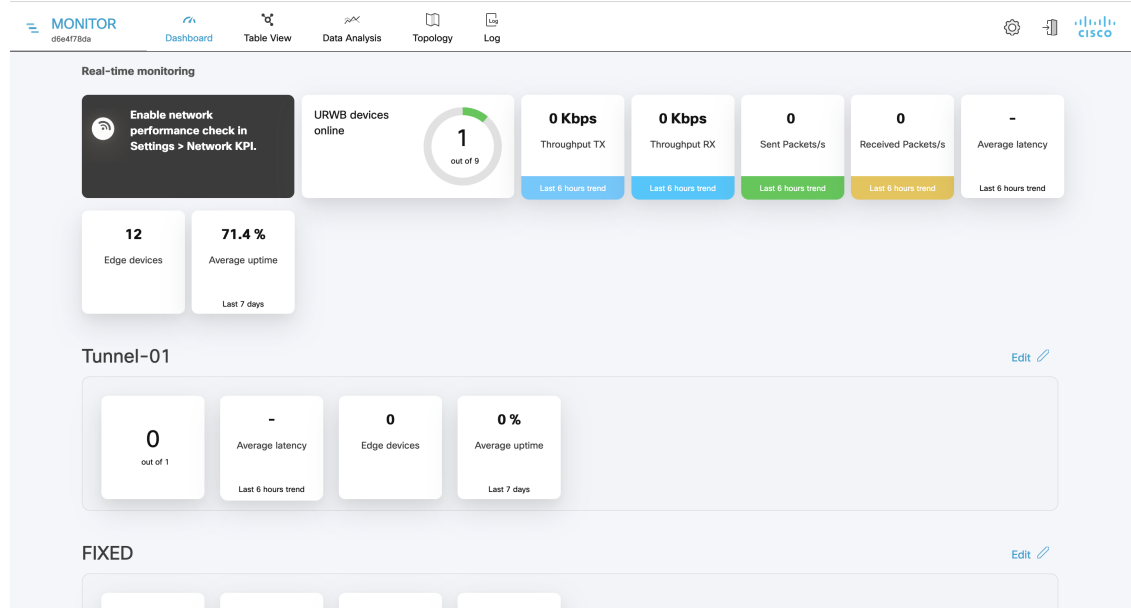




# Monitoring Network Performance

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## Viewing the Network Statistics

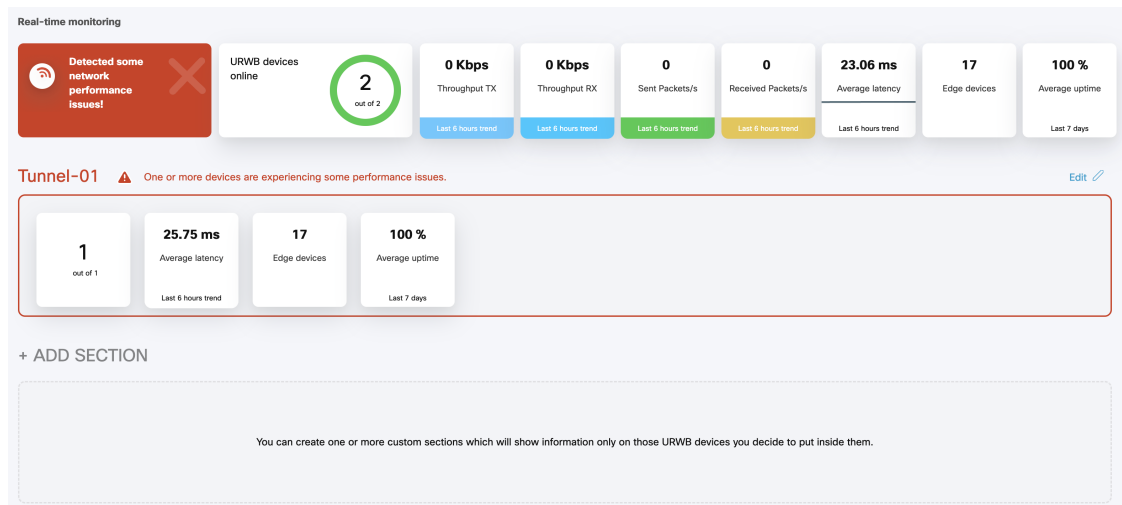


The real-time monitoring shows the performance of the combined network. Each box shows information about performance of a specified network section. In each network section, the blocks show operating parameters of the devices in the network such as:

- Number of devices currently connected to IW Monitor, in relation to the total number of devices associated to IW Monitor.

- Device latency (**Average latency**) values across the network or section during the last six hours.
- Aggregate network throughput transmitted (**Throughput TX**) by all devices in the network during the last six hours.
- Aggregate network throughput received (**Throughput RX**) by all devices in the network during the last six hours.
- Aggregate number of data packets sent (**Sent Packets/s**) by all devices in the network during the last six hours.
- Aggregate number of data packets received (**Received Packets/s**) by all devices in the network during the last six hours.
- Current number of edge devices (**Edge devices**).
- Average network or section uptime value (**Average uptime**). The average uptime value is the combined percentage of time for each network device or section connected to the IW Monitor in the last seven days.

