



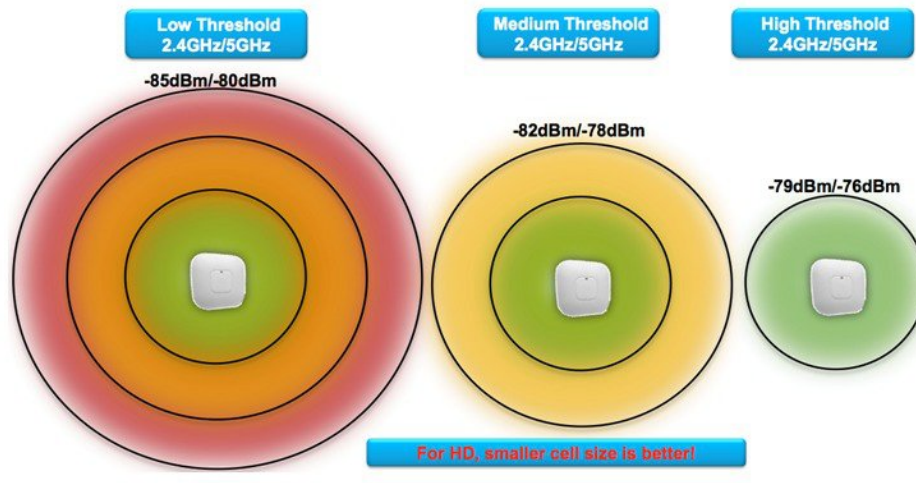
High Density Experience Features in Release 8.0

This section covers the following topics in depth:

- [Receiver Start of Packet Detection Threshold, on page 1](#)
- [Optimized Roaming, on page 5](#)
- [Dynamic Channel Assignment in RF Profiles, on page 11](#)

Receiver Start of Packet Detection Threshold

Receiver Start of Packet Detection Threshold (RX-SOP) determines the Wi-Fi signal level in dBm at which an AP radio will demodulate and decode a packet. The higher the RX-SOP level, the less sensitive the radio is and the smaller the receiver cell size will be. By reducing the cell size, we ensure that the clients are connected to the nearest access point using the highest possible data rates. This is ideal for high density environments such as stadiums and large auditoriums where there are a large number of client devices connected per AP. In a high density environment, the smaller the cell size, the better.

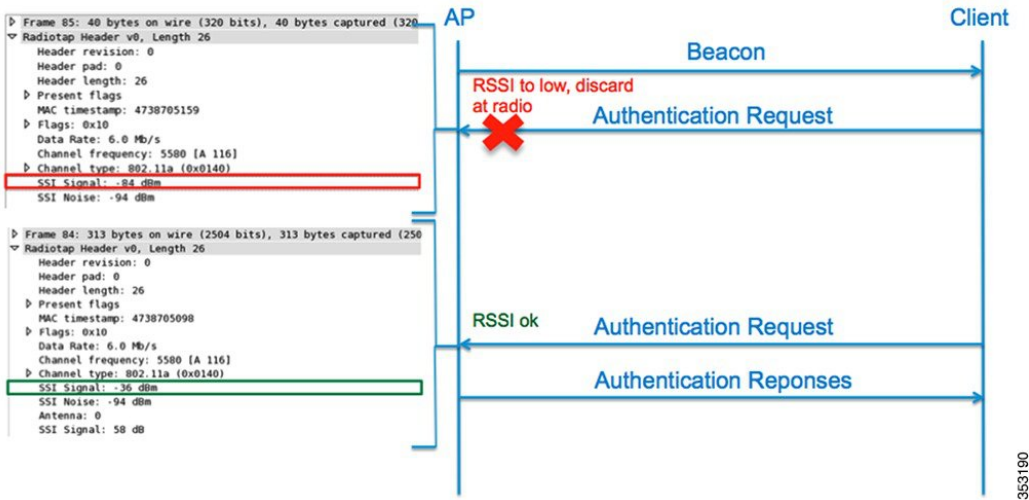


As the RX-SOP value increase, only packets of a higher RSSI value are decoded by the AP's radio. This decreases the cell size as shown in the figure above, but ensures that all clients are connected with a good RSSI value.

The following is an example of an AP receiving 802.11 packets. All frames received with weaker RSSI than configured RS-SOP will be classified as non-WiFi frames and will not get decoded by the radio, only packets

Receiver Start of Packet Detection Threshold

with acceptable RSSI values are decoded. Packets that are not decoded are treated as non-WiFi interference and detected at the AP as noise.



