



## Supplemental Manual



# SWARM MESA®



Research Electronics International, LLC



# SWARM MESA<sup>®</sup>

## Supplemental Manual

This document is intended to provide guidance and instruction on using the SWARM MESA™ to protect a user-determined Area of Interest (AOI) and detect RF signals in the given area.

This manual contains proprietary information intended solely for use with the SWARM MESA™ product.

The overall effectiveness of this product, and of any surveillance countermeasure, is dependent on the threat level and the user's ability to properly use the appropriate equipment.

REI offers the world's largest commercially available Technical Security training facility. Training courses include classroom instruction and hands-on exercises where students perform sweep exercises in "live" environments using target-rich project rooms. The progressive course curriculum is designed for the beginner or the seasoned Technical Security Technician.

Regularly scheduled courses are taught monthly; visit REI's website ([www.reiusa.net](http://www.reiusa.net)) or contact REI ([sales@reiusa.net](mailto:sales@reiusa.net)) for training dates.

Revision 1.1

© COPYRIGHT RESEARCH ELECTRONICS INTERNATIONAL

REI products are designed and intended for legal commercial applications. However, because laws and regulations vary from state to state and country to country, it is the sole responsibility of the purchaser and user/operator to check and comply with all applicable laws and regulations for the possession and operation of this equipment before and after making a purchase.

Information contained in this manual, including product operation and specifications, is subject to change without notice.

Any product or brand names contained in this manual are used only for identification purposes and are trademarks or registered trademarks of their respective holders.



**Research Electronics International, LLC**

455 Security Drive, Cookeville, TN 38506

U.S.A. (800) 824-3190 (US Only)

+1 931-537-6032

[www.reiusa.net](http://www.reiusa.net)

## SWARM MESA® Kit Case Contents



### First layer

- 1) Laptop sleeve
- 2) Laptop (inside sleeve)
- 3) 4 MESA units



### Second layer

- 4) Plastic box containing:
  - a) SWARM software USB key
  - b) 5 WiFi 5 USB adapters
- 5) 4 Omni-directional antennas
- 6) 6 Ethernet cables
- 7) Laptop power supply
- 8) 4 MESA power supply adapters
- 9) 4 Power supply plug adapters

## SWARM MESA® Cable Kit Case Contents



- 1) 7 Retractable Ethernet cables (large)
- 2) REI clamshell case (left, containing #3 & 4)
- 3) Ethernet switch
- 4) Ethernet switch power adapter
- 5) REI clamshell case (right, containing #6)
- 6) 7 Retractable Ethernet cables (small)

# Table of Contents

<b>SWARM MESA® Kit Case Contents</b> .....	<b>4</b>
<b>SWARM MESA® Cable Kit Case Contents</b> .....	<b>5</b>
<b>General Description</b> .....	<b>8</b>
<i>SWARM MESA® Kit Contents Description</i> .....	8
MESA Units .....	8
Omnidirectional Antennas .....	8
SWARM Laptop .....	9
Wi-Fi 5 USB Adapter .....	9
SWARM Software USB key .....	9
Use of Additional Search Probes .....	9
<b>SWARM MESA Physical Installation</b> .....	<b>10</b>
Place and Connect the Computer .....	10
Place and Connect the MESA Units .....	10
Connect Laptop to MESA Units .....	10
Connect Laptop to MESA Units .....	13
<b>SWARM Software Setup and General Use</b> .....	<b>15</b>
<i>Quick Setup Feature</i> .....	15
<i>Start Guide Feature</i> .....	21
<i>Creating and Scheduling Missions</i> .....	23
Creating a Mission .....	23
Scheduling an Ongoing Mission .....	29
<i>Editing Alarms</i> .....	30
<i>Exporting Lists</i> .....	36
<b>Appendix</b> .....	<b>37</b>
<i>System Requirements</i> .....	37
Hardware .....	37
Software .....	38
Network .....	38
<i>Specifications</i> .....	39
SWARM MESA Kit .....	39
SWARM MESA Cable Kit .....	40

## Table of Contents

<b>SWARM MESA® Kit Case Contents</b> .....	<b>4</b>
--	----------

<b>SWARM MESA® Cable Kit Case Contents .....</b>	<b>5</b>
<b>Table of Contents.....</b>	<b>6</b>
<b>General Description .....</b>	<b>8</b>
<i>SWARM MESA® Kit Contents Description.....</i>	<i>8</i>
MESA Units .....	8
Omnidirectional Antennas .....	8
SWARM Laptop .....	9
Wi-Fi 5 USB Adapter.....	9
SWARM Software USB key.....	9
Use of Additional Search Probes.....	9
<b>SWARM MESA Physical Installation .....</b>	<b>10</b>
Place and Connect the Computer .....	10
Place and Connect the MESA Units.....	10
Connect Laptop to MESA Units.....	10
Connect Laptop to MESA Units.....	13
<b>SWARM Software Setup and General Use .....</b>	<b>15</b>
<i>Quick Setup Feature .....</i>	<i>15</i>
<i>Start Guide Feature .....</i>	<i>21</i>
<i>Creating and Scheduling Missions.....</i>	<i>23</i>
Creating a Mission .....	23
Scheduling an Ongoing Mission .....	29
<i>Editing Alarms .....</i>	<i>30</i>
<i>Exporting Lists .....</i>	<i>36</i>
<b>Appendix .....</b>	<b>37</b>
<i>System Requirements.....</i>	<i>37</i>
Hardware .....	37
Software.....	38
Network .....	38
<i>Specifications.....</i>	<i>39</i>
SWARM MESA Kit .....	39
SWARM MESA Cable Kit.....	40

## General Description

The SWARM MESA™ is a system of MESA 2.0™ units tethered via Ethernet to a computer software system (SWARM) that assimilates RF signal input and compares these signals by both location and time to monitor for emerging potential threat devices. The SWARM MESA requires four to five MESA units for the protection of a user-created Area of Interest (AOI). A single MESA unit is placed inside the AOI, with three to four MESA units placed outside the AOI. Typical use will see the AOI to be a single room. In this guide, the MESA placed within the AOI will be referred to as the AOI MESA. Units placed exterior to the AOI will be referred to as Sensor MESAs.

Events, such as meetings, are protected by a Mission. Missions can either be ongoing (constant AOI protection without a scheduled end) or set for a defined period of time (see p. 23). A Mission can be created ahead of time with signal filtering for background RF (e.g., a radio station). Similar to a reference trace in MESA's SmartBars™ mode (see MESA 2.0 User Manual, p. 44), the Mission will collect an environmental reading for signals prior to an event and then monitor for new signals entering the area during an event. The Mission, however, will continue to compare past signals (the environmental reading) with present signals and current inside signals compared with current outside signals. It will present the user with alerts for new potential threat signal incidents as they appear. Geolocation and signal data are available in real-time. All signal data collected during the Mission will be saved for later analysis.

## SWARM MESA® Kit Contents Description

The SWARM MESA case contains four MESA units, four omnidirectional antennas, five Wi-Fi 5 USB adapters, a laptop containing SWARM software, and a software USB key. Additional MESA units can be purchased from REI.

### MESA Units

The MESA units are fully functional MESA 2.0 units that can be used individually as needed. (Please refer to the MESA 2.0 User Manual for guidance on this type of use.) For this guide, the MESA units should be placed in Spectrum Mode and connected via Ethernet cables to a computer running the SWARM software. See p. 10.



### Omnidirectional Antennas

The Omnidirectional Antenna is designed to receive signals from all directions perpendicular to the antenna. This will allow the SWARM MESA system to detect and geolocate signals to best protect the Area of Interest. Please use only the Omnidirectional Antenna with the SWARM MESA system.



Frequency range: 30 MHz – 6 GHz

*Note: Low-end antenna frequency performance: The Omnidirectional Antenna performance rolls off from 450MHz to 50MHz by approximately 20 dB, but the antenna is usable even below 30MHz.*

### SWARM Laptop

A laptop computer with SWARM software installed is included in the SWARM MESA product. This software requires the SWARM Software Key, also included. Insert the software key into the computer's USB port.

### Wi-Fi 5 USB Adapter

For use with the SWARM MESA, REI has provided Wi-Fi adapters. These are needed for the system to coordinate timing data for geolocation and data packet information. Insert one into each MESA unit via



one of the two USB ports located at the top of the unit. The MESAs have built-in capability for Wi-Fi, but that feature is not intended for SWARM MESA use.

*Please note: The button feature on the back of the Wi-Fi dongle is not used by the MESA. Take care not to press it, as it will implement options that may interfere with the SWARM MESA system.*

### SWARM Software USB key

The USB key is required to use the SWARM software.

### Use of Additional Search Probes

When useful, additional probes can be used with the MESA for physical searches (available from REI at [reiusa.net](http://reiusa.net)). Alerting signals can be traced to individual devices present within the AOI. For description and use of these probes, please see the 2.0 MESA User Manual (beginning p. 13). When using a MESA to search for a device, please do the following:

- 1) Unlock the screen by entering the password (created below, see p. 12).
- 2) Select the desired mode and appropriate probe to physically search for the device (see pp. 13-17 of the MESA 2.0 User Manual)
- 3) When finished, reconnect the MESA unit to the Ethernet cable and power supply
- 4) Restart the **API** by selecting the **API** tab
- 5) Press **Start**

## SWARM MESA Physical Installation

The SWARM MESA system uses direct Ethernet connections and includes six Ethernet cables (in the main case). The second case contains seven retractable Ethernet cables, an Ethernet switch, and the switch power supply. To prepare the MESAs for installation:

- 1) Connect MESA units to external power
- 2) Insert the Wi-Fi adapters
- 3) Attach the Omnidirectional antennas to the MESA units

### Place and Connect the Computer

After selecting the place to monitor the AOI from, connect the laptop to its power supply and connect the Ethernet cable.