A thin red box appears around the section if any performance-related faults arise and need immediate investigation. The + **ADD SECTION** at the bottom allows you to customize the section with the device information you want to monitor. To add a new section to an existing network, see [Creating a new Section](#).



## Viewing the Devices using Table View

**Step 1** Click  **Table View** to see the list of devices.

A new screen as below appears:

MONITOR  
d5e4f78da

Dashboard Table View Data Analysis Topology Log

Search by Mesh ID, label or IP address Filter by status  Critical  Warning  Disconnected

All sections (9) Uncategorized (1) Tunnel-01 (0) FIXED (2) Trains-A1 (0) TEST (4) Trains-A2 (0) MAGNUM (0) Test (0) doc teams (2)

**Uncategorized (1)**

Status	Label	IP Address	Mesh ID	FW version	Role	Frequency	TX Power	Channel width	More
ME	Cisco	10.115.11.90	5.0.178.85	8.7.5378c8b.52	Fluidity Infra	5745 MHz	23 dBm	20 MHz	...

1 - 1

**FIXED (2)**

Status	Label	IP Address	Mesh ID	FW version	Role	Frequency	TX Power	Channel width	More
MP	Cisco-21.201.156	10.115.11.129	5.21.201.156	8.8.1.10	R1 R2 Fixed Infra Disabled	5805 MHz	27 dBm	80 MHz	...
ME	Cisco-prodstaging	10.115.11.127	5.21.201.132	17.12.2.17	R1 R2 Fixed Infra Disabled	5805 MHz	27 dBm	80 MHz	...

1 - 2

- All the devices that are not assigned to any specific sections are shown under **Uncategorized**. To add uncategorized devices to a specific section, see [Creating a new Section](#).
- The devices that are assigned to specific network sections are shown in the relevant section.
- Following table describes each column:

Parameter	Description
<b>Status</b> (icon color and designation)	<p>Icon colors represent the following device status:</p> <ul style="list-style-type: none"> <li>• <b>Green:</b> Device is online and connected to an IW Monitor with all the performance levels in an acceptable range.</li> <li>• <b>Gray:</b> Device is disconnected from IW Monitor.</li> <li>• <b>Orange:</b> Device is online and connected to the IW Monitor but has one or more problems that cause it to perform at a lower-than-optimal level.</li> <li>• <b>Red:</b> Device is online and connected to IW Monitor but has one or more problems that cause unacceptably low performance. If a device icon is <b>orange</b> or <b>red</b>, the device may have one or more of the following problems:             <ul style="list-style-type: none"> <li>• Unusually high packet error rate</li> <li>• Unusually high link error rate</li> <li>• Unusually low received signal strength</li> <li>• Unusually high traffic latency</li> </ul> </li> </ul> <p>Icon designation are as follows:</p> <ul style="list-style-type: none"> <li>• <b>ME:</b> Device is configured as a mesh end.</li> <li>• <b>MP:</b> Device is configured as a mesh point.</li> <li>• <b>BR:</b> Device is configured as a wireless bridge device.</li> <li>• <b>PONTE:</b> This is applicable only for FM PONTE devices.</li> <li>• <b>GGW:</b> Gateway is configured as a Global Gateway.</li> </ul>
<b>Label</b>	<p>This is the user assigned device name.</p> <p><b>Note</b> You cannot change the device name using IW Monitor. Use IoT OD IW service, the device offline web interface (Configurator), or the device's command-line interface (CLI) to change the device's name.</p>
<b>IP Address</b>	<p>Shows the IP address of the device.</p>

Parameter	Description
<b>Mesh ID</b>	<p>Every device has a unique, factory set mesh identification number. for example: 5.a.b.c</p> <ul style="list-style-type: none"> <li>• If the device is set as the primary vehicle-mounted network device, then letter <b>P</b> is mentioned next to the Mesh ID.</li> <li>• If the device is set as a secondary device (a subordinate device within a vehicle-mounted network), then the letter <b>S</b> is mentioned next to the Mesh ID.</li> </ul>
<b>FW Version</b>	Shows value of the firmware release number.
<b>Role</b>	<p>Role designations represent the following device status:</p> <ul style="list-style-type: none"> <li>• <b>Fixed Infra:</b> Device is part of a fixed based infrastructure.</li> <li>• <b>Fluidity Vehicle:</b> Device is part of a Fluidity network, and installed in a moving vehicle.</li> <li>• <b>Fluidity Infra:</b> Device is part of a Fluidity network, and installed as part of a fixed infrastructure.</li> </ul> <p><b>Note</b> For Cisco Catalyst IW9165 and IW9167 devices, the <b>Role</b> parameter is specified for each radio interface. If the radio interface is disabled, it shows as <b>Disabled</b>.</p>
<b>Frequency</b>	<p>Shows the device's current operating frequency.</p> <p><b>Note</b> For dual-radio devices, the <b>Frequency</b> parameter is shown for each radio interface.</p>
<b>TX Power</b>	<p>Shows the user-defined value of the radio device's maximum transmission power level.</p> <p><b>Note</b> For dual-radio devices, the <b>TX Power</b> parameter is shown for each radio interface.</p>
<b>Channel width</b>	<p>Shows the value of the radio device's operating channel width.</p> <p><b>Note</b> For dual-radio devices, the <b>Channel width</b> parameter is shown for each radio interface.</p>

