



Observe Network Trends and Gain Insights

- [About Network Trends and Insights, on page 1](#)
- [View Wireless Access Point Performance Advisories, on page 1](#)
- [View Network Trends and Obtain Insights, on page 5](#)
- [Compare Access Points in Network Heatmaps, on page 8](#)
- [Compare KPI Values with Peers in Your Network, on page 10](#)
- [Compare Buildings, AP Model Families, and Wireless Endpoint Types, on page 12](#)
- [View and Monitor Network Performance Using Baselines, on page 15](#)

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.
- **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 and 5 GHz. Poor client experience is detected using statistical analysis of different KPIs, such as SNR, RSSI, link speed, packet retries, and packet failures.

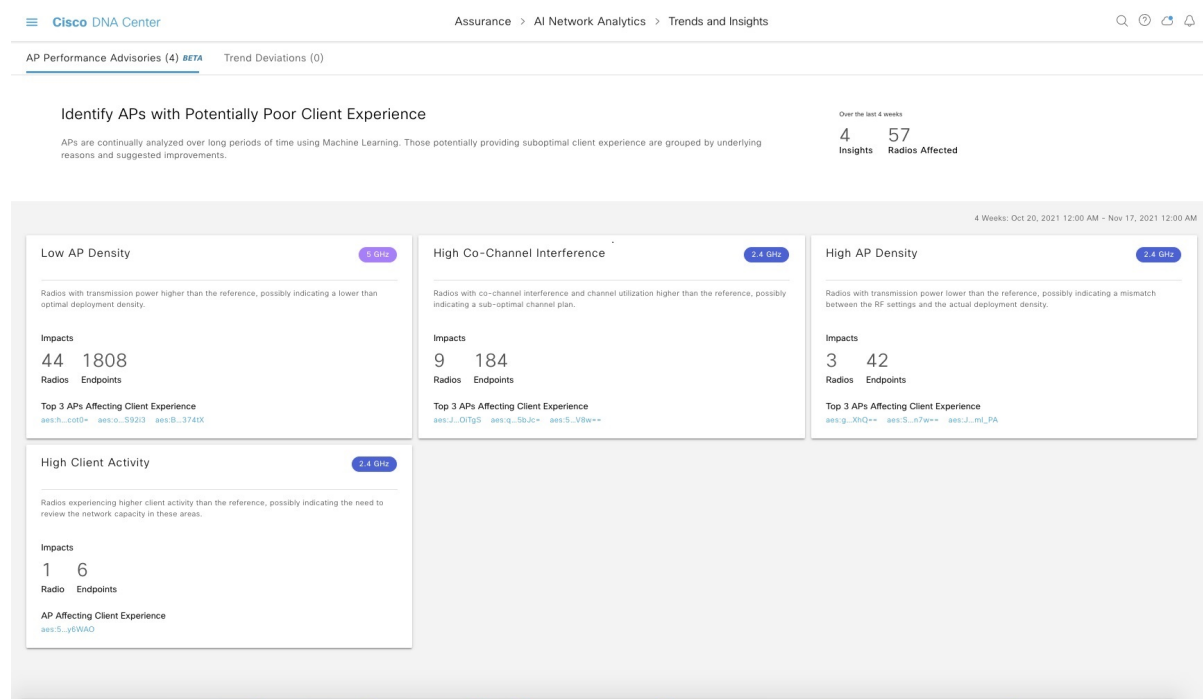
Use this procedure to view AP performance advisories that highlight the most active APs with poor client experience based on analysis of four weeks of data.

