Airvine WaveTunnel™

User Manual and Configuration Guide

Version: 1.4 Dec 2023

TABLE OF CONTENTS

WaveTunnel Introduction

The WaveTunnel 2041-DC is an indoor wireless backhaul system supporting multiple in-building topologies. Operating in the 60 GHz band, this is a point-to-point (PtP) system with a 2Gbps maximum throughput rate and a 100-meter link range.

The system has an advanced RF front end with enough gain to beam through indoor wall materials thus enabling NLOS backbones, and with +/- 45-degree steering can also avoid obstacles and beam around corners. The unit can be configured quickly by using a Smartphone App, AirvineMobile™ or a browser version, VineManager™. Powered by a collection of software, VineSuite, the WaveTunnel is the world's first mmWave indoor wireless backbone.

The WaveTunnel system can be employed in a variety of applications or markets. The product has been designed from the ground up to be simple to install, simple to configure and simple to use. All of this means no rf or special skills are needed enabling installation of a single unit in minutes.

WaveTunnel is ideal for a multitude or applications, a sampling is listed here:

- Multiple Dwelling Units
- Hospitality
- Industrial and Manufacturing
- Large Private Venue

Featured benefits for these and other applications include the ability to deploy without construction and hence there is little to no disruption to tenants, guests, or employees. In addition, Wave Tunnel provides:

- The ability to be deployed in a ring or daisy chain topology
- Our proprietary VineOS for resilient ring support
- Deployment of a high-speed Ethernet backbone in hours
- Nodes that automatically connect once configured
- The ability to be installed flush against a ceiling
- Three layers of security for your traffic

Regulatory Compliance & Safety Information

For important regulatory compliance information for the WaveTunnel System, please refer to the **Airvine Regulatory and Safety Guide** which is available for download at www.airvine.com/support.

Important Safety Warnings

All products are intended to be installed, used, and maintained by experienced and trained professional personnel only.

When installing and using these products, safety precautions should always be carefully followed to reduce the risk of fire, electrical shock, injury to persons, and damage to the system.

Such safety precautions including the following:

- Read the installation instructions before using, installing, or connecting the system to the power source.
- Only trained and qualified personnel should be allowed to install, replace, or service this equipment.
- Devices must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation.
- Installation of these products in the end use environments must conform to all applicable national and local regulations and codes including all relevant electrical codes.
- Devices are to be used with and powered only by power sources that are either provided by Airvine or recommended by Airvine. Failure to properly power the unit, which includes using power sources that don't comply to the system's required input voltage or current ranges, or the use of unapproved power sources, or the failure to not properly connect the power sources to the system's power connector, can result in possible injury or permanent damage to the unit.
- Ultimate disposal of this product should be handled according to all national laws and regulations.
- No user-serviceable parts inside; all repairs and services must be handled by a qualified Airvine service center.
- To avoid the risk of electric shock or damage to the unit, do not open unit or remove any covers of the unit.
- Do not insert any objects of any shape or size inside these devices while powered on. Such objects may contact hazardous energy parts that could result in a risk of fire, personal injury, or damage to the unit.
- Do not remove or alter the markings or labels affixed to these devices.
- Airvine devices are for indoor use only and are not meant to be installed outdoors.

Regularity and Safety Information

For important regulatory and safety information, please refer to the Airvine Regulatory and Safety Guide.

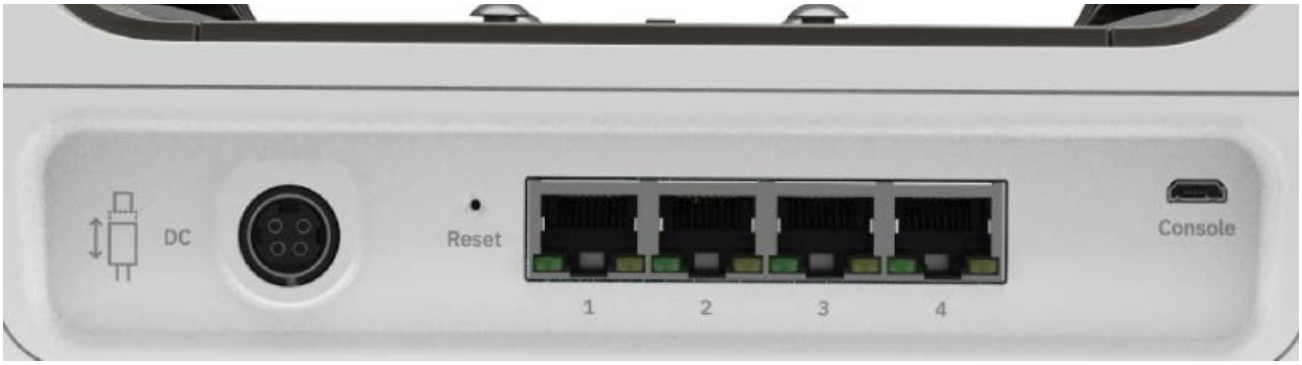
Key Specifications – Model 2041DC

Networking Interface	4 x 1 RJ45 Shielded Gigabit Ethernet ports Each port can support Power Over Ethernet (POE) PSE Output
RF Connections	2 x 60 GHz WaveTunnel radios – one on either side of the WaveTunnel unit, 802.11b/g/n WiFi for management.
Power Consumption	**Without External AC/DC Adapter:** 27W (no POE output) 147W (with max 120 Watt POE output) **Including ACC-PS180M External AC/DC Adapter (@115VAC):** 28W (no POE output) 152W (with max 120 Watt POE output) **Including ACC-PS180M External AC/DC Adapter (@230VAC):** 30W (no POE output) 163W (with max 120 Watt POE output)
Power Input Voltage & Current	Input Voltage Range: 43 to 58 VDC Max Input Current: 4.7A
Power Output (POE)	Total Maximum POE Power for System: 120 Watts Maximum POE Power for an Ethernet Port: 60 Watts POE Output Voltage Range: 43 to 58 VDC Note: POE output voltage will be equivalent to the WaveTunnel input DC Voltage.
DC Input Power Connector Type	Kycon KPJX-4S Female 4-PIN connector
External AC/DC Power Adapter (included with PN: WT-2041DC-1)	Part Number: ACC-PS180M External AC/DC Adapter (optional) Description: 180-Watt, 90 VAC to 264 VAC Input, 54VDC Output, Class II
Operating Temperature	0 – 40 °C
Humidity	0 – 95%
Usage	For Indoor Use Only

Electrical and Mechanical Interfaces: Model 2041DC

The WaveTunnel's simple design has the following Electrical and Mechanical Interfaces on the front panel listed from left to right:

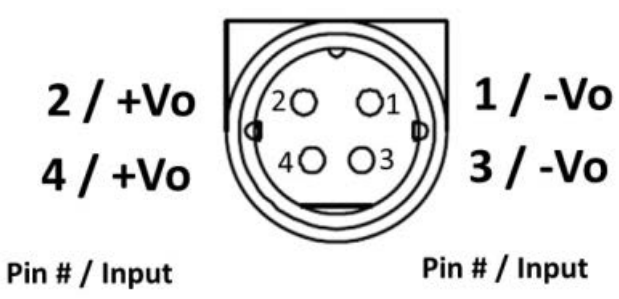
- DC Power Connector: Kycon KPJX-45 Circular Connector, 4-pin
- System Reset Button: Pin Hole (press to reset unit, press for 5 seconds to restore to factory defaults.
- 4 x 1 Gb Ethernet: RJ45, (POE Output, 120 Watts Total POE Output Power)
- Console Port Micro USB Type B connector, non-powered

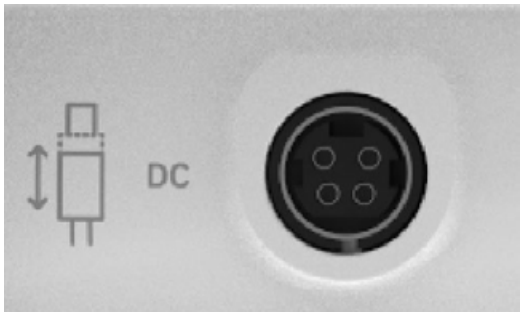


Model 2041DC – DC Power Connector Pinout

The following pinout shows the DC voltages assigned to each pin on the WaveTunnel DC Power Connector. The External Power Supplies offered by Airvine all follow this pinout and are compatible with the WaveTunnel unit. For optimal performance, it is recommended to use a power supply that outputs 54 Volts.

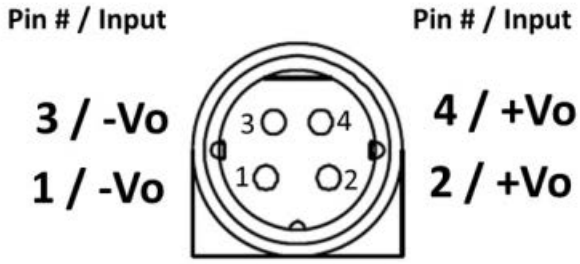
Warning: Not following the voltage/pin assignments will result in damage to the WaveTunnel unit (blowing internal non-replaceable fuses) and will require system repair.





Model 2041SM – DC Power Connector Pinout

Note: The WaveTunnel DC Power Kycon connector of Model 2041SM is upside down (rotated 180 degrees) from model 2041DC.



Connecting to and External DC Power Source

When connecting power to a WaveTunnel, connect the DC plug from the power brick into the WaveTunnel first. The circular connection is keyed for proper orientation. Once the DC plug is connected to the WaveTunnel, plug the AC power cord from the power brick into an electrical outlet.

For model **2041SM**, the flat side of the power connector is down.

For model **2041DC**, the flat side of the power connector is up.

External Power Adapter Specifications

WaveTunnel Units Typically Ship with an External AC/DC Power Adapter. Specifications for this External Power Adapter are as follows:

ACC-PS180M – AC/DC External Power Adapter

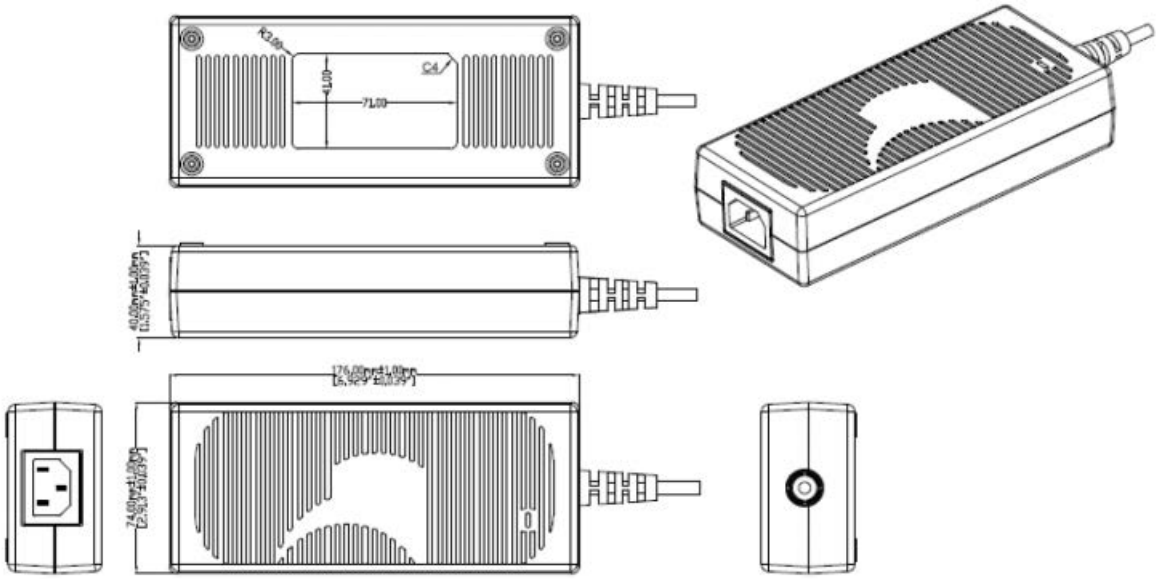
Part Number: ACC-PS180M

External AC/DC Adapter (optional)
Tested with WaveTunnel Model 2041-DC and included with WT-2041-DC-1.

ACC-PS180M – Key Specifications

Vendor/Model	GlobeTek, GTM961800PWWWVV.V-T3
Input Voltage & Current	Maximum Input Voltage Range: 90-264VAC Typical Input Voltage Range: 100-240 VAC Max Input Current: 2.2A
Output Voltage, Current, and Power	Output Voltage: 54 VDC Output Current: 3.333A Output Power: 180 Watts
Isolation	Class 2
Efficiency	DoE Level VI and EU CoC Tier 2 Compliant
Input Connector	Input Connector: IEC 60320 C14 Male Accommodates IEC 60320 C13 Female Connector Power Cord
Output Connector	Output Connector: Kycon KPPX-4P, 4-PIN Circular Connector, Male
DC Input Power Connector Type	Kycon KPJX-4S Female 4-PIN connector
Operating Temperature	Operating Temperature: -10°C to 40 °C (full load)
Humidity	0 - 95%, Relative Humidity, non-condensing
Usage	For Indoor Use Only

ACC-PS180M – Enclosure Drawing



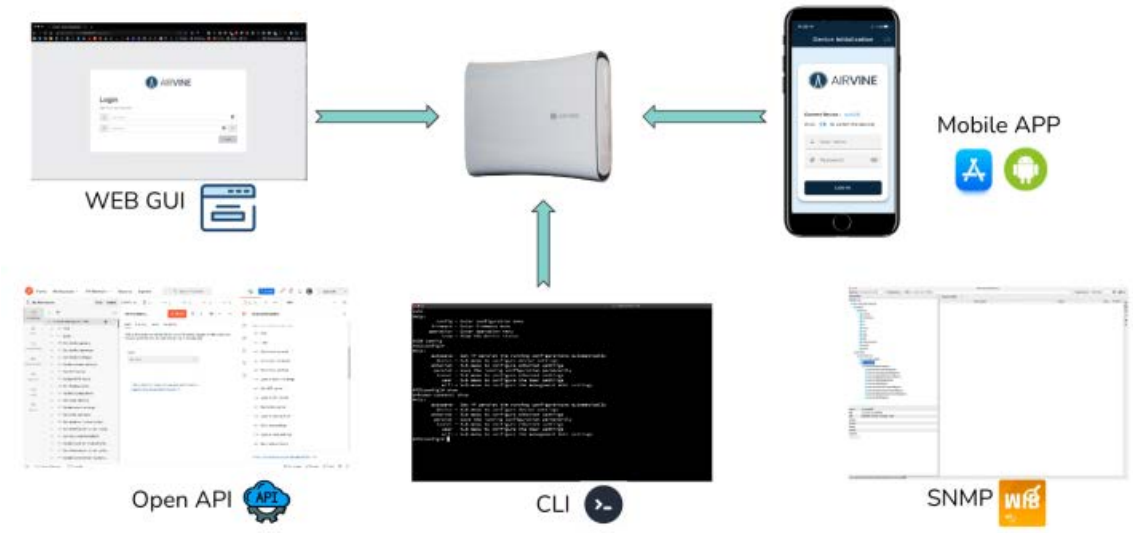
Configuring and Managing WaveTunnel Devices

Management Interfaces of WaveTunnel device

There are several management interfaces supported by the WaveTunnel device which you can use to manage the network. It includes:

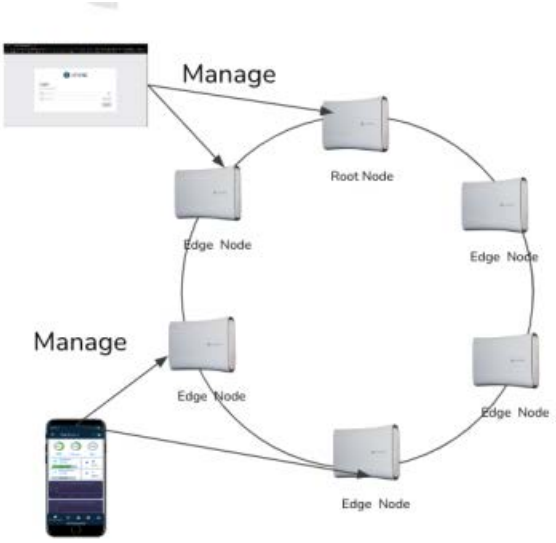
- WEB GUI
- Mobile App
- Command-Line Interface
- Open API
- SNMP interface

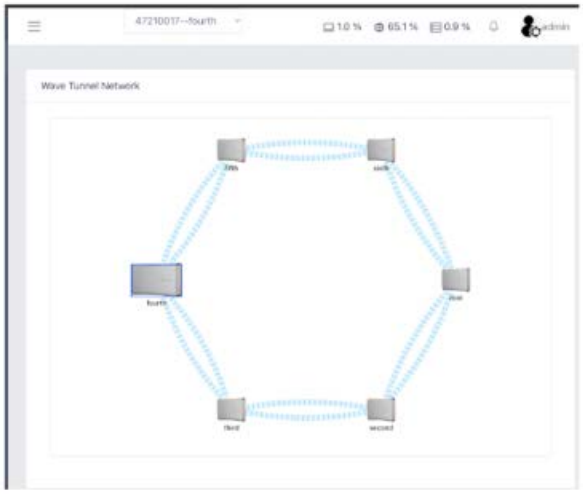
You can select the interfaces in your environment which are most appropriate to configure and monitor your network.



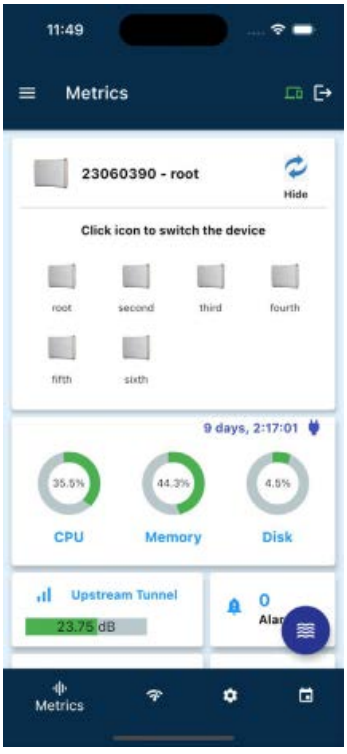
For Open API and SNMP, please refer to the API/SNMP documents for more detailed information.

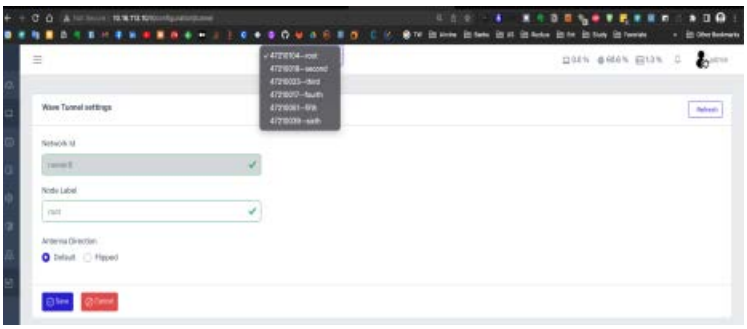
The architecture of the WaveTunnel network is designed as the “controller-less” system. It means there is no central controller in the network to manage the WaveTunnel devices. You can connect to any WaveTunnel device in the network to manage others via the WEB GUI or Mobile App. Please refer to the diagrams below.





To manage the WaveTunnel device, you can select any device on the network from the drop-down list in the WEB GUI or Mobile App.





Prerequisites for using the management interfaces

Web GUI Prerequisites

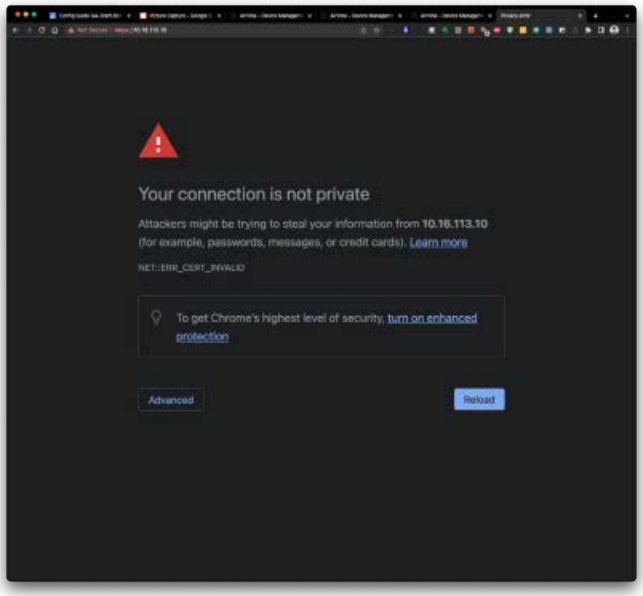
For being able to connect to the WEB GUI of the WaveTunnel device, you need a computer installed with one of the following web browsers:

- Google Chrome
- Microsoft Edge
- Safari
- Firefox

The WEB GUI supports both **http** and **https** connections.For https connections,the web server of the WaveTunnel device uses the self-signed certificate. Thus, you need to ignore the security warnings on the browser to bypass the validation.

