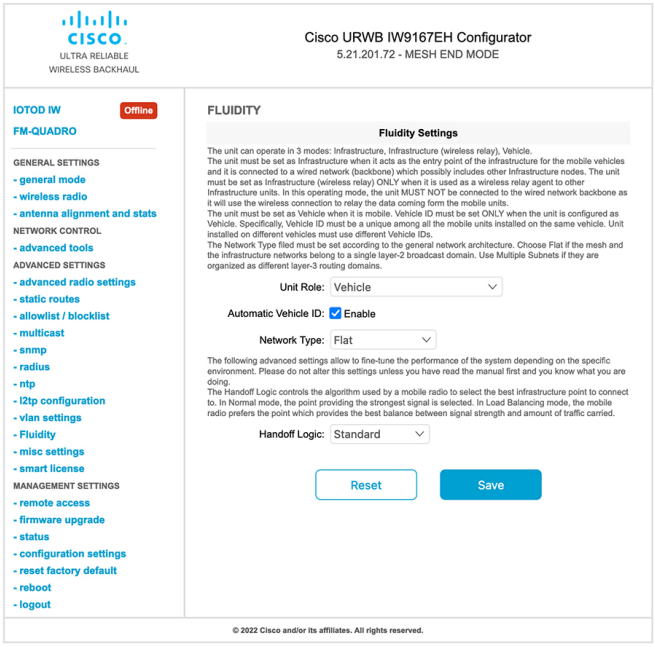
- Vehicle

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'.

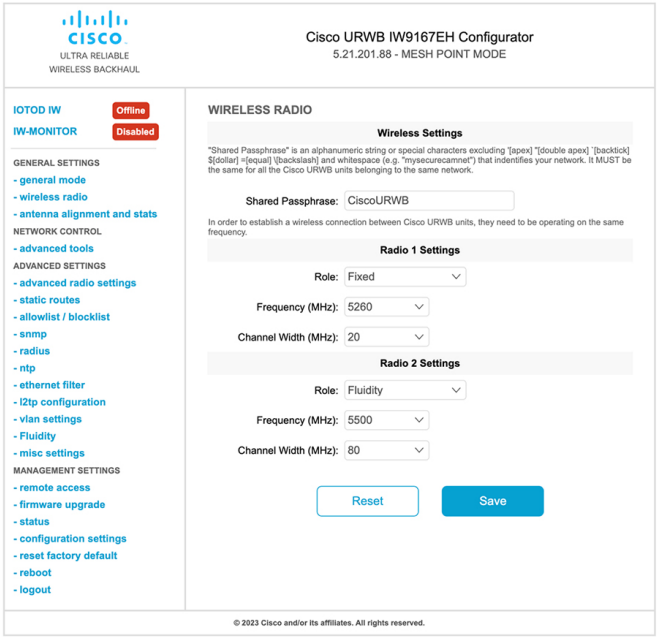
3. Check the **Automatic Vehicle ID** check box to automatically set Vehicle ID for mobile units.

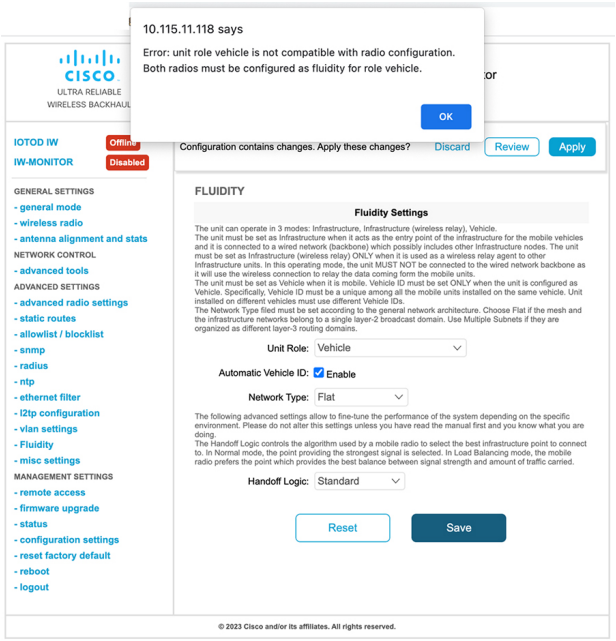




Following Fluidity configuration shows wireless interface device role configured as infrastructure mode:

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.





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]
   ```

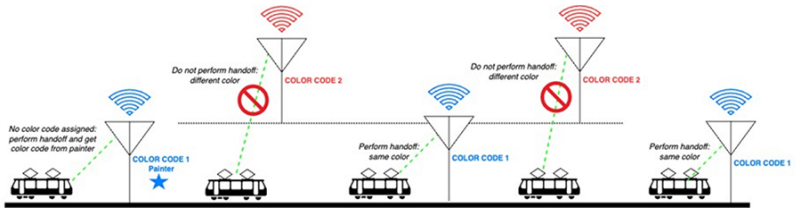
Configure fluidity coloring

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 3: 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
Devie# 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
```