FreeMile



User manual

Freemile 60 GHz

VER 1.3 FW 1.12.0

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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 licenseexempt 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 90° 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 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): 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 minimum distance 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 30 cm between the radiator and your body.

Freemile 60 FODU interfaces and LED indications



Freemile 60 radio unit has 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:





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

Chapter 2: INSTALLATION

Package contents

1

Max: Ø8.5mm/0.334 inch Min: Ø6.5mm/0.256 inch

1

wall

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 single screw (not included in the package). The wall mounting instructions are as follows:

Tools required: screwdriver (depending on a used screw)





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 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



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

Tighten the tie around the pole



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

Freemile 60 attaching to 100mm antenna kit

100mm antenna kit contains following parts:

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



- 1. Attach the radom to the radio with 4 screws included in the antenna kit package. Use size 2 Philips screwdriver
- 2. Remove the existing mounting bracket from the radio with size 4 Allen wrench
- 3. Using the same screws attach the mounting bracket from the antenna kit package to the radio
- 4. Use 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 supply (38...57V DC, at least 30W for a single Freemile 60 unit). The input power to the Freemile 60 should be 48V DC, and a minimum of 0.5A (24W) is recommended. The Freemile 60 FODU does support active PoE (802.3at, etc.).

PoE injector is included in Freemile 60 radio package. The PoE injector has a built-in AC/DC converter supporting 100-240V AC input and 48V DC output. It has a LED indicating about connected AC input (solid green).

The Ethernet cable from the PoE injector "POE" port must be connected to the 2.5 Gbps RJ-45 port on Freemile 60 radio unit (refer to *Freemile 60 FODU interfaces and LED indications* section). The total length of Ethernet cables from CPE to PoE injector (LAN port) and from Freemile 60 to PoE injector (POE port) combined should not exceed 100m. It is recommended to use outdoor-rated STP/FTP Ethernet cable Cat6 or better.

The Freemile 60 unit has the ability to send passive PoE out of the 1 Gbps port to power another device using the input power provided to the Freemile 60 unit. The setting of this option is described in the Web GUI *Configuration* \rightarrow *Network* section. The output voltage is the same as the input voltage and supports maximum 0.5A current (24W total).



When using the PoE-out feature on the Freemile 60 unit, make sure that the used power supply unit is rated at > 60W to power both Freemile 60 units. The supplied PoE injector provides only 24W excluding losses that may not be adequate to power both devices and may result in unstable operation.



Passive PoE out on the 1Gbps port can damage non-PoE devices. Do not connect non-PoE devices to the 1Gbps port when PoE out is enabled.

Bench-testing of Freemile 60 FODUs

For Freemile 60 radio link connection on the 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 on each side radio. 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 *Initial configuration* section. For configuration details refer to *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 web GUI section *Configuration* \rightarrow *Network*:

FreeMile	Management network
 Dashboard Activity 	Enable Management VLAN Management IPv4 mode Static
✤ Configuration	Management IPv4
🍇 Users	Enable IPv4 static IP
🗞 Tools	IP address Netmask
$\ensuremath{\mathbb{S}}$ $\ensuremath{}$ Backups and recovery	Gateway 192.168.100.1

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 Access point unit and the Station unit. This all can be set in web GUI section *Configuration* →*Wireless*:

FreeMile	a 60 GHz Radio
O Dashboard	Wireless mode
🛱 Activity	Access point
✤ Configuration	Antenna kit Base unit only (no antenna kit)
💄 Users	Channel width Channel
🗞 Tools	Full: 2.16 GHz V 1 (58320 MHz)
${\cal J}$ Backups and recovery	Max MCS MCS 12
	SSID SAF_WEB_testrack

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 web GUI section *Configuration* \rightarrow *Wireless*:

FreeMile	60 GHz Radio
① Dashboard	Wireless mode Station
😁 Activity	Antenna kit
✤ Configuration	Base unit only (no antenna kit)
a Users	Channel width Full: 2.16 GHz
💥 Tools	Max MCS
${\cal G}$ Backups and recovery	MCS 12
	SSID SAF_WEB_testrack

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:

FreeMile	Click the button to run aiming mo	ode for 5 minutes. This will update	the RSSI values on the signa	al bar below once a	second.	
Dashboard	Start Aiming					
Activity						
Configuration	Site survey scan					
Users	Important: This radio will go offlin Select radio:	ne temporarily once scanning has	started.			
Tools	60 GHz Radio	✓ Scan				
Backups and recovery	Scan results last updated: a few	seconds ago				۱
	Items per page: 10 🗸			Search		>
	SSID	BSSID	Channel	Signal	Security	
	SAF_WEB_testrack_ST	00:04:a6:81:a6:cc	1 (58320 MHz)	-39 dBm	WPA2-PSK-GCMP	

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 192.168.1.0 subnet. The IP address should be something other than the default IP addresses (192.168.1.1).