### Place and Connect the MESA Units

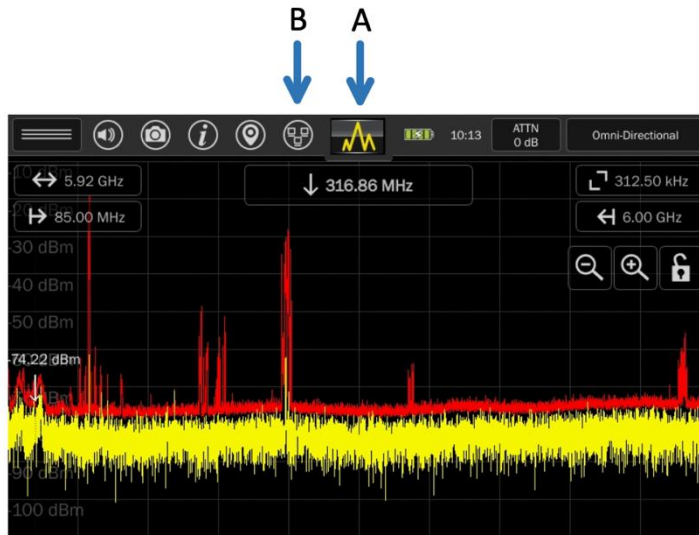
Place the AOI MESA inside the Area of Interest. Place the Sensor MESAs in areas outside the boundaries of the AOI, keeping these guidelines in mind:

- 1) Place Sensing MESA units in a non-square arrangement. Vary the distance and vector of each sensing MESA unit from the AOI MESA unit. A trapezoidal arrangement (if using 4 Sensing MESAs) would be a good practice.
- 2) Avoid allowing large metal objects (filing cabinets, refrigerators, etc.) between the AOI MESA and the sensing MESAs. This may interfere with the SWARM MESA's ability to detect and geolocate signals.
- 3) If the AOI contains external windows, it may be desirable to eliminate radio frequencies after using Quick Setup to create a Mission. See p. 23 for instructions.
- 4) Place all MESA units at desktop level for the best signal reception.
- 5) Take care to place Ethernet and power cables in a manner to avoid tripping hazards or unintended disconnection.

### Connect Laptop to MESA Units

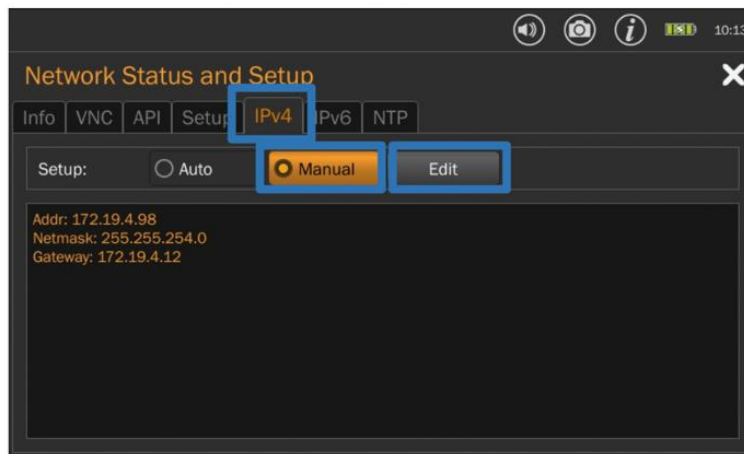
- 1) Prepare each MESA unit for connection:
  - a. If not already selected, place MESA in Spectrum Mode

- b. Press the **Network Settings** icon



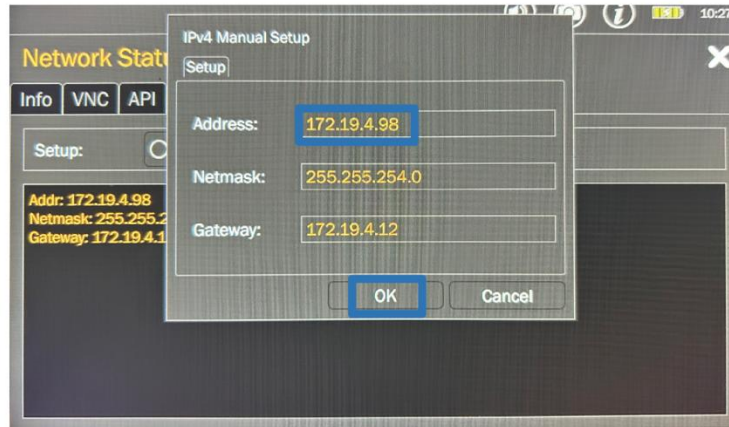
- 2) Each MESA will need a unique IP address. Obtain these IP addresses from the building's IT department. The first three of the four octets will need to match the IP address ("ipconfig" address) set by the computer in the above procedure. To set the IP address for each MESA unit, perform the following steps:

- a. Select the IPv4 tab
- b. Ensure **Manual** is selected
- c. Select **Edit**

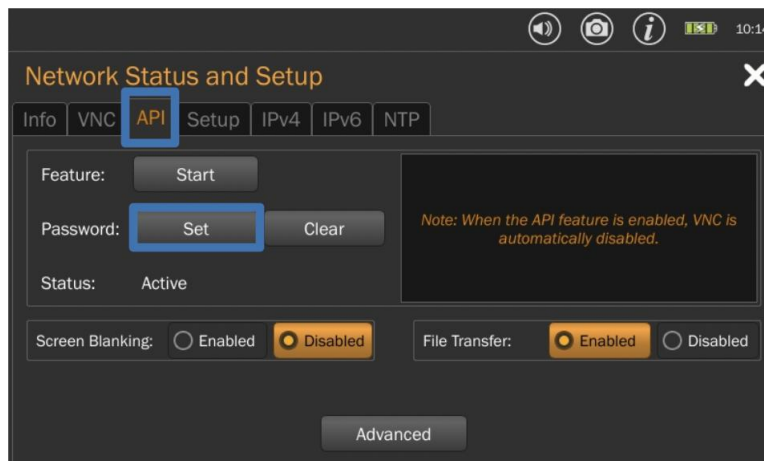


- d. In the next screen, enter the assigned unique IP address for that MESA

- e. Click OK



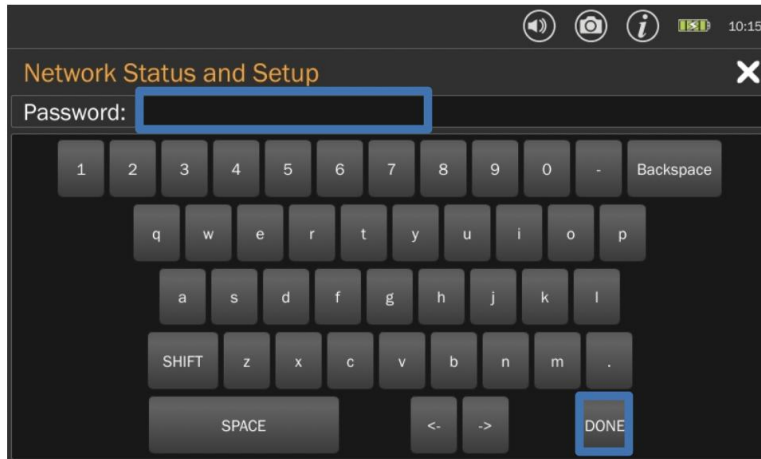
- 3) Start the API
  - a. Select the **API** tab
  - b. Select **Set**



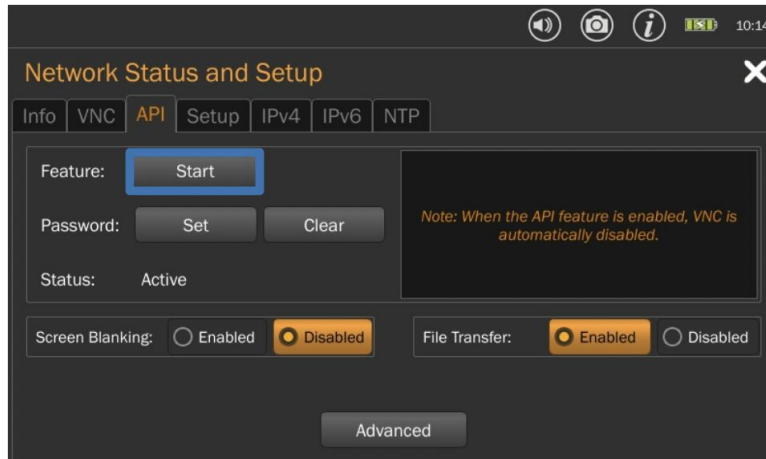
- c. Create and enter a password

Please note: When creating and entering a password, take care to enter it correctly and record it in a secure place. *There is no way for the user to unlock a locked MESA unit without the password.* If the password is lost, please contact REI at Tel: +1 931.537.6032 for assistance.

d. Select **Done**



e. Select **Start**



4) Repeat steps 1-5 for all remaining MESA units

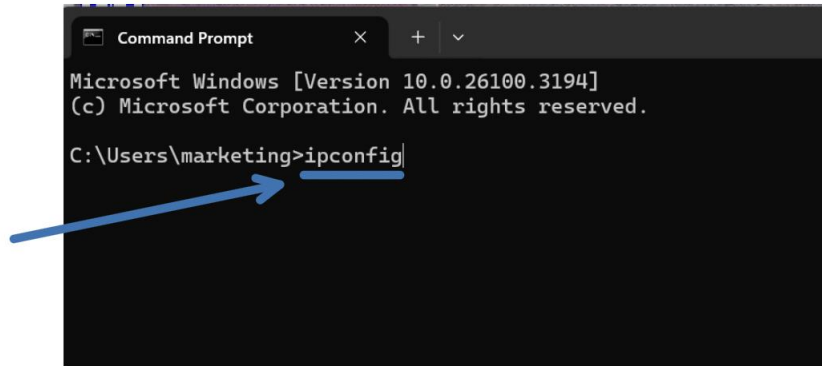
The screens will all now display “Locked for Remote Operation.” To unlock unit(s), press **Unlock** and enter the password.