In this example, the RX-SOP threshold is set to low, so authentication requests sent at -84 dBm are not decoded, but when the same message is sent at -36 dBm, it is decoded.

Table 1: RX-SOP Template Thresholds

802.11 Band	High Threshold	Medium Threshold	Low Threshold	Auto
5 GHz	-76 dBm	-78 dBm	-80 dBm	Use radio default
2.4 GHz	-79 dBm	-82 dBm	-85 dBm	Use radio default

The RX-SOP default threshold value is **Auto**, which means that the RX-SOP threshold is set to the radio’s default value.

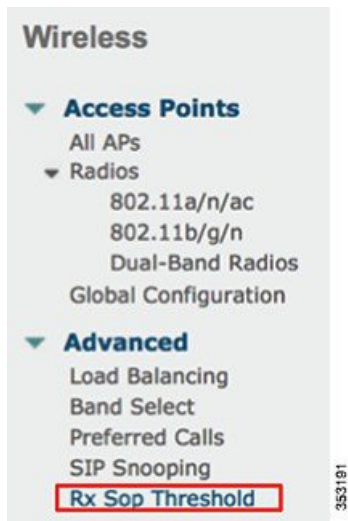


Note RX-SOP is supported on the following APs:

- 1552
- 1570
- 1600
- 1700
- 2600, 2700
- 3500, 3600, 3700

Configuring RX-SOP via the WLC GUI

1. To configure the RX-SOP threshold on a global level, go to **Wireless >Advanced > Rx Sop Threshold**.



2. A different value can be selected for the 2.4 GHz and the 5 GHz band. This value will be set globally for all APs. Only an RF Profile can override these settings.



Configuring RX-SOP via a RF Profile

1. To create a new RF Profile, from the WLC GUI, go to **Wireless > RF Profile**, and then click **New**.
2. Enter a RF Profile name and select a band. A separate profile must be applied to the 2.4 GHz band and 5 GHz band.

RF Profile > New

RF Profile Name

Radio Policy

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3. Select the **High Density** tab and choose the desired RX-SOP threshold.

RF Profile > Edit 'RX-SOP_5GHz'

< Back Apply

General 802.11 RRM **High Density** Client Distribution

High Density Parameters

Maximum Clients(1 to 200) 200
Client Trap Threshold 50

Multicast Parameters

Multicast Data Rates auto

Rx Sop Threshold Parameters

Rx Sop Threshold Auto

Auto
High
Medium
Low
Auto

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Note Existing RF profiles can be modified to include an RX-SOP Threshold. You need not create a new profile solely for RX-SOP.

- The RF Profile must now be applied to an AP Group. Go to **WLANs > Advanced > AP Groups**, then either add a new group or modify an existing group.
- Under the **RF Profile** tab, select the pre-band RF Profiles with the desired RX-SOP thresholds.

Ap Groups > Edit 'RxSopGroup'

General WLANs **RF Profile** APs 802.11u

Apply

802.11a RX-SOP_5GHz
802.11b RX-SOP_24GHz

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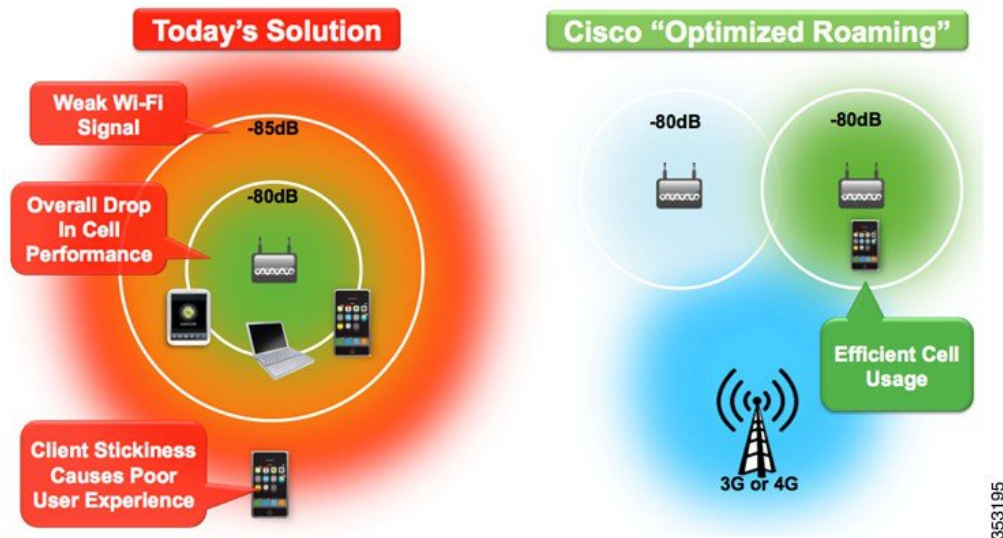
To complete the AP Group configuration, additional steps such as adding WLANs and selecting APs are required. These steps are not listed as part of this guide.