Internet Protocol Version 4 (TCP/IPv4)	Properties X
General	
You can get IP settings assigned autor this capability. Otherwise, you need to for the appropriate IP settings.	natically if your network supports ask your network administrator
Obtain an IP address automatical	у
OUse the following IP address:	
IP address:	192.168.1.2
Subnet mask:	255 . 255 . 255 . 0
Default gateway:	
Obtain DNS server address autom	atically
O Use the following DNS server add	resses:
Preferred DNS server:	
Alternative DNS server:	
Ualidate settings upon exit	Advanced
	OK Cancel

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

À

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

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

ล	
Sign In	
Username	
Password	69
	Log In



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

6. Press "Log in" button.



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

Web GUI description

Web interface consists of three parts, those parts are following:

FreeMile	Dashboard		2						 Freemile-AP 	9 و) G
Dashboard	System	Information :		2							
🗂 Activity	Treenine of			3							
✤ Configuration	Name Freemile-AP		Hostname freemile				Location testlabRiga				
a Users	Firmware Version	1.12.0 rev 54429			Driver Vers	sion	6.8.5747837				
🔅 Tools	Alt. Firmware	1.12.0 rev 54424			Antenna C	onfig	2.0.73735				
	System Uptime	2 days 20 hours			Serial Num	nber	504320100139				
${\mathcal S}$ Backups and recovery	System Time	2024/05/24 07:46			Antenna K	it	none				
	a Wireless S	tatus :							Status	Throughp	ut
	Mode		SSID		MAC	00:04:/	A6:81:A6:CC	Tx Power	37 dBm EIRP		
	Access point		SAF_WEB_testrack		Security	Open		Tx Bytes	426.8 MB		
					Channel	1 (583)	20) @ 2160 MHz	Rx Bytes	78.8 MB		
54429 兴	Connected Clien	ts (1)					Search			×	

1 Main menu tree

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

- Dashboard shows the overall status of your device
- Activity event log indicating recent events 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** 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 on the bottom of this section 3 1.12.0 rev 54419 \ll expanding the side panel.

allows hiding or

2 Header of the page

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

- FreeMile60 🕑 🗇 🕞 Freemile 60 radio information, can be viewed by pointing the cursor on it
- ^③ FreeMile60 by clicking on it the device actions/settings will be opened:

	(i) FreeMile60	0
DEVICE ACTIONS	FIRMWARE ACTIONS	
Fetch troubleshooting file Reset device to defaults Reboot device	Update firmware Upload a new firmware image to update the device firmware version	2

The following device actions can be done here:

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





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

⁽¹⁾ Freedilieso **(1)** 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:

Configur	ration > w	ireless	1≣	Save	Discard	FreeMile60	۲	₿
•	1 ≗≡	"List" button indicates parameters	s that v	vere o	changed	and are pending for	or	

saving in the configuration file

- Save "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

Dashboard page consists of several informational sections:

• System information of the device:

System	Information					
Name Freemile-AP			Hostname freemile		Location testlabRiga	1
Firmware Version Alt. Firmware System Uptime System Time	1.12.0 rev 54429 1.12.0 rev 54424 2 days 21 hours 2024/05/24 08:25	2 4		Driver Version Antenna Config Serial Number Antenna Kit	6.8.5747837 2.0.73735 504320100139 none	3 5

- 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
- 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 web GUI section Configuration →System
- 5) Serial number and antenna kit: the device's antenna kit can be configured in 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:

System Info FreeMile-60	ormation	
	Configure	

• 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:

Wireless Status Mode Access point	: 1	SSID SAF_WEB_testrack_	ST	MAC Security	00:04:A6:81:A6:C WPA2-PSK (GCM	С Тх Ро Р) Тх Ву	Status ower 37 dBm EIRP rtes 17.4 MB	Throughput 3
Connected Clients (1)	2 Signal ۞	MAC \Diamond	IP Address 🗘	Connected \Diamond	MCS (Tx/Rx)	Search	Download 🗘	×
> -	-35 dBm	00:04:A6:81:A6:	-	03:04:36	MCS 12 / MCS	9 513 bps	4.1 kbps	:

- 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 Name C

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

Conne	ected Clie	ents (T)							Search		×
Name	\diamond	Sign	nal 🗘	MAC 0	IP Addres	s 0	Connected 🛇	MCS (Tx/Rx)	Upload 🗘	Download \Diamond	
~ -		-35	dBm	00:04:A6:81:	A6:		03:28:23	MCS 12 / MCS 1	513 bps	3.0 kbps	:
Stat	S	тх	RX		Addl. Link Data			Packets / MCS D	atarate	Packets / TX Retry	Bucket
Byte	S	10.1 MB	29.3 MB		SNR	8					
Pack	kets	35 k	81 k		Distance	1 meters					1-3
Data	irate	4620 Mbps	385 Mbps		Sector	8/9					● 4-6 ● 7-9
6	At MCS1	, this link can w	vithstand tropical	l storms at >	TX Speedtest	0 Mbps	Run				10+ retries
	1k mm/ł	hr, or a max path	nloss of 35000 d	B/km.	RX Speedtest	0 Mbps	Run				

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

connected Clients (1)						Search			×
Name 🗘	Signal 0	MAC 0	IP Address 🗘	Connected 🗘	MCS (Tx/Rx)	Upload 0	Down	oad 🗘	
> ·	-36 dBm	00:04:A6:81:A6:		1 days 4 hours	MCS 12 / MCS	1 0 Mbps	3.3 kb	ps	;
								Kick client	

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

ଛ ₩i	reless Status	:								Status	Throughput
Interval:	5 minutes 🗸	4									N N 12 12
100 Mbps											
50 Mbps											
0 bps	15:35	15:35	15:36	15:36	15:37	15:37	15:38	15:38	15:39	45:3	9
					Rx	Tx					

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

and

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

S Wireles	s Status					Status	Throughput
Station Connec	tion Status			Packets / MCS Datarate	Packets / TX	Retry Bucket	
Signal -36 dBm		Connection Time 03:44:57	5			0 1-3 4-8	
SSID SAF_WEB_test	rack_ST	Distance 1 meters				• 7-9 • 10+ retries	
TX Speedtest RX Speedtest	0 Mbps Run 0 Mbps Run	6	4	At the lowest modulation, this pathloss of 42000 dB/km for t	link can withstand tropical this distance and channel.	storms (> 1k mm/hr)	, or max
AP Name			Security	WPA2-PSK (GCMP)	MCS (Tx/Rx)	MCS 9 / MCS 12	
AP IP Addr		7	Channel	1 (58320) @ 2160 MHz	Datarate (Tx/Rx)	2502 / 4620 Mbps	
AP BSSID	00:04:A6:81:A6:0	c	Link SNR	8	Bytes (Tx/Rx)	10.2 MB / 5.0 MB	
STA MAC	00:04:A6:81:A6:/	AB	Sector (Tx/Rx)	8/9	Packets (Tx/Rx)	67 k / 23 k	

- 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:

	🗟 Wireless	Status	
Ν	/lode	Configure	S
A	Access point		S
Ethernet status of the de	evice indica	tes both Ethernet	ports statuses, PoE status
MAC address			

Ethernet	Status					Internal Switch MAC	00:04:A6:81:A6:CA
ET1 2.5G	HO Port				H1 PoE Out Disabled		
Status Speed	Link up 100 Mbps Full Duplex	Bytes (Tx/Rx) Packets (Tx/Rx)	67.5 MB/60.1 MB 115 k/490 k	Status Speed	Link down -	Bytes (Tx/Rx) Packets (Tx/Rx)	-

Clicking on the "three dots" button will lead to *Configuration* -Network page:

Ethernet	Status	
	Configure	

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

ETH0 Throughput	ETH1 Throughput
Interval: 5 minutes V	Interval: 5 minutes V
100 MDps	100 mops
50 Mbps	50 Mbps
0 bps $\frac{16.32}{16.32} \frac{16.33}{16.33} \frac{16.34}{16.34} \frac{16.34}{16.35} \frac{16.35}{16.35} \frac{16.36}{16.36} \frac{16.37}{16.37}$ Rx \square Tx	0 bps 16:31 36:31 36:34 46:34 46:35 46:35 46:35 46:36 46:36 46:37 72:31 36:34 36:31 7x