**Step 2** Search for any device using the mesh ID number, assigned device name, or the device's IP address.

**Step 3** Or, filter the devices based on status such as **Critical**, **Warning**, **Disconnected**. Also, you can select the tabs for a quick view of the section.

Search by Mesh ID, label or IP address

Filter by status  Critical  Warning  Disconnected

All sections (17) Uncategorized (10) Tunnel-01 (1) Trains-A2 (2) Test (3) Trains-A1 (1)

- The **Critical** filter allows you to view the list of devices for which the thresholds are beyond the upper threshold limit.
- The **Warning** filter allows you to view the list of devices for which the thresholds are between the upper and lower threshold limits.
- The **Disconnected** filter allows you to view the devices which are disconnected from IW Monitor.

## Viewing the Uplink and Downlink Information for a Device

In the **More** column, click (...) of the device to view more detailed uplink and downlink information.

MONITOR 1.x-dev Dashboard Table View Data Analysis Topology Log

ME	Fluidmesh	10.115.11.64	5.1.79.77	8.6-rc10	Fixed Infra	5180 MHz	24 dBm	40 MHz	...
ME	Trailer-8-A1-testAAA	10.115.11.63	5.0.180.16	9.4	Fluidity Infra	5825 MHz	23 dBm	20 MHz	...

Latency: 0.45 ms | Jitter: 19.38 ms | Installed plugins (12): FM-AES, BW (30 Mbps), PMCL BW (UNLIMITED), PTP BW (UNLIMITED), FM-L2TP, FM-LF, FM-MOB, FLUIDITY-MOB BW (UNLIMITED), FLUIDITY-TRK BW (60 Mbps), FM-TITAN, FM-UNI2, FM-VLAN

Device configuration page

Realtime links

Link	Total Tpt.	Throughput	M.C.S. (rate)	L.E.R.	P.E.R.	RSI	
Trailer-8-A1-testAAA 10.115.11.63	0.03 Mbps	0 Mbps	7/2 SGI 20 MHz (144 Mbps)	0 %	0 %	-	TX
Cisco-0.180.19 5.0.180.19	0.03 Mbps	0.03 Mbps	7/2 SGI 20 MHz (144 Mbps)	-	-	-60 dBm	RX

Channel utilization breakdown

5.0.180.19: 0.05% (TX) | free: 99.95% (RX)

Edge devices (18)

10.115.11.92	10.115.11.55	10.115.11.60	10.115.11.115	10.115.11.174	10.115.11.230	10.115.11.81	10.115.11.176	10.115.11.87	192.168.10.92	10.115.11.80
10.115.11.147	10.115.11.158	10.115.11.1	10.115.11.111	10.115.11.160	10.115.11.159	10.115.11.180				

1 - 7

Following table describes each column with detailed explanation:

Parameter	Description
<b>Installed plugins</b>	List of the software plug-ins currently installed on the device, and it is only applicable for the legacy Fluidmesh products.
<b>License</b>	Shows the device's license level and is applicable only for Catalyst IW9165, IW9167, and IEC-6400 gateway. The <b>License</b> level can be <b>Essential</b> , <b>Advantage</b> , or <b>Premier</b> .
<b>Latency</b>	Shows the current network latency (the delay period between data transmission by the IW Monitor host and reception of a reply by a radio device). The latency value is calculated as half of the round-trip time of the relevant packets.
<b>Jitter</b>	Shows the current amount of network jitter (the deviation from the true periodicity of periodic data signals in relation to a reference clock signal).
<b>Link</b>	Shows the two endpoints of the wireless link.
<b>Role</b>	Role designations are as follows: <ul style="list-style-type: none"> <li>• <b>Fixed Infrastructure</b>: The radio unit is part of a wired LAN based infrastructure.</li> <li>• <b>Fluidity Infrastructure</b>: The radio unit is part of a Fluidity network, and installed in a moving vehicle.</li> <li>• <b>Fluidity Vehicle</b>: The radio unit is part of a Fluidity network, and installed as part of a fixed infrastructure.</li> </ul>
<b>Total Throughput (Total Tpt.)</b>	Shows the combined throughput rate per second for the uplink and downlink.
<b>Throughput</b>	Upper value shows the throughput rate per second for the downlink. The lower value shows the throughput rate per second for the uplink.
<b>M.C.S. (Rate)</b>	Shows the modulation and coding schema used by the relevant uplink or downlink.
<b>L.E.R.</b>	Shows the link error rate for the relevant uplink or downlink.
<b>P.E.R.</b>	Shows the packet error rate for the relevant uplink or downlink.
<b>RSSI</b>	Shows the received signal strength indication for the relevant uplink or downlink.