### Connect Laptop to MESA Units

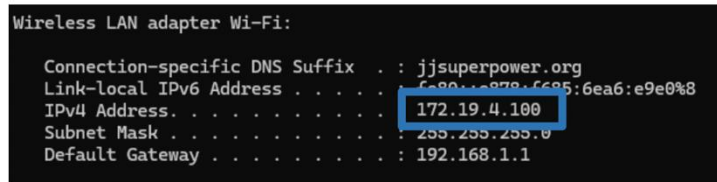
The SWARM system will set the NTP on each connected MESA unit. To implement this, please follow these steps:

1) Obtain the computer IP address:

- a. In the command prompt window, type: "ipconfig" and click **Enter**

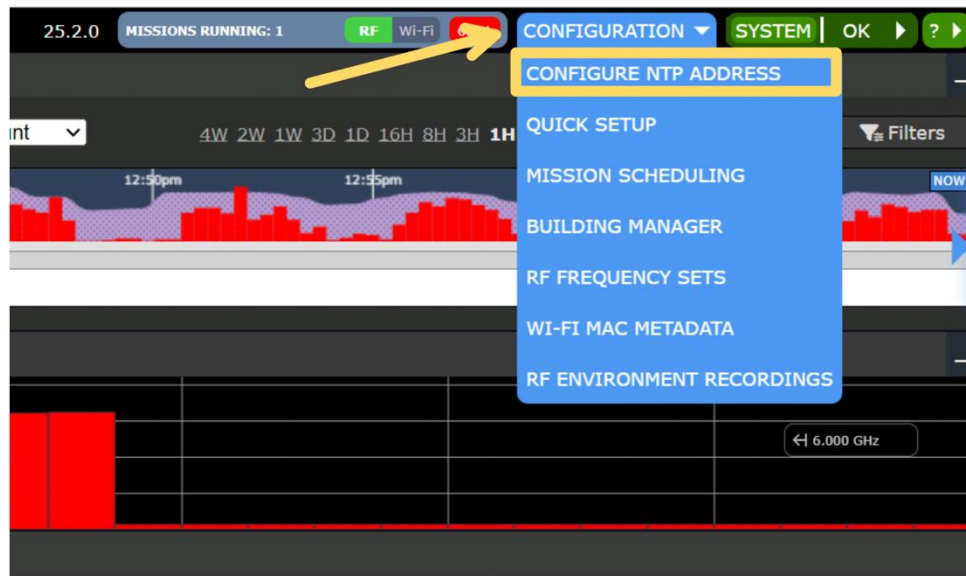


- b. Record the IP address following **IPv4** to use in the next steps  
*This number: 172...etc, is only for illustration. The NTP number will vary by situation.*



2) Set the NTP under **SWARM Settings**

- a. Under **Configuration**, select **CONFIGURE NTP ADDRESS**



- b. In the pop-up box, edit the address to reflect the number obtained in Step #1



- c. Click **Save**

## SWARM Software Setup and General Use

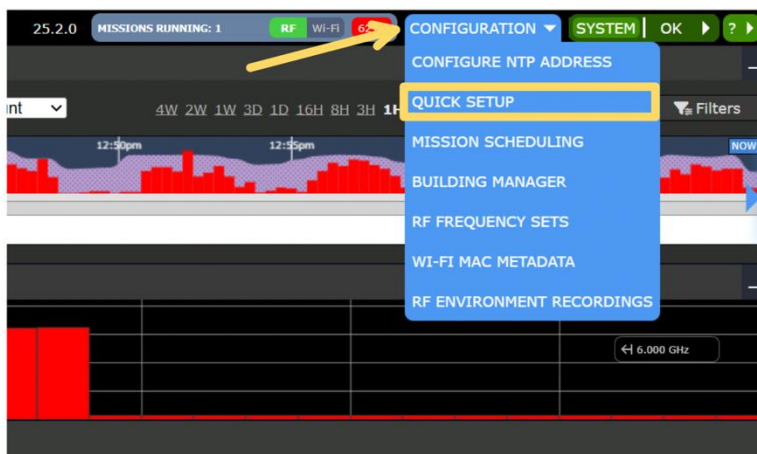
### Quick Setup Feature

The SWARM software provides the **Quick Setup** feature — a guided step-by-step process to set up a Mission in a new location. This guided process is intended for new environments, such as a new building, floor, etc. It will guide the user through creating a target area, an Area of Interest (AOI), and its surrounding area (for Sensor MESAs). Use **Mission Scheduling** (p. to create new missions for the same environment. It is only necessary to use the Quick-Setup feature when in new environments.

*Please note: This initial version of the SWARM MESA user manual will describe only the most basic instructions. Many more SWARM features are available but not covered in this manual version. Please contact REI for the availability of training courses and further literature.*

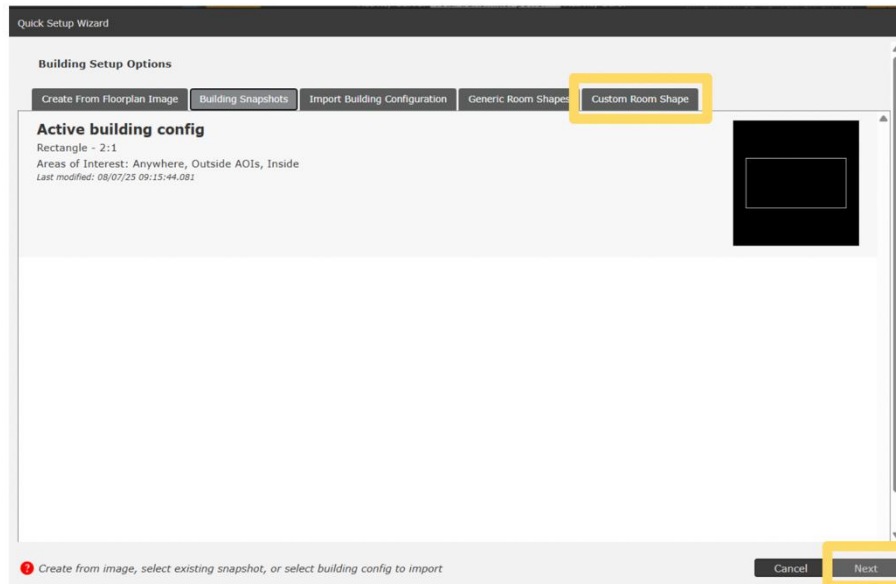
Once the system is physically deployed, use the **Quick Setup** feature by following these steps:

- 1) Under **Configuration**, select the **Quick Setup** option

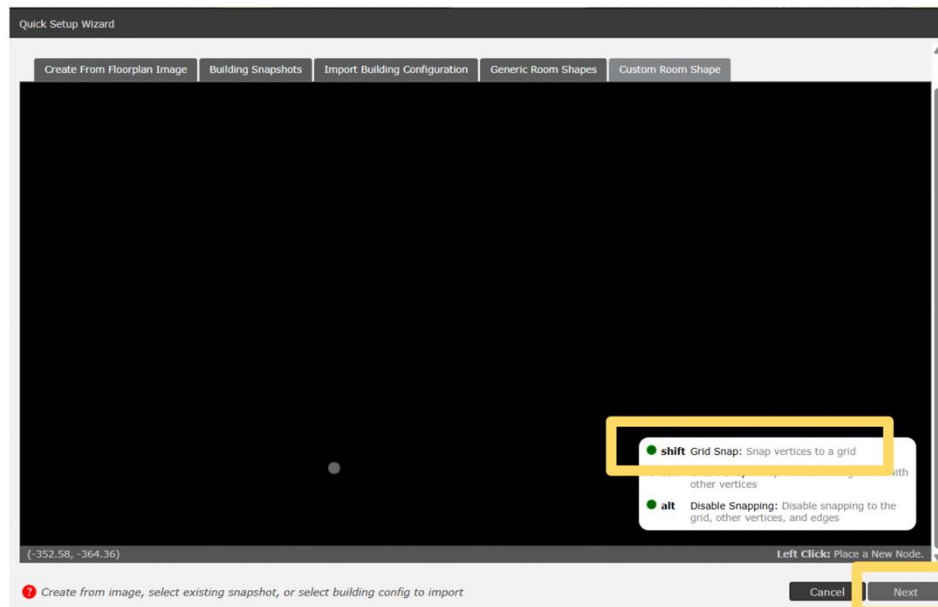


## 2) Building Setup Options

- a. Select the **Custom Room Shape** tab
- b. Select **Next**

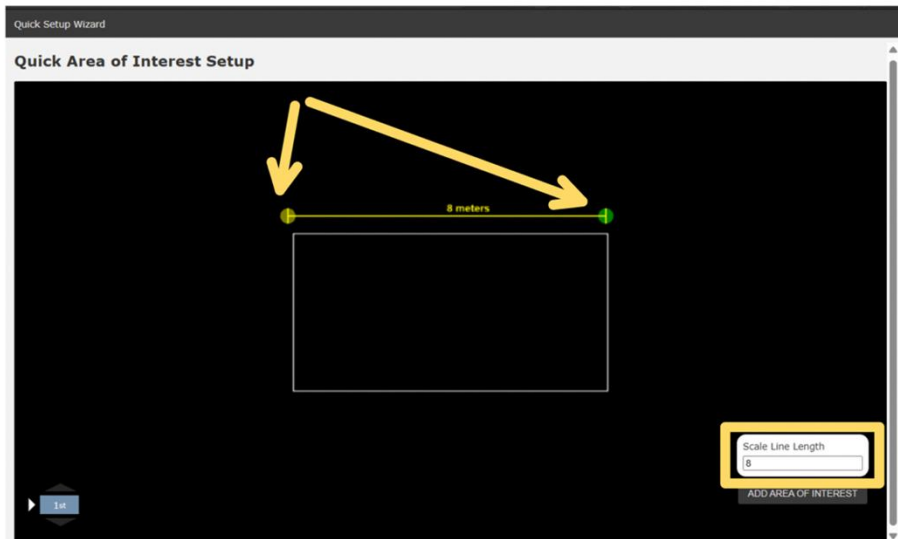


- c. Press the **Shift** key.
- d. In the grid that appears, create the room or area to be monitored

