FreeMile



User manual

Freemile 60 GHz

VER 1.5

FW 1.12.1

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This device complies with part 15 of the FCC Rules. The operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment to an outlet on a circuit different from the one connected to the receiver.
- Consult the dealer or an experienced radio/TV technician for help.

This device complies with Innovation, Science and Economic Development Canada license-exempt RSS standard(s). The operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Cet appareil est conforme aux normes RSS exemptes de licence d'Innovation, Sciences et Développement économique Canada. Le fonctionnement est soumis aux deux conditions suivantes: (1) cet appareil ne doit pas causer d'interférences, et (2) cet appareil doit accepter toute interférence, y compris les interférences pouvant entraîner un fonctionnement indésirable de l'appareil.

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Chapter 1: OVERVIEW

This document briefly describes the Freemile 60 series IP FODU (Full Outdoor) system, covering the built-in management system, configuration functionality, hardware features, etc.

The Freemile 60 is a robust and versatile 60 GHz frequency band TDD (Time Division Duplex) type Full Outdoor unit designed for High Capacity point-to-point and point-to-multipoint microwave networks. In point-to-multipoint mode, Freemile 60 product family can deliver multi-Gigabit speeds to up to 32 customers per sector at a fraction of the cost of deploying fiber.

The Freemile 60 units feature a proprietary TDMA scheduling protocol, which is perfect for video surveillance networks requiring high-capacity upload bandwidth.

Key features of Freemile 60 products:

- 2+ Gbps speed can be achieved in distances of up to 4+ km (antenna kit dependent) without trenching, permits, or licenses
- Support of the full 60GHz band, including channels 5 and 6 (57-71 GHz), enabling longer links and increased co-location opportunities
- The Freemile 60 radio features a modular design. The base unit features 90º of beam-forming coverage and can be paired with an antenna kit (sold separately as an accessory) to convert the radio from a wide beam-steering device to a highly directional one
- The low cost of the Freemile 60 product, combined with high subscriber density and quick installation, greatly decreases the total cost of ownership for service providers
- The Freemile 60 has 1 x 2.5 Gbps port (active PoE in) and 1 x 1 Gbps port with PoE out
- The 1 Gbps Ethernet port can be used as an "any"-band failover option, or to power accessories such as surveillance cameras

FODUs mechanical features

- Compact unit, Height: 130mm/5", Width: 120mm/5", Depth: 55mm/2”; Weight 425g/15 oz
- 1 x 2.5 Gbps Ethernet (PoE input), 1 x 1 Gbps Ethernet (PoE output) interfaces for Ethernet traffic and PoE power supply
- Pole or wall mountable via mounting backplate
- All the connectors downwards
- Power consumption: 17W without PoE output in use; 41W with PoE output in use

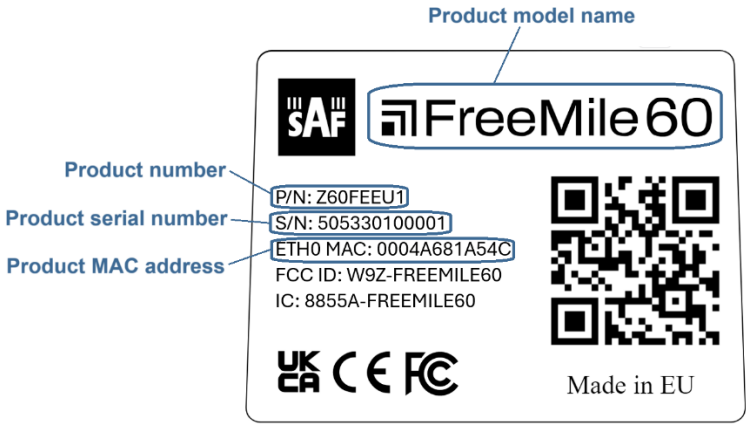


Figure 1.1 *Freemile 60 FODU*

Labeling

The label contains the following information (see sample in the picture below):

Product model name (“Freemile 60”): 60 GHz unlicensed band FODU
Product number (Z60FEEU1; Z60FEEB1): product identification number of the unit
Serial Number (505330100001): the serial number uniquely identifies the unit
MAC address (ETH0 MAC: 0004A681A54C): indicates the MAC address of the unit



Safety Regulations and Guidlines

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio technician for help

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user’s authority to operate this equipment.
This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

FCC Radiation Exposure Statement:
This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance 30 cm between the radiator and your body.

Industry Canada: This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.
Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio

exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

IC Radiation Exposure Statement: This equipment complies with IC RSS-102 radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 30 cm between the radiator and your body.
Cet équipement est conforme aux limites d'exposition aux rayonnements IC établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 30 cm de distance entre la source de rayonnement et votre corps.

CE Statement: This equipment complies with EU radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 30 cm between the radiator and your body.

Freemile 60 FODU interfaces and LED indications

Freemile 60 radio unit has the following interfaces:

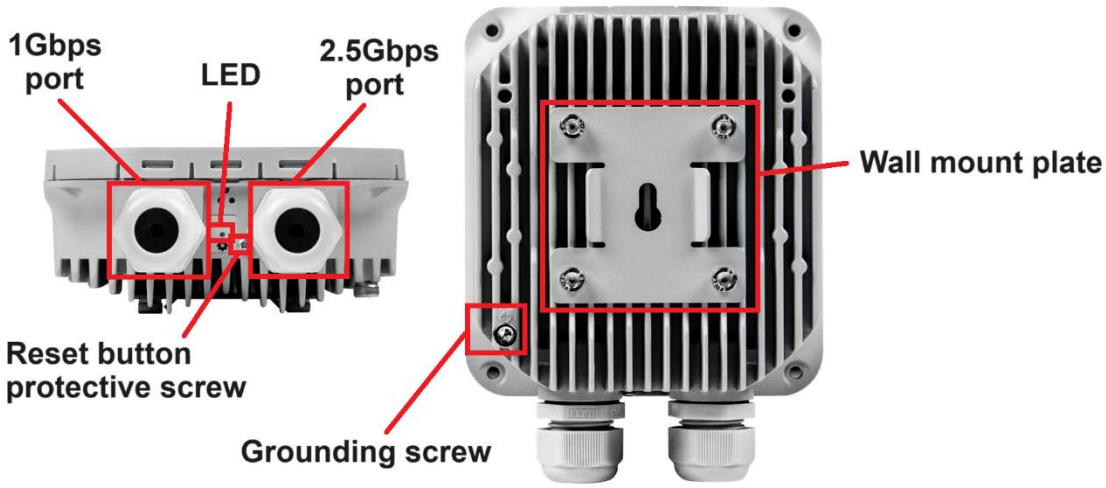


Figure 1.2 *Freemile 60 FODU interfaces*

1 Gbps port

1 Gbps Ethernet traffic port (RJ-45) supporting PoE output. It has implemented LED indication. The LED light will turn on and blink when a link is established, and the PoE out light will turn on when PoE output is enabled in software

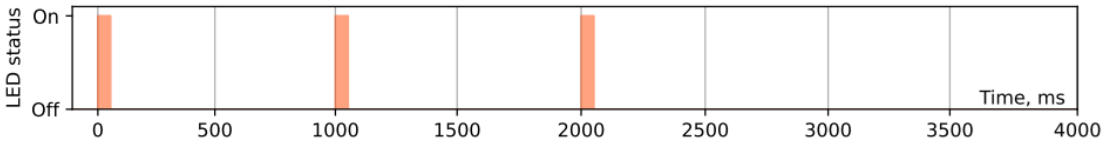
2.5 Gbps port

2.5 Gbps Ethernet traffic port (RJ-45) supporting PoE input. It has implemented LED indication. The LED light will turn on when a link is established, and the power light will turn on once the device is supplied with power

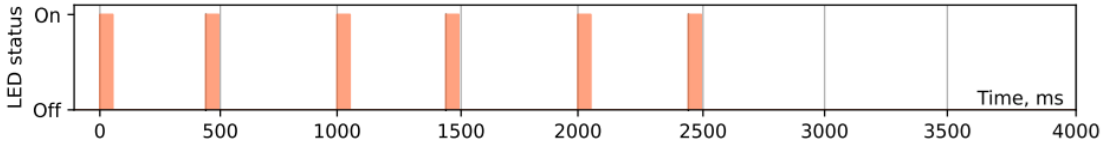
LED

Indicates the status and alarms of the device. Status/alarm LED indications are the following:

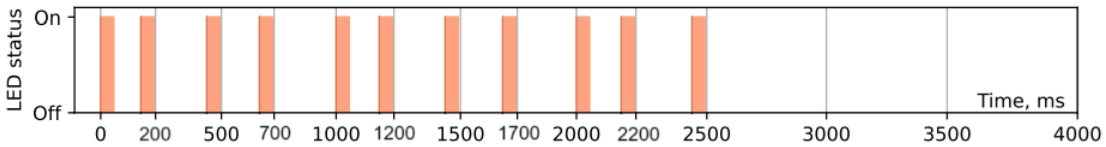
- **OFF** – the device is currently operating in Access Point mode, the device is powered off, or the radio modem is not detected
- **Blinking slowly** – the device is in Station or PTP mode and is currently scanning, blinking intervals is 1000 ms:



- **Blinking with medium speed** – the device is in Station or PTP mode and is connected with a low received signal in the range of -68..-71 dBm, blinking intervals is 400 ms:



- **Blinking with fast blink speed** – Case 1: If the unit is just booting up, the device is flashing the internal modem firmware. Case 2: If the unit is fully booted, then the device is in Station or PTP mode and connected to an Access Point with a medium received signal strength in the range of -65..-67 dBm, blinking intervals are 100-200 ms:



- **Solid ON** – The device is in Station or PTP mode and connected to an Access Point with excellent received signal strength in the range of -13..-64 dBm

Reset button protective screw

By removing the screw, the reset button will become available for resetting the device to factory defaults. To reset the device, use a paperclip or something similar to press the reset button. Press and hold the reset button for 20 seconds or more. Note that it will not have any effect if the reset button is disabled in the software.

Grounding screw

Grounding screw for equipment grounding. The equipment grounding can be done by connecting it to the grounding point of the tower. The recommended minimum grounding cable wire cross-section must be 2.5 mm2.

Wall mount plate

The plate for mounting the device on a wall – refer to the *Freemile 60 radio installation on a wall* section. It can also be used for mounting the device on the pole – refer to the *Freemile 60 radio installation on a pole* section. The wall mount plate must be removed to substitute with the pole mount bracket for use with the 100mm antenna kit – refer to the *Freemile 60 attaching to 100mm antenna kit* section.

Chapter 2: INSTALLATION

Package contents

Item	Quantity
Freemile 60 base model	1
48V, 0.5A PoE injector and power cable	1

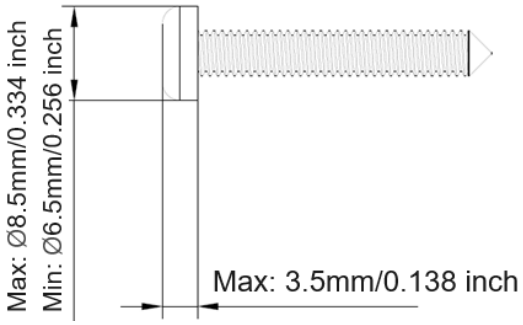
Antenna kits (and corresponding mounts), if ordered, are shipped separately.

Freemile 60 radio installation on a wall

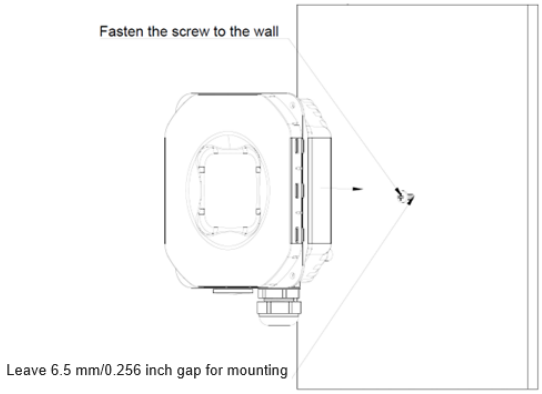
The Freemile 60 radio can be installed on the wall using a single screw (not included in the package). The wall mounting instructions are as follows:

Tools required: screwdriver (depending on the screw)

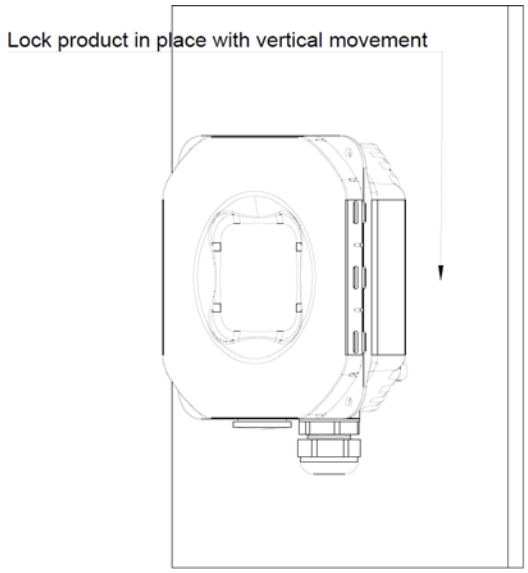




1 The dimensions of the screw that can be used to install the Freemile 60 radio on a wall.



2 Fasten the screw into the wall, leaving about 6.5mm/0.256 inch gap for radio mounting.

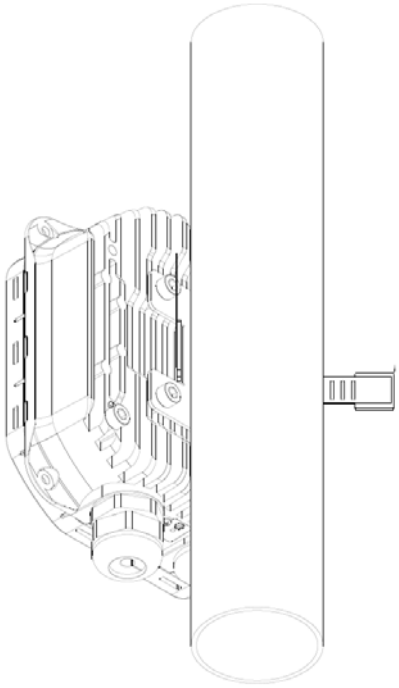


3 With vertical movement, mount the radio onto the screw. Adjust the screw gap if the radio is too loose. The ports/interfaces must be faced downwards.

