Cambium Networks™

USER GUIDE

cnPilot Enterprise Wi-Fi Access Points

System Release 4.2.3

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Contents

Upgrade/Downgrade Guidelines

Section-1

Mandatory image extension verification to follow while upgrading/downgrading from **4.x to 4.x, 3.11.x to 4.x and vice versa**. This procedure is applicable on cnMaestro (On-Premise recommended version is 2.2.1-r36 and above) and standalone AP UI/CLI. This procedure will **not be applicable on cnMaestro-Cloud**, since image upgrade/downgrade is automatic for APs.

Note

This recommendation is applicable for all models of cnPilot APs**.**

Refer the below table and validate the **image extension** w.r.t the version before proceeding to upgrade/downgrade.

Version		Image extension
From	To	
4.x	4.x	CIMG
4.x	3.11.x	IMG
3.11.x	4.x	**IMG

**Note

For **cnPilot e410/e430/e510/e600 and e700** APs, refer additional instructions mentioned in Section-2 before proceeding to upgrade/downgrade the AP.

Section-2

Attention

To upgrade/downgrade from 3.11.x (3.11.4-r9 /3.11.3.1-r4/3.11.3-r7 etc.) to 4.x (4.0/4.1/4.2 and later subsequent images) and vice versa, mandatorily use 3.11.4.1-r3 and 4.1-r3 and above image versions. Ignoring this suggestion can lead to failure in loading the image and resulting in flashed partition (backup partition) getting corrupted. To recover the corrupted partition, user may have to contact Cambium Support team.

Perform the below steps to upgrade the image from 3.11.4-r9 to 4.2.3-r2 and above:

1. First, upgrade the AP from **3.11.4-r9** to **3.11.4.1-r3**
2. Then upgrade the AP from **3.11.4.1-r3** to **4.2.3-r2** and above

Perform the below steps to downgrade the image from **4.2.3-r2** and above to **3.11.4-r9**:

1. First, downgrade the AP from **4.2.3-r2** and above to **3.11.4.1-r3**
2. Then downgrade the AP from **3.11.4.1-r3** to **3.11.4-r9**

Note

This recommendation is only applicable for **cnPilot e410/e430/e510/e600** and **e700** APs.

Chapter 1: About This User Guide

This chapter describes the following topics:

- Overview of cnPilot products
- Intended audience
- Purpose
- Related documents
- Features and Enhancements
- Supported hardware platforms

Overview of cnPilot products

Thank you for choosing Cambium cnPilot Access Point (AP)!

This User Guide describes the features supported by cnPilot Enterprise AP and provides detailed instructions for setting Up and configuring cnPilot Enterprise AP.

cnPilot's are the industry's upcoming feature-rich Wi-Fi APs designed for Indoor/Outdoor which are easy to deploy and configure.

Intended audience

This guide is intended for use by the system designer, system installer and system administrator.

Purpose

Cambium Network's cnPilot Enterprise AP documents are intended to instruct and assist personnel in the operation, installation and maintenance of the Cambium's equipment and ancillary devices. It is recommended that all personnel engaged in such activities be properly trained.

Cambium disclaims all liability whatsoever, implied or expressed, for any risk of damage, loss or reduction in system performance arising directly or indirectly out of the failure of the customer, or anyone acting on the customer's behalf, to abide by the instructions, system parameters, or recommendations made in this document.

Related documents

Table 1 provides details on cnPilot's support information.

Table 1: Related documents

cnPilot Enterprise product details	https://www.cambiumnetworks.com/products/wifi-cnpilot/
cnPilot Enterprise AP User Guide (This document)	https://support.cambiumnetworks.com/files

cnPilot Enterprise AP Release Notes	https://support.cambiumnetworks.com/files
Software Resources	https://support.cambiumnetworks.com/files
Knowledge Base (KB) Articles	http://community.cambiumnetworks.com/t5/cnPilot-E-Series-Enterprise-APs/bd-p/cnPilot_E_Series/
Community	http://community.cambiumnetworks.com/
Support	https://www.cambiumnetworks.com/support/contact-support/
Warranty	https://www.cambiumnetworks.com/support/warranty/
Feedback	For feedback, e-mail to support@cambiumnetworks.com/

Features and Enhancements

System Release 4.2.2

The System Release 4.2.2 includes the following new features:

Table 2: New features

Features	Platform Support	Summary
Radius based ePSK	All	ePSK feature is an extension of WPA2 PSK where multiple passphrases can assign to a single SSID.
Auto Cell	All	Auto Cell size is an automatic, self-tuning mechanism that balances cell size between APs to guarantee coverage while limiting the RF energy that could extend beyond the organizational boundary.

Features and Enhancements

System Release 4.2.3

The System Release 4.2.3 includes the following new feature:

Table 3: New features

Features	Platform Support	Summary
Cambium Traffic Class Premium feature	All	Cambium Traffic Class attributes are supported for wireless guest clients. The device allows guest clients to communicate destinations (defined using IP/Network address) defined under traffic class names without completing the guest authentication.

Supported hardware platforms

Table 4: Supported platforms

Hardware	Description
e400	2x2:2, 802.11a/b/g/n/ac wave 1 indoor Access Point
e500	2x2:2, 802.11a/b/g/n/ac wave 1 outdoor Access Point
e501S	2x2:2, 802.11a/b/g/n/ac wave 1 90°/120° outdoor Access Point
e502S	2x2:2, 802.11a/b/g/n/ac wave 1 30° outdoor Access Point
e410	2x2:2, 802.11a/b/g/n/ac wave 2 indoor Access Point
e410b	2x2:2, 802.11a/b/g/n/ac wave 2 Indoor Access Point.
e510	2x2:2, 802.11a/b/g/n/ac wave 2 outdoor Access Point
e600	2x2:2 for 2.4 GHz and 4x4:4 for 5 GHz, 802.11a/b/g/n/ac wave 2 indoor Access Point
e430	2x2:2, 802.11a/b/g/n/ac wave 2 indoor Access Point
e700	2x2:2 for 2.4 GHz and 4x4:4 for 5 GHz, 802.11a/b/g/n/ac wave 2 indoor Access Point

Premium feature list

System Release 4.2.2 and later releases of cnPilot Enterprise Wi-Fi AP firmware support certain advanced features which are available only through a paid subscription to cnMaestro X or XMS-Cloud management. These features will be identified with the label Premium feature in the applicable documentation. With the current System Release 4.2.3 end users can access these features without a management subscription; however, access to these features is currently on a free trial basis, and only for a limited time. As Cambium Networks releases new versions, we will begin enforcing restrictions on the use of these premium features only in conjunction with a current cnMaestro X or XMS-Cloud subscription, and at that time, the APs will stop enabling configurations, including these premium features if the user does not have a current subscription.

Table 5: Premium feature list

Feature Name	Release Details
RADIUS-based ePSK	System Release 4.2.2
ePSK scale (more than 300 keys)	System Release 4.1.1
Cambium Traffic Class	System Release 4.2.3

Chapter 2: Quick Start – Device Access

This chapter describes the following topics:

- Powering up the device
- Accessing the device
- LED status

Powering up the device

This section includes the following topics:

- Quick Start – Device Access
- Quick Start – Device Access

cnPilot product family can be powered either using PoE adapter provided in the package or it can be powered using 802.3af or 802.3at capable switches.

For cnPilot e600 and e430, there is additional provision to power ON device using DC power adapter.

Accessing the device

This section includes the following topics:

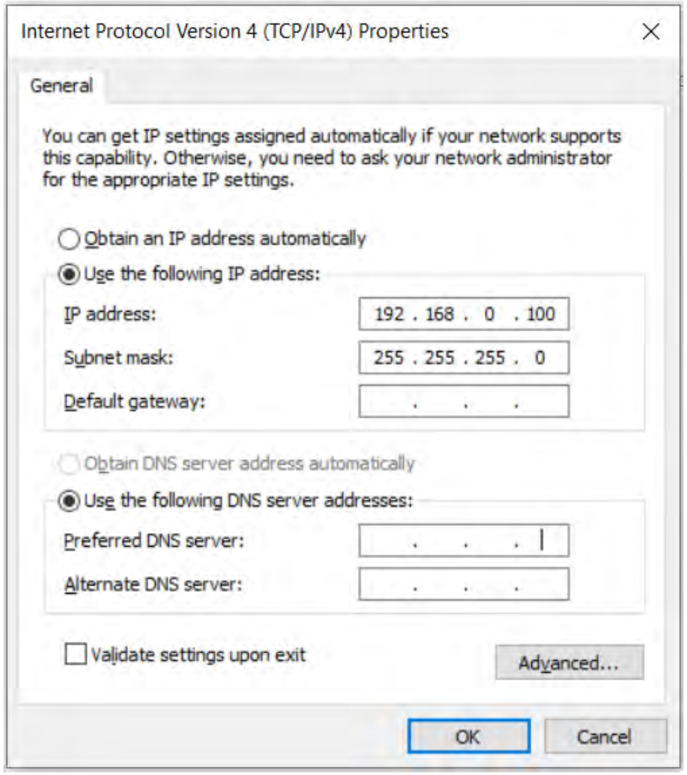
- Device access using default/fallback IP
- Device access using zeroconf IP
- Device access using DHCP IP address

Once the device is powered up ensure the device is up and running before you try to access it based on LED status. Power LED on the cnPilot device should turn Green which indicates that the device is ready for access.

Device access using default/fallback IP

1. Select Properties for the Ethernet port:
   a. For Windows 7: **Control Panel > Network and Internet > Network Connections > Local Area Connection**
   b. For Windows 10:**Control Panel > Network and Internet > Network and Sharing Center > Local Area Connection**.
2. IPAddress Configuration:

   The cnPilot AP obtains its IP address from a DHCP server. A default IP address of 192.168.0.1/24 will be used if an IP address is not obtained from the DHCP server.



Internet Protocol Version 4 (TCP/IPv4) Properties

General

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

○ Obtain an IP address automatically

● Use the following IP address:

IP address: 192 . 168 . 0 . 100

Subnet mask: 255 . 255 . 255 . 0

Default gateway: . . .

○ Obtain DNS server address automatically

● Use the following DNS server addresses:

Preferred DNS server: . . .

Alternate DNS server: . . .

□ Validate settings upon exit

Open any browser on the PC and browse http://192.168.0.1 with default credentials as below:

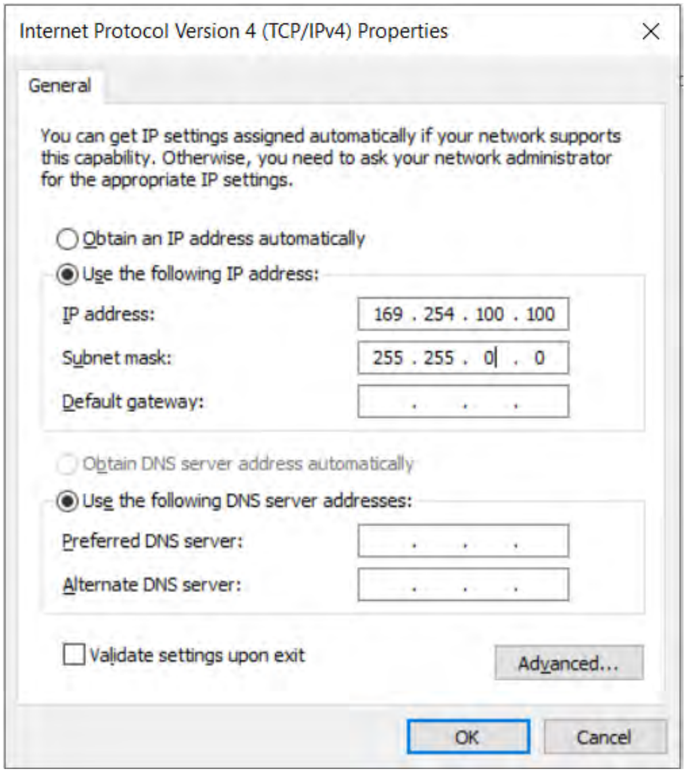
- Username: admin
- Password: admin

Device access using zeroconf IP

To access the device using zeroconf IP, follow the below steps:

For example:

1. Convert the last two bytes of ESN of the device to decimal. If ESN is 58:C1:CC:DD:AA:BB, last two bytes of this ESN is AA:BB. Decimal equivalent of AA:BB is 170:187.
2. Zeroconf IP of device with ESN 58:C1:CC:DD:AA:BB is 169.254.170.187
3. Configure Management PC with 169.254.100.100/16 as below:



Internet Protocol Version 4 (TCP/IPv4) Properties

General

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

○ Obtain an IP address automatically

● Use the following IP address:

IP address: 169 . 254 . 100 . 100

Subnet mask: 255 . 255 . 0 . 0

Default gateway: . . .

○ Obtain DNS server address automatically

● Use the following DNS server addresses:

Preferred DNS server: . . .

Alternate DNS server: . . .

□ Validate settings upon exit

4. Access the device UI using http://169.254.170.187 with default credentials as below:
   - Username: admin
   - Password: admin

Device access using DHCP IP address

1. Plug in the device to the network.
2. Get the IP address of the device from the System administrator.
3. Access device UI using http://<IP address> with default credentials as below:
   - Username: admin
   - Password: admin

LED status

The e410/e410b/e430/e425H/e600/e505 AP has single color LED. The power LED will glow Amber as the AP boots up and turn Green once it has booted up successfully. The network/status LED will glow Amber if the connection to cnMaestro controller/manager is down and turns Blue once the AP is connected successfully to cnMaestro.

Table 6: e410/e410b/e430/e425H/e600/e505 LED status

LED Color	Status Indication
🟧	• Device is booting up. **Note** If these LEDs remain ‘Amber’ for more than 5 minutes, indicates that the device failed to boot.
🟩	• Device is successfully up and accessible. • Wi-Fi services are up if configured.
🟦	• cnMaestro connection is successful.

The e700/e510 AP has two multi-colored LEDs. The power LED will glow Amber as the AP boots up and turns Green once it has booted up successfully. The network/status LED will glow Amber if the connection to cnMaestro controller/manager is down and turns Blue once the AP is connected successfully to cnMaestro.

Table 7: e700/e510 LED status

LED Color		Status Indication
⏻	🖧	
🟧	🟧	• Device is booting up. **Note** If these LEDs remain ‘Amber’ for more than 5 minutes, indicates that the device failed to boot.
🟩	🟧	• Device is successfully up and accessible. • Wi-Fi services are up if configured.
🟩	🟦	• Device is successfully up and accessible. • Wi-Fi services are up if configured. • cnMaestro connection is successful.

The e400/e500/e501S/e502S AP has two multi-colored LEDs. The power LED will glow Amber as the AP boots up and turns Green once it has booted up successfully. The network/status LED will glow Amber if the connection to cnMaestro controller/manager is down and turns Green once the AP is connected successfully to cnMaestro.

Table 8: e400/e500/e501S/e502S LED status

LED Color		Status Indication
⏻	🖧	
🟧	🟧	• Device is booting up. **Note** If these LEDs remain ‘Amber’ for more than 5 minutes, indicates that the device failed to boot.
🟩	🟧	• Device is successfully up and accessible. • Wi-Fi services are up if configured.
🟩	🟩	• Device is successfully up and accessible. • Wi-Fi services are up if configured. • cnMaestro connection is successful.

Chapter 3: Device Modes

cnPilot product family supports three modes of operation based on deployment size. Details of mode of operation supported by cnMaestro are given below:

- Device Modes
- Device Modes
- Device Modes

cnMaestro managed mode

This mode is also known as controller mode, in which all management traffic is tunneled to cnMaestro and data traffic is offloaded from AP to the network. There are provisions to tunnel data traffic to cnMaestro but has its own limitations w.r.t size of deployment. Device onboarding methods and procedures are explained in further chapters. By default, devices onboard to cnMaestro cloud (https://cloud.cambiumnetworks.com), however we can also onboard the devices to cnMaestro On-Premises by mapping the cnMaestro IP address on the device.

Note

cnMaestro managed mode is the recommended mode for any cnPilot devices.

Autopilot mode

This is a proprietary mode supported by cnPilot devices. This mode allows one of the cnPilot devices to act as controller, which allows to configure other devices in the network. This mode has its own limitations, which will be explained in detail in the following chapters.

Standalone mode

This is the default mode a cnPilot device operates. In this mode, it is expected that each device has to be configured and managed independently, which is cumbersome if deployment size exceeds 10 devices.

Chapter 4: cnMaestro Onboarding

This chapter describes the following topics:

- Overview
- Device Onboarding and Provisioning
- Directing devices to the cnMaestro On-Premises server using DHCP
- Claim using Cambium ID

Overview

cnMaestro is Cambium's next generation network management platform based on cloud technologies. In addition to the cloud-based cnMaestro solution, it can also be installed as a standalone On-Premises server. By default, all devices contact https://cloud.cambiumnetworks.com, no user action is required to direct devices to contact cnMaestro cloud. You can onboard and provision devices without any additional setup.

If you are using cnMaestro On-Premises you must direct devices to correct cnMaestro server using DHCP or static URL configuration.

Device Onboarding and Provisioning

This section includes the following topics:

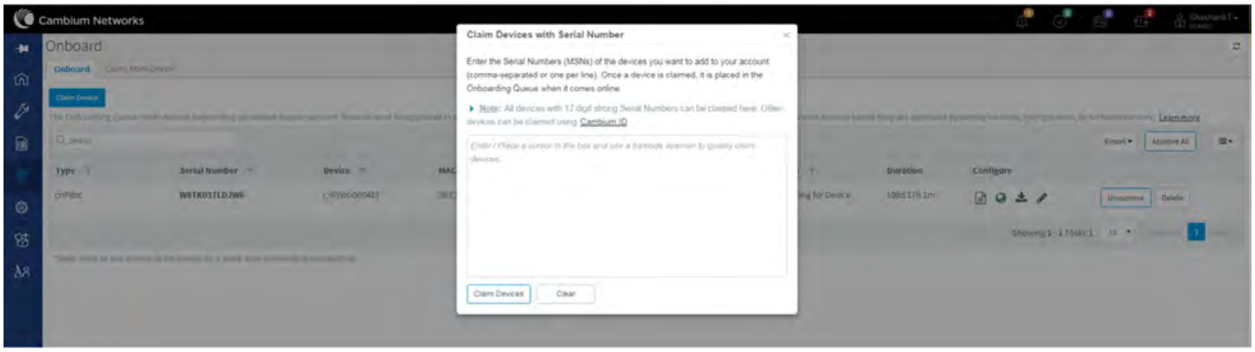
- Onboarding to cnMaestro cloud using MSN
- Onboarding to cnMaestro On-Premises
- Auto-Provisioning
- Other options

Onboarding to cnMaestro cloud using MSN

This mode is preferable for cnMaestro cloud. Inorder to claim through MSN Address, follow the below steps:

1. Login to On-Premises server using default username and password (admin/admin) or the username and password set by the Administrator.
2. Navigate to **Home > Onboard Devices > Claim from cnMaestro**.
3. Select the Device type that needs to be onboarded and provide the MSN in the combo box and click the Claim Devices button. Multiple MSN Addresses of same device type can be claimed using (,) separator between MSN or by entering them in the new line.

Figure 1: *Onboarding to cnMaestro cloud using MSN*



Claim Devices with Serial Number

Enter the Serial Numbers (MSNs) of the devices you want to add to your account (comma-separated or one per line). Once a device is claimed, it is placed in the Onboarding Queue when it comes online.

Note: All devices with 12 digit strong Serial Numbers can be claimed here. Other devices can be claimed using Cambium ID

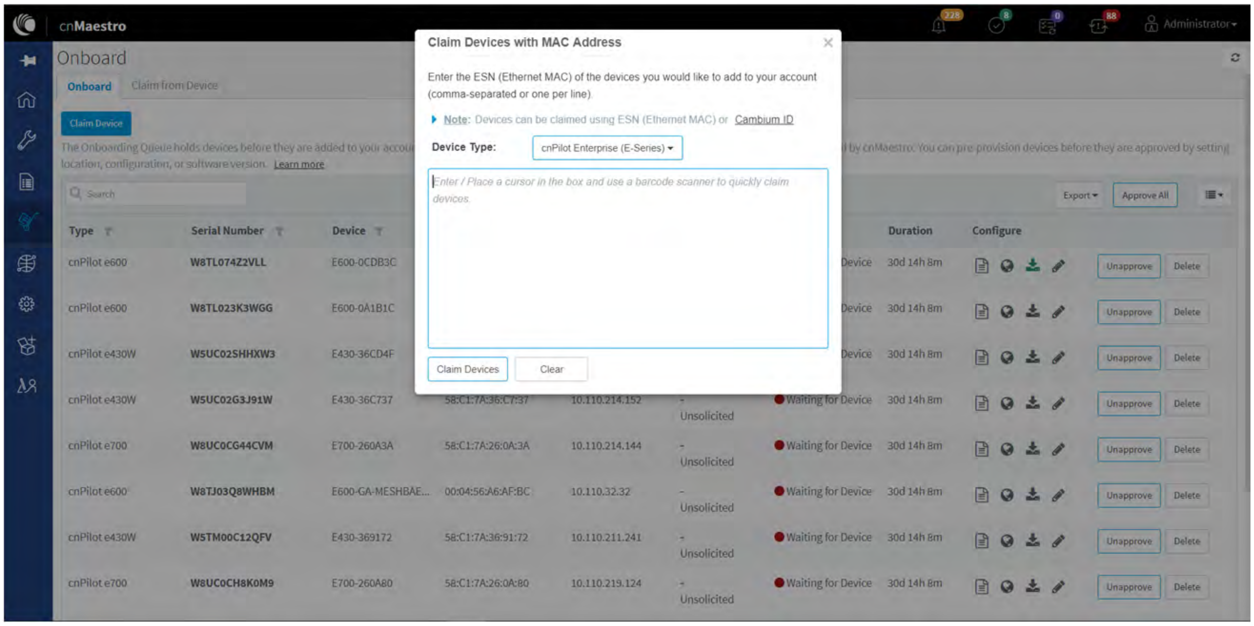
Cambium Networks
Onboard
Enter / Place a cursor in the box and use a barcode scanner to quickly claim devices.
Claim Devices
Clear

Onboarding to cnMaestro On-Premises

This mode is preferable for cnMaestro On-Premises. Inorder to claim through MAC Address (ESN), please follow the below steps:

1. Login to On-Premises server using default username and password (admin/admin) or the username and password set by the Administrator at the time of On-Premises server installation.
2. Navigate to **Home > Onboard Devices > Claim from cnMaestro**.
3. Select the Device type for which onboarding is to be done and provide the MAC Address in the combo box and click the Claim Devices button. Multiple MAC Addresses of same device type can be claimed using (,) separator between MAC Addresses or by entering them in the new line.

Figure 2: *Onboarding to cnMaestro On-Premises*



Claim Devices with MAC Address

Enter the ESN (Ethernet MAC) of the devices you would like to add to your account (comma-separated or one per line).