The information of the Airvine self-signed certificate.

For Google Chrome, there is no link on the warning page to ignore the certificate and move forward. You can type **“thisisunsafe”** to proceed.



The default login credential of the WEB GUI are

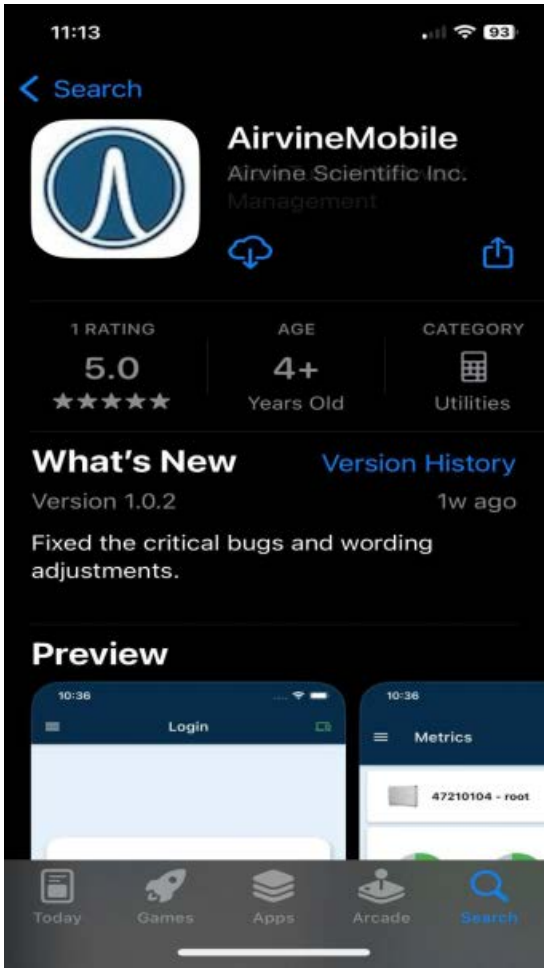
User name: **admin**
Password: **admin**

Mobile App Prerequisites

Download the “AirvineMobile” App from the App Store.

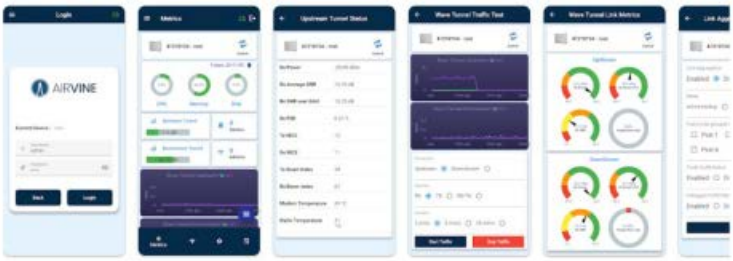
[Apple iOS]

Search “AirvineMobile” from the App Store in your mobile device.



[Android]

Search AirvineMobile and download the App from Google Play.

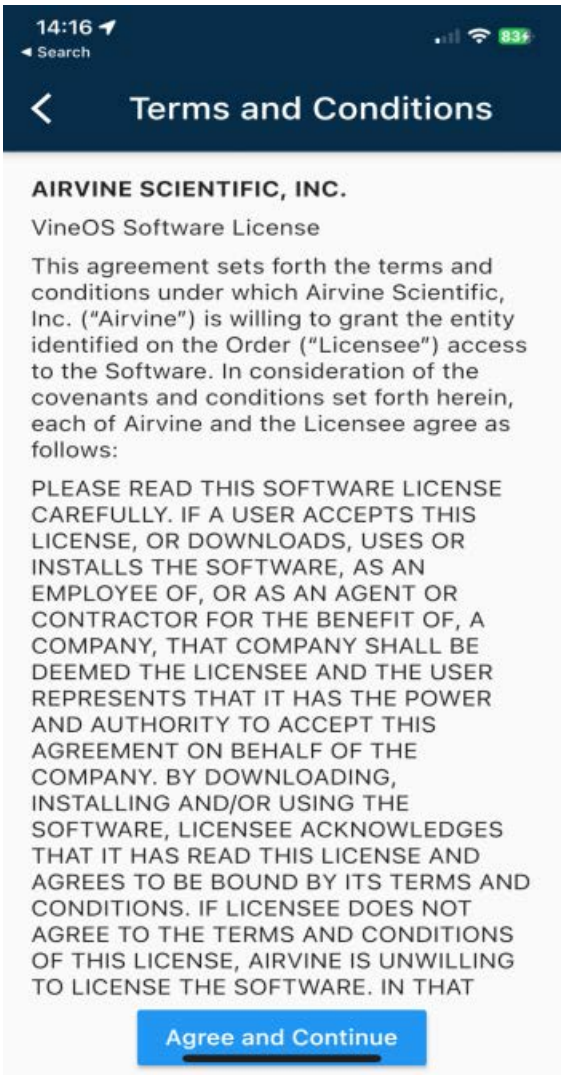


The default login credential of the mobile App are

User name: **admin**
Password: **admin**

Note: The MobileApp uses the 2.4 GHz WaveTunnel WiFi radio. To connect to

If you wish to use the WaveTunnel mobile app for managing your WaveTunnel devices, please read the "Terms and Conditions" before connecting.



Command-Line Interface Prerequisites

There are two methods you can use to get into the command-line interface of the WaveTunnel device. You can either use the serial cable or connect through the SSH connection.

The default login credential of the command-line interface is as follows.

User name: admin
Password: admin

Enable Password: blank, just hit enter key

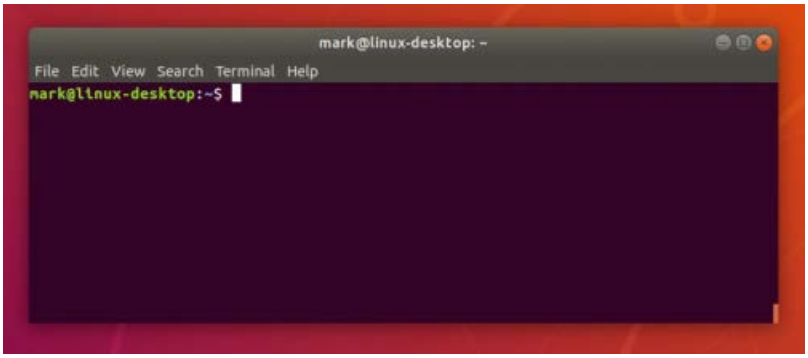
[CLI command keys]

Key	Action
Enter	Show the sub categories or command list
Tab	Auto complete
↑ ↓	View the command history
..	Go up to the parent category
Exit or Ctrl+D	Exit the CLI

[SSH Client]

To connect the WaveTunnel device, you need to have the SSH(Secure Shell protocol) client. It can be the Linux terminal console or SSH client on other operating systems. For example, Putty, Kitty, MobaXterm…..etc.

Linux Terminal



SSH Clients

With these ssh clients, you can type “ssh admin@[IP of WaveTunel]” to connect to the device.

For example, ssh admin@192.168.3.1 if you are connecting through the management WLAN.

```
allen@allen-unc:~$
allen@allen-unc:~$ ssh admin@192.168.1.100
admin@192.168.1.100's password:
Last login: Mon Sep 19 02:38:16 2022 from 192.168.1.200
AVS>

Help:
     deviceinfo - Show the device general information
         enable - Enter 'enable' for enable mode;'enable password' to change the password
           ping - Ping destination ip. Ex: ping 8.8.8.8
     traceroute - Trace route to destination ip. Ex: traceroute 8.8.8.8
             .. - Navigate up one category
           exit - Exit Command line interface


AVS>
```

[Serial USB cable]

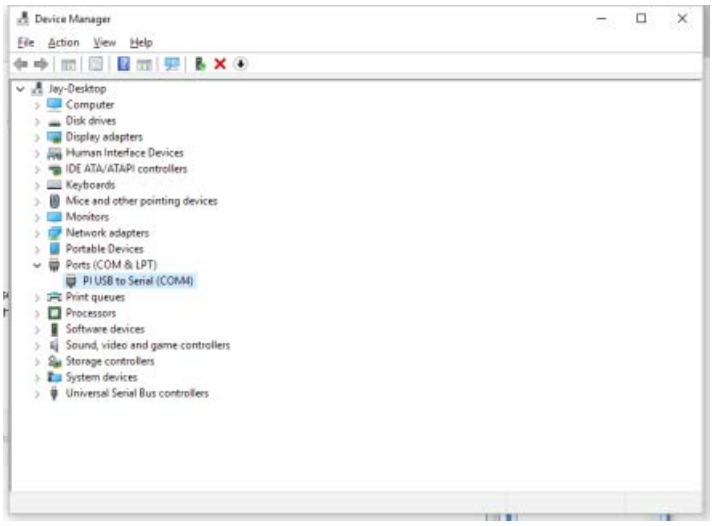
Micro-USB cable is required to connect to the WaveTunnel device if you want to use the console.

To use the serial cable connecting to the WaveTunnel device, you need to know the name of the serial port.

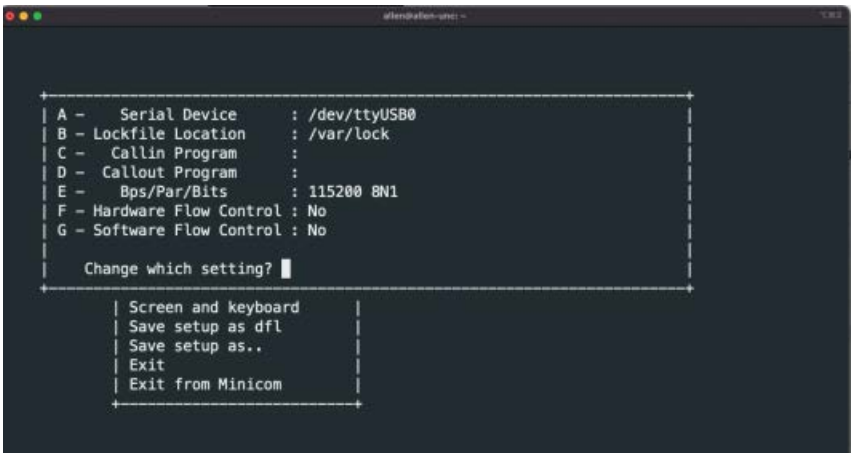
Below is an example of Linux or MacOS.

```
allen@allen-unc:~$ ls -al /dev/ttyUSB*
crw-rw---- 1 root dialout 188, 0 Sep 22 21:09 /dev/ttyUSB0
crw-rw---- 1 root dialout 188, 1 Sep 22 21:09 /dev/ttyUSB1
allen@allen-unc:~$
```

For Windows OS, please check the COM



Once you know the name of the serial port, you need to configure the settings in minicom or Putty as follows.



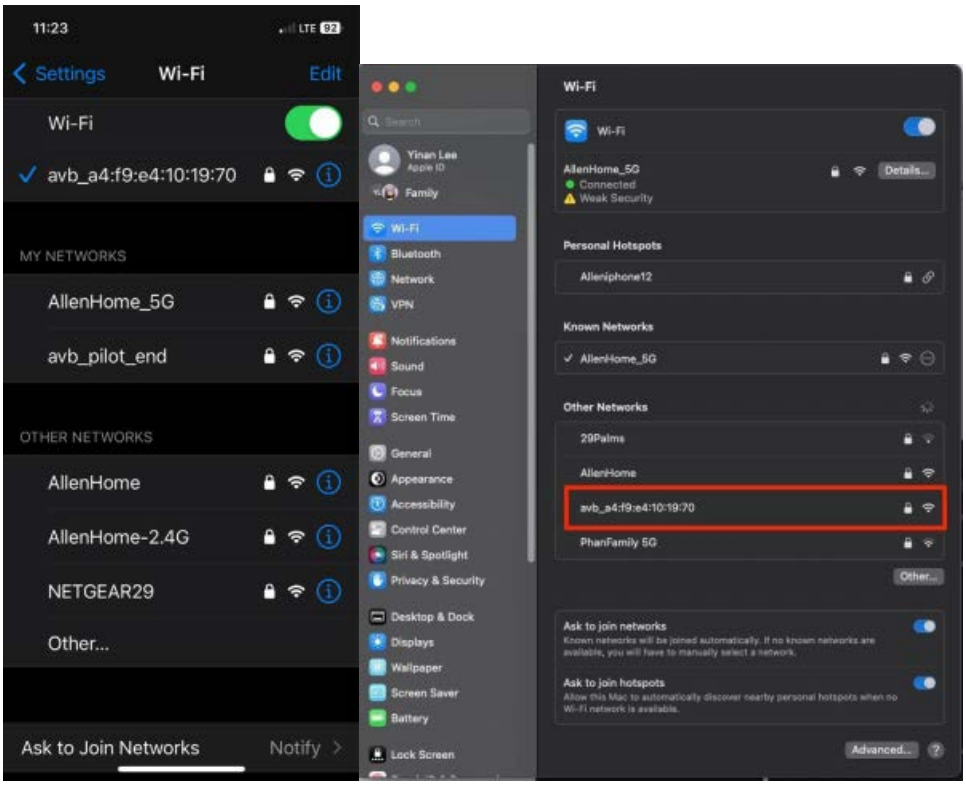
You can see the screen if you can connect to the device.

The console prompt after successfully login.

How to connect to the new WaveTunnel device

1. Management WLAN

The default management SSID is **“avb_[MAC_ADDRESS]”**. You can check the MAC address from the label of your WaveTunnel device.



You can connect to this SSID with your mobile device or laptop. The default passphrase is **“airvine!”**.

For the laptop, type “http://192.168.3.1” on your browser to access the WEB GUI.

2. Ethernet cable

You can plug in the ethernet cable to any of the ports of the WaveTunnel device.The default IP address of the WaveTunnel device is “**192.168.0.253**”. Set the IP address of your laptop to the same subnet(e.g. 192.168.0.100) for being able to connect to the WaveTunnel device.

3. Serial console cable

Please refer to the “Command-Line Interface Prerequisites” above.

Initialize the WaveTunnel device

Before You Begin you will need the following:

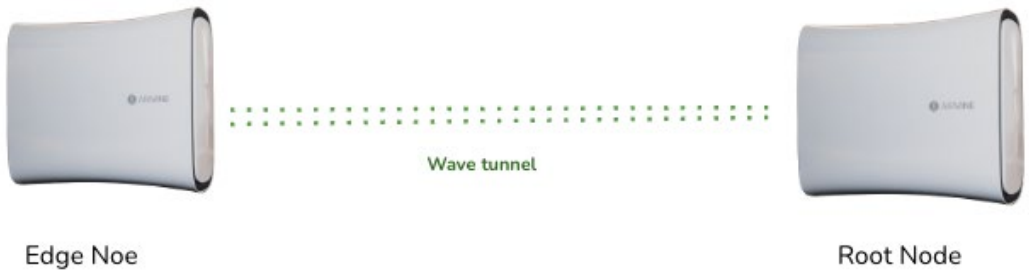
- MAC address, which is printed on each WaveTunnel device.
- Mounting location for each node

- Root node Ethernet cabling
- Each of the nodes to be installed must be in the factory default state
- The network topology of your deployment. Please refer to the following example for the pilot phase.

Mounting Instructions

Select mounting locations for each node in the network. Nodes should be mounted using the appropriate bracket and hardware, and then powered-up before beginning the configuration process. When multiple Ethernet cables are used ensure they are bundled together.

Important: These pre-production Nodes need to be mounted facing the same direction so the radios can communicate properly (see below WaveTunnel example, the Airvine logo is on the same side.



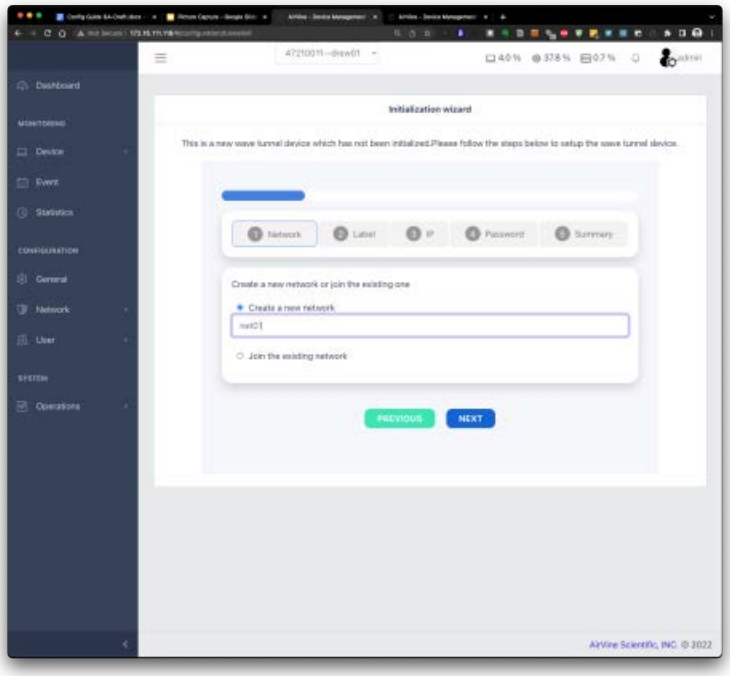
For more detailed mounting instructions, please see the "WaveTunnel Installation Guide".

Take the example below to set up the wave tunnel connection between the first(root) and the second(edge) nodes.

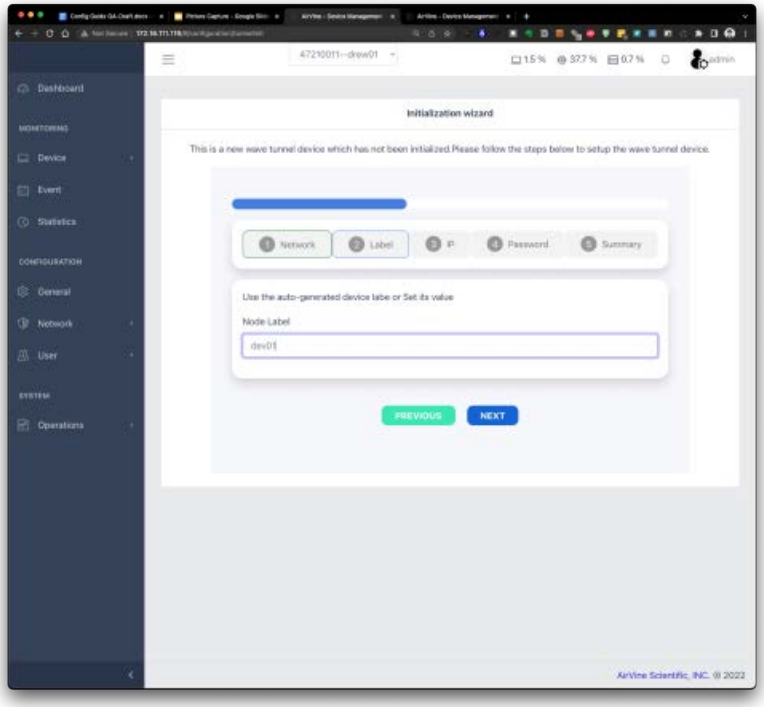
[WEB GUI]
Connect the WEB GUI through the default management SSID or ethernet cable.

- Set up the Root Node

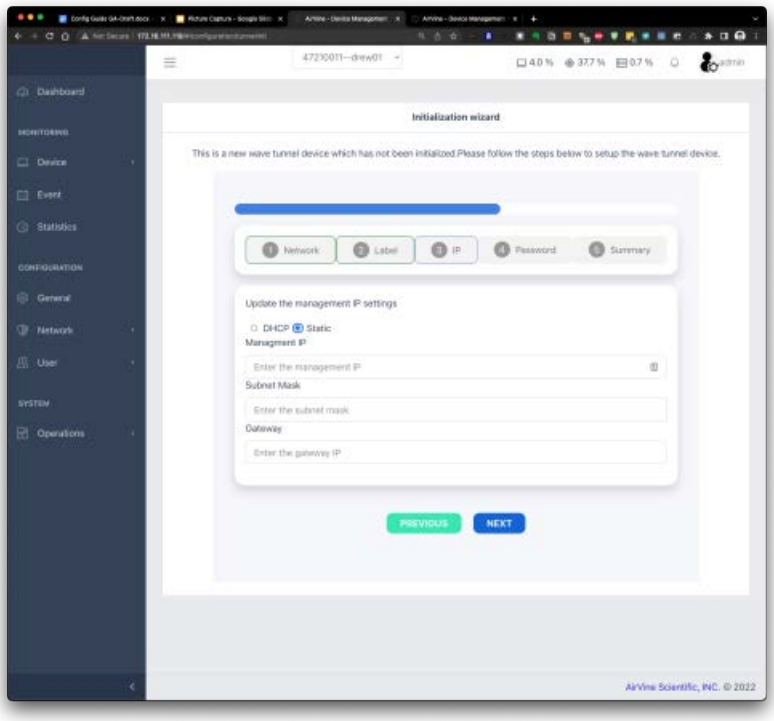
After logon to the WEB GUI, the initialization wizard is shown on the landing page. Following the Initialization wizard to set up the wave tunnel connection. The first step is selecting “Create a new network” and giving the name of this network.