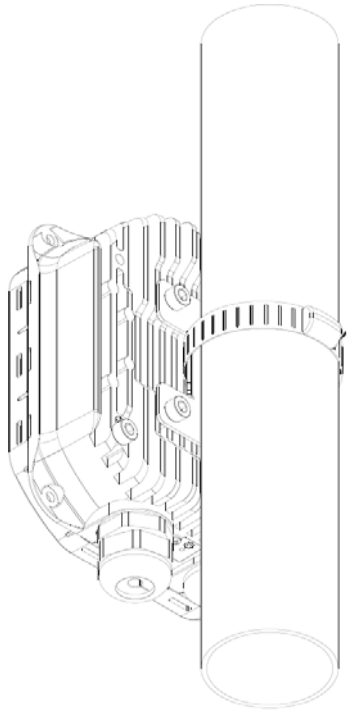
Freemile 60 radio installation on a pole

The Freemile 60 radio can be installed on a pole using a steel cable tie (not included in the package). The pole mounting instructions are as follows:

Tools required: Steel cable tie: width: up to 20 mm/0.79 inch; length: depending on the pole diameter



1 Place a steel cable tie into the radio mount and around the pole



2 Tighten the tie around the pole

It is recommended to protect the installed radio from direct sunlight.

Freemile 60 attaching to 100mm antenna kit

The 100mm antenna kit contains the following parts:

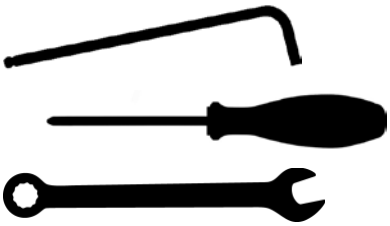
Item	Quantity
Radom	1
Screws for radome connection	4
Mounting bracket	1



Tools required: Size 4 Allen wrench (not supplied)

Size 2 Philips screwdriver (not supplied)

10mm (0.394”) wrench (not supplied)



1. Attach the radome to the radio with 4 screws included in the antenna kit package. Use a size 2 Philips screwdriver.
2. Remove the existing mounting bracket from the radio with a size 4 Allen wrench.
3. Using the same screws, attach the mounting bracket from the antenna kit package to the radio.
4. Use a 10 mm (0.394”) wrench to attach and tighten the radio mounting bracket to the pole. The recommended pole diameter size is 40mm..50mm (1.575 inch..1.969 inch).

Powering Freemile 60 FODU

Use the supplied Power over Ethernet (PoE) injector with an appropriate power source (38…57V DC). The FreeMile 60 unit operates on a 48V DC input.

Power consumption

- Up to 17W when PoE-out is not used
- Up to 41W total when PoE-out is enabled and fully loaded (including powered device)

1. Using the supplied PoE injector (24W)

The package includes a PoE injector with a built-in AC/DC converter:

- Input: 100–240V AC
- Output: 48V DC
- Status LED: solid green indicates AC input present

Usage:

- Suitable for powering a single FreeMile 60 unit
- Recommended when PoE-out is not used



When PoE-out is enabled, the supplied injector may not provide sufficient power, which may result in unstable operation.

2. Using a user-provided power source

When PoE-out functionality is required, use a power supply or PoE injector rated at:

- 38–57V DC output
- ≥ 60W total power



Although the maximum combined load does not exceed 41W, additional margin is required to compensate for Ethernet cable losses, power conversion inefficiencies, temperature-related derating, and transient load conditions.

Cabling

- Connect the Ethernet cable from the injector's "POE" port to the 2.5 Gbps RJ-45 port on the FreeMile 60 unit (for details, refer to the *Freemile 60 FODU interfaces and LED indications* section).
- The total combined Ethernet cable length (injector ↔ unit and injector ↔ LAN) must not exceed 100 meters.
- Use outdoor-rated Cat6 (or better) STP/FTP cable for optimal performance and reliability.

PoE-Out Feature

The FreeMile 60 can provide passive PoE output via the 1 Gbps port to power an external device (for details, refer to *Configuration → Network* section).

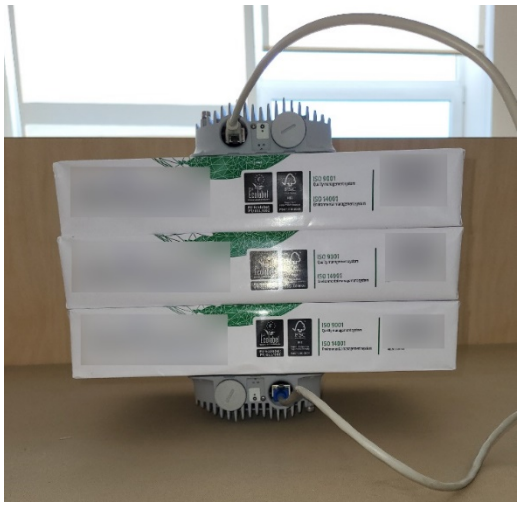
- Output voltage: same as input (~48V DC)
- Maximum output current: 0.5A
- Maximum output power: 24W

The powered device can be any compatible PoE device within these limits, not limited to FreeMile units.

- Ensure the power supply is rated ≥ 60W when using PoE-out
- Passive PoE output can damage non-PoE devices
- Do not connect non-PoE devices to the 1 Gbps port when PoE-out is enabled

Bench-testing of Freemile 60 FODUs

For Freemile 60 radio link connection on a table, 2-3 office paper packs can be used as attenuators between both radios, as indicated in the following example:



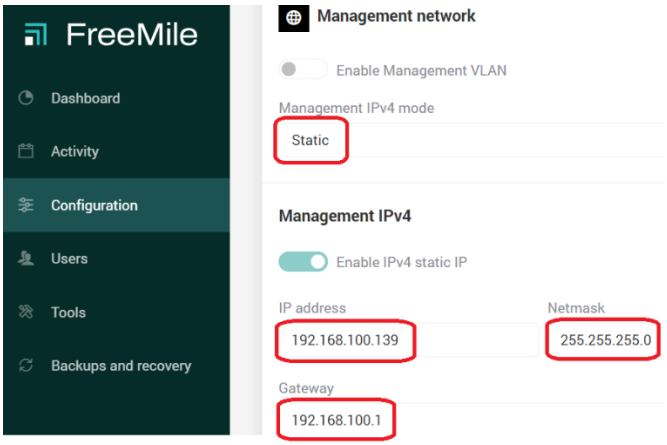
It can take up to 20-30 minutes for the link to stabilize to max MCS12 (or MCS9) capacity mode on both radios. In such testing conditions, the MCS value may differ for a radio unit on each side of the link. Refer to *Configuration→Wireless* for MCS parameter description.

Basic configuration of Freemile 60 link

This section describes Freemile 60 FODU's basic configuration to establish the link, either for production link before its installation on sites, or for bench-testing. For details of accessing the radios, refer to the *Initial configuration* section. For configuration details, refer to the *Web GUI description* section. The steps of the basic configuration of Freemile 60 FODUs are described below.

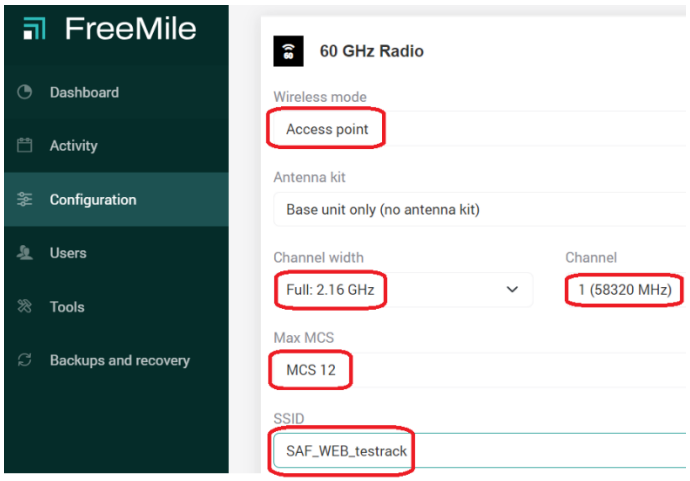
Configuration of network settings

For both Access Point (Point-to-point master) and Station (Point-to-point slave) units, set the Management IPv4 mode to 'Static', and specify IP address/netmask/gateway, or to 'DHCP' and obtain parameters automatically from the DHCP server. This can be set in the Web GUI section *Configuration →Network*:



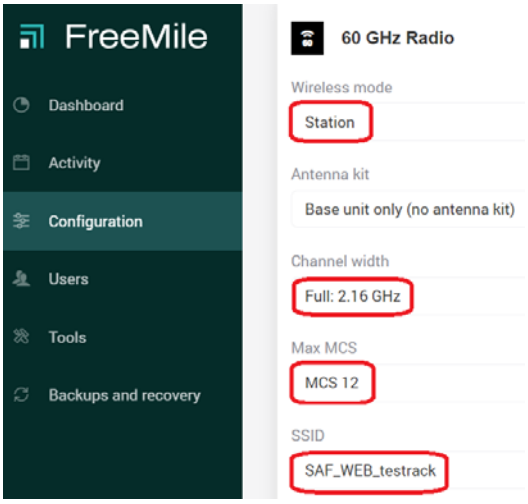
Configuration of Access Point or Point-to-point master unit

For Access point (point-to-multipoint) or Point-to-point master unit set Wireless mode to 'Access point' or 'Point-to-point master', specify the Channel width, frequency channel, and Max MCS (Modulation Coding Scheme) settings, and make sure the SSID is the same for the Access point unit and the Station unit. This all can be set in the Web GUI section *Configuration →Wireless*:

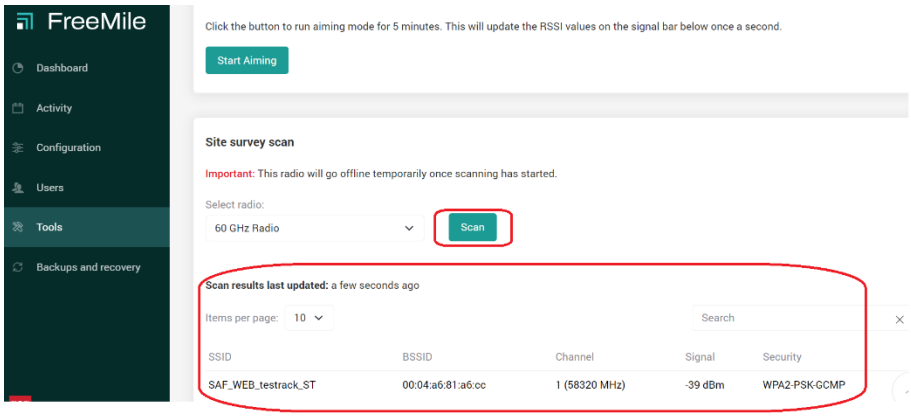


Configuration of Station or Point-to-point slave unit

For Station (point-to-multipoint) or Point-to-point slave unit set Wireless mode to 'Station' or 'Point-to-point slave', specify the Channel width and Max MCS (Modulation Coding Scheme) settings – the same as on Access point unit, and make sure the SSID is the same for Station unit and the Access point unit. This all can be set in the Web GUI section *Configuration →Wireless*:



For point-to-multipoint mode, in case there are several Freemile 60 Access point units available in range, and the Station device must be connected to one of them/specific one, use scanning functionality which can be found in web GUI *Tools →Site survey & aiming* section, to find all the Freemile 60 Access points and to choose the required one:



Chapter 3: WEB GUI

Initial configuration

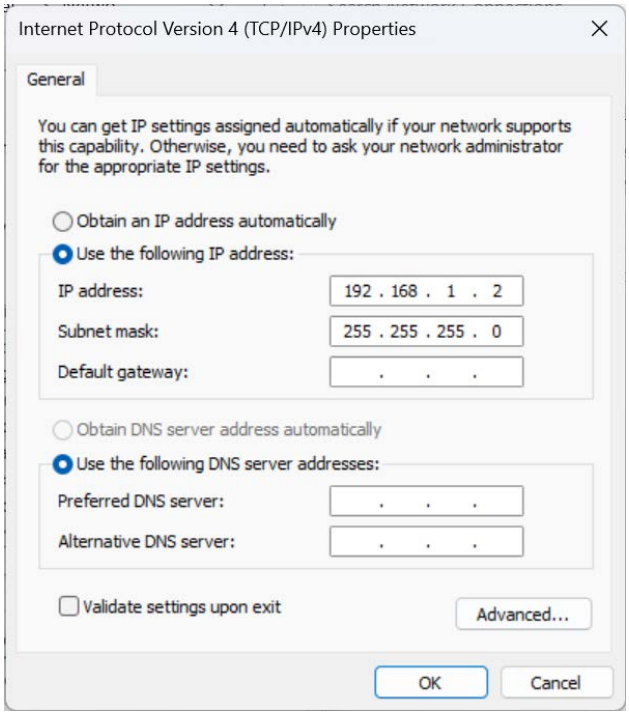
System requirements

To access the Freemile 60 Web GUI, a PC with the following Web browser must be used:

- Mozilla Firefox;
- Google Chrome;
- Microsoft Edge.

