Observe Network Trends and Gain Insights

About Network Trends and Insights

Cisco AI Network Analytics uses machine learning algorithms and AI techniques to provide the following:

- **Trends and Insights**: Determine global patterns (trends) and deviations to provide system-generated insights.

- **AP Performance Advisories**: Detect APs that have a consistently poor client experience, and provide a root cause and suggested actions.

- **Comparative Analytics**, which includes:

  - **AI-Driven AP Comparisons in Network Heatmaps**: Compare all of the APs in your network for a given month in a heatmap to spot trends and gain insights.

  - **AI-Driven Peer Comparisons**: Determine how your network is performing in comparison to your peer networks for a selected Key Performance Indicator (KPI).

  - **AI-Driven Network Comparisons**: View, compare, and identify performance improvement opportunities for objects in your network (buildings, AP model families, wireless endpoints) across selected KPIs.

View Wireless Access Point Performance Advisories

Cisco AI Network Analytics uses machine learning algorithms to identify wireless APs with a potentially poor client experience. APs are continually analyzed over long periods and those suspected of providing a

suboptimal client experience are grouped by underlying root cause and suggested improvements. Insights are generated, which consist of a set of radio and network features that can be used to diagnose any underlying issue that can be rectified. Insights have the following main components:

- Discover underperforming APs via various client experience KPIs.

- Find appropriate features that can discriminate between APs with a poor or good client experience that is both significant and actionable by the customer as a basis of root-cause analysis (RCA).

APs are analyzed on separate frequency bands of 2.4 GHz, 5 GHz and 6GHz. Poor client experience is detected using statistical analysis of different KPIs, such as SNR, RSSI, link speed, packet retries, and packet failures.

Use this procedure to view AP performance advisories that highlight the most active APs with poor client experience based on analysis of four weeks of data.

Step 1   Click the menu icon (≡) and choose **Assurance** > **Trends and Insights** > **AP Performance Advisories**.

Step 2   Click the **AP Performance Advisories** tab, which provides a summary of the number of different types of insights with common root-cause analysis category and affected radios.

Figure 1: Access Points Performance Advisories
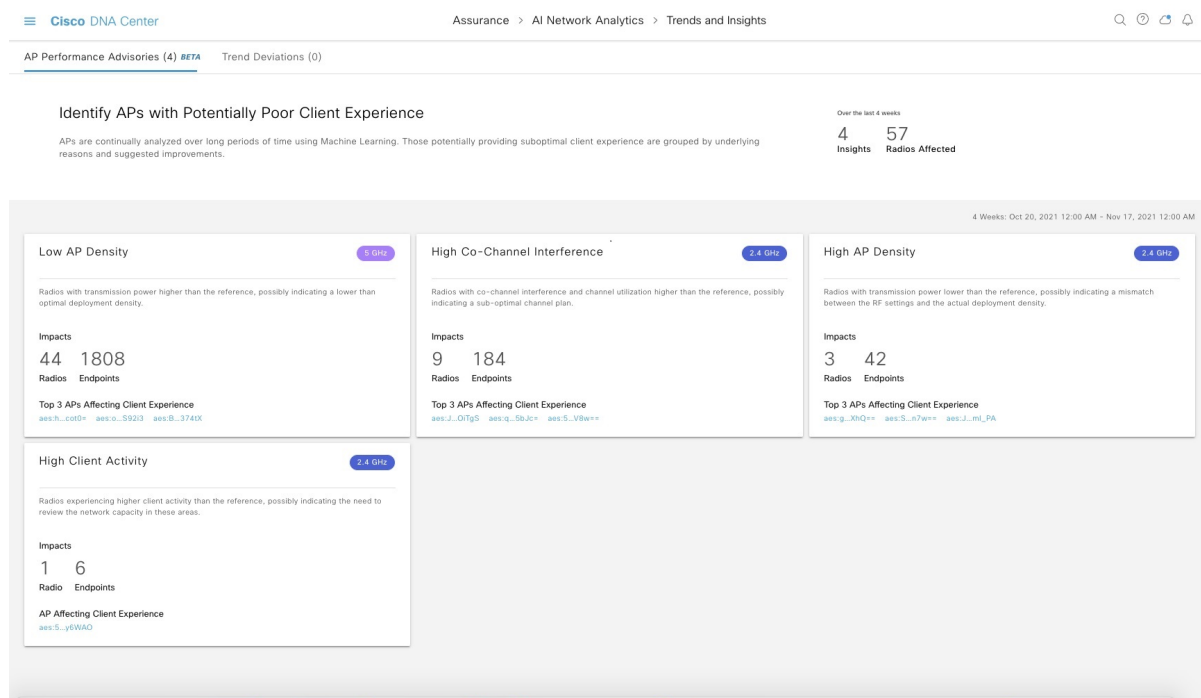
The following are the possible occurrences of insights with common root-cause analysis:

- External RF load

- External RF load with high client activity

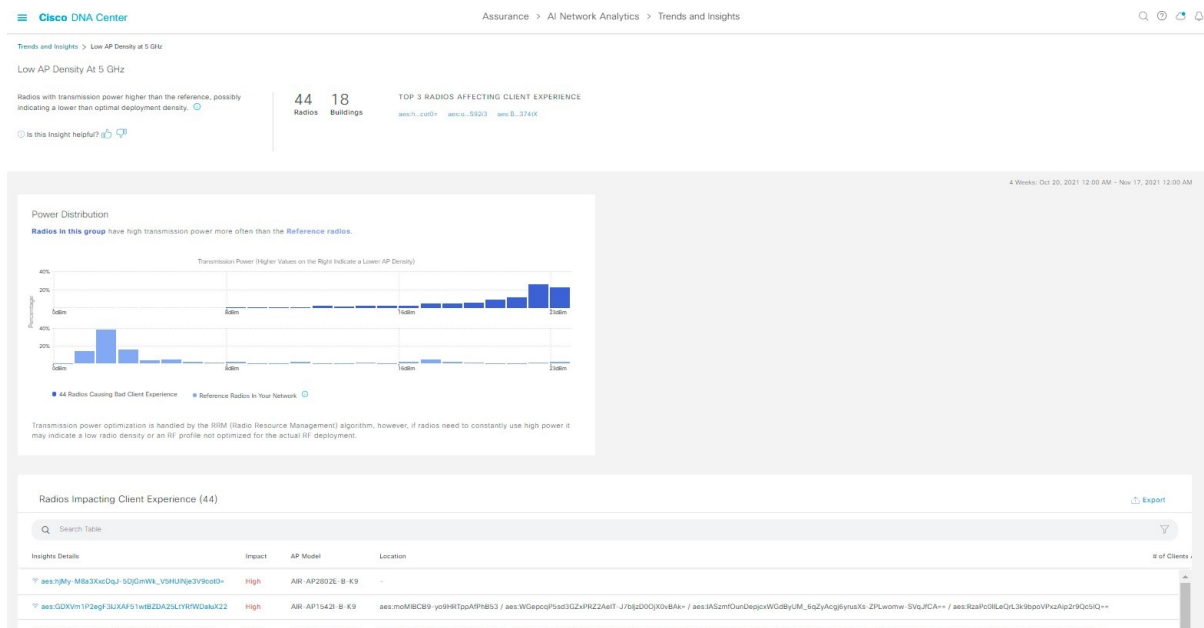- Frequent channel change

- High RF load

- High channel utilization

- High client activity

- High client load

- High AP deployment density

- Low AP deployment density

- Low AP deployment density and external interference

- Low AP deployment density and high load

Step 3   Use the **AP Performance Advisories** dashboard for the following insights summary:

Network Overview Window	
Item	**Description**
Insights Summary	Displays the name of the insight (Low AP Density, High Client Activity, and so on) and problem definition for a particular frequency band.
Impacts	Displays the number of impacted **Radios** and **Endpoints** for each insight.
Top 3 APs Affecting Client Experience	Displays the top three impacted APs for a particular frequency band. These are hyperlinks to the detailed page, shown in Step 5.