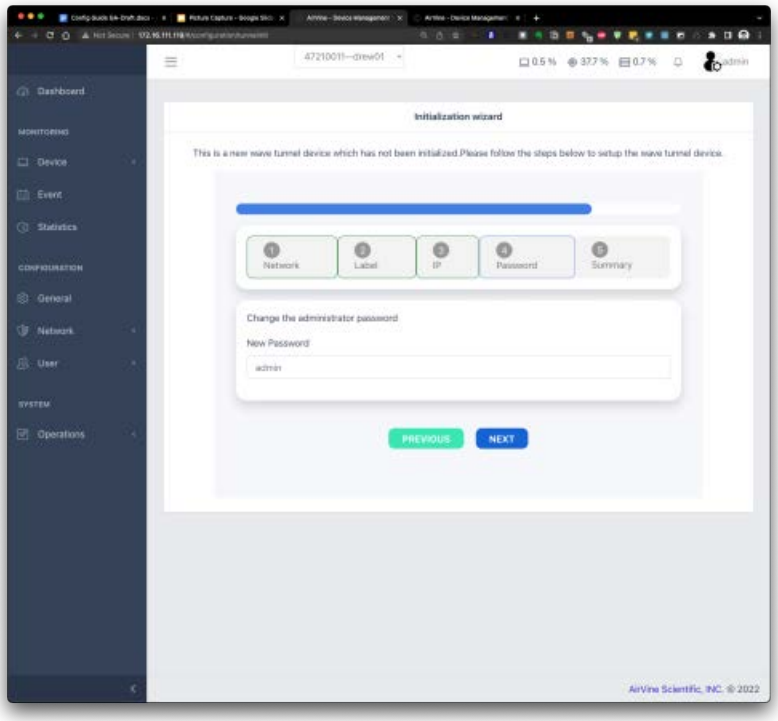
Input the label of this root node to recognize it later.



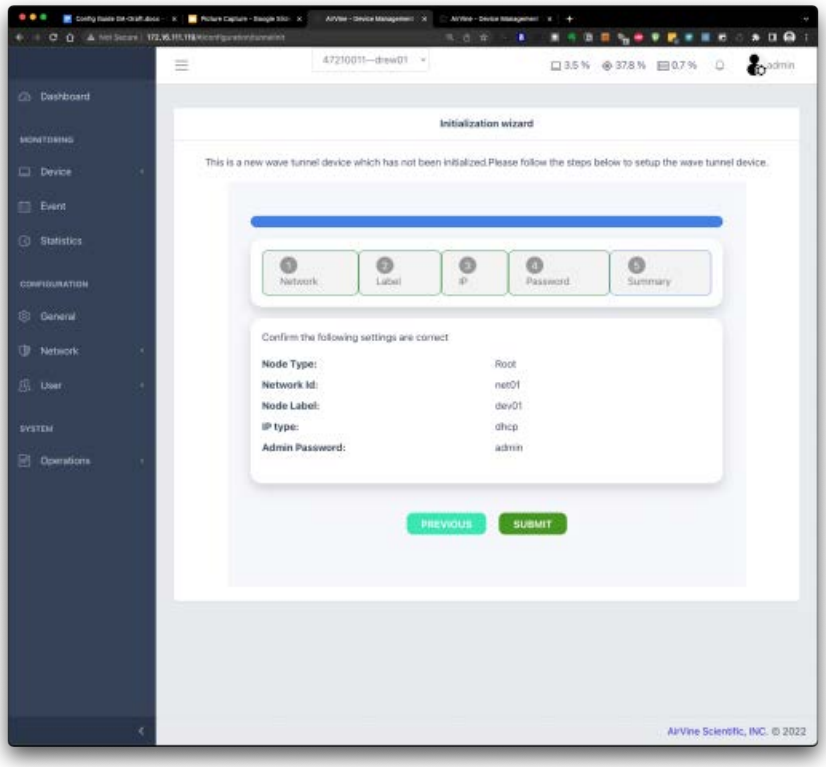
Configure the management IP of this WaveTunnel device. It can be DHCP or Static IP.



For security considerations, you can also change the default admin password in this step.

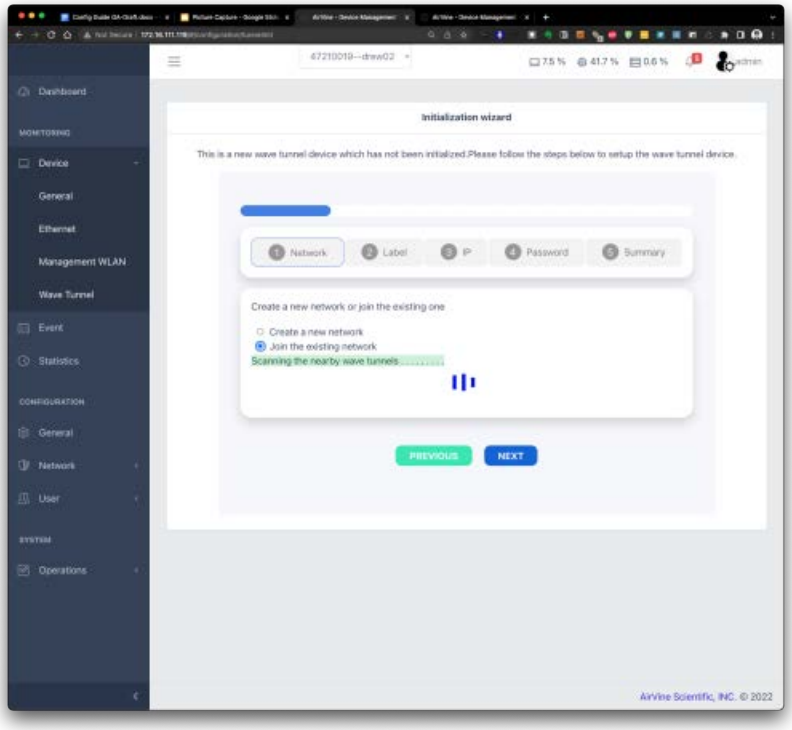


Review the settings and then click the “submit’ button to finish the configurations. You can go back to the previous steps to change the setting before clicking the “submit” button.After setup successfully, you can see the Dashboard page in your browser.

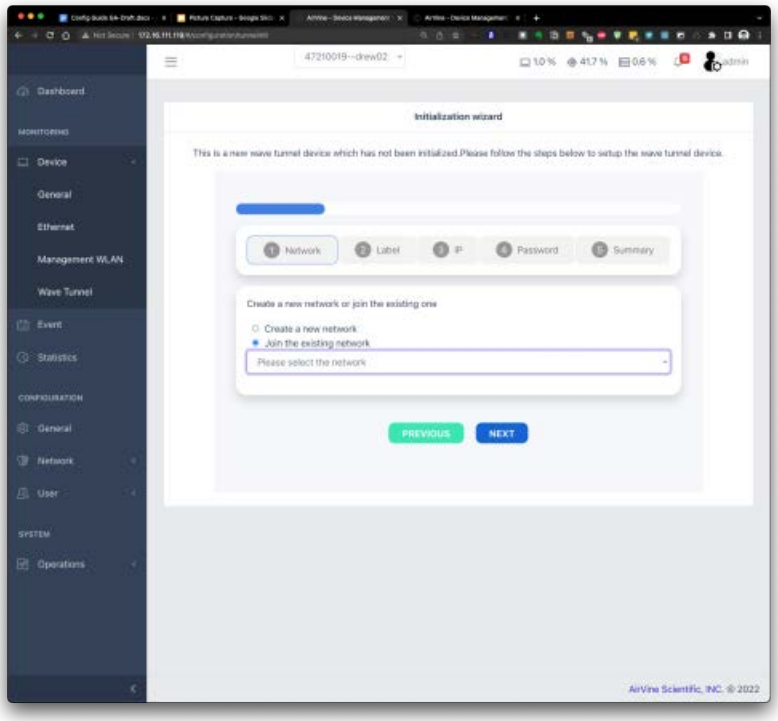


- Set up the Edge Node

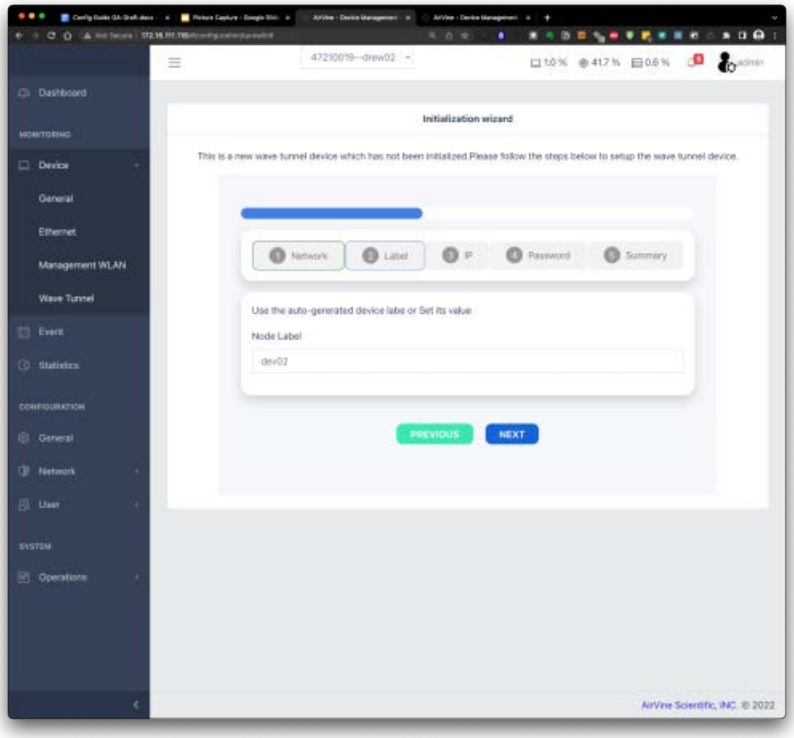
After logon to the WEB GUI, the initialization wizard is shown on the landing page. Following the Initialization wizard to set up the wave tunnel connection. The first step is selecting “join the existing network”. The page automatically scans the nearby WaveTunnel network and shows the list in the dropdown list.



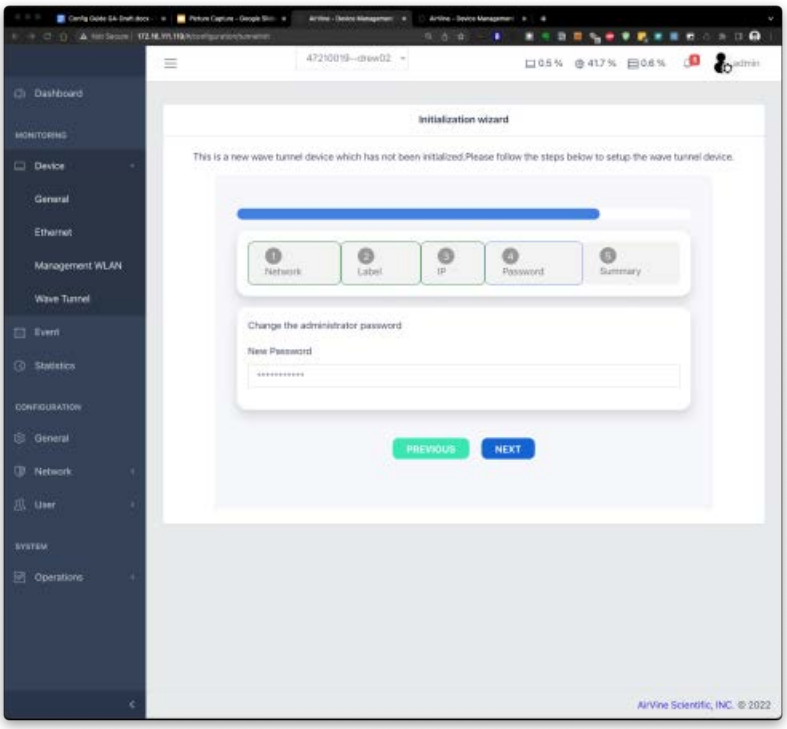
Select the network you want to connect from the drawdown list and then go to the “next” step.



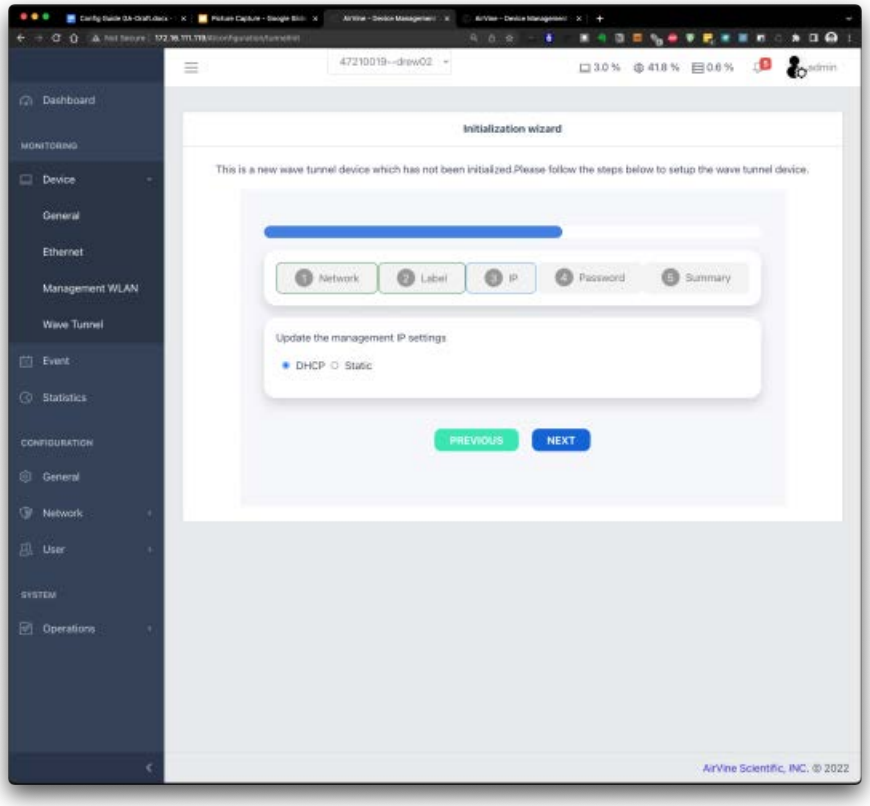
Input the label of this leaf node to recognize it later.



For security considerations, you can change the default admin password in this step.



Configure the management IP of this WaveTunnel device, it can be DHCP or Static IP.



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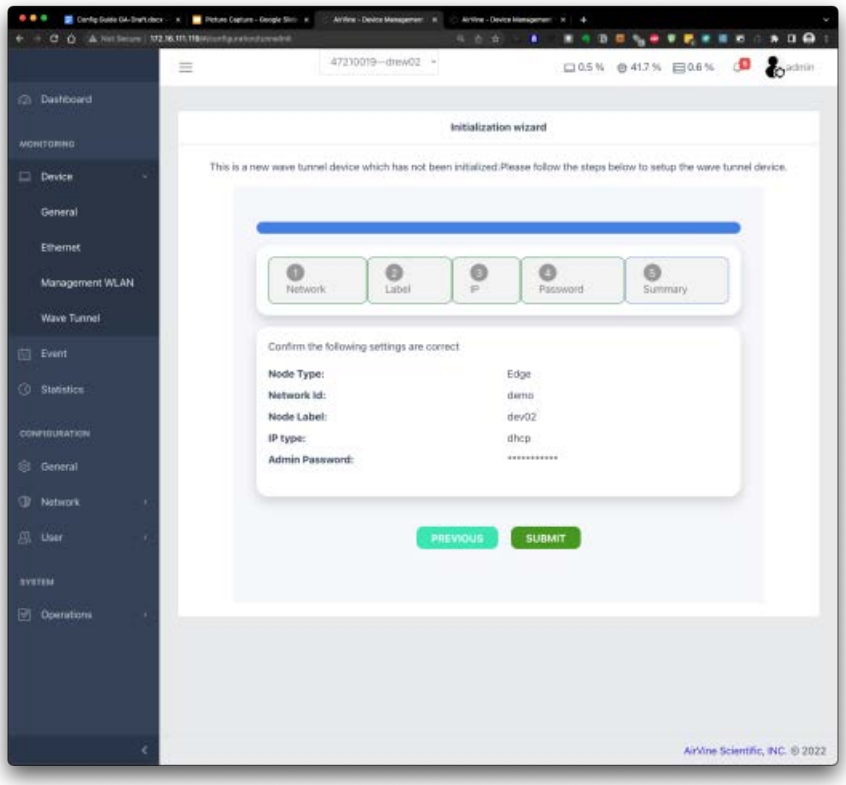


If you need to set up more than two WaveTunnel devices in your network, you can repeat the Leaf node setup steps to initialize the configurations for the remaining nodes. The max. Number of the WaveTunnel nodes supported in this release is up to 8.

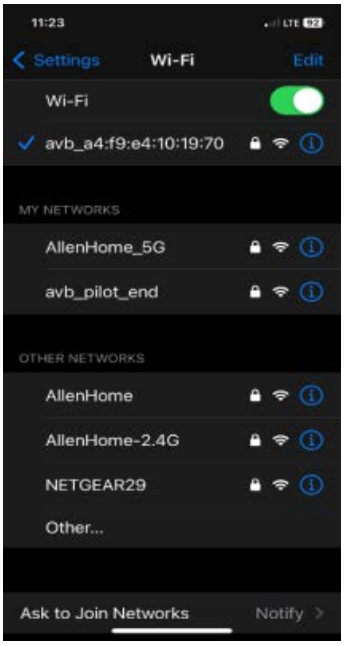
[Mobile App]

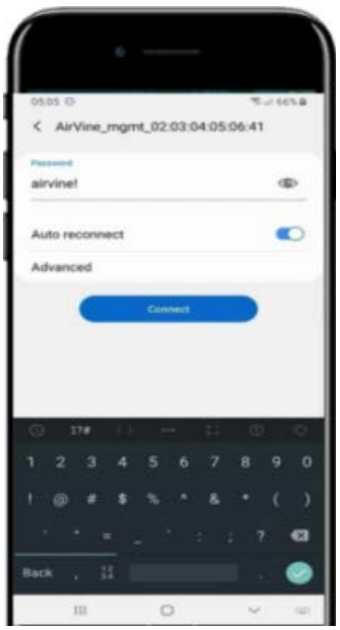
Open “AirvineMobile” App on your mobile device to configure a WaveTunnel node. The “Select Device Network” page appears for you to select the device network. Click “Device Wi-Fi” to select and connect to the management Wi-Fi SSID.

Connect the WaveTunnel node to be configured via the default management SSID which is “avb_[Device MAC]”. Note: A WaveTunnel node's MAC address is included in the default SSID for aiding in the setup of a network when there are other WaveTunnels broadcasting SSIDs in the area. The MAC address is printed on a label affixed to each WaveTunnel unit.

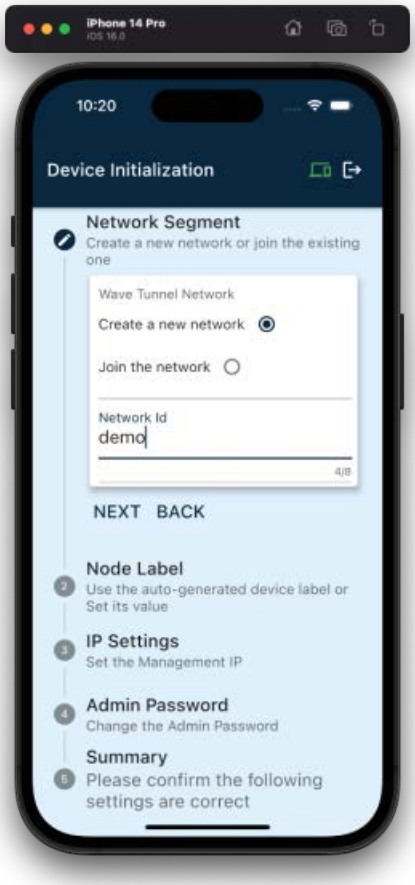
The default password for the management Wi-Fi SSID is “airvine!”. The exclamation mark is required.