Ethernet management connection configuration

Before proceeding with the initial link setup in the Web GUI, adjust the IPv4 settings of your LAN adapter to the 192.168.1.0 subnet. The IP address should be something other than the default IP addresses (192.168.1.1).



After applying these settings, you are ready to connect to the Web GUI.

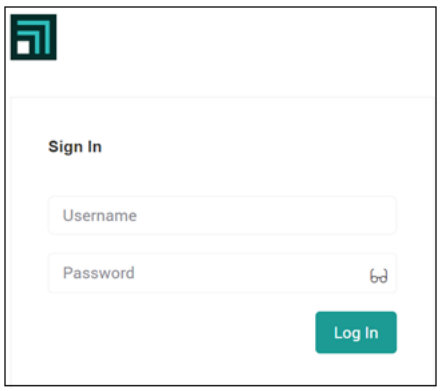
DHCP client is enabled on the main management network bridge of the device as well.

Accessing Web GUI

1. Connect your laptop to any of the Ethernet ports of the Freemile 60 device
2. Launch your browser and in the address field enter the IP address of a FODU. Default IP address is: 192.168.1.1

The device can also be accessible on the additional "alternative local IP" of 169.254.1.1

3. Press the “Enter” key.
4. The login screen will appear.
5. Enter username and password. Default credentials are as follows:
    - Username: **root**
    - Password: **admin**



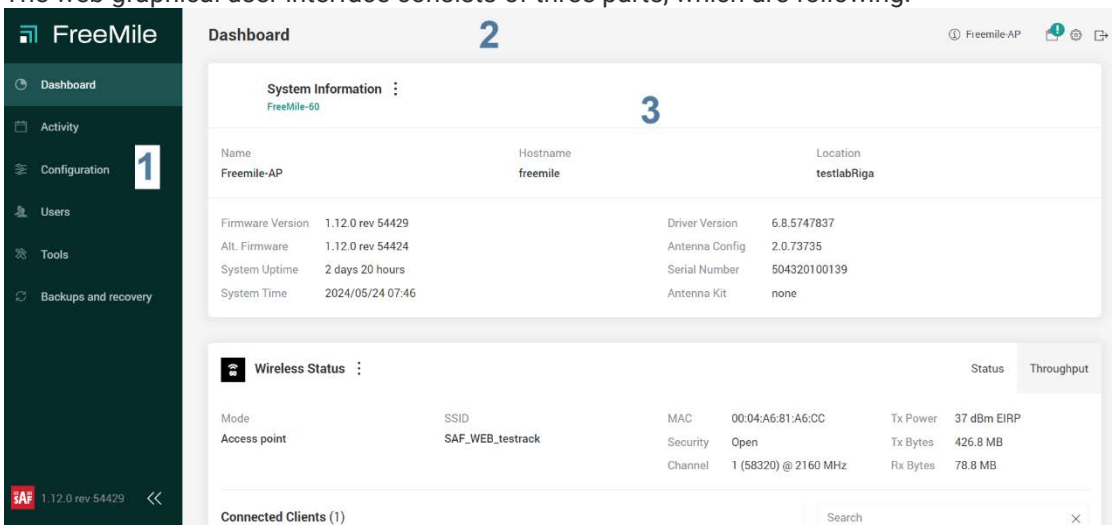
Change the default user credentials after logging in for the first time.

6. Press the “Log in” button.

User will automatically be logged out of the session in case of inactivity for more than 30 minutes.

Web GUI description

The web graphical user interface consists of three parts, which are following:



1 Main menu tree

Allows navigating between pages and sections of the Web GUI. It contains the following sections:

- **Dashboard** – shows the overall status of your device
- **Activity** – event log indicating recent events that happened on the device, like client association/disassociation events, user logins, DHCP events, etc
- **Configuration** – allows configuration of the device

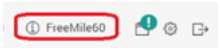
- **Users** – allows configuration of user access for the web GUI and API
- **Tools** – a set of various tools for advanced debugging tasks, such as Ping, Site survey and aiming, Traceroute, Device discovery, and others
- **Backups and recovery** – allows download and upload of configuration files to/from the user's PC

Clicking on the arrow at the bottom of this section 

allows hiding or expanding the side panel.

2 Header of the page

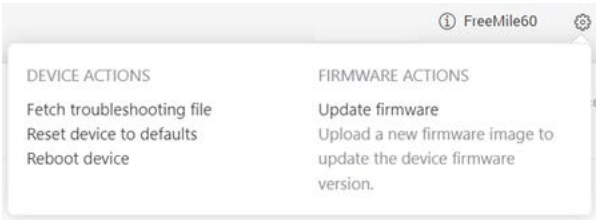
Indicates currently opened section name and system/device information and settings:

- 

Freemile 60 radio information, can be viewed by pointing the cursor on it
- 

indicates new event information. When clicking on it, the list of the latest events will be opened.
- 

by clicking on it, the device actions/settings will be opened:



The following device actions can be done here:

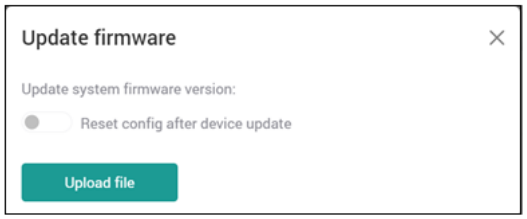
- **Fetch troubleshooting file** – allows downloading the troubleshooting file from the device
- **Reset device to defaults** – allows resetting the device to factory default settings



Resetting the device to factory defaults permanently removes all user data, configurations, and stored information. After the reset, the device is restored to its original factory configuration. This action cannot be undone.

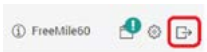
This option is useful when the device needs to be completely cleared before transfer, disposal, troubleshooting, or when there is a requirement to remove all data, including private and sensitive information.

- **Reboot device** – allows rebooting of the device
- **Update firmware** – allows upgrading or downgrading the firmware of the device. The following dialog will be shown when clicking on this option, allowing you to choose the firmware file and perform an upgrade:



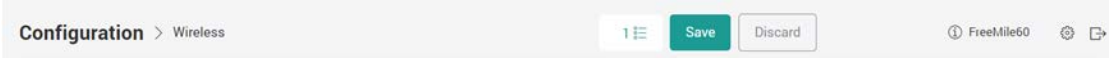


The option "Reset config after device update" must be enabled only in case the firmware has been downgraded.

- 

allows logging out from the device's Web GUI

When the 'Configuration' or 'Users' page is opened, and settings are changed, the following buttons will appear in the Header:



-  "List" button indicates parameters that were changed and are pending for saving in the configuration file
-  "Save" button must be used to apply and save the changes in the configuration file
-  "Discard" button can be used to discard all made changes

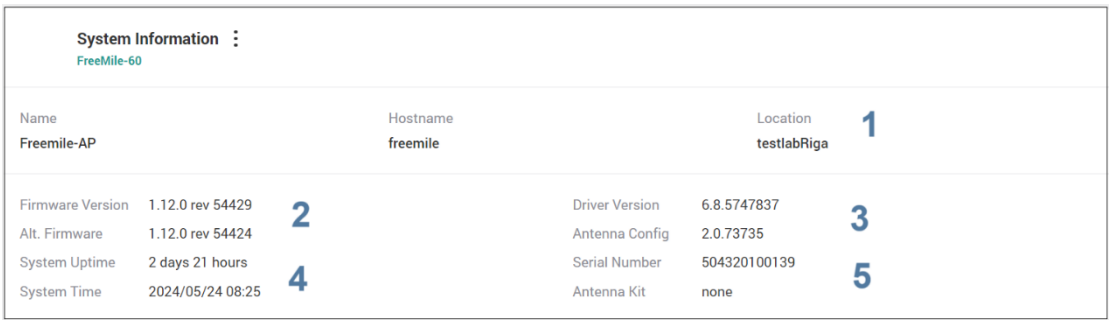
3 Main web GUI window

By default, the Dashboard page ("Dashboard") is shown after logging in. Contents will change according to the menu panel selection.

Dashboard

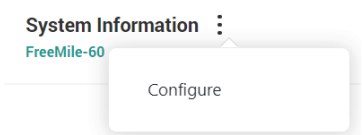
The Dashboard page consists of several informational sections:

- **System information** of the device:

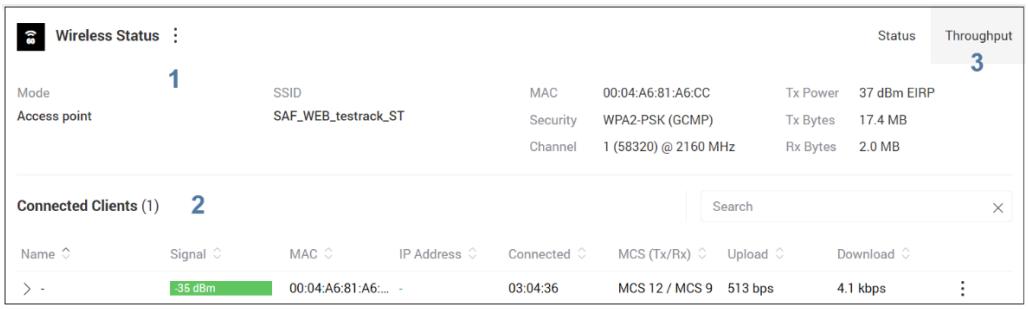


1) Device name, location, and hostname: device name is used to populate LLDP discovery fields, and the hostname will be used when sending DHCP requests
2) The firmware versions running on each device boot-bank (active and alternate/backup)
3) Driver and antenna config versions: these fields are mainly used for debug purposes
4) System Uptime since last reboot and current System Time: this is the device's current date and time. Time zone and other time settings are configurable in the Web GUI section *Configuration →System*
5) Serial number and antenna kit: the device's antenna kit can be configured in the Web GUI section *Configuration →Wireless* and is used to determine the estimated target RSSI of any connected peers

Clicking on the "three dots" button will lead to *Configuration →System* page:



- **Wireless status** of the device. This section differs for Access Point (Point-to-point master) devices and Station (Point-point-slave) devices. The Access Point (Point-to-point master) Wireless status page is following:

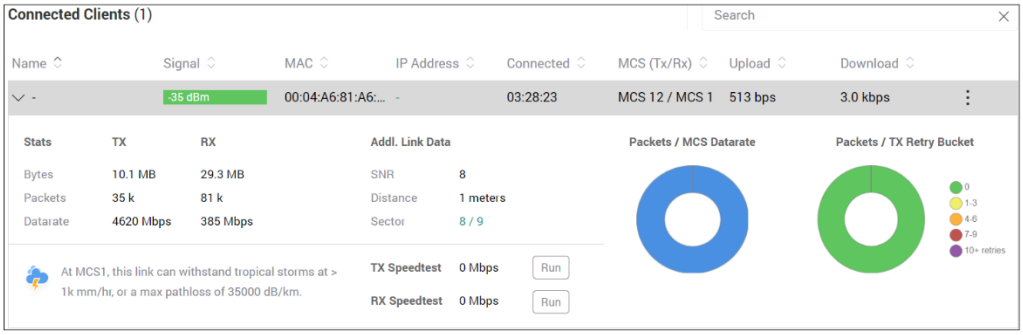


1) Contains Access point (Point-to-point master) wireless information.

