RF Profiles

Overview

Each wireless network is unique and faces its own unique challenges in coverage, configuration, and design. It is common for IT administrators to deploy several APs configured for a specific RF scenario (for example, a large, crowded auditorium) in one location, while also needing to deploy several networked APs elsewhere for a different RF scenario (for example, a small lobby). The radio setting requirements for these two groups of APs can look quite different even though all of the access points are on the same network.

This article will outline the RF Profiles feature and how it can be used to deploy customized radio settings to groups of MR Access Points.

RF Profiles

RF Profiles provide more control over radio settings for APs within a specific network. This feature is helpful especially in complex wireless deployments as multiple RF profiles can be defined and applied to APs within a network. By using RF profiles customers can now customize the RF settings for different areas at a property at scale and no longer need to manually make changes for each AP.

RF Profiles can be used with all APs running firmware MR25.x. After defining profiles customers can additionally override the settings from the Overview tab. By default two RF profiles are defined for every network. One for indoor APs and one for outdoor APs. APs within a network are automatically assigned to the corresponding RF profile. Network administrators can additionally check the assigned RF profile to a particular AP by going to Wireless → Radio Settings and the checking the Overview tab.

Using RF profiles is not mandatory. Administrators that do not want to use RF profiles can leave the AP in the default profiles and APs will inherit settings based on old radio settings page as described in Mapping to Default profiles. If any settings need to be changed in the default profiles then administrators have to define new profiles and apply the profiles to APs accordingly.

A maximum of 50 RF profiles can be defined.

Default Templates

Administrators can also select from five predefined templates for typical auditoriums, open offices, and outdoor coverage scenarios to help IT quickly configure wireless settings for maximum performance. After creating or selecting a specific RF Profile, settings (which comprise the profile) can then be applied, en masse, to groups of APs.
The five profiles are as follows:

1. **Auditorium**: This profile is designed for open auditorium deployments accommodating a large number of devices. TX power is in the lower range.

2. **Classroom**: This profile is designed to accommodate a medium number of devices in a classroom. TX power is in the lower range.

3. **Open Office**: This profile is designed to accommodate a medium number of devices in an open office environment. TX power is in the medium range.

4. **Conference Room**: This profile is designed to accommodate a medium number of devices in an open office environment. TX power is in the lower range.

5. **Outdoors**: This profile is configured to accommodate outdoor deployments. TX power is in the high range.

### Profile Settings

<table>
<thead>
<tr>
<th>Profile</th>
<th>2.4GHz min (dBm)</th>
<th>2.4GHz max (dBm)</th>
<th>5GHz min (dBm)</th>
<th>5GHz max (dBm)</th>
<th>Minimum bitrate (Mbps)</th>
<th>Channel Width (5GHz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auditorium</td>
<td>5</td>
<td>11</td>
<td>8</td>
<td>14</td>
<td>24</td>
<td>20</td>
</tr>
<tr>
<td>Classroom</td>
<td>8</td>
<td>14</td>
<td>11</td>
<td>17</td>
<td>24</td>
<td>20</td>
</tr>
<tr>
<td>Open Office</td>
<td>11</td>
<td>17</td>
<td>14</td>
<td>20</td>
<td>12</td>
<td>20</td>
</tr>
<tr>
<td>Conference Room</td>
<td>8</td>
<td>14</td>
<td>11</td>
<td>17</td>
<td>12</td>
<td>20</td>
</tr>
<tr>
<td>Outdoors</td>
<td>17</td>
<td>23</td>
<td>17</td>
<td>23</td>
<td>6 (5GHz)</td>
<td>20</td>
</tr>
</tbody>
</table>

All profiles are designed considering standard building materials. If older building materials are being used (eg: cinder block) settings might need changing. RX-SOP values have been set to default and need to be changed on a case by case basis. It is recommended to consult a wireless expert before changing RX-SOP values and also refer to the RX-SOP section for additional details.