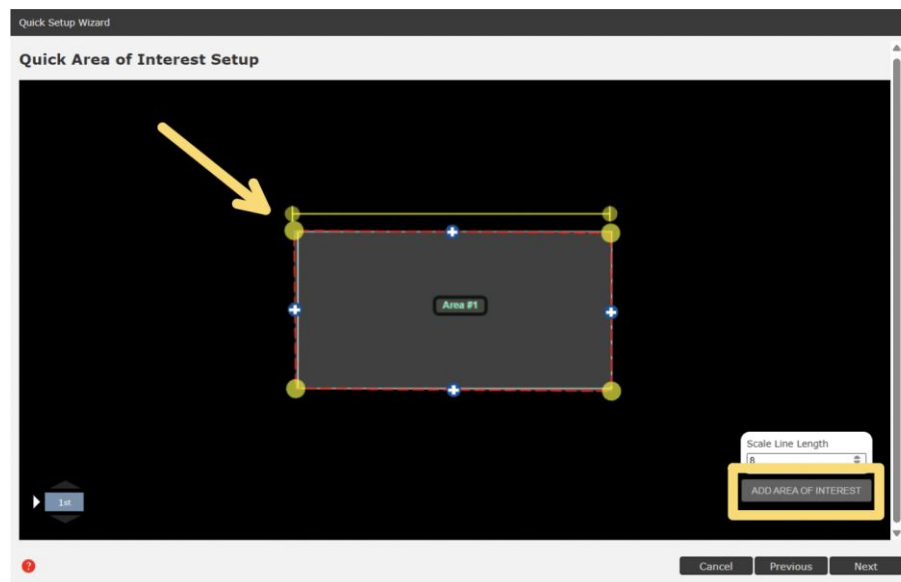


- e. When the desired shape is completed, click **Next**

- f. Adjust the scale line to match one wall of the perimeter. Adjust the meters to match the wall length.

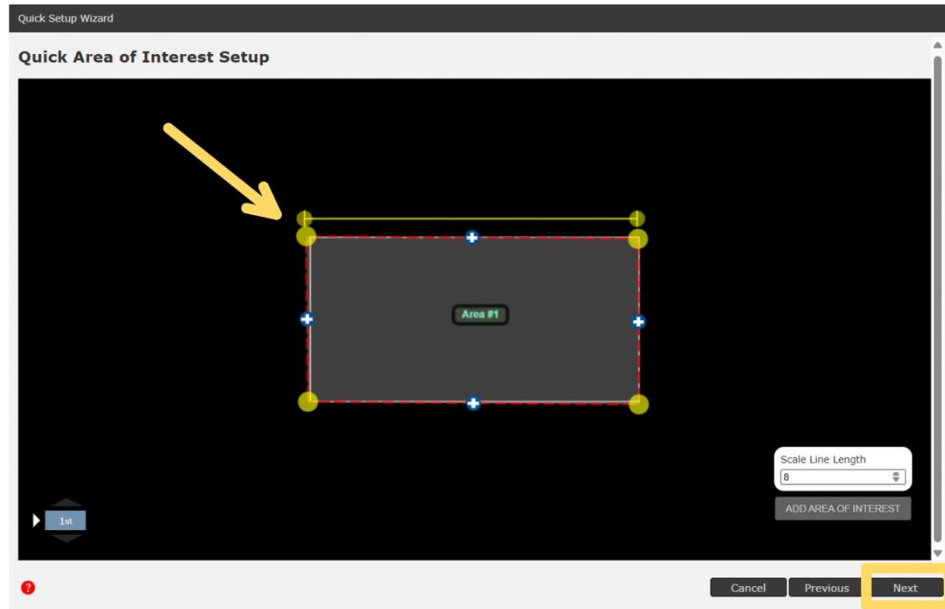


- g. Click **Add Area of Interest** below the *Scale Line Length*



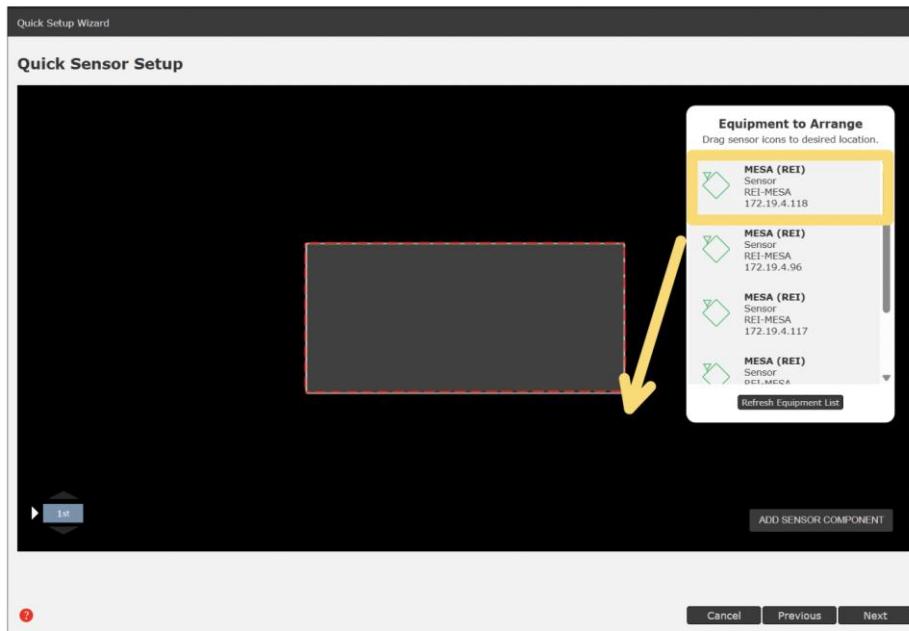
- h. Drag the *Area of Interest* corners to match the area to be monitored

- i. Click **Next**



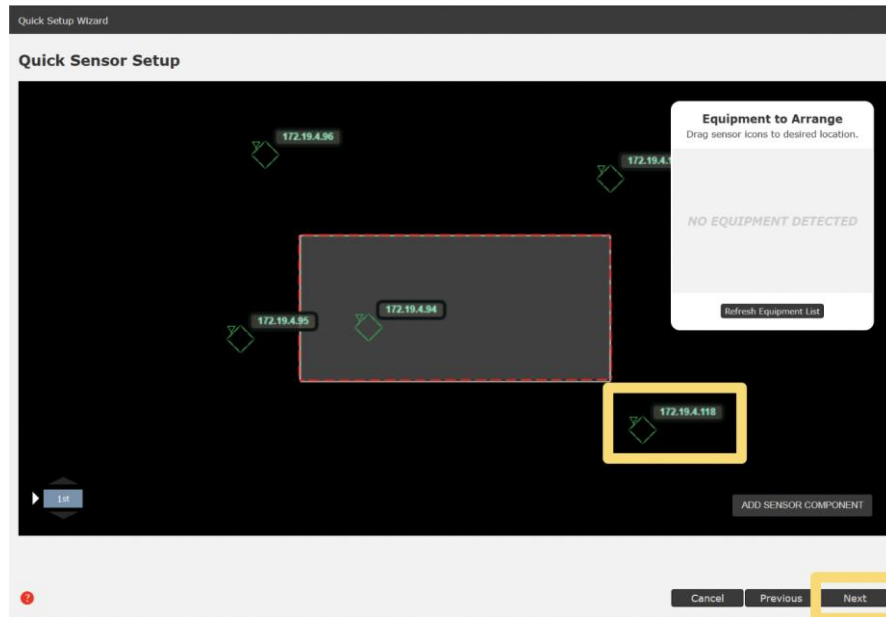
### 3) Quick Sensor Setup

From the pop-up box, drag and drop a MESA to the desired location. It will be identified by the IP address assigned to it by the IT department (see p. 11)