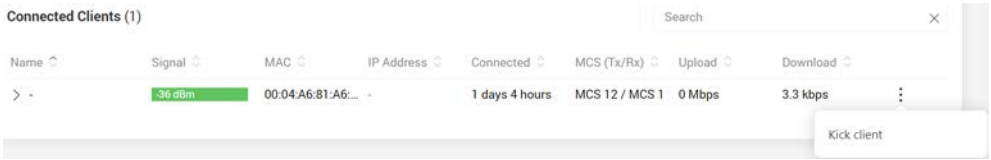
2) Indicates the list of Stations found by the Access point unit using built-in Device discovery functionality in *Configuration →Services* page. Clicking on the arrow button



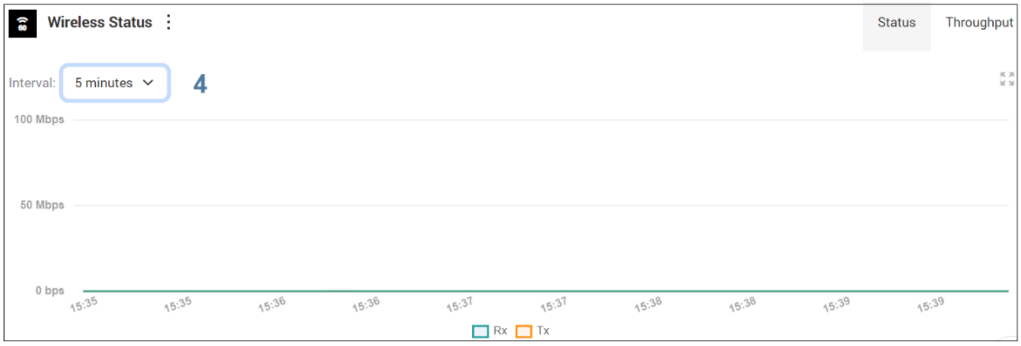
in the connected Stations list will open the Station device information page:



Clicking on the “three dots” button on the right side of the Station devices list in the Access point device menu will show the “Kick client” option, which allows disconnecting a particular Station from the Access point device:

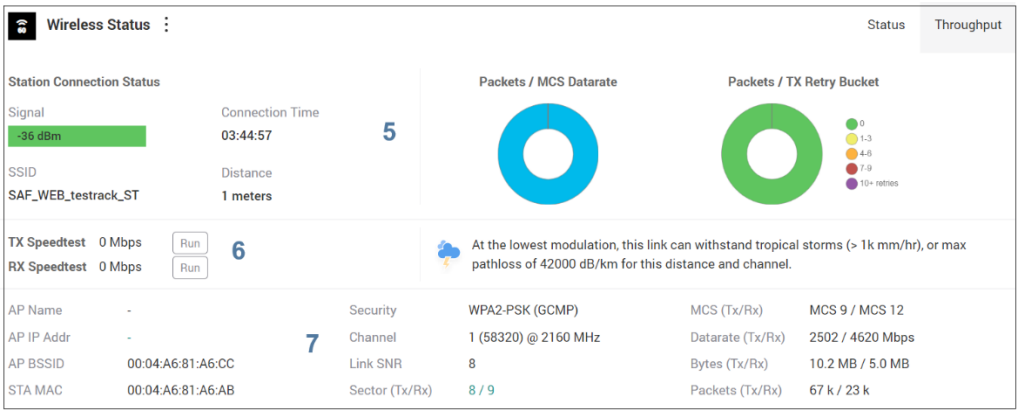


3) Clicking on the ”Throughput” tab will open the wireless throughput graph:



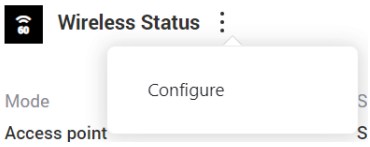
4) Allows choosing graph interval among 5 minutes, 2 hours, 1 day, 1 week, and 1 year

The Station (Point-to-point slave) Wireless status page is following:

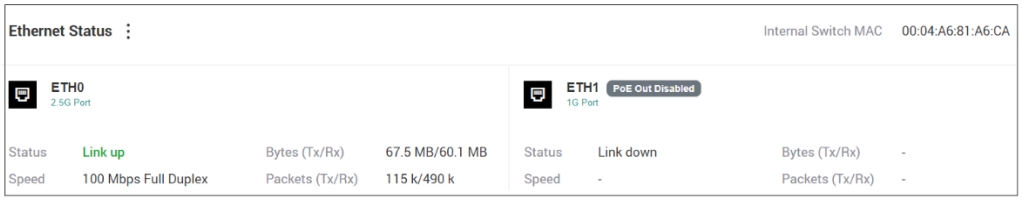


5) Connection status information of the Station (Point-to-point slave) device
6) Implemented Speed-test functionality to test throughput between the Access Point and clients, or vice versa. To start the speed test, the “Run” button must be pressed. The Speed-test is useful for troubleshooting purposes
7) Connected Access point details and connection information/status

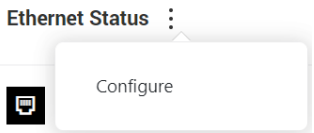
Clicking on the “three dots” button will lead to *Configuration →Wireless* page:



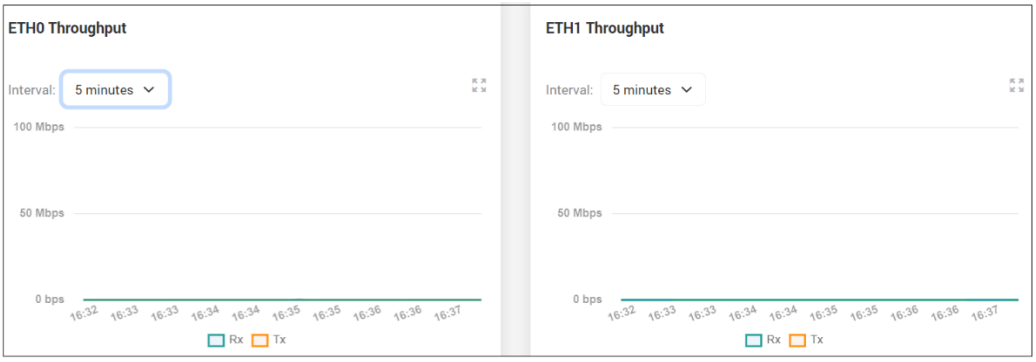
- **Ethernet status** of the device indicates both Ethernet port statuses, PoE status, and MAC address



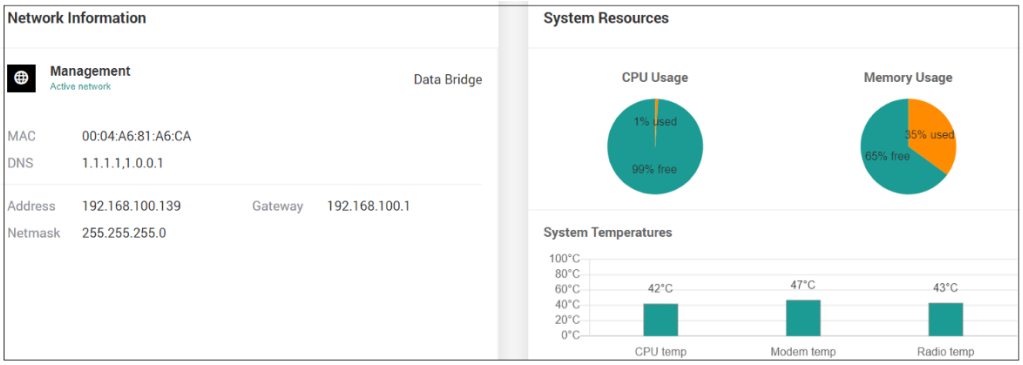
Clicking on the “three dots” button will lead to *Configuration →Network* page:



- **Ethernet throughput** of device’s Ethernet ports with option to choose intervals of 5 minutes, 2 hours, 1 day, 1 week, and 1 year:

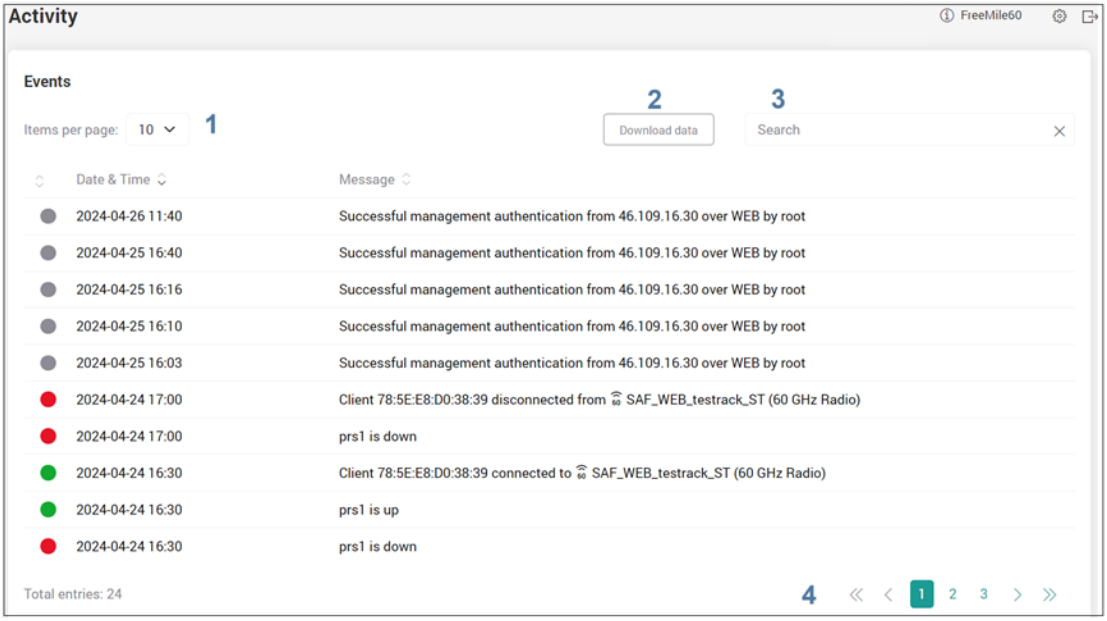


- **Network information** and **System resources** indicate management access information and system information like CPU and memory usage, and system temperature:



Activity

Indicates recent events, such as client association/disassociation, user login, DHCP events, etc.



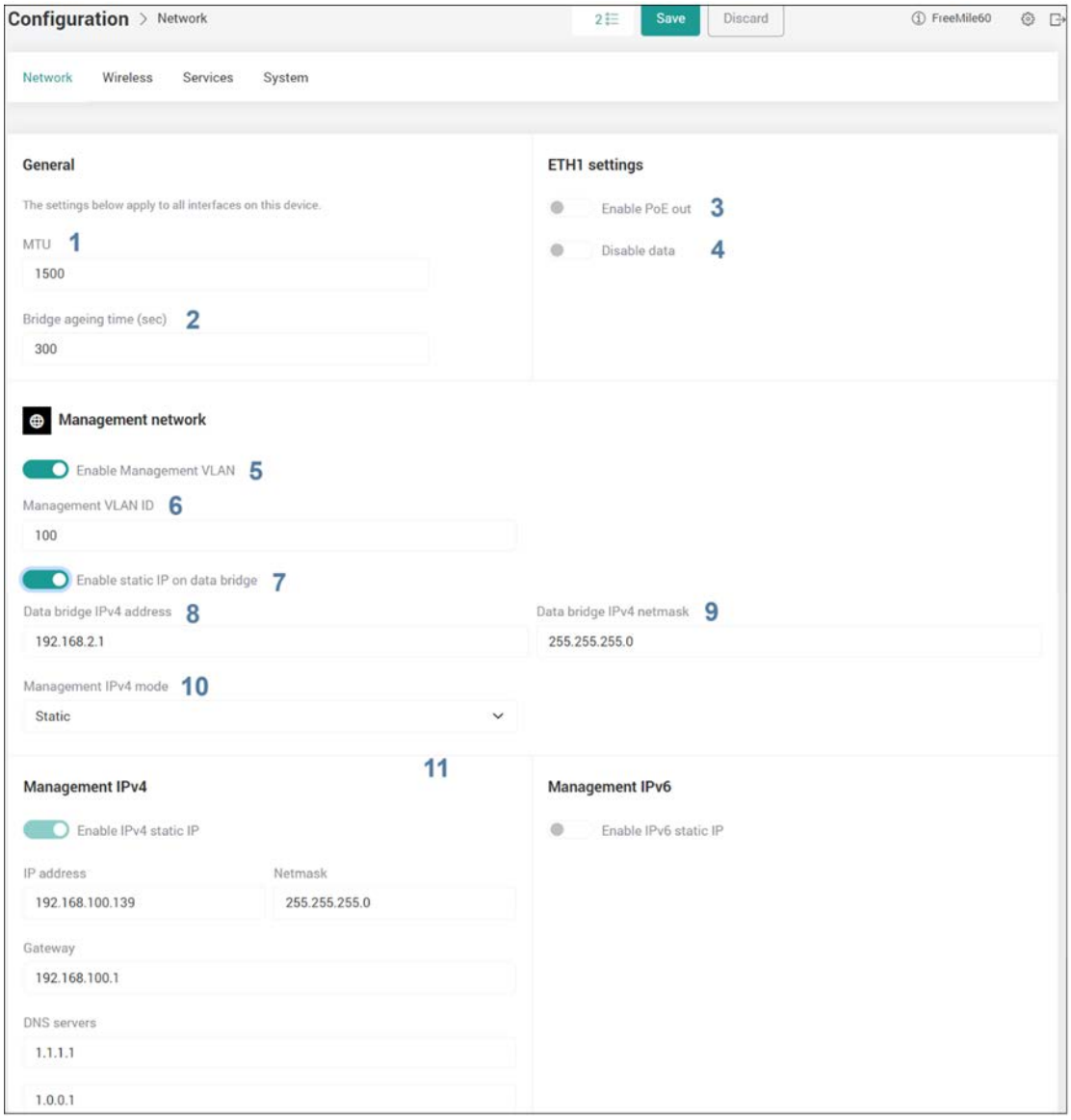
1) Allows choosing how many items per page will be displayed. It is possible to choose between 10, 25, 50, and “All” items.
2) Allows downloading the event data to the PC
3) Allows searching for any specific event from the list
4) Allows navigating through the event data lists

Configuration

The Configuration section allows configuration of the network, Wireless, System parameters, and supported Services. When any of the parameters are changed in the Configuration section, the “List”, “Save”, and “Discard” buttons will appear in the header of the web page. All new settings will be applied by pressing the “Save” button.