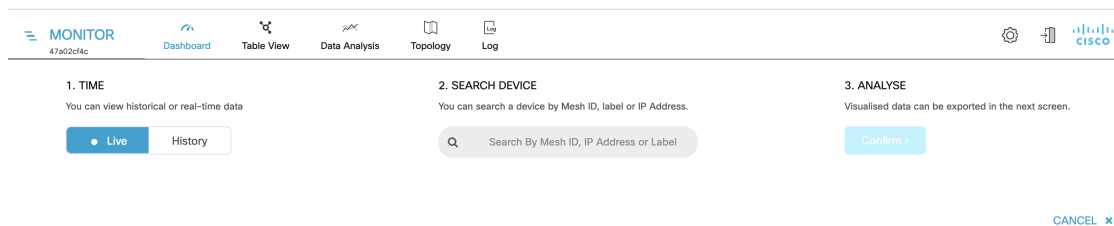
Parameter	Description
<b>Channel utilization breakdown</b>	<ul style="list-style-type: none"> <li>• The total width of the bar represents the total bandwidth of the channel carrying the uplink and downlink.</li> <li>• The solid portion represents the portion of bandwidth currently being used to transmit data.</li> <li>• The striped portion represents the portion of bandwidth currently being used to receive data.</li> <li>• The gray portion represents the portion of bandwidth that is currently not utilized.</li> <li>• Numerical percentage readouts are also given for transmission, reception and non utilization.</li> </ul>
<b>Attached devices</b>	This is a list of devices that are part of the section.

## Viewing Device Statistics in Real Time

IW Monitor has network statistics that allow you to view the network-related performance of any device in the current network. The statistical details for a device can be viewed in real-time as they occur. You can also view a performance graph that displays the device's previous performance on a historical timeline.

**Step 1** Click  **Data Analysis**.

A new screen extends as shown below:



**Step 2** For step 1: **TIME**, you can switch between real (live) and historical data for the data analysis.

a) To view statistics of a device for a particular period, select **History** tab.

**From** and **To** time fields and **Custom time range** field appears.



## 1. TIME

You can view historical or real-time data

● Live
History

👤 Custom time range
▼

Start date-time

**19 / 01 / 2023    21 : 35**

End date-time

**20 / 01 / 2023    20 : 36**

- b) Select the date and time for both **From** and **To** fields.

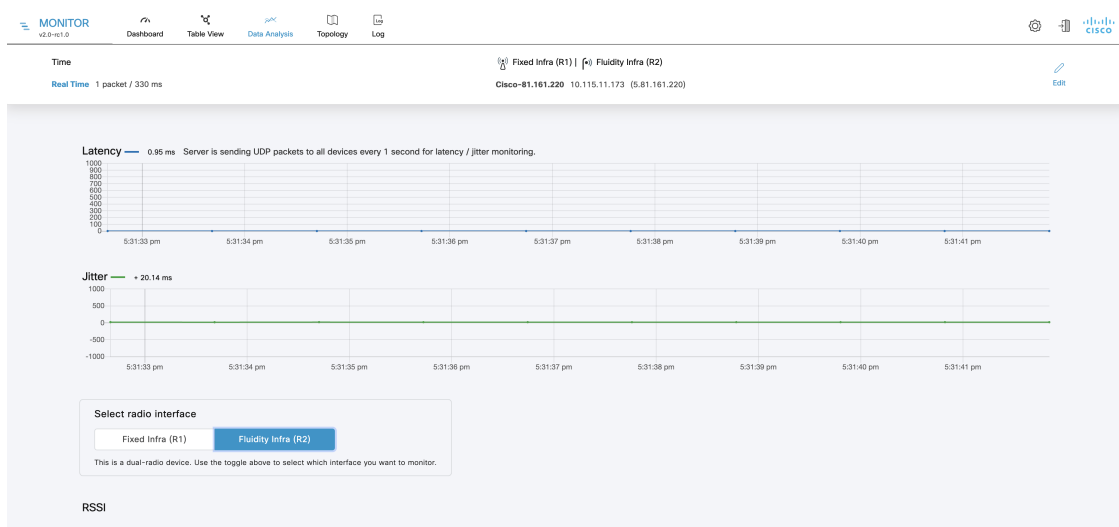
**Note**      The selected duration can't be more than 1 hour.

### Step 3

For step 2: **SEARCH DEVICE**, search for the device using the mesh ID number, assigned device name, or the device's IP address.