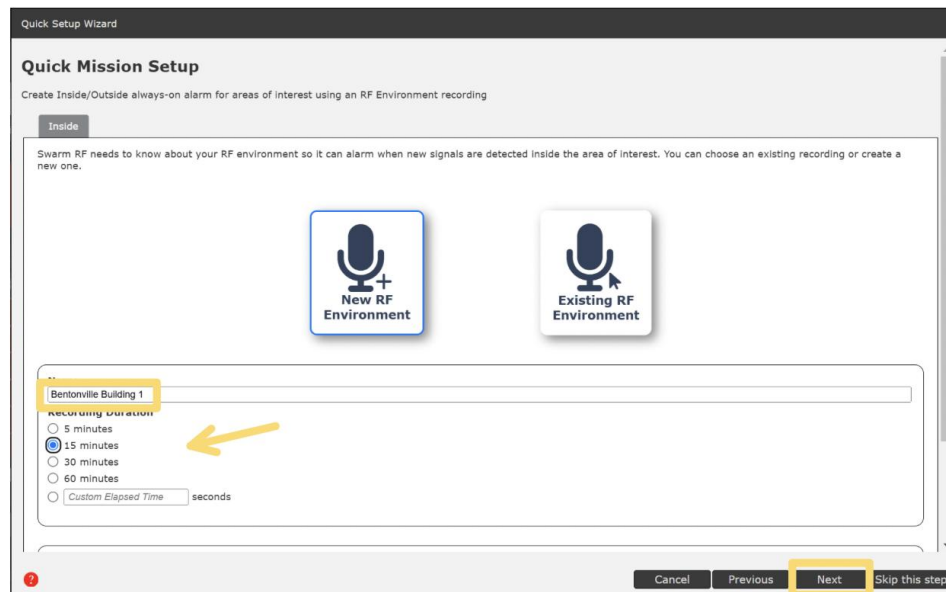
- a. Continue until all MESA units are placed, representative of their real locations

- b. Click **Next**



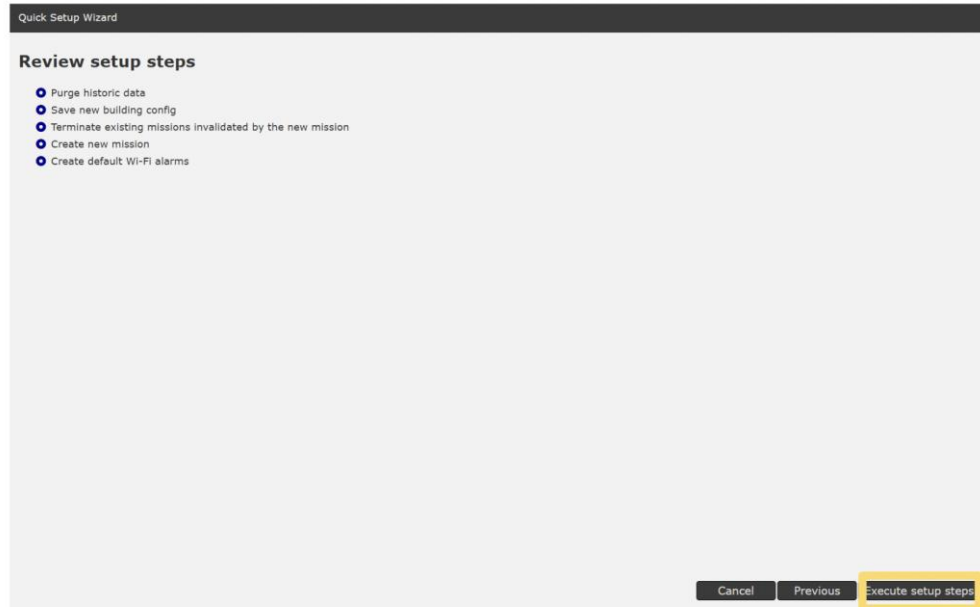
#### 4) Quick Mission Setup

- Select **New RF Environment**
- In the **Name** box, enter a descriptive name (required)
- Select a preset length of time (or create a custom time) to take a background RF baseline reading
- Click **Next**



## 5) Review Setup and Steps

- a. A list of setup steps to be performed is presented
- b. Confirm these steps are desired
- c. Click **Execute setup steps**

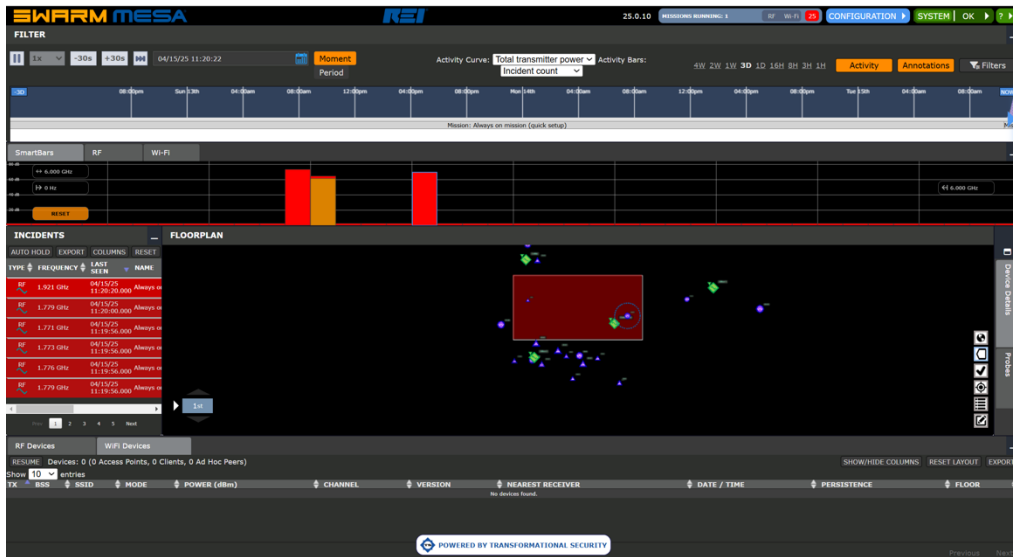


- d. The list will show the completed steps
- e. Click **Close**



## 6) SWARM

The SWARM monitoring software monitoring screen should appear like this:

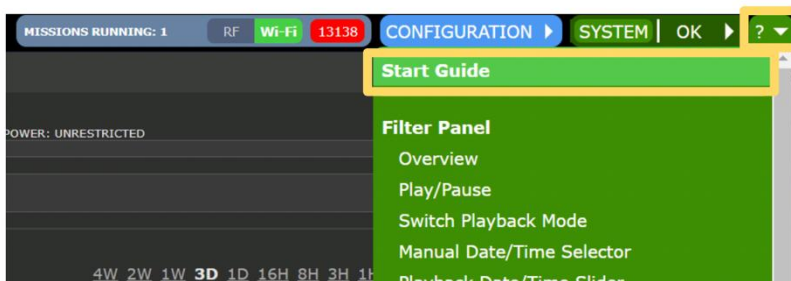


### Start Guide Feature

The SWARM software system contains a tutorial to help the user familiarize themselves with the elements and features of the SWARM Mission home screen. Once the Mission has been created, step through the tutorial for a description of each feature of the home screen.

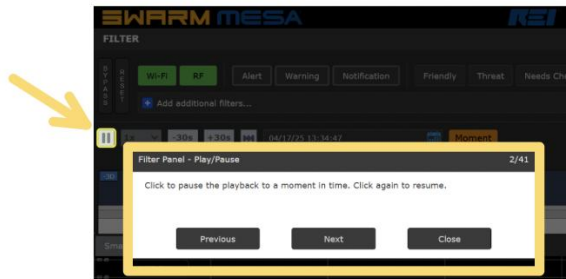
To begin the Start Guide:

- 1) Click on the ? help icon (top right of screen)
- 2) Select **Start Guide**



- 3) A screen element will be highlighted, and a pop-up box explaining the feature will be displayed

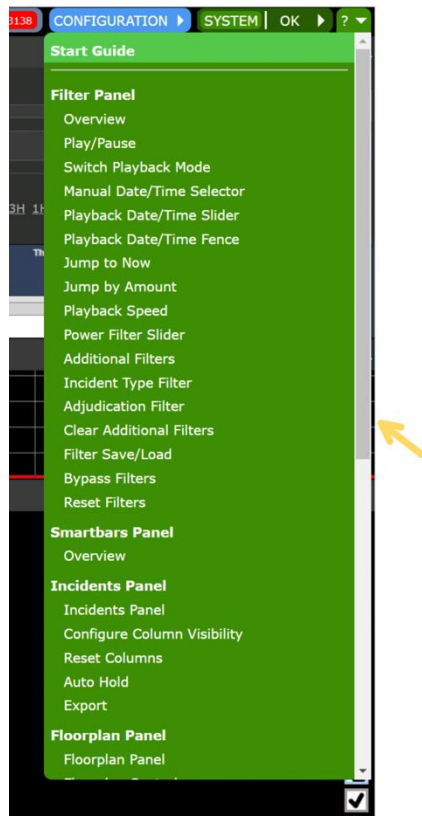
- 4) Select from the options of: Previous, Next, or Close



- 5) Continue through all the screen elements and features

*Or*

- 6) Return to the ? help icon and choose a specific element from the dropdown menu. Use the slider bar to access all items in the menu.