Step 1
Step 2

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

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

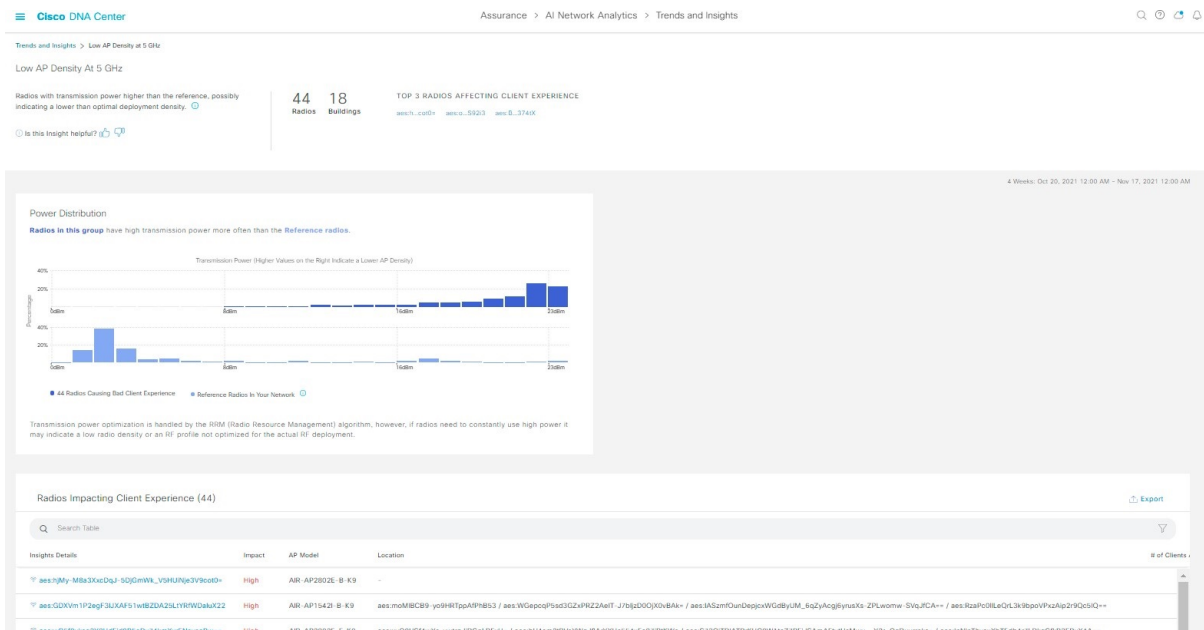
- Low AP deployment density
- Low AP deployment density and external interference
- Low AP deployment density and high load

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.

Insight Dashboard	
Item	Description
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	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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 > Network Insights**.

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	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: <ul style="list-style-type: none"> • 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 that was used on the AP on which the insight was observed. Values are 2.4 GHz , 5 GHz , or both 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 Intelligent.
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.
Troubleshoot	Provides links that allow you to troubleshoot and fix the trend before it becomes a critical issue: <ul style="list-style-type: none"> • 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. <ul style="list-style-type: none"> • 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.

Insight Details Slide-In Pane	
Item	Description
Issue Count	Issue count gradient.
Chart	<p>The beeswarm chart displays the performance of the client devices in your network in a 4-week time period as shown in the following figure. The bottom of the chart represents week 1; the top of the chart represents week 4. If there is a systematic deviation of network behavior over a time period, that trend is displayed by arrows in the chart.</p> <p>Figure 4: Beeswarm Chart</p> <p>Note</p> <ul style="list-style-type: none"> • Each circle in the beeswarm chart represents the following: <ul style="list-style-type: none"> • 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.