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

Network	Information		System Resources		
Han Activ	nagement ve network	Data Bridge	CPU Usage		Memory Usage
MAC DNS	00:04:A6:81:A6:CA 1.1.1.1,1.0.0.1		1% used 99% free		3 <mark>5% used</mark> 65% free
Address Netmask	192.168.100.139 255.255.255.0	Gateway 192.168.100.1	System Temperatures		
			100°C 80°C 60°C 42°C 20°C 20°C	47°C	43°C
			CPU temp	Modem temp	Radio temp

Activity

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

Activity		FreeMile60	٢	B
Events Items per page: 10 ~ 1	2 3 Download data		×	
🗘 🛛 Date & Time 🗘	Message 🗘			
2024-04-26 11:40	Successful management authentication from 46.109.16.30 over WEB by root			
0 2024-04-25 16:40	Successful management authentication from 46.109.16.30 over WEB by root			
0 2024-04-25 16:16	Successful management authentication from 46.109.16.30 over WEB by root			
0 2024-04-25 16:10	Successful management authentication from 46.109.16.30 over WEB by root			
0 2024-04-25 16:03	Successful management authentication from 46.109.16.30 over WEB by root			
0 2024-04-24 17:00	Client 78:5E:E8:D0:38:39 disconnected from $\widehat{\mathfrak{g}}$ SAF_WEB_testrack_ST (60 GHz Radio)			
2024-04-24 17:00	prs1 is down			
0 2024-04-24 16:30	Client 78:5E:E8:D0:38:39 connected to $_{\!$			
0 2024-04-24 16:30	prs1 is up			
2024-04-24 16:30	prs1 is down			
Total entries: 24	4 « < 1	2 3 >	»	

- 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 any specific event from the list
- 4) Allows navigating through the event data lists

Configuration

Configuration section allows configuration of Network, Wireless, System parameters and supported Services. When any of the parameters will be 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 "Save" button.

Configuration→Network

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

Configuration > Network	k	2 = Save Discard	③ FreeMile60
Network Wireless Ser	rvices System		
General		ETH1 settings	
The settings below apply to all int	erfaces on this device.	Enable PoE out 3	
мти 1		Disable data	
1500		•	
Bridge ageing time (sec) 2			
300			
Management network	k		
Enable Management	VLAN 5		
Management VLAN ID			
100			
Enable static IP on da	ata bridge 7		
Data bridge IPv4 address 8		Data bridge IPv4 netmask 9	
192.168.2.1		255.255.255.0	
Management IPv4 mode 10)		
Static		~	
	11		
Management IPv4		Management IPv6	
Enable IPv4 static IP		Enable IPv6 static IP	
IP address	Netmask		
192.168.100.139	255.255.255.0		
Gateway			
192.168.100.1			
DNS servers			
1.1.1.1			
1001			
1.0.0.1			

- MTU allows setting MTU (maximum transmission unit) for wireless interfaces, ethernet ports, and management/local bridge. The minimum allowed value is 1280 bytes, and the max is 7900 bytes
- Bridge ageing time allows setting 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 management VLAN on the device.
- Management VLAN ID appears when Management VLAN option is enabled. Allows to specify the management VLAN ID



Once the management VLAN is enabled and 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.
- Data bridge IPv4 address appears when the data bridge functionality is enabled. It allows setting IPv4 address for data bridge
- Data bridge IPv4 netmask appears when the data bridge functionality is enabled. It allows setting IPv4 netmask for data bridge
- Management IPv4 mode allows choosing between Static IP address or DHCP client mode
- Management IPv4 and Management IPv6 when Static management mode is chosen, allows setting IPv4 or IPv6 settings for management access

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

Management IPv4 mode		
DHCP client	~	
Management fallback IPv4 12	2	Management IPv4 netmask
192.168.100.139		255.255.255.0
DHCP broadcast		
Custom DNS		
DNS servers		
1.1.1.1		
1.0.0.1		