Configuring RX-SOP via the WLC CLI

```
config 802.11<a/b> rx-sop threshold <level>
```

```
auto          Revert 802.11a radio receiver SOP to auto
high          Set 802.11a radio receiver SOP to high
low           Set 802.11a radio receiver SOP to low
medium        Set 802.11a radio receiver SOP to medium
```

Optimized Roaming



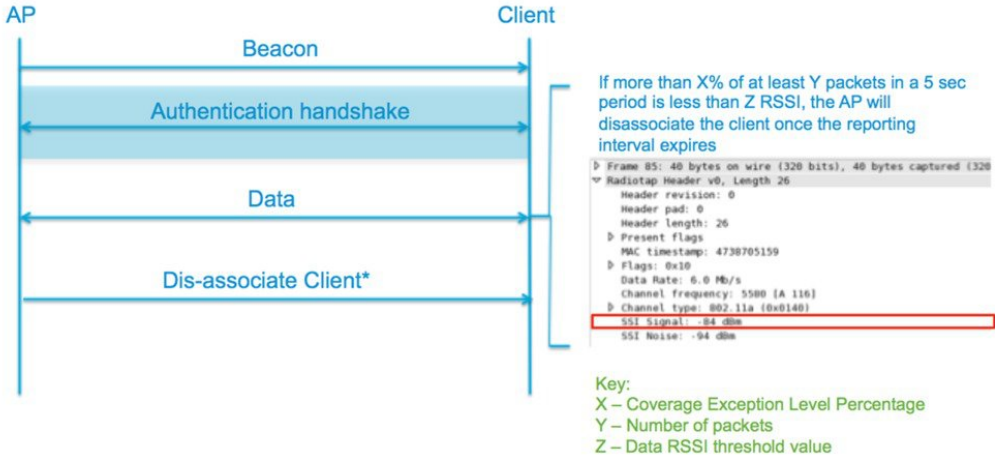
The Sticky Client Problem:

A client is referred as "Sticky" when it does not roam or move to a nearby AP connection that has stronger signal strength. As illustrated in the above figure, when Optimized Roaming is disabled, the client will continue to stay with the AP at very weak signal strength, for example—lower than -86 dB. Lower signal strength will lead to increase in Airtime interference, thus reducing the overall performance.

Solution—Cisco Optimized Roaming:

Cisco Optimized Roaming addresses the sticky client challenge by pro-actively disconnecting clients, thus enabling the clients to move to a nearby AP that offers stronger connectivity. It achieves this functionality by actively monitoring Data RSSI packets, and enforcing client disassociation when the RSSI is lower than the set threshold. As illustrated in the above figure, when Optimized Roaming is enabled, the clients with signal strength lower than -80 dB will receive disassociation and achieves the following:

- Client receives best connectivity and maintains the quality of experience.
- Improves overall performance of each AP cell by reducing Airtime interference.



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Note The client will be allowed to rejoin the AP when the client RSSI value has increased to 6 dBm above the disassociation threshold. For example, if the Data RSSI threshold is -80 dBm, the client will be allowed to re-associate once the RSSI values is increased to -74 dBm.