## Creating and Scheduling Missions

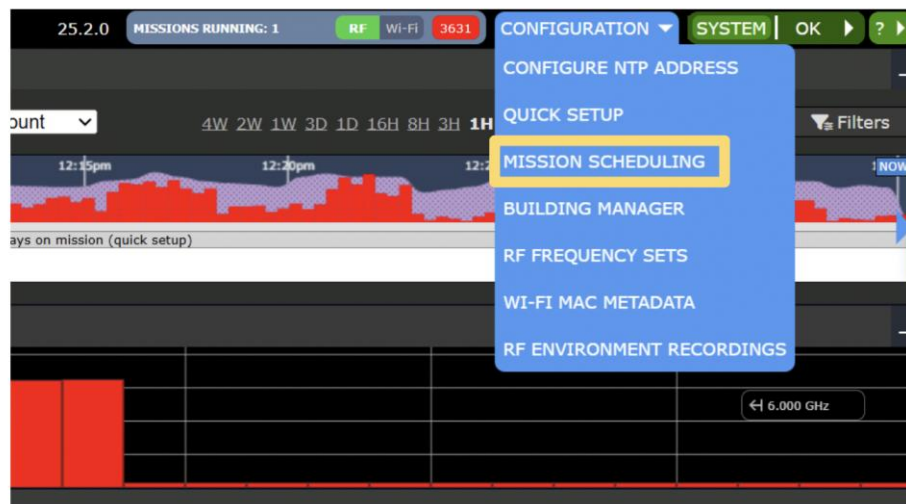
Missions can be created and scheduled on the Mission Calendar to prepare for future events. These will use the building configuration created when a new environment was first encountered. (New locations will need new building configurations and environmental recordings.)

### Creating a Mission

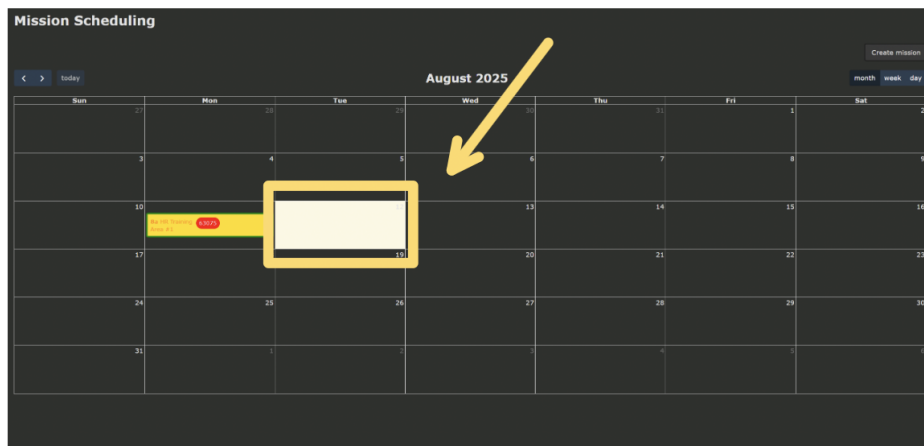
In situations where the SWARM system has been set up in a particular location and the Building Configuration setting area remains as desired, but a new event is about to take place, a new mission can be created. It is not necessary (and is even undesirable) to use the Quick Set-Up process for this situation (see p. 15). Quick Set-Up is designed for new environments only. To create a new mission:

#### 1) Schedule the Mission

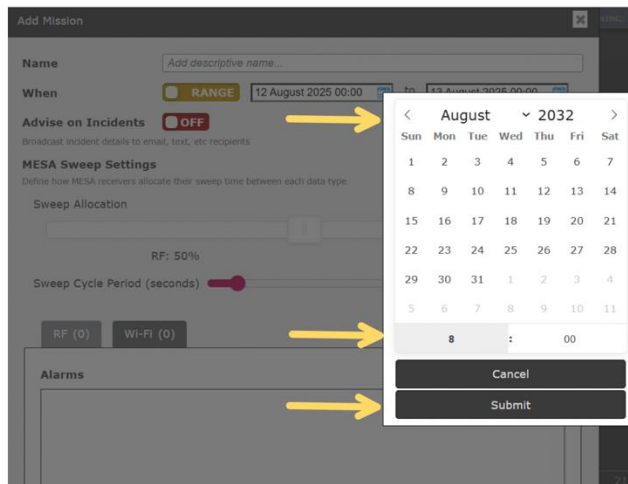
- a. From the **Configuration** menu, select **Mission Scheduling**



- b. Select the date



- c. Create start/stop dates and times, and then select **Submit**



## 2) Set RF alarm

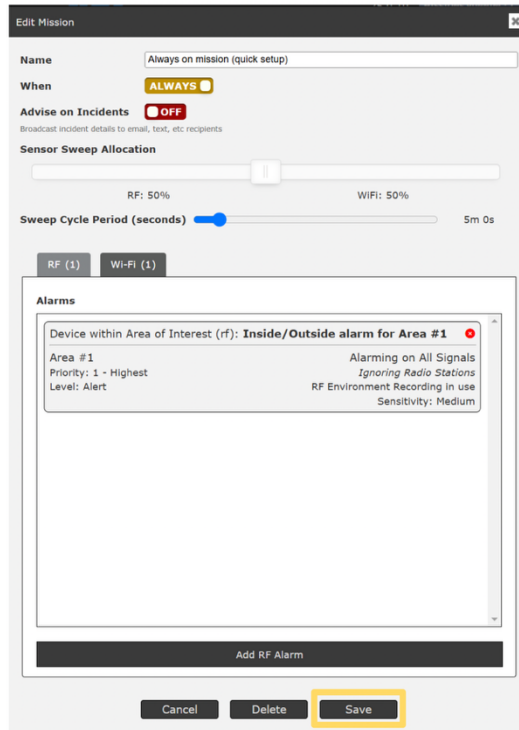
- Select the **RF** tab
- Select **Add RF Alarm**



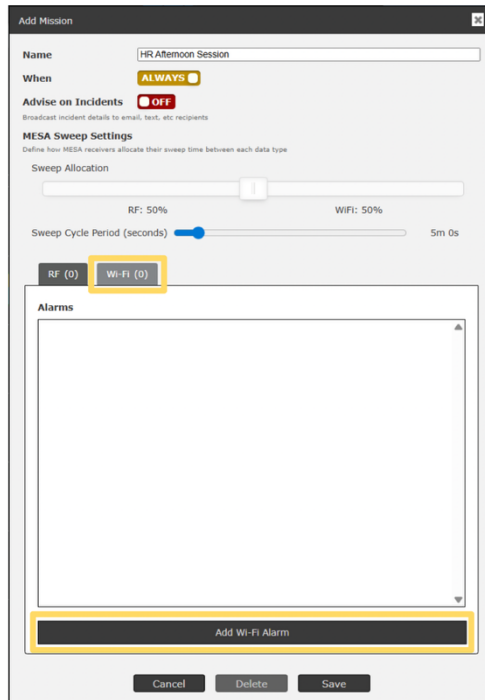
- c. Suggested RF settings:
  - i. Scheduling priority: 1 (Highest)
  - ii. Level: Alert
  - iii. Area of Interest: Area #1
  - iv. Signals of Interest (optional): create **Alarm On** or **Ignore** sets

- v. Select a previous environmental recording
- vi. (scroll down)
- vii. Sensitivity: leave at medium

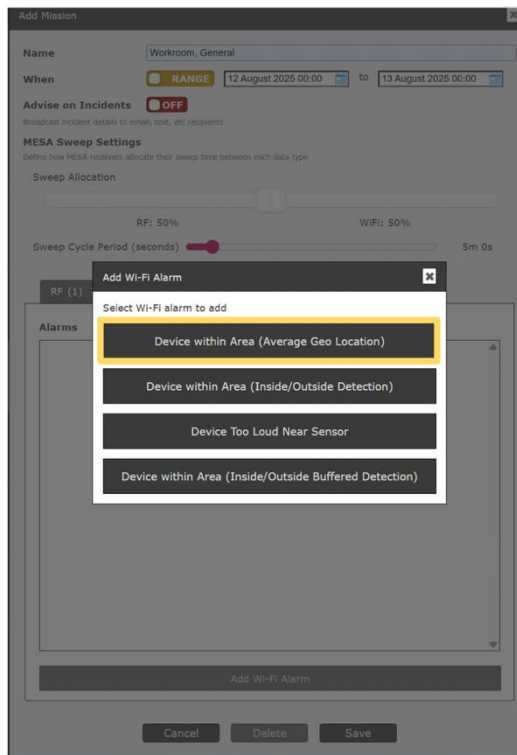
- viii. Click **Add**
- ix. Returning to the x page, click **Save**



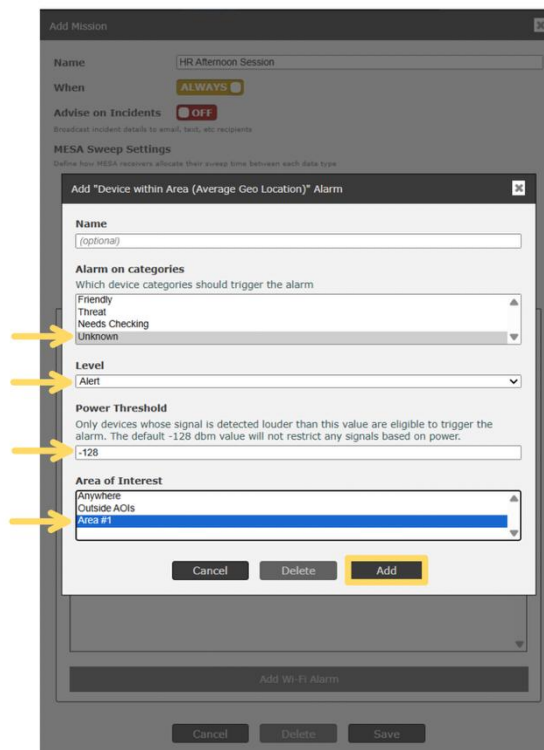
- 3) **Set Wi-Fi alarm**
  - a. Select the **Wi-Fi tab** and then **Add Wi-Fi Alarm**



b. Select Wi-Fi alarm to add: Device within Area (Average Geo Location) (suggested setting)



c. Choose settings (suggested settings):



i. Name: (optional)