Configuration→Network

For the Access Point or Point-to-point master device the Configuration→Network section is following:



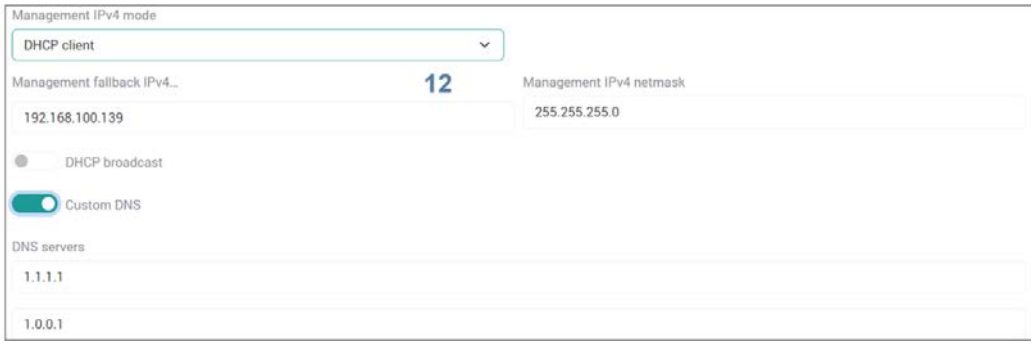
1) ***MTU*** – allows setting MTU (maximum transmission unit) for wireless interfaces, Ethernet ports, and the management/local bridge. The minimum allowed value is 1280 bytes, and the max is 7900 bytes.
2) ***Bridge ageing time*** – allows setting the aging time. The ageing determines the number of seconds a MAC address is kept in the forwarding database (FDB) after a packet has been received from that address. Setting to 0 will disable the ageing.
3) ***Enable PoE out*** – enables or disables PoE out on the ETH1 1G interface
4) ***Disable data*** – disables data over the ETH1 interface. This is useful if an external device will be powered via PoE out, but there is no need for data to pass over the link.
5) ***Enable Management VLAN*** – enables or disables the management VLAN on the device.
6) ***Management VLAN ID*** – appears when the Management VLAN option is enabled. Allows specifying the management VLAN ID

Once the management VLAN is enabled and the VLAN ID is specified, reconnect to the unit using the same VLAN ID set on the external device (e.g., switch). In case of wrong VLAN

settings, the unit may not be reachable and may require resetting the device to factory settings unless the data bridge static IP is enabled and set (see below point 7)

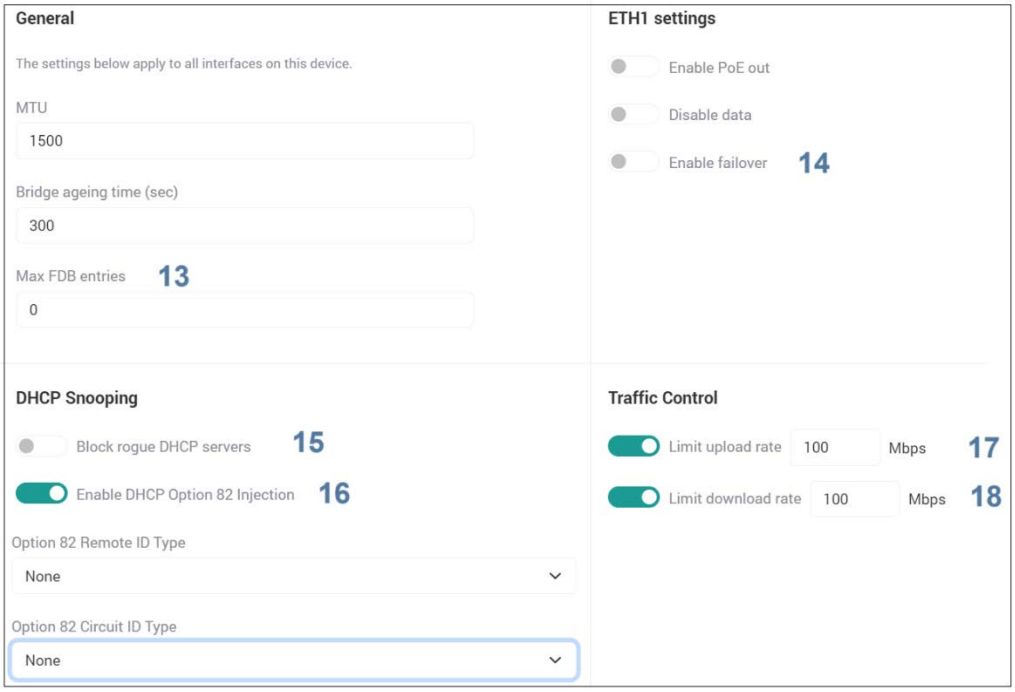
7) ***Enable static IP on data bridge*** – enables data bridge to the management over the data network instead of the management VLAN network. This can be helpful in cases where access to the device is needed during installation over the non-management VLAN network. Once aiming and installation are complete, this setting can be turned off, only allowing access to the web GUI over the management VLAN network.
8) ***Data bridge IPv4 address*** – appears when the data bridge functionality is enabled. It allows setting an IPv4 address for the data bridge.
9) ***Data bridge IPv4 netmask*** – appears when the data bridge functionality is enabled. It allows setting an IPv4 netmask for the data bridge.
10) ***Management IPv4 mode*** – allows choosing between a static IP address or DHCP client mode.
11) ***Management IPv4*** and ***Management IPv6*** – when Static management mode is chosen, it allows setting IPv4 or IPv6 settings for management access.

In the case of the "DHCP Client" mode, the following options will appear:



12) ***Management fallback IPv4, Management IPv4 netmask, DHCP broadcast,*** and ***Custom DNS*** – when the DHCP Client management mode is chosen, it allows setting the mentioned options for management access

For the Station or Point-to-point slave device in the Configuration→Network section, the following additional settings are available:



13) ***Max FDB entries*** – allows setting the maximum number of allowed FDB (forwarding database) entries. Value 0 is for an unlimited number (default setting). Altering the value will effectively limit the number of MAC addresses that can pass traffic via the ETH1 port. This setting is useful for limiting the number of connected customer devices - for example, value 1 will ensure only one customer router connection is allowed.



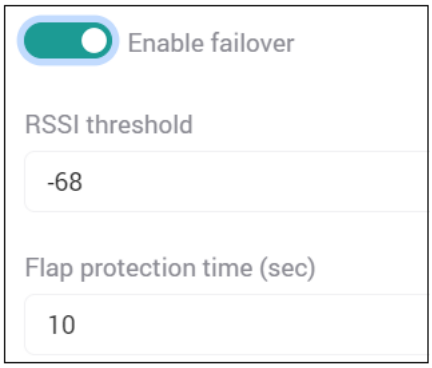
This setting is not compatible with failover mode.

14) ***Enable failover*** – allows enabling/disabling failover/backup over a device connected to the ETH1 port. For more detailed information about the failover mode, refer to *Failover mode* description.



- When data is disabled over the ETH1 port, the Failover function will be automatically disabled.
- Failover mode is supported only when the Data VLAN is disabled.
- Failover mode must be enabled BEFORE interconnecting the ETH1 port of the FreeMile 60 unit set in “Station” mode with the failover device in order to prevent network loops.

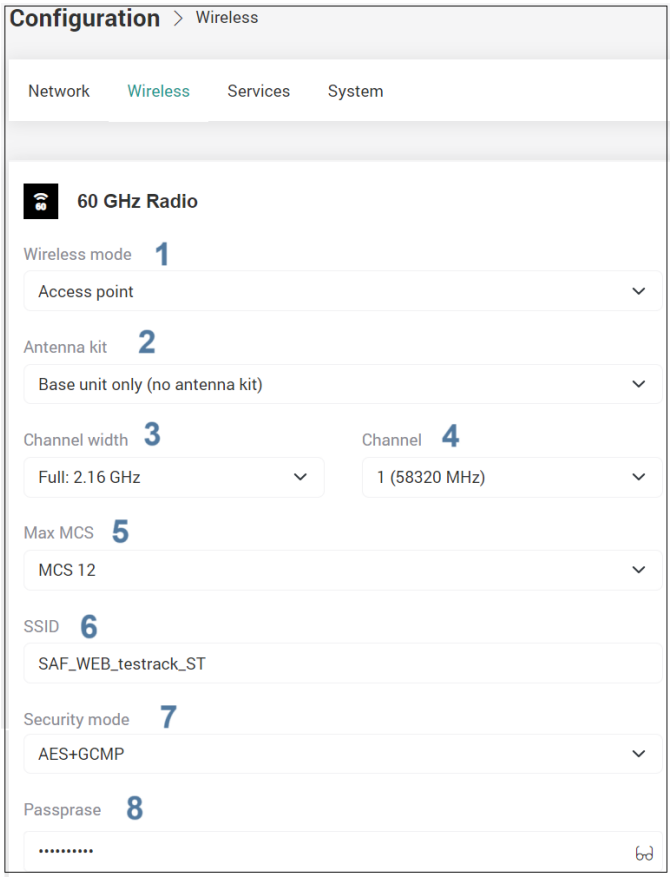
When enabling the failover mode, the ***RSSI threshold*** and ***Flap protection time*** settings will be displayed:



15) ***Block rogue DHCP servers*** – when this setting is enabled, DHCP discovery packets will be dropped at the Station before being passed downstream, and DHCP offer packets will be dropped at the Station before being passed upstream. Rogue DHCP servers can occur when a user connects the router backwards, exposing the DHCP server to the upstream WAN network, instead of the local network.
16) ***Enable DHCP Option 82 injection*** – allows enabling injection of DHCP Option 82 fields into upstream DHCP request packets. Users can choose to populate the Remote ID field, the Circuit ID field, or both. These fields can be set to one of the following options:
    - ***Station’s wireless MAC address*** – inserts the Station's wireless MAC address into the specified DHCP option 82 field. When the MAC address is inserted, it will be ASCII encoded and will include the colons and a null terminator character at the end. The station MAC, 00:04:A6:81:A5:4E would show up on the DHCP server as 30:30:3A:30:34:3A:41:36:3A:38:31:3A:41:35:3A:34:45
    - ***Custom field*** – inserts an ASCII string of the user’s choice (such as a customer's ID number or phone number) into the specified option 82 field. The string must be between 1 and 64 characters. The string will be hex-encoded and include a null terminator character at the end.
    - ***None*** – does not insert anything into the specified option 82 field
17) ***Limit upload rate*** – enables or disables traffic shaping on the upload (wireless) path, and sets the upload or download limit in Mbps
18) ***Limit download rate*** – enables or disables traffic shaping on the download (Ethernet) path, and sets the upload or download limit in Mbps

Configuration→Wireless

For the Access Point or Point-to-point master device, the Configuration→Wireless section is following:



1) ***Wireless mode*** – allows choosing wireless operation mode among Access point, Station, Point-to-point master, or Point-to-point slave.

When the point-to-point modes are enabled, only a single peer connection will be allowed, and the link will be optimized for point-to-point performance.

Changing the operating modes will require a reboot of the device to take effect.

