



Monitor

Cisco Ultra-Reliable Wireless Backhaul FM Monitor

Configuration Manual

(Formerly Fluidmesh)
Edition 1.4

Firmware V9.1 (3500 ENDO and 4500-series) and V1.3.0 (FM1000 & FM10000)

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1. HAZARDOUS CONDITION WARNINGS



IMPORTANT

In some jurisdictions, operation of any or all hardware that may be described in this manual may be subject to the following conditions:

1. The hardware may not cause harmful interference.
2. The hardware must accept any interference, including interference that may cause undesired operation.

Like all other global technology vendors, Fluidmesh is required to comply with all local health and government regulations in the locations in which we operate. This includes meeting radio frequency (RF) exposure limits for our products.

Our equipment is tested in accordance with regulatory requirements as a condition to our ability to market and sell in any given jurisdiction. As an equipment manufacturer, Fluidmesh defers to expert national and international health organizations responsible for guidance on the safety of RF signals, specifically the US Food and Drug Administration (FDA), Health Canada, the World Health Organization (WHO), and other national and global health agencies.

In May 2019, the FDA stated that there is "no link between adverse health effects and exposure at or under the current RF energy exposure limit", and that the current FCC RF exposure limits are sufficient to insure the safety of users.

If any Fluidmesh hardware unit breaks down or malfunctions, emits smoke or an unusual smell, if water or other foreign matter enters the unit enclosure, or if the unit is dropped onto a hard surface or damaged in any way, power off the unit immediately and contact an authorized Fluidmesh Networks dealer for assistance.

If you are adjusting and/or controlling a Fluidmesh device using control software such as the RACER™ interface or the device's local Configurator interface, do not make configuration changes unless you know with certainty that your changes will not negatively impact people or animals in the vicinity of the device and its antennas.

1.1. Water ingress hazard



CAUTION

In all circumstances where the Cisco FM Monitor will be installed in an outdoor location, it is compulsory to mount the Cisco FM Monitor inside an FM-SHIELD auxiliary mounting kit.

The FM-SHIELD auxiliary mounting kit is a proprietary Fluidmesh solution, and is designed specifically to assure the long-term durability and reliability of compatible radio transceivers that have been installed in outdoor environments.

If you need further information regarding the recommended usage of FM-SHIELD, contact your Fluidmesh Networks representative.

Relevant technical specifications for FM-SHIELD can be found in the *Fluidmesh FM-SHIELD installation manual*.

1.2. Radio-frequency transmission hazard



WARNING

The system shown in this manual is designed to be installed and operated in a way that avoids contact with the antennas by human beings. The legislation quoted in this section is designed to reduce overall exposure of human beings to RF radiation.

This section gives minimum separation distances between antennas and humans. It is strongly recommended that the system be installed in a location where these minimum separation distances can be maintained at all times.

United States: This system has been evaluated for RF exposure for humans, in accordance with FCC regulation CFR 47 Part 2.1091. To maintain compliance, the minimum separation distance from the antenna to general bystanders is 20cm/7.9in. (all FM Ponte kit and x200 radio transceivers), or 21cm/8.3 in. (all FM1300 Otto and x500 radio transceivers).

Canada: This system has been evaluated for RF exposure for humans, in accordance with ISED regulation RSS-102. To maintain compliance, the minimum separation distance from the antenna to general bystanders is 20cm/7.9in. for all Fluidmesh radio transceivers.

Europe / Australia / New Zealand: This system has been evaluated for RF exposure for humans, in accordance with standard EN 62232. To maintain compliance, the minimum separation distance from the antenna to general bystanders is 20cm/7.9in. for all Fluidmesh radio transceivers.

Before activating any device capable of transmitting RF signals, make sure that all persons and animals are protected from possible RF exposure.

Make sure that all RF feeds are securely connected to an appropriate antenna. Never activate any RF-capable device that is not connected to an antenna.

1.3. Optical radiation hazard



WARNING

If any Fluidmesh hardware device is equipped with one or more fiber-optic transceiver modules, it is classified as a Class 1 laser product. It may use laser-emitting components and/or very high-intensity light sources.

Do not look directly at the input/output end of the unit's **SFP** connector, or at the input/output end of any fiber-optic cable. Fiber-optic systems frequently use high-intensity light from laser or LED sources that may cause temporary or permanent blindness.

For additional guidance regarding the safe use of laser-based and LED-based fiber-optic technology, refer to *ANSI Z136.2 (Safe Use of Optical Fiber Communication Systems Utilizing Laser Diode and LED Sources)*.



IMPORTANT

The Cisco FM Monitor is not shipped from the factory with fiber-optic transceivers installed unless the fiber-optic transceivers were specified as part of the purchase order.

To gain fiber-optic capability, the unit must be equipped with a separate fiber-optic transceiver module.

1.4. Hot surfaces hazard

**WARNING**

The outer surfaces of transceiver and gateway unit enclosures may become hot during normal operation. During normal operation, do not touch or handle the unit enclosure without personal protective equipment.

2. Reporting mistakes and recommending improvements

You can help improve this manual.

If you find any mistakes, or if you know of a way to improve the procedures that are given, please let us know by E-mailing your suggestions to documentation@fluidmesh.com.

3. How to use this manual

The topics in this document are process-driven (as opposed to feature-based). In other words, the topics are structured in a way that takes you immediately to the relevant task, with no confusion.

To find a specific topic, browse this manual's table of contents. Alternatively, you can read the entire manual for training purposes.

4. What is FM Monitor?

The Cisco FM Monitor application is the second stage of Fluidmesh's device configuration and monitoring suite.

FM Monitor has been designed to complement and be used in conjunction with Fluidmesh's FM Racer (RADIO Configuration EnviRONment). The functionality of the two interfaces differs as follows:

- FM Racer is the cloud-based interface used to do online configuration of Fluidmesh radio transceiver devices and gateway devices.
- FM Monitor is a virtual-image-based diagnostic and analysis interface, with the virtual image supplied in Docker format. It is used to:
 - Monitor the real-time condition of Fluidmesh-based networks.
 - Generate statistics from network history.
 - Verify that device configuration settings are optimal for current network conditions.
 - Detect network-related events for diagnostic and repair purposes, and generate alerts if network-related faults arise.
 - Analyse network data, with the goal of increasing system uptime and maintaining optimum network performance.
 - Generate and back up network statistics databases for future reference.



IMPORTANT

FM Monitor cannot be used to configure Fluidmesh gateway and radio transceiver devices. Fluidmesh devices can be configured using any of the following methods:

- You can apply a pre-created, Cloud-based configuration, or do manual configuration of a device using the FM Racer interface. For instructions on how to use the FM Racer interface, refer to the *Cisco FM Racer Configuration Manual*.
- You can manually configure a device by using the device's built-in Configurator interface. For instructions on how to use the Configurator interface, refer to the Fluidmesh Installation and Configuration manual for the specific device.
- You can do command-line-based manual configuration of a device by using the device's built-in CLI interface. For instructions on how to use the CLI interface, refer to the *Fluidmesh Command-line interface user manual*.

5. Operational concepts

Within FM Monitor, working entities are based on a descending series of levels:

- The radio network currently being monitored by FM Monitor at any time is referred to as a *Project*.
- A Project can consist of a single *Section*, but usually consists of more than one Section. As a typical example, an open-cast mining site (the Project) may consist of various individual mining pits (Sections).



NOTE

In a Layer-3 network (in other words, a multiple-subnet scenario), a Section can be an individual subnet.

- A Section consists of a number of interlinked *Devices* (radio transceivers and, if needed, gateway devices).

6. Preparing to use FM Monitor

FM Monitor is compatible with all current and legacy Fluidmesh hardware devices.

Before attempting to install or use FM Monitor, make sure that all software and hardware prerequisites given in this section are met, or exceeded.

6.1. Software and hardware prerequisites

To monitor and analyse a Fluidmesh-based network using FM Monitor, all hardware devices, software applications and device firmware must conform to the standards in this section.

6.1.1. Fluidmesh device firmware

To be compatible with FM Monitor, the device firmware on your Fluidmesh devices must conform to the following versions:

- All Cisco FM3500 Endo and 4500 variants: version 9.1 or later.
- FM1000 Gateway and FM1000 gateway gateway devices: version 1.3.0 or later.
- All other Fluidmesh hardware devices will shortly feature FM Monitor support. Contact Fluidmesh Networks for more details.

To upgrade Fluidmesh device firmware, refer to the *Overwriting and upgrading the unit firmware* section of the Fluidmesh Installation and Configuration manual for the specific device.

6.1.2. FM Monitor server



IMPORTANT

It is recommended that the FM Monitor server be provided with a high-speed, high bandwidth internet connection for convenient installation of Docker and the FM Monitor image file.

If an internet connection is not available, the Docker application and FM Monitor image file can be installed manually. Refer to [“Installing and running the Docker container” \(page 17\)](#) for details.

When the FM Monitor Docker container has been successfully installed, the server can be isolated from the internet.

To run the Docker container for FM Monitor, you will need a dedicated server with the following minimum specifications:

Table 1. Minimum server specifications

Operating system	Windows 7 or later	Mac OS X 10.9.x or later	Linux (32-bit or 64-bit): <ul style="list-style-type: none"> • Ubuntu 14.04 or later • Debian 9 or later • OpenSuSE 14.2 or later • Fedora Linux 19 or later
Docker application	Yes	Yes	Yes
Base system	Virtual machine or bare metal	Virtual machine or bare metal	Virtual machine or bare metal
Processor	Intel Core i7 or Xeon (any frequency, mandatory minimum of four cores)	Intel Core i7 or Xeon (any frequency, mandatory minimum of four cores)	Intel Core i7 or Xeon (any frequency, mandatory minimum of four cores)
RAM	16 GB minimum	16 GB minimum	16 GB minimum
Hard disk	100 GB minimum* 1 TB or greater recommended	100 GB minimum* 1 TB or greater recommended	100 GB minimum* 1 TB or greater recommended
High-speed connection to local networks and radio transceiver units	Preferred	Preferred	Preferred
Screen resolution	1024x768 minimum	1024x768 minimum	1024x768 minimum

* Fluidmesh strongly recommends that you use a hard disk of at least 100 GB capacity. If a hard disk of less than 100 GB capacity must be used, adjust the maximum capacity available for statistics storage as shown in [“Allocating hard disk storage capacity to the FM Monitor statistics database” \(page 70\)](#).

6.1.3. Supported web browsers

To provide a suitable interface with which to operate FM Monitor, make sure a current version of any of the following web browsers is installed on your computer:

- Mozilla Firefox
- Google Chrome
- Microsoft Internet Explorer

- Microsoft Edge
- Apple Safari

If needed, upgrade your browser to its most current version.

6.1.4. Software plug-ins

Various plug-in software upgrades are available for Fluidmesh hardware devices. These plug-ins add functionality and enhance the performance of the unit.

The need for at least some additional software functionality may have been identified at the network design stage, or after initial device installation and configuration. In either case, installation and activation of the correct plug-ins is essential for correct device configuration.

For plug-in management procedures and a complete list of available software plug-ins for your Fluidmesh hardware unit, refer to the *Available plugins* section of the Fluidmesh Installation and Configuration manual for the specific device.

6.2. Using Docker

The Docker application is used to create container images.

A Docker image is a standard, self-contained unit of software that packages code and its dependencies in a manner that lets the application run quickly and reliably from one computing environment to another.

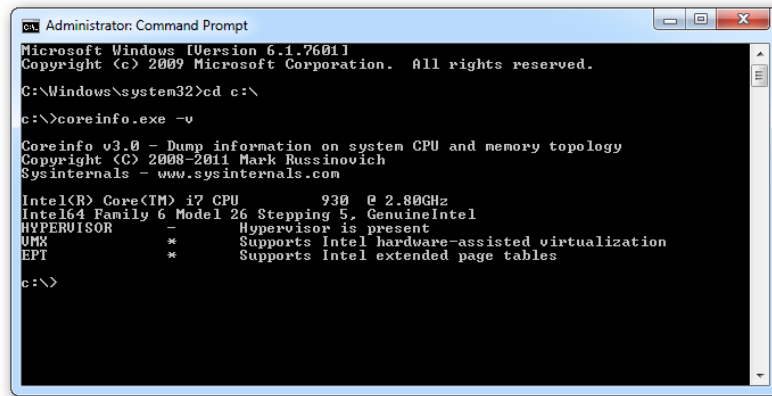
Docker images become containers at runtime when they run on the Docker engine.

6.2.1. Prerequisites to install Docker on the FM Monitor server

When Docker is installed on the FM Monitor server, it is essential to make sure that the server's CPU supports virtualization and second-level address translation (SLAT). Intel's version of SLAT is called EPT (Extended page tables).

Check that the server's processor or processors meets this requirement by doing the following steps:

1. Download and install the *infocore.exe* application by clicking [this link](#).
2. Unzip the downloaded program folder to the root of the server's C:\ drive.
3. Open the command prompt using Administrator privileges.
4. Enter the command **coreinfo.exe -v**.
 - If an Intel CPU supports SLAT, it will have an asterisk (*) in the EPT row (below).




- If your CPU does not support SLAT, it will have a dash (-) in the EPT row.

Alternatively, check whether or not your CPU supports SLAT by doing the steps below:

1. Click [this link](#).
2. Enter the name of your CPU, and check its specifications.

6.2.2. Installing and running the Docker container

To download the Docker application and FM Monitor image file from the Fluidmesh Partners Portal, and install and run FM Monitor on the designated FM Monitor server, do the procedures below.




IMPORTANT

Before doing the procedures in this section on a Microsoft operating system, make sure that Microsoft virtual machine capability (Hyper V) is running.

Alternatively, VMware is also supported.

Note that Oracle VM VirtualBox is not supported.



IMPORTANT

Do not install the Docker container on your local computer workstation. Docker must only be installed on the server assigned to host and run FM Monitor.

To view the minimum hardware specifications for the needed server, refer to [“Software and hardware prerequisites” \(page 14\)](#).

If the FM Monitor server does not have an internet connection, first do the following steps:

1. Navigate to the [Fluidmesh Partners Portal](#) from an internet-connected computer.
2. Click [this link](#) to open the Docker application download page.
3. Download the correct Docker application package.
4. Click [this link](#).
5. Click the *FIRMWARE AND TOOLS* folder.
6. Click the *TOOLS* folder.
7. Click the *FM Monitor* folder.
8. Download the FM Monitor image file (*fm-monitor-docker-v1.x.x.tar*).
9. Copy the Docker application package and FM Monitor image file to a suitable USB storage device.
10. Transfer the Docker application package and FM Monitor image file to the FM Monitor server.
11. Install the Docker application package and FM Monitor image file as shown in this section.

To install Docker and the FM Monitor image file on an internet-connected FM Monitor server, do the following procedures.

Make sure that the following firewall UDP ports are open to data traffic:

- *Port 6600* (passage of messages for association with the FM Monitor server).
- *Port 6610* (passage of periodic messages for latency and jitter calculation).

Download and install the Docker application by doing the following steps:

1. Click [this link](#) to open the Docker application download page.
2. Download the correct Docker application package.
3. Install the Docker application on the FM Monitor server.

Download the FM Monitor image file by doing the following steps:

1. Using the FM Monitor server, navigate to the [Fluidmesh Partners Portal](#).
2. Log in to the Partners Portal using your login credentials.
3. Click [this link](#).
4. Click the *FIRMWARE AND TOOLS* folder.
5. Click the *TOOLS* folder.
6. Click the *FM Monitor* folder.
7. Download the FM Monitor image file (*fm-monitor-docker-v1.x.x.tar*) to the FM Monitor server.

Load the FM Monitor image file to the FM Monitor server by doing the following steps:

1. Open a command-line window.
2. Enter the command **`docker load -i fm-monitor-docker-v1.x.x.tar`**.
3. Verify that the FM Monitor image file has been loaded by entering the command **`docker images`**.
 - A list of the Docker image files currently installed on the FM Monitor server will be shown.

Get the image ID value for the FM Monitor image file by doing the following steps:

1. Enter the command **`docker images`** in the open command-line window.
 - A list of the Docker image files currently installed on the FM Monitor server will be shown.
2. Search the *REPOSITORY* column of the Docker image file list for the *fm-monitor* image file.
3. Make a note of the *IMAGE ID* value of the FM Monitor Docker image.

Run the Docker container for the first time by doing the following steps:

1. Open a command-line window.
2. Enter the command **`docker run -d --name fm_monitor -p 8080:8080 -p 8443:8443 --restart always X`** where X is the *IMAGE ID* value of the FM Monitor Docker image.



IMPORTANT

By default, the port numbers the FM Monitor service runs on within the Docker container are:

- Port 8080 (http, no encryption)
- Port 8443 (https with SSL)

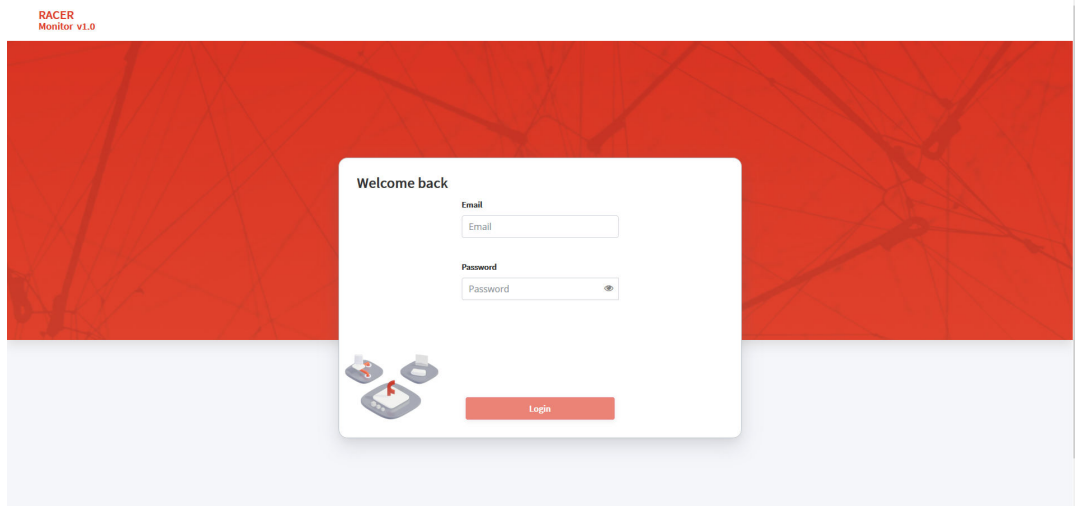
In some cases, it may not be possible to use the default host port numbers. Possible reasons may include company IT security policy settings, or the needed host port being assigned to another service.

In this case, modify the **`docker run`** command to include an unused host port. For example, a run command that specifies port 3000 would read **`docker run -d --name fm_monitor -p 3001:8080 -p 3000:8443 fm_monitor`**.

3. If you have modified the Docker run command to specify a different host port, you must specify the port number and SSL

settings used by FM Monitor. Refer to [“Adding a device manually” \(page 49\)](#) for details.