Step 4   Click each insight dashlet for the following information, where a common root-cause analysis is provided with the suggested actions for all radios in this category.

Figure 2: Insights Summary Dashboard for Impacted Radios

Insight Dashboard	
Item	**Description**
Summary	Displays the total number of radios analyzed over four weeks, the number of buildings, and the top three impacted APs.
KPI charts	Displays multiple KPI charts depending on the RCA category, which indicates the distribution of the KPI across all the radios. The charts can be used to compare and contrast the performance of radios with this common RCA, against reference radios that have no detected client experience problem.
Radios Impacting Client Experience table	Contains Insights Details, Impact (low, medium, or severe), AP Model, Location, # of Clients Affected, and KPIs Impacting Client Experience.
Export	Click **Export** to export the table data to a CSV file.

Step 5 In the **Radios Impacting Client Experience** table, click the hyperlinked AP to view the following detailed insights summary for a specific AP.

Figure 3: Insight Summary for Access Point

Insight Dashboard	
Item	**Description**
Top bar	Provides information such as AP model, location, impacted clients, and additional AP details hyperlinked to the Assurance Device window. Also provides suggested actions that are specific to the identified root cause and anomalous KPIs to improve the client experience.

Insight Dashboard	
Item	**Description**
Client Experience KPIs	• The histogram shows the distribution of the different KPIs that impact client experience, facilitating a comparison between the individual AP and the reference AP across the customer's network (APs without observed client experience problems).
	• By default, only KPIs with detected anomalies are shown. You can add more numbers of KPIs that display the distribution of KPIs, including the SNR, RSSI, link speed, packet retries, and packet failures.
	• You can hover your cursor over the histogram bin value to view additional details of the observed occurrence rate in the selected AP, versus the reference set of APs.
Radio Specific Root-Cause Context	• The histogram shows the distribution of the different root-cause analysis KPIs that impact radios. By default, only KPIs with detected anomalies are shown.
	• You can add more numbers of KPIs that display the distribution of RCA KPIs, including the SNR, RSSI, link speed, packet retries, and packet failures.
	• You can hover your cursor over the histogram bin value to view additional details of the observed occurrence rate in the selected radio, versus the reference set of radios.

View Network Trends and Obtain Insights

Trends are long-term evolutions of behavior in your network observed over a time period. These trends provide insights about the performance of your network (represented in beeswarm charts). The following types of insights are provided:

- **Intra-Site**: Cisco AI Network Analytics looks into a single site or building and highlights the outlier device only within that building. In this case, the entity in the beeswarm chart is a radio and it is represented by a circle.

- **Inter-Site**: Cisco AI Network Analytics looks at the global network and identifies an outlier building with respect to the selected KPI. In this case, the entity in the beeswarm chart is a building and it is represented by a polygon.

Use this procedure to view trends in your network.

Step 1 Click the menu icon (≡) and choose **Assurance** > **Trends and Insights** > **Trend Deviations**.

The **Network Insights** window appears with filters: **Capacity**, **Coverage**, and **Throughput**. Click the appropriate filter to refresh the data in the table. The Capacity filter is selected by default.

Note The filters are dynamic. If there are no insights available for a filter, that filter is not displayed.

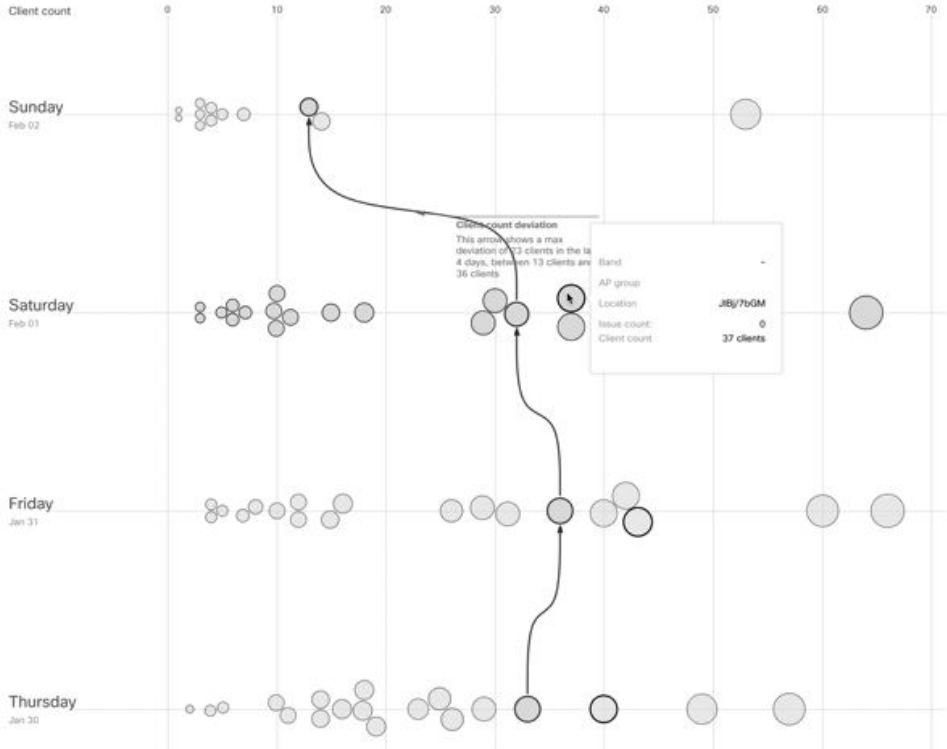| Insights Table	
Item	**Description**
Occurrence	Time duration when this trend was observed, such as May 27 - June 03 2019.
Insight Type	List the insight types that are named as **Daily** and **Weekly**
Insight	List of all the AI-driven insights that were observed during a specific time period.
Category	Category under which the insight was observed. Insight KPIs are grouped under the following categories: • **Capacity**: Radio Client Count, Channel Change Count • **Coverage**: Interference, Avg Client SNR, Avg Client RSSI, Traffic, Utilization • **Throughput**: Total Radio Throughput
Frequency band	Band frequency used on the AP on which the insight was observed. Values are **2.4 GHz**, **5 GHz**, and **6GHz** or all the band frequencies.
KPI	Key Performance Indicator (KPI) for that specific insight.
⋮ icon	Allows you to customize the columns that you want displayed in the Insights table. Click the ⋮ icon, uncheck the check box for the column that you do not want displayed, and then click **Apply**.