### Step 4

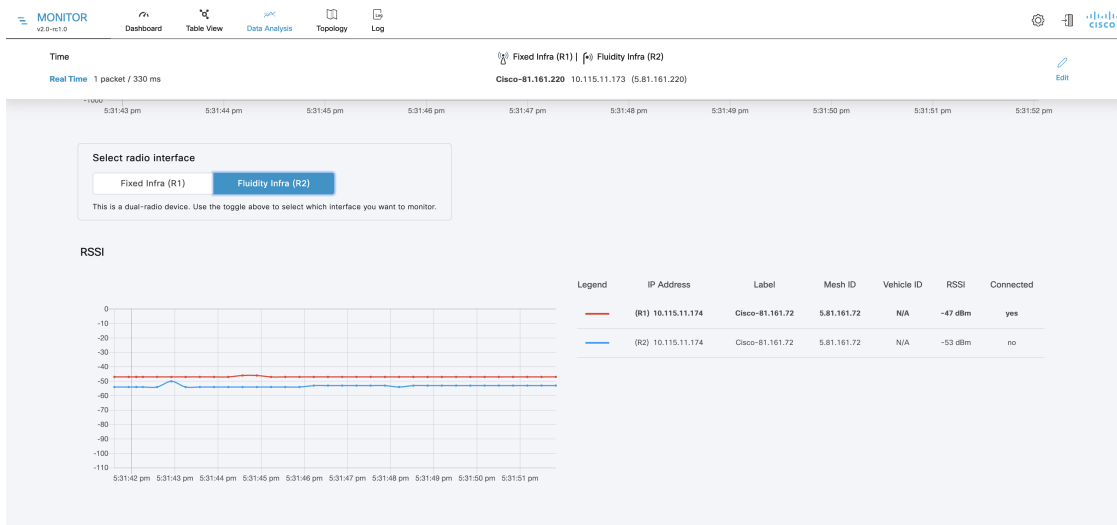
For step 3: **ANALYSE**, click **Confirm**.



A real-time statistical view of the device appears. For **History** tab selection, a time slider for the chosen period also appears.

- a. The first graph shows received signal strengths of the device and other radio units that the device could potentially connect with:

## Viewing Device Statistics in Real Time

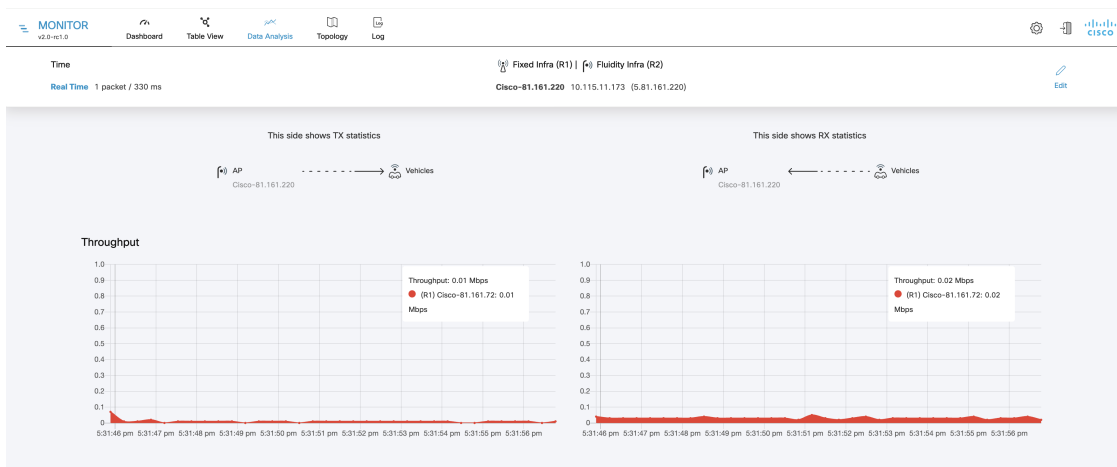


- The upper left corner of the graph shows whether the device currently accepts handoff requests.
- If the chosen device is currently connected to a Fluidity-enabled (vehicle-mounted) radio unit, a thick, dashed black line is superimposed over the Fluidity device's RSSI line. This line is the RSSI envelope and represents the strongest available signal.

**Note** In the right-hand section of the graph, devices to which the current device is connected are listed in descending order of received signal strength (RSSI).