4. Launch your chosen web browser.
5. Navigate to the URL `https://X:Y` where *X* is the IP address of the FM Monitor server, and *Y* is the chosen host port number.
 - If the FM Monitor Docker container was successfully launched, the *Welcome back* page will be shown (below).



7. Activating your FM Monitor license

Before FM Monitor can be used to monitor your network, you must obtain and enter an activation license number from Fluidmesh.

The grade of activation license you install will determine the number of Fluidmesh radio transceiver devices you can monitor. Activation licenses are available that allow you to monitor the following numbers of network-linked devices:

- 5 devices
- 10 devices
- 25 devices
- 50 devices
- 100 devices
- 250 devices
- 500 devices
- 1 000 devices
- 2 500 devices
- 5 000 devices

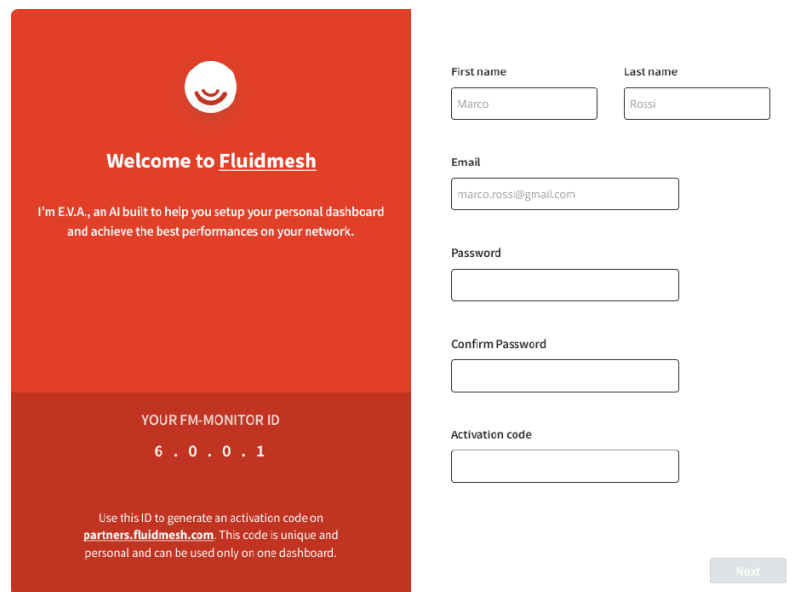
A Demo license option is also available. If activated, the Demo license stays active for three months.

FM Monitor license upgrades allow you to increase the number of devices that can be monitored under a single license, from the originally agreed number.


7.1. License activation

Get an FM Monitor activation license by doing the following steps:

1. Install and run the Docker container for FM Monitor as shown in [“Installing and running the Docker container” \(page 17\)](#).
 - When the FM Monitor container is run for the first time, you will see the **Welcome to Fluidmesh** screen (below).



- Make a note of the unique FM Monitor identification number of the installation. The number is always in the format **6.a.b.c** (lower left corner, above).
2. Contact your Fluidmesh Networks representative to purchase a FM Monitor license code.

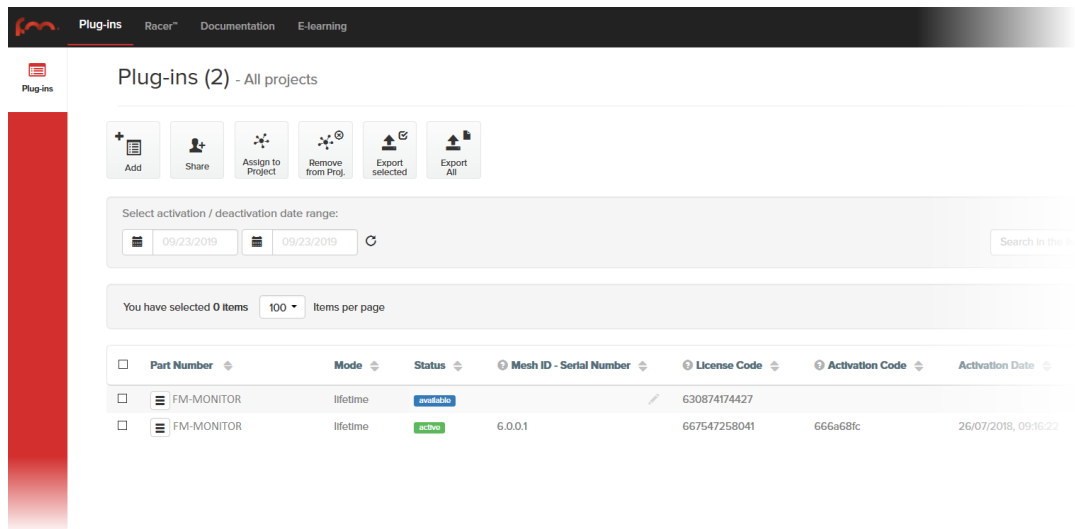


IMPORTANT

When contacting your Fluidmesh Networks representative, be sure to inform them of the exact number of radio transceiver units in your network, and whether or not the number of units is likely to increase in the near future.

You can get this information from the network design engineer, or from the system design documentation.

- You will be issued a *License code* suitable for the number of transceiver units in your network.
3. Log on to the [Fluidmesh Partner Portal](#).
 4. Click the **Plug-ins** link.
 - The *Plug-ins* page will be shown (below).



- Depending on your purchase, one or more FM Monitor licenses will be shown in the **Part Number** column (above).
 - First-run FM Monitor licenses have a format of *FM Monitor-X* where *X* is the maximum number of devices allowed as part of the network.
5. Enter the FM Monitor identification number for the current FM Monitor installation in the correct **Mesh ID - Serial Number** field of the *Plug-ins* page.
 6. Click anywhere outside the plug-in listings.
 - The **Activate** and **Deactivate** buttons will be shown.
 7. Click the **Activate** button.
 - The **Status** listing for the FM Monitor installation should change from **available** to **active**.
 - The license activation code should appear in the relevant **Activation Code** cell (above).
 8. Enter your first name, last name, E-mail address and FM Monitor password in the relevant entry fields of the **Welcome to Fluidmesh** screen.
 9. Enter the activation code seen in the relevant **Activation Code** cell into the **Activation code** cell of the **Welcome to Fluidmesh** screen (a typical example is shown below).

- If the activation code you have entered is valid, the **Next** button will become active.
10. Click the **Next** button.
- The *Add new device* screen will be shown (below).

11. Enter the IP address of the server on which your network's FM Monitor installation resides, in the *Server IP Address* field.

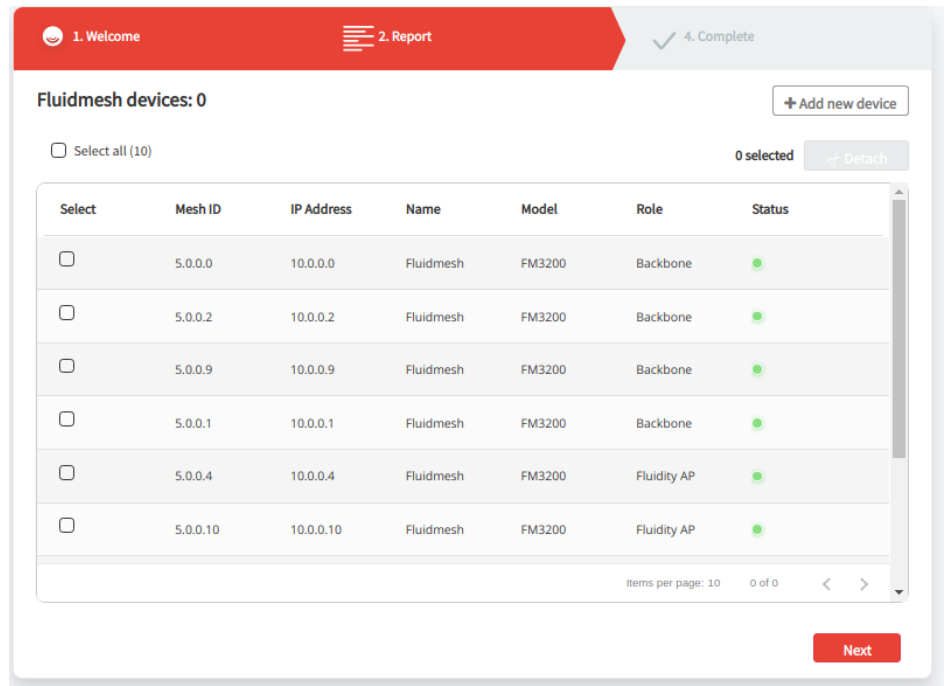


IMPORTANT
The FM Monitor installation servicing your network must be on the physical network server.

12. Enter the IP addresses of all Fluidmesh devices in your network in the *IP addresses* field.
13. Click the **Associate** button.
- Your network server and Fluidmesh devices will be associated with the FM Monitor installation.

14. Click the **Next** button.

- The Fluidmesh devices screen will be shown (below).



15. Click the **Next** button.

16. If you want to add more radio transceivers to the network, use the *Add new device* dialog as shown in [“First use, and adding network devices”](#) (page 30).

7.2. Transferring a current license to another FM Monitor installation

A FM Monitor license code that is currently in use can be deactivated. This allows the license code to be used in a different FM Monitor installation on the same server or on a different server, or transferred to another Fluidmesh user.

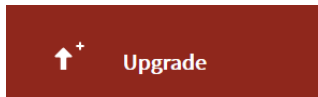
To deactivate an activated FM Monitor license for use with another FM Monitor installation, do the following steps:

1. Click the Settings button (below).

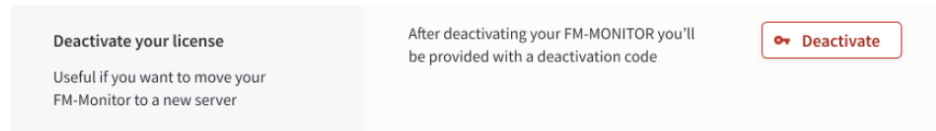


- The FM Monitor settings sections will be shown.

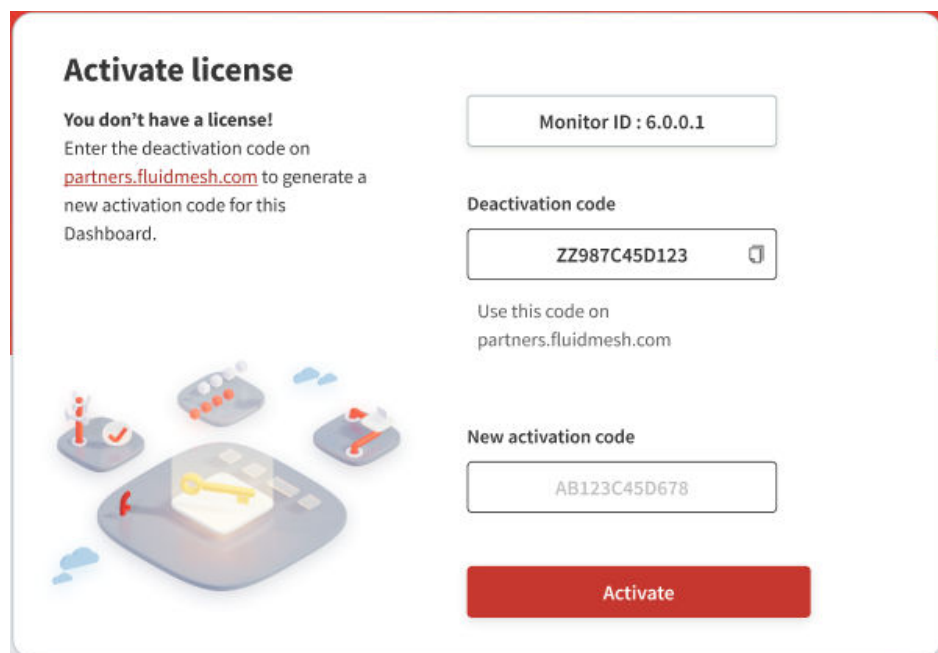
2. Click the **Upgrade** button (below).



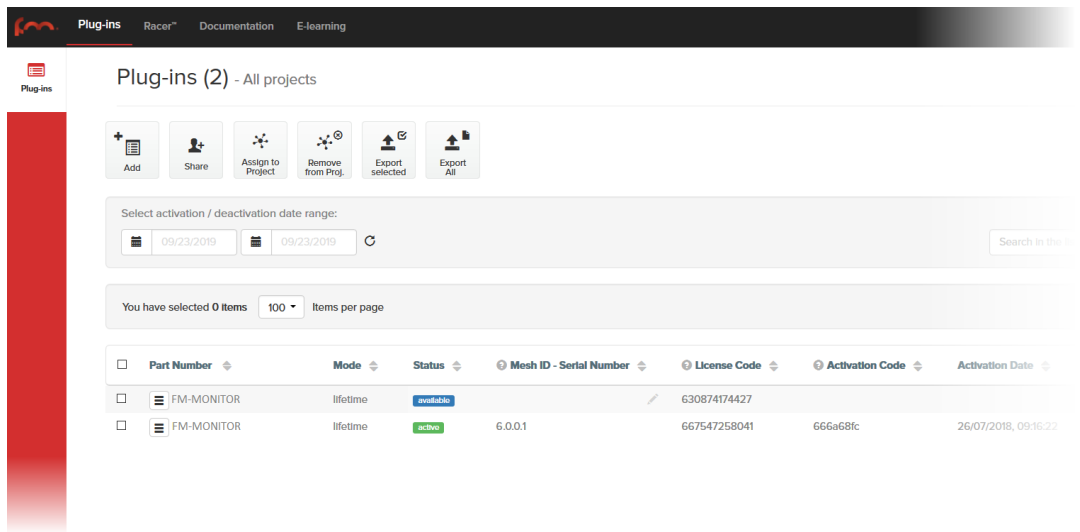
- The Upgrade settings page will be shown.
3. Click the red **Deactivate** button in the *Deactivate your license* section (below).



- FM Monitor will ask for confirmation that you want to deactivate the license.
4. Confirm the deactivation.
 - The license deactivation code will be shown in the *Activate license* dialogue (below).



5. Make a note of the license deactivation code.
6. Log on to the [Fluidmesh Partner Portal](#).
7. Click the **Plug-ins** link.
 - The Plug-ins web page will be shown (a typical view is shown below).



8. Check the selection check-box to the left of the relevant FM Monitor license listing.
 - The **Activate** and **Deactivate** buttons will be shown at the bottom of the web page.
9. Enter the Deactivation code for the plug-in in the *Deactivation Code* field for the relevant FM Monitor license listing.
10. Click the **Deactivate** button at the bottom of the web page.
 - The **PLUG-IN DEACTIVATION** dialog will be shown.
11. Click the **Deactivate** button.
 - The FM Monitor license will be deactivated.
 - The deactivation code will be shown in the **Deactivation Code** column of the relevant FM Monitor license listing.



IMPORTANT

If, for any reason, it is not possible to retrieve the deactivation code for the license (for example, if the FM Monitor server's boot sequence cannot be completed, or if the server is damaged and cannot be powered ON), send an E-mail describing the problem to support@fluidmesh.com.

If you need to re-activate a de-activated FM Monitor license, refer to *Reactivating a deactivated FM Monitor license* below.

7.3. Reactivating a deactivated FM Monitor license

To use a FM Monitor license deactivation code to generate a new license activation code, do the following steps:

1. Log on to the [Fluidmesh Partner Portal](#).
2. Click the **Plug-ins** link.
 - The Plug-ins web page will be shown.
3. Check the selection check-box to the left of the relevant plug-in listing.
 - The **Activate** and **Deactivate** buttons will be shown at the bottom of the web page.
4. The unique FM Monitor identification number of the installation is always in the format **6.a.b.c**. Enter the identification number of the new installation in the **Mesh ID - Serial Number** field.
5. Complete the license code activation process as shown in [“License activation”](#) (page 21).

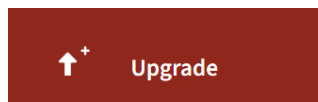
7.4. Viewing the current active license type and ID number

To view the license type and ID number of your active FM Monitor installation, do the steps that follow:

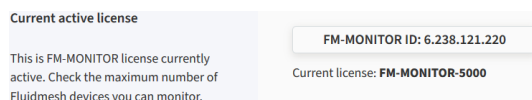
1. Log into FM Monitor as shown in [“Logging in to FM Monitor”](#) (page 34).
2. Click the Settings button (below).



- The FM Monitor settings sections will be shown.
3. Click the **Upgrade** button (below).



- The license-upgrade settings page will be shown.
4. The license type and ID number of your active FM Monitor installation will be shown in the **Current active license** section (a typical example is shown below):



7.5. Upgrading your FM Monitor license

To upgrade your active FM Monitor license to a level that allows more devices to be administered, do the steps that follow:

1. Review [“Activating your FM Monitor license” \(page 21\)](#) to decide what license upgrade is needed.
2. Contact your Fluidmesh Networks representative to purchase a license code for the upgraded FM Monitor license.



IMPORTANT

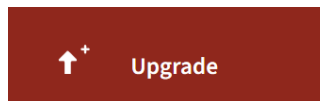
When contacting your Fluidmesh Networks representative, be sure to inform them of the exact number of radio transceiver units in your network, and whether or not the number of units is likely to increase in the near future.

You can usually get this information from the network design engineer, or from the system design documentation.

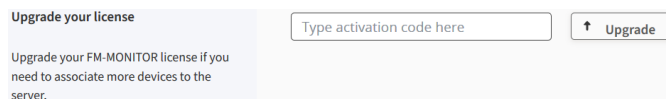
- You will be issued a License code suitable for the number of transceiver units in your network.
3. Log into FM Monitor as shown in [“Logging in to FM Monitor” \(page 34\)](#).
 4. Click the Settings button (below).



- The FM Monitor settings sections will be shown.
5. Click the Upgrade button (below).



- The license-upgrade settings page will be shown.
6. Find the *Upgrade your license* section (below):



7. Enter the upgrade activation code in the **Type activation code here** field.
8. Click the **Upgrade** button.
 - The current license will be upgraded.