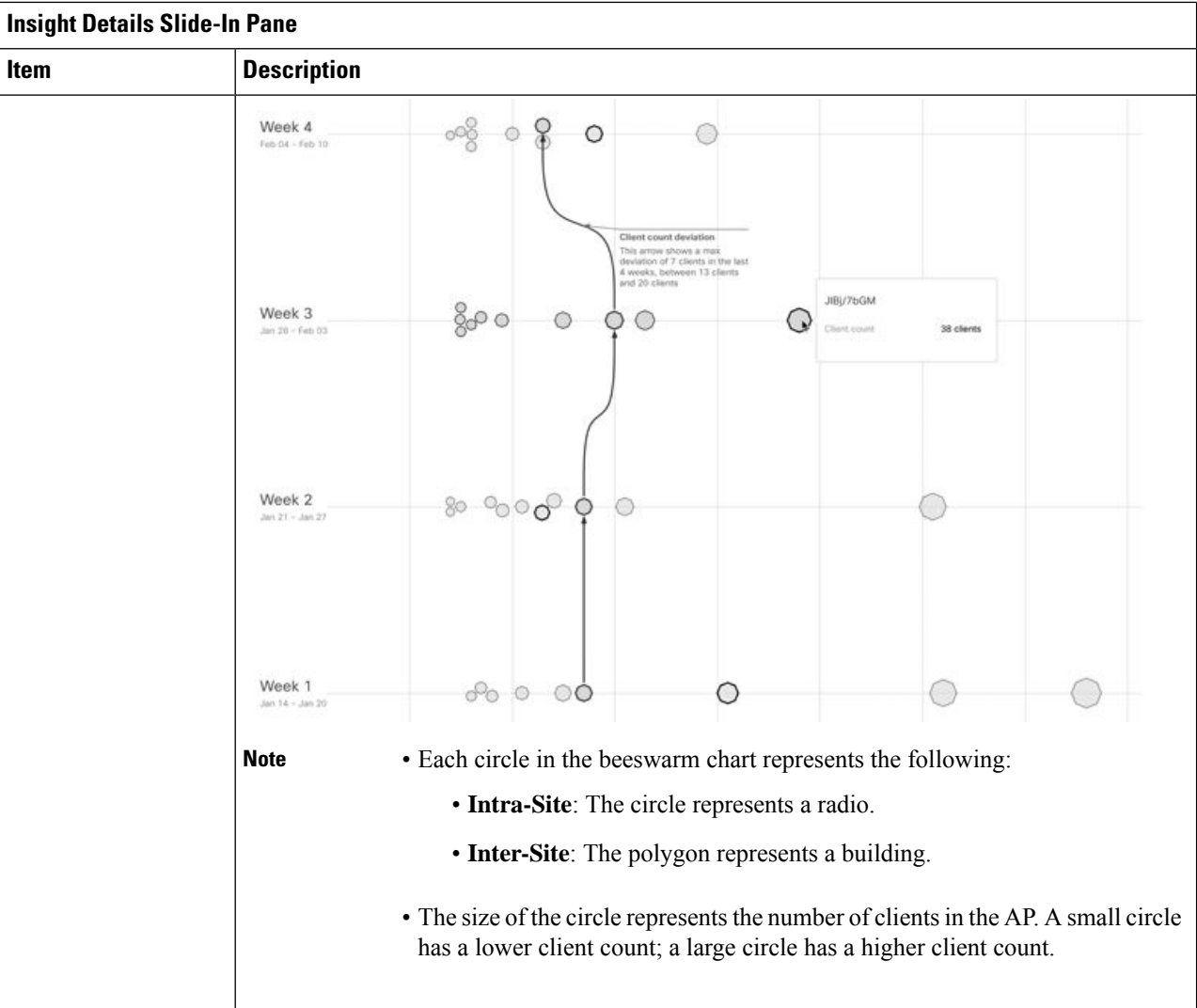**Step 2** From the **Insight** column, click an insight to open a slide-in pane, which provides the following information:

Insight Details Slide-In Pane	
Item	**Description**
Cisco AI	Provides information about how the insights are computed. Click Learn More to get an overview of Artificial Intelligence.
Insight Summary	A brief summary about the trend that is observed in the beeswarm chart. The summary provides information such as the name of the site or AP, client count, radio band frequency, and time period during which the deviation was observed.
Weekly Client Load	Client load per week.

Insight Details Slide-In Pane	
Item	**Description**

Troubleshoot	Provides links that allow you to troubleshoot and fix the trend before it becomes a critical issue:
	
	• **Network Heatmap** opens the heatmap and provides information about the AP or building that is highlighted in the beeswarm chart. The heatmap that displays is for the specific month in which the trend was observed.
	
	   • **Intra-Site**: The heatmap launches with the specific AP highlighted and prioritized in the list.
	
	   • **Inter-Site**: The heatmap launches with the filtered view of the APs in the building (site).
	
	• *AP_Name* opens the **Device 360** page for that AP.

Issue Count	Issue count gradient.

Insight Details Slide-In Pane	
Item	**Description**
Chart	

Insight Details Slide-In Pane

Item	Description
	The beeswarm chart displays the performance of the client devices in your network in a 4-day (daily insights) and week (weekly insights) time interval as shown in the following figure. If there is a systematic deviation of network behavior over a time period, that trend is displayed by arrows in the chart.

Figure 4: Beeswarm Chart

Daily Insights

Weekly Insights

Insight Details Slide-In Pane	
Item	**Description**

Note	• Each circle in the beeswarm chart represents the following:
	
	    • **Intra-Site**: The circle represents a radio.
	
	    • **Inter-Site**: The polygon represents a building.
	
	• The size of the circle represents the number of clients in the AP. A small circle has a lower client count; a large circle has a higher client count.

Step 3   Hover your cursor over a circle in the chart for information, such as the name and MAC address of the AP, the band frequency, the AP group, the location of the AP, issue count, client count, and the KPI value.

Note   For Global sites, when you hover your cursor over a circle in the chart, you see information about the building in which the trend was observed and the client count.

# Compare Access Points and Switches in Network Heatmaps

Use the Network Heatmap to visually compare all of the APs in your network for a given month to spot trends and gain insights. You can choose to compare APs across different KPIs and band frequencies. The insights you gain provide information about the most congested KPIs, the most congested APs, and within those APs, which APs are being used. This information allows you to further drill down to the site or building in which the trend has been observed. After you have pinpointed your AP or a group of APs, you can determine how those APs are behaving historically: per day, per week, and during the entire month.

Step 1 Click the menu icon (≡) and choose **Assurance** > **Network Heatmap**.

The **Network Heatmap** window appears with the following information:

Figure 5: Network Heatmap Window
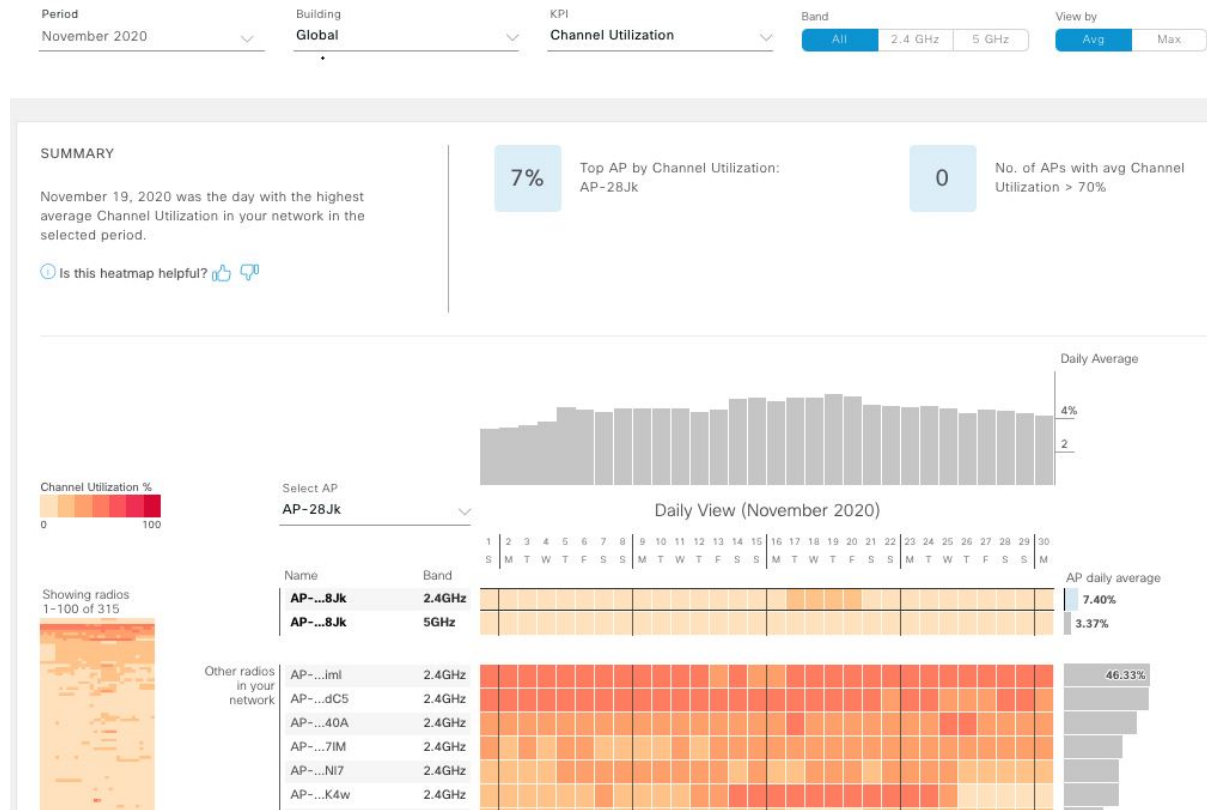
Network Heatmap Window	
Item	**Description**
Show	Display the heatmap information based on the device type that you choose from the drop-down list. You can choose **Access Points** or **Swithces**. Default is Acces Points.
KPI drop-down list	Displays information in the heatmap for the KPI you choose from the drop-down list. For Access Points, the default KPI is **Client Count**. For Switches, the default KPI is **Temperature: All Sensors**.
Swtich Family drop-down list	Displays information in the heatmap based on the switch family you choose from the drop-down list. This drop-down list is displayed only when you choose the device type Switches from the **Show** drop-down.
Time Range	Click the **Time Range** drop-down to choose **Month** or **Day** radio button to display information in the heatmap for a specific month or a day.

Network Heatmap Window	
Item	**Description**
Location	Displays information in the heatmap for your entire global network or for a specific site and building that you choose from the drop-down list. Default is **Global**.
Band	Displays information in the heatmap for the band frequency you choose. Options are: **2.4 GHz**, **5 GHz**, and **6 GHz**. By default all the three band frequencies are selected.
View By	Allows you to view the information in the heatmap based on the option you choose. Based on the KPI you choose, the options displayed in the **View By** list vary. Some KPIs allow you to sort by **Avg**, **Min**, or **Max**, some by **Avg** or **Max**, while other KPIs do not provide any options.
Summary area	Displays a summary of the insight gained from the heatmap analysis. Provides the following type of information: • The day of the month that was the busiest. • Number of APs or Swithes that had no clients per radio. • Number of APs or Swicthes that had more than 50 clients per radio.
Feedback icon	Click the icon to provide your comments on whether the information on this page was helpful, and then click **Submit**.
KPI gradient	Depending on the KPI you choose from the KPI drop-down list, this area provides information about the performance of the KPI in a color gradient. The darker color block indicates a significant KPI score. For example, a lower RSSI score is more significant than a higher RSSI score. A higher client count score is more significant than a lower client count score.
Search AP drop-down list	Allows you to search for and select an AP. Do the following: a. Click the **Search AP** drop-down list and enter the AP name in the search filter. The AP that you searched for is highlighted in the drop-down list. b. Click the highlighted AP to select it. The individual radios of the AP are displayed separately on the heatmap.
Network Daily Avg, **Min**, or **Max** graph	Depending on the **View By** option you chose, the appropriate graph is displayed • If you chose **Avg**, the graph shows the daily average value and highlights the highest daily average. • If you chose **Min** or **Max**, the graph shows minimum or maximum daily value, and highlights accordingly. Hover your cursor over the bar on the graph to view the KPI value for each day.

Network Heatmap Window	
Item	**Description**
Showing Radios heatmap	Provides a compressed view of the heatmap.
	By default, this area displays the heatmap for the first 100 radios. To view the heatmap data for additional radios, scroll down to the bottom of the compressed heatmap, and then choose the appropriate option from the drop-down list.
AP Heatmap area	Contains the following:
	• **Radios in Your Network**: Displays the name of the AP and the band frequency that was used by the client. Click on the icon next to the AP to open the **Device 360** page for that AP.
	Depending on the band frequency you choose from the **Band** options, this area lists the APs in the corresponding chosen band.
	• **AP Heatmap**: Allows you to determine how the APs are behaving historically: per hour, per day, per week, and during the entire month. The intensity of the color in the blocks indicates its significance. The darker color block is more significant than the lighter color block. Each row in the heatmap represents one AP.
	Hover your cursor over a color block in the **Heatmap** to get information about the AP, such as its name and MAC address, band frequency, location, and daily average KPI score.
	• **AP Daily Average** or **AP Daily Max**: Depending on what you choose in the **Sort By** option, this area displays the average KPI score or the max KPI score for each AP during the month. The AP with the highest score is listed on top.
	Hover your cursor over the **AP Daily Average** or the **AP Daily Max** area to determine the average or max KPI value for an AP during the month.
Export	Click **Export** to export the heatmap data to a CSV file.
	AP's and Filters applied to the heatmaps are applied to the exported data. Export is enabled only on the daily view and not on the hourly view.

Step 2 To view the heatmap data for additional radios, scroll down to the bottom of the window and choose the appropriate option from the drop-down list.

Compare KPI Values with Peers in Your Network

Use this procedure to determine how your network is performing compared to your peer networks for a selected Key Performance Indicators (KPI).
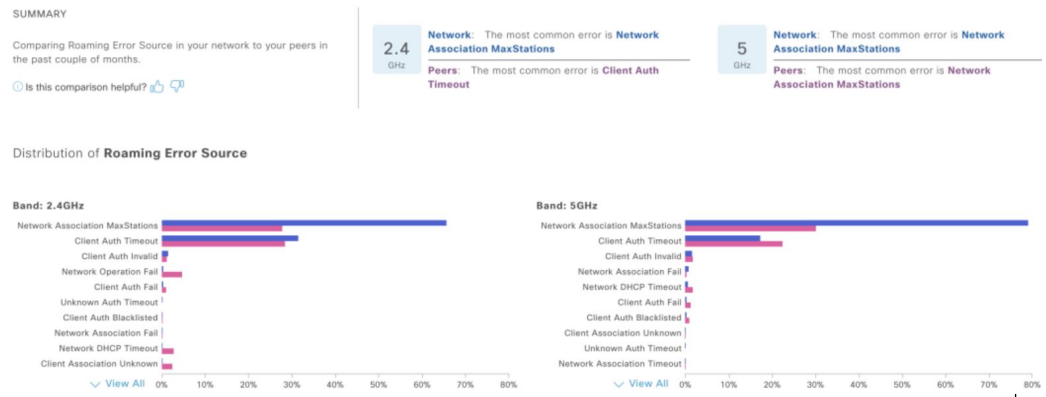
Note The peer networks that are used for comparison are of similar network size.

For computations, peer comparison uses a couple of months data from the date of onboarding.

Step 1   Click the menu icon (☰) and choose **Assurance** > **Peer Comparison**.