Once connected to the management Wi-Fi SSID, please press “<” on the bottom right to go to the “AirvineMobile” App.





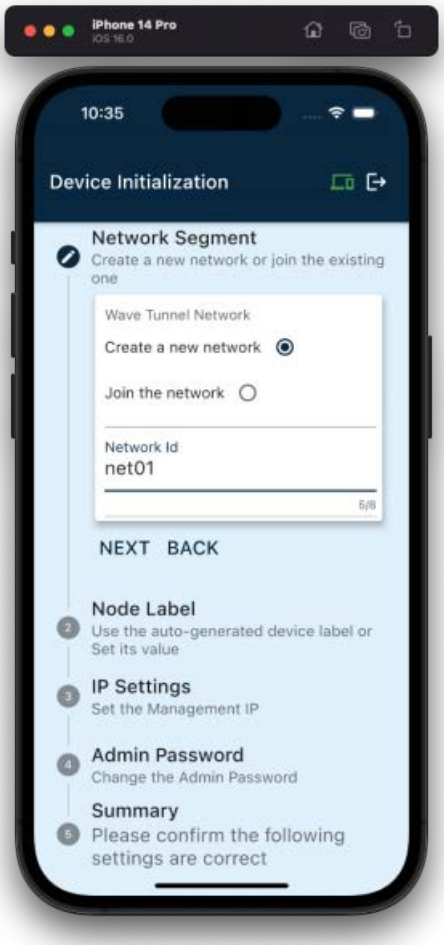
The “AirvineMobile” App is checking to see if it can reach the device via the selected Wi-Fi SSID. If the mobile App can reach the device, it will show the Device Initialization wizard page.



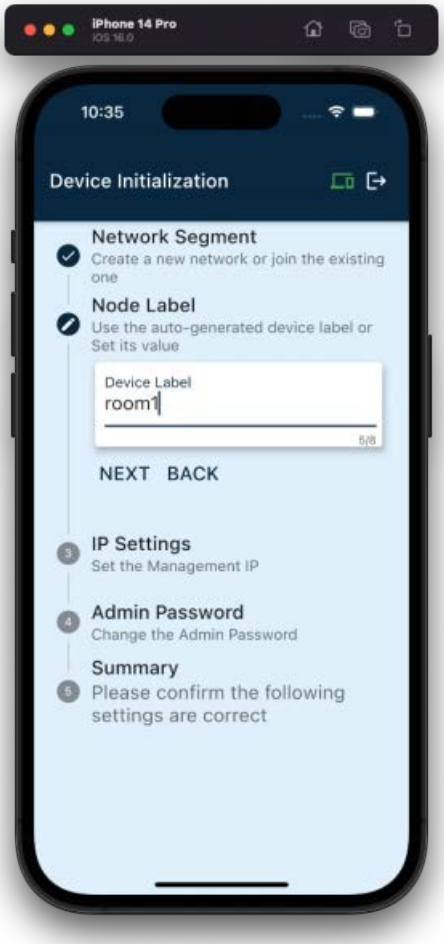
There are slight differences between the configurations of the root node and all other nodes. Please check the steps below.

Initializing the root device:

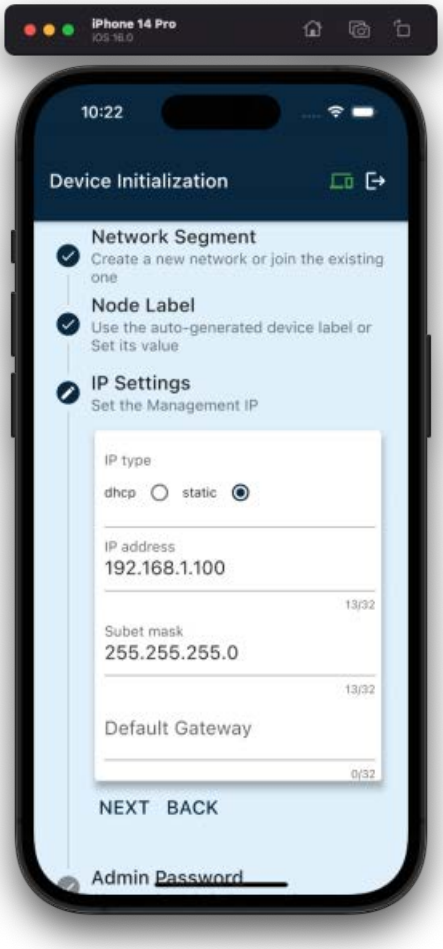
- To configure the root device, select the “Create a new network” option in the network segment step.
- Then input the Network ID for this new deployment. The Network ID can be automatically generated, or you can input any meaningful string for future identification of your network, for example.
  “net01”.
- Click “NEXT” for the next setting.


iPhone 14 Pro
10:35
Device Initialization
Network Segment
Create a new network or join the existing one
Wave Tunnel Network
Create a new network
Join the network
Network Id
net01
5/8
NEXT BACK
Node Label
Use the auto-generated device label or Set its value
IP Settings
Set the Management IP
Admin Password
Change the Admin Password
Summary
Please confirm the following settings are correct

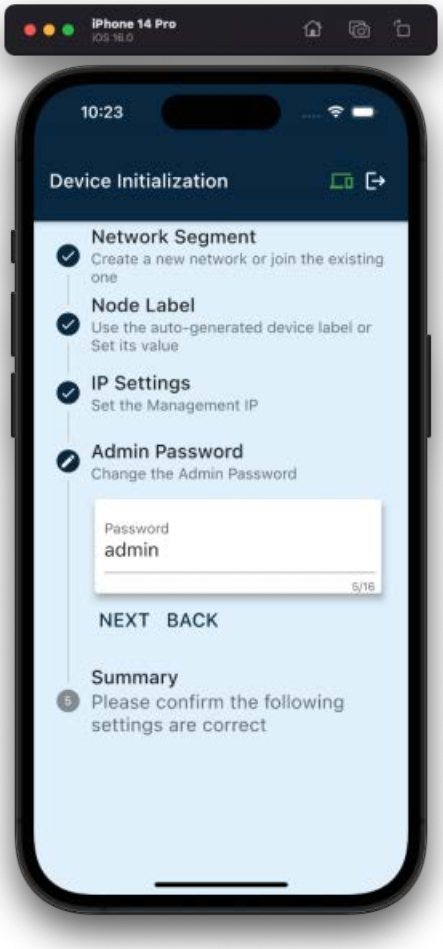
Input the “Device Label” to name this device. It will be used to recognize your device later.



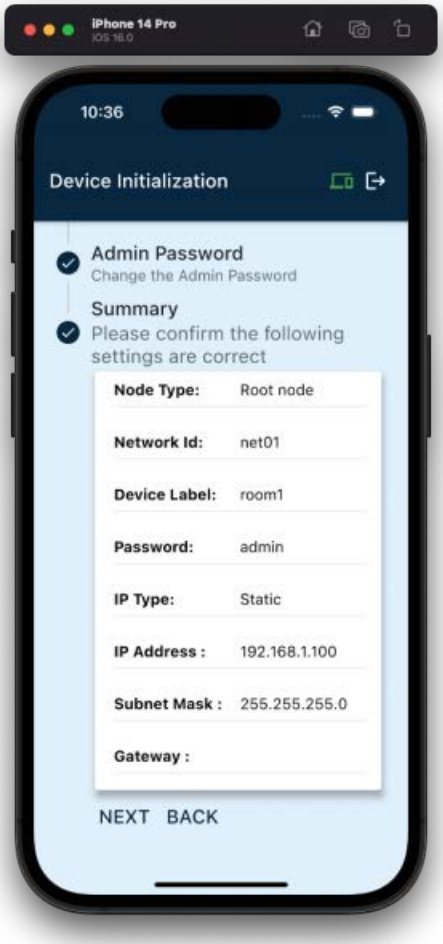
Click “Next” to set the management IP of your device.



Click “Next” to change the admin password of your device.



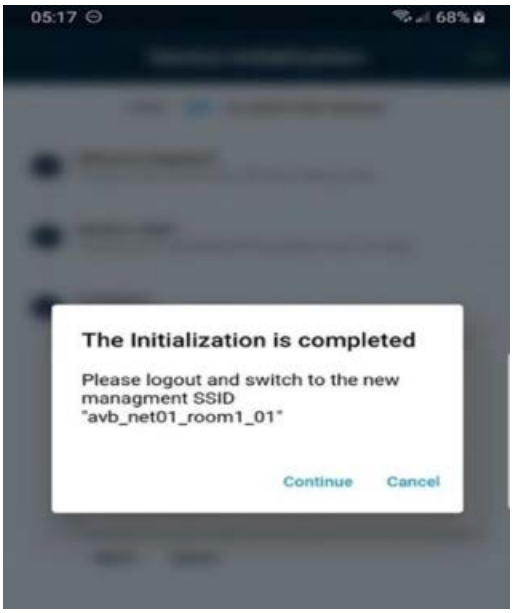
Click “Next” to check the summary of your configurations.



Once you confirm the configurations are correct, click “Next” to initialize the settings for this device.

When the initialization is completed, the popup window appears. Click “Continue” to finish the settings.

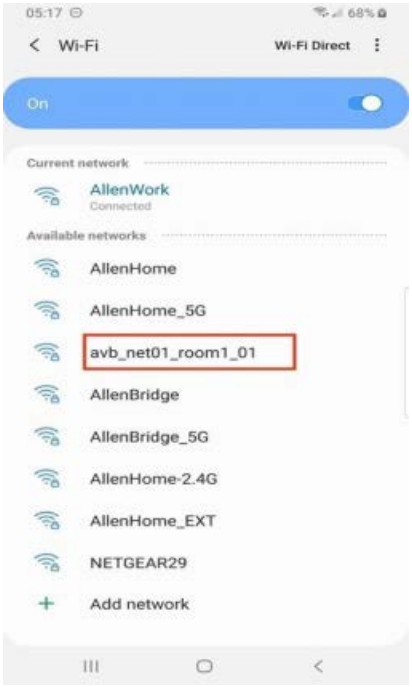
Note: the format of the management SSID for the WaveTunnel node has changed to a combination of **avb_[network Id]_[device label].**



The “Select Device Network” page will be shown to you after completing the initialization step.

Click on “Select Wi-FI” to switch to the newly configured management SSID “avb_net01_room1”.

Note: The management SSID changes after completing the initialization process from a default SSID to an SSID that includes the Network ID name and Node Label name.



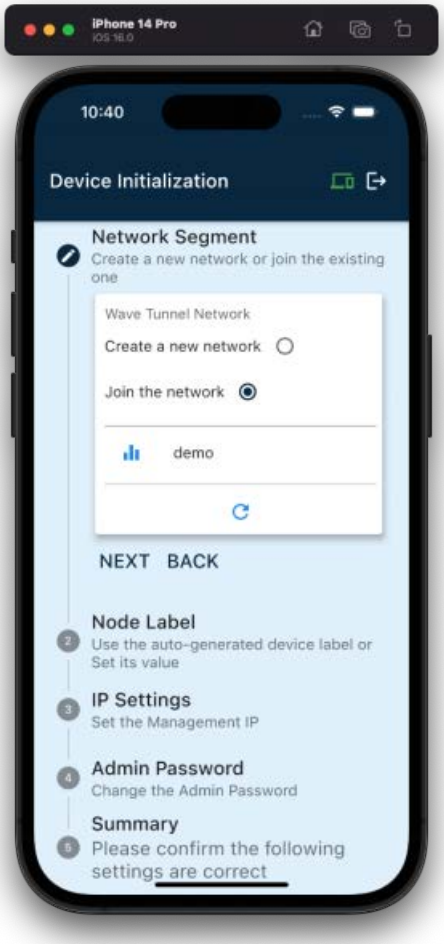
Click “Connect” to go to the Login page.

The root device has now been configured successfully. You can use the default username and password to login into the mobile App management pages.

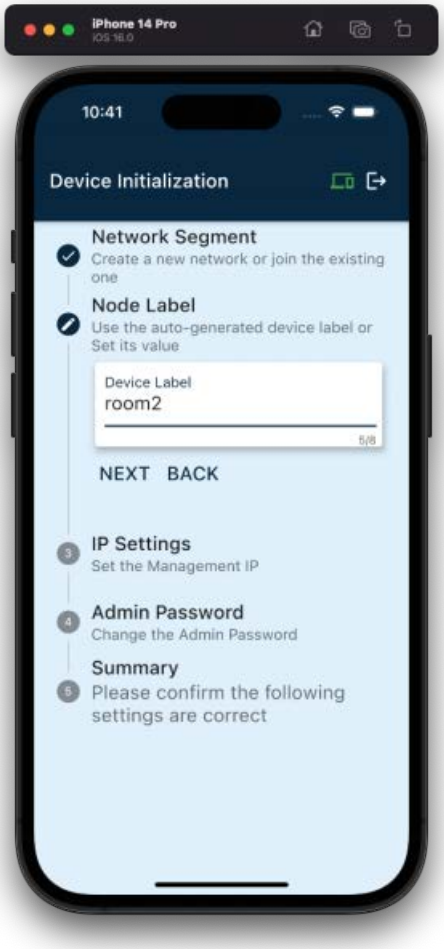
To configure the remaining devices in the network, select the “Join the network” option in the network segment step.

Nearby WaveTunnel devices will be broadcasting their SSIDs, which will appear in the list. Click on the SSID of the next node to be configured. This is the node that will talk to the root node that was just configured. Then click “next” for next settings.

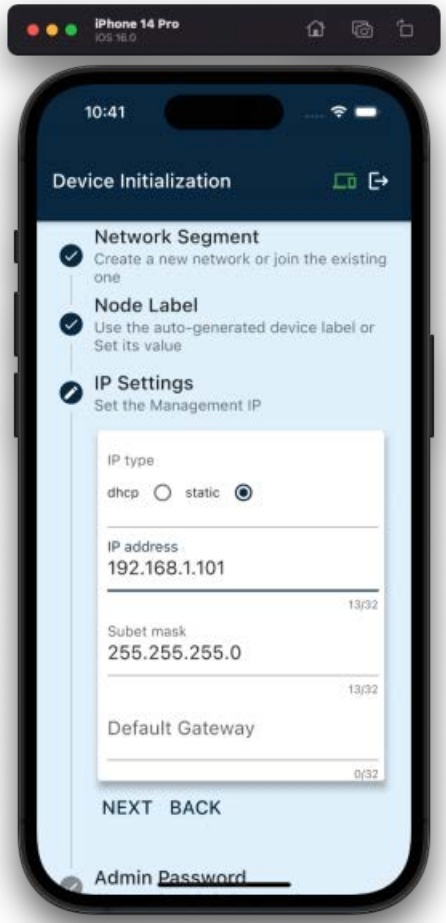
As each node is added to the network, traffic flows are automatically configured between that node and the root node. These flows can pass through relay nodes, but all traffic must flow to and from the root node.



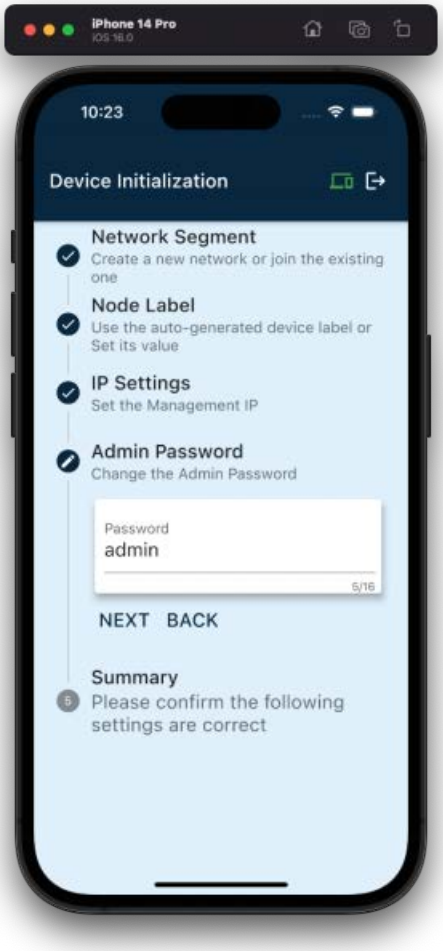
Enter the "Device Label" for this device. Your device can be recognized later using this information.



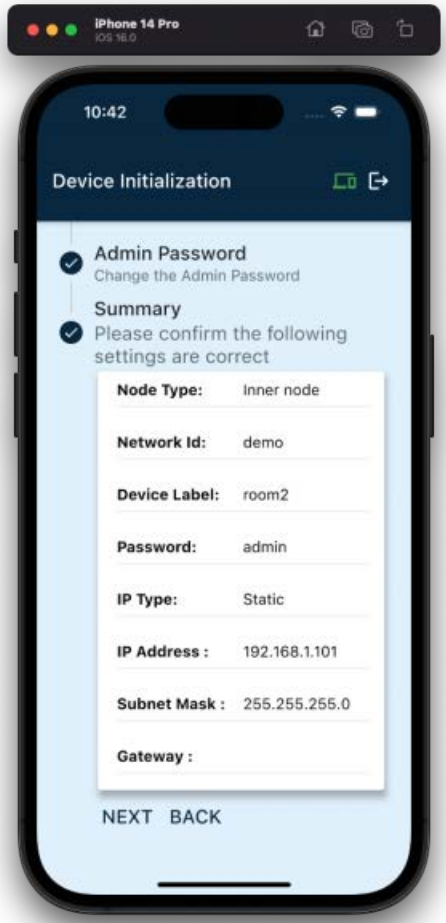
Click “Next” to set the management IP of your device.



Click “Next” to change the admin password of your device.

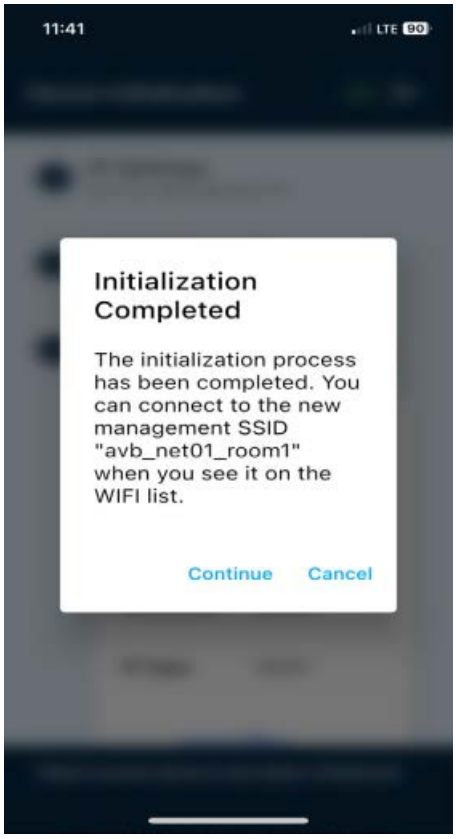


Click “Next” to check the summary of your configurations.



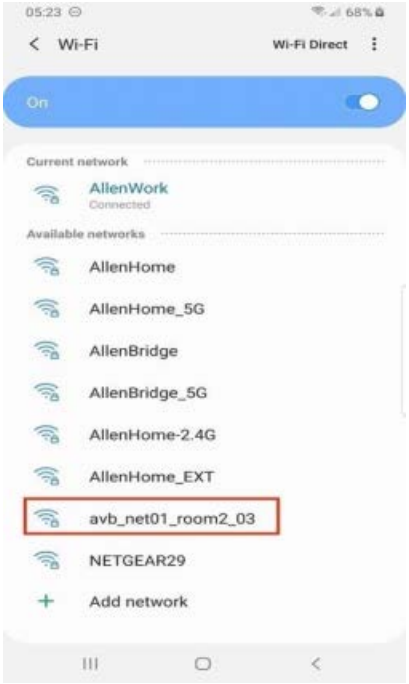
Once you confirm the configurations are correct, click “Next” to initialize the WaveTunnel settings for this device. When the initialization is completed, the popup window appears. Click “Continue” to finish the settings.