Table 2: Description of the Optimized Roam Feature

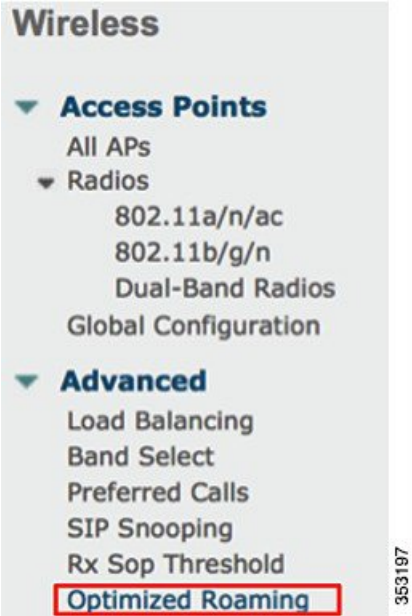
Feature	Description	Default
Enabling Optimized Roaming	Optimized Roaming is disabled by default. It can be enabled per band, meaning it can be enabled on b/g/n, a/ac/n, or both.	Disable

Feature	Description	Default
Setting the Optimized Roaming threshold parameters	<p>The Optimized Roaming thresholds are shared with the coverage hold detection thresholds.</p> <p>Here is a description of the three fields used for Optimized Roaming:</p> <ol style="list-style-type: none"> <li data-bbox="771 478 1136 695">1. Data RSSI value - This is the threshold value to determine if a data packets RSSI value is too low. Packets received at or below this value are considered below the optimized roaming threshold. <li data-bbox="771 720 1136 936">2. Coverage Exception Level Percentage - This marks the percentage of data packets that can be received below the Data RSSI value. If this percentage exceeds, the client will be disassociated. <li data-bbox="771 961 1136 1115">3. Number of Data Packets Received - This is the minimum number of packets that must be received to trigger a client disassociation. <p>By default, the data RSSI value is set to -80 dBm, the coverage exception level is 25%, and the default number of packets is 50.</p> <p>So by default, if Optimized Roaming is enabled and more than 25% of at least 50 packets in a 5 second period is less than -80 Data RSSI, the AP will disassociate the client once the reporting interval of 90 seconds expires.</p>	-80 dBm / 25% / 50 Packets
Optimized Roaming Interval	The time interval at which the AP reports the client statistics. This value is defaulted to 90 seconds	90

Feature	Description	Default
Optimized Roaming Data Rate Threshold	<p>The goal of the Optimized Roaming feature is only to affect clients that are connected on legacy data rates. These are the clients that are using a majority of the Airtime.</p> <p>This value applies the Optimized Roaming feature to clients connected at this data rate or lower. By default this is disabled, meaning Optimized Roaming is applied to all clients.</p>	Disabled

Configuring Optimized Roaming from the WLC GUI

1. To configure Optimized Roaming on a global level, go to **Wireless > Advanced > Optimized Roaming**.



2. On selecting the page, Optimized Roaming Mode, Optimized Roaming Interval, and Data Rate Threshold appear. Different values can be selected for the 802.11a/n/ac and 802.11b/g/n radios.

Wireless

- Access Points
 - All APs
 - Radios
 - 802.11a/n/ac
 - 802.11b/g/n
 - Dual-Band Radios
 - Global Configuration
- Advanced
 - Load Balancing
 - Band Select
 - Preferred Calls
 - SIP Snooping
 - Rx Sop Threshold
 - Optimized Roaming
- Mesh
- RF Profiles
- FlexConnect Groups
 - FlexConnect ACLs
- OEAP ACLs
- Network Lists
- 802.11a/n/ac
 - Network
 - RRM
 - RF Grouping
 - TPC

Optimized Roaming

802.11a

Optimized Roaming Mode Enable

Optimized Roaming Interval sec

Optimized Roaming Data Rate Threshold mbps

802.11b

Optimized Roaming Mode Enable

Optimized Roaming Interval sec

Optimized Roaming Data Rate Threshold mbps

1. CHDM configuration can be done in Wireless > Profile ---> Edit 'Profile Name' ---> RRM tab

2. Disable 802.11a / 802.11b network before Optimized Roaming Interval value

1
2
3
4
5.5
6
7
8
9
11
12
14
18
24
36
48
54
Disable

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- To change the Optimized Roaming RSSI thresholds, go to **Wireless > 802.11a/n/ac or 802.11b/g/n > RRM > Coverage**.

Wireless

- Access Points
 - All APs
 - Radios
 - 802.11a/n/ac
 - 802.11b/g/n
 - Dual-Band Radios
 - Global Configuration
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- 802.11a/n/ac
 - Network
 - RRM
 - RF Grouping
 - TPC
 - DCA
 - Coverage
 - General

802.11a > RRM > Coverage

General

Enable Coverage Hole Detection

Coverage Threshold

Data RSSI (-60 to -90 dBm)

Voice RSSI (-60 to -90 dBm)

Min Failed Client Count per AP (1 to 75)

Coverage exception level per AP (0 to 100 %)

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The Data RSSI value and the Coverage Exception level percentage can be configured using the WLC GUI or WLC CLI (See the WLC CLI command in the next section). The received data packet count can only be configured via the WLC CLI.