The **Peer Comparison** window appears with the following information:

Peer Comparison Window	
Item	**Description**
KPI drop-down list	Choose a KPI from the drop-down list. Options are: **Radio Throughput**, **Cloud Apps Throughput**, **Radio Resets**, **Packet Failure Rate**, **Interference**, **Onboarding Error Source**, **Roaming Error Source** and **RSSI**. Default is **Radio Throughput**.
Show	Choose the day for which you want to compare the KPI values between your network and your peer networks. Default is **All**.
Summary	AI Network Analytics analyzes the bar graphs and provides a brief summary about the findings: • **2.4 GHz**: Summary of the Network and Peer values for the 2.4-GHz band frequency. • **5 GHz**: Summary of the Network and Peer values for the 5-GHz band frequency.
Highlight Peers toggle button	Allows you to toggle between your network and the peer network graphs.
Peer Comparison Bar Graph	By default, highlights the KPI values for your network in the **Band 2.4 GHz** and **Band 5 GHz** graphs, as shown in the following figure. To highlight the KPI values for the peer networks, click the **Highlight Peers** button. *Figure 6: Peer Comparison Bar Graph* The colors in the graph represent the following: • **Blue**: Your network. • **Pink**: Peer networks.

Step 2   To display the KPI values for your network and your peer networks for a specific day, choose the appropriate day from the **Show** area.

Compare Buildings, AP Model Families, and Wireless Endpoint Types

Use this procedure to view, compare, and identify performance improvement opportunities for objects in your network (buildings, AP model families, wireless endpoints) across selected Key Performance Indicators (KPIs).

Step 1 Click the menu icon (☰) and choose **Assurance** > **Network Comparison**.

The **Network Comparison** window appears with the following information:

Figure 7: Network Comparison Window
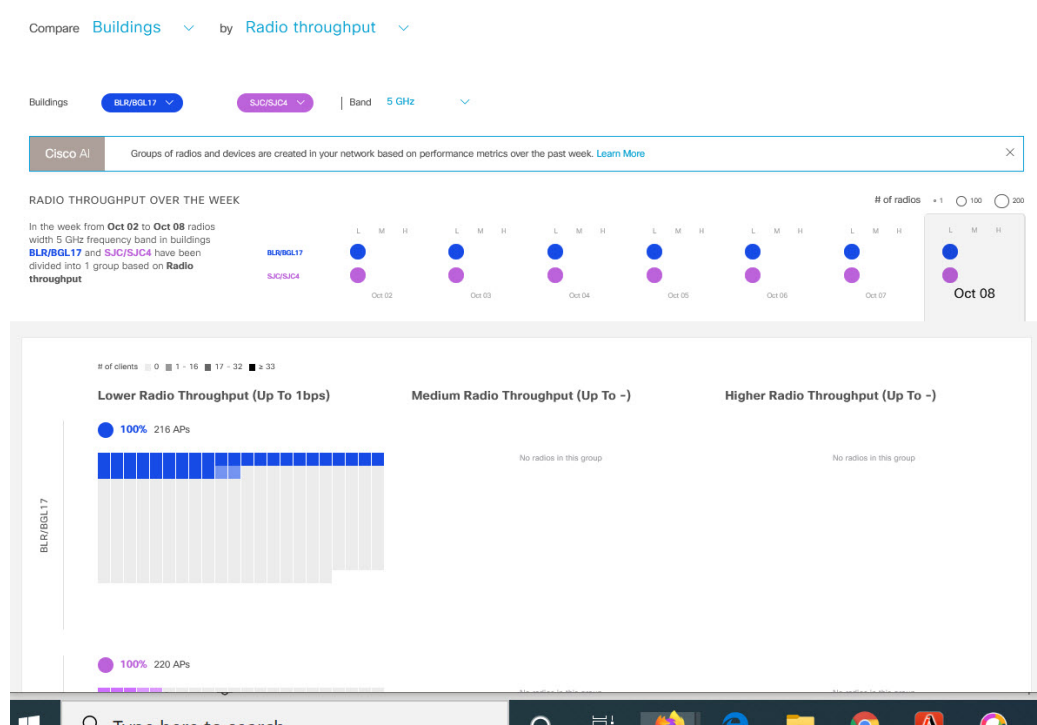
Network Comparison Window	
Item	**Description**
Compare drop-down list	Choose the object in your network that you want to compare. Options are: **Buildings** (sites), **AP Model Families**, or **Wireless Endpoints** (Android device, Android phone, IOS tablet, IOS phone, Linux workstation, and so on).

Network Comparison Window	
Item	**Description**
By KPI drop-down list	Choose a KPI that you want to use to compare the objects in your network.
	For **Buildings**, the options are:
	• **Radio Throughput**
	• **Channel Utilization**
	• **Average Client RSSI**
	• **Average Client SNR**
	• **Average Onboarding Time**
	• **Average Authorization Time**
	• **Average DHCP Time**
	• **Cloud Throughput**
	• **Media Throughput**
	• **Social Throughput**
	• **Interference**
	For **AP Model Families**, the options are:
	• **Radio Throughput**
	• **Interference**
	• **Media Apps Throughput**
	• **Average Client RSSI**
	• **Channel Utilization**
	• **Average Client SNR**
	• **Cloud Throughput**
	• **Social Throughput**
	For **Wireless Endpoints**, the options are:
	• **Average AAA Time**
	• **Average Onboarding Time**
	• **Average DHCP Time**

Network Comparison Window	
Item	**Description**
Buildings **AP Model Families** or **Wireless Endpoints** drop-down list	Choose the first network object (building, AP model family, or wireless endpoint), for which you want to compare the KPI values. The first network object is represented in blue color. Choose the second network object whose KPI values you want to compare with the first network object. The second network object is represented in pink/purple color.
Band	Choose the band frequency. Options are: **Band 2.4 GHz** and **Band 5 GHz**.
Summary/Timeline	Displays the average KPI performance for each day of the week, for each network object.
Client Count gradient or **Device Count** gradient	For certain KPIs, such as **Radio Throughput** and **Average Client RSSI**, this area provides the client count per radio for each of the sites. For certain KPIs, such as **Onboarding Time**, this area provides the number of devices for each of the sites. The intensity of the color in the blocks indicates the client count or device count. The darker color block has more clients or devices than the lighter color block.
AP Clusters or **Device Type Clusters**	This area displays two sets of clusters, one for each network object. From this area you can visually compare the performance of the two network objects. It provides the following information: • KPI performance, as a percentage. • How the objects in your network are clustered in each site. • Objects in your network that are experiencing low, medium, and high KPI values. For certain KPIs, such as **Onboarding Time** and **Authorization Time**, this area displays the following: • The types of devices that the client's onboarded in each site. For example, Windows workstation, OS X workstation, Linux workstation, Android phone, IOS device, and so on. • The number of each device type. • The number of devices that are experiencing slow, medium, and fast KPI time.

Step 2   Hover your cursor over a color block in the cluster to get information about the AP, such as the date, the building in which the AP resides, the model number of the AP, radio protocol, and the radio client count. A darker color block has more clients than a lighter color block.

# View and Monitor Network Performance Using Baselines

Cisco AI Network Analytics uses the most advanced machine learning techniques to define the baseline that is relevant to your specific network and sites. With this information Cisco AI Network Analytics is able to define what is normal for each network and site at a specific moment, and identify the most important issues.

Use this procedure to explore and monitor the network performance using machine learning algorithm derived baselines.

Step 1   Click the menu icon (☰) and choose **Assurance** > **Baselines**.