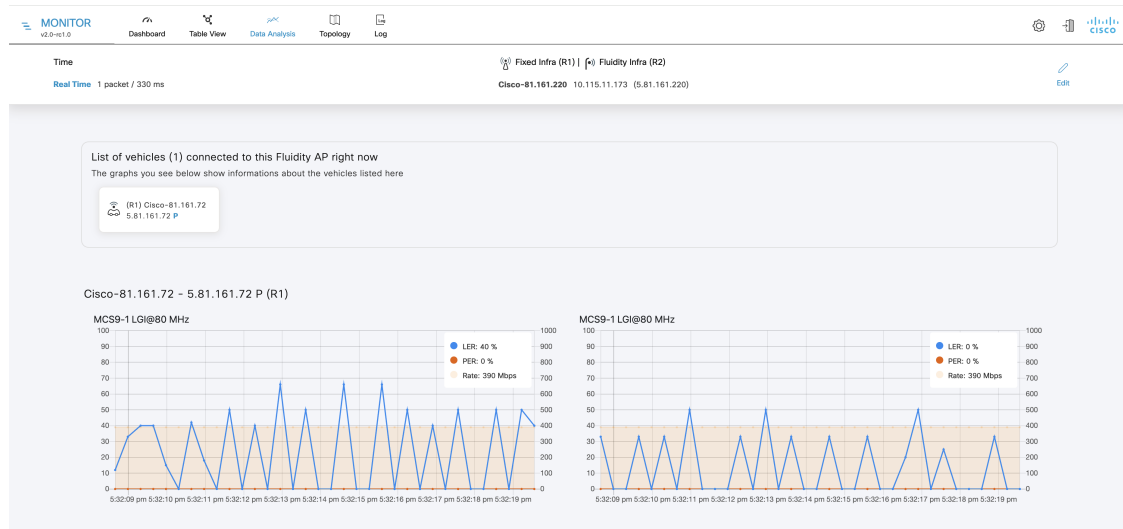
- b. The Throughput graphs show the throughput statistics as a function of Mbps/time. The throughput is shown for the selected device and the device to which the chosen device is currently connected.

**Note** The left graph shows uplink statistics (data flow from the current unit), while the right graph shows downlink statistics (data flow to the current unit).



- c. The LER / PER graphs shows the current link error and packet error rates (expressed in percentages over time) and the comparative signal modulation rates. LER and PER are shown for the selected device and the device to which the selected device is currently connected.

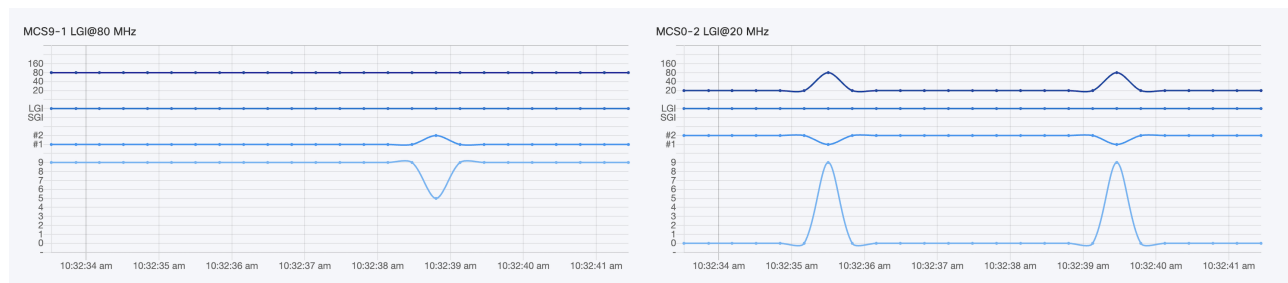
**Note** The left graph shows uplink statistics (data flow from the current device), while the right graph shows downlink statistics (data flow to the current device).



d. The graphs in the fourth row shows the modulation and coding schemas (MCS) for the selected device and the device to which the selected device is currently connected.

**Note** The left graph shows uplink statistics (MCS of the current device), while the right graph shows downlink statistics MCS of the unit to which the current device is connected).

e. The upper left corner of the graph shows whether the device currently accepts handoff requests.



**Note** This graph is shown only for vehicles.

**Step 5** Click **Edit** to view the statistical view for another device.


## Viewing the Devices from Topology

**Step 1** Click **Topology**.

**Step 2** Click on the device for more details.

Cisco Infra		Fluidmesh2	
10.15.12.116/24		10.115.11.195/24	
Mesh ID 5.3.210.136	<a href="#">Web page</a>	Mesh ID 5.1.69.238	<a href="#">Web page</a>
Model IW9167EH-ROW	Firmware 17.14.0.48	Model FM4801	Firmware 10.1.3660aed.94
R1 Freq 5180 MHz	R2 Freq 5745 MHz	Frequency 5660 MHz	Ch. width 80 MHz
R1 Ch. width 40 MHz	R2 Ch. width 40 MHz	Latency N/A	Jitter N/A
R1 Role Fluidity Infra	R2 Role Fixed Infra	Plugins FM-MOB FM-VLAN	
Latency 5 ms	Jitter 1 ms		

**Step 3** Click on **Web page** and it redirects to the respective web interface (Configurator) of the device.

**Step 4** Click  **Settings** to change the information displaying in the topology view:

a) In the **Appearance** tab, you can edit the following:

- **EDIT MODE:** The toggle button allows you to lock or unlock the position of any device on the topology map.
- **SHOW LINKS:** If the toggle button is enabled, the links not in use as routes are shown.
- **KPI VALUES ON ROUTES:** If the toggle button is enabled, the selected KPIs (**L.E.R**, **P.E.R**, **RSSI**, and **Link Utilization**) mentioned below will be shown for all wireless routes.
- **RESET TOPOLOGY SETTINGS:** Click **Clear Settings and reset view** to clear all the topology settings.