These values can also be set via an RF profile. If an RF Profile is applied, the RF Profile values will override the globally set values.

To view the Optimized Roaming statistics, go to **Monitor > Statistics > Optimized Roaming**.

The screenshot shows the Cisco WLC Monitor interface. The top navigation bar includes 'MONITOR', 'WLANs', 'CONTROLLER', 'WIRELESS', and 'SECURITY'. The left sidebar shows a tree view with 'Monitor' expanded, and 'Statistics' selected. Under 'Statistics', 'Optimized Roaming' is highlighted. The main content area displays 'Optimized Roaming Statistics' with two sections: '802.11a Optimized Roaming Stats' and '802.11b Optimized Roaming Stats'. Each section lists 'Optimized Roaming Disassociations' and 'Optimized Roaming Rejections', both showing a value of 0. A vertical ID '353708' is visible on the right side of the page.

Configuring Optimized Roaming from the WLC CLI

Enabling Optimized Roaming:

```
config advanced 802.11<a/b> optimized-roaming <enable/disable>
```

```
enable          Enable 802.11a OptimizedRoaming
disable         Disable 802.11a OptimizedRoaming
```

Setting the Data RSSI Threshold:

```
config advanced 802.11<a/b> coverage data rssi-threshold <dBm>
-60 to -90
```

Setting the Coverage Exception Level Percentage:

```
config advanced 802.11<a/b> coverage data fail-percentage <percent>
<percent>      1 to 100
```

Setting the Number of Data Packets Received:

```
config advanced 802.11<a/b> coverage packet-count <num-packets>
<num-packets> 1 to 255
```

Optimized Roam Interval:

```
config advanced 802.11<a/b> optimized-roaming interval <seconds>
```

Configure the reporting interval of 802.11a/b Optimized-Roaming

Optimized Roaming Data Rate Threshold:

```
config advanced 802.11<a/b> optimized-roaming datarate <mbps>
Enter a rate of either 6, 9, 12, 18, 24, 36, 48 or 54, or 0 for disable
```

Sample Configuration:

```
(WLC-IPv6) >config advanced 802.11a optimized-roaming enable
(WLC-IPv6) >show advanced 802.11a optimized-roaming

OptimizedRoaming
 802.11a OptimizedRoaming Mode..... Enabled
 802.11a OptimizedRoaming Reporting Interval.... 90 seconds
 802.11a OptimizedRoaming Rate Threshold..... disabled
```

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Note Per WLAN Coverage Hold Detection must be enabled on all WLANs that participate in Optimized Roaming.

Dynamic Channel Assignment in RF Profiles

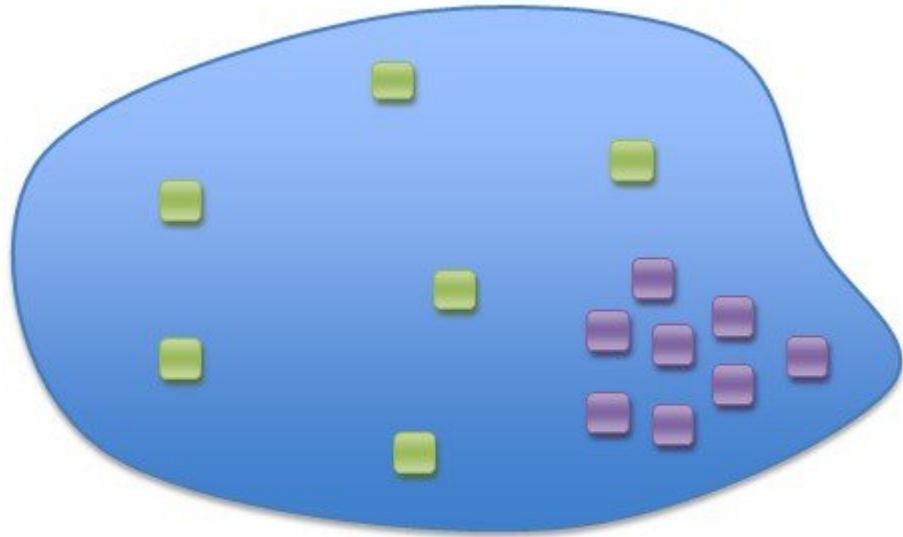
The 8.0 release now supports the ability to configure Dynamic Channel Assignment in an RF Profile. This is very powerful because of the following:

- Assign the channels that are supported per country to a specific group of APs in a multiple country supported WLC.
- Manage mixed channel (802.11n/ac 40/80 MHz) environment.
- Channel assignment by physical area – different channels can be assigned to different group of APs depending on their physical location.