Note: Devices can be claimed using ESN (Ethernet MAC) or Cambium ID

Device Type: cnPilot Enterprise (E-Series)

Auto-Provisioning

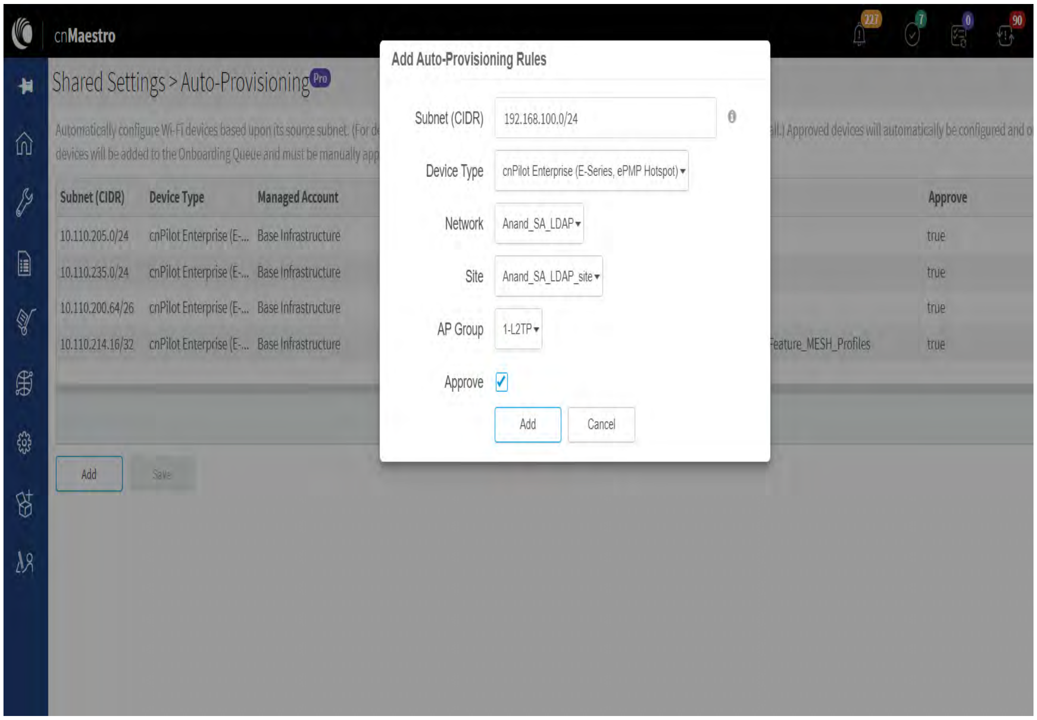
cnMaestro On-Premises supports Auto-Provisioning for cnPilot devices. This feature not only enables auto onboarding but also configures synchronization and positioning of device in the network architecture. It is triggered only at first instance of device onboarding. It can be configured on cnMaestro as below:

Configuration

It is enabled at Shared **Settings > Auto-Provisioning**, and it allows one to automatically configure and approve devices based upon IP address. To create rules for cnPilot devices:

1. Navigate to Shared **Settings > Auto-Provisioning** page.
2. To create a new rule, click **Add**. The following window appears:

Figure 3: *Auto-Provisioning*



Automatically configure Wi-Fi devices based upon its source subnet. (For d ... ll.) Approved devices will automatically be configured and o
devices will be added to the Onboarding Queue and must be manually app

Subnet (CIDR)	Device Type	Managed Account		Approve
10.110.205.0/24	cnPilot Enterprise (E-...	Base Infrastructure		true
10.110.235.0/24	cnPilot Enterprise (E-...	Base Infrastructure		true
10.110.200.64/26	cnPilot Enterprise (E-...	Base Infrastructure		true
10.110.214.16/32	cnPilot Enterprise (E-...	Base Infrastructure	eature_MESH_Profiles	true

Add Auto-Provisioning Rules

Subnet (CIDR): 192.168.100.0/24
Device Type: cnPilot Enterprise (E-Series, ePMP Hotspot)
Network: Anand_SA_LDAP
Site: Anand_SA_LDAP_site
AP Group: 1-L2TP
Approve: ☑

3. Enter the following details given in Auto-Provisioning parameter details:

Table 9: Auto-Provisioning parameter details

Parameter	Description
Subnet (CIDR)	The subnet with CIDR of the devices to which the rule has to be applied. For example, Subnet/CIDR (192.168.100.100/25) maps the devices with the IP addresses ranging from 192.168.100.1 to 192.168.100.126.
Device Type	Select the type of the device from the drop-down list.
Network	Select the network to which the device should be onboarded, once the device contacts the server.

Parameter	Description
Site	Select the site under which the device should be onboarded, once the device contacts the server.
AP Group	Select the AP Group which needs to be applied on the device, once the device contacts the server while onboarding.
Approve	Enables this option to auto-approve onboarding.

4. Click **Add**.

> **Note**
>
> Auto-Provisioning is supported only for cnMaestro On-Premises and not for cnMaestro cloud.

Other options

This section includes the following topics:

- AP Group
- cnMaestro Onboarding

The device onboarding screen can also be accessed from other locations in the UI. Below options can be used in both cloud cnMaestro and cnMaestro On-Premises. For cnMaestro On-Premises, ESN/MAC Address is required for onboarding/claiming device in an account whereas for cloud cnMaestro MSN is required to claim/onboard device in an account.

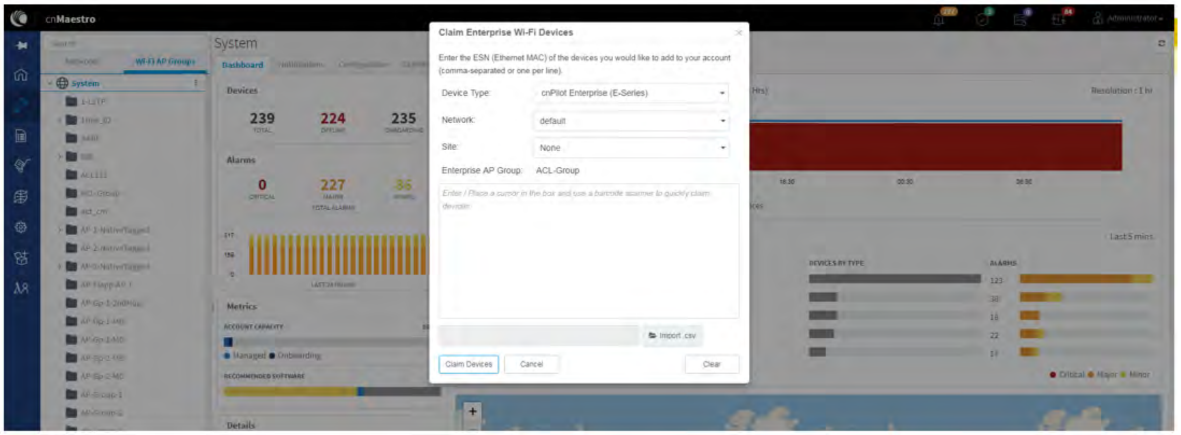
AP Group

Inorder to claim multiple devices from the AP Group in cloud, navigate to the Wi-Fi AP Groups tree view and click the drop-down menu for the selected AP Group.

1. Click the **Claim Devices** option.
2. In the pop-up dialog, select the Network and Site under which these devices needs to be placed and by default the devices claimed under this group will have the configuration settings from this AP Group.
3. Specify the MSNs/ESNs (Manufacturing Serial Number) of the devices line-by-line or comma-separated or click Import .csv option to import the MSNs/ESNs of the devices from a file.
4. Click **Claim Devices** to add to the selected AP Group with the configuration applied.

> **Note**
>
> In cnMaestro On-Premises the procedure to claim the device using Serial Number is same as cloud, but instead of MSN, the user should use the device MAC Addresses.

Figure 4: *Claiming the device using MAC address (ESN)*



Claim Enterprise Wi-Fi Devices

Enter the ESN (Ethernet MAC) of the devices you would like to add to your account (comma-separated or one per line).

Device Type: cnPilot Enterprise (E-Series)

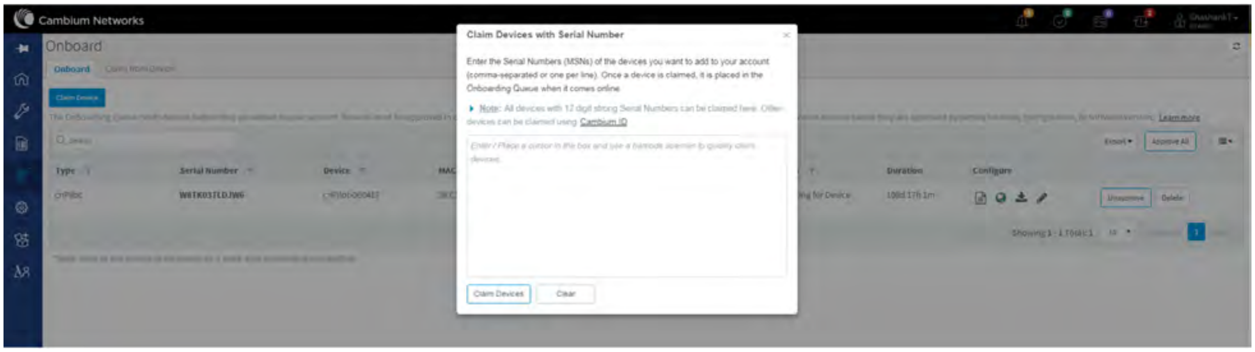
Network: default

Site: None

Enterprise AP Group: ACL-Group

Enter / Place a cursor in the box and use a barcode scanner to quickly claim devices.

Figure 5: *Claiming the device using Serial Number (MSN)*



Claim Devices with Serial Number

Enter the Serial Numbers (MSNs) of the devices you want to add to your account (comma-separated or one per line). Once a device is claimed, it is placed in the Onboarding Queue when it comes online.

Note: All devices with 12 digit strong Serial Numbers can be claimed here. Other devices can be claimed using Cambium ID

Enter / Place a cursor in the box and use a barcode scanner to quickly claim devices.

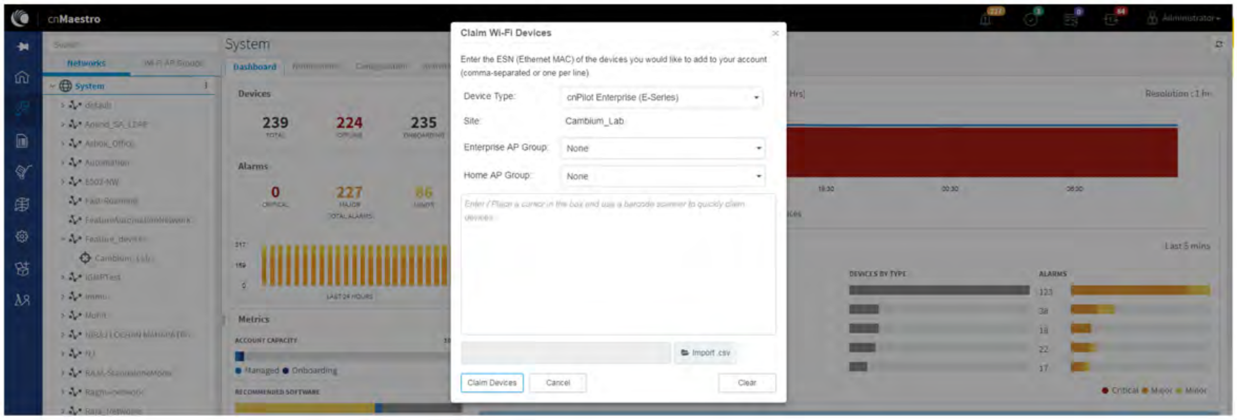
Site dashboard

Inorder to claim multiple devices from the Site dashboard in cloud, navigate to the Manage section and select a site under a network and click the drop-down menu for the selected site:

1. Click the **Claim Devices** option.
2. In the pop-up dialog, select the **Network and Site** under which these devices needs to be placed and by default the devices claimed under this group will have the configuration settings from this AP Group.
3. Specify the MSNs (Manufacturing Serial Number) /ESNs (Equipment Serial Number) of the devices line-by-line or comma-separated or click Import .csv option to import the MSNs/ESNs of the devices from a file.
4. Click **Claim Devices** to add to the selected AP Group with the configuration applied.

> **Note**
>
> Claim using MAC address is supported by cnMaestro On-Premises only.

Figure 6: *Claim the device using MAC address*



Claim Wi-Fi Devices

Enter the ESN (Ethernet MAC) of the devices you would like to add to your account (comma-separated or one per line).

Device Type: cnPilot Enterprise (E-Series)

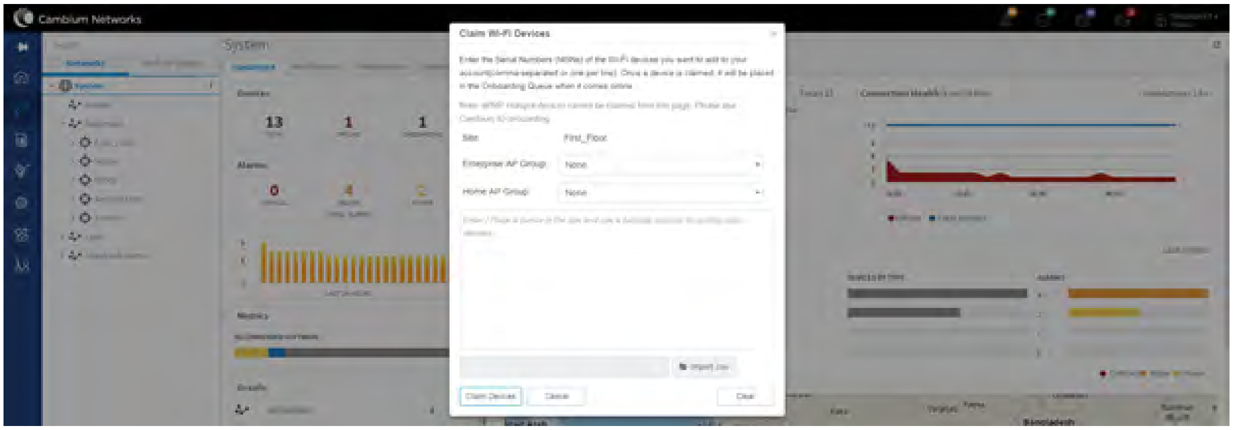
Site: Cambium_Lab

Enterprise AP Group: None

Home AP Group: None

Enter / Place a cursor in the box and use a barcode scanner to quickly claim devices

Figure 7: *Claim the device using MSN*



Claim Wi-Fi Devices

Enter the Serial Numbers (MSNs) of the Wi-Fi devices you want to add to your account(comma-separated or one per line). Once a device is claimed, it will be placed in the Onboarding Queue when it comes online.

Note: ePMP Hotspot devices cannot be claimed from this page. Please use Cambium ID onboarding.

Site: First_Floor

Enterprise AP Group: None

Home AP Group: None

Enter / Place a cursor in the box and use a barcode scanner to quickly claim devices

Directing devices to the cnMaestro On-Premises server using DHCP

From cnPilot System Release 4.0, cnPilot device can be onboarded either using IPv4/IPv6 DHCP options. Following are the options that are used in IPv4 and IPv6 respectively:

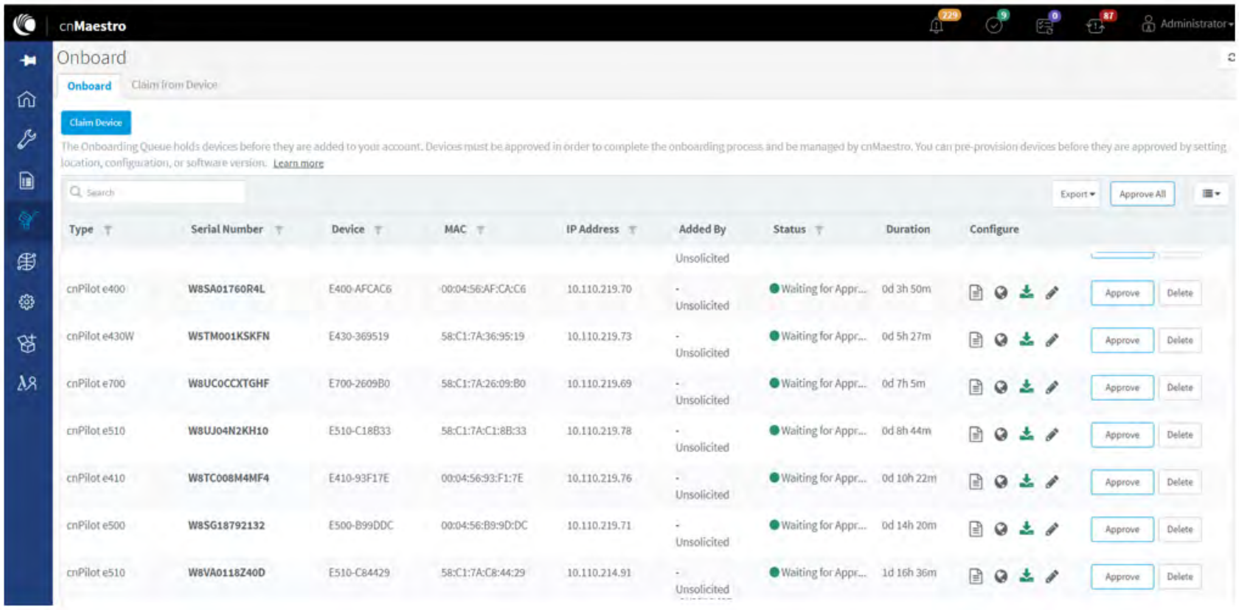
- IPv4
    - DHCP Option 43/52
    - DHCP Option 15/24
- IPv6
    - DHCP Option 43/52
    - DHCP Option 15/24

DHCP Option 43/52

This mode of onboarding is preferred to use when cnMaestro On-Premises is deployed at customer end. cnPilot reads Option 43/52 during DHCP transaction and then it connects to respective cnMaestro. This option is given high priority during cnMaestro discovery process. All these devices which have read the

Option 43/52 from DHCP transaction are available in Queue on cnMaestro, which needs to be further approved by end user.

Figure 8: *DHCP option 43/52*



Onboard

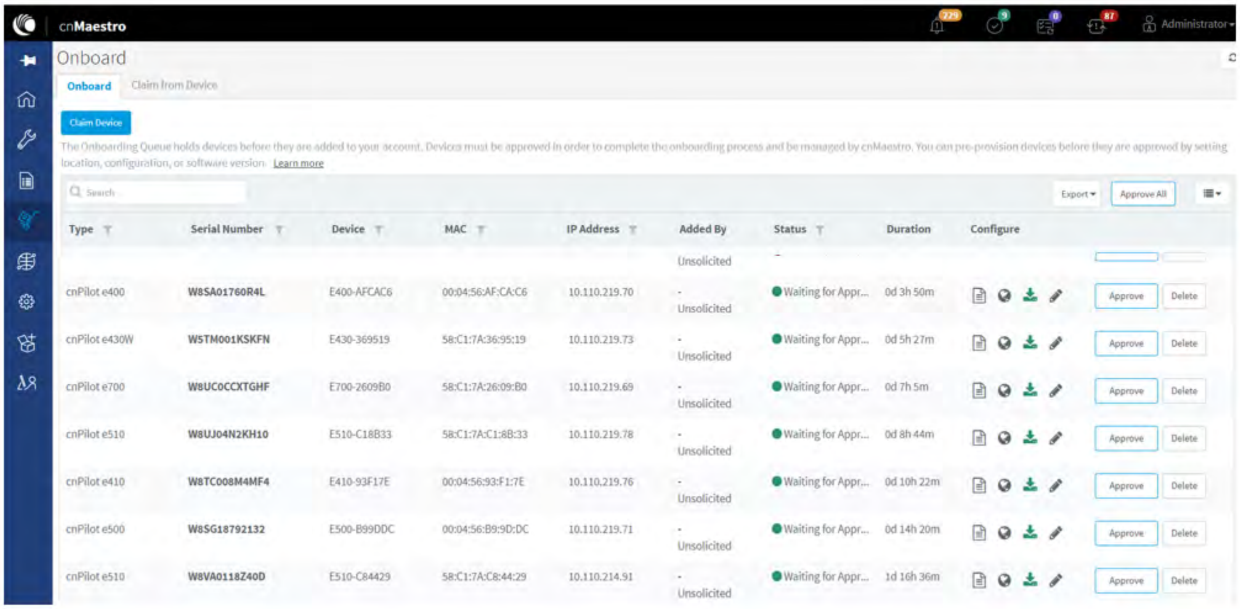
The Onboarding Queue holds devices before they are added to your account. Devices must be approved in order to complete the onboarding process and be managed by cnMaestro. You can pre-provision devices before they are approved by setting location, configuration, or software version. Learn more

Type	Serial Number	Device	MAC	IP Address	Added By	Status	Duration	Configure	
					Unsolicited				
cnPilot e400	W8SA01760R4L	E400-AFCAC6	00:04:56:AF:CA:C6	10.110.219.70	- Unsolicited	● Waiting for Appr...	0d 3h 50m		Approve Delete
cnPilot e430W	W5TM001KSKFN	E430-369519	58:C1:7A:36:95:19	10.110.219.73	- Unsolicited	● Waiting for Appr...	0d 5h 27m		Approve Delete
cnPilot e700	W8UCOCCXTGHF	E700-2609B0	58:C1:7A:26:09:B0	10.110.219.69	- Unsolicited	● Waiting for Appr...	0d 7h 5m		Approve Delete
cnPilot e510	W8UJ04N2KH10	E510-C18B33	58:C1:7A:C1:8B:33	10.110.219.78	- Unsolicited	● Waiting for Appr...	0d 8h 44m		Approve Delete
cnPilot e410	W8TC008M4MF4	E410-93F17E	00:04:56:93:F1:7E	10.110.219.76	- Unsolicited	● Waiting for Appr...	0d 10h 22m		Approve Delete
cnPilot e500	W8SG18792132	E500-B99DDC	00:04:56:B9:9D:DC	10.110.219.71	- Unsolicited	● Waiting for Appr...	0d 14h 20m		Approve Delete
cnPilot e510	W8VA0118Z40D	E510-C84429	58:C1:7A:C8:44:29	10.110.214.91	- Unsolicited	● Waiting for Appr...	1d 16h 36m		Approve Delete

DHCP Option 15/24

This mode of onboarding is preferred to use when cnMaestro On-Premises is deployed at customer end. cnPilot reads Option 15/24 during DHCP transaction and then it connects to respective cnMaestro. All these devices which have read the Option 15/24 from DHCP transaction are available in Queue on cnMaestro, which needs to be further approved by end user.

Figure 9: *DHCP option 15/24*



Onboard

The Onboarding Queue holds devices before they are added to your account. Devices must be approved in order to complete the onboarding process and be managed by cnMaestro. You can pre-provision devices before they are approved by setting location, configuration, or software version. Learn more

Type	Serial Number	Device	MAC	IP Address	Added By	Status	Duration	Configure	
					Unsolicited	-			
cnPilot e400	W8SA01760R4L	E400-AFCAC6	00:04:56:AF:CA:C6	10.110.219.70	- Unsolicited	● Waiting for Appr...	0d 3h 50m		Approve Delete
cnPilot e430W	W5TM001KSKFN	E430-369519	58:C1:7A:36:95:19	10.110.219.73	- Unsolicited	● Waiting for Appr...	0d 5h 27m		Approve Delete
cnPilot e700	W8UCOCCXTGHF	E700-2609B0	58:C1:7A:26:09:B0	10.110.219.69	- Unsolicited	● Waiting for Appr...	0d 7h 5m		Approve Delete
cnPilot e510	W8UJ04N2KH10	E510-C18B33	58:C1:7A:C1:8B:33	10.110.219.78	- Unsolicited	● Waiting for Appr...	0d 8h 44m		Approve Delete
cnPilot e410	W8TC008M4MF4	E410-93F17E	00:04:56:93:F1:7E	10.110.219.76	- Unsolicited	● Waiting for Appr...	0d 10h 22m		Approve Delete
cnPilot e500	W8SG18792132	E500-B99DDC	00:04:56:B9:9D:DC	10.110.219.71	- Unsolicited	● Waiting for Appr...	0d 14h 20m		Approve Delete
cnPilot e510	W8VA0118Z40D	E510-C84429	58:C1:7A:C8:44:29	10.110.214.91	- Unsolicited	● Waiting for Appr...	1d 16h 36m		Approve Delete

DHCP server configuration

More details on various DHCP server configuration for Option 43/52 is available in Cambium Knowledge Base (KB) section.

