

# Configure Multi Frequency with Fluidity on APs in CURWB Mode

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## Introduction

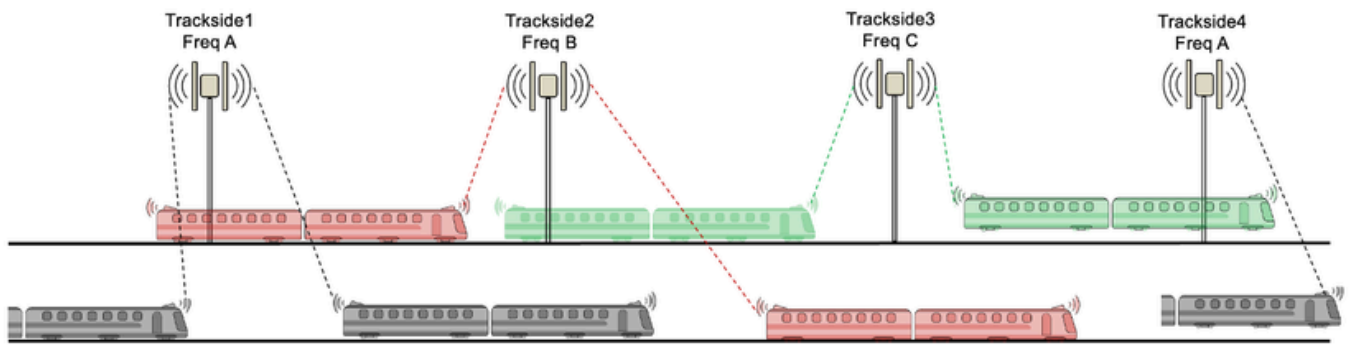
This document describes configuration of multiple frequencies in Fluidity deployments on APs operating in CURWB mode.

## Background Information

Basic fluidity layer 2 networks with single frequency deployment can be enhanced into multi-frequency deployment by leveraging FLUIDITY FREQUENCY SCAN. In high-density environments, such as ports, train-to-ground systems, and mining operations, the high concentration of wireless devices often results in interference. This interference can lead to increased channel utilization, resulting in latency in wireless communication. By employing multiple channels in these scenarios, the size of the collision domain is reduced, significantly improving wireless performance.

## Prerequisite

Before implementing this configuration, radios must be set up in Fluidity mode. Achieving a seamless handoff is possible if at least two radios are installed onboard. This setup allows one radio to maintain continuous connectivity while the second radio scans for the next available radio.



The ground base-station frequencies could be staggered in A B C A B C fashion or in a random order.

## Mechanics of Fluidity Frequency Scan

As a mobile unit moves along the track, if one or both radios disconnect from the infrastructure for a specified period, referred to as "Scan Isolation," the unit scans a predefined list of frequencies. Frequency scanning can be further customized so that, in addition to Scan Isolation, if the RSSI of the active connection falls lower than a specified threshold, the mobile unit initiates a scan of these frequencies. During scanning, if the unit finds another Fluidity-enabled trackside radio configured to one of the specified frequency and channel-width values that exceeds the RSSI delta, it establishes a connection with that unit.

### Configurable Parameters for Fluidity Frequency Scan:

Frequency Scan can be configured using the CLI or IW-Service. These settings are available to fine-tune the frequency scan feature:

**Scan Isolation:** A unit performs an auto scan if it is disconnected from the infrastructure for a configured amount of time, with a default recommended value of 3000 ms.

**Scan List:** Set a list of channels and channel bandwidths (in MHz) to scan for other Fluidity infrastructure units. In legacy radios, examples of scan lists could include frequencies such as 5180 40 5580 40 5745 40. However, for IW radios, channel numbers need to be used instead of frequencies, for example: 36 40 116 40 149 40.