2) ***Antenna kit*** – allows selecting the additional antenna kit that is attached to the device. If no additional antenna kit is attached to the device, the option “Base unit only (no antenna kit)” must be selected.
3) ***Channel width*** – allows choosing between Full (2.16 GHz) or Half (1.08 GHz) options

- The benefit of half channel is that more channels are available for high-density deployments and an increase in SNR due to increased receiver sensitivity.
- The data rate of a half channel is 1/2 of that of a full channel (up to MCS9)
- The channel scanning time is a bit longer for half channels, so it will take a longer time for stations to connect. Each channel scanned has up to 64 beam forming locations, and there are 11 half channels, so the total time to complete a full scan can be up to 1 minute.

4) ***Channel*** – indicates the list of available non-overlapping channels. For the full 2.16 GHz channel width, the selectable channels are 1-6, and channels 1-11 for half 1.08 GHz channel width.

The “Channel” option is not available in Station or Point-to-point slave units.

5) ***Max MCS*** – allows choosing the max MCS (Modulation Coding Scheme). The data rates will be dynamically selected up to the maximum MCS configured by the user.

- When half-channel support is enabled, the max MCS allowed is MCS 9
- Setting max MCS only affects the TX MCS rate of the current device. To set MCS for both TX and RX, the user must change the max MCS value on both the Access point and Station sides of the link

6) ***SSID*** – the radio's SSID/network name, configurable by the user
7) ***Security mode*** – select link encryption type – either "Open" or "AES+GCMP."
8) ***Passphrase*** – will appear when the "AES+GCMP" security mode is chosen, and can be changed by the user.

For the Station or Point-to-point slave device in the Configuration→Wireless section, the following additional settings are available:



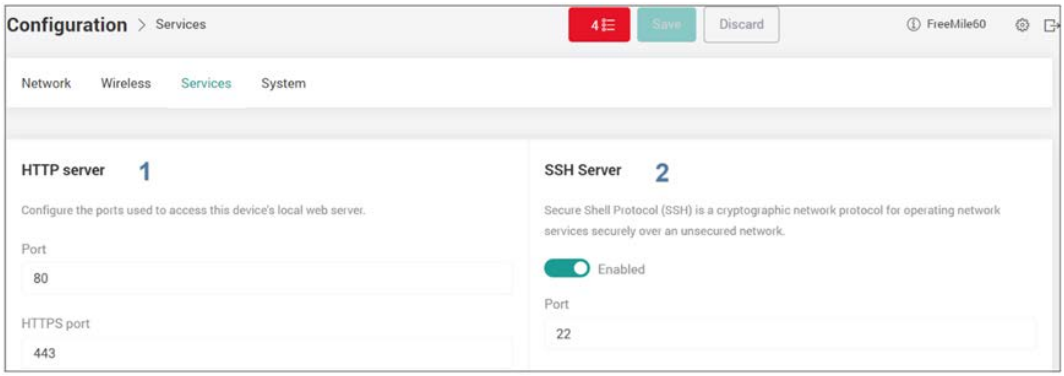
9) ***Failover*** – indicates the status of Failover mode.
10) ***Enabling*** Station profiles – allow input of multiple connection profiles. The client will connect to the SSID/profile with the highest priority first.

Once the station profiles are enabled, this radio's main SSID and security settings will no longer be in use, and the station will attempt to connect to the profiles created in the station profiles' table in order of priority.

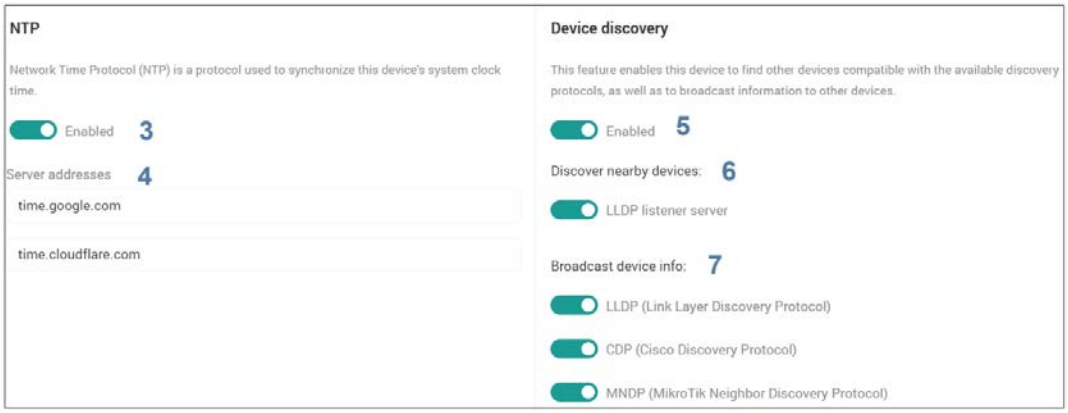
11) ***Priority*** – allows choosing the priority of the profile. Value 1 is the highest priority, and value 10 is the lowest one. When the user defines multiple profiles with the same priority, the device will connect to the SSID that has the better signal strength.
12) ***SSID*** – the SSID for the connection profile
13) ***Security Mode*** – the security mode that should be used when connecting to the specified Access point
14) ***Security Passphrase*** – the passphrase that should be used when connecting to the specified AP if the AES-GCMP security mode is chosen
15) ***Enable sorting*** – unchecking this option will disable sorting of the profiles table while adding/entering profiles, to keep the entries from jumping around during the changing of profile priorities.

Configuration→Services

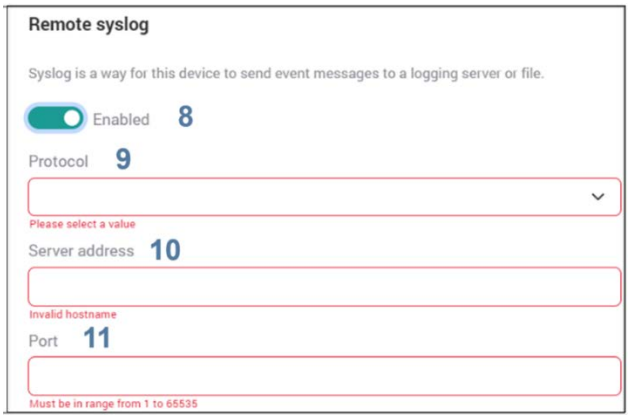
The following Services configuration options are available:



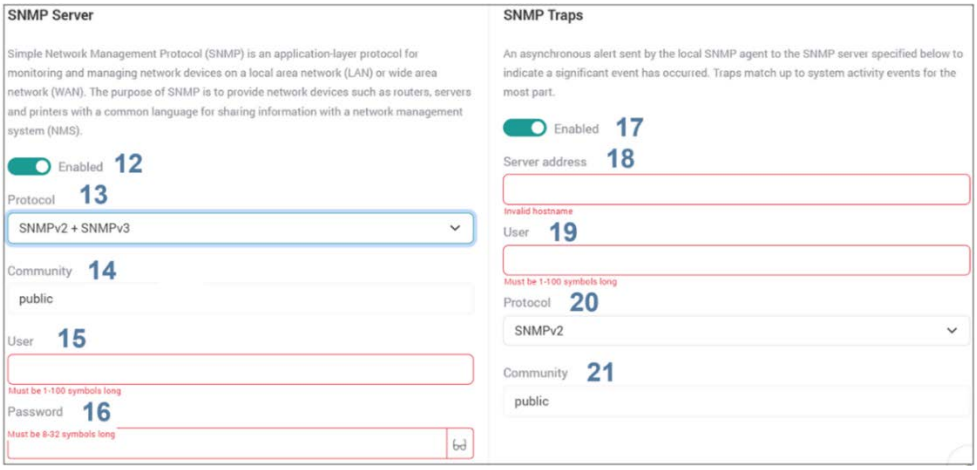
1) ***HTTP server*** – allows configuring HTTP and HTTPS ports used to access the device's local Web server
2) ***SSH server*** – allows enabling/disabling the SSH service, and configuring the SSH port for device access



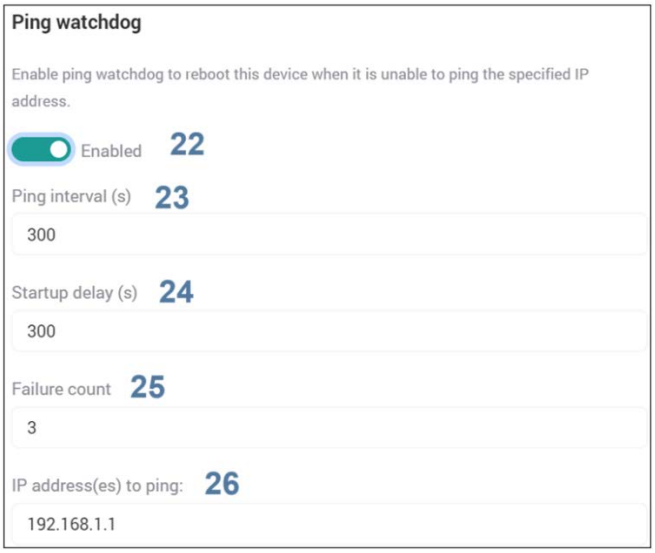
3) ***Enable*** NTP – allows enabling/disabling the NTP (Network Time Protocol) server. This service is enabled by default.
4) ***Server addresses*** – a list of NTP peers that the device should use when updating the local time
5) ***Enable*** device discovery – allows enabling/disabling the device discovery service for the device.
6) ***Discover nearby devices*** – enables the LLDP (Link Layer Discovery Protocol) server to find nearby devices on the network. Nearby devices can be found by using the Device discovery tool in the *Tools →Device discovery* page.
7) ***Broadcast device info*** – allows the device to be discoverable over LLDP (Link Layer Discovery Protocol), CDP (Cisco Discovery Protocol), and MNDP (Mikrotik Neighbor Discovery Protocol)



8) ***Enable*** remote syslog – allows enabling/disabling the remote syslog service
9) ***Protocol*** – allows choosing remote syslog server protocol: TCP or UDP
10) ***Server address*** – allows entering an IP address or hostname of the remote syslog server
11) ***Port*** – allows specifying port at which the remote syslog server is running



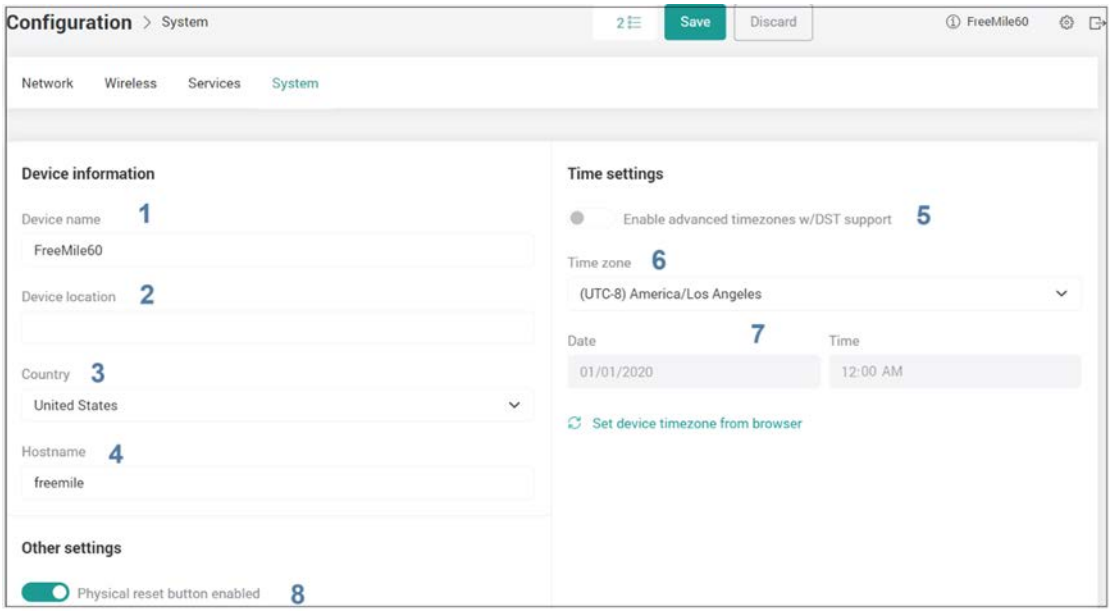
12) ***Enable*** SNMP server – enables the local SNMP server. The SNMP server is disabled by default.
13) ***Protocol*** – allows choosing following SNMP versions: SNMPv2, SNMPv3, or dual SNMPv2 + SNMPV3
14) ***Community*** – allows entering the community string for the SNMP server. Available only for SNMPv2. The default value is *public*.
15) ***User*** – allows entering the SNMP v3 authentication username. Length must be between 1 and 100 characters. Available only for SNMPv3
16) ***Password*** – allows entering SNMPv3 SHA+AES authentication passphrase. Length must be between 1 and 32 characters. Available only for SNMPv3
17) ***Enable*** SNMP traps – allows enabling/disabling SNMP traps to be sent from the device.
18) ***Server address*** – allows entering the hostname or IP of the SNMP trap receiver.
19) ***User*** – allows entering the username that should be included when connecting to the server. If no username is required, just use a dummy value.
20) ***Protocol*** – allows choosing the trap version: SNMPv2 or SNMPv3
21) ***Community*** or ***Password*** – allows entering the community string for SNMPv2, or allows specifying the password used for SNMPv3