8. First use, and adding network devices



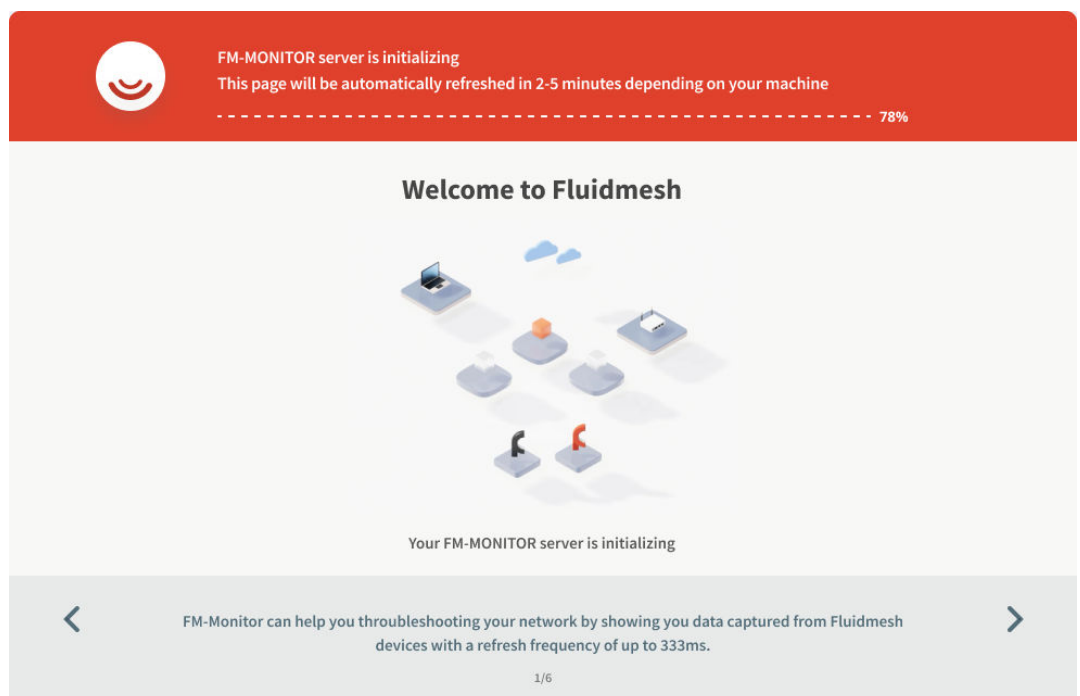
IMPORTANT

A login password for your FM Monitor interface will have been forwarded to you by Fluidmesh Support. You will need this password to access FM Monitor.

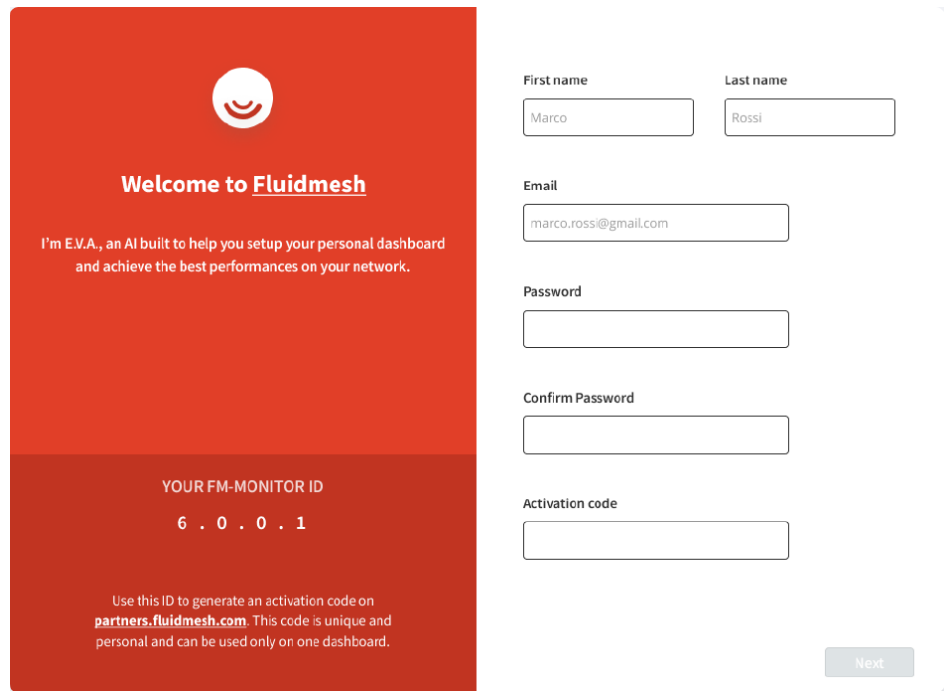
To use FM Monitor to monitor and analyse a Fluidmesh-based network, you must connect the FM Monitor interface to your Fluidmesh hardware devices. The first time you log on, FM Monitor will use a wizard to guide you through this process.

To use FM Monitor for the first time by adding previously networked Fluidmesh devices, do the following steps:

1. Launch your chosen web browser.
2. Enter the IP address and port number of the FM Monitor server in the browser's URL bar. The address must be in the following format: `https://[IP address]:[port number]`.
3. Press *Enter*.
 - If you are running FM Monitor for the first time, the server initialization page will be shown (below).

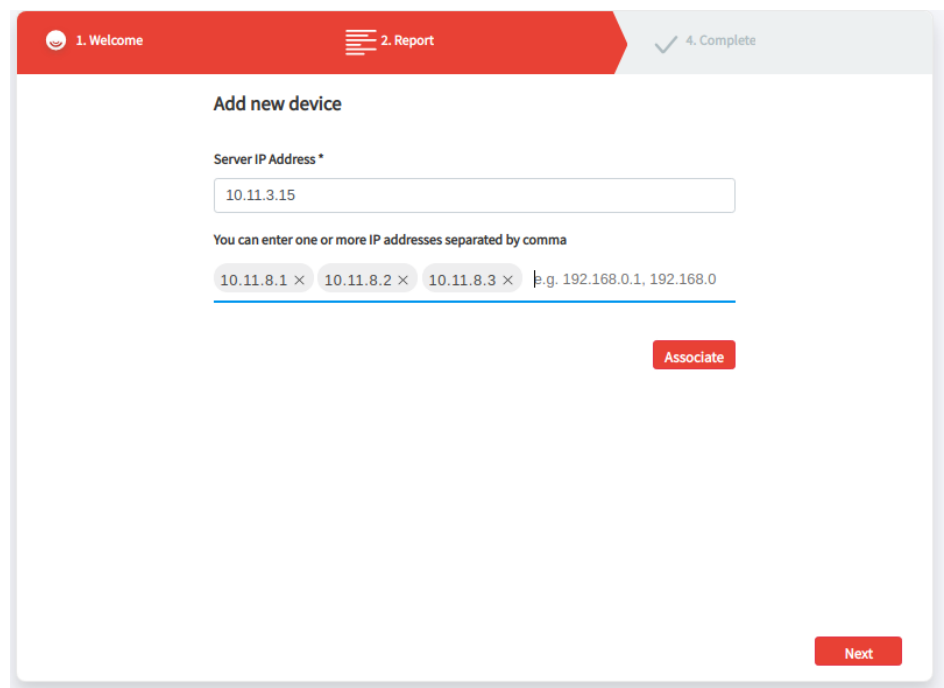


- If the server initialization was successful, the **Welcome to Fluidmesh** page will be shown (below).



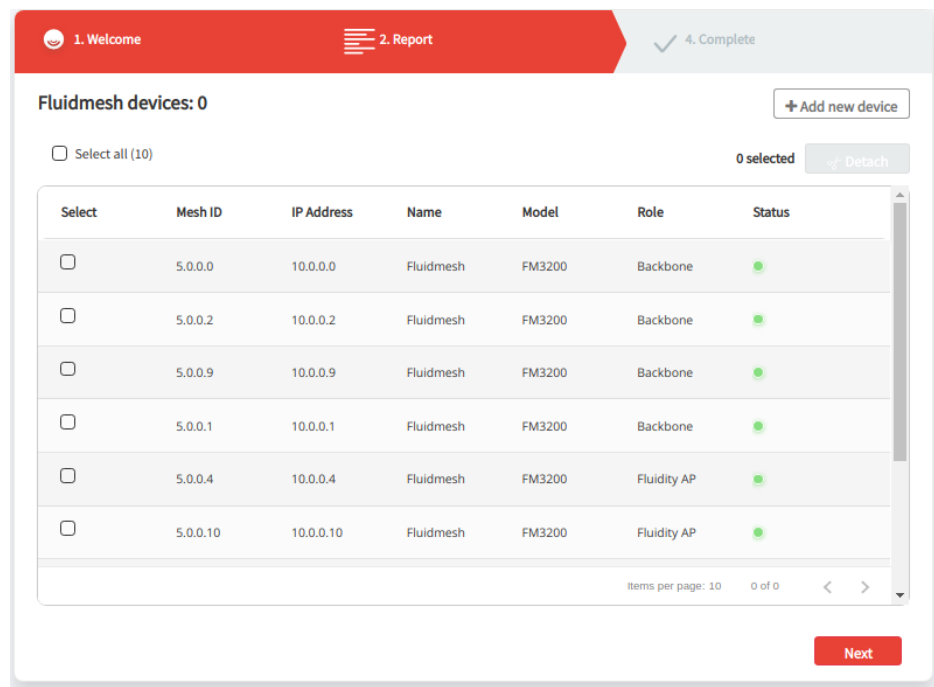
The image shows a registration form for Fluidmesh. On the left is a red welcome card with the Fluidmesh logo and text: "Welcome to Fluidmesh", "I'm E.V.A., an AI built to help you setup your personal dashboard and achieve the best performances on your network.", "YOUR FM-MONITOR ID: 6 . 0 . 0 . 1", and instructions to use this ID to generate an activation code on partners.fluidmesh.com. On the right is a registration form with fields for First name (Marco), Last name (Rossi), Email (marco.rossi@gmail.com), Password, Confirm Password, and Activation code. A "Next" button is at the bottom right.

4. Enter your first name, last name, E-mail address and login password in the correct fields.
5. Get the FM Monitor activation code as shown in [“Activating your FM Monitor license”](#) (page 21).
6. Click the **Next** button.
 - The *Add new device* screen will be shown (below).

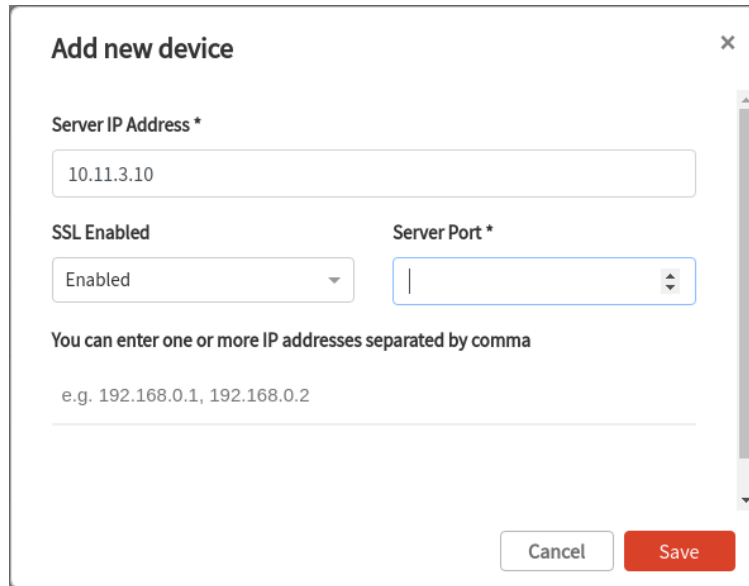


The image shows the "Add new device" screen. It has a progress bar at the top with steps: 1. Welcome, 2. Report, and 4. Complete. The main content area is titled "Add new device" and contains a "Server IP Address *" field with the value "10.11.3.15". Below it, a note says "You can enter one or more IP addresses separated by comma". There is a text input field containing "10.11.8.1 x 10.11.8.2 x 10.11.8.3 x | e.g. 192.168.0.1, 192.168.0". Below this is an "Associate" button. A "Next" button is at the bottom right.

7. Enter the IP address of the server on which your network's FM Monitor installation resides, in the *Server IP Address* field.
8. Enter the IP addresses of all Fluidmesh devices in your network in the *IP addresses* field.
9. Click the **Associate** button.
 - Your network server and Fluidmesh devices will be associated with the FM Monitor interface.
 - The Fluidmesh devices screen will be shown (below).



10. Click the **Next** button.
11. Make sure that all needed Fluidmesh devices are listed on the screen. If any additional devices must be registered, register the devices by doing the following steps:
 - a. Click the **+Add new device** button.
 - The *Add new device* dialog will be shown (below).

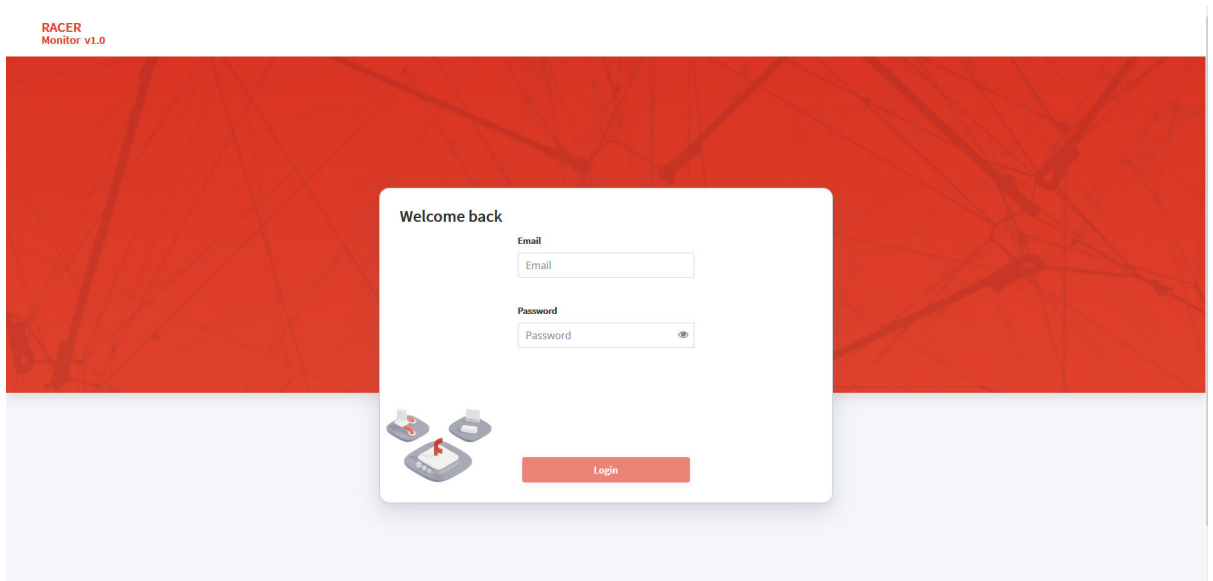


- b. Enter the IP address of the main server for your Fluidmesh-based network in the *Server IP Address* field.
 - c. Enter the IP addresses of all additional Fluidmesh devices in the IP addresses field. You can do this using any of three methods:
 - Enter a single device IP address (single devices only).
 - Copy and paste multiple IP addresses, with each IP address separated by a comma (Comma-separated values format).
 - Copy and paste multiple IP addresses from a column within a Microsoft Excel spreadsheet file.
 - d. Click the **Save** button.
 - The additional Fluidmesh device will be associated with the FM Monitor interface.
 - e. FM Monitor will analyse your network.
 - During the analysis, you will be informed if any problems are found.
 - When network analysis is complete, the *Complete* screen will be shown.
12. Click the **Done** button to complete your network setup.

9. Logging in to FM Monitor

To log in to FM Monitor after network devices have been added, do the following steps:

1. Launch your chosen web browser.
2. Enter the IP address and port number of the computer on which the FM Monitor image file is installed in the URL bar, and press Enter. The address must be in the following format: *https://[IP address]:[host port number]*
 - The *Welcome back* page will be shown (below).



3. Enter your E-mail address and login password in the correct fields.
4. Click the **Login** button.
 - The FM Monitor landing page will be shown.

10. Monitoring a network

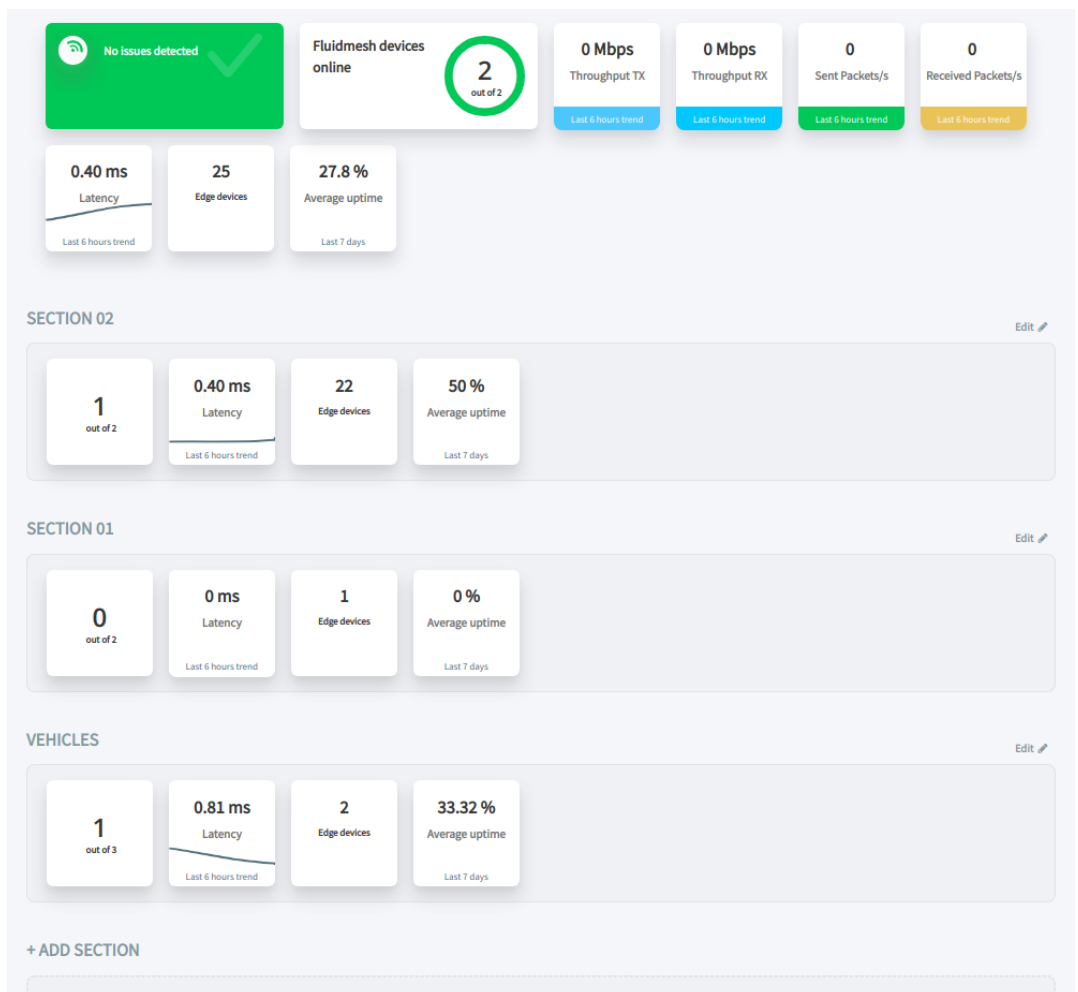
10.1. Viewing a real-time summary of network statistics

To view a real-time summary of performance statistics for the current network, do the following steps:


1. Log into FM Monitor as shown in section “[Logging in to FM Monitor](#)” (page 34).
2. Click the **Dashboard** button (below).



- The network statistics dashboard will be shown (a typical view is shown below).