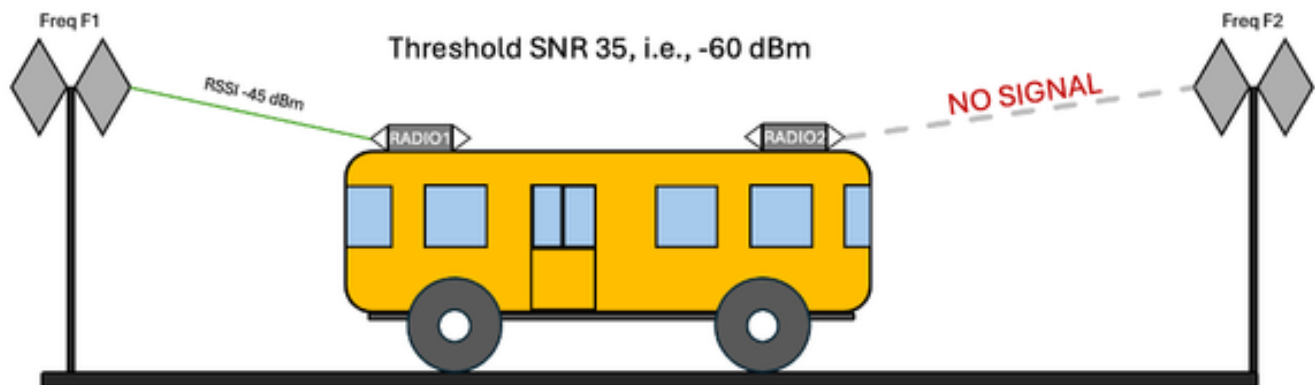
**Frequency Scan Periodic:** The Frequency Scan Periodic setting allows you to enable or disable frequency scan periodicity and select the scan period when the unit is idle. It initiates and repeats auto scanning at set intervals while idle, expressed in seconds. This feature is commonly used in dual radio onboard setups, where the idle radio scans during each scan period while the active radio is engaged in communication.

**Scan RSSI Threshold:** Set a critical RSSI threshold to trigger an auto scan, allowing further system customization based on design needs. This can be used in conjunction with Scan Isolation and Frequency Scan Periodic settings to optimize performance. The parameter is expressed in Signal-to-Noise Ratio (SNR). For instance, if the radios need to trigger a frequency scan at -70 dBm, the value is set to  $95 - 70 = 25$ .

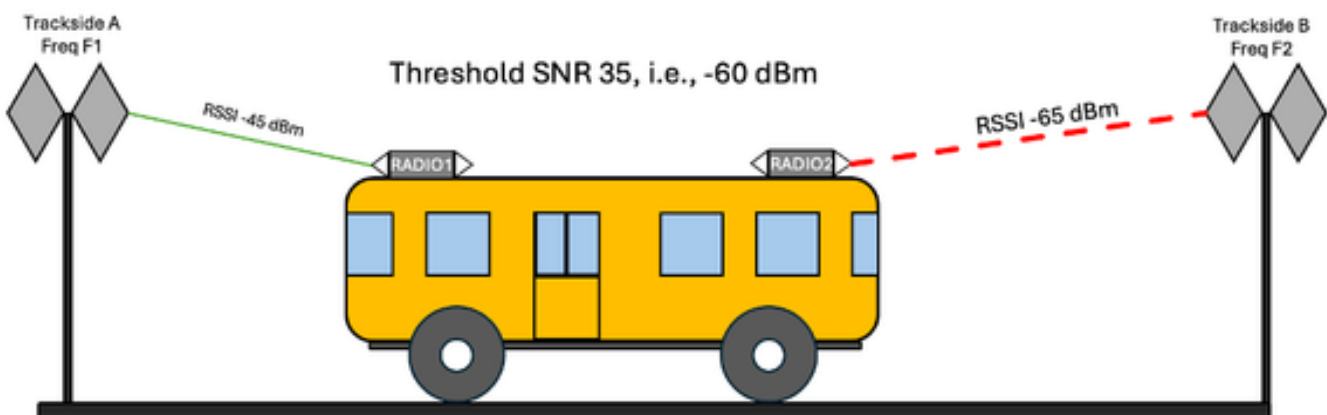
**Vehicle frequency:** Use this feature in specific designs where it is necessary to lock the same frequency on both radios onboard for a specific timeframe. **Frequency Locked** is used if all mobile units on the same vehicle need to use the same frequency; otherwise, Frequency Open allows mobile units on the vehicle to use different frequencies.

## Examples

- In this example, Radio 1 maintains a wireless signal strength of -45 dBm, while Radio 2 has no connection. Radio 2 performs an autoscan after waiting for the Scan Isolation period. If Frequency Scan Periodic is configured as well, Radio 2, being idle, continues to scan for a better trackside connection.



- In this example, while Radio 1 maintains a wireless signal of -45 dBm, Radio 2 detects a signal of -65 dBm from Trackside B, which is lower than the threshold. Consequently, Radio 2 scans for a better signal. If Frequency Scan Periodic is configured, Radio 2, being idle, continues to scan for a better trackside connection.