- ii. Alarm on categories: Unknown
- iii. Level: Alert
- iv. Power Threshold: leave at -128
- v. Area of Interest: Area#1
- vi. Select **Add**

d. Select **Save**

**Add Mission**

Name: HR Afternoon Session

When: ALWAYS

Advise on Incidents: OFF

**MESA Sweep Settings**  
Define how MESA receivers allocate their sweep time between each data type

Sweep Allocation: RF: 50% WiFi: 50%

Sweep Cycle Period (seconds): 5m 0s

RF (0) Wi-Fi (1)

**Alarms**

Device within Area (Average Geo Location) (wifi): Alarm 1be5af83  
Area #1 Level: Alert Power Threshold: -128 dBm

Add Wi-Fi Alarm

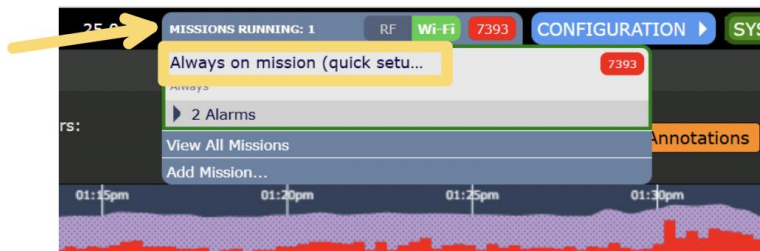
Cancel Delete Save

*Please note: These are only suggested settings and can be altered by the user to suit the environment and event.*

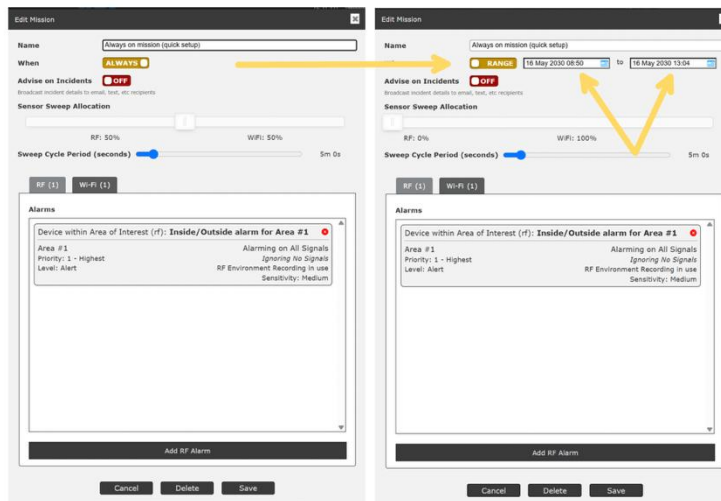
## Scheduling an Ongoing Mission

When using the Quick Setup feature, Missions are **Always On Mission** (ongoing) by default. If desired, these can then be scheduled for a determinate future time. This can be helpful after setting a mission's parameters to then schedule it for a future event. Keep in mind that two missions cannot occur at the same time. Ongoing missions prevent a second mission from being created.

- 1) Hover the mouse over the **Missions Running** tab
- 2) In the drop-down list, select the **Always On Mission**



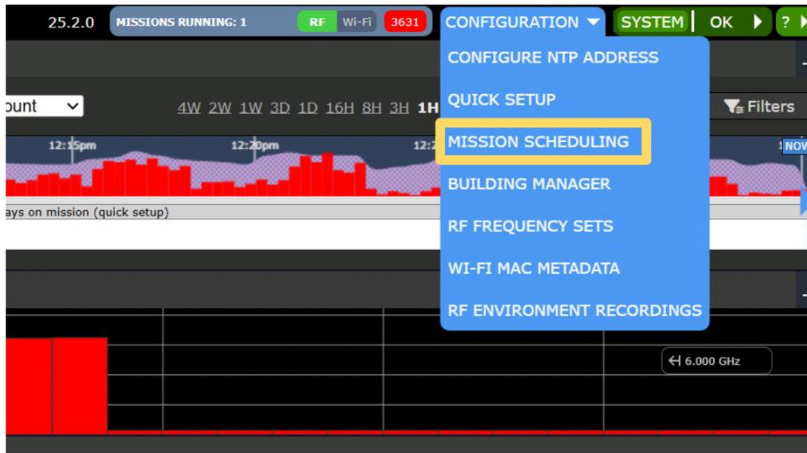
- 3) In the pop-up window, select **Always** and toggle it to **Range**
- 4) Schedule the beginning and end (date and time) in the fields that appear



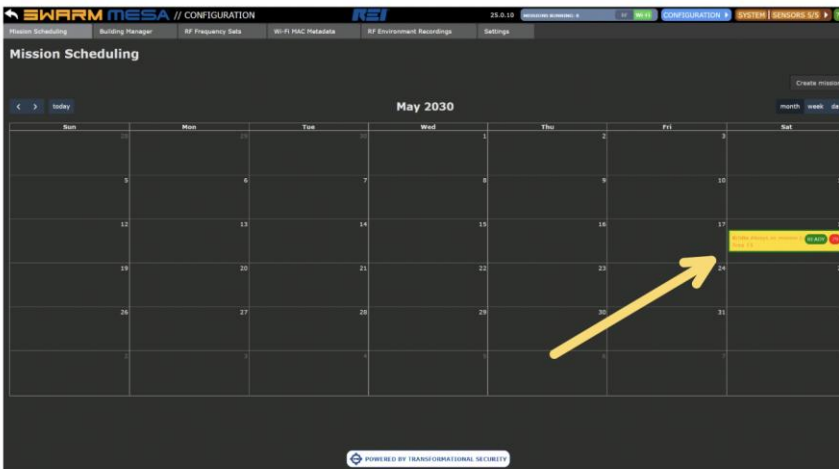
- 5) Click **Save**

To confirm a scheduled mission:

- 1) Select the **Configuration** tab and from the drop-down menu, click on **Mission Scheduling**



- 2) The Missions Calendar will appear. Confirm the Mission is scheduled as desired. Missions can be modified from the calendar view by double-clicking on the scheduled mission. The Mission window will appear.



## Editing Alarms

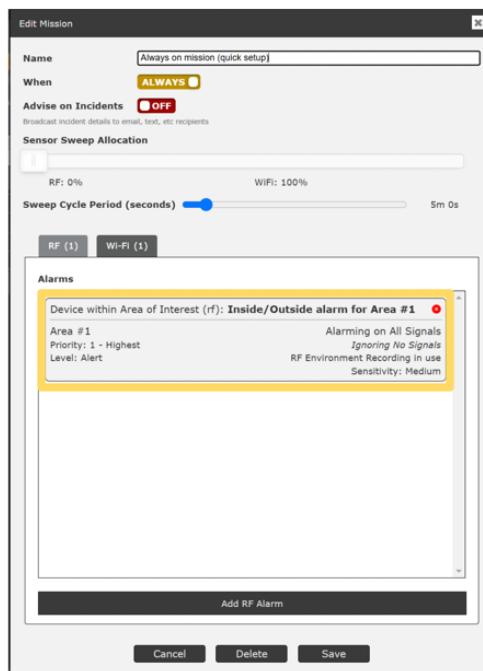
When the Mission is set up, the user may wish to customize a default alarm. For example, as mentioned during the physical setup, it may be helpful to ignore radio station frequencies for an AOI containing windows.

For this example, to ignore radio station frequencies (see p. 10), follow this procedure:

- 1) In the control bar at the top, from the **Missions Running** tab, select the gray box



- 2) **Edit Mission** pop-up window will appear
  - a. Confirm the **RF** tab is selected
  - b. Click within the alarm box to be edited



- 3) **Update "Device within Area of Interest" Alarm** pop-up window

- a. Under **Ignore**, select **Add Frequency Set(s)**

The screenshot shows a configuration window titled "Add 'Device within Area of Interest' Alarm". It contains several sections: "Name" (optional), "Scheduling Priority" (set to 1 - Highest), "Level" (Alert), "Area of Interest" (Anywhere, Outside ACIs, Area #1), "Signals of Interest" (ALARM ON, IGNORE, RF ENVIRONMENT). The "IGNORE" section is highlighted with a yellow arrow, and the "Add Frequency Set(s)" button is visible. The "RF ENVIRONMENT" section shows "None" selected.

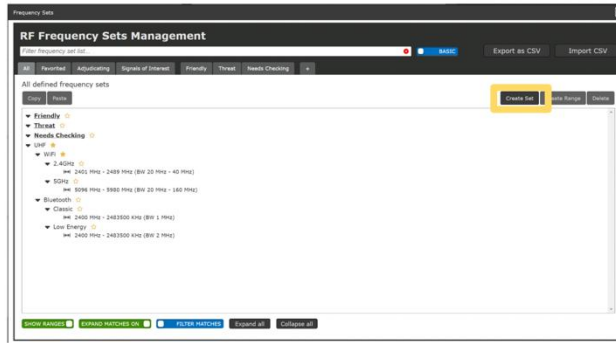
- 4) **Add Frequency Sets to Ignore Definition** pop-up window

- a. Select **Manage Frequency Sets**

The screenshot shows a pop-up window titled "Add Frequency Sets to Ignore Definition". It contains a search bar and three sections: "All Sets", "Favorited Sets", and "Adjudicating Sets". The "All Sets" section lists various frequency sets with "VIEW" and "ADD" buttons. The "Favorited Sets" section lists "UHF > WIFI". The "Adjudicating Sets" section lists "Friendly", "Needs Checking", and "Threat". The "Manage Frequency Sets" button is highlighted with a yellow box.