Windows server configuration

For Windows server configuration for onboarding devices to cnMaestro On-Premises server, please click the below URL.

http://community.cambiumnetworks.com/t5/cnMaestro/Device-Onboarding-and-Windows-DHCP-Options-for-cnMaestro-On/m-p/55199

Linux server configuration

A DHCP Server can be used to configure the IP Address, Gateway, and DNS servers for Cambium devices. If you administer the DHCP Server, you can also configure DHCP Options that will tell the devices how to access the cnMaestro (so the URL doesn't need to be set on each device).

http://community.cambiumnetworks.com/t5/cnMaestro/Device-Onboarding-and-Linux-DHCP-Options-for-cnMaestro-On/m-p/55187

Microtik server configuration

For Microtik Routerboard DHCP configuration for onboarding devices to cnMaestro On-Premises server, please click the below link.

http://community.cambiumnetworks.com/t5/cnMaestro/Microtik-Routerboard-DHCP-configuration-for-Onboarding-devices/m-p/56012

Claim using Cambium ID

This section includes the following topics:

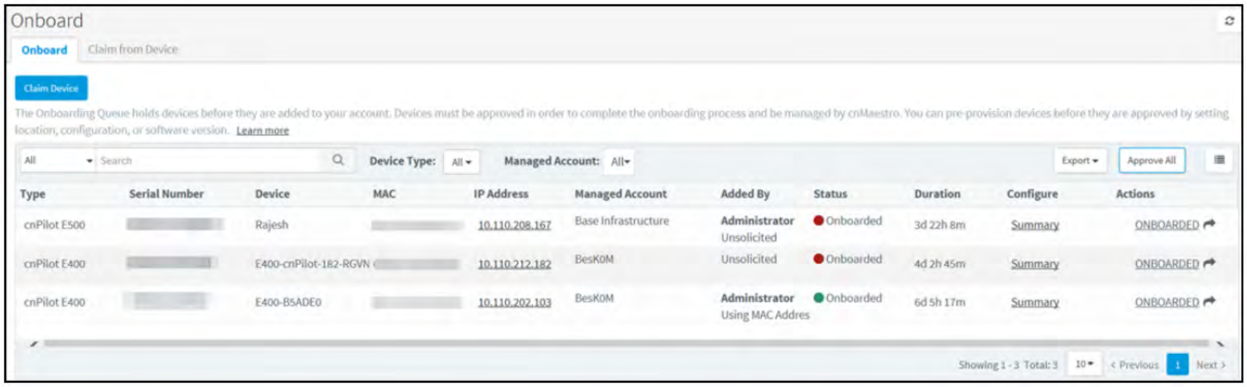
- Claim through static URL without Cambium ID and onboarding key
- Claim through static URL with Cambium ID and onboarding key

Claim through static URL without Cambium ID and onboarding key

Inorder to claim the devices using the static URL without Cambium ID and onboarding key please follow the below steps:

1. Login to device UI and navigate to **Configure > System > Management > cnMaestro**.
2. Provide static URL of On-Premises https://ON-PREMISESIPADDRESSORHOSTNAME and click **Save**.
3. Device will come to the onboarding queue in the cnMaestro **Home > Onboard Devices > Onboard** page and the user can approve the device.

Figure 10: *Claim through static URL without Cambium ID and onboarding key*



The Onboarding Queue holds devices before they are added to your account. Devices must be approved in order to complete the onboarding process and be managed by cnMaestro. You can pre-provision devices before they are approved by setting location, configuration, or software version. Learn more

Type	Serial Number	Device	MAC	IP Address	Managed Account	Added By	Status	Duration	Configure	Actions
cnPilot E500	[redacted]	Rajesh	[redacted]	10.110.208.167	Base Infrastructure	**Administrator** Unsolicited	● Onboarded	3d 22h 8m	Summary	ONBOARDED
cnPilot E400	[redacted]	E400-cnPilot-182-RGVN	[redacted]	10.110.212.182	BesKOM	Unsolicited	● Onboarded	4d 2h 45m	Summary	ONBOARDED
cnPilot E400	[redacted]	E400-B5ADE0	[redacted]	10.110.202.103	BesKOM	**Administrator** Using MAC Addres	● Onboarded	6d 5h 17m	Summary	ONBOARDED

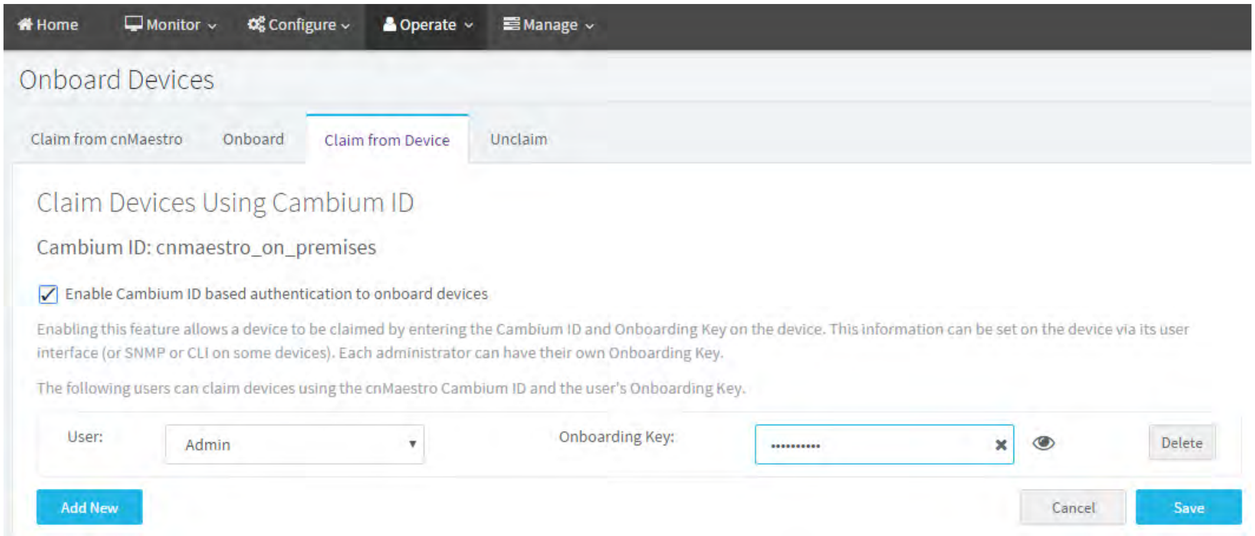
Showing 1 - 3 Total: 3

Claim through static URL with Cambium ID and onboarding key

Inorder to claim the devices using the static URL with Cambium ID and onboarding key, please follow the below steps:

1. Login to On-Premises server using default username and password (admin/admin) or the username and password set by the Administrator at the time of installation.
2. Navigate to **Home > Onboard Devices > Claim from Device** page.
3. Select the checkbox for “**Enable Cambium ID based authentication to onboard devices**”.
4. Click on **Add new** and select the username from the drop-down list and specify the onboarding key and click Save.
5. Login to device UI and navigate to **Configure > System > Management > cnMaestro.**
6. Provide static URL of On-Premises https://ON-PREMISESIPADDRESSORHOSTNAME and Cambium ID (cnMaestro_On-Premises) and onboarding key for that user and click **Save**.
7. Device will come to the onboarding queue in the cnMaestro **Home > Onboard Devices > Onboard** page and the user can approve the device.

Figure 11: *Claim through static URL with Cambium ID and onboarding key*



Onboard Devices

Claim Devices Using Cambium ID

Cambium ID: cnmaestro_on_premises

☑ Enable Cambium ID based authentication to onboard devices

Enabling this feature allows a device to be claimed by entering the Cambium ID and Onboarding Key on the device. This information can be set on the device via its user interface (or SNMP or CLI on some devices). Each administrator can have their own Onboarding Key.

The following users can claim devices using the cnMaestro Cambium ID and the user's Onboarding Key.

User: Admin

Onboarding Key: ••••••••••

Chapter 5: UI Navigation

You can manage cnPilot device using User Interface (UI) which is accessible from any network devices such as computer, mobile, tabs, etc. cnPilot device accessibility is explained in Chapter 3.

This chapter describes the following topics:

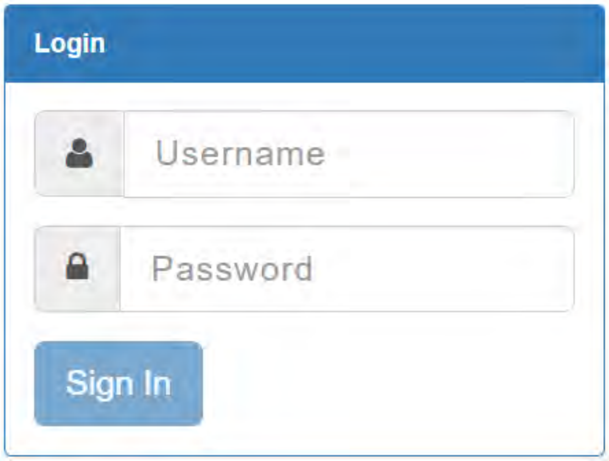
- Login screen
- Home page (Dashboard)

Login screen

To log to the UI, enter the following credentials:

- Username: admin
- Password: admin

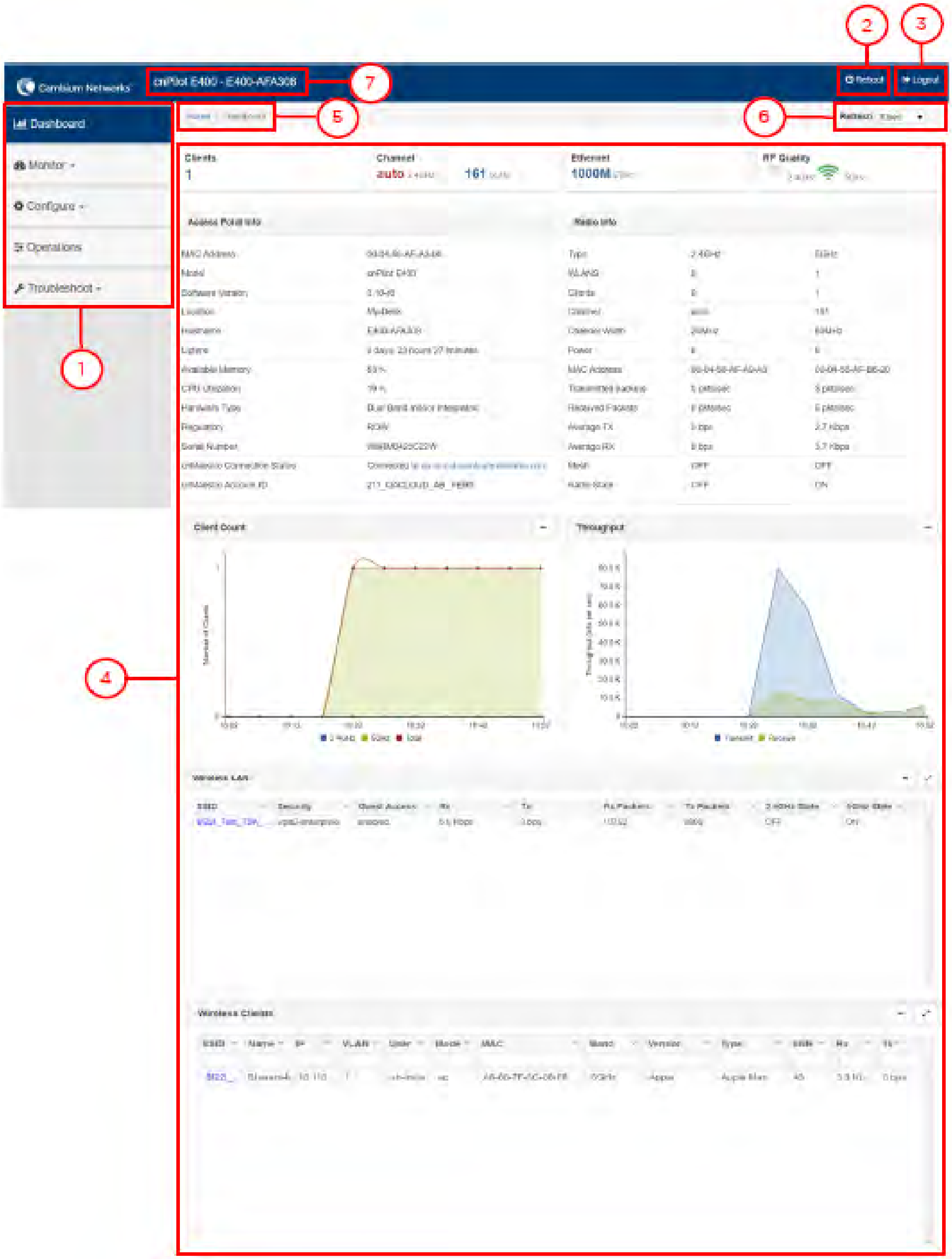
Figure 12: *UI Login page*



Home page (Dashboard)

On logging into cnPilot AP login page, the UI Home page is displayed. Following figure displays the parameters that are displayed in cnPilot AP Home page.

Figure 13: *cnPilot AP UI Home page*



Access Point Info

MAC Address	00-04-56-AF-A3-08
Model	cnPilot E400
Software Version	3.10-r8
Location	MyDesk
Hostname	E400-AFA308
Uptime	0 days 23 hours 27 minutes
Available Memory	53 %
CPU Utilization	19 %
Hardware Type	Dual Band Indoor Integrated
Regulatory	ROW
Serial Number	W8EM0425C22W
cnMaestro Connection Status	Connected to [illegible]
cnMaestro Account ID	211_QDCLOUD_A8_HERR

Radio Info

Type	2.4GHz	5GHz
WLANs	0	1
Clients	0	1
Channel	auto	161
Channel Width	20MHz	80MHz
Power	6	6
MAC Address	00-04-56-AF-A3-A3	00-04-56-AF-B5-20
Transmitted Packets	5 pkts/sec	3 pkts/sec
Received Packets	0 pkts/sec	6 pkts/sec
Average TX	0 bps	2.7 Kbps
Average RX	0 bps	5.7 Kbps
Mesh	OFF	OFF
Radio State	OFF	ON

Wireless LAN

SSID	Security	Guest Access	Rx	Tx	Rx Packets	Tx Packets	2.4GHz State	5GHz State
BGA_Test_TSW_	wpa2-enterprise	enabled	5.5 Kbps	0 bps	11032	9869	OFF	ON

Wireless Clients

SSID	Name	IP	VLAN	User	Mode	MAC	Band	Version	Type	SNR	Rx	Tx
BGA_	[illegible]	10.110	1	cn-[illegible]	ac	A8-60-7F-5C-06-FB	5GHz	Apple	Apple Mac	40	5.5 Kb	0 bps

Table 10: cnPilot AP web interface elements

Number	Element	Description
①	Menu	This section contains multiple tabs that helps user to configure, monitor and troubleshoot cnPilot device. Menu consists of the following: ▪ Dashboard ▪ Monitor ▪ Configure ▪ Operations ▪ Troubleshoot
②	Reboot	Global button to reboot cnPilot device (⏻).
③	Logout	Global button to logout user from cnPilot device (➜).
④	Content	Information in the area of web interface varies based on the tab selected in Menu section. Usually, this area contains details of configuration or statistics or provision to configure cnPilot device.
⑤	UI path	Provides UI navigation path information to user.
⑥	UI refresh interval	Provision to reload updated statistics at regular intervals.
⑦	Model number	Provides information related to cnPilot model number and configured hostname.

Monitor

The Monitor section provides information such as current configuration, traffic statistics across all interfaces configured on device and device details. Based on information provided in this section, it is categorized and displayed under following categories:

- System: Provides information related to cnPilot device such as Software Image, host name, Country code etc.
- Radio: Provides information such as RF Statistics, Neighbour list and current radio configuration of device.
- WLAN: Provides information on WLANs and Mesh configurations.

- **Network**: Provides information related to interfaces such as, default route, interface statistics, etc.
- **Services**: Provides information related to entities that support Bonjour.

Configure

This section allows user to configure cnPilot device based on deployment requirement. This tab has multiple sections as follows:

- **System**: Provision to configure System UI parameter.
- **Radio**: Provision to configure Radio settings (2.4GHz/5GHz).
- **WLAN**: Provision to configure WLAN parameters as per the end user requirement and type of wireless station.
- **Network**: Provides information related to VLAN, Routes, Ethernet ports etc.
- **Services**: Provides information related to Network and Bonjour Gateway.

Operations

This section allows user to perform maintenance of device such as:

- **Firmware update**: Provision to upgrade cnPilot devices.
- **System**: Provides different methods of debugging field issues and recovering device.
- **Configuration**: Provision to modify configuration of device.

Troubleshoot

The section provides users to debug and troubleshoot remotely. This tab has multiple sections and are as follows:

- **WiFi Analyzer**: When this is initialized, device provides information related to air quality.
- **Spectrum Analyzer**: Provides real-time cumulative distribution format view of RF environment and it is generated by the AP across 2.4 and 5GHz frequency bands.
- **WiFi Perf Speed Test**: Provision for the user to check the speed of link connectivity, either wireless or wired.
- **Connectivity:** Provides different modes network reachability of cnPilot device.
- **Packet Capture**: Provides feasibility for the user to capture packets on operational interfaces.
- **Logs**: Feasibility to check logs of different modules of cnPilot devices which will help support and the customer to debug an issue.
- **Unconnected Clients**: This section displays clients that are not connected/denied connection.

Chapter 6: Configuration - System

This chapter describes the following topics:

- System
- Management
- Time settings
- Event Logging

System

Table 11 lists configurable parameters that are available under Configuration > System UI tab:

Table 11: Configuration: System parameters

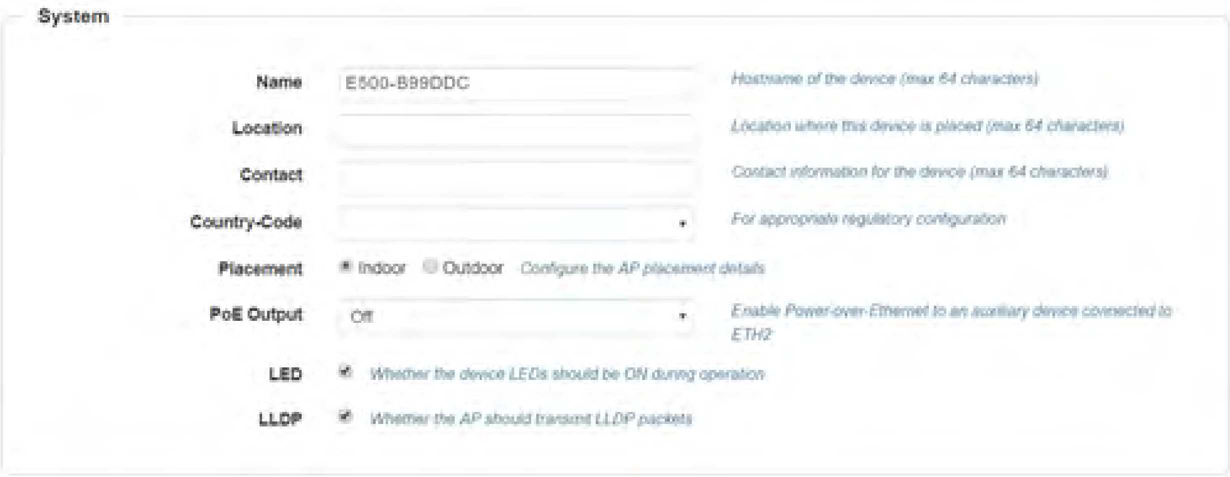
Parameter	Description	Range	Default
Name	Hostname of the device. Configurable maximum length of hostname is 64 characters.	–	cnPilot Model Number-Last 3 Bytes of ESN
Location	The location where the device is placed. The maximum length of location is 64 characters.	–	–
Contact	Contact information for the device.	–	–
Country-Code	To be set by the administrator to the country-of-operation of the device. The allowed operating channels and the transmit power levels on those channels depends on the country of operation. Radios remain disabled unless this is set. The list of countries supported depends on the SKU of the device (FCC, ROW etc.).	–	–
Placement	cnPilot device supports both Indoor and Outdoor deployments. Based on deployment user can configure it as follows: ▪ Indoor When selected, only Indoor channels for country code configured will be available and operational. ▪ Outdoor When selected, only outdoor channels for country code configured will be available and operational.	–	Indoor
PoE Output	Provision to power on standard 802.3af devices or Cambium devices. ▪ Cambium-PoE	-	Disabled

Parameter	Description	Range	Default
	▪ 802.3af		
LED	Select the LED checkbox for the device LEDs to be ON during operation.	–	Enabled
LLDP	Provision to advertise device capabilities and information in the L2 network.	–	Enabled

To configure the above parameters, navigate to the **Configuration > System** tab and provide the details as given below:

1. Enter the hostname of the device in the **Name** textbox.
2. Enter the location where this device is placed in the **Location** textbox.
3. Enter the contact details of the device is placed in the **Contact** textbox.
4. Select the appropriate country code for the regulatory configuration from the **Country-Code** drop-down list.
5. Select **Placement** checkbox parameter Indoor or Outdoor to configure the AP placement details.
6. Select **PoE Output** from the drop-down list.
7. Enable **LED** checkbox.
8. Enable **LLDP** checkbox.
9. Click **Save**.

Figure 14: *Configuration: System page*



System

Name	E500-B99DDC	Hostname of the device (max 64 characters)
Location		Location where this device is placed (max 64 characters)
Contact		Contact information for the device (max 64 characters)
Country-Code		For appropriate regulatory configuration
Placement	● Indoor ○ Outdoor	Configure the AP placement details
PoE Output	Off	Enable Power-over-Ethernet to an auxiliary device connected to ETH2
LED	☑	Whether the device LEDs should be ON during operation
LLDP	☑	Whether the AP should transmit LLDP packets

Management

Chapter 6 lists configurable fields that are displayed in the **Configuration > System > Management** tab:

Table 12: Configuration: System > Management parameters

Parameter	Description	Range	Default
Admin Password	Password for authentication of UI and CLI sessions.	–	Admin
Autopilot	Provision to configure mode of cnPilot device when Autopilot is enabled in network: ▪ Default Every cnPilot device by default operates as Auto-Pilot slave. ▪ Master When selected, cnPilot device will take the role of controller. ▪ Disabled When selected, auto-pilot mode is disabled on the device.	–	Default
Telnet	Enables Telnet access to the device CLI.	–	Disabled
SSH	Enables SSH access to the device CLI.	–	Enabled
SSH Key	Provision to login to device using SSH Keys. User needs to add Public Key in this section. If configured, user has to login to AP using Private Keys. This is applicable for both CLI and GUI.	–	Disabled
HTTP	Enables HTTP access to the device UI.	–	Enabled
HTTP Port	Provision to configure HTTP port number to access device UI.	1-65535	80
HTTPS	Enables HTTPS access to the device UI.	–	Enabled
HTTPS Port	Provision to configure HTTPS port number to access device UI.	1-65535	443
RADIUS Mgmt Auth	User has provision to control login to AP using RADIUS authentication. If enabled, every credential that are provided by user undergo RADIUS authentication. If success, allowed to login to UI of AP. This is applicable for both CLI and GUI.	–	Disabled
RADIUS Server	Provision to configure RADIUS IPv4 server for Management Authentication.	–	–
RADIUS Secret	Provision to configure RADIUS shared secret for Management authentication.	–	–
cnMaestro			
Cambium Remote Mgmt.	Enables support for Cambium Remote Management of this device.	–	Enabled

Parameter	Description	Range	Default
Validate Server Certificate	This allows HTTPs connection between cnMaestro and cnPilot device.	–	Enabled
cnMaestro URL	Static provision to onboard devices either using IPv4/IPv6/URL.	–	–
Cambium ID	Cambium ID used for provisioning cnMaestro (Cambium Remote Management) of this device.	–	–
Onboarding Key	Password used for onboarding the device to cnMaestro.	–	–
SNMP			
Enabled	Provision to enable SNMPv2 or SNMPv3 support on device	–	–
SNMPv2c RO community	SNMP v2c read-only community string.	–	–
SNMPv2c RW community	SNMP v2c read-write community string.	–	–
Trap Receiver IP	Provision to configure SNMP trap receiver IPv4 server.	–	–
SNMPv3 Username	Enter username for SNMPv3.	–	–
SNMPv3 Password	Enter password for SNMPv3.	–	–
Authentication	choose Authentication type as MD5 or SHA.	–	MD5
Access	Choose Access type as RO or RW.	–	RO
Encryption	Choose ON or OFF.	–	ON

To configure the above parameters, navigate to the **Configuration > System** tab and provide the details as given below:

1. Enter the admin password of the device in the **Admin Password** textbox.
2. Select **Default**, Master or Disabled to enable/disable the Autopilot management of APs from the drop-down list.
3. Enable the **Telnet** checkbox to enable telnet access to the device CLI.
4. Enable the **SSH** checkbox to enable SSH access to the device CLI.
    a. If certificate-based login is required, enter **SSH Key** in the textbox else disabled
5. Enable the **HTTP** checkbox to enable HTTP access to the device UI.
6. If custom port other than default is required, enter **HTTP** port number value for HTTP access in the textbox.
7. Enable the **HTTPS** checkbox to enable HTTPS access to the device UI.