## Configuration

### Configuring Frequency Scan through IW Service

- Once the Fluidity option is enabled and the radio is configured as a vehicle, Fluidity Frequency Scan can be activated.
- In a Frequency Scan configuration, it is essential to include Scan Isolation, typically set to 3000ms
- Frequency Scan Periodic, Scan RSSI Threshold, and Vehicle Frequency are optional fields that can be fine-tuned according to specific needs.
- Fluidity Scan List can contain 2 or more frequencies.

## Edit Device Configuration

Q Search

Key Control

FluidMAX

Multicast

SNMP

Radius

NTP

L2TP

Vlan

Fluidity

Fluidity Advanced

Fluidity Pole Proximity

● Fluidity Frequency Scan

Fluidity MPO

Fluidity Frequency Scan

● Frequency Autoscan

Enable

● Scan Isolation (ms)

3000

● Frequency Scan Periodic Enable

Disable

Frequency Scan Periodic (s)

Parameter disabled

## Edit Device Configuration

Q Search

Key Control

FluidMAX

Multicast

SNMP

Radius

NTP

L2TP

Vlan

Fluidity

Fluidity Advanced

Fluidity Pole Proximity

● Fluidity Frequency Scan

Fluidity MPO

Fast Failover (TITAN)

Misc

Spanning Tree

MPLS

● Scan RSSI Threshold Enabled

Disable

Scan RSSI Threshold (dB)

Parameter disabled

● Vehicle frequency

Frequency open

Fluidity Scan List

Frequency (MHz)

5180 MHz

Channel width

20

Frequency (MHz)

5200 MHz

Channel width

20

## Configuring Frequency Scan through CLI

```
MP_Vehicle_Primary#configure fluidity scan isolation 3000
MP_Vehicle_Primary#configure fluidity scan list 36 20 40 20
MP_Vehicle_Primary#configure fluidity scan periodic 120
MP_Vehicle_Primary#write
MP_Vehicle_Primary#reload
```

## Troubleshooting Frequency Scan

- During the design stage, ensure that trackside radios provide sufficient coverage to prevent both radios from starting a scan simultaneously.
- If seamless roaming across multiple frequency trackside radios is not occurring, it is possibly due to the frequency scan not being triggered or insufficient coverage affecting connectivity.
- When the Scan RSSI threshold is enabled, verify it is set correctly as an SNR value; incorrect settings can negatively impact network performance.
- If the vehicle has only one radio onboard, transitioning from one trackside operating on frequency F1 to another on frequency F2 is not seamless, as the radio must scan for a strong signal, resulting in temporary disconnection.
- Use logging to observe frequency scanning and frequency changes, as shown in the example log entries:

```
Apr  8 01:48:20 m481BA442C224 kernel: [*04/07/2025 21:48:20.1719] DOT11_DRV[1]: Channel set to 36
Apr  8 01:48:20 m481BA442C224 kernel: [*04/07/2025 21:48:20.1719] DOT11_DRV[1]: Stop Radio1 - Begin
Apr  8 01:48:20 m481BA442C224 kernel: [*04/07/2025 21:48:20.1780] DOT11_DRV[1]: set_channel Channel set
Apr  8 01:48:20 m481BA442C224 kernel: [*04/07/2025 21:48:20.3246] DOT11_DRV[1]: Channel set to 40
Apr  8 01:48:20 m481BA442C224 kernel: [*04/07/2025 21:48:20.3247] DOT11_DRV[1]: Stop Radio1 - Begin
Apr  8 01:48:20 m481BA442C224 kernel: [*04/07/2025 21:48:20.3277] DOT11_DRV[1]: set_channel Channel set
Apr  8 01:48:20 m481BA442C224 kernel: [*04/07/2025 21:48:20.3375] DOT11_DRV[1]: Start Radio1 - Begin
Apr  8 01:48:20 m481BA442C224 kernel: [*04/07/2025 21:48:20.3396] DOT11_DRV[1]: set_channel Channel set
Apr  8 01:48:20 m481BA442C224 kernel: [*04/07/2025 21:48:20.4748] DOT11_DRV[1]: Channel set to 36
Apr  8 01:48:20 m481BA442C224 kernel: [*04/07/2025 21:48:20.4748] DOT11_DRV[1]: Stop Radio1 - Begin
Apr  8 01:48:20 m481BA442C224 kernel: [*04/07/2025 21:48:20.4775] DOT11_DRV[1]: set_channel Channel set
```