3. The network statistics dashboard is divided up as follows:
 - The *network* row contains statistics blocks. These blocks show information regarding the performance of the *combined network*.
 - Each row following the *network* row contains statistics blocks with information regarding the performance of a *specified section* of the network.
 - If a colored border surrounds a section row, the border indicates the performance status of the section as follows:
 - *Orange border*: Performance of the section is below optimum standards.
 - *Red border*: The section has a performance-related fault that needs immediate investigation.
 - The **+ADD SECTION** link allows you to add new sections to the overall network as needed. To add a new section to an existing network, refer to [“Adding a new section to the current project” \(page 40\)](#).
4. The FM Monitor *Dashboard* view contains one or more horizontal divisions for each section of the network. Each section division contains a number of blocks.



NOTE
Not all blocks may be shown for all network sections.

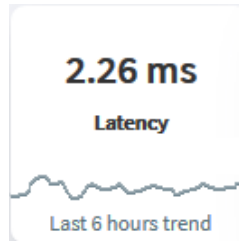
If shown in the *network* section, the blocks show operating parameters for radio units comprising the network. If shown in any other section, the blocks show operating parameters only for radio units comprising the relevant section.

The blocks contain the following information:

- The first block shows the number of radio units currently connected to FM Monitor, in relation to the total number of radio units in the network, or the relevant section (below).



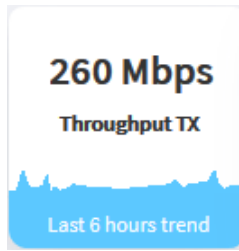
- One block shows the trend in radio-unit latency values across the network or network section during the last six hours. The lower part of the block contains a mini-graph that shows variations in latency during this period (below).



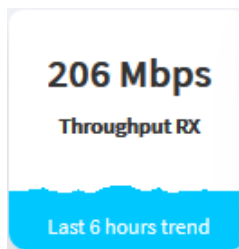
NOTE

Typical examples of average latency calculation are as follows:

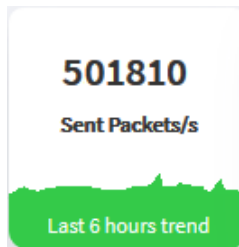
1. In a network made up of three radio units, units 5.0.0.1 and 5.0.0.3 are part of Section A, and unit 5.0.0.2 is a stand-alone unit.
 2. Current average latency values per unit are as follows:
 - Unit 1 (5.0.0.1): 0.4 ms.
 - Unit 2 (5.0.0.2): 0.1 ms
 - Unit 3 (5.0.0.3): 1.6 ms
 3. The calculation for current average section latency (in this case, of Section A) is *(Sum of latency of all individual radio units in the section) ÷ number of individual radio units in the section)*.
 - A typical example of this calculation might be: $(0.4ms + 1.6ms) \div 2 \text{ units} = 1 \text{ ms section latency}$.
 4. The calculation for current average network latency is: *(Sum of latency of all individual radio units in the network ÷ number of individual radio units in the network)*.
 - A typical example of this calculation might be: $(0.4ms + 0.1ms + 1.6ms) \div 3 \text{ units} = 0.7 \text{ ms network latency}$.
- One block shows the aggregate network throughput transmitted by all edge devices in the network during the last six hours. The lower part of the block contains a mini-graph showing variations in throughput during this period (below).



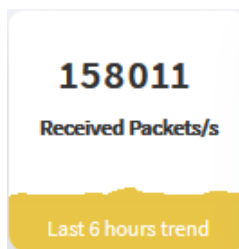
- One block shows the aggregate network throughput received by all edge devices in the network during the last six hours. The lower part of the block contains a mini-graph showing variations in throughput during this period (below).



- One block shows the aggregate number of data packets sent by all radio units in the network during the last six hours. The lower part of the block contains a mini-graph showing variations in packet rate during this period (below).



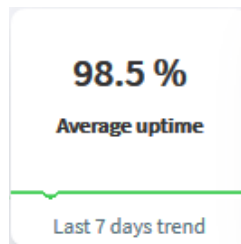
- One block shows the aggregate number of data packets received by all radio units in the network during the last six hours. The lower part of the block contains a mini-graph showing variations in packet rate during this period (below).



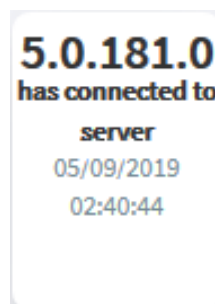
- One block shows the current number of edge devices (in other words, the number of non-Fluidmesh devices connected to the wired backbone, such as computers or IP cameras) in the relevant network or section (below).



- One block shows the average network or section uptime value (below). The average uptime value is calculated as the combined percentage of time for which each radio device in the network or section has been connected to FM Monitor, over the previous seven days.



- One block shows the current device connection status of the last radio unit in the network or section to disconnect from, or reconnect to the FM Monitor server (below). The date and time on which the connection or disconnection happened is also listed.



11. Working with project sections

Within FM Monitor, a *Project* usually consists of more than one *Section*. A *Section* consists of a number of interlinked hardware *Devices*.

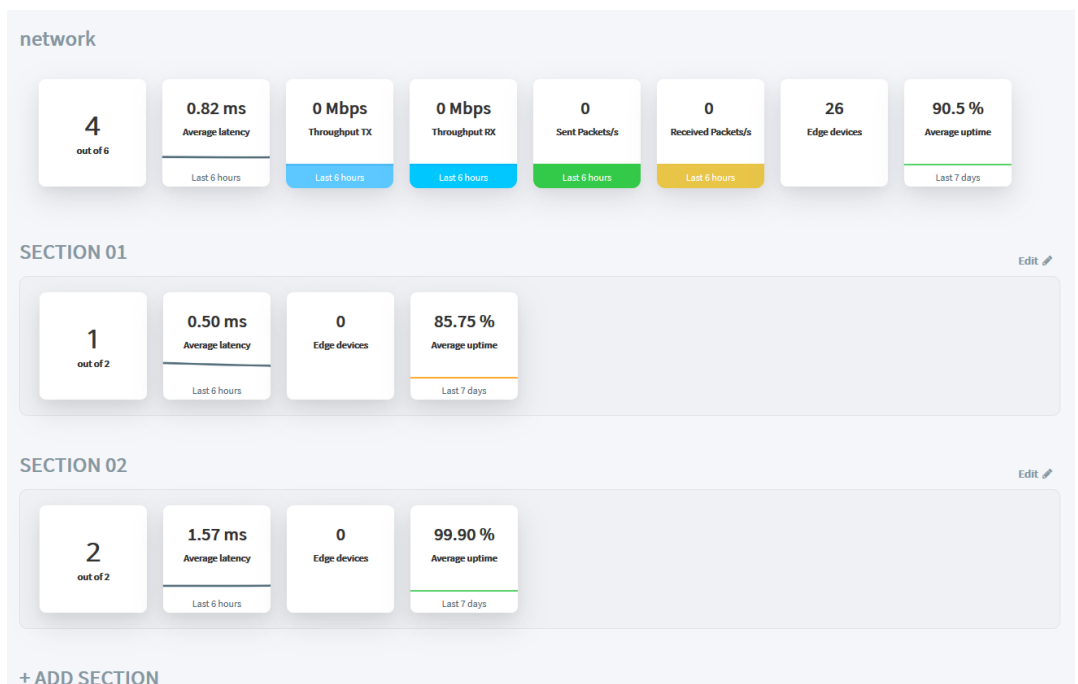
11.1. Adding a new section to the current project

To add a new section to the current project, do the following steps:


1. Log into FM Monitor as shown in “[Logging in to FM Monitor](#)” (page 34).
2. Click the **Dashboard** button (below).



- The list of Sections making up the current Project will be shown (a typical view is shown below).



3. Click the **+ADD SECTION** link at the bottom of the view.
 - A new Section wizard will be shown (below).

Type section name 

Find radio Show selected devices only Select All

<input type="checkbox"/> 5.0.161.165 Fluidmesh2 10.11.8.2 backbone	<input type="checkbox"/> 5.0.180.25 Fluidmesh 10.11.8.1 backbone	<input type="checkbox"/> 5.0.181.0 Truck02 10.11.8.6 fluidity_mob auto-46336	<input type="checkbox"/> 5.0.210.100 Fluidmesh 10.11.8.3 fluidity_ap
---	---	---	---

0 selected units

Confirm Cancel

4. Enter the name of the new section in the *Type section name* field.

Within FM Monitor, *uncategorized* radio devices are radio devices that are part of the current Project but have not yet been assigned to a specific Section. If the current Project contains uncategorized radio devices, these will be shown in the lower section of the new Section wizard (above).

Add radio devices to the new section using either of the methods below.

To add *uncategorized* devices to the new section from the uncategorized device list, do the following steps:

1. Choose specific devices from the uncategorized list by checking check-boxes belonging to the chosen radio device or devices (below). Alternatively, select all uncategorized devices by checking the *Select All* check-box.

<input type="checkbox"/> 5.0.161.165 Fluidmesh2 10.11.8.2 backbone	<input checked="" type="checkbox"/> 5.0.180.25 Fluidmesh 10.11.8.1 backbone	<input type="checkbox"/> 5.0.181.0 Truck02 10.11.8.6 fluidity_mob auto-46336
---	--	---

2. If you have selected specific devices from the uncategorized list, and you want to de-clutter the list by removing irrelevant devices, check the *Show selected devices only* check-box.
 - If the *Show selected devices only* check-box is checked, only radio devices whose check-boxes have been checked will be shown in the uncategorized list.
3. Click the **Confirm** button to add the chosen devices. Alternatively, click the *Cancel* button to end the addition of new devices.
 - If the **Confirm** button was clicked, the chosen devices will be added to the project.

To search for and add uncategorized radio devices to the new section, do the following steps:

1. The *Find radio* control is located in the upper left part of the Section wizard. Click the *Search by* field.

- The *Search by* field will change to a blinking cursor.
2. Search for the Fluidmesh radio unit you want by entering part or all of one of the following identifiers:
 - The unit's Mesh ID number.
 - The unit's user-assigned device name label.
 - The unit's IP address.
 - If one or more uncategorized radio devices exist whose identifiers match the entered information, FM Monitor will list the devices in separate blocks, below the *Find radio* control.
 3. Check the check-boxes in the blocks belonging to the chosen radio device or devices.
 4. Click the **Confirm** button to add the chosen devices. Alternatively, click the **Cancel** button to end the addition of new devices.
 - If the **Confirm** button was clicked, the chosen devices will be added to the section.

12. Working with devices

12.1. Viewing a list of devices currently associated with the FM Monitor server

To view a list of Fluidmesh radio transceiver devices that are part of the current network, do the following steps:

1. Log into FM Monitor as shown in section [“Logging in to FM Monitor”](#) (page 34)
2. Click the **Table View** button (below).



Table View

- The current Fluidmesh radio device list will be shown (a typical view is shown below).

Fluidmesh devices

Show me: **All (3)** SECTION 02 (1) SECTION 01 (0) VEHICLES (2) Show only assets with issues

Find radio: Search by Mesh ID, label or IP address

SECTION 02 (1)									
Status	Label	Type	IP Address	Mesh ID	Frequency	TX Power	Ch. width	Firmware	More
	Backbone-ME	Backbone	10.11.8.2	5.0.161.165	5800 MHz	24 dBm	40 MHz	9.1.04e17cd.170	...

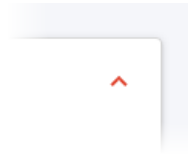
Items per page: 10 1 - 1 of 1 < >

VEHICLES (2)									
Status	Label	Type	IP Address	Mesh ID	Frequency	TX Power	Ch. width	Firmware	More
	Truck01	Fluidity Vehicle	10.11.8.5	5.0.217.122 M	5200 MHz	25 dBm	40 MHz	9.1.04e17cd.170	...
	Truck03	Fluidity Vehicle	10.11.8.7	5.0.180.16 M	5200 MHz	max dBm	40 MHz	9.1.04e17cd.170	...

Items per page: 10 1 - 2 of 2 < >

Depending on the size and composition of your network, the Fluidmesh Radios list may be divided into blocks as follows:

- All radio devices that have not yet been assigned to specific network sections will be shown in the *Uncategorized* block. To add uncategorized devices to specific network sections, refer to [“Adding a new section to the current project”](#) (page 40).
- Radio devices that have been assigned to specific network sections will be shown in the relevant section block. To minimize or maximize a section block for easier viewing, click the arrow in the upper right corner of the block (a *minimize* arrow is shown below).



The following information is shown for each radio device:

- *Status* (icon color): Icon colors are as follows:
 - Green (below): The device is online and connected to FM Monitor. All performance levels are acceptable.



- Gray (below): The device is disconnected from FM Monitor.



- Orange (below): The device is online and connected to FM Monitor, but has one or more problems causing it to perform at a lower-than-optimal level.



- Red (below): The device is online and connected to FM Monitor, but has one or more problems causing unacceptably low performance.





IMPORTANT

If a radio device icon is orange or red, the device may have one or more of the following problems:

- Unusually high packet error rate.
- Unusually high link error rate.
- Unusually low received-signal strength.
- Unusually high traffic latency.

To inspect the device's performance statistics in real time, refer to [“Viewing a real-time summary of network statistics”](#) (page 35).

- *Status* (icon designation): Icon designations are as follows (above):
 - *ME*: The device has been configured as a mesh-end.
 - *MP*: The device has been configured as a mesh-point.
 - *BR*: The device has been configured as a wireless bridge device.
- *Label*: This is the user-assigned device name.



NOTE

You cannot change the device name using FM Monitor. If needed, the device name can be changed using any of the following interfaces:

- The FM Racer configuration interface.
- The device's offline Configurator interface.
- The device's command-line interface (CLI).

- *Type*: Type designations are as follows:
 - *Backbone*: The radio unit is part of a wired LAN-based infrastructure.
 - *Fluidity AP*: The radio unit is part of a Fluidity network, and installed in a moving vehicle.
 - *Fluidity Vehicle*: The radio unit is part of a Fluidity network, and installed as part of a fixed infrastructure.
- *Mesh ID*: Every Fluidmesh hardware device has a unique, factory-set mesh identification number that takes the form 5.a.b.c.
 - If an **M** is seen next to the Mesh ID number, the unit is set as the principal unit of an vehicle-mounted network. If a unit is set as a principal, it dictates the operating frequency of the mesh cluster of which it is a principal unit.
 - If an **S** is seen next to the Mesh ID number, the unit is set as a Subordinate unit (a subordinate unit within a vehicle-mounted network). If a unit is set as a Subordinate and its FluidMAX™ Autoscan feature is enabled, the unit will scan

the spectrum of available frequencies for a principal unit that shares its Cluster ID tag, and set itself to that principal unit's operating frequency.

- *Frequency*: This value is the radio device's current operating frequency.
- *TX Power*: This value is the radio device's user-configured maximum transmission power level.
- *Ch. width*: This value is the radio device's operating-channel width.
- *Firmware*: This value is the release number of the firmware currently installed on the radio device.

12.1.1. Viewing uplink and downlink information for a device

To view radio uplink and downlink information for a radio device, click the **More**-column ... button (below) for the device listing.

More

...

- The *Links (realtime)* display for the radio device will be shown. A typical example is shown below.

The screenshot shows a network management interface for a device named 'TESTBED A'. The main table lists device details:

Status	Label	Type	IP Address	Mesh ID	Frequency	TX Power	Ch. width	Firmware	More
ME	AP-01	Fluidity AP	10.11.8.8	5.0.149.138	5400 MHz	max dBm	40 MHz	9.1.9edfe30.615	...

Below the table, there is a 'Links (realtime)' section with the following data:

Label / Mesh ID	Type	Total Throughput	Throughput	M.C.S. (Rate)	L.F.R.	P.E.R.	RSI	
VehicleTest	Vehicle	0.04 Mbps	0.03 Mbps	4/1 SGI 40 MHz (90 Mbps)	0 %	0 %	-79 dBm	DOWNLINK
5.0.180.17			0.01 Mbps	4/2 SGI 40 MHz (180 Mbps)	0 %	0 %	-65 dBm	UPLINK

At the bottom, there is a 'Channel utilisation breakdown' bar chart showing 5.0.180.17 at 0.06% and 0.50% utilisation, with 99.43% free. Below that are 'Installed plugins (7)' and 'Attached devices (12)' lists.

The following information is shown for each radio device:

- *Label / Mesh ID*: The user-assigned device name and factory-set mesh identification number of the radio device.
- *Type*: Type designations are as follows:
 - *Backbone*: The radio unit is part of a wired LAN-based infrastructure.

- *Fluidity AP*: The radio unit is part of a Fluidity network, and installed in a moving vehicle.
- *Fluidity Vehicle*: The radio unit is part of a Fluidity network, and installed as part of a fixed infrastructure.
- *Total Throughput*: This value shows the combined throughput rate per second for the uplink and downlink.
- *Throughput*: The upper value shows the throughput rate per second for the downlink. The lower value shows the throughput rate per second for the uplink.
- *M.C.S. (Rate)*: This value shows the modulation and coding schema used by the relevant uplink or downlink.
- *L.E.R.*: This value shows the link error rate for the relevant uplink or downlink.
- *P.E.R.*: This value shows the packet error rate for the relevant uplink or downlink.
- *RSSI*: This value shows the received signal strength indication for the relevant uplink or downlink.
- *Channel utilisation breakdown*:
 - The total width of the bar represents the total bandwidth of the channel carrying the uplink and downlink.
 - The solid blue portion represents the portion of bandwidth currently being used to transmit data.
 - The black-and-blue striped portion represents the portion of bandwidth currently being used to receive data.
 - The gray portion represents the portion of bandwidth that is currently un-utilized.
 - Numerical percentage readouts are also given for transmission, reception and non-utilization.
- *Installed plugins*: This is a list of the Fluidmesh software plug-ins currently installed on the radio unit.
- *Attached devices*: This is a list of edge devices (in other words, non-Fluidmesh devices connected to the wired backbone, such as computers or IP cameras) that form part of the section that includes the radio unit.
- *Latency*: This value shows the current amount of network latency (in other words, the delay period between data transmission by the FM Monitor server, and reception of a reply by a radio device). The latency value is an estimate, calculated as half of the round-trip time of the relevant packets.
- *Jitter*: This value shows the current amount of network jitter (in other words, the deviation from true periodicity of periodic data signals, in relation to a reference clock signal).

12.1.2. Viewing devices that have problems

You can choose to view only radio devices that currently have technical or configuration problems.

To view only a list of radio devices that currently have problems, do the following steps:

1. Log into FM Monitor as shown in section [“Logging in to FM Monitor” \(page 34\)](#).
2. Click the **Table View** button (below).



Table View

- The current Fluidmesh radio device list will be shown.
3. Check the *Show only assets with issues* check-box (below).

SECTION 02 (2)

Show only assets with issues

- The Table View will be re-loaded.
- The *Radios* list will show only radio units that have technical and/or configuration problems.

12.1.3. Locating Fluidmesh devices to be viewed

To only view information for a specific Fluidmesh radio unit, do the following steps:

1. Log into FM Monitor as shown in section [“Logging in to FM Monitor” \(page 34\)](#).
2. Click the **Table View** button (below).