8. If custom port other than default is required, enter HTTP port number value for **HTTP** access in the textbox.
9. If RADIUS based login is required, enable RADIUS Mgmt Auth checkbox and enter the details of RADIUS server as follows:
    a. Enter **RADIUS Server** parameter in the textbox.
    b. Enter **RADIUS Secret** parameter in the textbox.

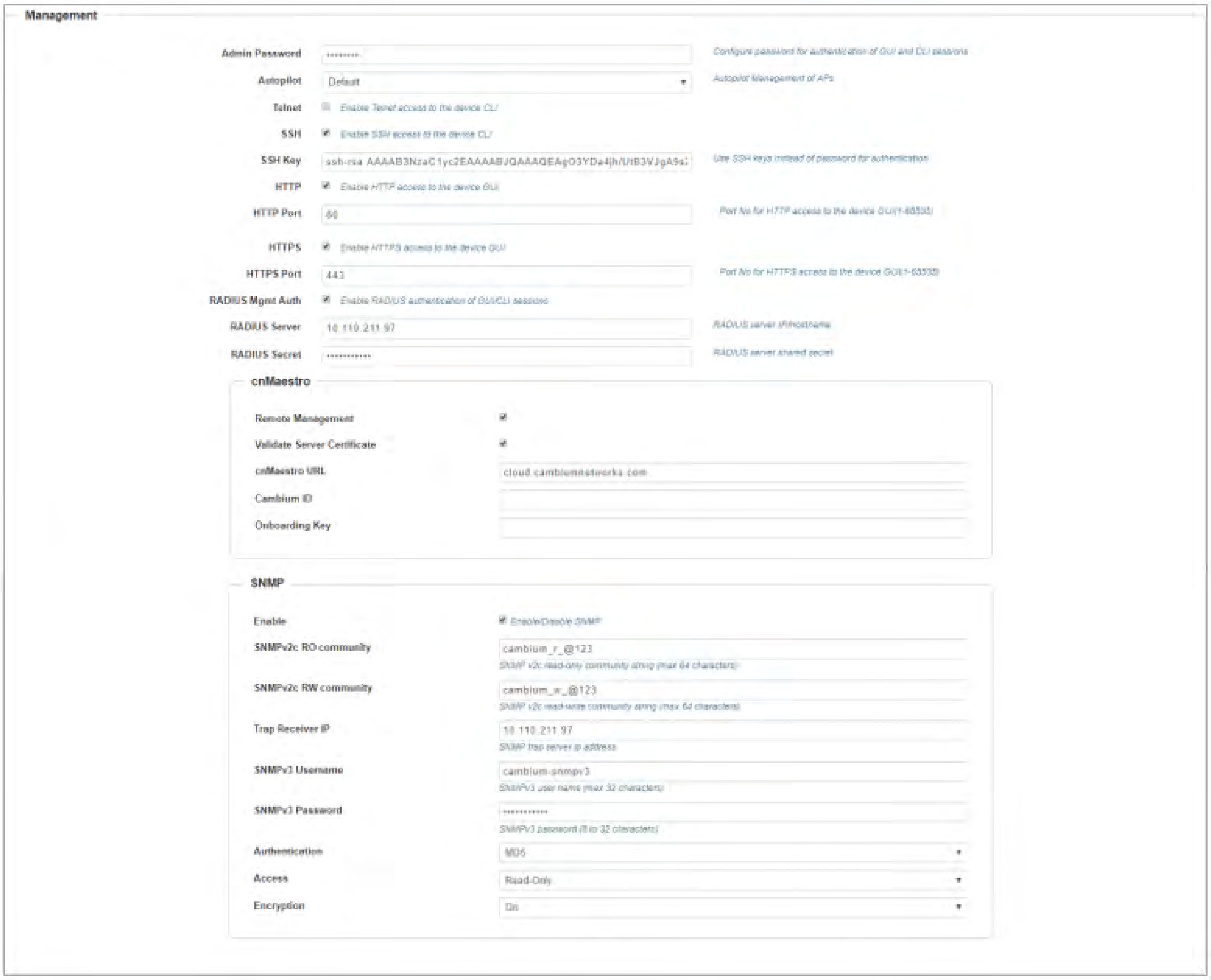
To configure cnMaestro:

1. Enable **Remote Management** checkbox to support for Cambium Remote Management of this device.
2. Enable **Validate Server Certificate** checkbox to support HTTPS connection between cnMaestro and cnPilot.
3. Enter the URL for cnMaestro in the **cnMaestro URL** textbox.
4. Enter the Cambium ID of the user in the **Cambium ID** textbox.
5. Enter the onboarding Key in the **Onboarding Key** textbox.

To configure SNMP:

1. Select **Enable** checkbox to enable SNMP functionality.
2. Enter the SNMP v2c read-only community string in the **SNMPv2c RO community** textbox.
3. Enter the SNMP v2c read-write community string in the **SNMPv2c RW community** textbox.
4. Enter the **Trap Receiver IPv4** (Currently Cambium support SNMP only v1 and v2c Traps) in the textbox.
5. Enter the SNMP V3 username in the **SNMPv3 Username** textbox.
6. Enter the SNMP V3 password in the **SNMPv3 Password** textbox.
7. Select MD5 or SHA from the **Authentication** drop-down list.
8. Select RO or RW from the **Access** drop-down list.
9. Select ON or OFF from the **Encryption** drop-down list.
10. Click **Save**.

Figure 15: *Configuration: Management page*



Management

Admin Password	••••••••	Configure password for authentication of GUI and CLI sessions
Autopilot	Default ▾	Autopilot Management of APs
Telnet	□ Enable Telnet access to the device CLI	
SSH	☑ Enable SSH access to the device CLI	
SSH Key	ssh-rsa AAAAB3NzaC1yc2EAAAABJQAAAQEAgO3YDa4jh/UiB3VJgA9s:	Use SSH keys instead of password for authentication
HTTP	☑ Enable HTTP access to the device GUI	
HTTP Port	80	Port No for HTTP access to the device GUI(1-65535)
HTTPS	☑ Enable HTTPS access to the device GUI	
HTTPS Port	443	Port No for HTTPS access to the device GUI(1-65535)
RADIUS Mgmt Auth	☑ Enable RADIUS authentication of GUI/CLI sessions	
RADIUS Server	10.110.211.97	RADIUS server IP/Hostname
RADIUS Secret	••••••••••••	RADIUS server shared secret

cnMaestro

Remote Management	☑
Validate Server Certificate	☑
cnMaestro URL	cloud.cambiumnetworks.com
Cambium ID	
Onboarding Key	

SNMP

Enable	☑ Enable/Disable SNMP
SNMPv2c RO community	cambium_r_@123 SNMP v2c read-only community string (max 64 characters)
SNMPv2c RW community	cambium_w_@123 SNMP v2c read-write community string (max 64 characters)
Trap Receiver IP	10.110.211.97 SNMP trap server ip address
SNMPv3 Username	cambium-snmpv3 SNMPv3 user name (max 32 characters)
SNMPv3 Password	•••••••••••• SNMPv3 password (8 to 32 characters)
Authentication	MD5 ▾
Access	Read-Only ▾
Encryption	On ▾

Time settings

User can configure up to two NTP servers. These are used by the AP to set its internal clock to respective time zones configured on the device. While powering ON the AP, the clock will reset to default and resyncs the time as the cnPilot AP does not have battery backup. The servers can be specified as an IPv4 addresses or as a hostname (Eg: pool.ntp.org). If NTP is not configured on device, device synchronizes time with cnMaestro if onboarded.

Table 13 lists the fields that are displayed in the **Configuration > System > Time Settings** section:

Table 13: Configuration: System > Time Settings parameters

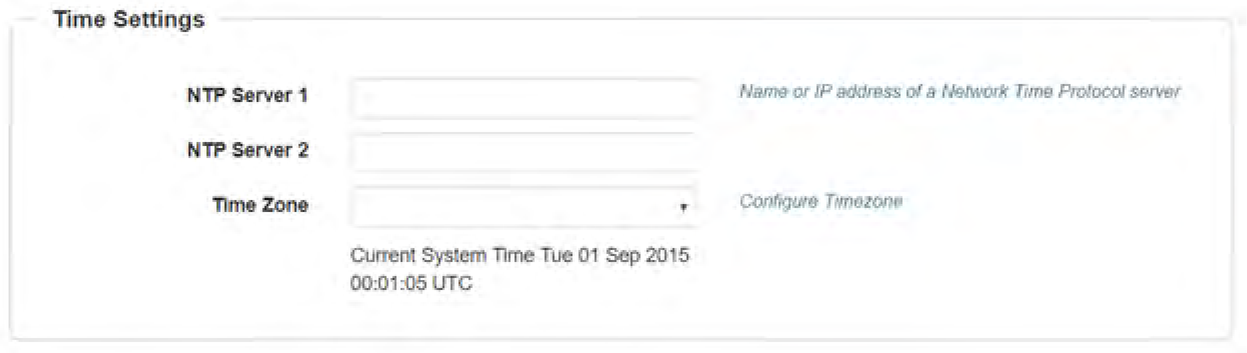
Parameter	Description	Range	Default
NTP Server 1	Name or IPv4 address of a Network Time Protocol server 1.	–	–
NTP Server 2	Name or IPv4 address of a Network Time Protocol server 2.	–	–

Parameter	Description	Range	Default
Time zone	Time zone can be set according to the location where the AP is installed. By selecting the appropriate time zone from the drop-down list, ensures that the device clock is synced with the wall clock time. **Note** Accurate time on the AP is critical for features such as WLAN Scheduled Access, Syslogs etc.	–	–

To configure the above parameters, navigate to the **Configuration > System** tab and provide the details as given below:

1. Enter the name or IPv4 address of the **NTP server 1** in the NTP Server 1 textbox.
2. Enter the name or IPv4 address of the **NTP server 2** in the NTP Server 2 textbox.
3. Select the time zone settings for the AP from the **Time Zone** drop-down list.
4. Click **Save**.

Figure 16: *Configuration: Time settings page*



Time Settings

NTP Server 1 — Name or IP address of a Network Time Protocol server

NTP Server 2

Time Zone — Configure Timezone

Current System Time Tue 01 Sep 2015 00:01:05 UTC

Event Logging

cnPilot devices supports multiple troubleshooting methods. Event Logging or Syslog is one of the standard troubleshooting processes. If you have Syslog server in your network, you can enable it on cnPilot device.Table 14 lists the fields that are displayed in the Configuration > System > Event Logging section.

Table 14 lists the fields that are displayed in the **Configuration > System > Event Logging** section.

Table 14: Configuration: System > Event Logging parameters

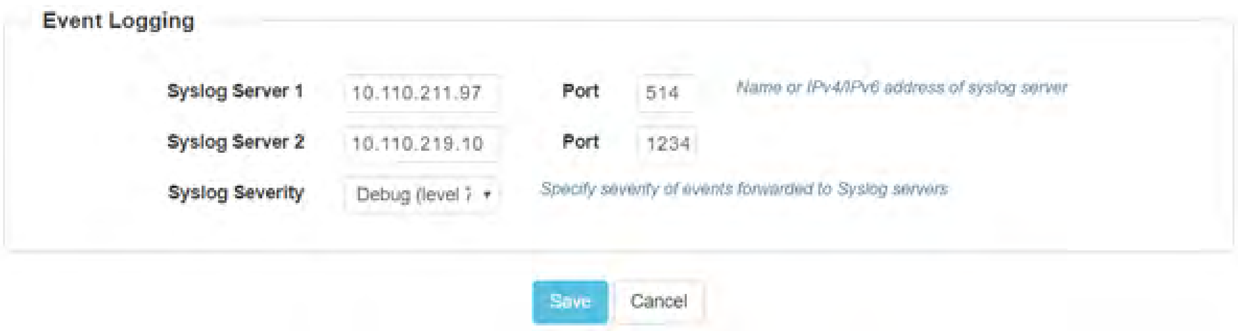
Parameter	Description	Range	Default
Syslog Server 1	Hostname or IPv4/IPv6 address of the Syslog server and respective port number.	–	514

Parameter	Description	Range	Default
Syslog Server 2	Hostname or IPv4/IPv6 address of the Syslog server and respective port number.	–	514
Syslog Severity	Provision to configure severity of Logs that must be forwarded to the server. The Log levels supported are as per RFC.	–	Debug

To configure the above parameters, navigate to the **Configuration > System** tab and provide the details as given below:

1. Enter the FQDN or IPv4/IPv6 address of the **Syslog Server 1** along with customized port number in the textbox. If the port number is not entered, AP will take default value as 514.
2. Enter the FQDN or IPv4/IPv6 address of the **Syslog Server 2** along with customized port number in the textbox. If the port number is not entered, AP will take default value as 514.
3. Select the **Syslog Severity** from the drop-down list.
4. Click **Save**.

Figure 17: *Configuration: Event Logging page*



Event Logging

Syslog Server 1: 10.110.211.97 Port: 514 *Name or IPv4/IPv6 address of syslog server*

Syslog Server 2: 10.110.219.10 Port: 1234

Syslog Severity: Debug (level 7 *Specify severity of events forwarded to Syslog servers*

Maximum of two Syslog servers can be configured on cnPilot device. Events are sent to both configured Syslog servers if they are up and running.

Chapter 7: Configuration – Radio

This chapter describes the following topics:

- Overview
- Configuring Radio parameters

Overview

cnPilot devices support numerous configurable radio parameters to enhance the quality of service as per the deployment.

Configuring Radio parameters

All cnPilot devices support dual concurrent radio operations, i.e. both 2.4GHz and 5GHz can be turned on in parallel and hence each radio can be configured independently. Radio 1 represents configuration of 2.4 GHz Wi-Fi radio and Radio 2 represents configuration of 5 GHz Wi-Fi radio of cnPilot device. Information of each band radio configurable parameters are listed in Configure: Radio parameters.

Table 15: Configure: Radio parameters

Parameter	Description	Range	Default
Radio			
Enable	Enables operation of radio.	-	Enabled
Channel	User can select the channel from the drop-down list. Channels in drop-down list is populated based on Country selected in Configuration > System UI.	**2.4GHz**: 1 - 14 **5GHz**: 36 - 173	Auto
Channel Width	User can select operating width of the channel. • For 2.4GHz: Only 20MHz channel width is supported. • For 5GHz: 20MHz, 40MHz and 80MHz channel width is supported.	-	• 20MHz for 2.4GHz • 80MHz for 5GHz

Parameter	Description	Range	Default
Transmit Power	User can configure transmit power of each radio based on coverage and SLA. Unit of transmit power is in dBm and its range is from 4 to 30. Maximum transmit power of cnPilot devices varies based on model number. More details of transmit power supported by each cnPilot device is available at https://www.cambiumnetworks.com/products/wifi/ . Transmit power drop-down box varies as per the country selected in Configuration > System UI. Default value is AUTO, which means radio transmit power is configured to maximum as per the county configured selected in Configuration > System UI.	**2.4GHz**: 4 - 30 **5GHz:** 4 - 30	Auto
Beacon Interval	User can configure time durations between two consecutive Beacon's. It is termed as Beacon interval.	50ms - 3400ms.	100
Minimum Unicast rate	Provision to adjust the coverage area of cnPilot device. Higher the rate selected, lesser the range. User can configure this value based on SLA in deployment. Drop-down list contains all values that are advertised by cnPilot device which includes legacy, HT and VHT rates.	Standard 802.11b and 802.11g data rates	1Mbps
Multicast data rate	Provision to configure multicast traffic rate. This is modified based on type of wireless station that will be connected to cnPilot device. Drop-down list contains highest-basic, lowest-basic and highest-supported.	–	• Highest Basic for 2.4GHz • Lowest Basic for 5GHz
Airtime Fairness	Airtime Fairness is a solution on APs to increase the performance of 11n and 11ac clients (HT clients) in the presence of legacy 11abg clients. Legacy clients need more airtime to transmit/receive the data compared to HT clients (11n and 11ac clients). Because of this the overall throughput of the HT clients falls down. Enabling this feature improves the performance of HT clients by throttling the legacy clients. Compared to faster clients (802.11n/802.11ac), the slower clients (802.11a/802.11bg) consumes more airtime to transmit the same size data, in turn the throughput of faster clients fall as they get lesser chance to transmit (lesser airtime). Enabling this feature improves the performance of faster clients in a wireless network which is dominated by slower clients. This is achieved by controlling the airtime of slower clients.	–	Disabled

Parameter	Description	Range	Default
Candidate Channels	cnPilot provides user to configure selective channels based on their requirement. Options vary based on band of operation and is as follows: • For 2.4GHz: • All • Specific • For 5GHz: • All • Specific • Prefer Non-DFS • Prefer DFS	**2.4GHz:** 1 - 14 **5GHz:** 36-173	All
Mode	All cnPilot devices are either 802.11ac Wave 1 or 802.11ac Wave 2 supported. There are few legacy clients which might not work as expected, hence this parameter can be tuned to backward compatibility based on wireless clients.	• 2.4GHz:b, bg, n, gn • 5GHz: a, ac, an, n, n-ac.	• 11n mixed mode for 2.4GHz • 11ac for 5GHz
Short Guard Interval	Standard 802.11 parameter to increase the throughput of cnPilot device.	–	Enabled
Off Channel Scan (OCS)			
Enable	Provision to enable OCS on device to capture neighbour clients and APs.	–	–
Dwell-time	Configure the time period to spend scanning of Wi-Fi devices on a channel.	50-300	50ms
Auto-RF (Dynamic Channel Change Options) **Note** 1. System release 4.0 2. Pre-releases of 4.0			
Enable	Provision to enable Auto-RF on device.	–	Disabled
Channel Selection Mode	Auto-RF supports two modes of channel selection: • Interference based	–	Interference

Parameter	Description	Range	Default
	• Channel Utilization based		
Channel Hold Time	Configure time period for the device to be on same channel selected by Auto-RF algorithm, irrespective of quality of channel after selection.	5-1800	120 Min
Channel Utilization Threshold	Configure the utilization thresholds to trigger channel selection by Auto-RF.	20-40	25%
Auto-RF (Dynamic Channel Change Options)			
Note 1. System release 3.11.4 2. Post releases of 3.11.4			
Enable	Provision to enable Auto-RF on device.	–	Disabled
Packet Error Rate	Parameter to measure the unsuccessful packet transmissions by AP.	0-100 %	-
Channel Utilization	Parameter to measure the Channel efficiency.	0-100 %	-
Noise	Parameter to measure Noise Level on current operating channel of AP.	0 to -106 dBm	-
Auto-Cell			
Dynamic Power	Provision to enable dynamic power management.	-	-
Mode	Select the required dynamic power modes. Two modes are supported: 1. By-channel 2. By-band	-	By-channel
Minimum Transmit Power	The minimum transmit power that the AP can assign to a radio when adjusting automatic cell sizes	1-20 dBm	8 dBm
Minimum Neighbour Threshold	The minimum number of neighbors to consider for power reduction by autocell logic.	1-10	2
Cellsize Overlap Threshold	Cell overlap that will be allowed when the AP is determining automatic cell sizes.	0-100%	50%
Enhanced Roaming			

Parameter	Description	Range	Default
Enable	Provision to enable enhanced roaming on device.	–	Disabled
Roam SNR threshold	cnPilot device triggers de-authentication of wireless station, when the wireless station is seen at configured SNR or below.	1-100	15dB

To configure the above parameters, navigate to the **Configure > Radio** tab and select Radio 1 (2.4GHz) or Radio 2 (5GHz) tab and provide the details as given below:

1. Select the **Enable** checkbox to enable the operations of this radio.
2. Select the primary operating channel from the **Channel** drop-down list.
3. Select the operating width (20 MHz, 40 MHz, or 80 MHz) of the channel from the Channel Width drop-down list for 5 GHz only. cnPilot do not support 40 MHz and 80 MHz in 2.4 GHz.
4. Select radio transmit power from the **Transmit Power** drop-down list.
5. Enter the beacon interval in the **Beacon Interval** textbox.
6. Select **Minimum Unicast Rate** from the drop-down list
7. Select **Highest Basic, Lowest Basic or Highest** Supported from the Multicast data rate drop-down list.
8. Enable **Airtime Fairness** checkbox.
9. Select the preferred **Candidate Channels** from the drop-down list.
10. Select **Mode** details from the drop-down list.
11. Enable **Short Guard Interval** checkbox.
12. Click **Save**.

To configure **Off Channel Scan**:

1. Select **Enable** checkbox to enable the operations of this radio.
2. Enter **Dwell-Time** in milliseconds in the textbox.
3. Click **Save**.

To configure **Auto-RF**:

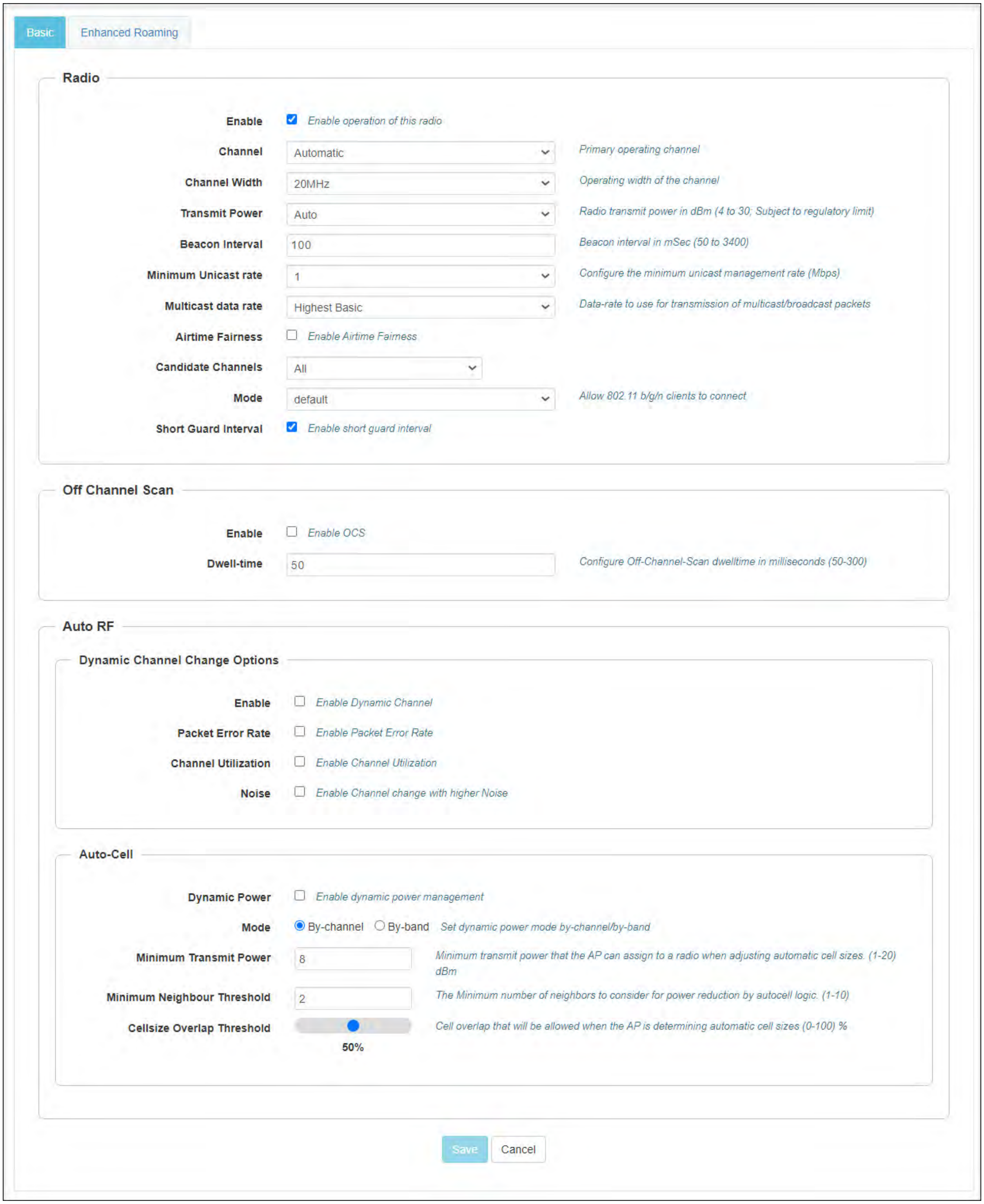
1. Select **Enable** checkbox to enable the operations of this radio.
2. Select **Channel Selection Mode** from the drop-down list.
3. Enter **Channel Hold Time** in minutes in the textbox.
4. Enter **Channel Utilization Threshold** parameter in the textbox.
5. Click **Save**.