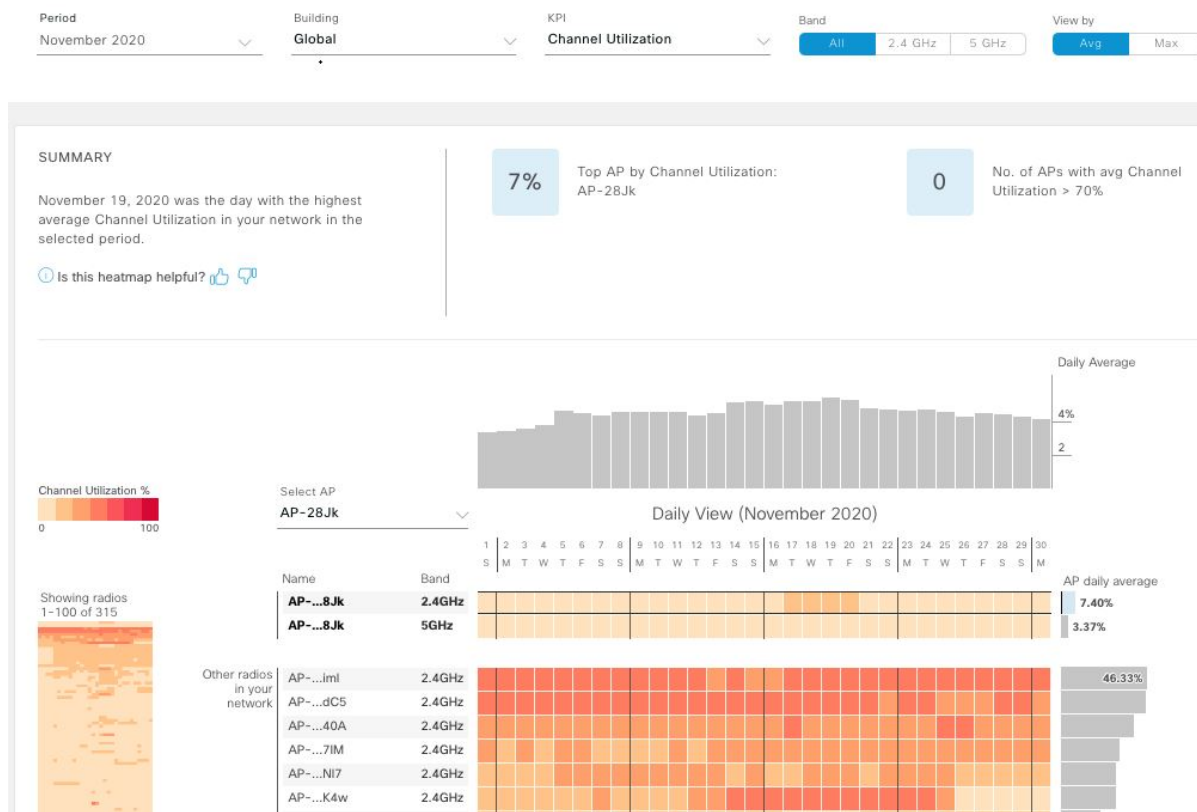
Compare Access Points in Network Heatmaps

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
Period	Displays information in the heatmap for the month you choose from the drop-down list.
Building	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 .

Network Heatmap Window	
Item	Description
KPI drop-down list	Displays information in the heatmap for the KPI you choose from the drop-down list. Default is Client Count .
Band	Displays information in the heatmap for the band frequency you choose. Options are: All , 2.4 GHz , and 5 GHz . Default is All .
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: <ul style="list-style-type: none"> • The day of the month that was the busiest. • Number of APs that had no clients per radio. • Number of APs 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: <ol style="list-style-type: none"> 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. 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 <ul style="list-style-type: none"> • 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. <p>Hover your cursor over the bar on the graph to view the KPI value for each day.</p>

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: <ul style="list-style-type: none"> • 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 , 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: <ul style="list-style-type: none"> • 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	<p>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.</p> <p>To highlight the KPI values for the peer networks, click the Highlight Peers button.</p> <p>Figure 6: Peer Comparison Bar Graph</p> <p>SUMMARY</p> <p>Radio Throughput in your network was very similar to your peers in the last 25 days.</p> <p>Period: Jun 15, 2019 - Jul 10, 2019</p> <p>2.4 GHz Network: 3.61% of the times above 271Kbps Peers: 4.26% of the times above 271Kbps</p> <p>5 GHz Network: 6.31% of the times above 271Kbps Peers: 6.01% of the times above 271Kbps</p> <p>Distribution of Radio Throughput <input type="checkbox"/> Highlight peers</p> <p>Band: 2.4GHz</p> <p>Band: 5GHz</p> <p>● Network ● Peers</p> <p>Notes Samples between 0 and 1bps are not shown by default. Please note that 85.31% of your network is in this range.</p> <p>Notes Samples between 0 and 1bps are not shown by default. Please note that 80.64% of your network is in this range.</p>
	<p>The colors in the graph represent the following:</p> <ul style="list-style-type: none"> • 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.