Table View

- The current Fluidmesh radio device list will be shown.
3. The *Find radio* control is located in the upper left part of the interface (below). Click the *Search by* field.



- The *Search by* field will change to a blinking cursor.
4. Search for the Fluidmesh radio unit you want by entering part or all of one of the following identifiers:
 - The unit’s Mesh ID number.
 - The unit’s user-assigned device name label.
 - The unit’s IP address.
 5. If one or more radio devices exist whose identifiers match the entered information, FM Monitor will list the devices below the *Find radio* control.

12.2. Associating devices with, and disassociating devices from the current project

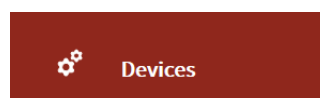
12.2.1. Adding a device manually

To add one or more Fluidmesh radio units to the current project by completing the *Add new device* wizard, do the following steps:

1. Log into FM Monitor as shown in section “[Logging in to FM Monitor](#)” (page 34).
2. Click the Settings button (below).



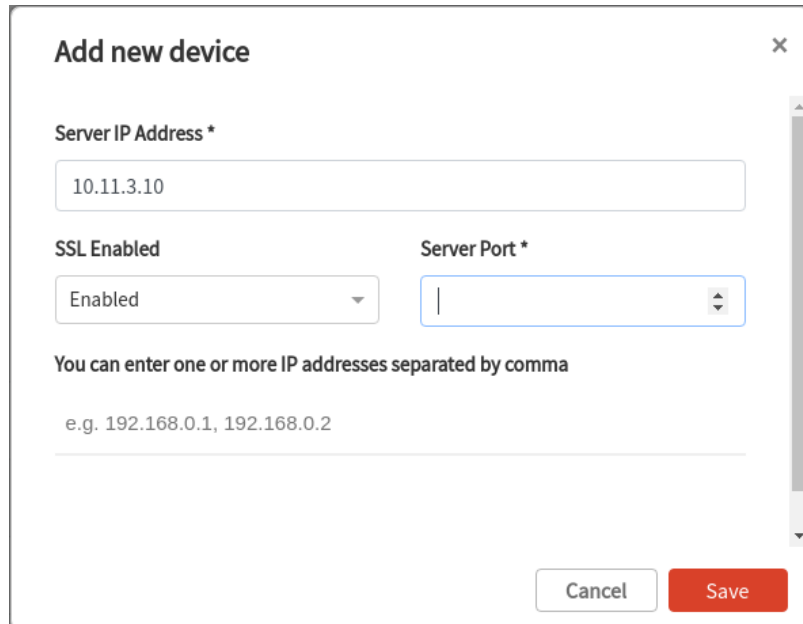
- The FM Monitor settings sections will be shown.
3. Click the **Devices** button (below).



4. The *Fluidmesh devices* dialog will be shown.
5. Click the **+ Add new device** button (below).



- The *Add new device* wizard will be shown (below).



6. Enter the IP address of the main server for your Fluidmesh-based network in the *Server IP Address* field.
7. Enter the IP address of the new Fluidmesh radio unit or units in the *You can enter one or more IP addresses separated by comma* entry field.



IMPORTANT

If entering the IP addresses of more than one Fluidmesh radio unit, separate each IP address with a comma and a space. (A typical example might be: *192.168.0.1, 192.168.0.2, 192.168.0.3*).

8. The *SSL Enabled* drop-down should usually be set to **Enabled**. If the FM Monitor server is configured to use https (secure socket layer) data transfer, set the *SSL Enabled* drop-down to **Enabled**. If the FM Monitor server is configured to use http data transfer, set the *SSL Enabled* drop-down to **Disabled**.
9. Enter **8443** or **443** in the *Server Port** field. If the FM Monitor Docker container is configured to use a host port that is not the default port, enter the correct host port number in the *Server Port** field.
10. Click the **Save** button to add the new device or devices. Alternatively, click the **Cancel** button to end the addition of new devices.
 - If the **Save** button was clicked, the new devices will be added to the project.

12.2.2. Removing a device

A Fluidmesh hardware device can be removed from the current FM Monitor project using either of two methods:

- The device can be removed using FM Monitor's *device detach* function.
- The device can be removed using the *device detach* function in the unit's offline Configurator interface.

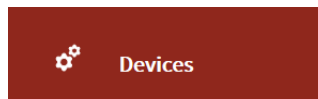
To remove one or more Fluidmesh devices from the current project using the FM Monitor device detach function, do the following steps:

1. Log into FM Monitor as shown in section “[Logging in to FM Monitor](#)” (page 34).
2. Click the Settings button (below).



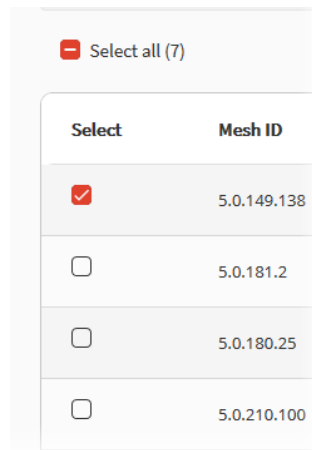
- The FM Monitor settings sections will be shown.

3. Click the **Devices** button (below).

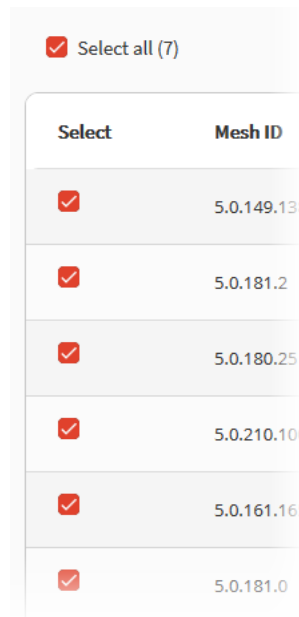


- The Fluidmesh devices dialog will be shown.

4. If you need to search for a specific device, do the following steps:
 - a. Search for a Fluidmesh device by entering any *one* of the following identifiers in the *Search a device* entry field:
 - The unit’s Mesh ID number.
 - The unit’s user-assigned device name label.
 - The unit’s IP address.
 - b. FM Monitor will begin the search when your text entry is complete.
 - If one or more devices exist whose identifiers match the entered information, FM Monitor will list the devices in the *Fluidmesh devices* list.
5. Check the **Select** check-box for the specific device or devices to be removed (below).




- Alternatively, select all devices in the Fluidmesh devices list by checking the **Select all** check-box (below).



- The **Detach** button will become active (below).





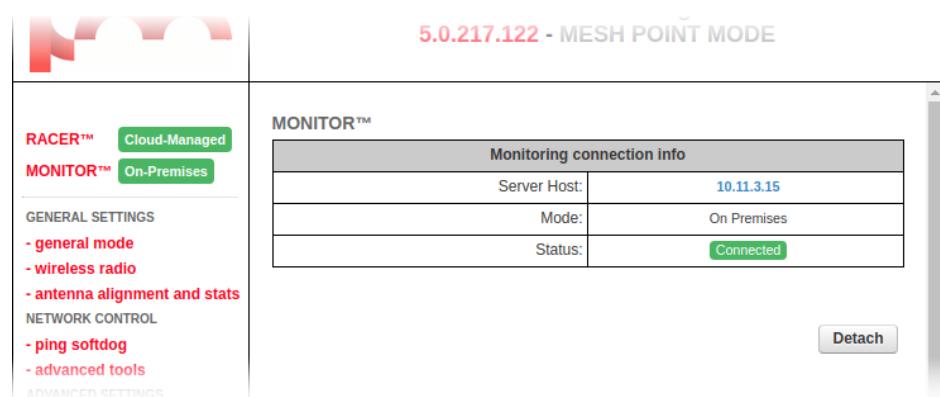
CAUTION
 If the **Detach** button is clicked, the selected devices will be removed from the project with no further notification.

- Click the **Detach** button.

- The selected devices will be permanently removed from the project. Devices can be re-added if needed.

To remove a Fluidmesh hardware device from the current project using the Configurator interface's device detach function, do the following steps:

1. Access the device's offline Configurator interface as shown in the *Device configuration using the Configurator interface* section of the Fluidmesh Installation and Configuration manual for the specific device.
2. Click the **MONITOR™** link in the left-hand settings menu.
 - The **MONITOR™** landing page will be shown (below).



3. The following information will be shown in the **MONITOR™** table:
 - The *Server Host* row shows the IP address of the FM Monitor server.
 - The *Mode* and *Status* rows show the connection status that currently exists between the device and the FM Monitor server. See the point below for an explanation of the mode and status parameters.
4. A colored icon will be shown to the right of the **MONITOR™** link. The icon shows a summary of the current mode and status parameters.
 - If the icon is red, and reads *Disabled*, the FM Monitor application has been disabled.
 - If the icon is gray, and reads *On-Premises*, the FM Monitor application is enabled, but the device is not currently connected to the FM Monitor server. A possibility is that the FM Monitor server cannot be reached.
 - If the icon is green, and reads *On-Premises*, the FM Monitor application is enabled, and the device is connected to the FM Monitor server.
5. Remove the device from the current project by clicking the **Detach** button.

- The colored icon to the right of the **MONITOR™** link should turn gray, and read *On-Premises*.

12.3. Viewing network statistics for a radio device

FM Monitor has statistical functions that allow you to view the network-related performance of any radio device that is part of the current network.

Statistical functions for a radio device can be viewed in real time, as they occur. Alternatively, logs of the device’s past performance can be viewed as a historical timeline.

12.3.1. Viewing statistics for a radio device in real time

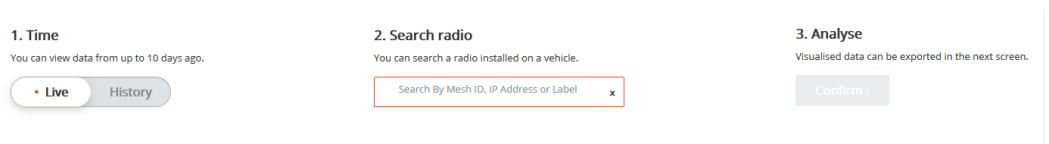
To view network statistics for a Fluidmesh radio device in real time, do the following steps:

1. Log into FM Monitor as shown in section “[Logging in to FM Monitor](#)” (page 34).
2. Click the **Data Analysis** button (below).



Data Analysis

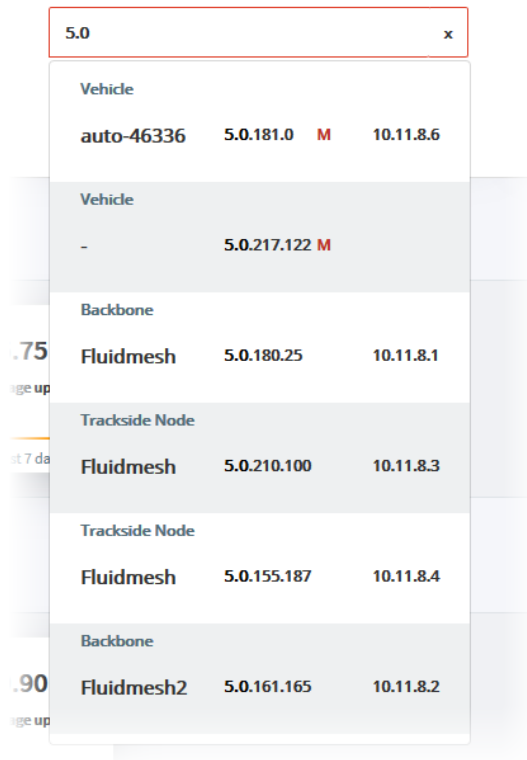
- FM Monitor’s statistical data analysis dialog will be shown (below).



3. Switch the data analysis dialog to Live mode by switching the *Time* switch to *Live* (as seen above).
4. Click the *Search By* field of the *Search radio* section.
 - A blinking cursor will appear in the *Search By* field.
5. Search for the Fluidmesh radio unit you want by entering part or all of one of the following identifiers:
 - The unit’s Mesh ID number.
 - The unit’s user-assigned device name label.
 - The unit’s IP address.
 - If one or more radio devices exist whose identifiers match the entered information, FM Monitor will list the devices below the *Search By* field (below).

2. Search radio

You can search a radio installed on a vehicle.



6. Click the chosen radio device in the list below the *Search By* field.

- The **Confirm >** button in the *Analyse* section will become active (below).

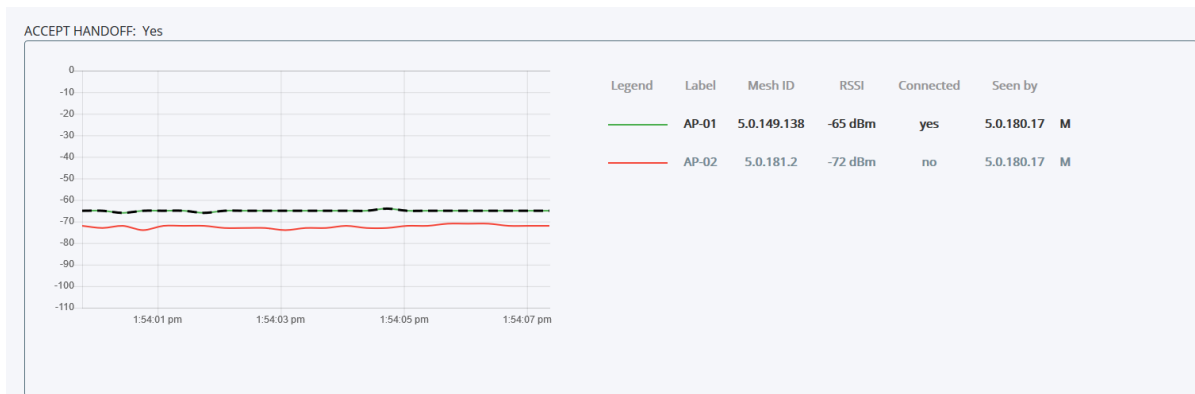


7. Click the **Confirm >** button.

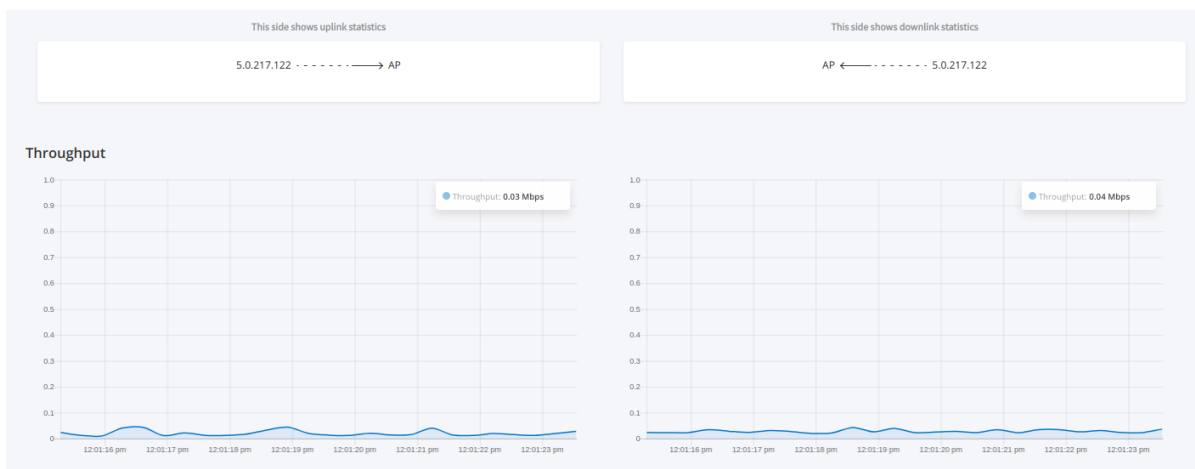
- A real-time statistical view for the radio device will be shown. Scroll down the page to see all performance statistics for the device.
 - The first graph shows received signal strengths for the chosen radio unit and all other radio units that the chosen unit could potentially connect to. A typical view is shown below.
 - The upper left corner of the graph shows whether the chosen radio unit is currently accepting handoff requests.
 - If the chosen radio unit is currently connected to a Fluidity-enabled (vehicle-mounted) radio

unit, a thick, dashed black line will be superimposed over the Fluidity unit's RSSI line. This line is known as the *RSSI envelope*, and will usually represent the strongest available signal.

- Note that in the right-hand section of the graph, radio units to which the current unit are connected are listed in descending order of received signal strength (RSSI).

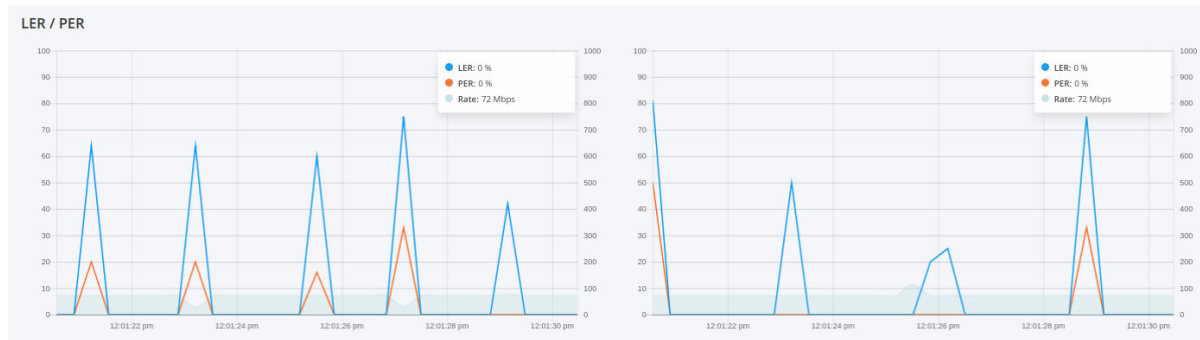


- The *Throughput* graphs show throughput statistics as a function of Mbps/time. Throughput is shown for the chosen radio unit, and the radio unit with the highest RSSI to which the chosen unit is currently connected. A typical view is shown below. Note that the left graph shows uplink statistics (in other words, data flow from the current unit), while the right graph shows downlink statistics (in other words, data flow to the current unit).



- The *LER / PER* graphs show 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 chosen radio unit, and the radio unit with the highest RSSI to which the chosen unit is currently connected. A typical view is shown below. Note that the left graph shows uplink statistics (in other words, data flow from the current unit), while the right graph shows downlink statistics (in other words, data flow to the current unit).