To configure **Auto-Cell**:

1. Select **Dynamic Power** checkbox to enable the operations of this radio.
2. Select the required dynamic power **Mode** as By-channel or By-hand.

3. Enter the **Minimum Transmit Power** in the textbox.
4. Enter **Minimum Neighbour Threshold** parameter in the textbox.
5. Click **Save**.

Figure 18: *Configure: Radio parameters*



Radio

Enable ☑ *Enable operation of this radio*

Channel: Automatic — *Primary operating channel*

Channel Width: 20MHz — *Operating width of the channel*

Transmit Power: Auto — *Radio transmit power in dBm (4 to 30; Subject to regulatory limit)*

Beacon Interval: 100 — *Beacon interval in mSec (50 to 3400)*

Minimum Unicast rate: 1 — *Configure the minimum unicast management rate (Mbps)*

Multicast data rate: Highest Basic — *Data-rate to use for transmission of multicast/broadcast packets*

Airtime Fairness □ *Enable Airtime Fairness*

Candidate Channels: All

Mode: default — *Allow 802.11 b/g/n clients to connect*

Short Guard Interval ☑ *Enable short guard interval*

Off Channel Scan

Enable □ *Enable OCS*

Dwell-time: 50 — *Configure Off-Channel-Scan dwelltime in milliseconds (50-300)*

Auto RF

Dynamic Channel Change Options

Enable □ *Enable Dynamic Channel*

Packet Error Rate □ *Enable Packet Error Rate*

Channel Utilization □ *Enable Channel Utilization*

Noise □ *Enable Channel change with higher Noise*

Auto-Cell

Dynamic Power □ *Enable dynamic power management*

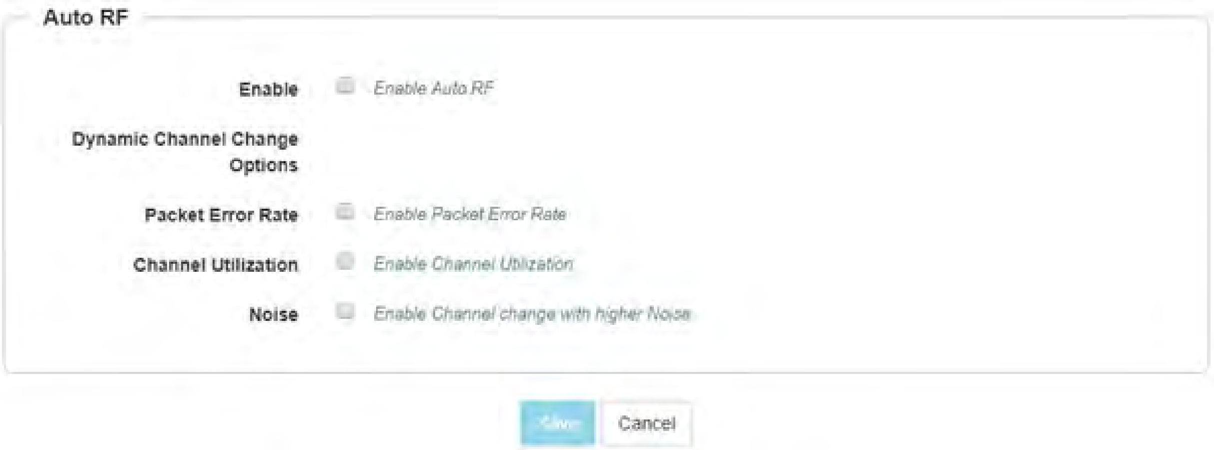
Mode ● By-channel ○ By-band *Set dynamic power mode by-channel/by-band*

Minimum Transmit Power: 8 — *Minimum transmit power that the AP can assign to a radio when adjusting automatic cell sizes. (1-20) dBm*

Minimum Neighbour Threshold: 2 — *The Minimum number of neighbors to consider for power reduction by autocell logic. (1-10)*

Cellsize Overlap Threshold: 50% — *Cell overlap that will be allowed when the AP is determining automatic cell sizes (0-100) %*

Auto-RF: System release 3.11.4


Auto RF

Enable □ Enable Auto RF

Dynamic Channel Change Options

Packet Error Rate □ Enable Packet Error Rate

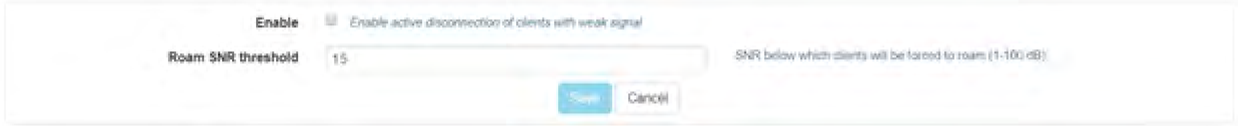
Channel Utilization □ Enable Channel Utilization

Noise □ Enable Channel change with higher Noise

To configure **Enhanced Roaming**:

1. Select the **Enable** checkbox to enable the operations of this radio.
2. Enter **Roam SNR threshold** parameter in the textbox.
3. Click **Save**.

Figure 19: *Configure: Enhanced Roaming parameters*


Enable □ Enable active disconnection of clients with weak signal

Roam SNR threshold 15 SNR below which clients will be forced to roam (1-100 dB)

Chapter 8: Configuration - Wireless LAN

This chapter describes the following topics:

- Overview
- Configuring WLAN parameters

Overview

cnPilot devices support up-to 32 unique WLANs. Each of these WLANs can be configured as per the customer requirement and type of wireless station.

Configuring WLAN parameters

Configurable parameters under WLAN profile are categorized into two sections:

1. Basic
2. Advanced

Table 16 lists the configurable parameters for a WLAN profile which is common across bands.

Table 16: Configure: WLAN > Basic parameters

Parameters	Description	Range	Default
WLAN > Basic			
Enable	Option to enable a WLAN profile. Once enabled, a Beacon is broadcasted with SSID and respective configured parameters in a WLAN profile.	–	–
Mesh	This parameter is required when a WDS connection is established with cnPilot devices. Four options are available under this parameter: 1. Base A WLAN profile configured with mesh-base will operate like a normal AP. Its radio will beacon on startup so its SSID can be seen by radios configured as mesh-clients. 2. Client A WLAN profile configured with mesh-client will scan all available channels on startup, looking for a mesh-based AP to connect. 3. Recovery	–	OFF (Access Profile Mode)

Parameters	Description	Range	Default
	A WLAN profile configured as mesh-recovery will broadcast pre-configured SSID upon detection of mesh link failure after a successful connection. This needs to be exclusively configured on mesh-base device. Mesh-client will auto scan for mesh-recovery SSID upon failure of mesh link. 4. Off Mesh support disable on WLAN profile.		
SSID	SSID is the unique network name that wireless stations scans and associates.	–	–
VLAN	VLAN is configured to segregate wireless station traffic from AP traffic in the network. Wireless stations obtain IP address from the subnet configured in VLAN field of WLAN profile.	1-4094	1
S-VLAN Tag	Provision to enable Q-in-Q tagging.	-	Disbale
S-VLAN Type	Provision to select the outer S-VLAN type. (802.1q or 802.1 ad)	-	-
S-VLAN	Provision to configure the S-VLAN id.	2-4094	-
Security	This parameter determines key values that is encrypted based on selected algorithm. Following security methods are supported by cnPilot devices: 1. Open This method is preferred when Layer 2 authentication is built in the network. With this configured on cnPilot device, any wireless station will be able to connect. 2. Osen This method is extensively used when Passpoint 2.0 is enabled on cnPilot devices. If Passpoint 2.0 is disabled, this security plays no role in wireless station association. 3. WPA2-Pre-Shared Keys This mode is supported with AES and TKIP encryption. WPA-TKIP and WPA-AES can be enabled from the CLI with the “allow-tkip” CLI option. 4. WPA2 Enterprise This security type uses s 802.1x authentication to associate wireless stations. Thiis a centralized system of authentication method. WPA-TKIP and WPA-AES can be enabled from the CLI with the “allow-tkip” CLI option.	–	Open
Passphrase	String that is a key value to generate keys based on security method configured.	–	12345678

Parameters	Description	Range	Default
Radios	Each SSID can be configured to be transmitted as per the deployment requirement. For a regular access profile, options available to configure transmit mode of SSID: ▪ 2.4GHz and 5GHz ▪ 2.4GHz ▪ 5GHz For mesh profile, options available are: ▪ 2.4GHz ▪ 5GHz	–	2.4GHz and 5GHz
VLAN Pooling	This parameter is required when user requires to distribute clients across multiple subnets. Different modes of VLAN pooling is supported by cnPilot devices, based on infrastructure available at deployment site. Modes supported are as follows: 1. Disabled This feature is disabled for this WLAN. 2. Radius Based User is expected to configure WPA2 Enterprise for this mode to support. During association phase, cnPilot obtains pool name form RADIUS transaction and based on present distribution of wireless station across VLANs, cnPilot selects appropriate VLAN and wireless station requests an IP address from the VLAN selected by cnPilot device. 3. Static For this mode to support, user requires to configure VLAN Pool details available under Configure > Network > VLAN pool. During association phase, cnPilot obtains pool and based on present distribution of wireless station across VLANs, cnPilot selects appropriate VLAN and wireless station requests an IPv4/IPv6 address from the VLAN selected by cnPilot device.	–	Disabled
Max Clients	This specifies the maximum number of wireless stations that can be associated to a WLAN profile. This varies based on cnPilot device model number. Refer Table 17 for more details.	1-512 (Refer Table 17)	127
Client Isolation	This feature needs to be enabled when there is a need for prohibition of wireless station to station communication either over the network or on an AP. Three options are available to configure based on requirement:	–	Disabled

Parameters	Description	Range	Default
	1. Disable This option when selected disables client isolation feature. i.e. any wireless station can communicate to other wireless station. 2. Local This options when selected enables client isolation feature. This option prevents wireless station communications connected to same AP. 3. Network Wide* This options when selected enables client isolation feature. It prevents wireless station communications connected to different AP deployed in same network. 4. Network Wide Static* This option when configured enables client isolation feature across network. User has to configure gateway MAC to access device across subnets. ***Note**: When selected, user has provision to add MAC addresses to the Client isolation MAC List. Maximum 64 MAC addresses can be added.		
cnMaestro Managed Roaming	By default, cnPilot devices support Layer 2 roaming. This option enables Layer 3 roaming. It is mandatory that cnPilot devices are connected to cnMaestro. Layer 3 roaming is valid only for Guest Access.	–	Disabled
Hide SSID	This is the basic security mode of a Wi-Fi device. This parameter when enabled, will not broadcast SSID.	–	Disabled
Session Timeout	This field is specific to non-guest wireless stations. When a wireless station connects, a session timer is triggered. Once session time expires, wireless station must undergo either re-authentication or re-association based on state of wireless station. By default, it is enabled.	60-604800	28800
Inactivity Timeout	Inactivity timer triggers whenever there is no communication between cnPilot device and wireless station associated to cnPilot device. Once the timer reaches the configured Inactivity timeout value, APs sends a de-authentication to that wireless station. By default, it is enabled.	60-28800	1800
Drop Multicast Traffic	When enabled, will drop all multicast flowing in or out of that WLAN.	–	Disabled

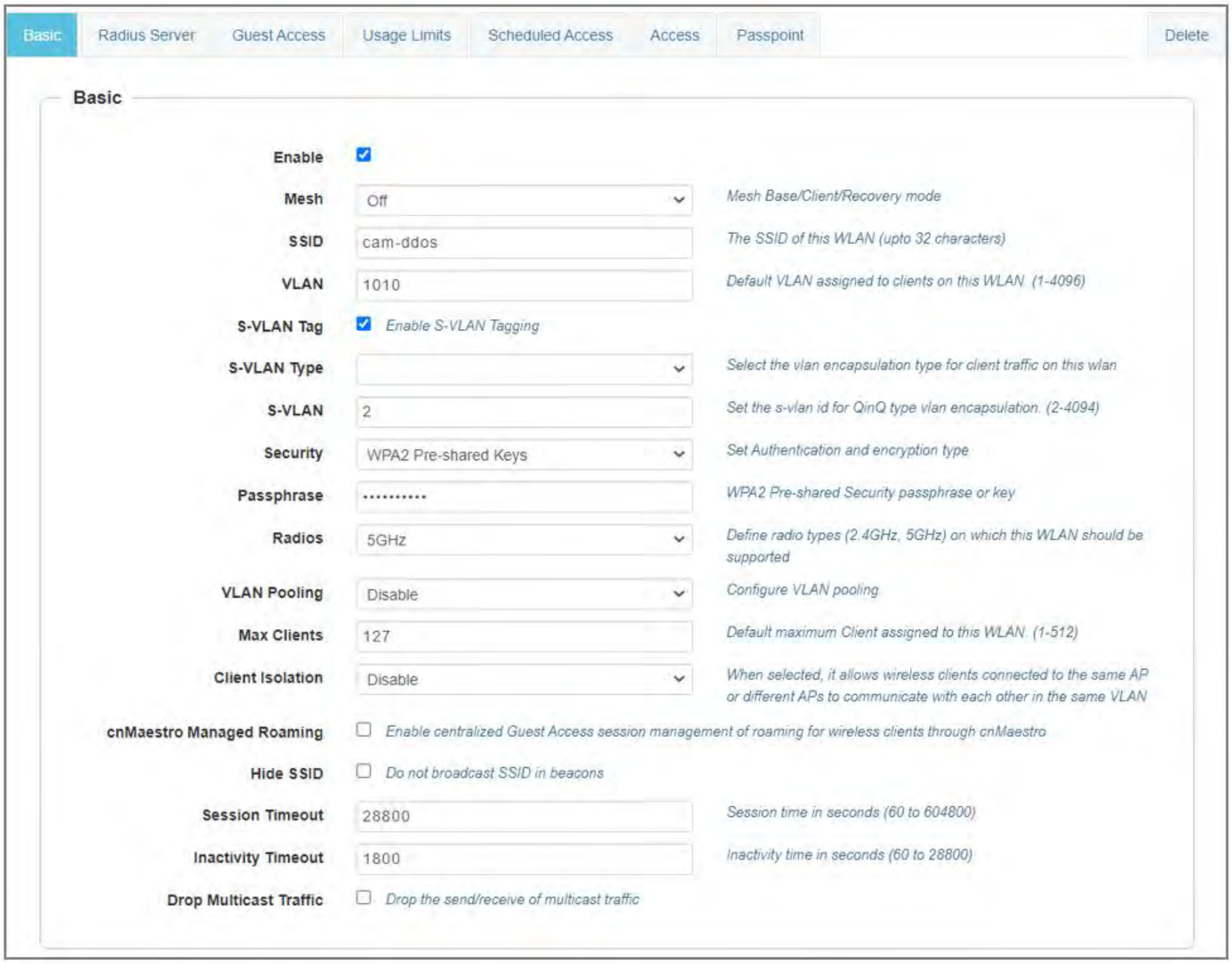
To configure the above parameters, navigate to the **Configure > WLAN > Basic** tab and provide the details as given below:

1. Select the **Enable** checkbox to enable a particular WLAN.
2. Select the operating parameters from the **Mesh** drop-down list.
3. Enter the SSID name for this WLAN in the **SSID** textbox.
4. Enter the default VLAN assigned to the clients on this WLAN in the **VLAN** textbox.
5. Enable **S-VLAN Tag** check-box.
6. Select the VLAN encapsulation type for the client traffic on this WLAN from the **S-VLAN Type** drop-down list.
7. Select the S-VLAN id for Q-in Q type VLAN encapsulation from the **S-VLAN** drop-down list.
8. Select **Security** type from the drop-down list.
9. Enter WPA2 Pre-shared security passphrase or key in the **Passphrase** textbox.
10. Select the radio type (2.4GHz, 5GHz) on which the WLAN should be supported from the **Radios** drop-down list.
11. Select the required **VLAN Pooling** parameters from the drop-down list.
12. Select **Max Clients** parameter value from the drop-down list.
13. Select the required **Client Isolation** parameter from the drop-down list.
14. Enable **cnMaestro Managed Roaming** checkbox for layer2/layer 3 roaming.
15. Enable **Hide SSID** checkbox.
16. Enter the session timeout value in the **Session Timeout** textbox.
17. Enter the inactivity timeout value in the **Inactivity timeout** textbox.
18. Select **Drop Multicast Traffic** checkbox to enable dropping multicast traffic.
19. Click **Save.**

Table 17: WLAN (Max Clients) parameters

Number of Clients	2.4GHz	5GHz	Concurrent
e600 and e700	512	512	512
e410/e430 and e510	256	256	256
e400 and e500/e501S/e502S	256	128	256
e425H and e505	100	100	100

Figure 20: *Basic parameter*



Basic

Enable	☑	
Mesh	Off	Mesh Base/Client/Recovery mode
SSID	cam-ddos	The SSID of this WLAN (upto 32 characters)
VLAN	1010	Default VLAN assigned to clients on this WLAN (1-4096)
S-VLAN Tag	☑ Enable S-VLAN Tagging	
S-VLAN Type		Select the vlan encapsulation type for client traffic on this wlan
S-VLAN	2	Set the s-vlan id for QinQ type vlan encapsulation. (2-4094)
Security	WPA2 Pre-shared Keys	Set Authentication and encryption type
Passphrase	••••••••••	WPA2 Pre-shared Security passphrase or key
Radios	5GHz	Define radio types (2.4GHz, 5GHz) on which this WLAN should be supported
VLAN Pooling	Disable	Configure VLAN pooling
Max Clients	127	Default maximum Client assigned to this WLAN. (1-512)
Client Isolation	Disable	When selected, it allows wireless clients connected to the same AP or different APs to communicate with each other in the same VLAN
cnMaestro Managed Roaming	□ Enable centralized Guest Access session management of roaming for wireless clients through cnMaestro	
Hide SSID	□ Do not broadcast SSID in beacons	
Session Timeout	28800	Session time in seconds (60 to 604800)
Inactivity Timeout	1800	Inactivity time in seconds (60 to 28800)
Drop Multicast Traffic	□ Drop the send/receive of multicast traffic	

Q-in-Q VLAN Tagging

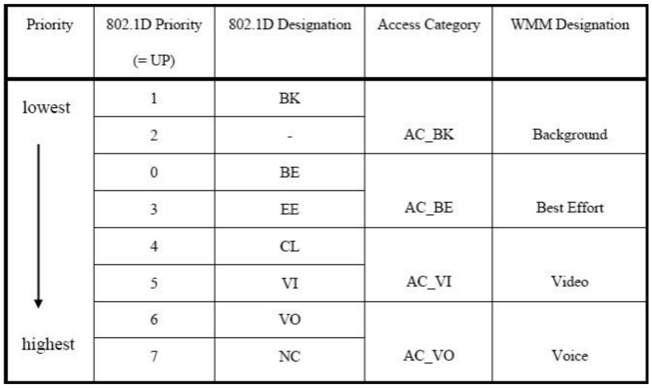
A Q-in-Q VLAN Tagging enables segregation of the traffic from different customers or location at the core end . It allows the administrator to double tag the wireless traffic coming from the user before tunneling over the GRE. The inner tag is called customer VLAN ID and outer tag is called service provider VLAN ID. Using the Q-in-Q tunneling feature over GRE, service providers can use a single VLAN (S-VLAN Id) to support customers with multiple VLANs. Customer VLAN ID (C-VLAN IDs) are preserved and traffic from different customers is segregated within the service-provider infrastructure even when they appear to be on the same VLAN.

Note

Q-in-Q feature is supported only for tunnedled WLAN profile using L2GRE.

Table 18: Configure: WLAN > Advanced parameters

<table>
<tr><th>Parameters</th><th>Description</th><th>Range</th><th>Default</th></tr>
<tr><td colspan="4">WLAN > Advanced</td></tr>
<tr><td>UAPSD</td><td>When enabled, cnPilot devices support WMM Power Save / UAPSD. This is required where applications such as VOIP Calls, Live Video streaming etc. is in use. This feature helps to prioritize traffic. Below is the default traffic priority followed by cnPilot device.