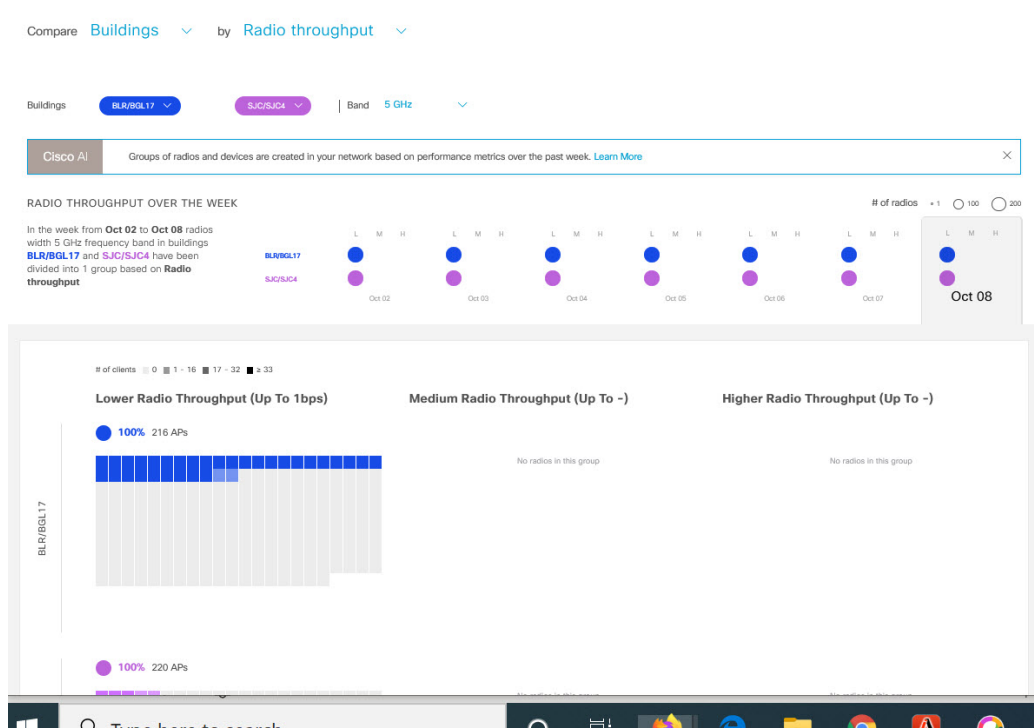
Compare Buildings, AP Model Families, and Wireless Endpoint Types

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 Object Comparison**.

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

Figure 7: Network Object Comparison Window



Network Object 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 Object Comparison Window	
Item	Description
By KPI drop-down list	<p>Choose a KPI that you want to use to compare the objects in your network.</p> <p>For Buildings, the options are:</p> <ul style="list-style-type: none"> • 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 <p>For AP Model Families, the options are:</p> <ul style="list-style-type: none"> • Radio Throughput • Interference • Media Apps Throughput • Average Client RSSI • Channel Utilization • Average Client SNR • Cloud Throughput • Social Throughput <p>For Wireless Endpoints, the options are:</p> <ul style="list-style-type: none"> • Average AAA Time • Average Onboarding Time • Average DHCP Time

Network Object Comparison Window	
Item	Description
Buildings AP Model Families or Wireless Endpoints drop-down list	<p>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.</p> <p>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.</p>
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	<p>For certain KPIs, such as Radio Throughput and Average Client RSSI, this area provides the client count per radio for each of the sites.</p> <p>For certain KPIs, such as Onboarding Time, this area provides the number of devices for each of the sites.</p> <p>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.</p>
AP Clusters or Device Type Clusters	<p>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:</p> <ul style="list-style-type: none"> • 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. <p>For certain KPIs, such as Onboarding Time and Authorization Time, this area displays the following:</p> <ul style="list-style-type: none"> • 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.


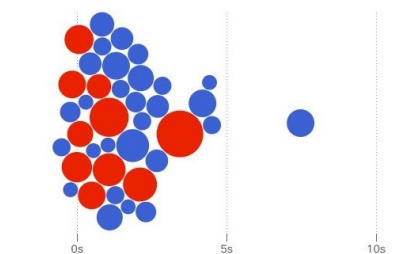
Figure 8: Baselines Dashboard



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 WLCs 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: <ul style="list-style-type: none"> • 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
 <p>Beeswarm Chart</p>	<p>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.</p> <p>KPI: Onboarding Time ▾</p>  <p>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:</p> <ul style="list-style-type: none"> • Blue color: The circle represents a building. Hover your cursor over a circle in the chart to get information, such as location, KPI, SSID, WLCs 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, WLCs, 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 on 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 WLC 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.

The color coded charts are displayed below the timeline slider, to determine how your network is performing, issues triggered based on the deviations from the predicted baseline for a selected Key Performance Indicator (KPI) within the specified time period. Hover and move your cursor over the charts to view synchronized tooltips that displays duration, predicted upper and predicted lower range at a selected point in time.

The color codes represents the following:

- Red color represents the AI driven issues
- Blue color represents the average KPI duration
- Green color 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) (for example 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, data is displayed in the table contains 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.