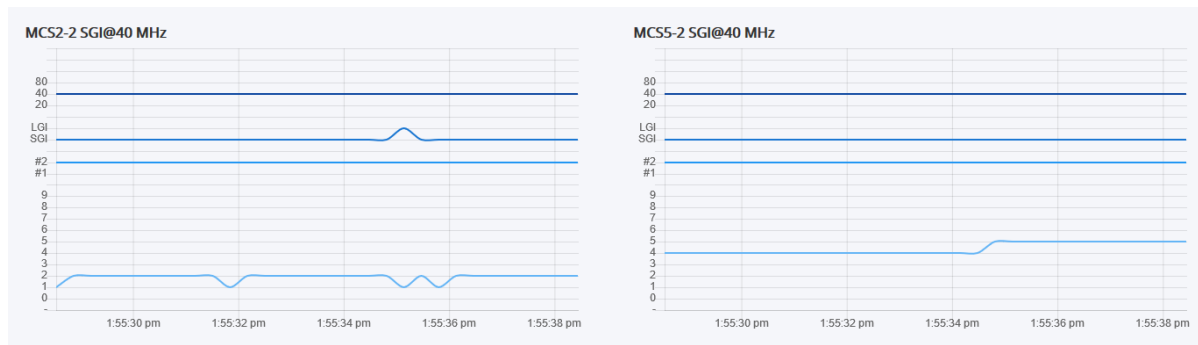


NOTE

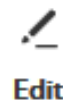
The signal modulation rate plot line is an expression of the channel's maximum theoretical throughput.

The modulation plot line is calculated using modulation and coding scheme (MCS) data.

- The graphs in the fourth row show the modulation and coding schemas for the chosen radio unit, and the radio unit with the highest RSSI to which the chosen unit is currently connected. A typical view is shown below. Note that the left graph shows uplink statistics (in other words, the MCS of the current unit), while the right graph shows downlink statistics (in other words, the MCS of the unit to which the current unit is connected).



8. To view the statistical view for another radio unit, click the **Edit** button (below).



- FM Monitor’s statistical data analysis dialog will be shown.
9. Search for the correct Fluidmesh radio unit and view its statistics as shown in this section.

12.3.2. Viewing past-time statistics for a radio device

To view network statistics for a Fluidmesh radio device that span a specified period of time, do the following steps:

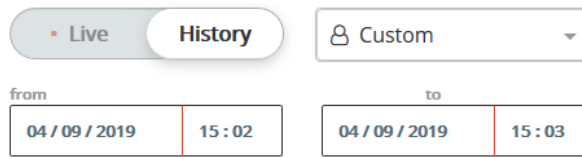
1. Log into FM Monitor as shown in section “[Logging in to FM Monitor](#)” (page 34).
2. Click the **Data Analysis** button (below).
 - FM Monitor’s statistical data analysis dialog will be shown (below).



3. Switch the data analysis dialog to History mode by switching the *Time* switch to *History* (below).

1. Time

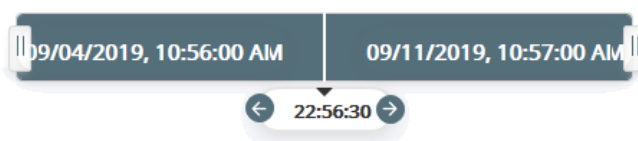
You can view data from up to 10 days ago.



- *From* and *To* time fields will appear in the data analysis dialog (above).
4. Specify the earlier limit of the needed time period by clicking the *Date* section of the *From* field, and choosing a date from the drop-down calendar.
 5. Specify the later limit of the needed time period by clicking the *Date* section of the *To* field, and choosing a date from the drop-down calendar.
 6. If needed, refine the *From* and *To* times by clicking the *Time* sections of the *From* and *To* fields, and entering new time values.
 7. Click the *Search By* field of the *Search radio* section.
 - A cursor will appear in the *Search By* field.
 8. Search for the Fluidmesh radio unit you want by entering part or all of one of the following identifiers:
 - The unit's Mesh ID number.
 - The unit's user-assigned device name label.
 - The unit's IP address.
 - If one or more radio devices exist whose identifiers match the entered information, FM Monitor will list the devices below the *Search By* field.
 9. Click the chosen radio device in the list below the *Search By* field.
 - The **Confirm >** button in the *Analyse* section will become active (below).



10. Click the **Confirm >** button.
 - A time slider for the chosen period will appear (below).



11. If needed, adjust the total statistical period by clicking-and-dragging the start time marker (far left, above) and/or the end time marker (far right, above).
12. View any point in the total statistical period by clicking-and-dragging the time cursor (center, above) to the chosen point.
 - The *Data Analysis* view will show the statistical graphs for the chosen point in time. For instructions on how to interpret the graphs, refer to “[Viewing statistics for a radio device in real time](#)” (page 54).

12.4. Device configuration

12.4.1. Editing a device’s configuration parameters

To do offline configuration of a radio device, do the following steps:

1. Log into FM Monitor as shown in section “[Logging in to FM Monitor](#)” (page 34).
2. Click the **Table View** button (below).



Table View

- The current Fluidmesh radio device list will be shown.
3. Find the listing for the relevant radio device.
 4. Click the **More** button for the device listing (below).

More



5. Click the *Device configuration page* link (below) for the device listing.

 [Device configuration page](#)

- Your web browser will prompt you to enter the radio device’s user name and password.

**NOTE**

If they have not yet been changed from the factory defaults, the device's user name and password are both **admin**.

6. Enter the correct user name and password in the prompt dialog.
7. Press *Enter*.
 - You will be taken to the offline Configurator interface for the radio unit.

**NOTE**

For instructions on how to use the Configurator interface, refer to the Fluidmesh Installation and Configuration manual for the specific device.

13. Logging important network events

FM Monitor includes a data logging function. This function allows you to log and recall all important network-related events that have happened within any Project to which the FM Monitor application is linked.

13.1. Events and event data

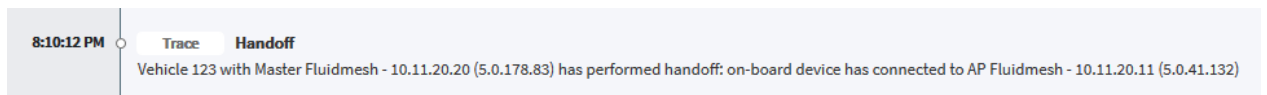
Every important network-related event logged by FM Monitor's data logging function is referred to simply as an 'Event'.

When an event is logged, it is stored in the FM Monitor database and the following data is attached to the event:

- A timestamp that describes when the event happened.
- A title that summarizes what happened during the event.
- A detailed description of what happened during the event.
- The level of importance applied to the event.

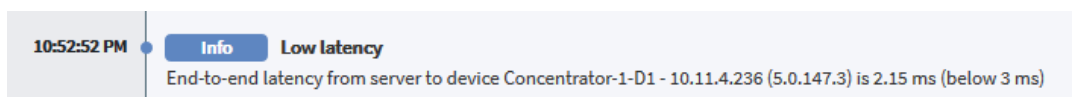
The importance of every type of event is graded according to four ascending levels:

- *Trace* (Trace-level events are considered trivial, but can be useful for diagnostic troubleshooting. A typical example is shown below.)



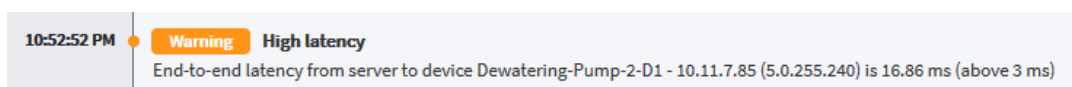
8:10:12 PM | Trace Handoff
 Vehicle 123 with Master Fluidmesh - 10.11.20.20 (5.0.178.83) has performed handoff: on-board device has connected to AP Fluidmesh - 10.11.20.11 (5.0.41.132)

- *Info* (Info-level events are normal system events. This is the default event display level. A typical example is shown below.)



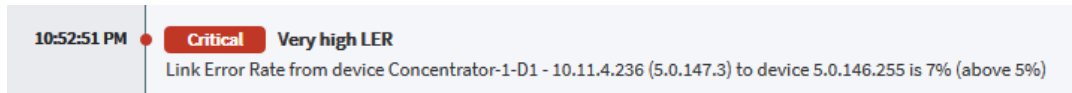
10:52:52 PM | Info Low latency
 End-to-end latency from server to device Concentrator-1-D1 - 10.11.4.236 (5.0.147.3) is 2.15 ms (below 3 ms)

- *Warning* (Warning-level events are those that have a potentially negative impact on system performance, and should be addressed as soon as practically possible. A typical example is shown below.)



10:52:52 PM | Warning High latency
 End-to-end latency from server to device Dewatering-Pump-2-D1 - 10.11.7.85 (5.0.255.240) is 16.86 ms (above 3 ms)

- *Critical* (Critical-level events are those that have an immediate, negative impact on system performance and/or system integrity, and should be addressed immediately. A typical example is shown below.)



By default, 99 different types of system-related events are logged. When the **Log** view is enabled, any or all events that have been logged can be chosen for display on the logging timeline view.

13.2. Network events by category and type

All network events are arranged by category and type.

The event types that are logged and can be displayed are as follows:

Users account management events:

- Logout
- Account updated
- Account created
- Account deleted
- Login
- Password changed

Network events/failures events:

- Block list
- Disconnected edge devices
- Block list expired
- Frequency scan OFF
- Deny Handoff Disabled
- Handoff
- Connected new edge devices
- Frequency scan ON
- Deny Handoff Enabled
- Connected device
- Disconnected device

Settings events:

- Updated statistics threshold per section
- Updated time threshold
- Disabled logger
- Updated log level
- Updated list of log events
- Removed statistics threshold per section

- Enabled all log events
- Updated Fluidity statistics period
- Enabled advanced diagnostic
- Disabled performance check
- Updated UDP ping period (for latency / jitter)
- Enabled performance check
- Enabled logger
- Disabled advanced diagnostic
- Updated backbone statistics period
- Enabled UDP ping (for latency / jitter)
- Updated database size threshold
- Updated statistics threshold
- Disabled UDP ping (for latency / jitter)

Devices management events:

- Time session saved
- Section updated
- Devices detached
- Section name updated
- Section deleted
- Devices attached
- Section devices updated
- Section created

Configuration changes events:

- Transmission power live update
- Transmission power update
- Channel width live update
- Channel width update
- Fluidity enabled
- Frequency update
- Fluidity role updated
- Firmware upgrade
- Fluidity disabled
- Fluidity auto vid enabled
- IP update
- Fluidity manual vid updated
- Fluidity auto vid disabled
- Label update

- Frequency live update
- Node type update

Network performance events:

- Good RSSI
- High LER
- UDP Packet Loss
- Very high LER
- Very High PER
- Low RSSI
- Low LER
- Low latency
- High latency
- Very high latency
- Very low RSSI
- UDP Packet Loss
- Interval-Count
- High PER
- Low PER

FM Monitor license management events:

- License activated
- License deactivated
- License upgraded
- License expired

Database events:

- Stats cleaning (exceeded max database size)
- Database compact started
- Database compact finished
- Stats cleaning (exceeded time threshold)
- Backup

System events:

- System startup
- System shutdown
- System upgrade

13.3. Filtering and viewing network events

To view a log of network events for the current network, do the following steps:

1. Log into FM Monitor as shown in “Logging in to FM Monitor” (page 34).
2. Click the **Log** button (below).



- The data log display controls will be shown (a typical view is shown below).

1. Time

from

Custom

13 / 12 / 2019

17 : 58

to

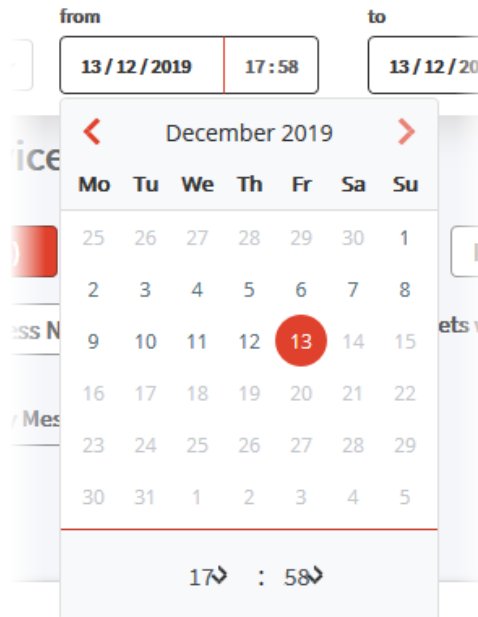
13 / 12 / 2019

17 : 59

2. View log

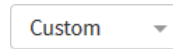
Confirm >

3. Specify the data log display range by doing the following steps:
 - a. Click the **from** field.
 - A calendar view will be shown (below).

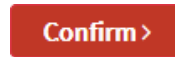


- b. Click the correct start date for the needed event-log viewing range.
- c. If needed, refine the start time for the needed viewing range by clicking the time field and entering a new start time.
- d. Click the **to** field. Specify the correct end time and date as shown above.

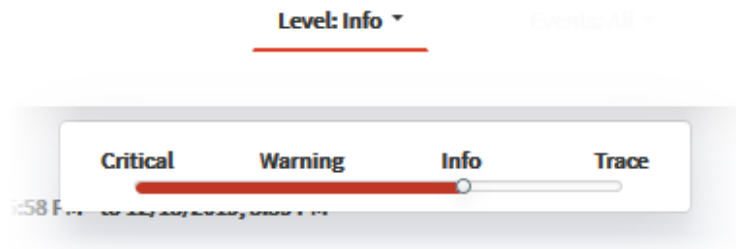
- e. Alternatively, choose a custom date/time range by clicking the **Custom** drop-down (below) and clicking one of the available date range options.




4. Click the **Confirm>** button (below).



- A log of network-related events will be shown for the chosen date/time range.
5. By default, FM Monitor logs every network-related event to memory, meaning that the log list shown on your screen may be very long. If needed, filter the listed network events by doing the following steps:
 - a. Choose the overall criticality level of the shown list of network events by clicking the **Level:** drop-down (below) and clicking **Trace**, **Info**, **Warning** or **Critical**.





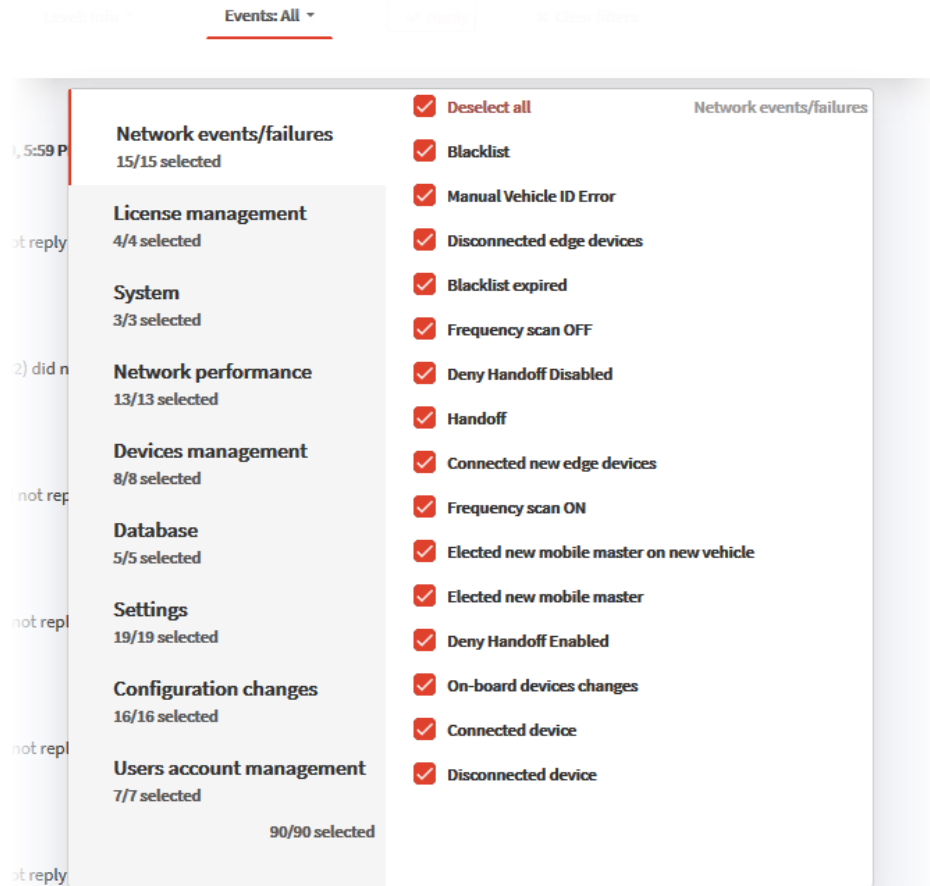
NOTE

Criticality levels are inclusive of the chosen level, and all levels below the chosen level.

- If you choose **Critical**, only Critical events will be shown.
- If you choose **Warning**, Critical and Warning events will be shown.
- If you choose **Info**, Critical, Warning and Information events will be shown.
- If you choose **Trace**, Critical, Warning, Information and Trace events will be shown.

- b. If needed, choose specific network event types by clicking the **Events:** drop-down (upper portion, below),

clicking the relevant network event category (left column, below) and checking the check-boxes for the needed network events (right column, below).



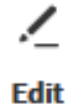
c. Click the **Apply** button (below).



d. If needed, clear the filters that have been created by clicking the **Clear Filters** button (below).



e. If needed, modify the data log display range by clicking the **Edit** button (below), and specifying a different data log display range as shown in this section.



6. All specified network-related events are shown in descending chronological order (in other words, more recent events are shown at the top of the log). To view events that happened a longer time ago, scroll down the log.

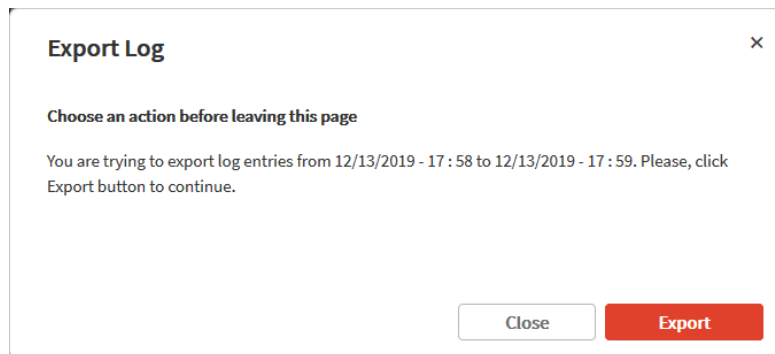
13.4. Exporting a network event log as a *.CSV file

To download a network event log to your computer as a *.CSV file, do the following steps:

1. Request a log of network events for the current network as shown in [“Filtering and viewing network events” \(page 65\)](#).
2. Click the **Export** button (below).



- FM Monitor will show the **Export Log** dialog (below).



3. If the date/time range shown in the **Export Log** dialog is correct, click the dialog’s **Export** button. If not, click the **Close** button and modify the data log display range as shown in [“Filtering and viewing network events” \(page 65\)](#).
4. Follow the system prompts to download the FM Monitor log file to your chosen location.

14. Customizing FM Monitor settings

14.1. Customizing FM Monitor database settings

To customize FM Monitor configuration settings that affect the functions of the linked network-statistics database, you must use the *Database* section of the FM Monitor Settings menu.

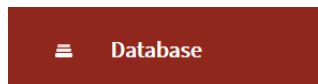
To access the Database settings menu, do the following steps:

1. Log into FM Monitor as shown in [“Logging in to FM Monitor”](#) (page 34).
2. Click the Settings button (below).



- The FM Monitor settings sections will be shown.