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

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

General	ETH1 settings
The settings below apply to all interfaces on this device.	Enable PoE out
MTU 1500 Bridge ageing time (sec) 300 Max FDB entries 13 0	 Disable data Enable failover 14
DHCP Snooping	Traffic Control
Block rogue DHCP servers 15	Limit upload rate 100 Mbps 17
Enable DHCP Option 82 Injection 16	Limit download rate 100 Mbps 18
Option 82 Remote ID Type	
None	~
Option 82 Circuit ID Type	
None	×

13) **Max FDB entries** – allows setting the maximum number of allowed FDB (forwarding database) entries. Value 0 is for 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 ETH1 port, the Failover function will be automatically disabled
 - Failover mode is supported only when 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:

Enable failover
RSSI threshold
-68
Flap protection time (sec)
10

- 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 upload or download limit in Mbps
- 18) *Limit download rate* enables or disables traffic shaping on the download (ethernet) path, and sets upload or download limit in Mbps

Configuration→Wireless

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

Configuration >	Wireless		
Network Wireles	s Services	System	
🔓 60 GHz Rad	io		
Wireless mode 1			
Access point			~
Antenna kit 2			
Base unit only (no a	antenna kit)		~
Channel width 3		Channel 4	
Full: 2.16 GHz	~	1 (58320 MHz)	~
Max MCS 5			
MCS 12			~
ssid 6			
SAF_WEB_testrack	_ST		
Security mode 7			
AES+GCMP			~
Passprase 8			
			60

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

- 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 more channels 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 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

Â

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 \rightarrow Wireless section following additional settings are available:

Failover 9			
Failover to ETH1	is not enabled.		
Station Profile	s ?		
Enable	10		
Priority 🗘	$_{\text{SSID}}$ \bigcirc 12	Security Mode \bigcirc 13 Security Passphrase \bigcirc 14	\$
1	SAF_WEB_testrack	AES+GCMP 🗸 🗸	ы×
+ Add		15	🕑 Enable sorting

- 9) *Failover* indicates the status of Failover mode
- 10) **Enabling** of Station profiles allow to input 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:

Configuration > Services	4 ₩ Discard ① FreeMile60 ③ 🗗			
Network Wireless Services System				
HTTP server 1	SSH Server 2			
Configure the ports used to access this device's local web server.	Secure Shell Protocol (SSH) is a cryptographic network protocol for operating network services securely over an unsecured network.			
Port				
80	Enabled			
	Port			
HTTPS port	22			
443				

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

NTP	Device discovery
Network Time Protocol (NTP) is a protocol used to synchronize this device's system clock time.	This feature enables this device to find other devices compatible with the available discovery protocols, as well as to broadcast information to other devices.
Enabled 3	Enabled 5
Server addresses 4	Discover nearby devices: 6
time.google.com	LLDP listener server
time.cloudflare.com	Broadcast device info: 7
	LLDP (Link Layer Discovery Protocol)
	CDP (Cisco Discovery Protocol)
	MNDP (MikroTik Neighbor Discovery Protocol)

- 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
- 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)

Remote syslog	
Syslog is a way for this device to send event messages to a logging server or file.	
Enabled 8	
Protocol 9	
	``
Please select a value Server address 10	
Port 11	
Must be in range from 1 to 65535	

- 8) Enable remote syslog allows enabling/disabling the remote syslog service
- Protocol allows choosing remote syslog server protocol: TCP or UDP
- 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

SNMP Server	SNMP Traps
Simple Network Management Protocol (SNMP) is an application-layer protocol for monitoring and managing network devices on a local area network (LAN) or wide area network (WAN). The purpose of SNMP is to provide network devices such as routers, servers and printers with a common language for sharing information with a network management system (HMS).	An asynchronous alert sent by the local SNMP agent to the SNMP server specified below to indicate a significant event has occurred. Traps match up to system activity events for the most part.
Enabled 12	Server address 18
Protocol 13	
SNMPv2 + SNMPv3	Invalid hostname User 19
Community 14	
public	Must be 1-100 symbols long Protocol 20
User 15	SNMPv2 V
	Community 21
Must be 1-100 symbols long Password 16	public
Must be 8-32 symbols long	

- 12) **Enable** SNMP server enables the local SNMP server. The SNMP server is disabled by default
- 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*
- User allows entering SNMPv3 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
- 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
- Community or Password allows entering community string for SNMPv2, or allows specifying password used for SNMPv3

Ping watchdog	
Enable ping watchdog to reboot this device when it is unable to ping the specified IP address.	
Enabled 22	
Ping interval (s) 23	
300	
Startup delay (s) 24	
300	
Failure count 25	
3	
IP address(es) to ping: 26	
192.168.1.1	