The screenshot shows the 'Appearance' settings panel. At the top, there are four tabs: 'Appearance' (selected), 'Layout', 'Background', and 'Positioning'. The 'Appearance' panel contains the following sections:

- EDIT MODE**: A toggle switch for 'Lock or unlock the position of your devices on the map.' (Currently off).
- SHOW LINKS**: A toggle switch for 'When this is on, also the links not in use as routes will be shown.' (Currently off).
- KPI VALUES ON ROUTES**: A toggle switch for 'If enabled, selected KPIs will be shown on all wireless routes between fixed' (Currently off).
- SELECT KPIs**: A section with four radio buttons: 'L.E.R.', 'P.E.R.', 'RSSI', and 'Link Utilization'. Below them is the text: 'Choose which KPIs you want to show on wireless routes.'
- RESET TOPOLOGY SETTINGS**: A section with a link that says 'Clear settings and reset view'.

At the bottom right of the panel is a blue button labeled 'Save changes'.

b) In the **Layout** tab, you can choose a predefined template to set up the view based on the use case.

The screenshot shows the 'Layout' settings panel. At the top, there are four tabs: 'Appearance', 'Layout' (selected), 'Background', and 'Positioning'. The 'Layout' panel contains the following sections:

- Choose a template**: A section with the text 'Start from one of our template to quickly set up your view' and five radio buttons: 'Mining', 'Rail', 'Entertainment', 'Fixed', and 'Other' (which is selected).

c) In the **Background** tab, you can customize the background of the topology view.

The screenshot shows the 'Background' settings panel. At the top, there are four tabs: 'Appearance', 'Layout', 'Background' (selected), and 'Positioning'. The 'Background' panel contains the following sections:

- Set a background**: A section with the text 'Choose if you want to upload your background image' and two radio buttons: 'Image' and 'None' (which is selected).

d) In the **Positioning** tab, you can choose between the two below options:

- **Automatic (hierarchy)** - Allows the devices to automatically positioned as a tree.
- **Coordinates (CSV file)** - You can upload a CSV file with the list of coordinates for each device (latitude and longitude). Then, position any two devices in the panel and all the other devices will be automatically positioned based on the geo coordinates in the CSV file.

Appearance
Layout
Background
Positioning ✕

Choose a coordinate system

The option you select now will affect how the radios are displayed later.

Automatic (hierarchy)
  Coordinates (CSV file)

Network's layout (preview)

You can move any device after completing the wizard by enabling 'Manual layout' in the Topology Settings

The preview shows five device cards arranged horizontally. Each card has a location pin icon above it. The cards are: Fluidmesh... (IP: 10.115.11.61), CiscoURW... (ME, IP: 10.115.11.231), ME 10.115.11.141, Trailer-8-A... (ME, IP: 10.115.11.63), and Cisco-test... (MP, IP: 10.115.11.128).

Note: the layout above doesn't show any Fluidity Vehicle. These devices will be shown on the map after completing the wizard

Save changes

**Step 5** Click **Edit Mode** to change the topology view based on devices or background.

The following pop-up appears once you click on **Edit Mode**:

a) Click **Continue to Edit Mode**.

**Edit mode** ✕

Remember that while you're in edit mode:

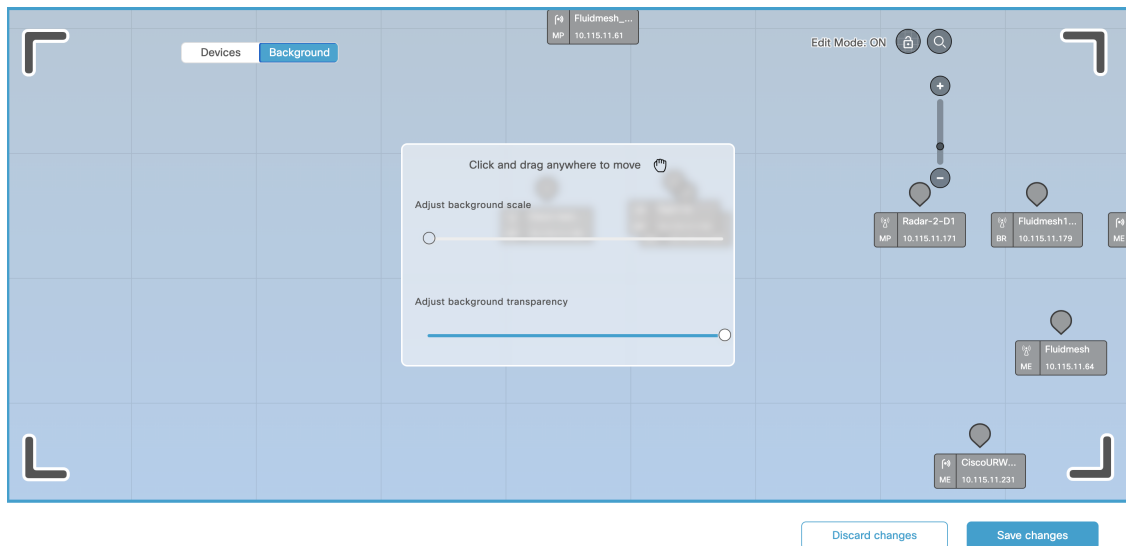
- Fluidity vehicles are not showed on the map
- Topology, links and nodes status will not be updated
- Node sidebar and link widgets cannot be opened

These conditions are only valid while you're in Edit Mode. To exit Edit Mode click on 'Save changes' button or 'Discard changes' button to the bottom of the page.