<table>
<tr><th>Priority</th><th>802.1D Priority (= UP)</th><th>802.1D Designation</th><th>Access Category</th><th>WMM Designation</th></tr>
<tr><td>lowest</td><td>1</td><td>BK</td><td>AC_BK</td><td>Background</td></tr>
<tr><td></td><td>2</td><td>-</td><td></td><td></td></tr>
<tr><td></td><td>0</td><td>BE</td><td>AC_BE</td><td>Best Effort</td></tr>
<tr><td></td><td>3</td><td>EE</td><td></td><td></td></tr>
<tr><td></td><td>4</td><td>CL</td><td>AC_VI</td><td>Video</td></tr>
<tr><td></td><td>5</td><td>VI</td><td></td><td></td></tr>
<tr><td></td><td>6</td><td>VO</td><td>AC_VO</td><td>Voice</td></tr>
<tr><td>highest</td><td>7</td><td>NC</td><td></td><td></td></tr>
</table>
</td><td>–</td><td>Disabled</td></tr>
<tr><td>QBSS</td><td>When enabled, appends QBSS IE in Management frames. This IE provides information of channel usage by AP, so that smart wireless station can decide better AP for connectivity. Station count, Channel utilization and Available admission capacity are the information available in this IE.</td><td>–</td><td>Disabled</td></tr>
<tr><td>DTIM interval</td><td>This parameter plays a key role when power save supported mobile stations are part of infrastructure. This field when enabled controls the transmission of Broadcast and Multicast frames.</td><td>1-255</td><td>1</td></tr>
<tr><td colspan="4">Monitored Host</td></tr>
<tr><td>Host</td><td>This feature is required where there is interrupted backbone network. cnPilot device monitors the reachability of hostname/IP configured in this parameter and modifies the state of WLAN.</td><td>–</td><td>Disabled</td></tr>
<tr><td>Interval</td><td>The frequency of monitoring the network health based on the status of keep-alive mechanism w.r.t configured monitored host.</td><td>60-3600 Sec</td><td>300</td></tr>
<tr><td>Attempts</td><td>The number of packets in the keep-alive mechanism to determine the status.</td><td>1-20</td><td>1</td></tr>
<tr><td>DNS Logging Host</td><td>This feature is required when an Administrator requires to monitor the websites accessed by wireless stations connected to WLAN profile.</td><td>–</td><td>Disabled</td></tr>
</table>

Parameters	Description	Range	Default
Connection Logging Host	When enabled provides information of all TCP connections accessed by a wireless station that is associated to WLAN.	–	Disabled
Band Steering	This feature when enabled, steers wireless stations to connect to 5GHz. There are three modes supported by cnPilot device. The mode can be selected based on either deployment or wireless station type. Below is the order of modes, which forces wireless station to connect to 5GHz band. • Low • Normal • Aggressive	–	Disabled
Proxy ARP	Provision to avoid ARP flood in wireless network. When enabled, AP responds to ARP requests for the wireless stations connected to that AP. This is for IPv4 infrastructure.	–	Enabled
Proxy ND	Provision to avoid ARP flood in wireless network. When enabled, AP responds to ARP requests for the wireless stations connected to that AP. This is for IPv6 infrastructure.	–	Disabled
Unicast DHCP	Provision to transmit DHCP offer and ACK/NACK packets as Unicast packets to wireless stations.	–	Enabled
Insert DHCP Option 82	When enabled, DHCP packets generated from wireless stations that are associated to APs are appended with Option 82 parameters. Option 82 provides provision to append Circuit ID and Remote ID. Following parameters can be selected in both Circuit ID and Remote ID: • Hostname • AP MAC • BSSID • SSID • VLAN ID • Site ID • Custom • All	–	Disabled
Tunnel Mode	This option is enabled when user traffic is tunneled to DMZ network either using L2TP or L2GRE.	–	Disabled

Parameters	Description	Range	Default
Fast-Roaming Protocol	One of the important aspects to support voice applications on Wi-Fi network (apart from QoS) is how quickly a client can move its connection from one AP to another. This should be less than 150 msec to avoid any call drop. This is easily achievable when WPA2-PSK security mechanism is in use. However, in enterprise environments there is a need for more robust security (the one provided by WPA2-Enterprise). With WPA2-Enterprise, the client exchanges multiple frames with AAA server and hence depending on the location of AAA server the roaming-time will be above 700 msec. Select any one of the following: 1. OKC This roaming method is a proprietary solution to bring scalability to the roaming problem. This method avoids the need to authenticate with AAA server every time a client moves to new AP. 2. 802.11r This is the IEEE standard for fast roaming, introduces a new concept of roaming where the initial handshake with the new AP is done even before the client roams to the target AP, which is called Fast Transition (FT). Two modes of FT roaming are supported:By default, this is enabled. • Over-the-Air: • Over-the-DS	–	Disabled
Re-association Timeout	It’s the number of seconds after which the reassociation attempt of a client to an AP should timeout. This is applicable only when FT roaming is enabled.	1-100	20
RRM (802.11k)	AP sends the SSID name of the neighbor APs (SSID configured on multiple APs) to 11k clients. Following parameters needs to be enabled: • Enable OCS • Enable RRM • Support for WPA2 authentication method	–	Disabled

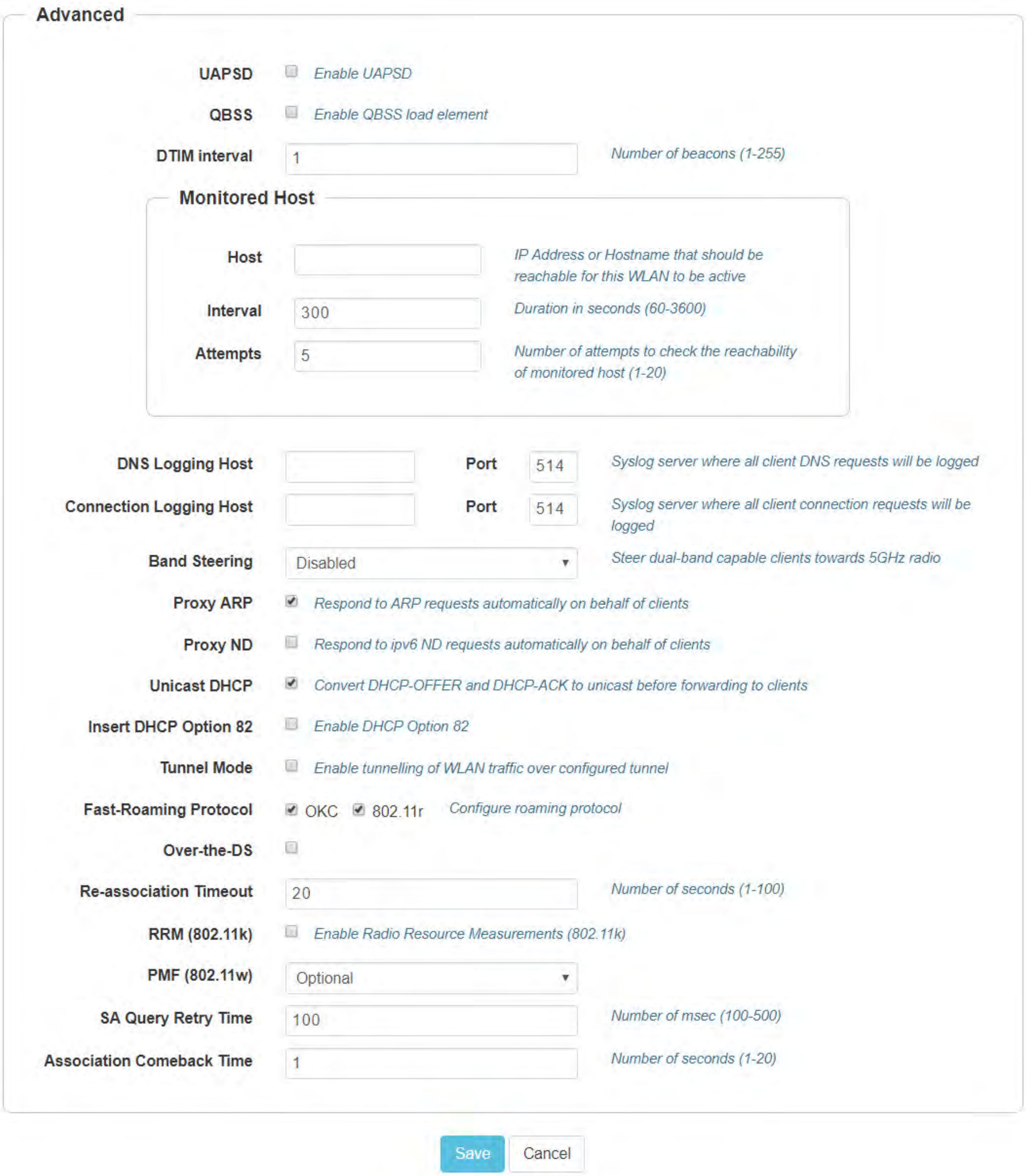
Parameters	Description	Range	Default
PMF (802.11w)	802.11w, also termed as Protected Management Frames (PMF) Service, defines encryption for management frames. Unencrypted management frames makes wireless connection vulnerable to DoS attacks as well as they cannot protect important information exchanged using management frames from eavesdroppers.	• Optional • Mandatory • Disabled	–
SA Query Retry Time	The legitimate 802.11w client must respond with a Security Association (SA) Query Response frame within a pre-defined amount of time (milliseconds) called the SA Query Retry time.	100-500	100ms
Association Comeback Time	This value is included in the Association Response as an Association Comeback Time information element. AP will deny association for the configured interval.	1-20	1 Sec

To configure the above parameters, navigate to the **Configure > WLAN > Basic** tab and provide the details as given below:

1. Select the **UAPSD** checkbox to enable UAPSD.
2. Select the **QBSS** checkbox to enable QBSS.
3. Enter the value in the **DTIM interval** textbox to configure DTIM interval.
4. Enter IP address or Hostname in **Host** textbox.
5. Enter **Interval** time duration in the textbox.
6. Select number of attempts to check the reachability of monitored host in the **Attempts** drop-down list.
7. Enter an IP Address or Hostname in the **Monitored Host** textbox.
8. Enter the FQDN or IP address of the Server where all the client DNS requests will be logged in the DNS Logging Host server along with customized port number in the textbox. If the port number is not entered, AP will take default value as 514.
9. Enter the FQDN or IP address of the Server where all wireless client connectivity events/logs will be displayed in the configured Connection Logging Host server along with customized port number in the textbox. If the port number is not entered, AP will take default value as 514.
10. Select **Band Steering** parameter for 5GHz band from the drop-down list.
11. Enable **Proxy ARP** checkbox to avoid ARP flood in wireless network.
12. Enable **Proxy ND** checkbox to avoid ARP flood in wireless network.
13. Enable **Unicast DHCP** checkbox to Convert DHCP-OFFER and DHCP-ACK to unicast before forwarding to clients.
14. Enable Insert **DHCP Option 82** checkbox.
15. Select **Option 82 Circuit ID** to enable DHCP Option-82 from the drop-down list.
16. Select **Option 82 Remote ID** to choose the MAC address of the AP from the drop-down list.

17. Select **Tunnel Mode** checkbox to enable tunnelling of WLAN traffic over configured tunnel.
18. Enable the required OKC or 802.11r configure roaming protocol in the **Fast-Roaming Protocol** checkbox.
19. Enable **RRM (802.11k)** checkbox.
20. Select **PMF (802.11w)** parameter from the drop-down list.
    a. Enter **SQ Query Retry Time** in the textbox.
    b. Enter **Association Comeback Time** in the textbox.
21. Click **Save.**

Figure 21: *Advanced parameter*



Advanced

UAPSD □ *Enable UAPSD*

QBSS □ *Enable QBSS load element*

DTIM interval 1 *Number of beacons (1-255)*

Monitored Host

Host *IP Address or Hostname that should be reachable for this WLAN to be active*

Interval 300 *Duration in seconds (60-3600)*

Attempts 5 *Number of attempts to check the reachability of monitored host (1-20)*

DNS Logging Host **Port** 514 *Syslog server where all client DNS requests will be logged*

Connection Logging Host **Port** 514 *Syslog server where all client connection requests will be logged*

Band Steering Disabled ▾ *Steer dual-band capable clients towards 5GHz radio*

Proxy ARP ☑ *Respond to ARP requests automatically on behalf of clients*

Proxy ND □ *Respond to ipv6 ND requests automatically on behalf of clients*

Unicast DHCP ☑ *Convert DHCP-OFFER and DHCP-ACK to unicast before forwarding to clients*

Insert DHCP Option 82 □ *Enable DHCP Option 82*

Tunnel Mode □ *Enable tunnelling of WLAN traffic over configured tunnel*

Fast-Roaming Protocol ☑ OKC ☑ 802.11r *Configure roaming protocol*

Over-the-DS □

Re-association Timeout 20 *Number of seconds (1-100)*

RRM (802.11k) □ *Enable Radio Resource Measurements (802.11k)*

PMF (802.11w) Optional ▾

SA Query Retry Time 100 *Number of msec (100-500)*

Association Comeback Time 1 *Number of seconds (1-20)*

Table 19: Configure: WLAN > Radius Server parameters

Parameters	Description	Range	Default
Authentication Server	Provision to configure RADIUS Authentication server details such as Hostname/IPv4/IPv6, Shared Secret, Port Number and Realm. Maximum of three RADIUS server can be configured.	–	Disabled
Accounting Server	Provision to configure Accounting server details such as Hostname/IPv4/IPv6, Shared Secret, Port Number. Maximum of three RADIUS server can be configured.	–	Disabled
Timeout	Wait time period for response from AAA server.	1-30	3
Attempts	Parameter to configure number of attempts that a device should send AAA request to server if no response is received within configured timeout period.	1-3	1
Accounting Mode	This field is enabled based on customer requirement. Accounting packet is transmitted based on mode selected. 1. Start-Stop Accounting packets are transmitted by AP to AAA server when a wireless station is connected and then disconnects. 2. Start-Interim-Stop Accounting packets are transmitted by AP to AAA server when a wireless station connects and then at regular intervals of configured Interim Update Interval and then when it disconnects. 3. None Accounting mode will be disable.	–	Disabled
Accounting Packet	When enabled, Accounting-On is sent for every client when connected.	–	Disabled
Sync Accounting Records	When enabled, will share the accounting records when wireless stations move across different AP that are Layer 2 connected.	–	Disabled
Server Pool Mode	User can configure multiple Authorization and Accounting servers. Based on number of wireless stations, user can choose either Failover or Load Balance mode. 1. Load Balance AP communicates with multiple servers and ensures that authorization and accounting are equally shared across configured servers. 2. Failover	–	Load Balance

Parameters	Description	Range	Default
	AP selects the RADIUS server which is up and running based on the order of configuration.		
NAS Identifier	This is configurable parameter and is appended in RADIUS request packet. 1. AP-ETH0-MAC: NAS identifier attribute will be ETH0 MAC address 2. WLAN-BSSID: NAS identifier attribute will be WLAN-BSSID 3. Custom: Any custom value	–	Hostname/ System Name
Interim Update Interval	This field is used when RADIUS accounting is enabled, and mode selected as Start-Interim-Stop.	10-65535	1800
Dynamic Authorization	This option is required, where there is a CoA requests from AAA/RADIUS server.	–	Disabled
Dynamic VLAN	When enabled, AP honors the VLAN information provided in RADIUS transaction. Wireless station requests IP address from the same VLAN learnt through RADIUS.	–	Enabled
Proxy through cnMaestro	This option is enabled, whenever cnMaestro is required to act as proxy server to RADIUS authentication requests coming from cnPilot devices that are connected to cnMaestro.	–	Disabled
Called Station ID	Following information can be communicated to RADIUS server: • AP-MAC • AP-MAC: SITE-NAME • AP-MAC: SSID • AP-MAC: SSID-SITE-NAME • AP-NAME • AP-NAME: SITE-NAME • AP-NAME: SSID • SITE-NAME • SSID • CUSTOM		AP-MAC: SSID

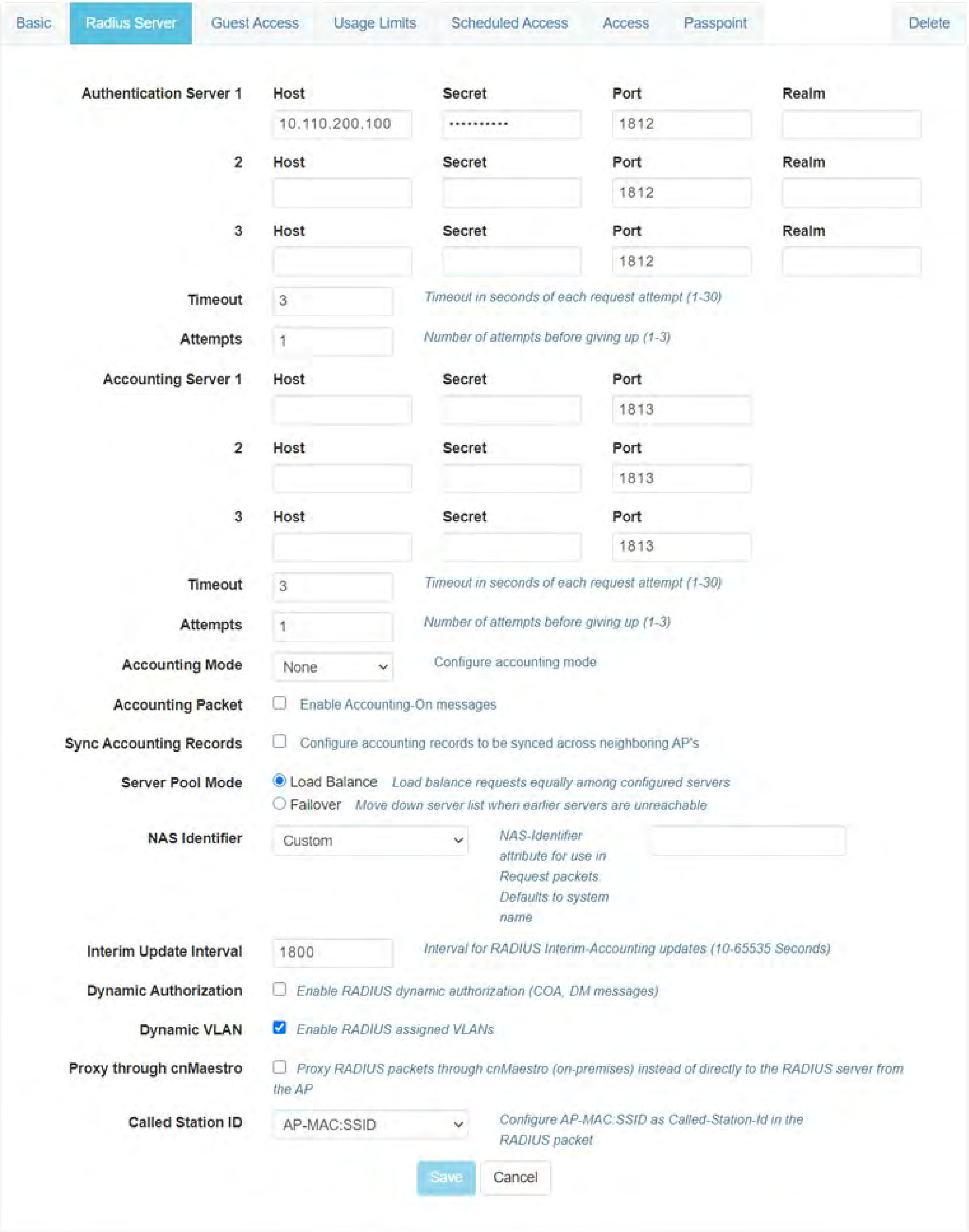
To configure the above parameters, navigate to the **Configure > WLAN** tab and select Radius Server tab and provide the details as given below:

1. Enter the RADIUS Authentication server details such as Hostname/Shared Secret/Port Number/ Realm in the **Authentication Server 1** textbox.
2. Enter the time in seconds of each request attempt in **Timeout** textbox.
3. Enter the number of attempts before a request is given up in the **Attempts** textbox.
4. Select the configuring **Accounting Mode** from the drop-down list.
5. Enable **Accounting Packet** checkbox.
6. Enable Sync **Accounting Records** checkbox to enable sync accounting records configuration.
7. Enable Load Balance/Failover in the **Server Pool Mode** checkbox.
8. Enter the **NAS Identifier** parameter in the textbox.
9. Enter the **Interim Update Interval** parameter value in the textbox.
10. Enable **Dynamic Authorization** checkbox to configure dynamic authorization for wireless clients.
11. Enable **Dynamic VLAN** checkbox.
12. Enable **Proxy through cnMaestro** checkbox.
13. Select **Called Station ID** from the drop-down list.
14. Click **Save**.

Table 20: NAS IP with AP dual stack

IPv6 preference	AP Address Mode	NAS ID
Yes	DUAL STACK	IPv6
No	DUAL STACK	IPv4
Yes	IPv6 only	IPv6
No	IPv6 only	IPv6
Yes	IPv4 only	IPv4
No	IPv4 only	IPv4

Figure 22: *Radius Server parameter*



	Host	Secret	Port	Realm
Authentication Server 1	10.110.200.100	••••••••••	1812	
2			1812	
3			1812	

Timeout: 3 — *Timeout in seconds of each request attempt (1-30)*

Attempts: 1 — *Number of attempts before giving up (1-3)*

	Host	Secret	Port
Accounting Server 1			1813
2			1813
3			1813

Timeout: 3 — *Timeout in seconds of each request attempt (1-30)*

Attempts: 1 — *Number of attempts before giving up (1-3)*

Accounting Mode: None — Configure accounting mode

Accounting Packet: □ Enable Accounting-On messages

Sync Accounting Records: □ Configure accounting records to be synced across neighboring AP's

Server Pool Mode: ● Load Balance *Load balance requests equally among configured servers*
○ Failover *Move down server list when earlier servers are unreachable*

NAS Identifier: Custom — *NAS-Identifier attribute for use in Request packets. Defaults to system name*

Interim Update Interval: 1800 — *Interval for RADIUS Interim-Accounting updates (10-65535 Seconds)*

Dynamic Authorization: □ *Enable RADIUS dynamic authorization (COA, DM messages)*

Dynamic VLAN: ☑ *Enable RADIUS assigned VLANs*

Proxy through cnMaestro: □ *Proxy RADIUS packets through cnMaestro (on-premises) instead of directly to the RADIUS server from the AP*

Called Station ID: AP-MAC:SSID — *Configure AP-MAC:SSID as Called-Station-Id in the RADIUS packet*

Table 21: Configure: WLAN > Guest Access > Internal Access Point parameters

Parameters	Description	Range	Default
WLAN > Guest Access > Internal Access Point			
Enable	Enables the Guest Access feature.	–	Disabled
Access Policy	There are four types of access types provided for the user: 1. Clickthrough This mode allows the users to get access data without any authentication mechanism. User can access internet as soon as he is connected and accepts Terms and Conditions. 2. RADIUS This mode when selected, user has to provide username and password, which is then redirected to RADIUS server for authentication. If successful, user is provided with data access. 3. LDAP This mode when selected, user has to provide username and password, which is then redirected to LDAP server for authentication. If successful, user is provided with data access. 4. Local Guest Account User must configure username and password on device, which has to be provided in the redirection page for successful authentication and data access.	–	Clickthrough
Redirect Mode	This option helps the user to configure the HTTP or HTTPS mode of redirection URL. 1. HTTP AP sends a HTTP POSTURL to the associated client, which will be http://<Pre-defined-URL>. 2. HTTPS AP sends HTTPS POSTURL to the successful associated client, which will be https://<Pre-defined-URL>.	–	HTTP
Redirect Hostname	User can configure a friendly hostname, which is added in DNS server and is resolvable to cnPilot IP address. This parameter once configured will be replaced with IP address in the redirection URL provided to wireless stations.	–	–

Parameters	Description	Range	Default
Title	User can configure a Title to the splash page. Configured text in this parameter will be displayed in the redirection page. This text is usually Bold.	Up to 255 characters	Welcome To Cambium Powered Hotspot
Contents	User can configure the contents of Splash page using this field. Displays the text configured under the Title section of redirection page.	Up to 255 characters	Please enter username and password to get Web Access
Terms	Splash page displays the text configured when user accepts Terms and Agreement.	Up to 255 characters	–
Logo	Displays the logo image updated in URL http (s)://<ipaddress>/logo.png. Either PNG or JPEG format of logo are supported.	–	–
Background Image	Displays the background image updated in URL http (s)://<ipaddress>/backgroundimage.png. Either PNG or JPEG format of logo are supported.	–	–
Success Action	Provision to configure redirection URL after successful login to captive portal services. User can configure three modes of redirection URL: 1. Internal Logout Page After successful login, wireless client is redirected to logout page hosted on AP. 2. Redirect user to External URL Here users will be redirected to URL which is configured on device in Redirection URL configurable parameter. 3. Redirect user to Original URL Here users will be redirected to URL that is accessed by user before successful captive portal authentication.	–	Internal Logout page
Redirect user to External URL	Provision to configure re-direction URL after successful login and an additional information of AP and wireless station information can be appended in the URL. ▪ Prefix Query Strings in Redirect URL This option is selected by default. Following information is appended in the redirection URL: • SSID	–	–

Parameters	Description	Range	Default
	- AP MAC - NAS ID - AP IP - Client MAC - Redirection URL - User can provide either HTTP or HTTPS URL		
Redirection user to Original URL	Users will be redirected to URL that is accessed by user before successful captive portal authentication. There is additional parameter Prefix Query Strings in Redirection URL that is enabled by default and details given below: This option is selected by default. Following information is appended in the redirection URL: Prefix Query Strings in Redirect URL - SSID - AP MAC - NAS ID - AP IP - Client MAC	–	–
Success message	Provision to configure text to display upon successful Guest Access authentication. This is applicable only when Success Action mode is Internal Logout Page.	–	–
Redirect	- If enabled, only HTTP URLs will be redirected to Guest Access login page. - If disabled, both HTTP and HTTPs URLs will be redirected to Guest Access login page.	–	Enabled
Redirect User Page	IPv4/IPv6 address configured in this field is used as logout URL for Guest Access sessions. IPv4/IPv6 address configured should be not reachable to internet.	–	1.1.1.1
Proxy Redirection Port	Proxy port can be configured with which proxy server is enabled. This allows URL's accessed with proxy port to be redirected to login page.	1 - 65535	–

Parameters	Description	Range	Default
Session Timeout	This is the duration of time, client will be allowed to access internet if quota persists, after which AP sends de-authentication. Wireless station has to undergo Guest Access authentication after session timeout.	60 - 2592000	28800
Inactivity Timeout	Provision to configure timeout period to disconnect wireless stations that are associated but no data traffic. AP starts timer when there is no data received from a wireless station and disconnects when timer reaches 0.	60 - 2592000	1800
MAC Authentication Fallback	It's a mechanism in which wireless stations will be redirected to Guest Access login page after any supported type of MAC address authentication fails.	–	Disabled
Extend Interface	Provision to support Guest Access on Ethernet interface.	–	Disabled
Whitelist	Provision to configure either IPv4/IPv6 or URLs to bypass traffic, therefor user can access those IPs or URLs without Guest Access authentication.	–	–
Captive Portal bypass User Agent	Provision to limit the auto-popup to a certain browser as configured based on User-agent of browsers.	–	–

To configure the above parameters, navigate to the **Configure > WLAN > Guest Access** tab and provide the details as given below:

1. Select **Enable** checkbox to enable the Guest Access feature.
2. Enable **Internal Access Point** checkbox.
3. Enable the required access types from the **Access Policy** checkbox.
4. Enable HTTP or HTTPS from the **Redirect Mode** checkbox.
5. Enter **Redirect Hostname** in the textbox.
6. Enter the title to appear in the splash page in the **Title** textbox.
7. Enter the content to appear in the splash page in the **Contents** textbox.
8. Enter the terms and conditions to appear in the splash page in the **Terms** textbox.
9. Enter the logo to be displayed in the **Logo** textbox.
10. Select the **Background** Image to be displayed on the splash page in the textbox.
11. Enable configured modes of redirection URL in **Success Action** checkbox.
12. Enter **Success** message to appear in the textbox.
13. Enable Redirect checkbox for **HTTP** packets.
14. Enter configuring IP address in the **Redirect User** Page textbox.