- 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:

Configuration > System	2 ़ Save	Discard	 FreeMile60 	G		
Network Wireless Services System						
Device information	Time settings					
Device name 1 FreeMile60	Enable advance	ed timezones w/DST support 5				
Device location 2	(UTC-8) America/Los A	(UTC-8) America/Los Angeles				
Country 3	Date 01/01/2020	7 Time				
United States	✓ Set device timezone	from browser				
freemile						
Other settings						
Physical reset button enabled 8						

- 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
- 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
- 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
- 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 become unreachable

Users

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 "Save" button.

Users		6 🗄 Save Discard	(i) FreeMile60 (ii) E
Users configuration + Add			
User name 2	Role 3	4 Status Set new password 5	
root	Admin	× (ы
test	Read-Only	~ 	ы×

- 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

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

Tools→Site survey & Aiming

The following options are available:

Fools > Site survey	/ & aiming						-	① FreeMile60	•	© E
Site survey & aiming	Ping	Traceroute	View log	Device discovery	View bridge tab	le Sector In	fo			
Aiming 💱 🛛 🕇										
Click the button to ru	n aiming m	ode for 5 minute	s. This will up	date the RSSI values	on the signal bar b	elow once a sec	ond.			
Start Aiming										
RSSI: -35 dBm										
Peak: -34 dBm										
Last updated: 0s ago										
Site survey scan	2									
Important: This radio	will go offl	ine temporarily o	nce scanning	has started.						
Select radio:			_							
60 GHz Radio			~	Scan						
Scan results last upd	lated: n/a									
Items per page: 10) ~						Search			×
SSID	BSSI	D	Ch	annel	S	gnal	Security			
No results found. Sc	an again to	update cached r	esults.							

 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 max reached 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 LED blinking pattern. For LED blinking pattern refer to *Freemile 60 FODU interfaces and LED indications* section

 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 > Ping							FreeMile60	0	G
Site survey & aiming	Ping	Traceroute	View log	Device discovery	View bridge table	Sector Info			
Ping tool									
Use: OIPv4 OIPv6	5								
IP address or host nam	10	Ping iteration	os count	Ping					
Please enter an IP	address o	r host name and	d start ping	tool to see ping data	1				

Tools→Traceroute

Performs a basic traceroute operation from the device:

Tools > Traceroute							(i) FreeMile6	0	G
Site survey & aiming	Ping	Traceroute	View log	Device discovery	View bridge table	Sector Info			
Traceroute tool									
Use: • IPv4 O IPv6	5								
IP address or host nam	ie			Traceroute					
Please enter an IP	address o	er host name and	i start trace	route tool to see tra	aceroute data				

Tools→View log

Search and view the device's log output:

ols > View log								(1) FreeMile60	٢
iite surve <mark>y</mark> & aiming	g Ping	Traceroute	View log	Device discovery	View brid	ge table Sector	Info		
evice log Ret	Iresh								
Search									×
[former a man 1	L					rowe pressoands .	
[682905.286440]	DRIVER_LOG	[ALWAYS-OSIF]-	[Private_Prin	tRxPerformance:477]:	local mac:	00:04:a6:81:a6:cc	Payload Rx: 0 Mbits/s	MSDU processing: (0 Mbit
[684105.278667]	DRIVER_LOG	[ALWAYS-OSIF]-	[Private_Prin	tRxPerformance:477]:	local mac:	00:04:a6:81:a6:cc	Payload Rx: 0 Mbits/s	MSDU processing: (0 Mbit
[685305.270928]	DRIVER_LOG	[ALWAYS-OSIF]-	[Private_Prin	tRxPerformance:477]:	local mac:	00:04:a6:81:a6:cc	Payload Rx: 0 Mbits/s	MSDU processing: (0 Mbit
[686505.262582]	DRIVER_LOG	[ALWAYS-OSIF]-	[Private_Prin	tRxPerformance:477]:	local mac:	00:04:a6:81:a6:cc	Payload Rx: 0 Mbits/s	MSDU processing: (0 Mbit
[687705.254001]	DRIVER_LOG	[ALWAYS-OSIF]	[Private_Prin	tRxPerformance:477]:	local mac:	00:04:a6:81:a6:cc	Payload Rx: 0 Mbits/s	MSDU processing: (0 Mbit
[688905.245561]	DRIVER_LOG	[ALWAYS-OSIF]-	[Private_Prin	tRxPerformance:477]:	local mac:	00:04:a6:81:a6:cc	Payload Rx: 0 Mbits/s	MSDU processing: (0 Mbi
[690105.239390]	DRIVER_LOG	[ALWAYS-OSIF]-	[Private_Prin	tRxPerformance:477]:	local mac:	00:04:a6:81:a6:cc	Payload Rx: 0 Mbits/s	MSDU processing: (0 Mbi
[691305.285969]	DRIVER_LOG	[ALWAYS-OSIF]	[Private_Prin	tRxPerformance:477]:	local mac:	00:04:a6:81:a6:cc	Payload Rx: 0 Mbits/s	MSDU processing: (e Mbi
[692505.327717]	DRIVER_LOG	[ALWAYS-OSIF]-	[Private_Prin	tRxPerformance:477]:	local mac:	00:04:a6:81:a6:cc	Payload Rx: 0 Mbits/s	MSDU processing: (0 Mbi
[693765.211877]	DRIVER_LOG	[ALWAYS-OSIF]	[Private_Prin	tRxPerformance:477]:	local mac:	00:04:a6:81:a6:cc	Payload Rx: 0 Mbits/s	MSDU processing: (0 Mbi
[694965.203596]	DRIVER_LOG	[ALWAYS-OSIF]-	[Private_Prin	tRxPerformance:477]:	local mac:	00:04:a6:81:a6:cc	Payload Rx: 0 Mbits/s	MSDU processing: (e Mbi
[696165.195419]	DRIVER_LOG	[ALWAYS-OSIF]-	[Private_Prin	tRxPerformance:477]:	local mac:	00:04:a6:81:a6:cc	Payload Rx: 0 Mbits/s	MSDU processing: (0 Mbi
[697365.187392]	DRIVER_LOG	[ALWAYS-OSIF]-	[Private_Prin	tRxPerformance:477]:	local mac:	00:04:a6:81:a6:cc	Payload Rx: 0 Mbits/s	MSDU processing: (8 Mbi
[698565.179496]	DRIVER_LOG	[ALWAYS-OSIF]	[Private_Prin	tRxPerformance:477]:	local mac:	00:04:a6:81:a6:cc	Payload Rx: 0 Mbits/s	MSDU processing: (0 Mbi
[699765.171344]	DRIVER_LOG	[ALWAYS-OSIF]-	[Private_Prin	tRxPerformance:477]:	local mac:	00:04:a6:81:a6:cc	Payload Rx: 0 Mbits/s	MSDU processing: (0 Mbi
[700965.163351]	DRIVER_LOG	[ALWAYS-OSIF]	[Private_Prin	tRxPerformance:477]:	local mac:	00:04:a6:81:a6:cc	Payload Rx: 0 Mbits/s	MSDU processing: (0 Mbi
[702165.155279]	DRIVER LOG	[ALWAYS-OSIF]-	[Private Prin	tRxPerformance:4771:	local mac:	00:04:a6:81:a6:cc	Payload Rx: 0 Mbits/s	MSDU processing: (a Mbit

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:

Cools > Device disco	very				(FreeMile60 (2)) (
Site survey & aiming	Ping Traceroute	View log Device	e discovery View bridge t	table Sector Inf	ío		
Device discovery	Refresh				Search	×	<
Chassis ID 🗘	Local Port 🗘	Remote Port 🗘	IPv4 address 🛇	IPv6 address 🗘	Name 🗘	VLAN 🗘	
> 00:04:A6:81:A6:A9	prs0	br-wan	192.168.100.145 🗐	2001::1 🗉	FreeMile60	-	
> 00:17:A4:02:F5:40	eth0	5	192.168.100.4 🗐		ProCurve Switch 2626	5 -	

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 adjust further the position of the Station. More details of 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 configuration file to the PC for backup and recovery purposes:

Backups and recovery		FreeMile60	0	G
Recovery configuration				
Export system settings	Import system settings	Send system settings to cloud		
Download a copy of the current device configuration:	Restore the device configuration from a backup file:	Create a configuration backup on cloud:		
Download file	Upload file	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 the synchronization. For example, the device connected to ETH1 port can be even 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 preconfigured 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 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



Refer to 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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