The **Baselines** dashboard appears.

Figure 8: Baselines Dashboard
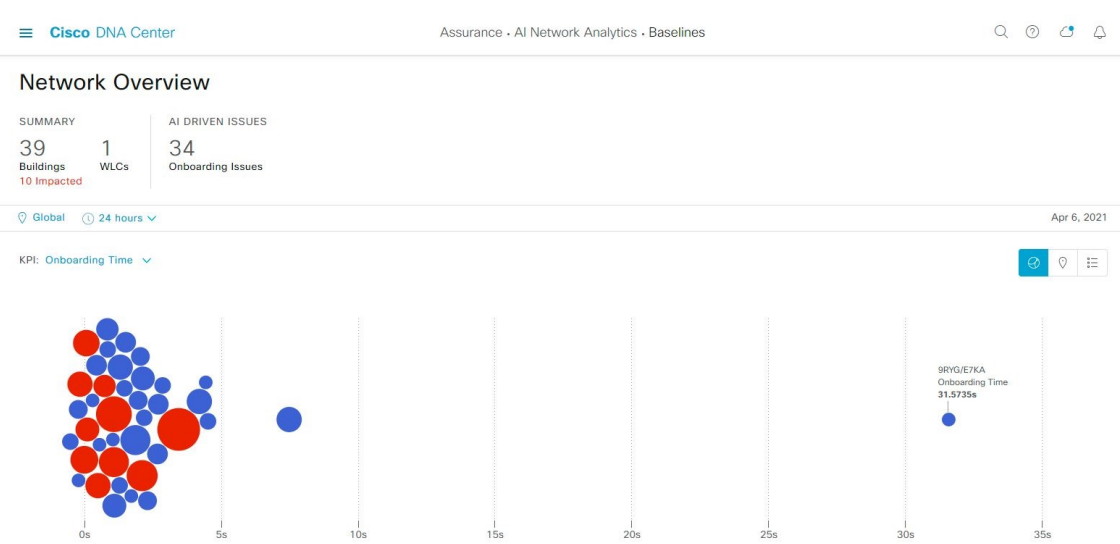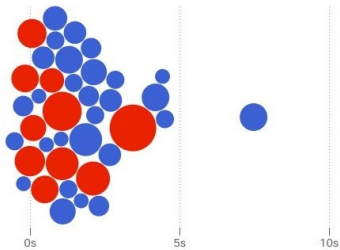
Step 2   Use the Network Overview window to view the following information:

Network Overview Window	
Item	**Description**
Summary	Displays the total number of buildings, buildings impacted with issues and wireless controllers in your network.
AI Driven Issues	Displays the issues detected by Cisco AI Network Analytics, triggered based on deviations from the predicted baseline for your specific network environment.
⊙ Global ⌄ Location drop-down list	Click the location icon to open the slide in pane to select a site or building. The information is refreshed in the dashboard based on your selection.

Network Overview Window	
Item	**Description**
🕐 Time Range setting	Enables you to display data within a specified time range on the dashboard. Do the following: • From the drop-down menu, choose the length of the range: 24 Hours, or the custom range • Specify the Start Date and the End Date. • Click Apply
KPI drop-down list	Choose a KPI from the drop-down list. Options are: **Onboarding Time**, **Onboarding Failures**, **DHCP Time**, **Authentication Time**, and **Association Failures**. Default is **Onboarding Time.**
Map View	Click this toggle button to display the health of all the network sites on a geographic location-oriented map view of your network.
List View	Click this toggle button to display the sites and buildings from your network in a list format.

Network Overview Window	
Item	**Description**
  Beeswarm Chart	Click this toggle button to view the beeswarm chart which provides the insights about the performance of the client devices of your network with respect to the selected KPI. In this case, the entity in the beeswarm chart is a building and it is represented in a circles. Each circle in the beeswarm chart represents the following: • Blue color: The circle represents a building. Hover your cursor over a circle in the chart to get information, such as location, KPI, SSID, wireless controllers and client count. • Red color: The circle represents a building impacted with issues. Hover your cursor over a circle in the chart to get information, such as location, KPI value, SSID, wireless controllers, client count, and AI-driven issues. • The size of the circle represents the number of clients connected. A small circle has a lower client count and the large circle has a higher client count.

Step 3 From the beeswarm chart, click a circle to display the building view for the following information:

Building View
Displays the specific information of a site or building. You can select the KPIs, SSID, and wireless controller from the respective drop down list to view the data.
Use the timeline slider to specify a more granular time range. You can click and drag the timeline boundary lines to specify the time range.
Use the color-coded charts below the timeline slider to determine how your network is performing. View issues based on the deviations from the predicted baseline for a selected KPI within the specified time period. Hover and move your cursor over the charts to view synchronized tooltips that display duration, predicted upper, and predicted lower range at a selected point in time.
The color codes represent the following:
• Red represents AI-driven issues
• Blue represents the average KPI duration
• Green represents the predicted KPI
Click **View Details** to open a slide-in pane with additional details, depending on the KPI you choose from the KPI charts. In the slide-in pane, the color-coded charts are displayed for Average KPI Duration(s) (such as Onboarding Time, DHCP Time, Onboarding Failures, and Authentication Time) and Unique Clients.
Sankey charts are displayed to emphasize the major flow between floors and device type (client devices). Below the charts, you can see the AP name, onboardings, failed onboardings, percentage of failed onboardings, client count, and so on.
Note   The client count shown in the table is an average of chosen time interval over the individual client count readings observed in the 30-minute window.

View the RF Network Using the AI-Enhanced RRM Dashboard

Cisco AI Network Analytics uses machine learning algorithms to define the behavior of a radio frequency (RF) network within a building enabled with enhanced Radio Resource Management (RRM).

Before you begin

- You must assign a location to an AI RF profile to view the AI-Enhanced RRM dashboard. For more information, see **Assign Location to an Existing AI RF Profile** in the *Cisco DNA Center User Guide*.

- You must provision the devices across the AI RF profile assigned locations to access AI-Enhanced RRM insights. For more information, see **Provision Wireless Devices** in the *Cisco DNA Center User Guide*.

- Cisco AI-Enhanced RRM is supported only on Cisco Catalyst 9800 Series Wireless Controllers and Cisco IOS XE Release 17.7.1 or later.

- To use the **Run RRM Simulation**, **Insights**, and **Service Bundle** options, you must be a **Super Admin** or **Network Admin**.
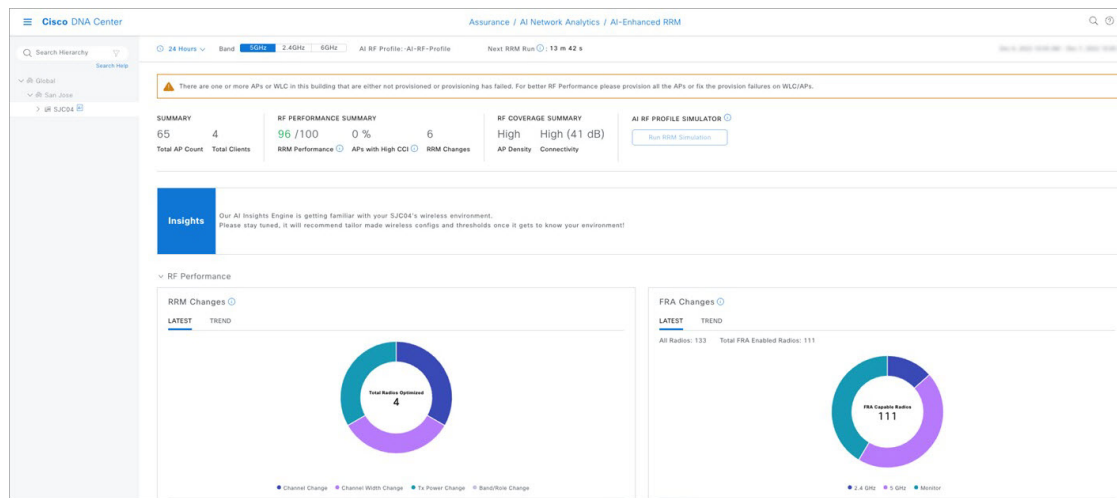
Step 1   Click the menu icon (☰) and choose **Assurance** > **AI-Enhanced RRM**.