The format of the management SSID is now a combination of **avb_[network Id]_[device label].**



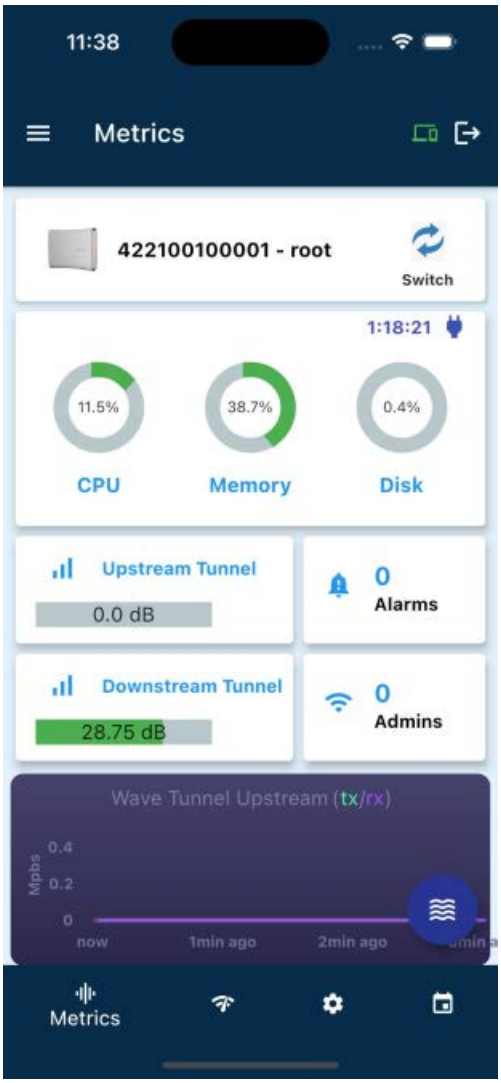
The “Select Device Network” page will be shown for you to switch the New Management SSID.

Click “Select Wi-FI” to switch to the newly configured management SSID “avb_net01_room2”.



Click “Connect” to go to the Login page

This device is configured successfully. You can use the default username and password to login the mobile App management page. You will see the tunnel connection is established on the dashboard page.



Manage WaveTunnel device firmware

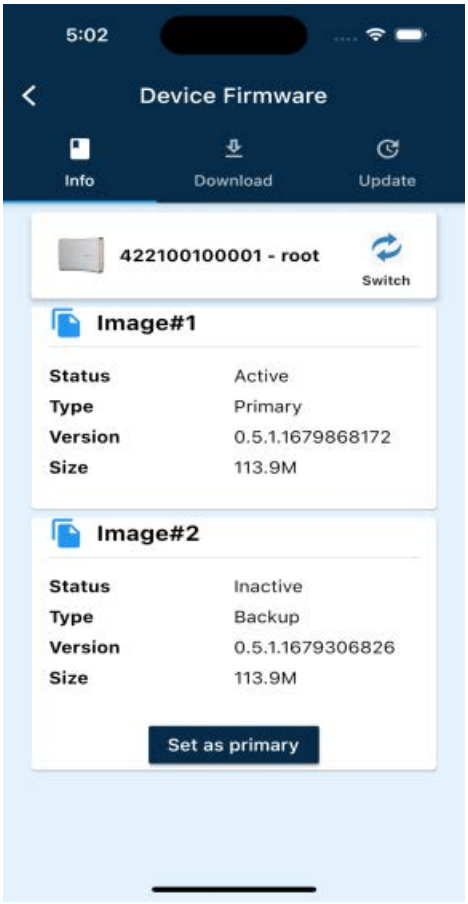
Check the current firmware information

There are two image banks in the WaveTunnel device which allow us to load two firmware image files. But only one image is active and the other is the backup. This gives us the capability to update the image to the back bank first without impacting the service. Also, we can revert back to the previous if the new firmware is not running well.

The Firmware information page shows the following information.

Active status, Is Primary or backup image, Firmware version , Size, checksum.
[WEB GUI]
Operation -> Firmware Update

[Mobile App]
Settings -> Firmware -> Info



[CLI]
Firmware -> info

```
AVS# firmware
AVS(firmware)#

Help:
         info - Show the current firmware status
     download - Download the firmware file from the configured server
        write - Write the firmware file into image bank
      primary - Set the firmware image as primary
         file - Sub menu to manage the firmware file
       server - Sub menu to configure the firmware file servers
           .. - Navigate up one category
         exit - Exit Command line interface


AVS(firmware)# info


Current firmware info:
```

Image number	Active	Primary	Version	Size	Checksum
1	Active	Primary	0.5.1.1678391060	113.9M	18267e997b384384ca3788bf514b5568
2	Inactive	Backup	0.5.1.1678307349	113.9M	f3542c3c2154f320c7efd804f9503de8

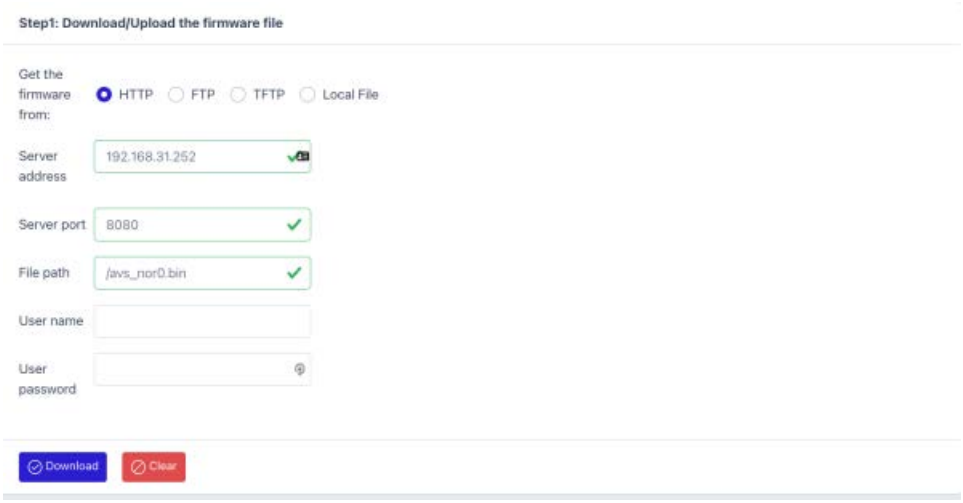
```
AVS(firmware)#
```

Upload/Download the firmware file to the device

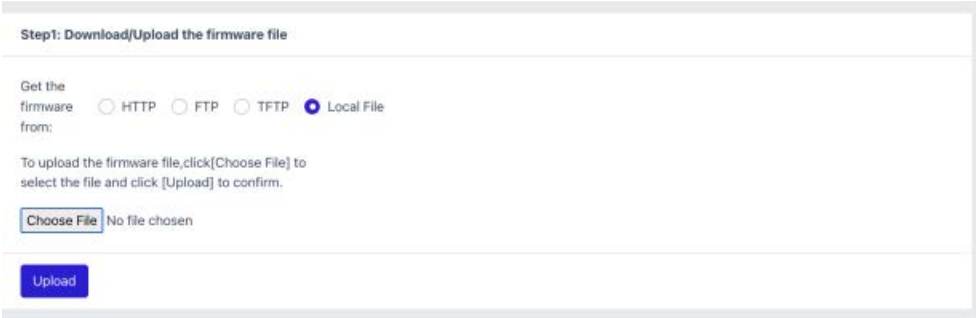
There are two mechanisms you can get the firmware image file to be loaded into your WaveTunnel device. You can set up the Http,FTP or TFPF server and put the image file on it. Then, you can download the image file from the server through WEB GUI, Mobile App or CLI to your device. Or you can directly upload the firmware image file from your local laptop through the WEB GUI to the device.

For the download mechanism, you need to put the server address, server port , the file path of the image file, user name(optional),password(optional) before starting the download operation.

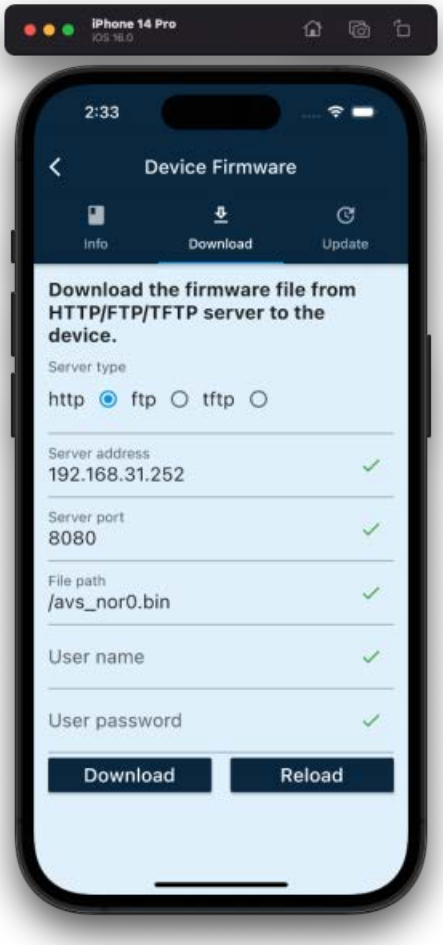
[WEB GUI]
Operation -> Firmware Update -> Step 1
Input the server setting and click “download” button



Select the firmware image file from your local laptop and then click “upload” button.



[Mobile App]
Settings -> Firmware -> Download
Input the server setting and click download button



[CLI]
Firmware - > Server

Input the server configurations in this category.

```
AVS(firmware-server)#

Help:
           ll - List the firmware server setting
          set - Set the attribute of the firmware file servers
         save - Save the changed attributes of the file servers
           .. - Navigate up one category
         exit - Exit Command line interface


AVS(firmware-server)# ll

Firmware file server settings
```

Description	Attribute Name	Current Value
Server type	serverType	HTTP
HTTP server address	httpServer	192.168.31.252
HTTP server port	httpPort	8080
HTTP remote image path	httpPath	/avs_nor0.bin
HTTP server user name	httpUser	
HTTP server user password	httpPassword	
FTP server address	ftpServer	192.168.31.252
FTP server port	ftpPort	21
FTP remote image path	ftpPath	/avs_nor0.bin
FTP server user name	ftpUser	
FTP server user password	ftpPassword	
TFTP server address	tftpServer	192.168.31.252
TFTP server port	tftpPort	69
TFTP remote image path	tftpPath	/avs_nor0.bin

Firmware -> download

Input the “download” command to download the file

```
AVS(firmware-server)# ..
AVS(firmware)# ll
Unknown Command: ll

Help:
          info - Show the current firmware status
      download - Download the firmware file from the configured server
         write - Write the firmware file into image bank
       primary - Set the firmware image as primary
          file - Sub menu to manage the firmware file
        server - Sub menu to configure the firmware file servers


AVS(firmware)# download
```

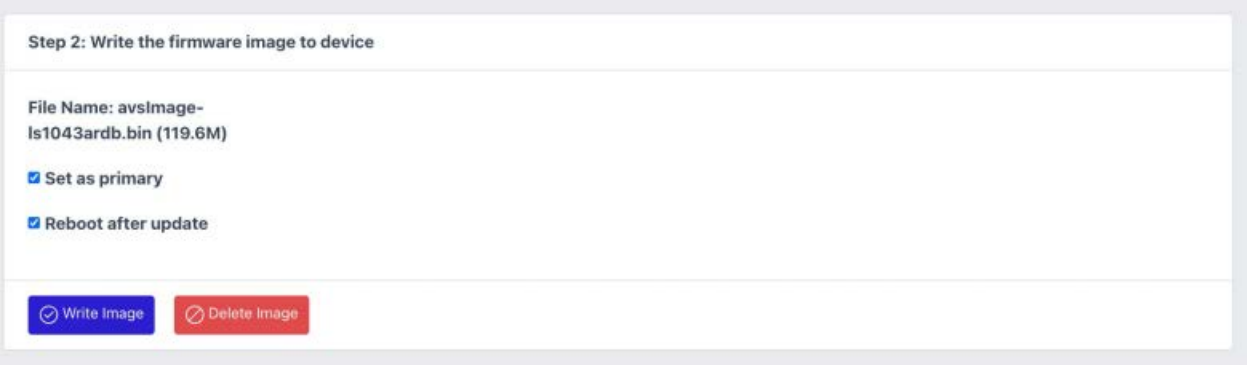
Update the firmware

Once the firmware image file is downloaded or uploaded to the WaveTunnel device. You can see the image file name on the page. Clicking the “Write image” button to update the firmware to the WaveTunnel device. Clicking the “Delete image” button to discard the uploaded image.

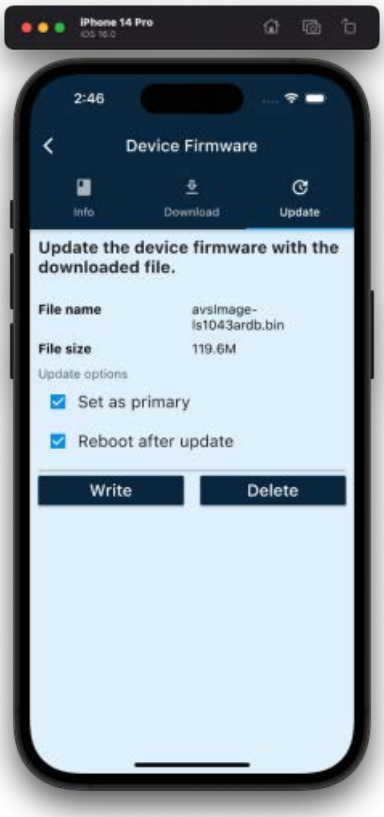
There are two options on the update page.

[Set as primary] => The updated image will set to primary after system reboot
[Reboot after update] => The WaveTunnel will be rebooted automatically after the firmware update operation. Un-selected it to delay the reboot if you want to do it later. But the image will only take effect after the system reboot with the primary flag set.

[WEB GUI]
Operation -> Firmware Update -> Step 2

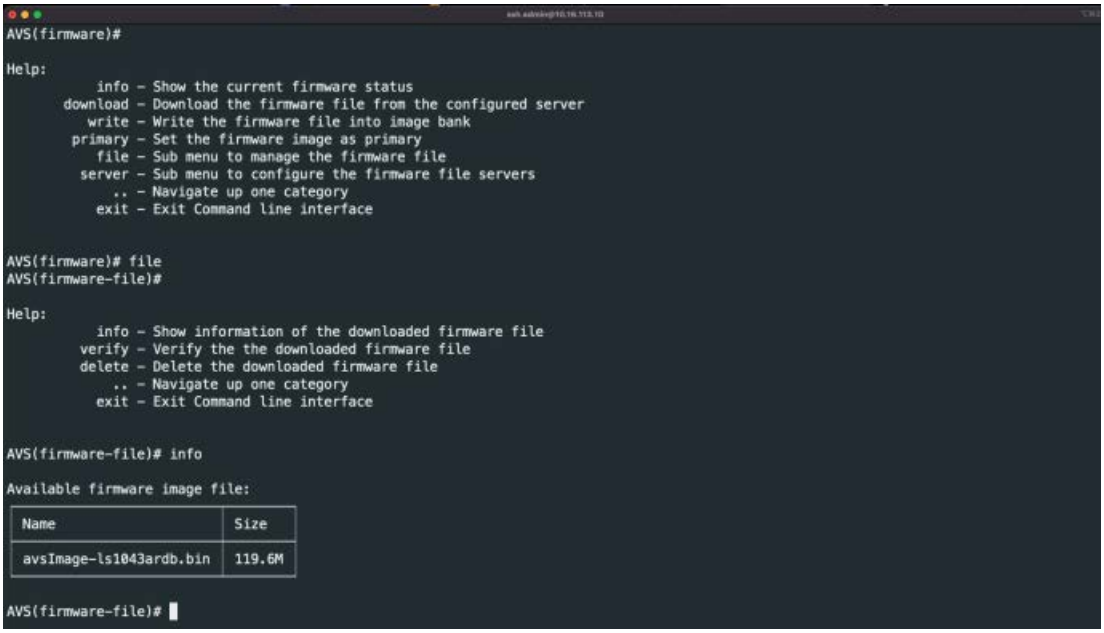


[Mobile App]
Settings -> Firmware -> Update



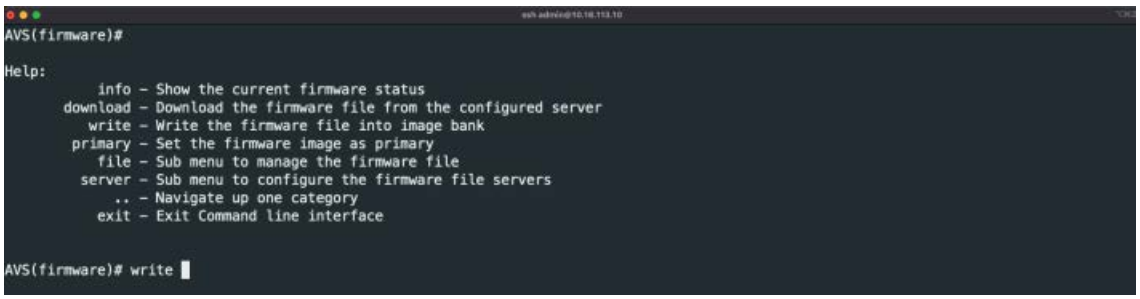
[CLI] Firmware -> File -> Info

To check if the firmware image file exists or not.



[CLI] Firmware - > Write

Type “write” command to trigger the firmware update operation.



Configuring WaveTunnel Devices

Once the Wave tunnel connections are established,you should not change the setting in most scenarios. But if you do need to modify the configuration,here are the pages for you to do it.

Updating WaveTunnel Configurations

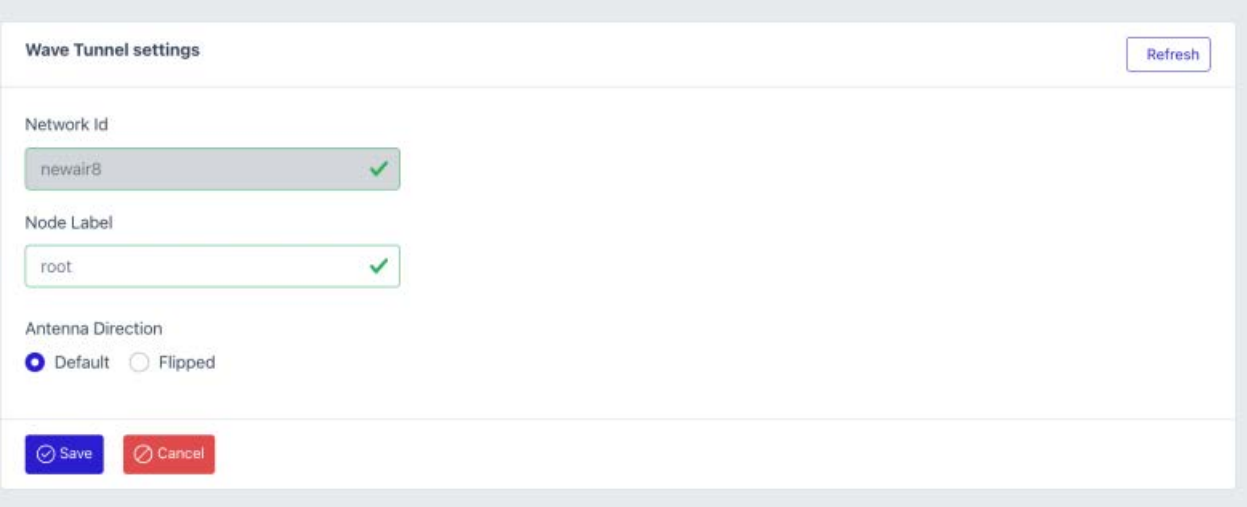
General WaveTunnel settings

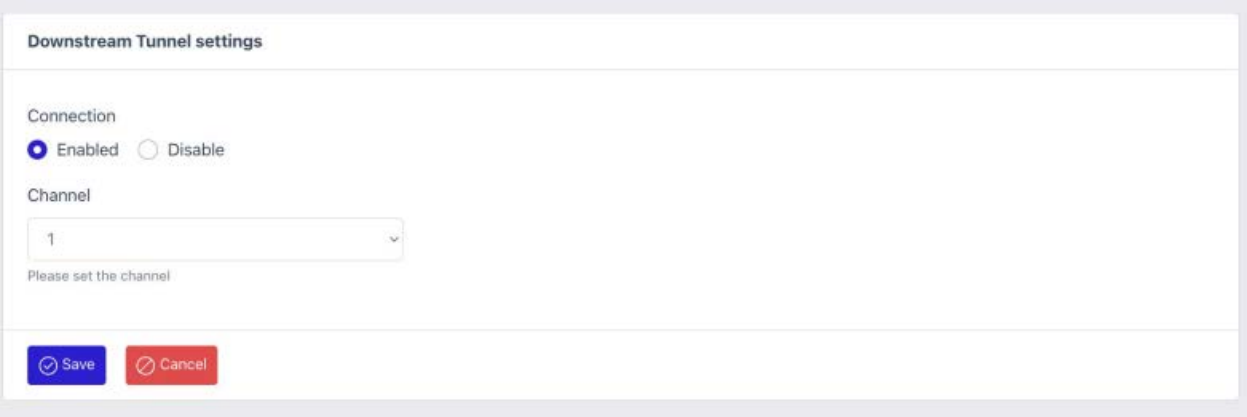
The General Node settings,you can change the label and the antenna direction. For the antenna direction, you will need to adjust the position of the nodes after you make the changes. We suggest you not change it if there is no strong requirement.