15. Enter Port number in the **Proxy Redirection Port** textbox.
16. Enter the session timeout in seconds in the **Session Timeout** textbox.
17. Enter the inactivity timeout in seconds in the Inactivity **Timeout** textbox.
18. Enable MAC Authentication Fallback checkbox if guest-access is used only as fallback for clients failing MAC-authentication.
19. Enter the name of the interface that is extended for guest access in the **Extend Interface** textbox.
20. Click **Save**.

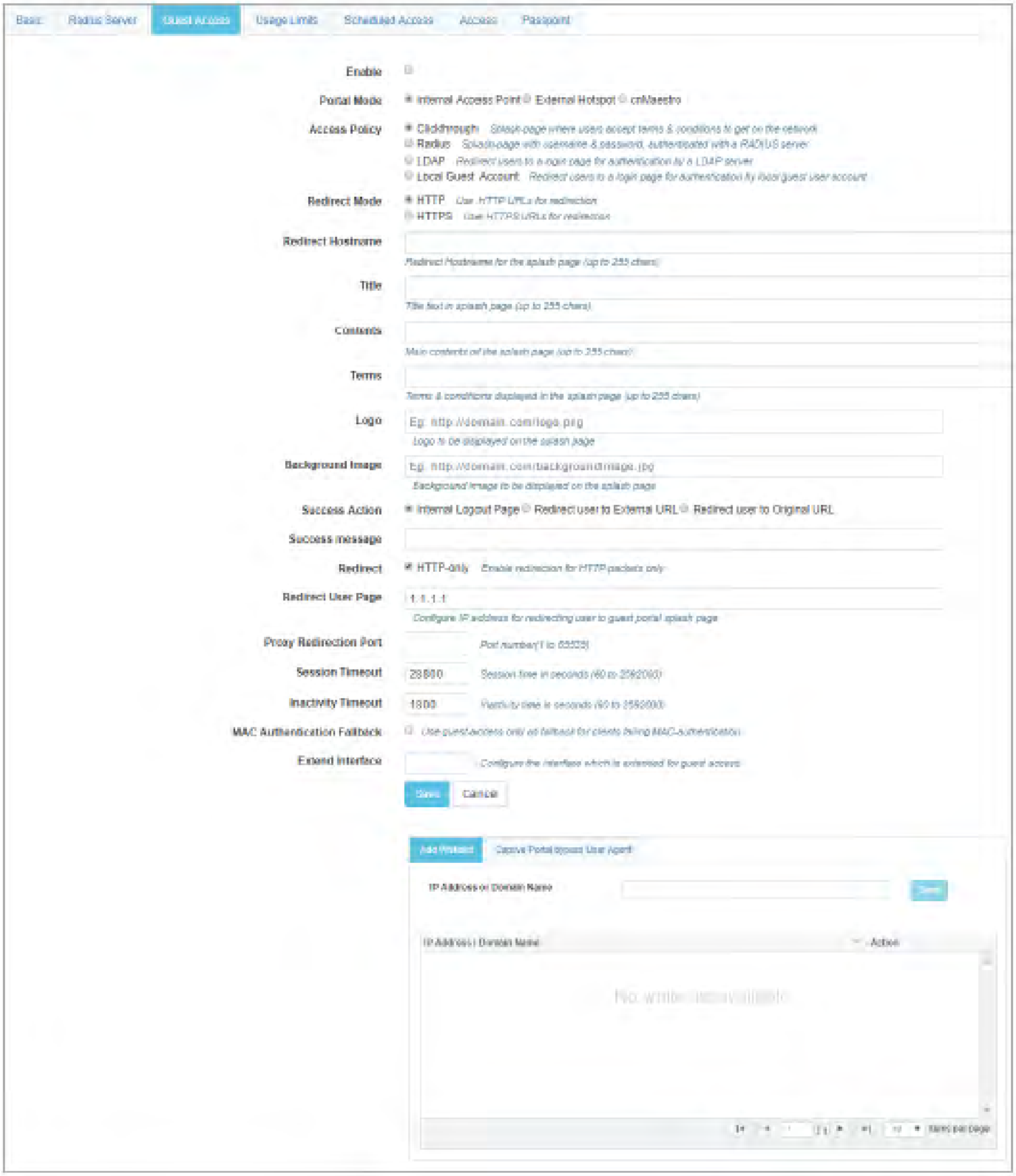
To configure **Whitelist** parameter:

1. Enter the IP address or the domain name of the permitted domain in the IP Address or Domain Name textbox.
2. Click **Save**.

To configure the **Captive Portal bypass User Agent** parameter:

1. Select **Index** parameter value from the drop-down list.
2. Enter **User Agent** String parameter in the textbox.
3. Select **Status Code** from the drop-down list.
4. Enter **HTML** Response in the textbox.
5. Click **Save**.

Figure 23: *Configure: WLAN > Guest Access > Internal Access Point parameter*



Enable □

Portal Mode ● Internal Access Point ○ External Hotspot ○ cnMaestro

Access Policy
● Clickthrough *Splash-page where users accept terms & conditions to get on the network*
○ Radius *Splash-page with username & password, authenticated with a RADIUS server*
○ LDAP *Redirect users to a login page for authentication by a LDAP server*
○ Local Guest Account *Redirect users to a login page for authentication by local guest user account*

Redirect Mode
● HTTP *Use HTTP URLs for redirection*
○ HTTPS *Use HTTPS URLs for redirection*

Redirect Hostname
Redirect Hostname for the splash page (up to 255 chars)

Title
Title text in splash page (up to 255 chars)

Contents
Main contents of the splash page (up to 255 chars)

Terms
Terms & conditions displayed in the splash page (up to 255 chars)

Logo Eg: http://domain.com/logo.png
Logo to be displayed on the splash page

Background Image Eg: http://domain.com/backgroundimage.jpg
Background image to be displayed on the splash page

Success Action ● Internal Logout Page ○ Redirect user to External URL ○ Redirect user to Original URL

Success message

Redirect ☑ HTTP-only *Enable redirection for HTTP packets only*

Redirect User Page 1.1.1.1
Configure IP address for redirecting user to guest portal splash page

Proxy Redirection Port *Port number(1 to 65535)*

Session Timeout 28800 *Session time in seconds (60 to 2592000)*

Inactivity Timeout 1800 *Inactivity time in seconds (60 to 2592000)*

MAC Authentication Fallback □ *Use guest-access only as fallback for clients failing MAC-authentication*

Extend Interface *Configure the interface which is extended for guest access*

IP Address or Domain Name

IP Address / Domain Name	Action

No whitelist available

Table 22: Configure: WLAN > Guest Access > External Hotspot parameters

Parameters	Description	Range	Default
WLAN > Guest Access > External Hotspot			
Access Policy	There are four types of access types provided for the end user: 1. Clickthrough This mode allows users to get access data without any authentication mechanism. User can access internet as soon as he is connected and accepts Terms and Conditions. 2. RADIUS User has to provide username and password, which is then redirected to RADIUS server for authentication. If successful, user is provided with data access. 3. LDAP User must provide username and password, which is then redirected to LDAP server for authentication. If successful, user is provided with data access. 4. Local Guest Account User has to configure username and password on device, which has to be provided in the redirection page for successful authentication and data access.	–	Clickthrough
LDAP Server baseDN	Provision to configure the point from where the server will search for users.	-	–
LDAP Server adminDN	Provision to configure the Admin Domain which binds with LDAP server for successful search of LDAP/AD server.	-	–
LDAP Server Admin Password	Provision to configure Admin password of LDAP/AD server to search all organizational unit defined in a Domain component.	-	–
Redirect Mode	Provision to configure the HTTP or HTTPS mode of redirection URL. 1. HTTP AP sends a HTTP POSTURL to the associated client, which will be http://<Pre-defined-URL>. 2. HTTPS	–	HTTP

Parameters	Description	Range	Default
	AP sends HTTPS POSTURL to the successful associated client, which will be https://<Pre-defined-URL>.		
Redirect Hostname	User can configure a friendly hostname, which is added in DNS server and is resolvable to cnPilot IP address. This parameter once configured will be replaced with IP address in the redirection URL provided to wireless stations.	–	–
WISPr Clients External Server Login	Provision to enable re-direction of guest access portal URL obtained through WISPr.	–	Disabled
External Page URL	User can configure landing/login page which is posted to wireless stations that are not Guest Access authenticated.	–	–
External Portal Post Through cnMaestro	This is required when HTTPS is only supported by external guest access portal. This option when enabled minimizes certification. Certificate is required to install only in cnMaestro On-Premises.	–	Disabled
External Portal Type	Two modes of portal types are supported by cnPilot products. 1. Standard This mode is selected, for all third-party vendors whose Guest Access services is certified and integrated with cnPilot products. 2. XWF This mode is selected for Facebook Express Wi-Fi deployment.	–	Standard
XWF Version	1. XWF-v1 is also called as XWF-Lite 2. XWF-v2 is also called as XWF-Full 3. XWF-v3	–	1
XWF Key	This is applicable when XWF portal mode is selected irrespective of XWF version.	–	–
XWF Access Token	XWF Access token in URL encoded format.	-	-
XWF SSE Server Timeout	This is applicable when XWF portal mode is selected. Provision to configure XWF SSE Server Timeout.	5-1800	60
Success Action	Provision to configure redirection URL after successful login to captive portal services. User can configure three modes of redirection URL:	–	Internal Logout Page

Parameters	Description	Range	Default
	1. Internal Logout Page After successful login, Wireless client is redirected to logout page hosted on AP. 2. Redirect user to External URL Here users will be redirected to URL which is configured on device in Redirection URL configurable parameter. 3. Redirect user to Original URL Here users will be redirected to URL that is accessed by user before successful captive portal authentication.		
Redirect user to External URL	Provision to configure re-direction URL after successful login and an additional information of AP and wireless station information can be appended in the URL. • Prefix Query Strings in Redirect URL This option is selected by default. Following information is appended in the redirection URL: ◦ SSID ◦ AP MAC ◦ NAS ID ◦ AP IP ◦ Client MAC • Redirection URL User can provide either HTTP or HTTPS URL.	–	–
Redirection user to Original URL	Users will be redirected to URL that is accessed by user before successful captive portal authentication. There is additional parameter Prefix Query Strings in Redirection URL that is enabled by default and details given below: • Prefix Query Strings in Redirect URL This option is selected by default. Following information is appended in the redirection URL: ◦ SSID ◦ AP MAC ◦ NAS ID ◦ AP IP ◦ Client MAC	–	–
Success message	Provision to configure text to display upon successful Guest Access authentication. This is applicable only when Success Action mode is Internal Logout Page.	–	–

Parameters	Description	Range	Default
Redirection URL Query String	Following information is appended in the redirection URL, if “Prefix Query Strings in Redirect URL” is enabled. • Client IP • RSSI • AP Location	–	Disabled
Redirect	• If enabled, only HTTP URLs will be redirected to Guest Access login page. • If disabled, both HTTP and HTTPs URLs will be redirected to Guest Access login page.	–	Enabled
Redirect User Page	IP address configured in this field is used as logout/disconnect/redirect to captive portal URL for Guest Access sessions. IP address configured should not be reachable to internet.	–	1.1.1.1
Proxy Redirection Port	Proxy port can be configured with which proxy server is enabled. This allows URL’s accessed with proxy port to be redirected to login page.	1 - 65535	–
Session Timeout	This is the duration of time, client will be allowed to access internet if quota persists, after which AP sends de-authentication. Wireless station has to undergo Guest Access authentication after session timeout.	60 - 2592000	28800
Inactivity Timeout	Provision to configure timeout period to disconnect wireless stations that are associated but no data traffic. AP starts timer when there is no data received from a wireless station and disconnects when timer reaches 0.	60 - 2592000	1800
MAC Authentication Fallback	It’s a mechanism in which wireless stations will be redirected to Guest Access login page after any supported type of MAC address authentication failures.	–	Disabled
Extend Interface	Provision to support Guest Access on Ethernet interface.	–	Disabled
Traffic Class 1	This is exclusively applicable for XWF portal type. This traffic class includes IP and URLs related to XWF for successful re-direction, login and payments.	–	–
Traffic Class 2	This is exclusively applicable for XWF portal type. This traffic class includes whitelist IP/URLs that can be accessed without Guest Access authentication.	–	–

Parameters	Description	Range	Default
Whitelist	Provision to configure either IPs or URLs to bypass traffic, such that user can access those IPs or URLs without Guest Access authentication. This parameter is valid for standard portal type.	–	–
Captive Portal bypass User Agent	Provision to limit the auto-popup to a certain browser as configured based on User-agent of browsers. This is valid for standard portal type.	–	–

To configure the above parameters, navigate to the **Configure > WLAN > Guest Access** tab and provide the details as given below:

1. Enable the required access types from the **Access Policy** checkbox.
2. Enable HTTP or HTTPS from the **Redirect Mode** checkbox.
3. Enter **Redirect Hostname** in the textbox.
4. Enable **WISPr Clients External Server Login** checkbox.
5. Enter **External Page URL** in the textbox.
6. Enable **External Portal Post Through cnMaestro** checkbox.
7. Select **External Portal** Type from the drop-down list.
8. Enable configured modes of redirection URL in **Success Action** checkbox.
9. Enter **Success** message to appear in the textbox.
10. Enable the required **Redirection URL Query String** checkbox.
11. Enable **Redirect** checkbox for HTTP packets.
12. Enter configuring IP address in the **Redirect User Page** textbox.
13. Enter Port number in the **Proxy Redirection Port** textbox.
14. Enter the session timeout in seconds in the **Session Timeout** textbox.
15. Enter the inactivity timeout in seconds in the **Inactivity Timeout** textbox.
16. Select the MAC Authentication Fallback checkbox if guest-access is used only as fallback for clients failing MAC-authentication.
17. Enter the name of the interface that is extended for guest access in the **Extend Interface** textbox.
18. Click **Save**.
19. Select **Traffic Class 1** and **Traffic Class 2** tabs and enter the following:
    1. Enter **Name** in the textbox.
    2. Enter **Policy** in the textbox.
    3. Click **Save**.
20. Select Internet tab and enter **Name** in the textbox.

1. Click **Save**.

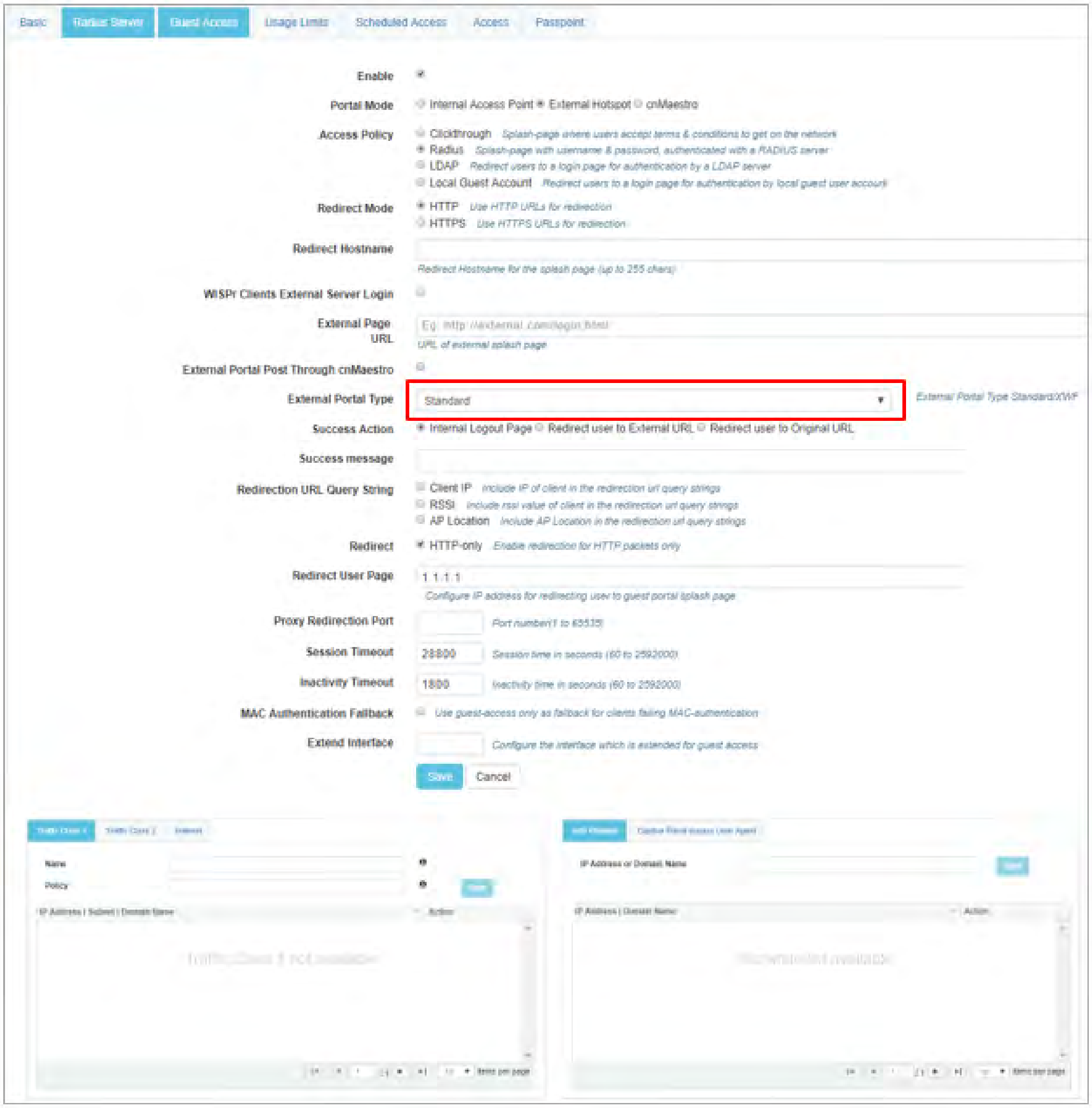
To configure **Whitelist**:

1. Enter the IP address or the domain name of the permitted domain in the IP Address or Domain Name textbox.
2. Click **Save**.

To configure **Captive Portal bypass User Agent**:

1. Select **Index** parameter value from the drop-down list.
2. Enter **User Agent String** parameter in the textbox.
3. Select **Status Code** from the drop-down list.
4. Enter **HTML Response** in the textbox.
5. Click **Save**.