Step 2   In the left pane, you can either search for a site by entering its name in the **Find Hierarchy** field or expand **Global** to choose the sites.

The **AI-Enhanced RRM** dashboard is displayed.

Figure 9: AI-Enhanced RRM Dashboard

Step 3   Use the **AI-Enhanced RRM** dashboard top-menu bar for the following functionality:

Item	Description
Time Range	Enables you to display data within a specified time range on the dashboard. The available time ranges are **24 Hours**, **7 Days**, or **14 Days**.
Band	Enables you to toggle between the **2.4GHz**, **5GHz**, and **6GHz** band to display the data for a particular band.
AI RF Profile	Displays the current AI RF profile assigned to the building.
Next RRM Run	AI-Enhanced RRM computation occurs every 30 minutes. RRM decisions are updated and pushed to the device after the computation.

Step 4   Use the summary dashlet to view the following information:

Item	Description
Summary	Displays the total number of AP counts and Clients in your network.
RF PERFORMANCE SUMMARY	• **RRM Performance**: Shows a composite metric based on several KPIs, such as co-channel interference, noise, SNR, and radio utilization. • **APs with High CCI**: Shows the percentage of APs seeing high co-channel interference. • **RRM Changes**: Shows the total number of RRM channel changes, channel bandwidth changes, and Tx power change events by the time of the day.

Item	Description
RF COVERAGE SUMMARY	• **AP Density**: Shows the density of APs as low, medium, or high in RF coverage. • **Connectivity**: Shows the connectivity of APs in RF coverage

Step 5   Under **AI RF Profile Simulator**, click **Run RRM Simulation** to simulate RF configurations, visualize the impact, and update or create an RF profile.

The AI RF Profile Simulator allows you to simulate changes to the current RF profile and visualize the projected outcomes against the AI-Enhanced RRM dashlets.

Note   The RRM simulation runs based on the radio band that you selected on the AI RF profile and cannot be modified in the simulator. **Run RRM Simulation** is not supported for the 6-GHz radio band.

a) In the **Welcome to RRM Simulator** window, click **Create Simulation**.

The current AI RF profile information is displayed.

b) You can modify the attributes under the band that is selected for simulation, as needed, to see the metrics.

Note   • For 5 GHz, the attributes such as **Busy Hour**, **Data Rates**, **Client Limit**, **RX SOP**, **Zero Wait DFS**, **Coverage Hole Detection**, and **802.11ax** are not considered for simulation.

   • For 2.4 GHz, the attributes such as **Busy Hour**, **Data Rates**, **Client Limit**, **RX SOP**, **Coverage Hole Detection**, **802.11ax** are not considered for simulation.

c) Click **Reset** to change the AI RF profile attribute value to the corresponding base AI RF profile value.
d) Click **Run Simulation**.

A message stating that the **Simulation in Progress** is displayed.

e) In the **Simulation Result** window, review the simulation configured on the AI RF profile for the selected band.

To edit any details, click the **Edit** option that is displayed in the corresponding area of the window.

   • **Simulation Name**

   • **Profile Details**

   • **RF Performance**

   • **RF Coverage**

f) To compare the simulated and currently applied AI RF profile configurations, check the **Compare to AI RF Profile** check box.
g) Click **Upgrade AI RF Profile**.
h) In the **Upgrading AI RF Profile** dialog box, do the following:

   • If an AI RF profile is assigned to multiple buildings, a new RF profile is created and you can edit the RF profile name and task name.

   • If an AI RF profile is assigned to one building, you can edit the task name but cannot edit the RF profile name.

Click **Now** or **Later** to indicate when you want to apply the recommendations and then click **Apply**.

| Note | Upgrading the AI RF profile causes the AP to momentarily lose association with the wireless controller, which may result in client connectivity disruption. |

Step 6   Use the **Insights** dashlet to review the insights generated by the AI-Enhanced RRM. The insights are configuration recommendations that can be applied to the AI RF profile.

The **Insights** dashlet displays the following possible insights:

- Busy Hours

- Channel Width

- Channel List

- Enable FRA

- Preferred Scanning Channel (PSC) Enforcement

- TPC Threshold

Step 7   Click the **Insights** icon to view the Cisco recommended insights.

   a)   In the **Review Cisco AI Recommendations for RRM** window, review and check the check box of the configurations for the AI RF profile from the available recommendations for the selected site.
   b)   Click **Run Simulation** to view the simulation result.
   c)   Click **Now** or **Later** to indicate when you want to apply the recommendations and click **Apply**.

| Note | Upgrading the AI RF profile causes the AP to momentarily lose association with the wireless controller, which may result in client connectivity disruption. |

Step 8   Expand **RF Performance** for the following functionality:

Item	Description
RRM Changes dashlet	Includes the following tabs: • **LATEST**: Shows the total number of RRM channel changes, channel bandwidth changes, Tx power change, and band or role change events in the last 30 minutes. • **TREND**: Shows the channel changes, channel bandwidth change, Tx power change, and band or role change events for APs and selected time in the time range. Click either the color segment in the graph or the **View Details** link to open the **RRM Changes** slide-in pane. a. Hover your cursor over the color segment in the graph to view the **Change Category** and **Total Affected APs**. b. Click a segment in the graph to view the device data in the **Access Points** table that is displayed below the chart: • Radio • Change Category c. Click the radio button next to the AP to view the **Event Reasoning** of change categories managed by RRM. **Note** In the **Access Points** table, hover your cursor over the **i** icon to view more details. d. Click **Export** to download the AP table data to your local machine.

Item	Description

FRA Changes dashlet	Displays the number of total radios, Flexible Radio Assignment (FRA)-capable radios, and FRA-enabled radios for the following radio modes:
	
	• 2.4 GHz
	
	• 5 GHz
	
	• Monitor
	
	Includes the following tabs:
	
	• **LATEST**: Shows the total number of FRA-capable and FRA-enabled radios. Also shows a split of FRA-capable radios between 2.4-GHz, 5-GHz, and monitor radio modes.
	
	• **TREND**: Shows the number of FRA-enabled radios for 2.4-GHz, 5-GHz, and monitor radio modes for the selected time in the time range.
	
	Click either a color segment in the graph or the **View Details** link to open the **FRA Changes Details** slide-in pane.
	
	a. Hover your cursor over a color segment in the graph to view the number of FRA-enabled radios for the corresponding radio mode.
	
	b. Click the color segment in the graph to view the AP device data in the **Radios** table that is displayed below the chart:
	
	    • AP Name
	
	    • Slot ID
	
	    • COF %
	
	    • Suggested mode
	
	    • Channel
	
	    Note In the **Radios** table, hover your cursor over the **i** icon to view more details.
	
	c. Click **Export** to download the data to your local machine.