3. Click the **Database** button (below).



- The database settings page will be shown.

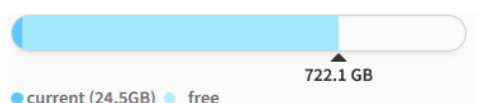
4. Proceed to the sub-sections below.

14.1.1. Allocating hard disk storage capacity to the FM Monitor statistics database

The **Maximum database size** slider in the **Database** section of the FM Monitor Settings menu serves two functions:

- The slider is a visual reference that shows the amount of hard disk space currently allocated to network-statistics storage, and the amount of hard disk space currently occupied by network-statistics data.
- The slider is also used to specify the amount of hard disk space allocated to network-statistics storage.

To allocate a specific amount of the FM Monitor database server’s storage capacity to network-statistics storage, click-and-drag the **Maximum database size** slider (below).



If the amount of network-statistics data currently stored on the hard disk approaches the specified amount, but is recorded over less than the amount of time specified by the **Time threshold** slider, FM Monitor will overwrite the oldest data with the newest data in real time.

- The amount of currently occupied hard disk space is shown in medium blue.
- The amount of hard disk space currently allocated to network-statistics storage is shown in light blue.



IMPORTANT

The amount of allocated hard disk space cannot be less than the amount of currently occupied hard disk space, or more than the total capacity of the hard disk.

Fluidmesh strongly recommends that you use a hard disk of at least 100 GB capacity for network statistics storage.

If you must use a hard disk of less than 100 GB capacity, assign no more than 75% of the drive's free capacity to network-statistics storage. If you assign more than this amount, FM Monitor may encounter performance issues.

14.1.2. Setting an overwrite cycle period for the FM Monitor statistics database

No matter how much data capacity a hard drive has, the capacity is finite. When the user-specified network statistics-recording period ends, FM Monitor responds by over-writing the oldest data with the newest data in real time.



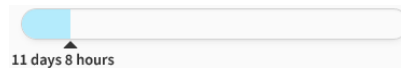
TIP

Use this function to fine-tune the amount of occupied disk space if excessive amounts of data are being written to the hard disk in short periods of time.

The **Time threshold** slider in the *Database* section of the FM Monitor Settings menu serves two functions:

- The slider is a visual reference that shows the time period for which network statistics are recorded before the oldest statistics data is overwritten.
- The slider is also used to specify the network-statistics recording time period.

To specify a network-statistics storage overwrite threshold, click-and-drag the **Time threshold** slider (below).

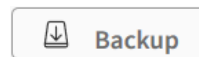


- The specified storage overwrite threshold period is shown below the slider.
- The minimum amount of time-related network-statistics data that can be stored before overwrite is one hour.
- The maximum amount of time-related data that can be stored before overwrite is 90 days.

14.1.3. Backing up the FM Monitor statistics database

To create a new network-statistics database backup, or update the existing database backup, do the following steps:

1. Click the **Backup** button (below).



- The *Backup database* dialog will be shown.
2. Back up the current database by clicking the **Confirm** button. Alternatively, cancel the current backup by clicking the **Cancel** button.

14.1.4. Forcing deletion of the least recent FM Monitor statistics data

You can force deletion of the oldest statistics and event data in the FM Monitor database.

Usually, this is not necessary, as the process is automatic (see [“Allocating hard disk storage capacity to the FM Monitor statistics database”](#) (page 70) and [“Setting an overwrite cycle period for the FM Monitor statistics database”](#) (page 71) for details). However, manual deletion may be necessary if you judge that excessive amounts of network-statistics data are being written to the hard disk in short periods of time.

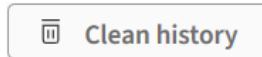


IMPORTANT


It is strongly recommended that you backup the database as shown in [“Backing up the FM Monitor statistics database”](#) (page 72) before forcing the deletion of statistics data. If the current network-statistics record is deleted, it cannot be retrieved.

To delete the ongoing record of current network statistics, do the following steps:

1. Click the **Clean history** button (below).



- The *Delete history* dialog will be shown.



NOTE
 Network-statistics data is only deleted if the amount of stored data exceeds the thresholds set by the **Maximum database size** slider and/or the **Time threshold** slider.

 In this case, the oldest 10% of the currently stored network-statistics data will be deleted.

2. Delete the current network-statistics record by clicking the **Confirm** button. Alternatively, cancel the deletion by clicking the **Cancel** button.

14.2. Customizing FM Monitor statistical settings

To customize FM Monitor configuration settings affecting the real-time recording of network statistics, you must use the *Statistics* section of the FM Monitor *Settings* menu.

To access the *Statistics* settings menu, do the following steps:

1. Log into FM Monitor as shown in [“Logging in to FM Monitor” \(page 34\)](#).
2. Click the Settings button (below).



- The FM Monitor settings sections will be shown.
3. Click the **Statistics** button (below).




- The statistics settings page will be shown.

14.2.1. Changing the interval at which statistical data is logged

To change the time interval at which statistical data is logged, click-and-drag the **Sampling period (Backbone)** slider (in cases where Fluidity

functionality is not present or has been disabled) and/or the **Sampling period (Fluidity)** slider (for Fluidity access-point and mobile radio units).



NOTE

Only change the default frequency intervals if there is a good reason to do so. Logging data at a higher-than-normal frequency will increase the rate at which the FM Monitor database occupies hard disk space.

- Higher data-logging frequency yields a more detailed statistical log with less possibility that anomalies may be missed, especially in mobility scenarios.
- Lower data-logging frequency uses less hard disk space.

Recommended data-logging frequency intervals are:

- 330 ms (Fluidity)
- 5 sec (backbone)

14.2.2. Collecting debugging data

To log debugging data that can be used by Fluidmesh Networks for quicker and more advanced technical support, switch the *Advanced diagnostic data* switch (below) to *On*.

Advanced diagnostic data

Record data that can be used by Fluidmesh tech support for a quicker troubleshooting.

On
Off

Debug data is not recorded.


14.2.3. Increasing the accuracy of network latency and jitter readings

To increase the accuracy with which the FM Monitor server calculates network latency and jitter, click-and-drag the **UDP packet period** slider (below).


UDP packet period

These packets are used to calculate end-to-end latency and jitter in your network.

Very high
High
Normal
Off



100ms 1s 10s Never



NOTE

Higher UDP packet frequency sampling yields more accurate latency and jitter readings.

Lower UDP packet frequency sampling helps reduce network congestion.

- The minimum interval at which UDP packets can be sent is every 100 ms.
- The maximum interval at which UDP packets can be sent is every ten seconds.
- Alternatively, disable UDP packet transmission by clicking-and-dragging the slider to *Off*.

14.3. Customising FM Monitor event-logging settings

To customize FM Monitor configuration settings that affect the network-statistics logging function, you must use the **Log** section of the FM Monitor Settings menu.

To access the Log settings menu, do the following steps:

1. Log into FM Monitor as shown in [“Logging in to FM Monitor” \(page 34\)](#).
2. Click the Settings button (below).



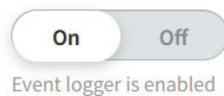
- The FM Monitor settings sections will be shown.

3. Click the Log button (below).



- The event-log settings page will be shown.

To activate the network-statistics logging function, click the **Enable logger** button to **On** (below).



The importance of every type of network event is graded according to four ascending levels:

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

To change the level to which network events are logged, click-and-drag the **Logging Level** slider (below).

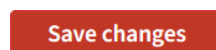


To choose only specific network events for inclusion in network-statistics logs, regardless of importance level, do the steps that follow:

1. Enable network event logging by clicking the **Enable logger** button to **On** as shown above.
2. Scroll to the *Events* section of the Log page. All network event types are grouped into one of the following categories:
 - Users account management
 - Network events/failures
 - Settings
 - Devices management
 - Configuration changes
 - Network performance
 - License management
 - Database
 - System
3. Select or de-select any or all of the event types by clicking the **On/Off** button for the needed event type (below).



4. Click the **Save changes** button (below).



- The new network-statistics logging settings will be saved.

14.4. Setting network key performance indicators

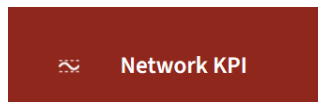
The *Performance check* feature allows you to set performance thresholds that influence the *Status* icons of individual radio units in the FM Monitor *Table View* (refer to “[Viewing a list of devices currently associated with the FM Monitor server](#)” (page 43)).

To enable the *Performance check* feature, do the following steps:

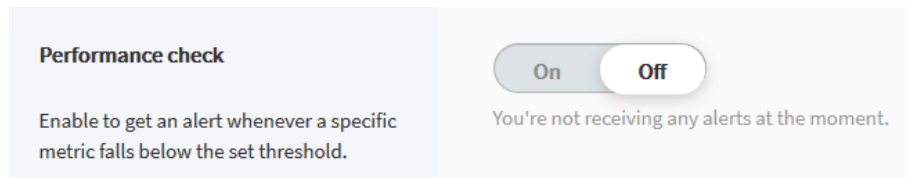
1. Click the Settings button (below).



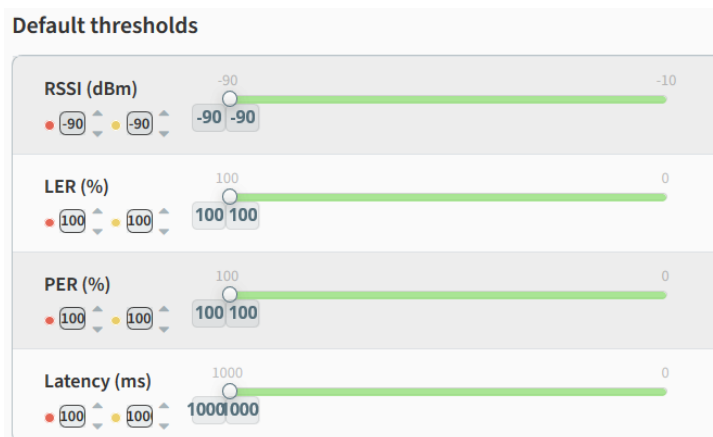
- The FM Monitor settings sections will be shown.
2. Click the **Network KPI** button (below).



- The **Performance check** page will be shown.
3. Switch the *Performance check* switch (below) to *On*.

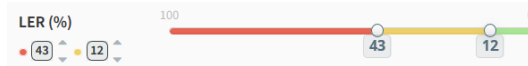


- The *Default thresholds* section will be shown (below).



14.4.1. Setting universal performance thresholds

Each performance threshold slider has two buttons that can be clicked-and-dragged (a typical example is shown below).



If you want to apply the same performance-alert thresholds to all sections that are part of the current network, adjust the performance thresholds by doing the steps that follow:

1. Click-and-drag the left-side button to set the lower performance threshold. If the relevant parameter falls below this threshold, the relevant *Status* icons will turn red.
 2. Click-and-drag the right-side button to set the upper performance threshold. If the relevant parameter falls below this threshold, the relevant *Status* icons will turn yellow.
- If radio signal strength, link error rate, packet error rate or network latency drop below the specified levels, the *Status* icons of individual radio units in the *Table View* will show the relevant status. For information on what the icon colors mean, refer to [“Viewing a list of devices currently associated with the FM Monitor server” \(page 43\)](#).



NOTE

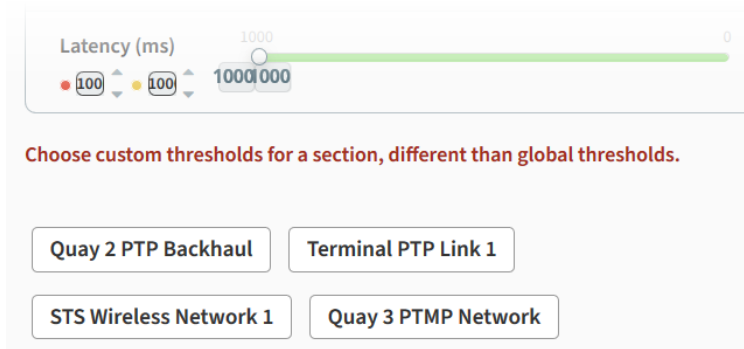
RSSI, LER, PER and latency performance thresholds must be set according to individual project requirements.

As a general rule, setting a performance-alert threshold somewhere near its real-world ideal value will help in monitoring for acceptably high network performance. Setting a threshold too close to its *best possible* value may give an unrealistically low representation of performance.

14.4.2. Setting different performance thresholds for each section

If you want to apply different performance thresholds to different sections of the network, do the steps that follow:

1. Make sure that the current network is partitioned into two or more sections. For instructions on how to partition the network into sections, refer to [“Adding a new section to the current project” \(page 40\)](#).
2. If the network is partitioned, a button for each network section will be shown under the *Default thresholds* sliders. A typical example of network selection buttons is shown below:



3. Click the button for the network section for which you want to alter performance thresholds.
 - A separate group of performance-alert threshold sliders will be shown for the specified network section.
4. Adjust the performance-alert thresholds for the specified network section by clicking-and-dragging the relevant sliders.
5. Repeat the steps above for all network sections.

15. Adding and modifying user accounts

Each FM Monitor user can update their own name details and access password.

FM Monitor users can also add other users to the FM Monitor portal.

15.1. Modifying an existing FM Monitor user account

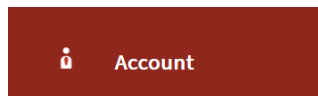
To access the user account settings page, do the following steps:

1. Log in to FM Monitor as shown in [“Logging in to FM Monitor” \(page 34\)](#).
2. Click the Settings button (below).



- The FM Monitor settings sections will be shown.

3. Click the **Account** button (below).



- The user account settings page will be shown.

To change your first name and/or last name details for the FM Monitor portal, do the following steps:


1. Enter your first name in the **First name** field, and enter your last name in the **Last name** field (below).

<p>Your details</p> <p>Update your first name and last name</p>	<input type="text" value="demo@fluidmesh.com"/> <small>demo@fluidmesh.com</small>				
	<table border="0"> <tr> <td style="text-align: center;"><small>First name</small></td> <td style="text-align: center;"><small>Last name</small></td> </tr> <tr> <td style="text-align: center;"><input type="text" value="Demo"/></td> <td style="text-align: center;"><input type="text" value="Fluidmesh"/></td> </tr> </table>	<small>First name</small>	<small>Last name</small>	<input type="text" value="Demo"/>	<input type="text" value="Fluidmesh"/>
<small>First name</small>	<small>Last name</small>				
<input type="text" value="Demo"/>	<input type="text" value="Fluidmesh"/>				

2. Click the **Save changes** button (below).



- The new first name and last name details will be saved.



IMPORTANT

You cannot change the listed E-mail address using the user account settings page. The listed E-mail address can be changed using the FM Racer interface. For details, refer to the *Cisco FM Racer Configuration Manual*.

To change your access password details for the FM Monitor portal, do the following steps:

1. Enter your current access password in the *Current password* field (below). Note that passwords are case-sensitive.

Change password	<input style="width: 90%;" type="password" value="Current password"/>	Your new password has to be 8 characters minimum. It has to include at least one uppercase letter, one lowercase letter and one digit.
Choose a new password	<input style="width: 90%;" type="password" value="New password"/>	
	<input style="width: 90%;" type="password" value="Repeat new password"/>	

2. Enter the new access password in the *New password* field (above).
3. Enter the new access password in the *Repeat new password* field (above).
 - New passwords must be a minimum of eight characters, and must include at least one uppercase letter, one lowercase letter and one digit.
 - If the passwords entered in the *New password* field and the *Repeat new password* field do not match, the new password cannot be saved.
 - Entered passwords are obscured by default. To view the password text you have entered, click the 'Eye' symbol (below).



4. Click the **Save changes** button (below).



- The new first name and last name details will be saved.

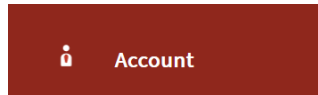
15.2. Viewing, adding and deleting users from the FM Monitor portal

To view the list of existing users on the FM Monitor portal, do the following steps:



1. Log in to FM Monitor as shown in “Logging in to FM Monitor” (page 34).
2. Click the Settings button (below).



- The FM Monitor settings sections will be shown.
3. Click the **Account** button (below).



- The list of existing FM Monitor user accounts will be shown in the **Other users** section (below).

Other users	Email	First name	Last name	Status
Add or remove users here. New user will have to use the one time password for their first login.	matthew.garcia@gmail.com	Matthew	Garcia	Pending ●●●●●●●●●●  ×
	marcos.martinez@gmail.com	Marcos	Martinez	Pending ●●●●●●●●●●  ×
	name@email.com *	First name *	Last name *	+

To add a new user to the FM Monitor portal, do the following steps:

1. Enter the new user’s E-mail address in the *name@email.com* field (above).
2. Enter the new user’s first name in the *First name* field (above).
3. Enter the new user’s last name in the *Last name* field (above).
4. Confirm that the details you have entered are correct.
5. Click the + symbol (below).



- The new user will be added to the **Other users** list. The status of the new user listing will be shown as **Pending** (below).



- A random access password will be generated for the new user.
6. View the password for the new user listing by clicking the 'Eye' symbol (below) to the right of the obscured password (below).



- The text of the new user's password will be unhidden.
7. Make a note of the new user's password.
 8. Forward the password to the new user. The user must use their randomly generated password to log in to their new user account.
 - When the new user logs in to their user account for the first time, the user will see a notification advising them to change the random password for a new password.

To delete a user from the FM Monitor portal, do the following steps:

1. View the list of existing FM Monitor user accounts in the **Other users** section.
2. If needed, scroll up or down the user account list to find the user listing that must be deleted.
3. Delete the user account by clicking the **X** to the right of the relevant user listing (below).



- The **Remove user** dialog will be shown.
4. To delete the user account, click the **Remove** button. To cancel the user deletion, click the **Discard** button, or close the **Remove user** dialog.

16. Updating FM Monitor

From time to time, Fluidmesh Networks will inform FM Monitor users of updated editions of FM Monitor. These notifications will arrive by E-mail.

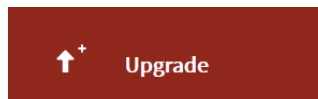
For best performance and the least likelihood of network errors, it is strongly recommended that you always use the latest version of FM Monitor. Updated versions may include new features, improved operation and bug fixes.

To update FM Monitor to the latest version, do the following steps:

1. Log into FM Monitor as shown in [“Logging in to FM Monitor” \(page 34\)](#).
2. Click the Settings button (below).



- The FM Monitor settings sections will be shown.
3. Click the **Upgrade** button (below).



- The database settings page will be shown.
4. To update FM Monitor manually by using a *.MON file, refer to [“Updating FM Monitor manually” \(page 84\)](#).