RF Profiles allow Network Administrators to apply different RF characteristics to an AP Group. This allows for a completely customized RF environment for access points that are connected to the same physical WLC.

In the following example, the APs covering a large meeting room with many clients are assigned a High Density RF Profile. The High Density RF Profile uses 40 MHz channels to minimize channels from being reused, lower the TX power to shrink the cell size, and disable lower data rates to remove low performing clients.

The APs in RF Profile 2 are deployed in a less density enterprise office space. Their cell sizes are larger, 80 MHz channel widths are used, and the Tx power is greater.



-  High density RF Profile 1 AP: Bandwidth 40 MHz
-  RF Profile 2 AP: Bandwidth 80 MHz

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In previous releases, the following features were supported in RF Profiles:

- Data Rates
- Tx Power Control Threshold
- Tx Power Max/Min
- High Density Configurations
 - Start Of Packet Threshold
 - Clear Channel Assessment Threshold
 - Client Limitation per WLAN/Radio(s)
- Stadium Vision Configurations
 - Multicast Data Rate
- Out-Of-Box AP Configurations
- Band Select Configurations
- Load Balancing Configurations
- Coverage Hole Mitigation Configurations

In the 8.0 release, the following DCA and Trap Threshold configurations are supported:

- DCA Configurations:
 - Avoid Foreign AP Interference
 - Channel Width
 - DCA Channel List
- Trap Thresholds:
 - Clients

- Interference
- Noise
- Utilization

Assigning Channels to a RF Group

We can now assign channels to an RF Group. This gives the network administrator the ability to select the channels that DCA can select by group of APs. The administrator can configure the first floor of a building to use only UNII-1 channels, the second floor to use UNII-2, and the third floor to use UNII-3.

You can either edit an existing RF profile or create a new RF profile. Go to **Wireless > RF Profile > Edit RF Profile Name > RRM** tab.

RF Profile > Edit 'Enterprise'

The screenshot shows the configuration page for an RF Profile named 'Enterprise'. The 'RRM' tab is selected. The 'DCA Channel List' section is highlighted with a red box, showing a list of selected channels: 36, 40, 44, 48, 52, 56, 60, 64, 149, 153, 157, 161. Below the list, there is a table with columns 'Select' and 'Channel'.

Select	Channel
<input type="checkbox"/>	100
<input checked="" type="checkbox"/>	157

Select the channels that you would like configured for this RF Profile.



Note

- The country code with the desired channels must be enabled on the WLC globally. Channels that are not part of the selected country codes cannot be selected here.
- WLCs with Bridge Mode APs will not allow multiple country codes to be selected.
- Channels must be selected under Global DCA on the controller to be available in profiles.
- You must disable 802.11a/b networks to change DCA channels or Bandwidth (20/40/80).
- RF Profiles and AP groups must be present on every controller in the RF Group.
- DCA Channel Sensitivity and Channel Assignment Interval are only configurable on a global WLC level.

Assigning Channel Width to an RF Group

Different channel widths can be assigned to different RF groups. This allows network administrators to select 20/40/80 MHz channel widths per group of APs.

You can either edit an existing RF profile or create a new RF profile. Go to **Wireless > RF Profile > Edit RF Profile Name > RRM** tab.

RF Profile > Edit 'Enterprise'

General 802.11 **RRM** High Density Client

TPC

Maximum Power Level Assignment (-10 to 30 dBm) 30

Minimum Power Level Assignment (-10 to 30 dBm) -10

Power Threshold v1(-80 to -50 dBm) -70

Power Threshold v2(-80 to -50 dBm) -67

DCA

Avoid AP Foreign AP Interference Enabled

Channel Width 20 MHz 40 MHz 80 MHz

DCA Channel List

DCA Channels

36, 40, 44, 48, 52, 56, 60, 64, 149, 153, 157, 161

Select	Channel
<input type="checkbox"/>	157
<input checked="" type="checkbox"/>	157

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