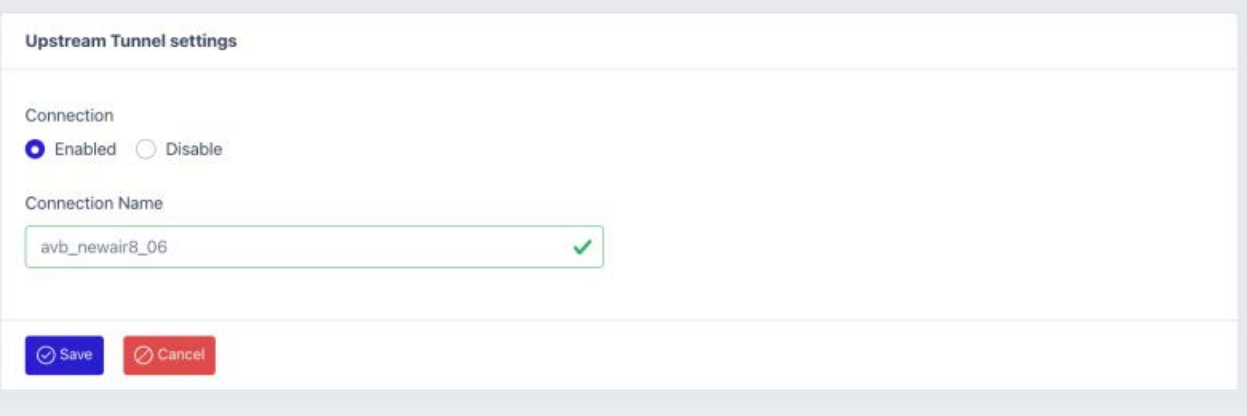
The Downstream tunnel settings.
You can enable/disable the downstream connection or change the channel value. If you disable the connection,it will cause the connection to be lost in the network. We suggest disable only when there is no downstream node connected. For the channel setting,please ensure the channel setting is not identical to the neighboring device to avoid the interference.

The Upstream tunnel settings.
You can enable/disable the upstream connection or change the connection name. If you disable the connection,it will cause the connection to be lost in the network. We suggest disable only when there is no upstream node connected or you want to switch the upstream connection to another device.

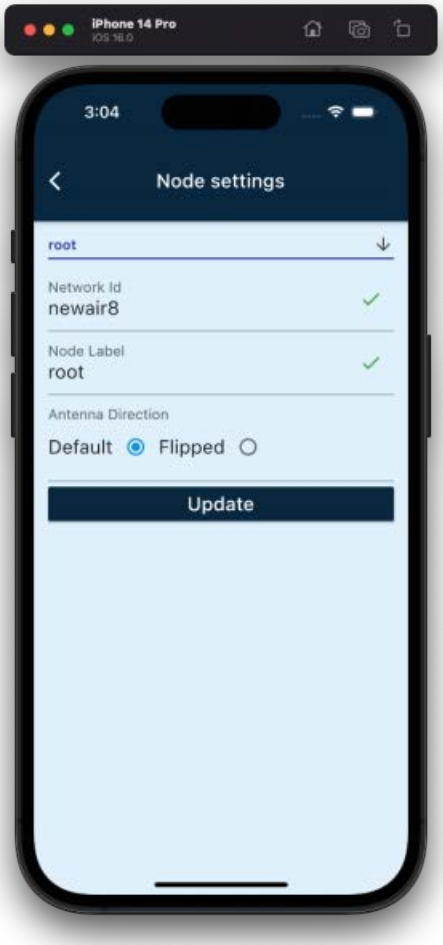
[WEB GUI]
Configuration -> Network -> Wave Tunnel



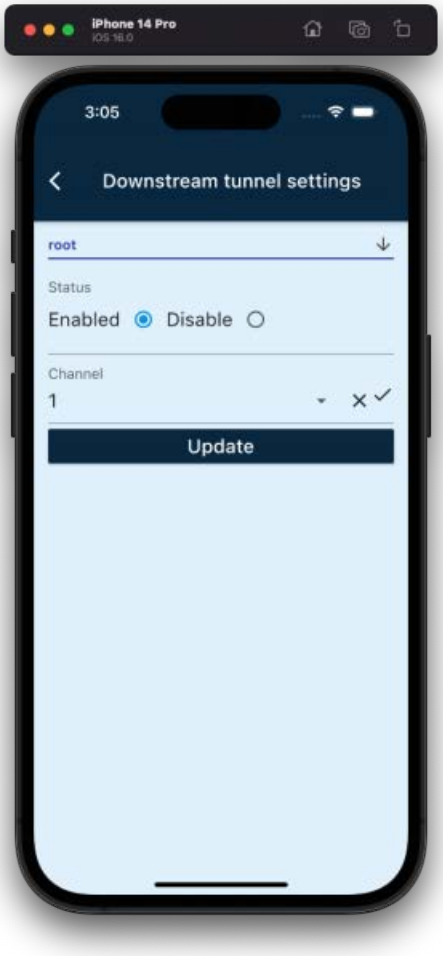




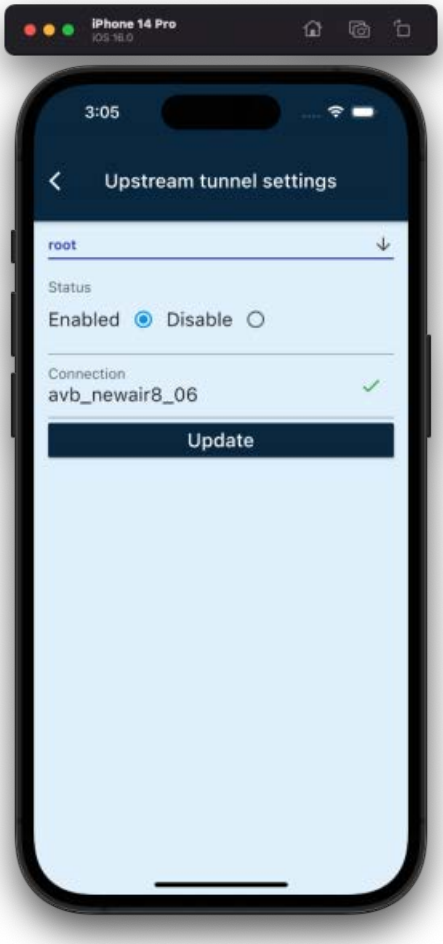
[Mobile App]
Settings -> Wave Tunnel settings



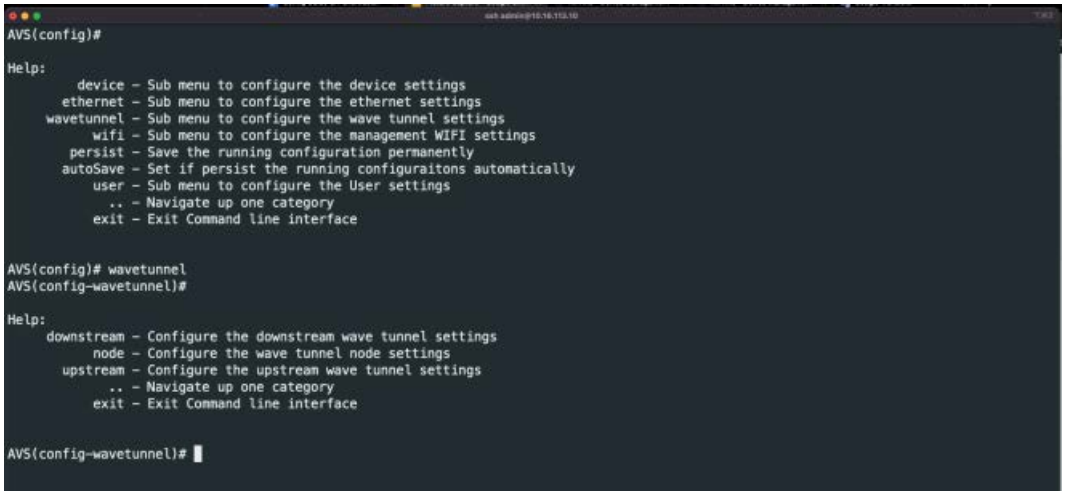
Settings -> Downstream Tunnel settings



Settings -> Upstream Tunnel settings



[CLI] config -> wavetunnel



[CLI] config -> wavetunnel -> node

```
AVS(config-wavetunnel)# node

Wave tunnel node settings
```

Description	Attribute Name	Current Value
Node Type	type	Root Node
Network Id	networkId	newair8
Node Id	nodeId	1
Antenna direction	antennaDirection	Default direction
Node label	label	root

```
AVS(config-wavetunnel-node)# set networkId test

Set networkId to test

Wave tunnel node settings
```

Description	Attribute Name	Current Value	Modified Value
Node Type	type	Root Node	
Network Id	networkId	newair8	test
Node Id	nodeId	1	
Antenna direction	antennaDirection	Default direction	
Node label	label	root	

```
AVS(config-wavetunnel-node)# save
```

[CLI] config -> wavetunnel -> downstream

```
AVS(config-wavetunnel)# downstream

Downstream wave tunnel settings
```

Description	Attribute Name	Current Value
Status	enabled	Enabled
Channel	channel	1

```
AVS(config-wavetunnel-downstream)# set channel 2

Set channel to 2

Downstream wave tunnel settings
```

Description	Attribute Name	Current Value	Modified Value
Status	enabled	Enabled	
Channel	channel	1	2

```
AVS(config-wavetunnel-downstream)# save
```

config -> wavetunnel -> upstream

```
AVS(config-wavetunnel)# upstream

Upstream wave tunnel settings
```

Description	Attribute Name	Current Value
Status	enabled	Enabled
Connection Name	ssid	avb_newair8_06

```
AVS(config-wavetunnel-upstream)# set ssid avb_demo_06

Set ssid to avb_demo_06

Upstream wave tunnel settings
```

Description	Attribute Name	Current Value	Modified Value
Status	enabled	Enabled	
Connection Name	ssid	avb_newair8_06	avb_demo_06

```
AVS(config-wavetunnel-upstream)# save
```

Scan the WaveTunnel network

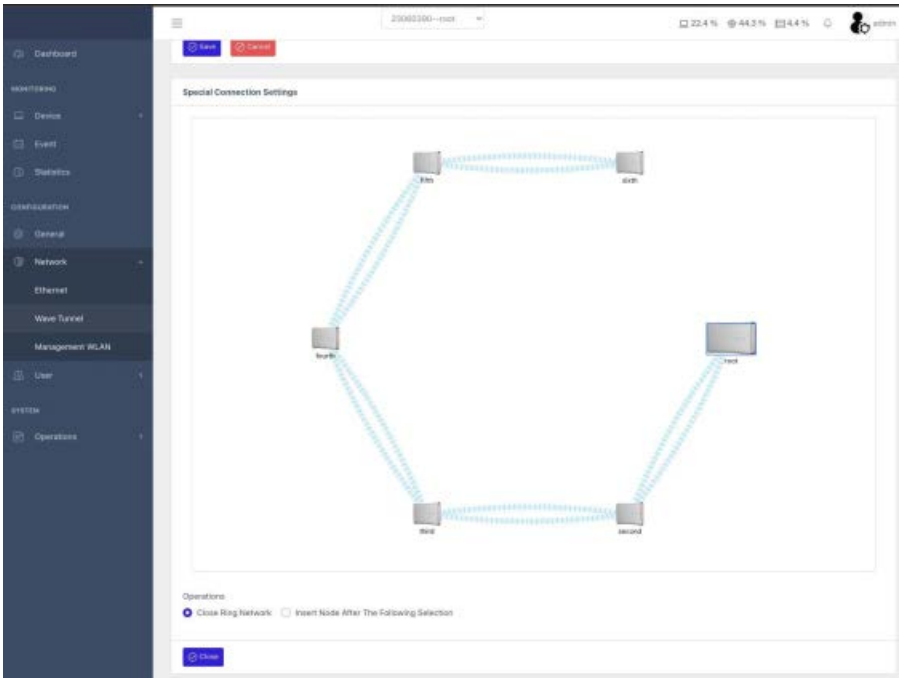
If there is a WaveTunnel device removed from the network or you are seeing an abnormal network topology diagram on the WEB GUI, you can use the “Scan Tunnel” to clean up the cache data of network devices. It will retrieve the information from each node in the network and reflect the changes of your network.

System -> System Operations-> Scan Tunnel

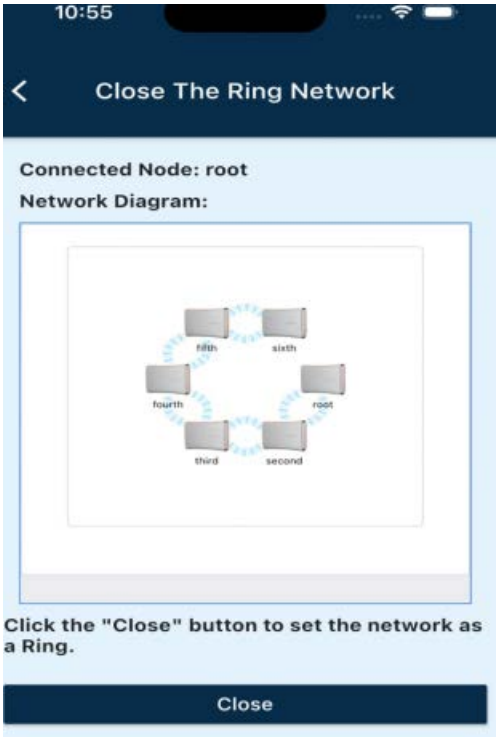
Close the Ring Network

WaveTunnel devices are configured in order (from root to leaf).. If you want to form a ring network to support the redundancy. You can use this function to close the ring network. The configuration is to set the root node point to the end leaf node. You can either do it from WEB GUI or Mobile App.

[WEB GUI] Configuration -> Network -> Wave Tunnel

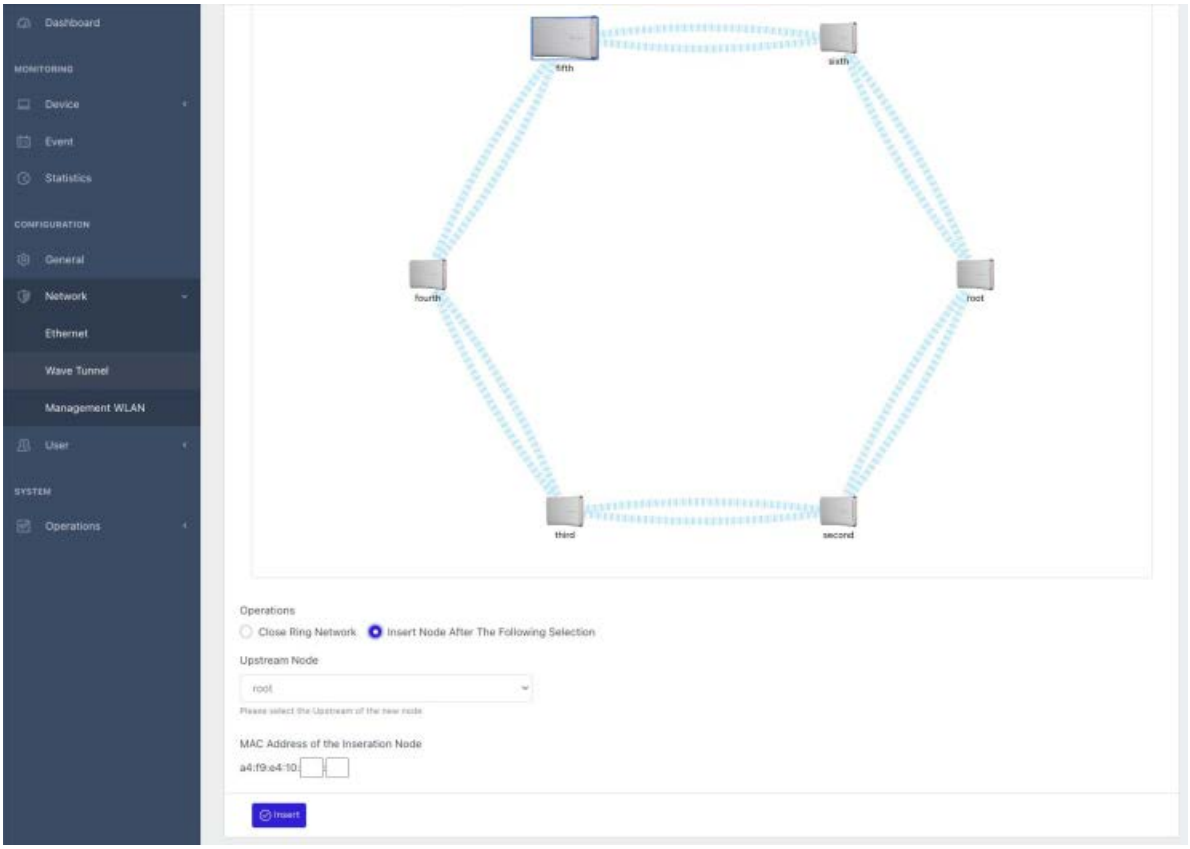


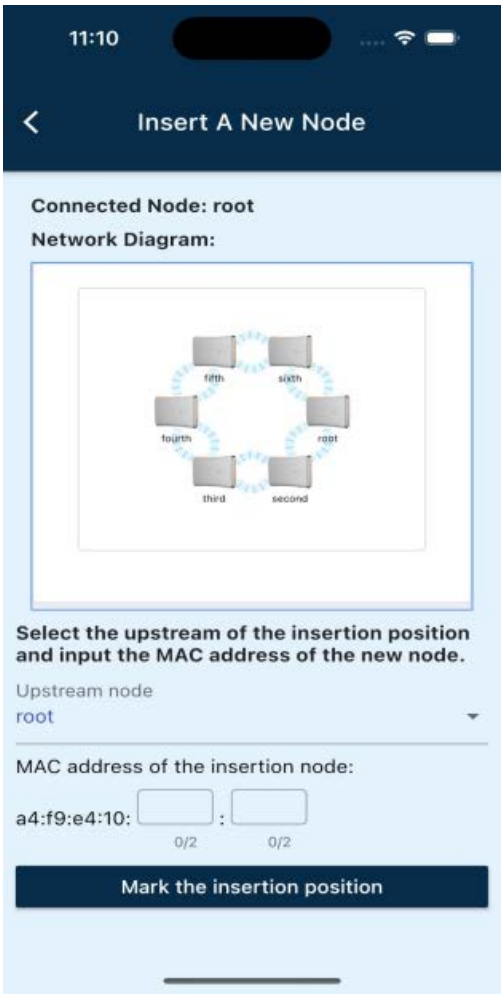
[Mobile App] Settings -> Wave Tunnel settings->Close Ring



Insert a WaveTunnel Device to the Network

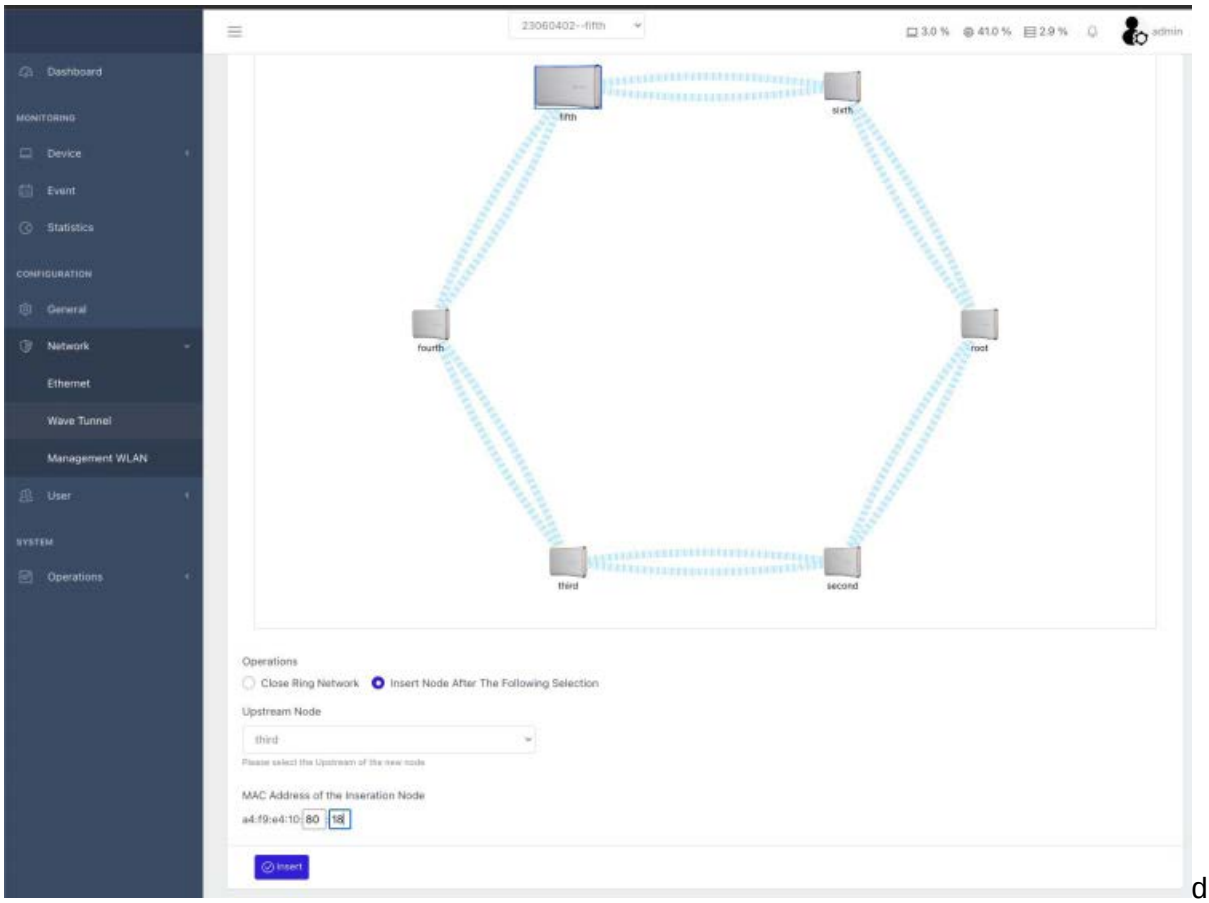
WaveTunnel devices are configured in order (from root to leaf). The function can be used to finish the setup if you need to install a new WaveTunnel device in the position of an existing network.