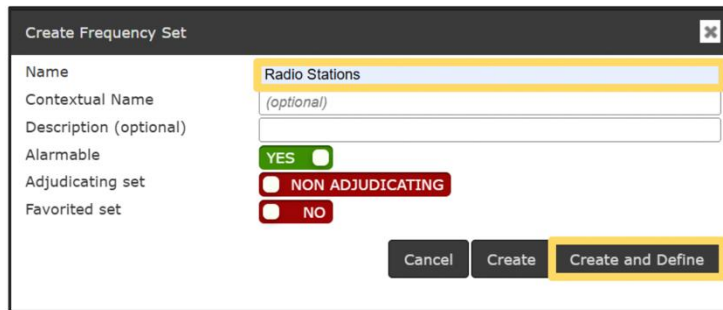
- 5) **RF Frequency Sets Management** pop-up window

a. Select **Create Set**



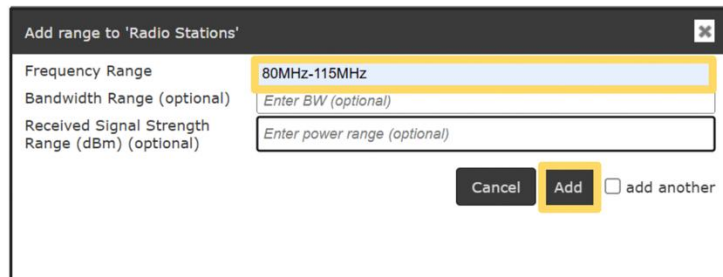
6) **Create Frequency Set** pop-up window

- a. Enter a **Name**
- b. Select **Create and Define**



7) **Add range to 'Radio Stations'** pop-up window

- a. Define desired frequency range
- b. Click **Add**

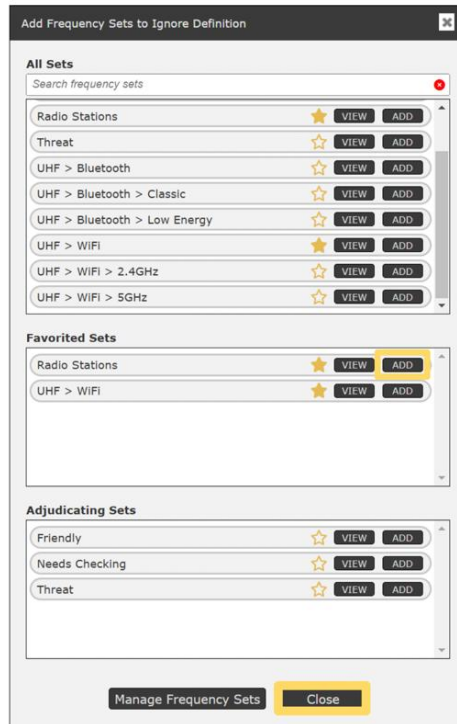


8) Close **Frequency Sets** pop-up window by clicking **X**

9) Returning to **Add Frequency Sets to Ignore Definition**

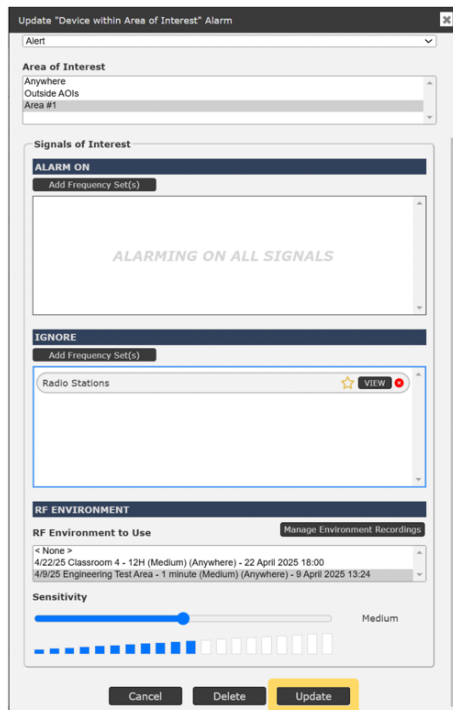
- a. Select the frequency set defined earlier (in this example, **Radio Stations**)
- b. Click **Add**

- c. Click **Close**



- 10) Returning to **Update "Device within Area of Interest" Alarm** pop-up window

- a. Scroll to the bottom  
b. Click **Update**



- 11) Returning to the **Edit Mission** pop-up window
  - a. Confirm the alarm is edited as desired
  - b. Click **Save**

The screenshot shows the 'Edit Mission' interface with the following settings:

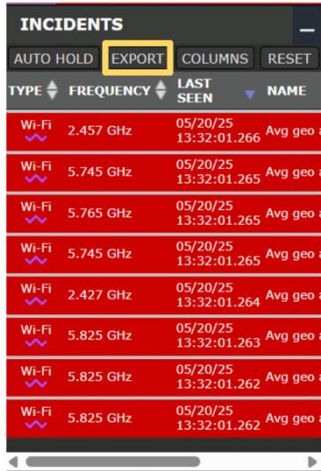
- Name:** Always on mission (quick setup)
- When:** ALWAYS
- Advise on Incidents:** OFF
- Sensor Sweep Allocation:** RF: 50%, WiFi: 50%
- Sweep Cycle Period (seconds):** 5m 0s
- Alarms:** A list containing one alarm: "Device within Area of Interest (rf): Inside/Outside alarm for Area #1". The alarm details are: Area #1, Priority: 1 - Highest, Level: Alert, Alarming on All Signals, Ignoring Radio Stations, RF Environment Recording in use, Sensitivity: Medium.

At the bottom, there are three buttons: Cancel, Delete, and Save. The Save button is highlighted with a yellow border.

## Exporting Lists

The SWARM software compiles found signals into various lists. On the left side of the home screen is the Alarm Incident list. This contains signals that fall within the user-set parameters of potential threat devices. There are also comprehensive lists (both RF and WiFi) found signals located at the bottom of the home screen. These can all be exported for further analysis or creating reports. For the purposes of this manual, the Alarm Incident List will be used as an example for exporting. Comprehensive RF and WiFi lists can also be exported in the same manner. To export the Alarm Incident List:

- 1) Under **Incidents**, select **Export**



- 2) In the pop-up that appears, type “csv” into the field that follows **Output NULL values as:**
- 3) Leave defaults **Full date/time (ISO)** and leave unchecked the box following **Include metadata file:**
- 4) Select **Export**



- 5) View the exported **.csv** file in a spreadsheet program such as MS Excel.

## Appendix

### System Requirements

#### Hardware

- MESA receivers
- Processing computer — SWARM requires a computer to run the back-end software (database, processing, analytics engine, and NTP time server)
  - Minimum system requirements:
    - Windows 10
    - Intel i5 or equivalent
    - 32 GB RAM
    - 500 GB disk space
    - 1440×900 graphic resolution
    - Gigabit Ethernet adapter
  - Recommended system configuration:
    - Intel i7 2.5 GHz or faster processor
    - 64 GB RAM
    - Nvidia 900/Radeon 400 series or equivalent with 4 GB VRAM

## Software

SWARM has been tested on Windows 10/11 and requires Chrome (included).

## Network

- **Gigabit Ethernet and switches**

**Ports** (TCP, except where noted)

Port	Purpose
3001	Message Server
3030	Activity Server Manager
3306	MySQL Database
4430	Web Server (HTTPS)
7000	License Server
7100	Sensor Status
8000	Web Server (HTTP)
8500	Spear Engine Interface
8586	SWARM Supervisor
9017	REST Server Node
9007	Spear Engine
20292	IRIS SCPI
30000 – 30099	Activity Service Client
43000	RRCP / MESA Control & Data (TCP) RRCP / MESA Autodiscover (UDP)

## Specifications

### SWARM MESA Kit

#### Case

<b>Weight with contents</b>	31 lbs. (14 kg)
<b>Dimensions</b>	21.96 x 13.97" x 8.98 (55.8 x 35.5 x 22.8 cm)

#### Laptop

Lenovo ThinkPad P16s Gen3 (Intel)	
<b>Battery</b>	75Wh
<b>Power Adapter</b>	135W USB-C Slim (3-pin)
<b>Dimensions (WxDxH)</b>	14.24 x 9.97 x .083 in
<b>Weight</b>	4.01 lbs. (1.82 kg)
<b>Operating System</b>	Windows 11 Pro, English
<b>Ports</b>	1 x USB-A 1 x USB-A, Always On 2 x USB-C 1 x HDMI 1x Headphone/microphone 3.5 mm
<b>Mil-Spec Test</b>	MIL-STD-810 military test passed

#### MESA 2.0

See the included MESA 2.0 manual.

## SWARM MESA Cable Kit

### Case

<b>Weight with contents</b>	22 lbs. (10 kg)
<b>Dimensions</b>	21.96 x 13.97" x 8.98 (55.8 x 35.5 x 22.8 cm)

### Ethernet Switch

Gigabit Unmanaged Essentials Switch (NETGEAR)	
<b>DC Input/Power In</b>	12V / 0.5A
<b>Power Consumption (Max and Standby)</b>	3.04W/0.36W
<b>Heat Dissipation (Max and Standby) (BTU/Hr)</b>	10.40 BTU/1.06 BTU
<b>10/100/1000Mbps Ports (Auto Uplink)</b>	8
<b>Form Factor</b>	Desktop or wall-mountable
<b>Bandwidth</b>	16 Gbps

### Ethernet Cables

Large Cable	Retractable Network Cable Extender (EXTINGO)
<b>Length</b>	50 ft (15.24 m)
<b>Dimensions</b>	3 x 5.1 x 6.5 in