Cancel
Continue to Edit Mode

- In **Devices** view, you will see the devices.


- In **Background** view, you can adjust the background scale and transparency to concentrate on a particular section of the topology view.



- Click **Save changes**.

**Step 6** Click  **Zoom** to zoom in/out the topology view.

## Filtering and Viewing Network Events

**Step 1** Click  to view a log of network events for the current device.

A new screen extends as shown below:



**Step 2** For step 1: Select the available time range options from the **Custom time range** drop-down list or set the start date and time and end date and time as required.

**Step 3** For step 2: Click **Confirm**.

A log of network related events is shown for the chosen date/time range.

11/2/2023 - 15:51 to 11/2/2023 - 15:52

Level: Info - Events: All -

Disconnected edge devices  
3:51:44 PM

Connected new edge devices  
3:51:44 PM

New edge devices (IP addresses: 192.168.1.187) are attached to Fluidmesh device Cisco-81.161.152 - 192.168.1.10 / 5.81.161.152.  
Full list of edge devices connected to this Fluidmesh unit

IP Address	VLAN ID
192.168.1.130	0
192.168.1.103	0
192.168.1.101	0
192.168.1.102	0
192.168.1.187	0
192.168.1.194	0
192.168.1.104	0
192.168.1.105	0
192.168.1.172	0

Disconnected edge devices  
3:51:39 PM

Edge devices (IP addresses: 192.168.1.187) are not attached anymore to Fluidmesh device Cisco-81.161.152 - 192.168.1.10 / 5.81.161.152.  
Full list of edge devices connected to this Fluidmesh unit

**Step 4** If required, click **Level** to choose the overall criticality level of the shown list of network events.

Level: All ▾ Events: All

Critical Warning Info Trace

The levels are as below:

- **Critical** - Critical level events have an immediate, negative impact on system performance and/or system integrity, and must be addressed immediately.
- **Warning** - Warning level events have a potentially negative impact on system performance, and should be addressed as soon as practically possible.
- **Info** - Info level events are normal system events. This is the default event display level.
- **Trace** - Trace level events are considered trivial, but can be useful for diagnostic troubleshooting.

**Note** Criticality levels are inclusive of the chosen level, and all levels below the chosen level. For example:

- If you select **Critical**, only **Critical** events are shown.
- If you select **Warning**, then **Critical** and **Warning** events are shown.
- If you select **Info**, then **Critical**, **Warning** and **Information** events are shown.
- If you select **Trace**, then **Critical**, **Warning**, **Information** and **Trace** events are shown.

**Step 5** Choose the specific network event types as below:

a) Click **Events**.

A pop-up appears.



- b) In the pop-up, click the relevant category from left pane, and select the check-boxes for the required network event.
- c) Click **Apply**.

All the specified network-related events are shown in descending chronological order (more recent events are shown at the top of the log).

- d) (Optional) To clear the applied filters, click **Clear Filters**.
- e) (Optional) To edit the time range of the log, click **Edit**.

The screenshot shows a filter selection interface. On the left, a vertical pane lists various categories with their selection counts:

- RADIUS events: 8/8 selected
- Network events/failures: 12/12 selected
- Titan (Fast-Failover): 6/6 selected
- License management: 4/4 selected
- System: 3/3 selected
- Network performance: 14/14 selected
- Devices management: 8/8 selected
- Device Credentials: 4/4 selected
- Ethernet Port: 2/2 selected
- Database: 9/9 selected
- Settings: 19/19 selected
- Configuration changes: 21/21 selected
- Users account management: 6/6 selected

The 'RADIUS events' category is selected, and the right pane shows a list of RADIUS events, all of which are checked:

- RADIUS configuration mismatch
- RADIUS failed authentication renewal
- RADIUS failed authentication
- RADIUS successful authentication
- RADIUS Authentication request
- RADIUS Mode Changed
- RADIUS authentication renewal request
- RADIUS successful authentication renewal

At the top right of the event list, there is a 'RADIUS events' header and a 'Deselect all' button with a checked checkbox.

## Exporting a Network Event Log as a CSV File

- Step 1** Request the log of network events as mentioned in [Filtering and Viewing Network Events, on page 15](#).

**Step 2** Click [Export](#).

A **Export Log** pop-up appears.

**Step 3** Check the date/time range shown in the **Export Log** pop-up, and click **Export**.

**Step 4** Select the location in your computer to save the file.

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