There are two steps to finish the insertion. Let's take the above network as an example for inserting a device between node third and node fourth.

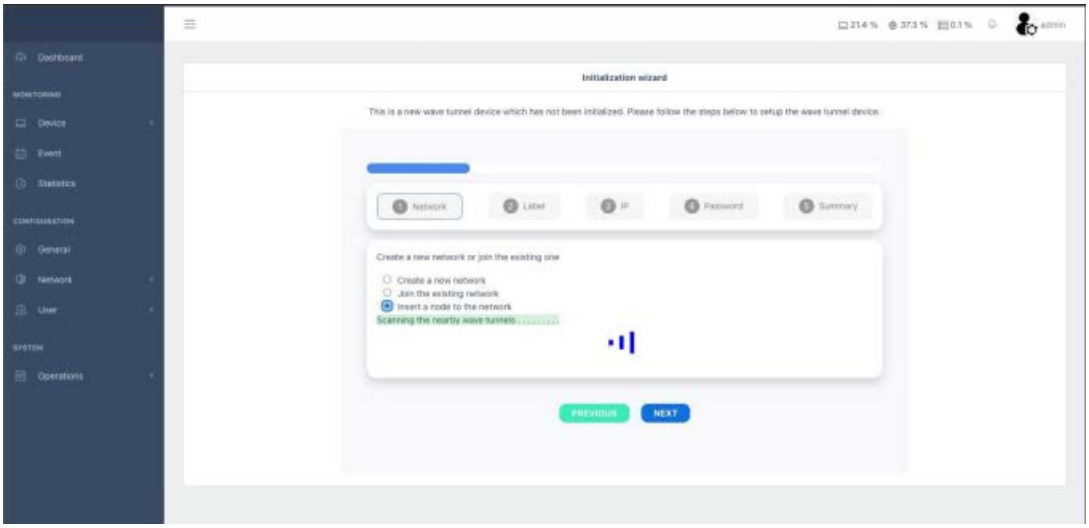
Step 1: Mark the insertion position
Connect to any device in the existing network. Select node "third" as the upstream node and input the MAC address of the new node which is planned to be inserted.

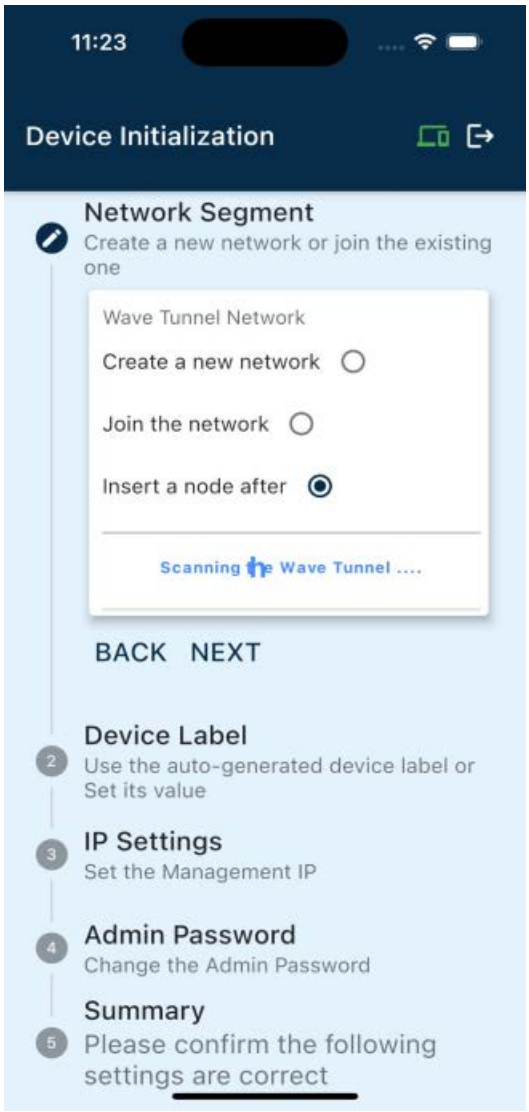


d

Step 2: join the new WaveTunnel device to the network

Use WEB GUI or Mobile to connect to the new WaveTunnel device. In the setup wizard, select the option “Insert a node into the network”. Following the steps of the setup wizard to finish the initialization of the new device. Once finished, you can see the new node is inserted into the position specified in step 1.





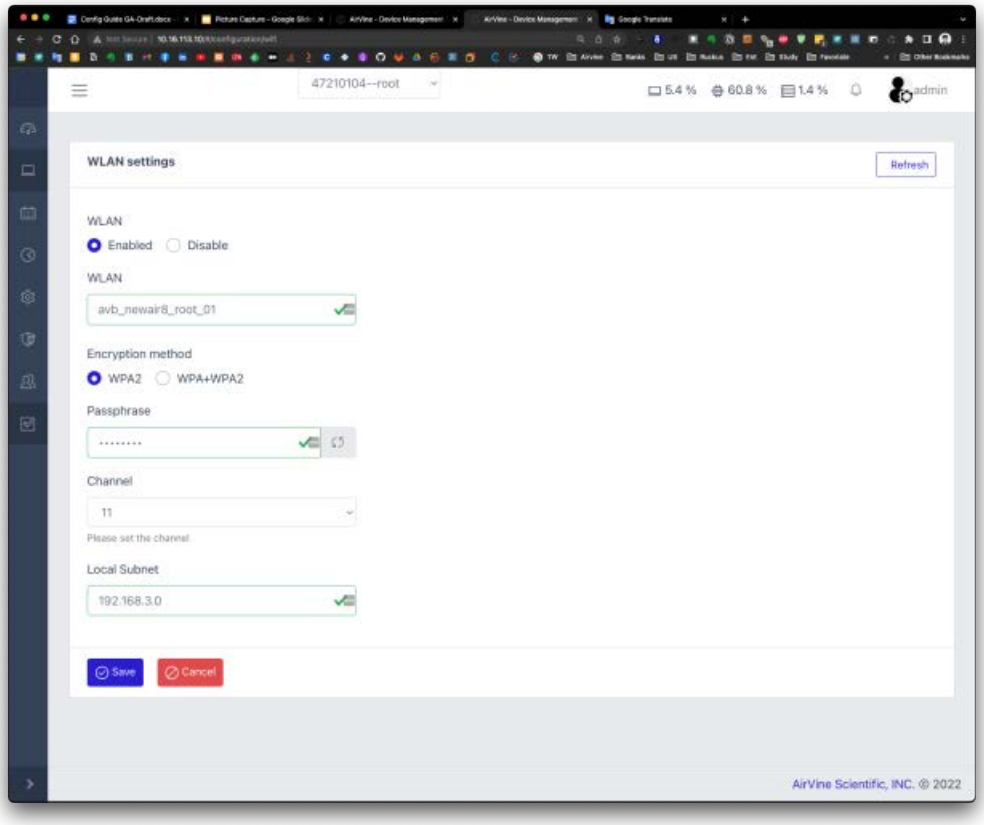
Note: You need to finish step (2) within 30 minutes after step(1). Otherwise, the settings in step (1) will be rollback. This design is to avoid the service impact of the WaveTunnel disconnection.

Update the Management WiFi Wireless LAN (WLAN)

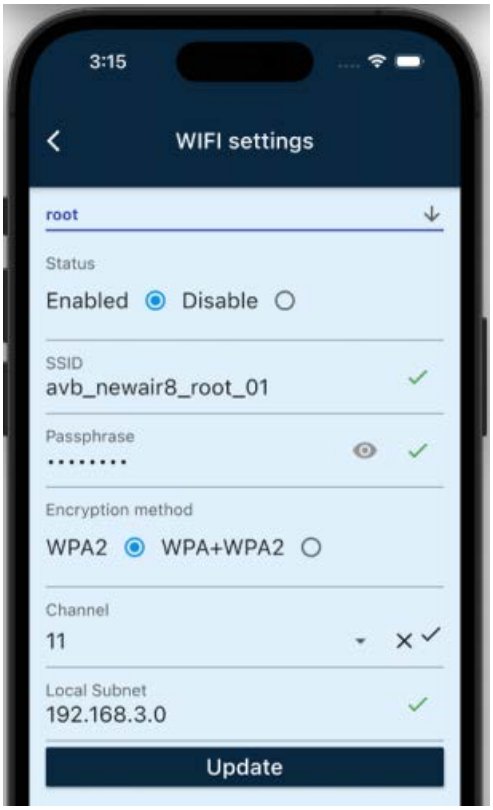
The Wi-Fi management WLAN is used for local management of the WaveTunnel device. You can change the settings according to your need. For example, you can disable the WLAN or change the default passphrase after the wave tunnel initialization for security considerations.

There are several attribute values you can change on this page. It includes enabled/disable, SSID name,encryption method, passphrase, channel and local subnet.

[WEB GUI] Configuration -> Network -> Management WLAN



[Mobile App] Settings -> WIFI settings



[CLI] config -> wifi

```
AVS(config)#

Help:
        device - Sub menu to configure the device settings
      ethernet - Sub menu to configure the ethernet settings
    wavetunnel - Sub menu to configure the wave tunnel settings
          wifi - Sub menu to configure the management WIFI settings
       persist - Save the running configuration permanently
      autoSave - Set if persist the running configuraitons automatically
          user - Sub menu to configure the User settings
            .. - Navigate up one category
          exit - Exit Command line interface

AVS(config)# wifi

Management WIFI settings
```

Description	Attribute Name	Current Value
Connection	enabled	Enabled
SSID	name	avb_newair8_root_01
Encryption method	encryption	WPA2
Passphrase	passphrase	airvine!
Channel	channel	11
Local subnet	subnet	192.168.3.0

```
AVS(config-wifi)#
```

```
AVS(config-wifi)# ll

Management WIFI settings
```

Description	Attribute Name	Current Value
Connection	enabled	Enabled
SSID	name	avb_newair8_root_01
Encryption method	encryption	WPA2
Passphrase	passphrase	airvine!
Channel	channel	11
Local subnet	subnet	192.168.3.0

```
AVS(config-wifi)# set channel 1

Set channel to 1

Management WIFI settings
```

Description	Attribute Name	Current Value	Modified Value
Connection	enabled	Enabled	
SSID	name	avb_newair8_root_01	
Encryption method	encryption	WPA2	
Passphrase	passphrase	airvine!	
Channel	channel	11	1
Local subnet	subnet	192.168.3.0	

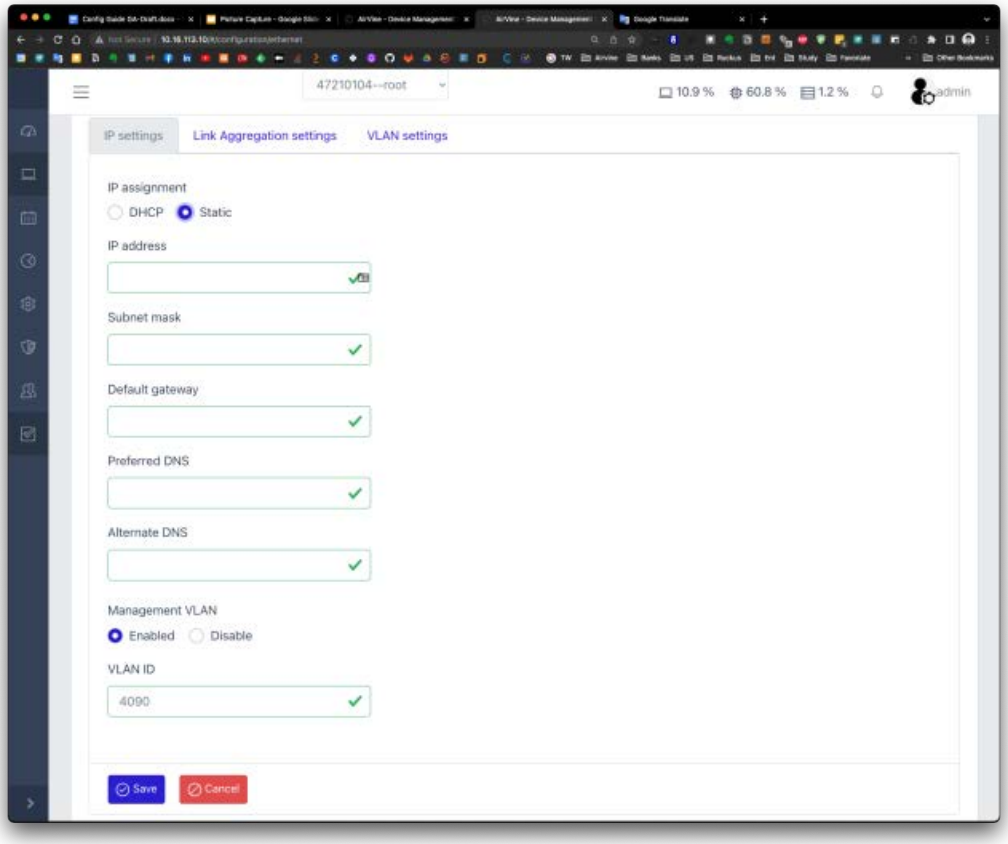
```
AVS(config-wifi)# save
```

Update the Ethernet Configurations

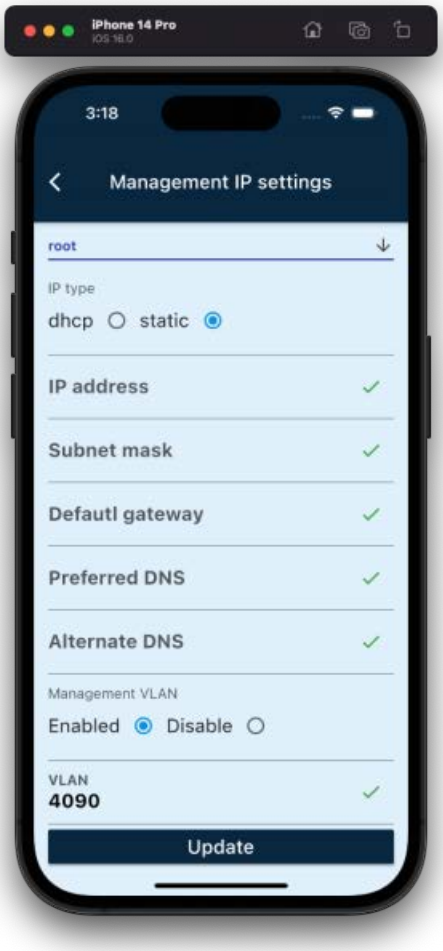
Management IP settings

You can configure the management IP of the WaveTunnel device on this page. It includes the type of IP assignment, IP address, subnet mask, default gateway and management VLAN.

[WEB GUI] Configuration-> Network ->Ethernet ->IP settings



[Mobile App] Settings-> Management



[CLI] config ->ethernet-> management

```
AVS(config)#

Help:
        device - Sub menu to configure the device settings
      ethernet - Sub menu to configure the ethernet settings
    wavetunnel - Sub menu to configure the wave tunnel settings
          wifi - Sub menu to configure the management WIFI settings
       persist - Save the running configuration permanently
      autoSave - Set if persist the running configuraitons automatically
          user - Sub menu to configure the User settings
            .. - Navigate up one category
          exit - Exit Command line interface


AVS(config)# ethernet
AVS(config-ethernet)# management

Ethernet IP settings
```

Description	Attribute Name	Current Value
IP assignment	ipType	DHCP
Preferred DNS	primaryDnsServer	
Alternate DNS	secondaryDnsServer	
Management vlan enable	mgmtVlanEnabled	Disable

```
AVS(config-ethernet-ip)#
```

```
AVS(config-ethernet-ip)# ll

Ethernet IP settings
```

Description	Attribute Name	Current Value
IP assignment	ipType	DHCP
Preferred DNS	primaryDnsServer	
Alternate DNS	secondaryDnsServer	
Management vlan enable	mgmtVlanEnabled	Disable

```
AVS(config-ethernet-ip)# set ipType static

Set ipType to static

Ethernet IP settings
```

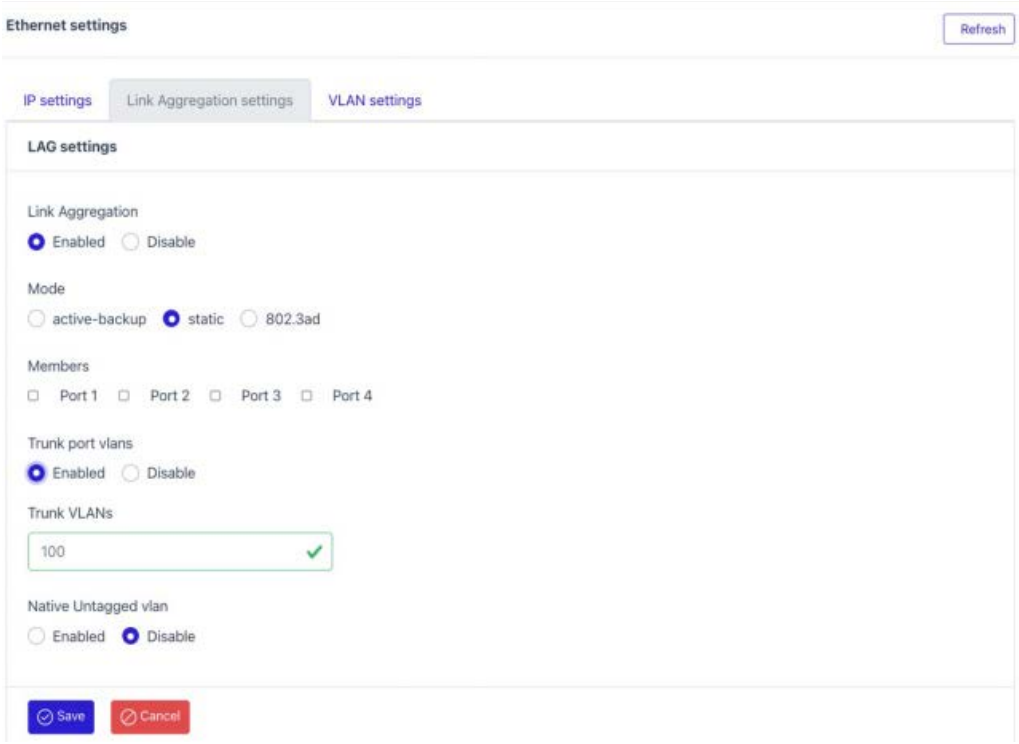
Description	Attribute Name	Current Value	Modified Value
IP assignment	ipType	DHCP	static (Static)
IP address	ip		
Subnet mask	submask		
Default gateway	gateway		
Preferred DNS	primaryDnsServer		
Alternate DNS	secondaryDnsServer		
Management vlan enable	mgmtVlanEnabled	Disable	

```
AVS(config-ethernet-ip)# save
```

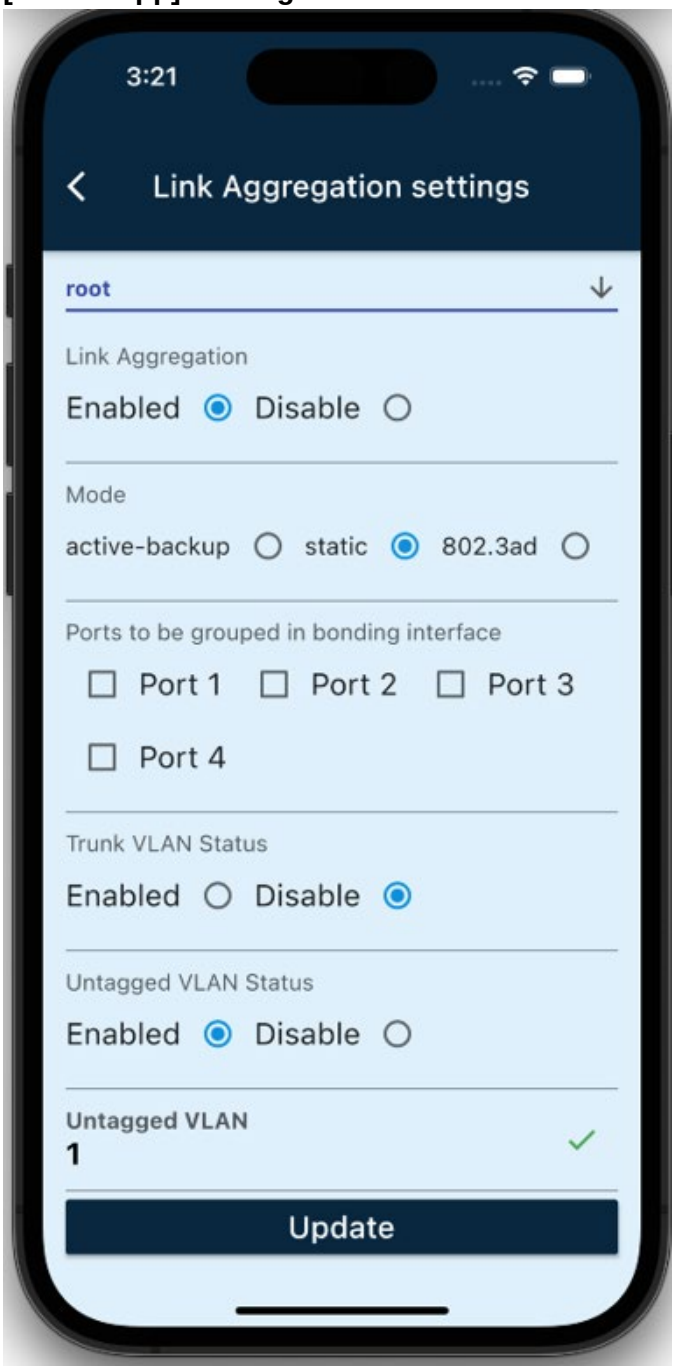
Link aggregation settings

If your backend switch supports link aggregation, you can configure ethernet ports on this page. Select the LAG type and the ports want to be aggregated. The LAG interface also supports trunk VLAN and native VLAN. For trunk VLAN,it can be a range of VLAN id. For example, 2,3,4-8.