22) ***Enable*** Ping watchdog – enables the ping watchdog service. This service pings the specified IP address at the given interval and reboots the device after receiving a certain number of failures in a row. This service is disabled by default.
23) ***Ping interval*** – how long the service should wait, in seconds, between attempts to ping the provided IP address
24) ***Startup delay*** – the length of time in seconds that the service should wait until it attempts the first ping after the device has finished the bootup process
25) ***Failure count*** – the maximum allowed number of failures allowed (in a row) before the device will be rebooted
26) ***IP address(es) to ping*** – the IP address that the service will attempt to ping

Configuration→System

The following System configuration options are available:



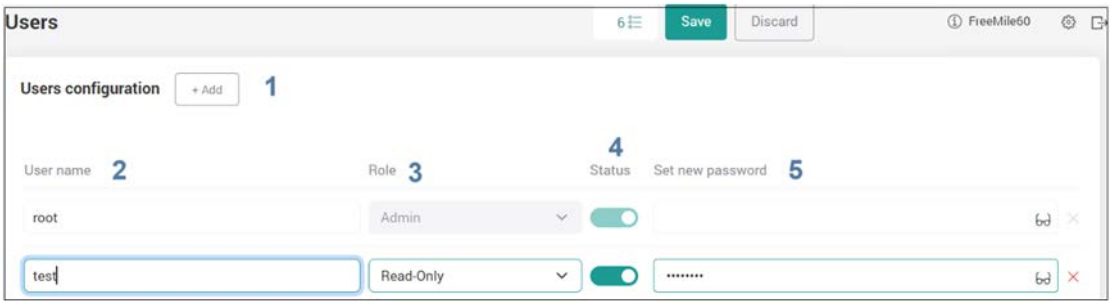
1) ***Device name*** – allows entering the name of this device. This field is used to populate the system name field used in the *Tools →Device discovery* list.
2) ***Device location*** – allows entering the physical location of this device. This free-form field is not used internally by the system; it can be set to any customer's chosen name.
3) ***Country*** – allows selecting the country where this device will be used. The country field is used to set local regulatory rules.
4) ***Hostname*** – allows entering the system hostname of the device. This must be a valid hostname format and only contain alphanumeric characters, periods, and dashes, and must start or end in an alphanumeric character.
5) ***Enable advanced time zones w/DST support*** – allows selecting this option to enable time zones that have DST support enabled.
6) ***Time zone*** – allows selecting the time zone that should be used for this device's time
7) ***Date, time*** – use the date and time fields to manually set the device's local date and time. Manual date/time configuration is not possible if the NTP is enabled.
8) ***Physical reset button enable*** – allows enabling or disabling the physical reset button.



It is not recommended to disable the device's physical reset button, as misconfiguration could make the device unreachable.

Users

The Users section allows the configuration of users. When any of the parameters are changed in the Users section, the “List”, “Save”, and “Discard” buttons will appear in the header of the Web page. All new settings will be applied by pressing the “Save” button.



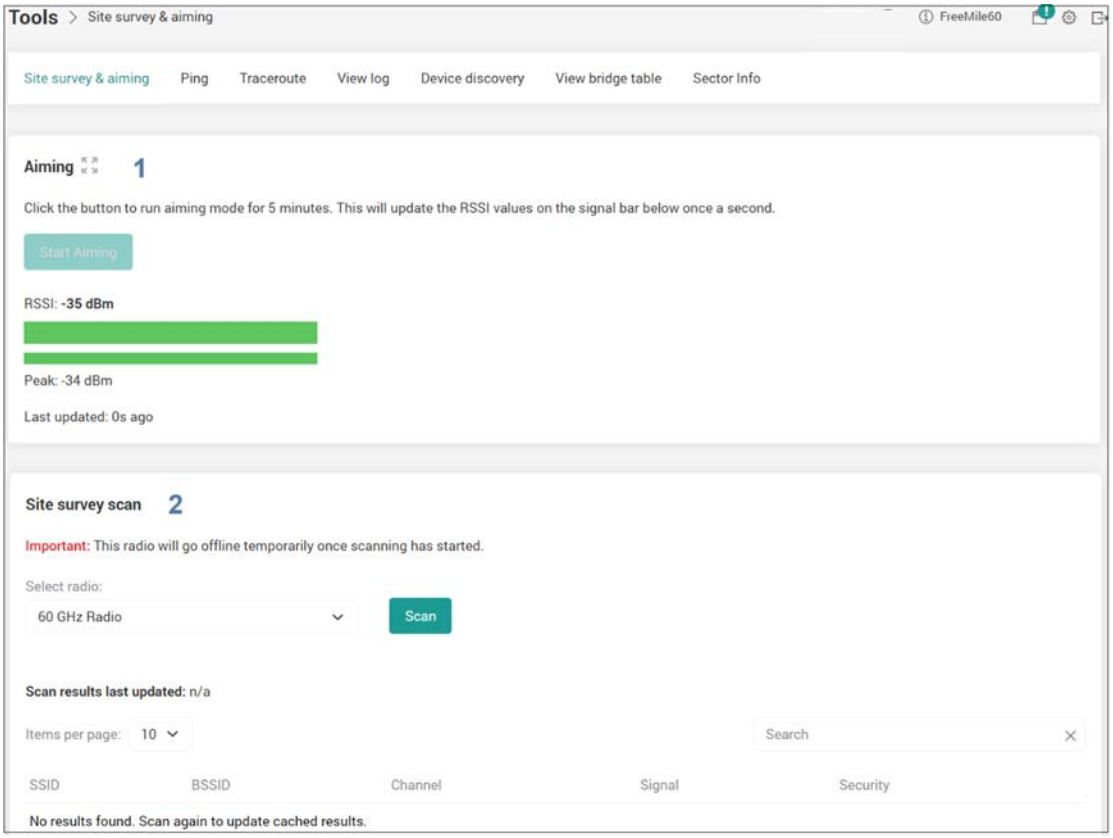
1) ***+Add*** – allows adding new users to the list
2) ***User name*** – allows setting the user name
3) ***Role*** – allows choosing the user role between “Admin” and “Read-Only” options.
4) ***Status*** – allows enabling or disabling the user
5) ***Set new password*** – allows setting the password for each user

Tools

The Tools section contains several tools for operation with Freemile 60 radios.

Tools→Site survey & Aiming

The following options are available:



1) ***Aiming*** – the Aiming tool can be used during the link alignment to display the RSSI signal strength changes at a faster rate than it is displayed in the device's dashboard. This tool is available only when operating in Station or Point-to-point slave modes. To view the aiming data in full-screen mode, click the "fullscreen" icon next to the Aiming header.



When the Aiming is started, two lines are displayed – the RSSI line indicating the actual RSSI level, and the Peak line indicating the maximum RSSI level at some point during the Aiming process.

The coloring of both lines will change among green, orange, and red depending on the RSSI level, and in accordance with the LED blinking pattern. For the LED blinking pattern, refer to *Freemile 60 FODU interfaces and LED indications* section.

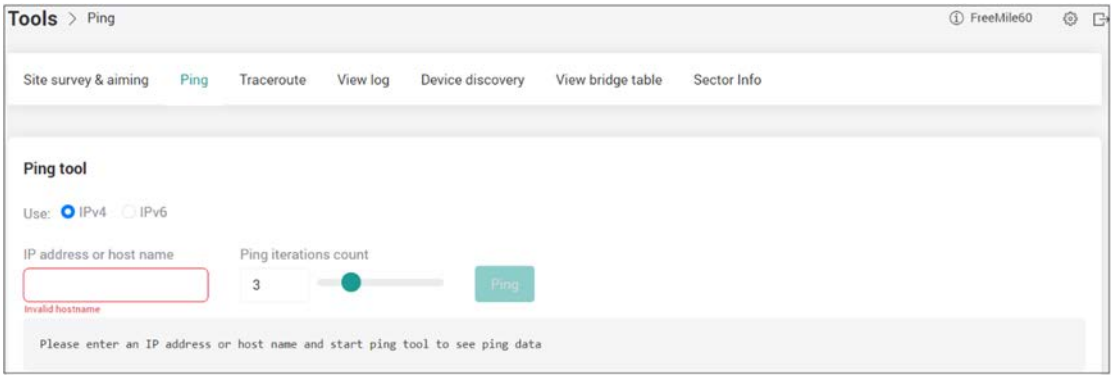
2) ***Site survey scan*** – use the site survey tool to view a list of other Freemile 60 Access points broadcasting in the nearby area. This tool is only available when operating in Station or Point-to-point slave modes.



Running a site survey scan will temporarily cause the radio to become unreachable. It will come back automatically when scanning is complete.

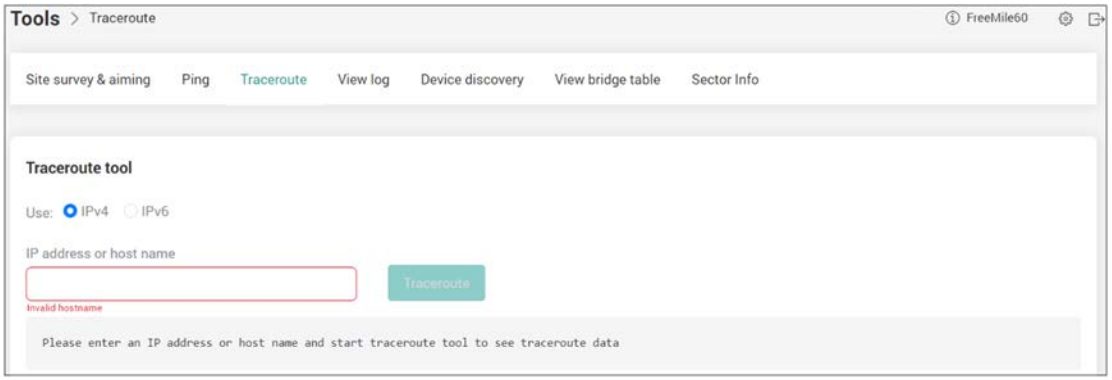
Tools→Ping

Performs basic pinging of IPv4 or IPv6 address from the device:



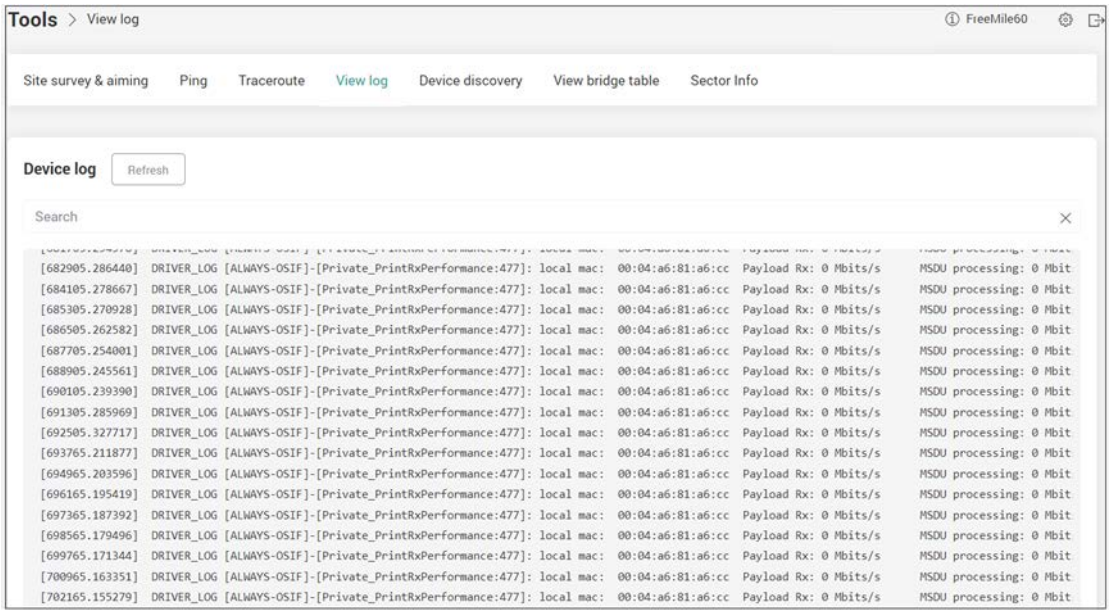
Tools→Traceroute

Performs a basic traceroute operation from the device:



Tools→View log

Search and view the device's log output:



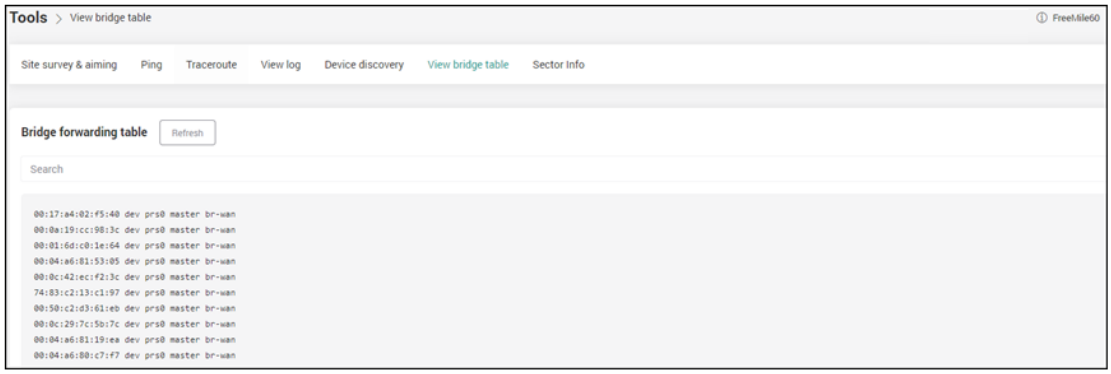
Tools→Device discovery

Use the device discovery tool to find other devices in the network. The Device Discovery option must be enabled under the *Configuration →Services* in “Device discovery” section for the device(s) to be discoverable:



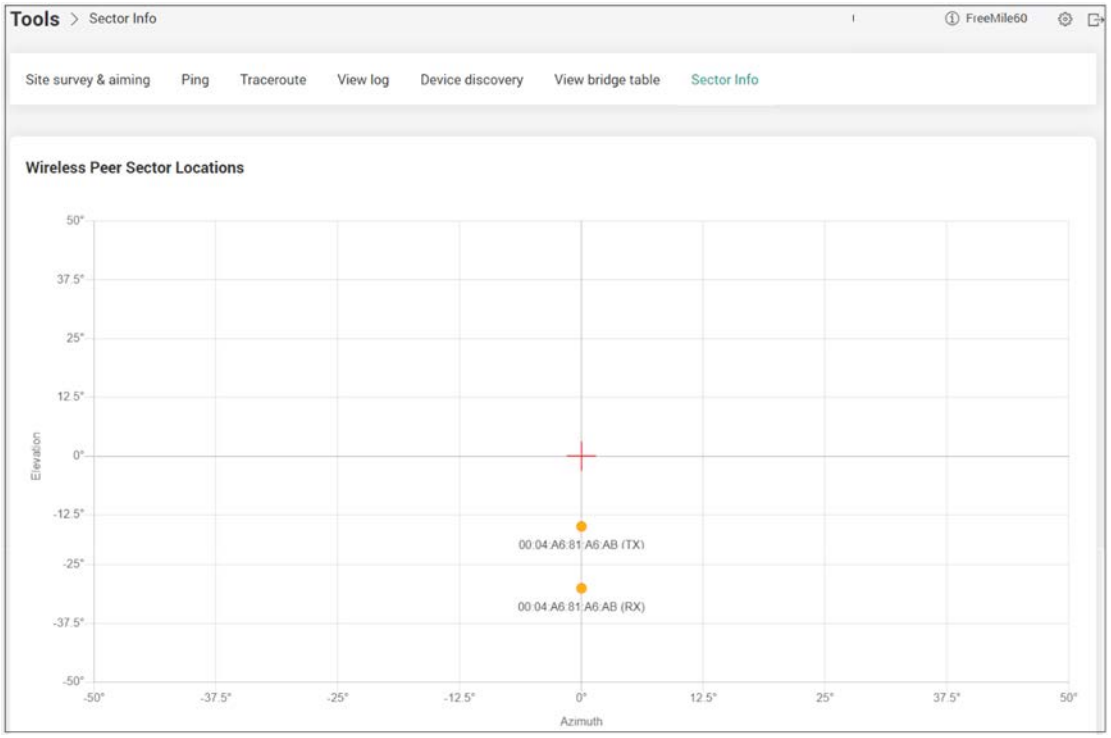
Tools→View bridge table

Use the bridge table tool to view the MAC addresses in the device's bridge forwarding table, as well as their associated interface and bridge:



Tools→Sector info

The sector tool will allow visually see how each peer is connected to the current device (the orange dots), which can help to determine how close connected peers are to the boresight (red “X”):



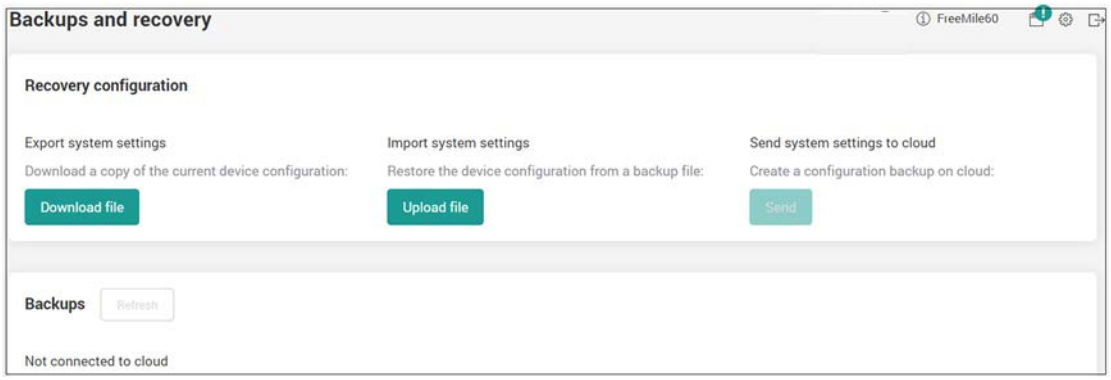
On the Access point side, boresight should be pointed in the center of the area. It is expected that each client will show up on a different sector, based on its physical location (azimuth & elevation), relative to the Access point.

On the Station side, the general goal is to get as close to boresight as possible. However, this is not a strict requirement. As long as there is a signal in the expected range, no need to further adjust the position of the Station. More details of the Sector info tool can be found in *Sector info tool description*

- Sector info is not currently available when an antenna kit is selected
- When clicking on a connected peer's sector ID from the Dashboard section, it will be possible only to see that individual sector on the sector tool
- When multiple peers are connected to the same sector, the point will be indicated as larger, and a list of up to the first 3 devices connected on that sector will be indicated
- It is possible for a peer to be connected on different sectors for RX and TX. When this happens, a peer will be represented by two dots, each with a "(RX)" or "(TX)" label following the peer's name
- There are 4 total beams used when a link is made: Access point TX and RX, and Station TX and RX
- TX and RX sectors will be the same in almost all cases on each side of the link

Backups and recovery

Allows downloading/uploading the configuration file to the PC for backup and recovery purposes:


Backups and recovery
FreeMile60
Recovery configuration
Export system settings
Download a copy of the current device configuration:
Download file
Import system settings
Restore the device configuration from a backup file:
Upload file
Send system settings to cloud
Create a configuration backup on cloud:
Send
Backups
Refresh
Not connected to cloud

Chapter 5: FUNCTIONAL DESCRIPTION AND TOOLS

Failover mode

The Freemile 60 units operating in Station or Point-to-point slave modes can be configured in Failover mode. In this mode, it can use an alternative upstream data path via a device connected to the ETH1 (1Gbps) port if the wireless link has faded or has lost synchronization. For example, the device connected to the ETH1 port can even be a different Station unit pointed to a completely different site.

The alternative data path will be used under the following circumstances:

1. The Station is not currently associated with any Access Point, or
2. The RSSI of the wireless link drops below the pre-configured RSSI threshold (refer to section *Configuration →Network* for Failover mode configuration details)

The device will switch back to the wireless uplink data path once the following two conditions are met:

1. The station is connected to the Access Point at an RSSI level that is above the pre-configured failover threshold, and
2. The RSSI level of the link has been above the failover threshold value for the amount of time defined in the "Flap protection time (sec)" field under the Failover mode settings.

The current failover status can be viewed from the Station device Dashboard. It will be updated once the device's wireless signal is back within a normal range, and the flap timer is counting down. More status details are available under the ETH1 settings of the Dashboard. Also, the activity events, log entries, and SNMP traps are all created whenever the device's failover state changes.

Sector info tool

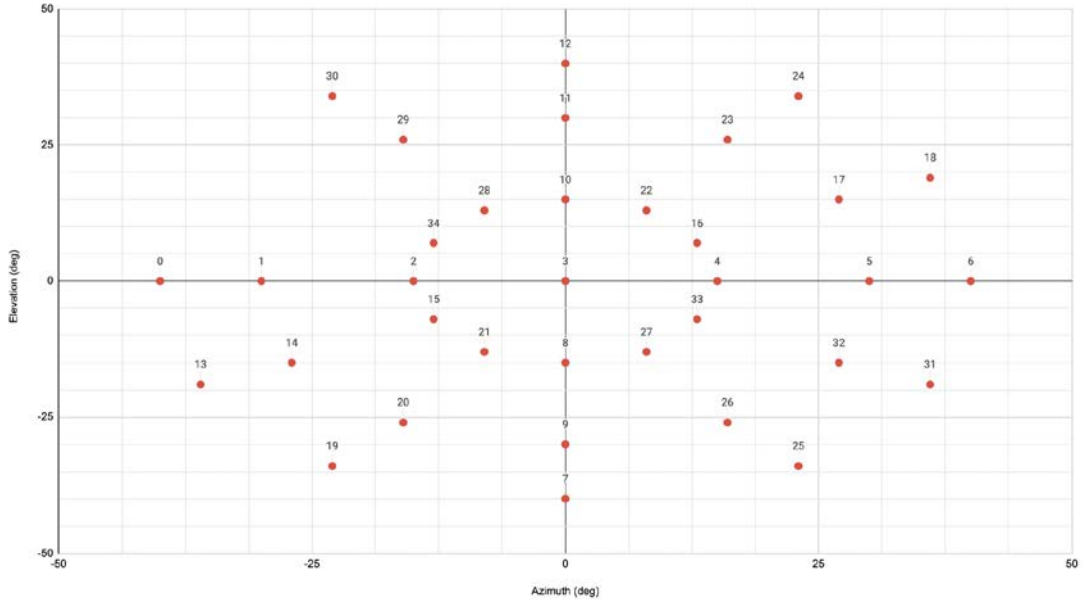
The sector tool will allow visually see how each peer is connected to the current device (the orange dot), which can help to determine how close connected peers are to the boresight. The boresight is the red cross in the graph indicating the device itself.

On the Access Point side, boresight should be pointed in the center of the area. It is expected that each client will show up on a different sector, based on its physical location (azimuth & elevation), relative to the Access Point.

On the Station side, the general goal is to get as close to boresight as possible. However, this is not a hard requirement. As long as there is a signal in the expected range, there is no need for further adjusting the position of the Station.

There are 4 total beams used when a link is made: Access Point TX and RX, and Station TX and RX. The TX and RX sectors will be the same in almost all cases on each side of the link.

Sector mapping example:



MIB files

Contact techsupport@saftehnika.com for MIB files.

ABBREVIATIONS

AP – Access Point
AC – Alternating Current
AES – Advanced Encryption Standard
ANSI – American National Standards Institute
API – Application Programming Interface
CPU – Central Processing Unit
CDP – Cisco Discovery Protocol
DC – Direct Current
DHCP – Dynamic Host Configuration Protocol
DNS – Domain Name System
DST – Daylight Saving Time
ETH – Ethernet
FCC - The Federal Communications Commission
FDB – Forwarding Database
FODU – Full Outdoor Unit
FTP – Foil Twisted Pairs
FW – Firmware
GUI – Graphical User Interface
GCMP – Galois/Counter Mode Protocol
HTTP – Hypertext Transfer Protocol
HTTPS – Hypertext Transfer Protocol Secure
IEEE - Institute of Electrical and Electronics Engineers
IP – Internet Protocol
ISEDC – Innovation, Science and Economic Development Canada
LED – Light-Emitting Diode
LLDP – Link Layer Discovery Protocol
MAC – Media Access Control
MCS – Modulation Coding Scheme
MIB – Management Information Base
MNDP – Mikrotik Neighbor Doscovery Protocol
MTU – Maximum Transmission Unit
NTP – Network Time Protocol
PC – Personal Computer
PoE – Power over Ethernet
PTP – Point-to-point
RF – Radio frequency
RSSI – Received Signal Strength Indicator
RX – Receive
SHA – Secure Hash Algorithm
SNMP - Simple Network Management Protocol
SSID – Service Set Identifier
SSH - Secure Shell
STP – Shielded twisted pair
TCP – Transmission Control Protocol
TDD – Time Division Duplex
TDMA – Time Division Multiple Access
TV – Television
TX – Transmit
UDP – User Datagram Protocol
URL – Uniform Resource Locator
VLAN – Virtual Local Area Network



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