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### Create Custom Profile/Edit an Existing Profile

Administrators can create custom profiles or edit existing profiles as required, depending on use case. The following options can be set as part of RF profiles:

#### Profile Name

Name of the profile. Usually named after a particular location within a venue or a unique identifier that can denote the RF profile for a particular application. Eg: Concessions stand

#### Band Selection

Customers can set SSID availability in this section. Using the options provided, availability can be set either on a per AP or a per SSID basis.
1. **Per AP**: Using this option, customers can set SSID availability on an AP basis for all APs assigned to this profile. This option will set SSID availability for all SSIDs broadcasted by the AP. Customers can either use Dual Band (with or without band steering), 5 GHz Only and 2.4 GHz at an AP level.

2. **Per SSID**: Using this option, customers can set SSID availability on a per SSID basis that are assigned to APs included in the RF profile. Customers can either use Dual Band (with or without band steering), 5 GHz Only and 2.4 GHz at an SSID level.

If 2.4 GHz support is needed, it is recommended to use 'Dual-band with band steering' to ensure support for 2.4 GHz devices while dual band devices will be steered to use the 5 GHz band. For more details refer to the Band Steering Overview article. If 2.4 GHz support is not needed, it is recommended to use "5 GHz band only". Testing should be performed in all areas of the environment to ensure there are no coverage holes.

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**Minimum bitrate configuration**

Customers can set minimum bitrate in this section. Using this option minimum bitrate can either be set on a per band basis or per SSID basis. It is recommended to use minimum bit rates per band. Using minimum bit rate on a per SSID basis will yield different experiences for each SSID and may also lead to coverage holes if not planned accordingly. Minimum bit rate per SSID can be used in applications where only known device types will be used and performance needs to be optimized for specific device types. It is recommended to consult a wireless expert before using minimum bit rate per SSID.

If minimum bit rate is set to be configured on a per band basis, the minimum bit rate slider appears in 2.4 GHz and 5 GHz radio settings section as shown below:
Client Balancing

Customers can enable/disable client balancing in this section. As the name suggests, the feature tries to balance clients across APs. Additional details about the feature can be found here.

Channel Assignment Method

This option allows administrators to customize the channels to be included for AutoChannel. By clicking on Change channels used by AutoChannel, administrators are able to select a list of channels available for selection as shown below. Channels highlighted will be used as part of the AutoChannel algorithm. To quickly include or exclude DFS channels from the list of channels used by AutoChannel, the Select DFS channels or Deselect DFS channels button can be clicked.
Using AutoChannel, Cisco Meraki access points automatically adjust the channels of their radios to avoid RF interference (Both 802.11 and non-802.11) and develop a channel plan for the Wireless Network.

**Transmit Power Range**

Using this option, customers can set a custom range for the TX power. Although, AutoTX Power tries to optimize the TX power based on the overall RF environment. In complex environments, it may be necessary to limit the range depending on the requirements.

On 2.4 GHz, the allowed range is 5 dBm to 30 dBm since the AutoTX operates in that range. If lower Tx power values are needed, they can be manually set from the Overview page.

On 5 GHz, the allowed range is 8 dBm to 30 dBm since the AutoTX operates in that range. If lower Tx power values are needed, they can be manually set from the Overview page.
RX-SOP

Using RX-SOP values, the receive sensitivity of the AP can be controlled. The higher the RX-SOP level, the less sensitive the radio is and the smaller the receiver cell size will be. The reduction in cell size ensures that clients are connected to the nearest access point using the highest possible data rates. RX-SOP can be configured in the range of -65 dBm to -95 dBm.

As an example, using -75 dBm will result in a smaller coverage footprint as compared to -85 dBm since RX-SOP values are on a negative scale.

It is strongly recommended to use RX-SOP only after consulting a wireless expert.

Once customers click on Set RX-SOP under the Radio Transit power range option, a warning message will show up indicating to proceed with caution as shown below.

After customers click on proceed, an option to enable/disable RX-SOP will be presented as shown below.
If **Enabled** is selected, a slider to configure the RX-SOP value shows up.