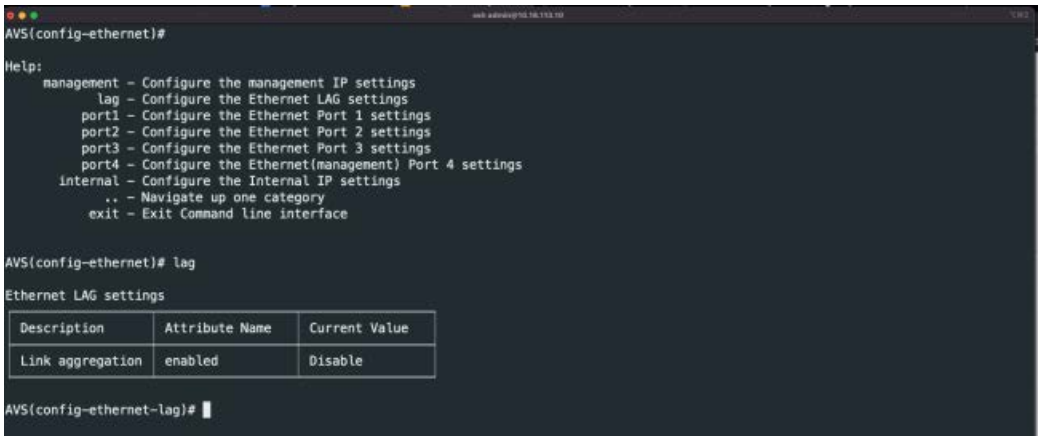
[WEB GUI] Configuration-> Network ->Ethernet ->Link aggregation settings

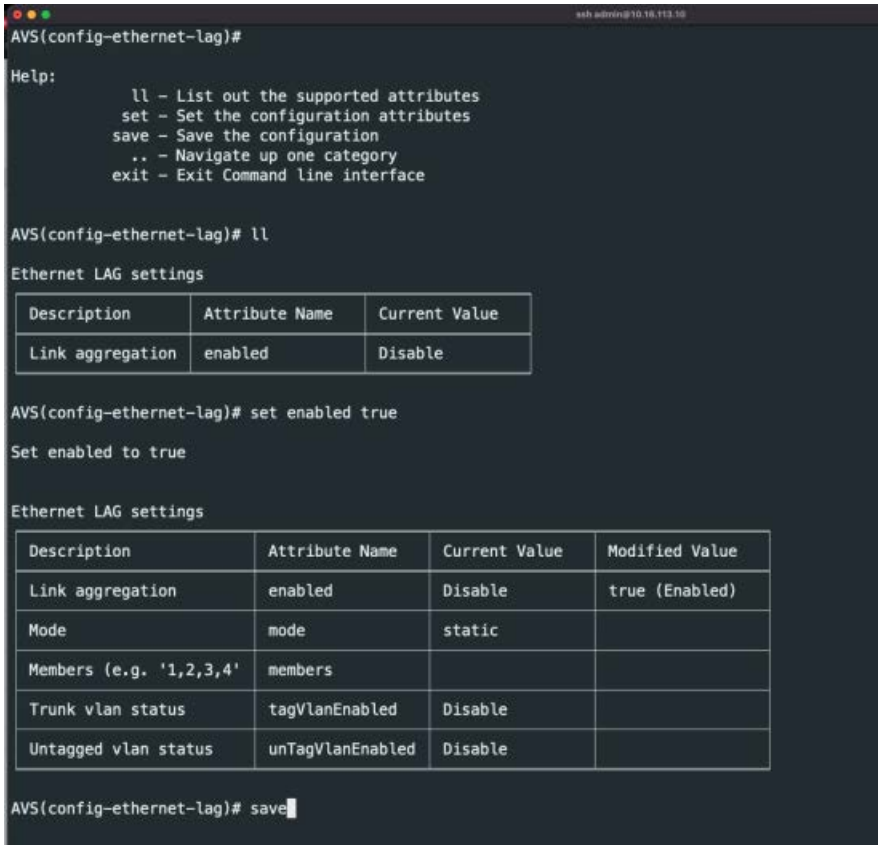


[Mobile App] Settings -> LAG



[CLI] config -> ethernet - lag

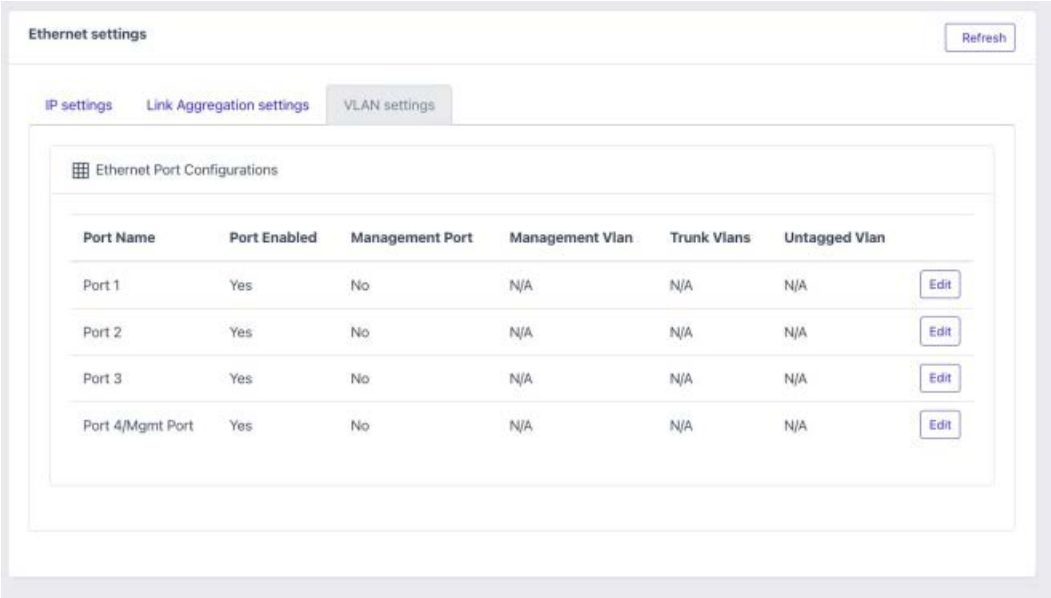




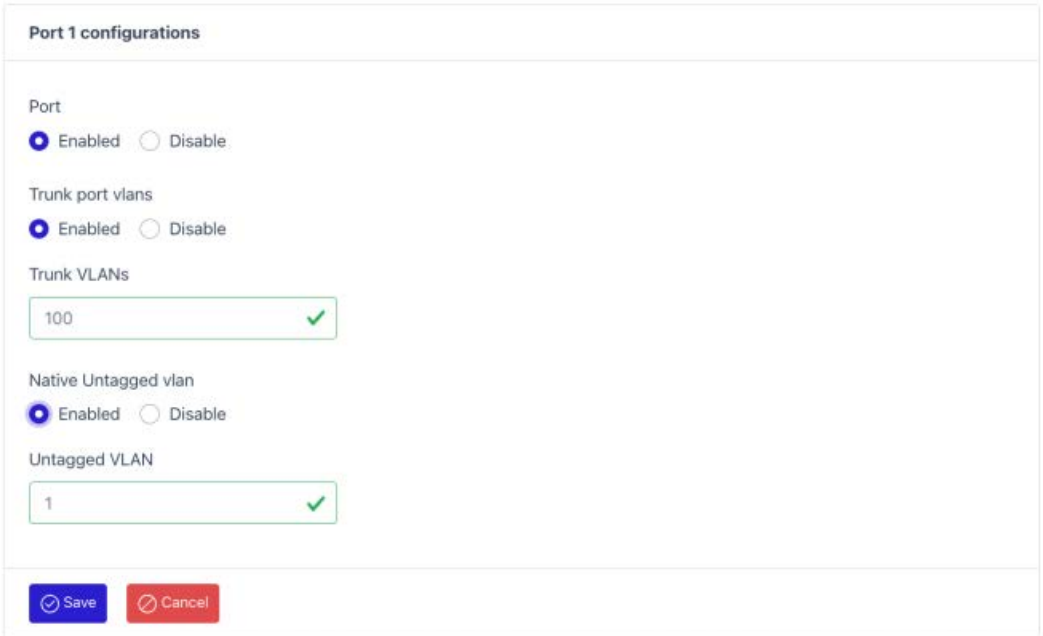
Ethernet Port and VLAN settings

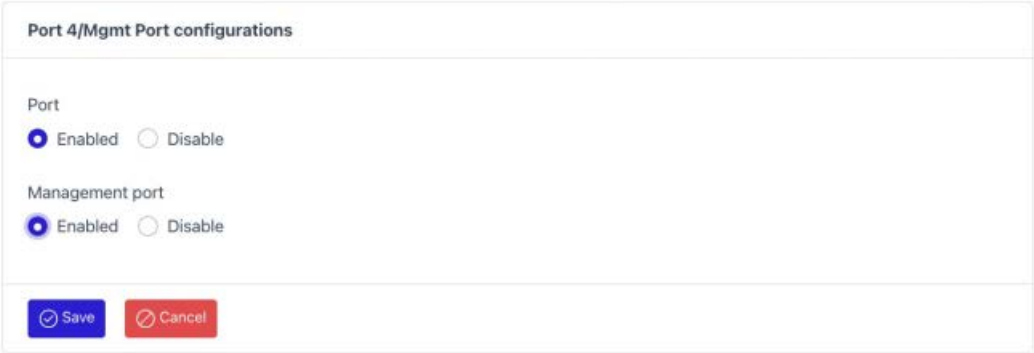
You can configure the ethernet port settings on this page. Enable/Disable the ethernet port or change the VLAN settings. The ethernet port supports trunk VLAN and native VLAN. For trunk VLAN, it can be a range of VLAN id. For example, 2,3,4-8. The port 4 can be enabled to be the dedicated management interface.

[WEB GUI] Configuration-> Network ->Ethernet -> VLAN settings



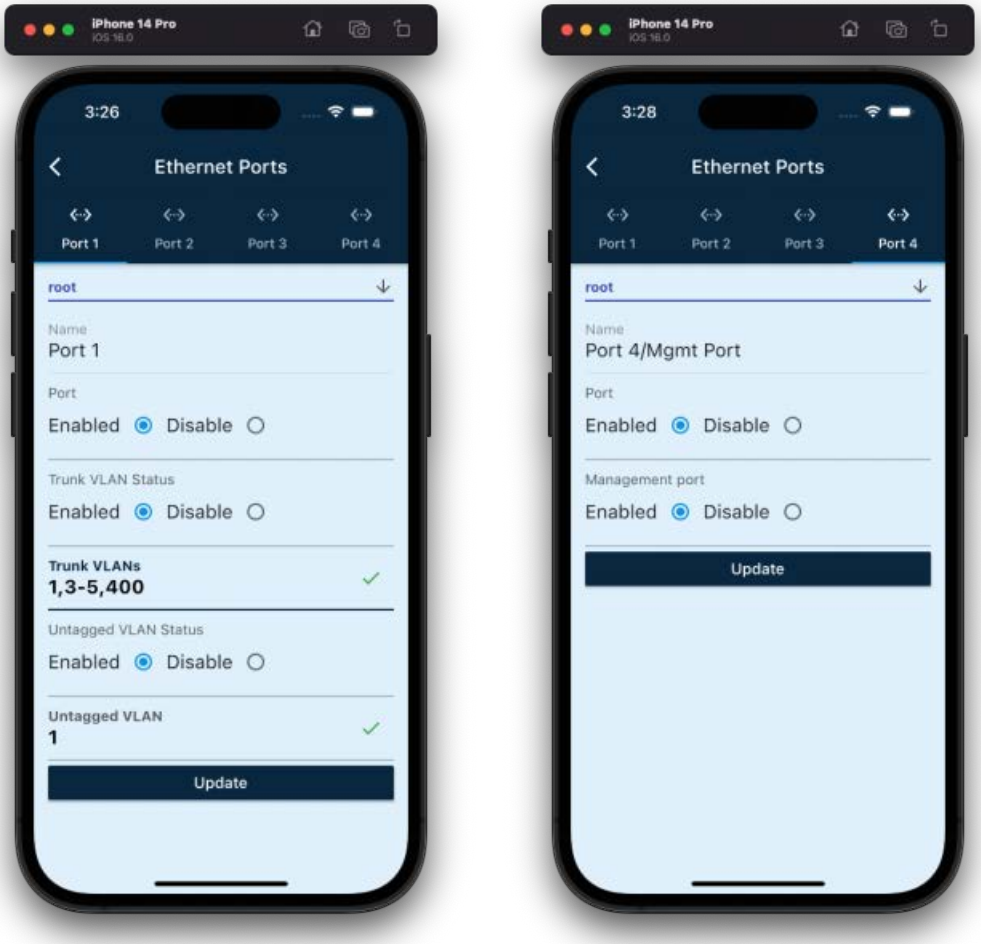
Click “edit” to configure the specific port





Port 4 can be configured as a dedicated management port.

[Mobile App] **Settings -> Ports**



[CLI] **config -> ethernet -> portN**

```
AVS(config-ethernet-port1)#

Help:
            ll - List out the supported attributes
           set - Set the configuration attributes
          save - Save the configuration
            .. - Navigate up one category
          exit - Exit Command line interface


AVS(config-ethernet-port1)# ll

Port 1 settings
```

Description	Attribute Name	Current Value
Port	enabled	Enabled
Trunk vlan status	tagVlanEnabled	Disable
Untagged vlan status	unTagVlanEnabled	Disable

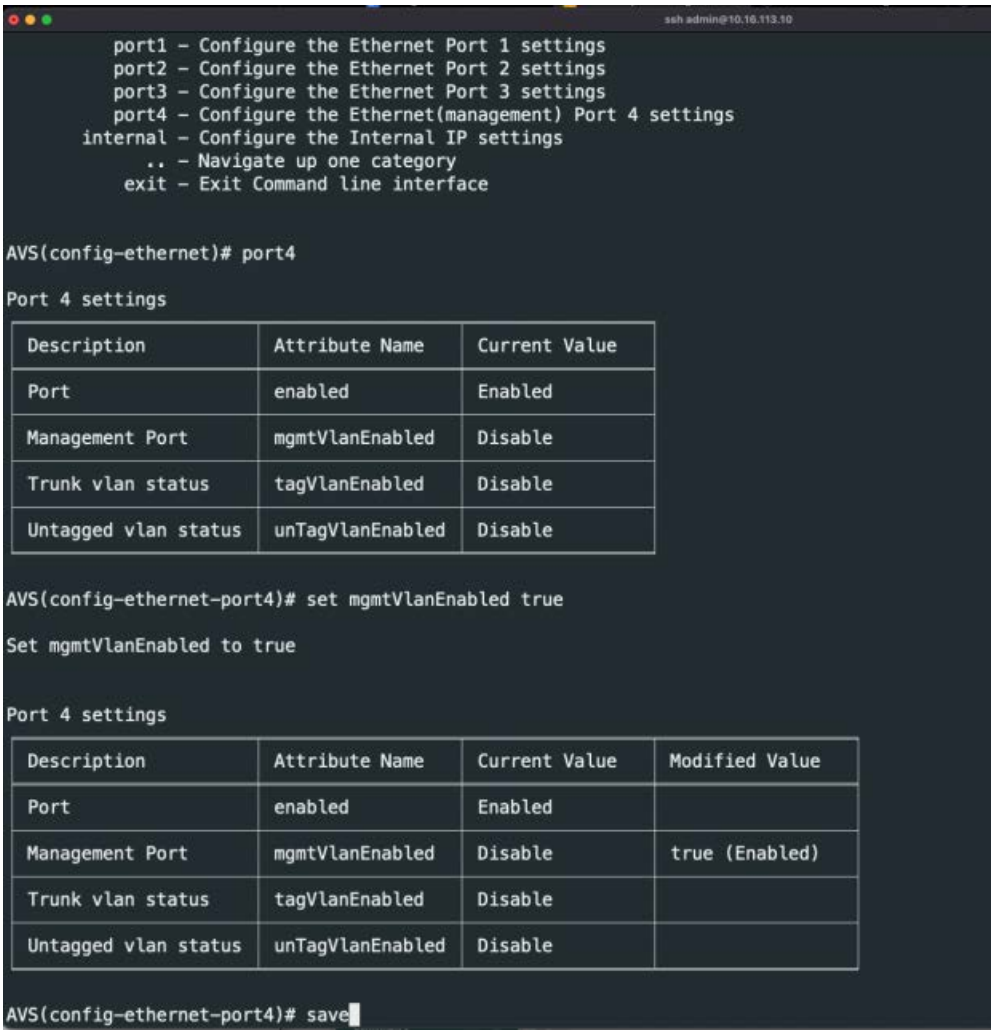
```
AVS(config-ethernet-port1)# set tagVlanEnabled true

Set tagVlanEnabled to true


Port 1 settings
```

Description	Attribute Name	Current Value	Modified Value
Port	enabled	Enabled	
Trunk vlan status	tagVlanEnabled	Disable	true (Enabled)
Trunk vlan	tagVlans	100	
Untagged vlan status	unTagVlanEnabled	Disable	

```
AVS(config-ethernet-port1)# save
```


ssh admin@10.16.113.10
port1 - Configure the Ethernet Port 1 settings
port2 - Configure the Ethernet Port 2 settings
port3 - Configure the Ethernet Port 3 settings
port4 - Configure the Ethernet(management) Port 4 settings
internal - Configure the Internal IP settings
.. - Navigate up one category
exit - Exit Command line interface
AVS(config-ethernet)# port4
Port 4 settings
Description | Attribute Name | Current Value
Port | enabled | Enabled
Management Port | mgmtVlanEnabled | Disable
Trunk vlan status | tagVlanEnabled | Disable
Untagged vlan status | unTagVlanEnabled | Disable
AVS(config-ethernet-port4)# set mgmtVlanEnabled true
Set mgmtVlanEnabled to true
Port 4 settings
Description | Attribute Name | Current Value | Modified Value
Port | enabled | Enabled
Management Port | mgmtVlanEnabled | Disable | true (Enabled)
Trunk vlan status | tagVlanEnabled | Disable
Untagged vlan status | unTagVlanEnabled | Disable
AVS(config-ethernet-port4)# save