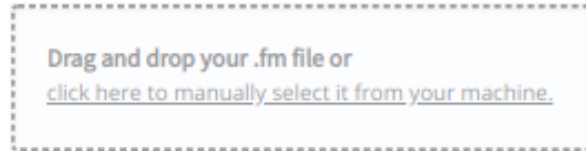
16.1. Updating FM Monitor manually

In order to prepare to update FM Monitor, you must get the most recent FM Monitor image file. Do the following steps:

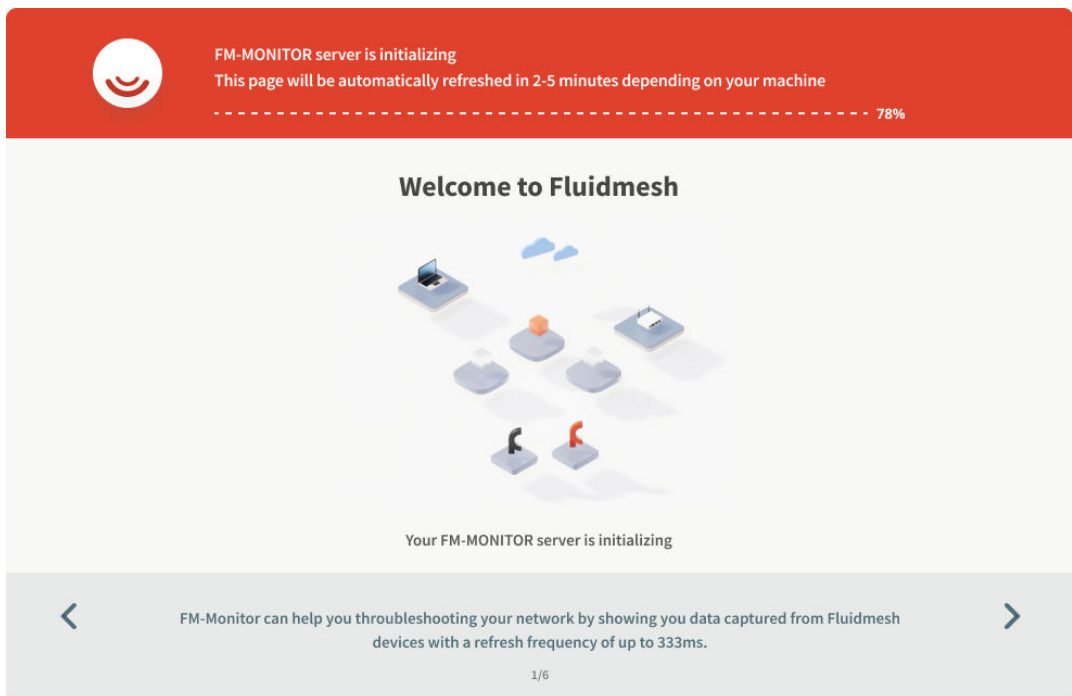
1. Using the FM Monitor server, navigate to the [Fluidmesh Partners Portal](#).
2. Log in to the Partners Portal using your login credentials.
3. Click [this link](#).
4. Click the *FIRMWARE AND TOOLS* folder.
5. Click the *TOOLS* folder.
6. Click the *FM Monitor* folder.
7. Download the FM Monitor image file (*fm-monitor-upgrade-to-v1.y.y.mon*) to the FM Monitor server.

To update FM Monitor manually, do the following steps:

1. Locate the correct FM Monitor image file on your computer.
 - FM Monitor image files have an *.MON file extension.
 - The FM Monitor Upgrade page has a target block for *.MON files (below).



2. Upload the correct *.MON file using either of the two methods below:
 - Drag and drop the *.MON file to the target block.
 - Manually select the *.MON file from your computer by clicking the target block and using your browser's file upload dialog to upload the file.
3. The server initialization page will be shown (below).



- The FM Monitor application will be updated.

17. Uninstalling FM Monitor

If needed, uninstall FM Monitor from the FM Monitor server by doing the steps that follow:

1. Deactivate the FM Monitor license as shown in [“Activating your FM Monitor license”](#) (page 21).
2. Open a command-line window on the FM Monitor server.
3. Enter the command **`docker ps -a`**.
 - The command-line interface will show the **CONTAINER_ID** value of the FM Monitor installation.
4. Enter the command **`docker rm -f <CONTAINER_ID>`** where **<CONTAINER_ID>** is the **CONTAINER_ID** value in step 3. above.
 - The Docker container for the FM Monitor installation will be removed from the FM Monitor server.
5. Enter the command **`docker images`**.
 - The command-line interface will show the **IMAGE_ID** value of the FM Monitor Docker image.
6. Enter the command **`docker rmi -f <IMAGE_ID>`** where **<IMAGE_ID>** is the **IMAGE_ID** value in step 5. above.
 - The FM Monitor Docker image will be removed from the FM Monitor server.

18. Notices and copyright



WARNING

Installation of Fluidmesh hardware devices and their supporting infrastructure must be done by suitably qualified personnel only. In some countries, installation by a certified electrician may be required.

Fluidmesh hardware installations must comply with all applicable local legislation.



WARNING

Never disassemble a Fluidmesh hardware device to any extent that is not described in the relevant device user's manual. Fluidmesh devices contain no user-serviceable parts. Disassembling a Fluidmesh hardware device will invalidate the device warranty, and may compromise the operational integrity of the device.

On some Fluidmesh radio transceiver devices, the lower access cover must be removed to gain access to the hardware *Reset* button. Do not operate a radio transceiver device for extended periods if its lower access cover has been removed.



WARNING

To avoid danger from non-ionizing radiation and/or electric shock and/or high-intensity laser or LED light sources, be sure to install the unit only in a location with restricted access.



WARNING

To avoid danger from electric shock, do not expose the unit to water or high humidity if the unit is powered ON, or if any access covers have been removed from the unit enclosure.

Do not place liquid-filled objects on or above the unit.

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19. Fluidmesh end-user license agreement

19.1. Preamble

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19.2. Notice

This is an agreement between you and Fluidmesh, a division of Cisco (hereafter known as 'Fluidmesh').

You must read and agree to the terms of this firmware license agreement (hereafter known as the 'agreement') before any Fluidmesh firmware can be downloaded, installed or used. By clicking the 'Accept' button on any Fluidmesh firmware download webpage, or by downloading, installing or using Fluidmesh firmware and/or by using any Fluidmesh device running Fluidmesh firmware, you are agreeing to be bound by the terms and conditions of this agreement. If you do not agree with the terms and conditions of this agreement, then you should not download, install or use any Fluidmesh firmware, and you agree to forego any implied or stated rights to download, install or use Fluidmesh firmware.

19.3. Definitions

For the purpose of this Agreement, the following terms shall have the following meanings:

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'Fluidmesh Device' means a Fluidmesh networking device that you purchase or otherwise rightfully acquire;

'Fluidmesh Firmware' means the firmware in object code form made available by Fluidmesh for Fluidmesh Devices; and

'You' and 'Your' mean the company, entity or individual who owns or otherwise rightfully acquires the Fluidmesh Device into which the Fluidmesh Firmware will be incorporated.

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You may:

(a) download and use Fluidmesh Firmware for use in Fluidmesh Devices, and make copies of the Fluidmesh Firmware as reasonably necessary for such use, provided that you reproduce, unaltered, all proprietary notices that exist on or in the copies.

You may not, and shall not permit others to:

(a) use the Fluidmesh Firmware on any devices or products that are not owned by you or your business organization;

(b) use the Fluidmesh Firmware on any non-Fluidmesh Devices;

(c) copy the Fluidmesh Firmware (except as expressly permitted above), or copy the accompanying documentation;

(d) modify, translate, reverse engineer, decompile, disassemble or otherwise attempt (i) to defeat, avoid, bypass, remove, deactivate, or otherwise circumvent any software protection mechanisms in the Fluidmesh Firmware, including without limitation any such mechanism used to restrict or control the functionality of the Fluidmesh Firmware, or (ii) to derive the source code or the underlying ideas, algorithms, structure or organization from the Fluidmesh Firmware (except that the foregoing limitation does not apply to the extent that such activities may not be prohibited under applicable law); or

(e) distribute, rent, transfer or grant any rights in the Fluidmesh Firmware or modifications thereof or accompanying documentation in any form to any person without the prior written consent of Fluidmesh.

(f) remove any Cisco or Fluidmesh copyright notice, or Cisco or Fluidmesh branding from the Fluidmesh Firmware or modify any user interface of the Fluidmesh Firmware or Fluidmesh Device.

Fluidmesh Devices must be properly installed and they are sold for installation by a professional installer only. Fluidmesh Devices must be installed by a professional installer of wireless networking products certified by Fluidmesh, and they are not designed for installation by the general public. It is your responsibility to follow local country regulations, including operation within legal frequency channels, output power, and Dynamic Frequency Selection (DFS) requirements. You are responsible for keeping the devices working according to these rules.

(g) The Fluidmesh Firmware contains technological protection or other security features designed to prevent unauthorized use of the Fluidmesh Firmware, including features to protect against use of the Fluidmesh Firmware beyond the scope of the license granted herein, or in a manner prohibited herein. You agree that you shall not, and shall not attempt to, remove, disable, circumvent or otherwise create or implement any workaround to, any such copy protection or security features.

This license is not a sale. Title and copyrights to the Fluidmesh Firmware, and any copy made by you, remain with Fluidmesh and its suppliers. Unauthorized copying of the Fluidmesh Firmware or the accompanying documentation, or failure to comply with the above restrictions, will result in automatic termination of this license and will make other legal remedies available to Fluidmesh.

19.6. Open-source software

You hereby acknowledge that the Fluidmesh Firmware may contain Open Source Software. You agree to review any documentation that accompanies the Fluidmesh Firmware or is identified in the documentation for the Fluidmesh Firmware, in order to determine which portions of the Fluidmesh Firmware are Open Source Software and are licensed under an Open Source Software license. To the extent that any such license requires that Fluidmesh provide you with rights to copy, modify, distribute or otherwise use any Open Source Software that are inconsistent with the limited rights granted to you in this Agreement, then such rights in the applicable Open Source Software license shall take precedence over the rights and restrictions granted in this Agreement, but solely with respect to such Open Source Software. You acknowledge that the Open Source Software license is solely between you and the applicable licensor of the Open Source Software. You shall comply with the terms of all applicable Open Source Software licenses, if any. Copyrights to the Open Source Software are held by the copyright holders indicated in the copyright notices in the corresponding source files, or as disclosed at www.fluidmesh.com.

19.7. Termination

This license will continue until terminated. Unauthorized copying of the Fluidmesh Firmware or failure to comply with the above restrictions will result in automatic termination of this Agreement and will make other legal

remedies available to Fluidmesh. This license will also automatically terminate if you go into liquidation, suffer or make any winding-up petition, make an arrangement with your creditors, or suffer or file any similar action in any jurisdiction in consequence of debt.

Furthermore, Fluidmesh may immediately terminate this Agreement if (i) you fail to cure a breach of this Agreement (other than a breach pursuant to Fluidmesh intellectual property rights) within thirty (30) calendar days after its receipt of written notice regarding such breach, or (ii) you breach any Fluidmesh intellectual property right. Upon termination of this license for any reason, you agree to destroy all copies of the Fluidmesh Firmware. Any use of the Fluidmesh Firmware after termination is unlawful.

19.8. Feedback

You may provide suggestions, comments or other feedback ('Feedback') with respect to Fluidmesh Firmware, and Fluidmesh Devices. Feedback, even if designated as confidential by you, shall not impose any confidentiality obligations on Fluidmesh. You agree that Fluidmesh is free to use, disclose, reproduce, license or otherwise distribute and exploit any Feedback provided by you as Fluidmesh sees fit, entirely without obligation or restriction of any kind on account of intellectual property rights, or otherwise.

19.9. Consent to use of data

You acknowledge and agree that Fluidmesh may, directly or indirectly through the services of third parties, collect and store information regarding the use and performance of the Fluidmesh Firmware and Fluidmesh Devices, and about equipment through which it otherwise is accessed and used.

You further agree that Fluidmesh may use such information for any purpose related to any use of the Fluidmesh Firmware and Fluidmesh Devices by you, including, without limitation, improving the performance of the Fluidmesh Firmware or developing updates and verifying your compliance with the terms of this Agreement and enforcing Fluidmesh's rights, including all intellectual property rights in and to the Fluidmesh Firmware.

Fluidmesh shall have the right to collect and analyze data and other information relating to the provision, use and performance of various aspects of the Fluidmesh Firmware and Fluidmesh Devices and related systems and technologies ('Data'), and you give Fluidmesh the right to use and disclose such Data (during and after the term of this Agreement) in accordance with Fluidmesh's Privacy Policy. If you choose to allow diagnostic and usage collection, you agree that Fluidmesh and its subsidiaries and agents may collect, maintain, process and use diagnostic, technical, usage and related information, including but not limited to unique system or hardware identifiers, information about your

device, system and software, that is gathered periodically to provide and improve Fluidmesh's products and services, facilitate the provision of software updates, product support and other services to you (if any) related to Fluidmesh products, and to verify compliance with the terms of this license. Fluidmesh may use this information, as long as it is collected in a form that does not personally identify you, for the purposes described above.

To enable Fluidmesh's partners and third-party developers to improve their software, hardware and services designed for use with Fluidmesh products, Fluidmesh may also provide any such partner or third-party developer with a subset of diagnostic information that is relevant to that partner's or developer's software, hardware and/or services, as long as the diagnostic information is in a form that does not personally identify you.

19.10. Warranty disclaimer

Fluidmesh Firmware, including without limitation any open source software, any Fluidmesh Device, and any accompanying documentation are provided 'As is', and Fluidmesh and its suppliers make, and you receive, no warranties or conditions, whether express, implied, statutory or otherwise, or in any communication with you, and Fluidmesh and its suppliers specifically disclaim any implied warranty of merchantability, satisfactory quality, fitness for a particular purpose, or non-infringement and their equivalents.

Fluidmesh does not warrant that the operation of the Fluidmesh Firmware will be uninterrupted or error-free or that the Fluidmesh Firmware will meet your specific requirements. You acknowledge that Fluidmesh has no support or maintenance obligations for the Fluidmesh Firmware.

19.11. Limitation of liability

Except to the extent that liability may not by law be limited or excluded, in no event will Fluidmesh or its suppliers be liable for loss of, or corruption to data, lost profits or loss of contracts, cost of procurement of substitute products or other special, incidental, punitive, consequential or indirect damages arising from the supply or use of the Fluidmesh Firmware, howsoever caused and on any theory of liability (including without limitation negligence).

This limitation will apply even if Fluidmesh or an authorized distributor or authorized reseller has been advised of the possibility of such damages, and notwithstanding the failure of essential purpose of any limited remedy. In no event shall Fluidmesh's or its suppliers' or its resellers' liability exceed five hundred United States dollars (US\$ 500). You acknowledge that this provision reflects a reasonable allocation of risk.

19.12. Exclusion of liability for emergency services

Fluidmesh does not support, nor are the services intended to support or carry, emergency calls to any emergency services, including but not limited to 911 dialing.

Fluidmesh will not be held responsible for any liability or any losses, and you, on behalf of yourself and all persons using the services through the licensed products, hereby waive any and all such claims or causes of action for losses arising from, or relating to, any party's attempts to contact emergency service providers using the licensed products, including but not limited to calls to public safety answering points.

Fluidmesh will not be held liable for any losses, whether in contract, warranty, tort (including negligence), or any other form of liability, for any claim, damage, or loss, (and you hereby waive any and all such claims or causes of action), arising from or relating to your (i) inability to use the services to contact emergency services, or (ii) failure to make additional arrangements to access emergency services.

The parties expressly acknowledge and agree that Fluidmesh has set its prices and entered into this agreement in reliance upon the limitations of liability and disclaimers of warranties specified herein, which allocate the risk between Fluidmesh and the end user and form a basis of the bargain between the parties.

19.13. Export control

You acknowledge that the Fluidmesh Devices, Fluidmesh Firmware, documents, technical data, and any other materials delivered under this Agreement are subject to U.S. export control laws, and may also be subject to export or import regulations in other countries. You agree to comply strictly with these laws and regulations and acknowledge that you have the responsibility to obtain any licenses to export, re-export, or import as may be required after delivery to you. You shall not, directly or indirectly, export, re-export or release the Fluidmesh Devices and Fluidmesh Firmware, to, or make the Fluidmesh Devices and Fluidmesh Firmware accessible from any jurisdiction or country to which export, re-export or release is prohibited by law, rule or regulation. In particular, but without limitation, the Fluidmesh Devices and Fluidmesh Firmware may not be exported or re-exported (a) into any U.S. embargoed countries or (b) to anyone on the U.S. Treasury Department's list of Specially Designated Nationals or the U.S. Department of Commerce Denied Person's List or Entity List.

By using the Fluidmesh Devices and Fluidmesh Firmware, you represent and warrant that you are not located in any such country or on any such list. You acknowledge and agree that you shall strictly comply with all applicable laws, regulations and rules, and complete all required undertakings (including obtaining any necessary export license or other governmental approval), prior to operating the Fluidmesh Devices and

Fluidmesh Firmware, or exporting, re-exporting, releasing or otherwise making the Fluidmesh Devices and Fluidmesh Firmware available outside the U.S. You acknowledge and agree that Fluidmesh has no further responsibility after the initial delivery to you, and you hereby agree to indemnify and hold Fluidmesh harmless from and against all claim, loss, liability or damage suffered or incurred by Fluidmesh resulting from, or related to your failure to comply with all export or import regulations.

19.14. General

This Agreement shall not be governed by the 1980 U.N. Convention on Contracts for the International Sale of Goods. Rather, this Agreement shall be governed by the laws of the State of Illinois, including its Uniform Commercial Code, without reference to conflicts of laws principles. You agree to the exclusive jurisdiction and venue of the State and Federal courts in Illinois, United States.

This Agreement is the entire agreement between you and Fluidmesh, and supersedes any other communications or advertising with respect to the Fluidmesh Firmware and accompanying documentation. If any provision of this Agreement is held invalid or unenforceable, such provision shall be revised to the extent necessary to cure the invalidity or unenforceability, and the remainder of the Agreement shall continue in full force and effect.

This Agreement and all documents, notices, evidence, reports, opinions and other documents given or to be given under this Agreement (collectively with this Agreement, 'Documents') are and will be written in the English language only. In the event of any inconsistency between any Document in the English language and any translation of it into another language, the English-language Document shall prevail. If you are acquiring the Fluidmesh Firmware on behalf of any part of the U.S. Government, the following provisions apply: The Fluidmesh Firmware and accompanying documentation are deemed to be 'commercial computer software' and 'commercial computer software documentation' respectively, pursuant to DFAR Section 227.7202 and FAR 12.212(b), as applicable. Any use, modification, reproduction, release, performance, display or disclosure of the Fluidmesh Firmware and/or the accompanying documentation by the U.S. Government or any of its agencies shall be governed solely by the terms of this Agreement and shall be prohibited except to the extent expressly permitted by the terms of this Agreement. Any technical data provided that is not covered by the above provisions is deemed to be 'technical data-commercial items' pursuant to DFAR Section 227.7015(a). Any use, modification, reproduction, release, performance, display or disclosure of such technical data shall be governed by the terms of DFAR Section 227.7015(b).

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