<table>
<thead>
<tr>
<th>Minimum received power (RX-SOP)</th>
<th>Listen for clients farther away</th>
<th>Ignore weaker clients</th>
</tr>
</thead>
<tbody>
<tr>
<td>-85 dBm</td>
<td>-90</td>
<td>-85</td>
</tr>
<tr>
<td>-80</td>
<td>-75</td>
<td>-70</td>
</tr>
<tr>
<td>-65 dBm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Assigning RF Profiles to APs

The RF profile can be assigned to a specific AP or multiple APs in bulk on the **Wireless > Radio Settings** page in the dashboard. On the list of APs, select the checkbox next to each AP that you would like to apply the profile to, then use the **Edit Settings** drop-down and select **Assign Profile**. This will allow you to choose which profile you would like to be assigned to the selected devices. Once the profile selection has been made, the proposed changes will be displayed on the dashboard for confirmation before they are applied to the selected devices.
When applying RF Profiles, administrators have the option to retain certain settings as shown below.

**Clear overrides on 1 Access Point**

Some of these APs have manually configured settings which override profile settings. The power, channel and channel width settings of the chosen RF profile will not apply to the selected APs unless you clear their manual overrides.

- Clear channel width override
- Clear channel overrides
- Clear power overrides

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**Tips**

- After assigning RF profiles, make sure the selected APs are unselected as they will not be automatically unselected.

- After RF profiles have been assigned, TX power and channel assignment changes might take up to 60 minutes to reflect changes as calculations are done through Meraki dashboard. If the change is to disable any particular band, the changes will take effect immediately.

- A maximum of 1500 APs can be assigned to each RF profile.
Antenna Bulk Assignment

From Radio Settings, antennas can be assigned to the desired Access points.

This can be achieved by:

- Select the desired Access Point by clicking on the checkbox
- Click on "Edit Settings" and select "Bulk Edit settings"

- Select "Antenna / antenna gain" and click Next
Select the desired antenna and click on "Review changes".
Click on "Apply Changes", assignment for the APs selected will be updated at this point.
RF Profiles and Old Radio Settings

When administrators go to Wireless → Radio Settings they will be directed to the radio settings page that includes RF Profiles and administrators need to click on View old version to go to the old page that does not have RF profiles.

If custom RF profiles have been configured and assigned to APs, warnings will be shown to users asking them to make configuration changes using the new page.
Channel planning

Country settings are now configured on the Network-wide General settings page.

Country/Region: United States

Regulatory domain: FCC

The following radio settings are now configured on the new Radio settings page.

- Radio power: Enable automatic power red
- Auto channel: Allow DFS channels
- Default 5GHz channel width: 20 MHz
- Client balancing: Off

If options on old radio settings need to be unlocked, then APs should be assigned to default profiles and any new RF profiles need to be deleted. Administrators can then go back to the old page and make changes.

Regulatory domain

After RF Profiles is enabled for the organization, regulatory domain settings will be moved to Network-wide → General. The Wireless Options section on the Access Control page will show a pop-up message asking administrators to configure settings using RF Profiles as shown below:

Clicking on Go to RF Profiles will direct to the administrators to the new radio settings page but, if Dismiss this message is selected the message will be minimized and the settings will be displayed with a note directing administrators to the new RF Profiles page as shown below:
Mapping to Default Profiles

Once customers move to the new page with RF profiles, APs are automatically assigned to either an Indoor or Outdoor profile. All indoor APs in the network will be assigned to the default indoor profile and outdoor APs will be assigned to the outdoor profile. After defining new profiles, APs can then be moved to respective profiles depending on design needs.

**Band selection**

Band selection and bit rate selection in default profiles is based on the current SSID settings. If the settings are the same across all active SSIDs band selection will be set on a Per AP basis and bitrate will be set to per band and both bands will have the same value. If the settings are different for each SSID then band selection and bitrate will be set on a per SSID basis and the configuration for each SSID will be retained.

**Transmit power settings**

Transmit power range will be set to 5 - 30 dBm for 2.4 GHz and 8 - 30 dBm for 5 GHz if Enable Automatic power reduction is selected on the old radio settings page. If Always use 100% power is selected transmit power range will be set to 30 dBm for both bands. If any APs have TX power and channel set manually, the settings will be retained and the AP will be counted towards one of the APs that have overrides. Rx-SOP will be set to a default value of -95 dBm.

**Channel width**

Channel width is set depending on the settings on the old radio settings page. On 2.4 GHz the APs will always default to 20 MHz and for 5 GHz the AP will use the value from the channel width drop-down.