Item	Description
RRM Performance dashlet	Includes the following tabs: • **LATEST**: Shows the total number of APs contributing to **Poor**, **Fair**, and **Good** AP health scores in the last 30 minutes. • **TREND**: Shows the **Poor**, **Fair**, and **Good** RRM health score of APs for the percentage of AP count and selected time in the time range. Click either a color segment in the graph or the **View Details** link to open the **RRM Health** slide-in pane. a. Hover your cursor over the color segment in the graph to view the **Fair**, **Poor**, and **Good** RF performance score of the AP and its radio. b. Click the color segment in the graph to view the following device data in the **Access Points** table that is displayed below the chart: • AP Name • Slot ID • Neighbor • Interference • Noise • Client **Note** In the **Access Points** table, hover your cursor over the **i** icon to view more details. c. Click **Export** to download the AP table data to your local machine.

Item	Description
Co-Channel Interference dashlet	Includes the following tabs: • **LATEST**: Shows the total number of APs experiencing **Low**, **Medium**, and **High** co-channel interference in the last 30 minutes. • **TREND**: Shows the percentage of **Low**, **Medium**, and **High** co-channel interference of APs for the percentage of AP count and selected time in the time range. Click either a color segment in the graph or the **View Details** link to open the **Co-Channel Interference** slide-in pane. a. Hover your cursor over the color segment in the graph to view the **Low**, **Medium**, and **High** co-channel interference of APs. b. Click the color segment in the graph to view the following device data in the **Access Points** table that is displayed below the chart: • AP Name • Slot ID • Channel • Impact Score • CCI (dBm) • Duty Cycle **Note** In the **Access Points** table, hover your cursor over the **i** icon to view more details. c. Click **Export** to download the AP table data to your local machine.

Item	Description
Utilization Per Channel dashlet	Displays the utilization chart.
	For the 6-GHz band, the utilization chart is based on the UNII level that you choose in the **View by** drop-down list. The UNII levels are **PSC**, **UNII 5**, **UNII 6 & 7**, and **UNII 8**. The default view is **PSC**.
	The **LATEST** tab displays the total number of APs experiencing co-channel interference in the last 30 minutes.
	Hover your cursor over the chart to view the following details:
	• Channel Number
	• Utilization
	• Interference
	• Max Utilization
	• Min Utilization
	The **TREND** tab displays the utilization per channel details for the percentage of utilization and selected time in the time range.
	Note The **Select Channel** drop-down list allows you to search a channel by entering its name or choose a channel from the list to display the details.
AP and Radar per Channel dashlet	Displays the AP and radar information per channel for the 5-GHz band.
	The **LATEST** tab displays the AP and radar per channel details in the chart for APs and channels in the last 30 minutes.
	Hover your cursor over the chart to view the following details for the 5-GHz band:
	• Channel #
	• No. of Radios
	• No. of Radar Event per Channel
	The **Trend** tab displays the number of radios and radar event for the selected channel.
AP per Channel dashlet	Displays the AP information per channel for the 2.4-GHz and 6-GHz bands.
	The **LATEST** tab displays the channel number and number of radios on that channel.
	Hover your cursor over the chart to view the following details:
	• Number of channels
	• Tx/Rx utilization
	• Interference
	The **TREND** tab displays the number of radios for the selected channel.

Step 9   Expand **RF Coverage** for the following functionality:

Item	Description

AP Spatial Density dashlet	The AP spatial density value represents the number of APs that are the neighbors of a selected AP in your infrastructure at or above -70 dBm. The density of APs affects the optimal effective values of channels, channel width, and Tx power.
	
	• **LATEST**: Shows the number of APs that are the neighbors of a selected AP in your infrastructure for the percentage of radio count, AP neighbor density, and percentage of client count in the last 30 minutes.
	
	Hover your cursor over the chart to view the following:
	
	  • AP Neighbor Density
	
	  • Radio Count
	
	  • Client Count
	
	• **TREND**: Shows the average neighbor density number and radio count for the AP count and selected time in the time range.
	
	Average neighbor density ranges are **<5**, **5-10**, **10-15**, **15-20**, **20-25**, and **>=25**.
	
	Click either a color segment in the graph or the **View Details** link to open the **AP Spatial Density Details** slide-in pane.
	
	a. Click a color segment in the graph to view the **Top APs** graph by lower/higher neighbor density and the following device data in the **Access Points** table:
	
	  • AP Name
	
	  • Slot ID
	
	  • Neighbor Density Metric
	
	  • Total Rx Neighbors
	
	  • Highest on Channel Neighbor RSSI
	
	  • Total on Channel Neighbors
	
	Note In the **Access Points** table, hover your cursor over the **i** icon to view more details.
	
	b. In the **Top APs** area, click the drop-down list to choose top APs by lowest neighbor density or highest neighbor density.
	
	c. Hover your cursor over the **Top APs** chart to view the **Min**, **Max**, and **Latest** APs in the chart for AP and neighbor count.
	
	d. Click **Export** to download the AP table data to your local machine.

Item	Description
Power Distribution dashlet	

Item	Description

	The power distribution chart helps you visualize the physical Wi-Fi coverage areas in your environment. It also allows you to identify the APs that are operating at maximum and minimum power levels.
	
	For the 6-GHz band, you can display the data based on **Power Level** or **Power dBm** that you choose in the **Filter** drop-down list.
	
	    • **LATEST**: Shows the number of APs that are operating at different power level along with radio count percentage and neighbor count percentage in the last 30 minutes.
	
	    • Hover your cursor over the chart to view the following:
	
	        • Operating Power Level (for power level view for the 6-GHz band)
	
	        • Operating Power dBm for the 6-GHz band (for power dBm view)
	
	        • Radio Count
	
	        • Neighbor Count
	
	    • **TREND**: Shows the operating power level, radio count, and selected time in the time range.
	
	    Hover your cursor over the trend chart to view the radio count percentage operating at different power levels.
	
	    The power levels calculations are from **Level 1** (maximum power level) to **Level 8** (minimum power level).
	
	Click either a color segment in the graph or the **View Details** link to open the **Power Distribution Details** slide-in pane.
	
	a. Click a color segment in the graph to view the **Top APs** graph by lower/higher neighbor density and the following device data in the **Radios** table:
	
	        • AP Name
	
	        • Slot ID
	
	        • Coverage Hole Count
	
	        • Tx Power (dBm)
	
	        • Neighbor Count
	
	        • Neighbor Density Metric
	
	        • Delta Average Neighbor Tx power (dB)
	
	    For the 6-GHz band, if you filter the data using **Power dBm**, the following device data is displayed in the **Radios** table:
	
	        • AP Name
	
	        • Slot ID
	
	        • Coverage Hole Count

Item	Description
	• Tx Power (dBm)
	• Neighbor Count
	• Neighbor Density Metric
	• Delta Average Neighbor Tx power (dB)
	• Channel Width (MHz)
	Note In the **Access Points** table, hover your cursor over the **i** icon to view more details.
	b. Click **Export** to download the AP table data to your local machine.

Step 10   Expand **Additional Site Level Information** to download a service bundle.

Step 11   In the **Service Bundle** area, click the **Request a Latest Service Bundle** link to download a service bundle for the last one hour for the selected building.

Step 12   To download service bundle data for any other time period in the past 14 days, in the **SELECT A PERIOD TO DOWNLOAD** area, specify the **Start Date**, **Start Time**, **End Date**, and **End Time**, and then click **Download Service Bundle**.

A service bundle is saved to your local machine that contains configuration parameters and RRM telemetry used for RRM algorithms at the selected time period. This service bundle can be provided to Cisco Technical Assistance Center (TAC) for troubleshooting.