Figure 24: *Configure: WLAN > Guest Access > External Hotspot (Standard) parameter*



Enable ☑

Portal Mode ○ Internal Access Point ● External Hotspot ○ cnMaestro

Access Policy
○ Clickthrough *Splash-page where users accept terms & conditions to get on the network*
● Radius *Splash-page with username & password, authenticated with a RADIUS server*
○ LDAP *Redirect users to a login page for authentication by a LDAP server*
○ Local Guest Account *Redirect users to a login page for authentication by local guest user account*

Redirect Mode
● HTTP *Use HTTP URLs for redirection*
○ HTTPS *Use HTTPS URLs for redirection*

Redirect Hostname
Redirect Hostname for the splash page (up to 255 chars)

WISPr Clients External Server Login □

External Page URL Eg: http://external.com/login.html
URL of external splash page

External Portal Post Through cnMaestro □

External Portal Type Standard ▾ *External Portal Type Standard/XWF*

Success Action ● Internal Logout Page ○ Redirect user to External URL ○ Redirect user to Original URL

Success message

Redirection URL Query String
□ Client IP *include IP of client in the redirection url query strings*
□ RSSI *include rssi value of client in the redirection url query strings*
□ AP Location *include AP Location in the redirection url query strings*

Redirect ☑ HTTP-only *Enable redirection for HTTP packets only*

Redirect User Page 1.1.1.1
Configure IP address for redirecting user to guest portal splash page

Proxy Redirection Port *Port number(1 to 65535)*

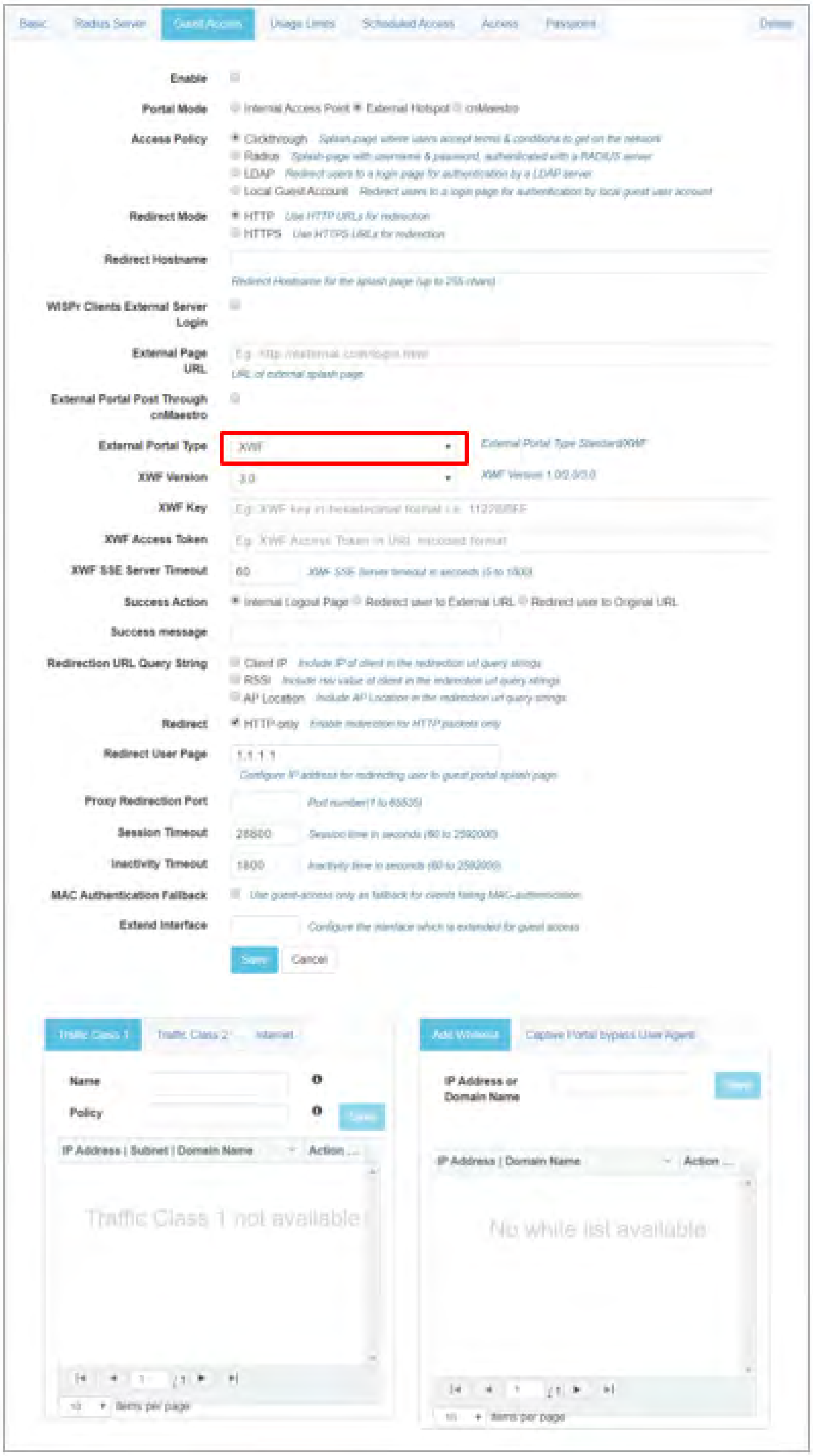
Session Timeout 28800 *Session time in seconds (60 to 2592000)*

Inactivity Timeout 1800 *Inactivity time in seconds (60 to 2592000)*

MAC Authentication Fallback □ *Use guest-access only as fallback for clients failing MAC-authentication*

Extend Interface *Configure the interface which is extended for guest access*

Figure 25: *Configure: WLAN > Guest Access > External Hotspot (XWF) parameter*



Enable □

Portal Mode ○ Internal Access Point ● External Hotspot ○ cnMaestro

Access Policy
● Clickthrough *Splash page where users accept terms & conditions to get on the network*
○ Radius *Splash-page with username & password, authenticated with a RADIUS server*
○ LDAP *Redirect users to a login page for authentication by a LDAP server*
○ Local Guest Account *Redirect users to a login page for authentication by local guest user account*

Redirect Mode
● HTTP *Use HTTP URLs for redirection*
○ HTTPS *Use HTTPS URLs for redirection*

Redirect Hostname
Redirect Hostname for the splash page (up to 255 chars)

WISPr Clients External Server Login □

External Page URL: E.g. http://external.com/login.html
URL of external splash page

External Portal Post Through cnMaestro □

External Portal Type: XWF *External Portal Type Standard/XWF*

XWF Version: 3.0 *XWF Version 1.0/2.0/3.0*

XWF Key: E.g. XWF key in hexadecimal format i.e. 11223BEFF

XWF Access Token: E.g. XWF Access Token in URL encoded format

XWF SSE Server Timeout: 60 *XWF SSE Server timeout in seconds (5 to 1500)*

Success Action ● Internal Logout Page ○ Redirect user to External URL ○ Redirect user to Original URL

Success message

Redirection URL Query String
□ Client IP *Include IP of client in the redirection url query strings*
□ RSSI *Include rssi value of client in the redirection url query strings*
□ AP Location *Include AP Location in the redirection url query strings*

Redirect ☑ HTTP-only *Enable redirection for HTTP packets only*

Redirect User Page: 1.1.1.1
Configure IP address for redirecting user to guest portal splash page

Proxy Redirection Port *Port number(1 to 65535)*

Session Timeout: 28800 *Session time in seconds (60 to 2592000)*

Inactivity Timeout: 1800 *Inactivity time in seconds (60 to 2592000)*

MAC Authentication Fallback □ *Use guest-access only as fallback for clients failing MAC-authentication*

Extend Interface *Configure the interface which is extended for guest access*

Table 23: Configure: WLAN > Guest Access > cnMaestro parameters

Parameters	Description	Range	Default
WLAN > Guest Access > cnMaestro			
Guest Portal Name	Provision to configure the name of the Guest Access profile which is hosted on CnMaestro.	–	–
Redirect	▪ If enabled, only HTTP URLs will be redirected to Guest Access login page. ▪ If disabled, both HTTP and HTTPs URLs will be redirected to Guest Access login page.	–	Enabled
Redirect User Page	IP address configured in this field is used as logout URL for Guest Access sessions. IP address configured should be not reachable to internet.	–	1.1.1.1
Proxy Redirection Port	Proxy port can be configured with which proxy server is enabled. This allows URL's accessed with proxy port to be redirected to login page.	1 - 65535	–
Inactivity Timeout	Provision to configure timeout period to disconnect wireless stations that are associated but no data traffic. AP starts timer when there is no data received from a wireless station and disconnects when timer reaches 0.	60 - 2592000	1800
MAC Authentication Fallback	It's a mechanism in which wireless stations will be redirected to Guest Access login page after any supported type of MAC address authentication fails.	–	Disabled
Extend Interface	Provision to support Guest Access on Ethernet interface.	–	Disabled
Whitelist	Provision to configure either IPs or URLs to bypass traffic, such that user can access those IPs or URLs without Guest Access authentication.	–	–
Captive Portal bypass User Agent	Provision to limit the auto-popup to a certain browser as configured based on User-agent of browsers.	–	–

To configure the above parameters, navigate to the **Configure > WLAN > cnMaestro** tab and provide the details as given below:

1. Enter **Guest Portal Name** which is hosted on cnMaestro in the textbox.
2. Enable **Redirect** checkbox for HTTP packets.
3. Enter configuring IP address in the **Redirect User Page** textbox.
4. Enter Port number in the **Proxy Redirection Port** textbox.
5. Enter the inactivity timeout in seconds in the **Inactivity Timeout** textbox.
6. Select the **MAC Authentication Fallback** checkbox if guest-access is used only as fallback for clients failing MAC-authentication.

7. Enter the name of the interface that is extended for guest access in the **Extend Interface** textbox.
8. Click **Save**.

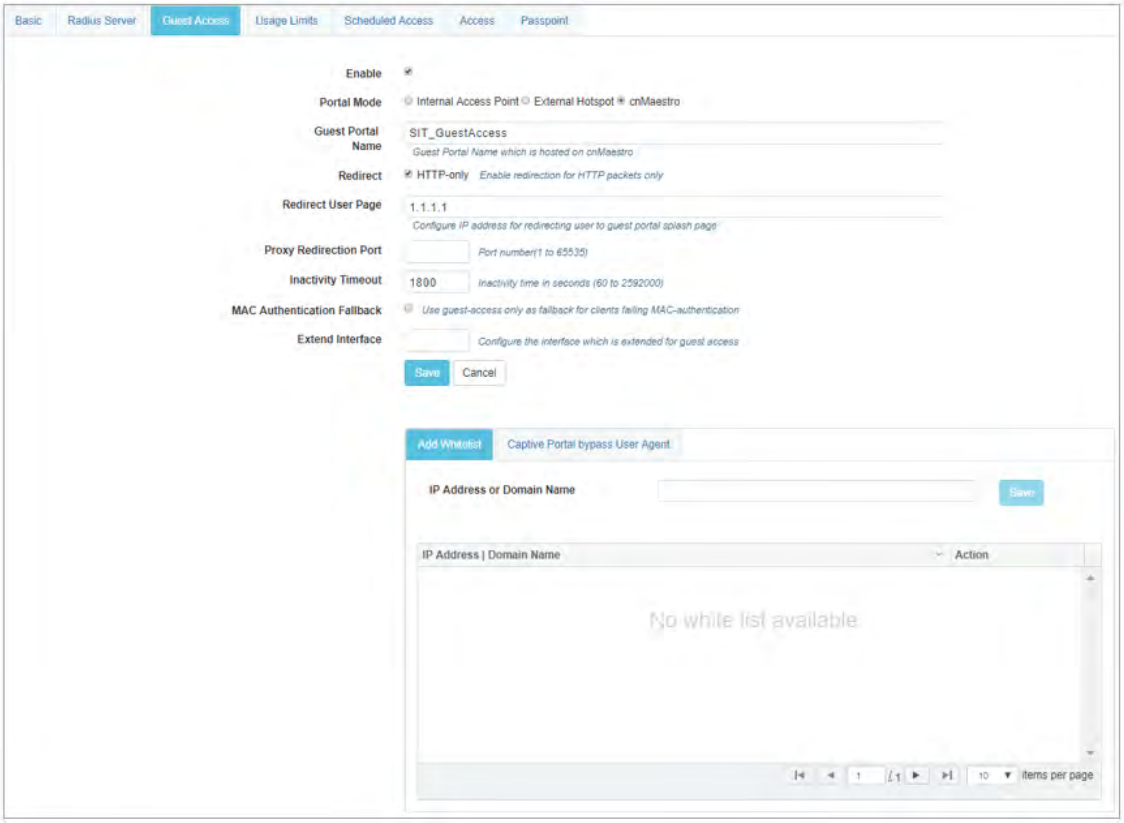
To configure the **Whitelist parameter**:

1. Enter the IP address or the domain name of the permitted domain in the **IP Address** or **Domain Name** textbox.
2. Click **Save**.

To configure the **Captive Portal bypass User Agent** parameter:

1. Select Index parameter value from the drop-down list.
2. Enter **User Agent String** parameter in the textbox.
3. Select S**tatus Code** from the drop-down list.
4. Enter **HTML Response** in the textbox.
5. Click **Save**.

Figure 26: *Configure: WLAN > Guest Access > cnMaestro parameter*



Enable ☑

Portal Mode ○ Internal Access Point ○ External Hotspot ● cnMaestro

Guest Portal Name: SIT_GuestAccess
Guest Portal Name which is hosted on cnMaestro

Redirect ☑ HTTP-only *Enable redirection for HTTP packets only*

Redirect User Page: 1.1.1.1
Configure IP address for redirecting user to guest portal splash page

Proxy Redirection Port: *Port number(1 to 65535)*

Inactivity Timeout: 1800 *Inactivity time in seconds (60 to 2592000)*

MAC Authentication Fallback □ *Use guest-access only as fallback for clients failing MAC-authentication*

Extend Interface: *Configure the interface which is extended for guest access*

IP Address or Domain Name

IP Address | Domain Name	Action
No white list available	

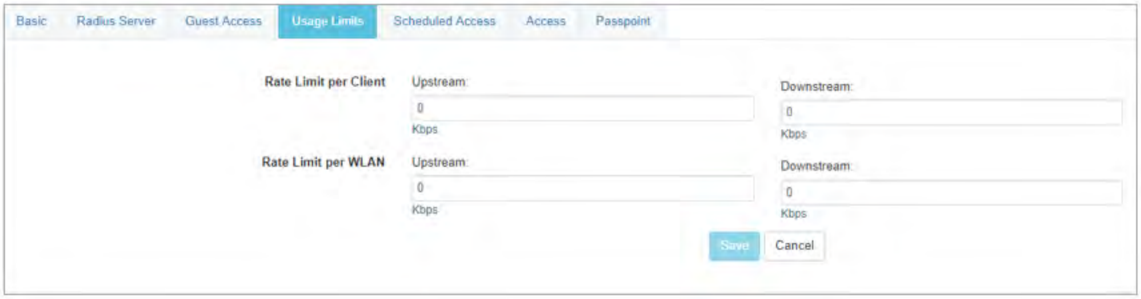
Table 24: Configure: WLAN > Usage Limits parameters

Parameters	Description	Range	Default
Rate Limit per Client	Provision to limit throughput per client. Default allowed throughput per client is unlimited. i.e., maximum allowed by 802.11 protocols. The traffic from/to each client on a SSID can be rate-limited in either direction by configuring Client rate limit available in usage-limits inside the WLAN Configuration. This is useful in deployments like public hotspots where the backhaul is limited and the network administrator would like to ensure that one client does not monopolize all available bandwidth.	–	0 [Unlimited]
Rate Limit per WLAN	Provision to limit throughout across WLAN irrespective of number of associated wireless stations to WLAN. All upstream/downstream traffic on an SSID (aggregated across all wireless clients) can be rate-limited in either direction by configuring usage-limits inside the WLAN Configuration section of the GUI. This is useful in cases where multiple SSIDs are being used and say one is for corporate use, and another for guests. The network administrator can ensure that the guest VLAN traffic is always throttled, so it will not affect the corporate WLAN.	–	0 [Unlimited]

To configure the above parameters, navigate to the **Configure > WLAN > Usage Limits** tab and provide the details as given below:

1. Enter Upstream and Downstream parameters in the **Rate Limit per Client** textbox.
2. Enter Upstream and Downstream parameters in the **Rate Limit per WLAN** textbox.
3. Click **Save**.

Figure 27: *Configure: WLAN > Usage Limits parameters*



Rate Limit per Client
Upstream: 0 Kbps
Downstream: 0 Kbps

Rate Limit per WLAN
Upstream: 0 Kbps
Downstream: 0 Kbps

Table 25: Configure: WLAN > Scheduled Access parameters

Parameters	Description	Range	Default
Scheduled Access	Provision to configure the availability of Wi-Fi services for a selected time duration. cnPilot has capability of configuring the availability of Wi-Fi services on all days or on specific day (s) of a week. Time format is in Hours.	00:00 Hrs. - 23:59 Hrs.	Disabled

To configure the above parameter, navigate to the **Configure > WLAN > Scheduled Access** tab and provide the details as given below:

1. Enter the start and end time to enable the Wi-Fi access in the respective textboxes.
2. Click **Save**.

Figure 28: *Configure: WLAN > Scheduled Access parameters*

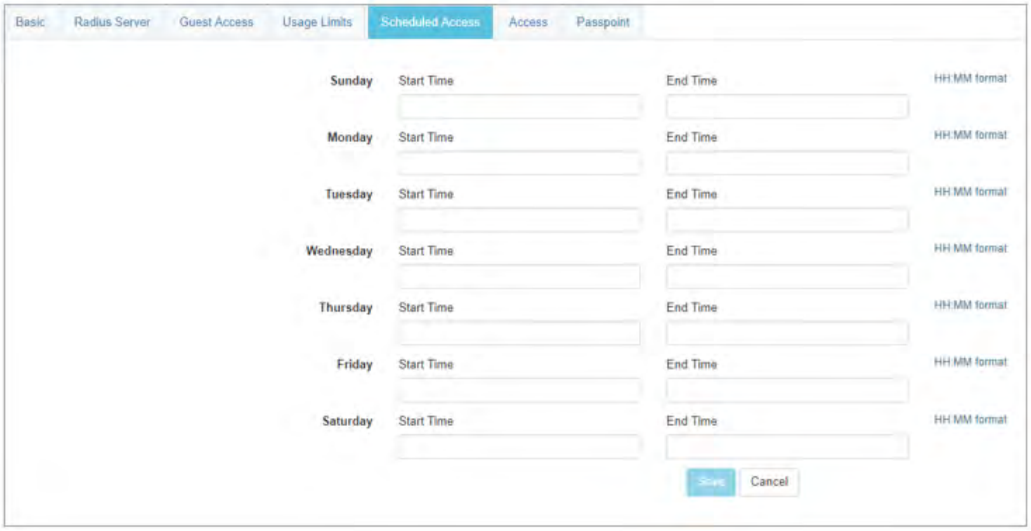


Table 26: Configure: WLAN > Access parameters

Parameters	Description	Range	Default
ACL			
Precedence	Provision to configure index of ACL rule. Packets are validated and processed based on precedence value configured.	1-256	1
Policy	Provision to configure whether to allow, deny or route traffic.	Allow/deny/Route	Deny
Direction	Provision to apply the ACLs rules configured either in any direction or specific direction.	–	–
Type	cnPilot devices support three layers of ACLs. A rule can be configured as below: ▪ MAC ▪ IP This type is for IPv4 based IP ACL. ▪ IP6 This type is for IPv6 based IP ACL. ▪ Proto	–	IP

Parameters	Description	Range	Default
	This type is for protocol supported in IPv4. ▪ Proto6 This type is for protocol supported in IPv6.		
Source IP/Mask	This option is available when ACL type is configured to an IPv4/IPv6 address. This field helps user to configure if rule needs to be applied for a single IPv4/IPv6 address or range of IPv4/IPv6 addresses.	–	–
Destination IP/Mask	This option is available when ACL type is configured to an IPv4/IPv6 address. This field helps user to configure if rule needs to be applied for a single IPv4/IPv6 address or range of IPv4/IPv6 addresses.	–	–
Source MAC/Mask	This option is available when ACL type is configured to a MAC address. This field helps user to configure if rule needs to be applied for a single device MAC address or range of MAC addresses.	–	–
Destination MAC/Mask	This option is available when ACL type is configured to MAC address. This field helps user to configure if rule needs to be applied for a single device MAC address or range of MAC addresses.	–	–
Protocol	This option is available when user selects ACL type as proto/proto6. User can select following protocols: • TCP • UDP • ICMP • Any	–	TCP
Source Port	Provision to apply ACL with combination of protocol and port.	–	–
Destination Port	Provision to apply ACL with combination of protocol and port.	–	–
Description	To make administrator easy to understand, a text string can be added for each ACL rule.	–	–
DNS-ACL			
Precedence	Provision to configure index of ACL rule. Packets are validated and processed based on Precedence value configured.	–	1

Parameters	Description	Range	Default
Action	Provision to configure whether to allow or deny traffic.	–	Deny
Domain	Provision to configure domain names and rules are applied based on Action configured.	–	–
MAC Authentication			
MAC Authentication Policy	cnPilot supports multiple methods of MAC authentication. Following are details of each mode: 1. Permit Wireless station MAC addresses listed will be allowed to associate to AP. 2. Deny When user configures a MAC address, those wireless station shall be denied to associate and the non-listed MAC address will be allowed. 3. Radius For every wireless authentication, cnPilot sends a radius request and if radius accept is received, then wireless station is allowed to associate. 4. cnMaestro This option is preferable when administrator prefers centralized MAC authentication policy. For every wireless authentication, AP sends query to cnMaestro if it allowed or disallowed to connect. Based on the configuration, wireless stations are either allowed or denied.	–	Deny
MAC		–	–
Description		–	–

To configure the above parameter, navigate to the **Configure > WLAN > Access** tab and provide the details as given below:

To configure ACL:

1. Select **Precedence** from the drop-down list.
2. Select type of **Policy** from drop-down list.
3. Select **Direction** from the drop-down list.
4. Select **Type** from the drop-down list.
5. Enter IP address of source in the **Source IP/Mask** textbox.
6. Enter IP address of destination in the **Destination IP/Mask** textbox.

7. Enter **Description** in the textbox.
8. Click **Save**.

To configure **DNS ACL**:

1. Select **Precedence** from the drop-down list.
2. Select type of action from **Action** drop-down list.
3. Enter domain name in the **Domain** textbox.
4. Click **Save**.

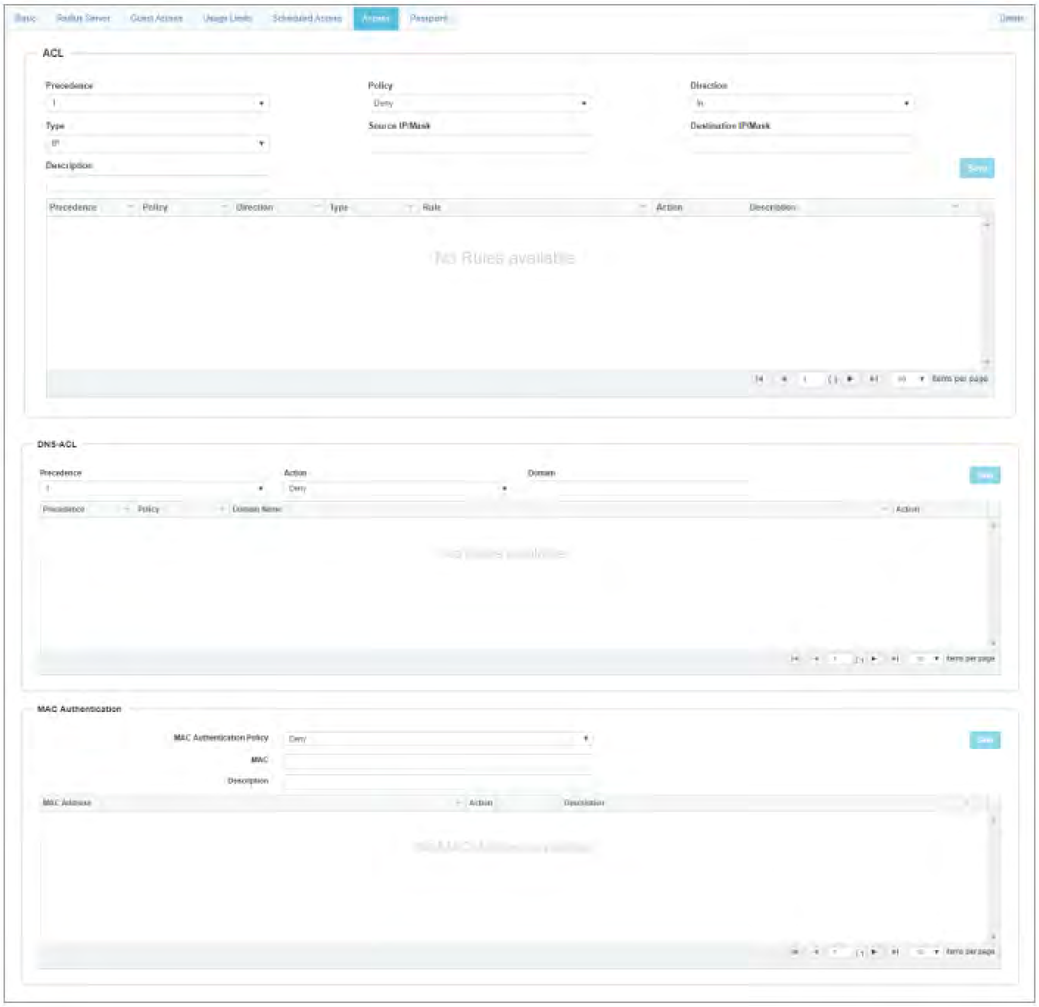
To configure **MAC Authentication**:

1. Select **MAC Authentication Policy** from the drop-down list.
2. Enter **MAC** in the textbox.
3. Enter **Description** in the textbox.
4. Click **Save**.

Table 27: Behavior of IP ACL when dual stack is enabled

IPv4 ACL Rule	IPv6 ACL Rule	Remark
No rule	No rule	All IPv4 and IPv6 allowed
IPv4 permit rule	No rule	All IPv6 packets dropped
No rule	IPv6 rule	All IPv4 packets dropped
IPv4 permit rule	IPv6 permit rule	All IPv4 and IPv6 allowed

Figure 29: *Configure: WLAN > Access parameters*



Precedence: 1

Policy: Deny

Direction: In

Type: IP

Precedence: 1

Action: Deny

MAC Authentication Policy: Deny

Table 28: Configure: WLAN > Passpoint parameters

Parameters	Description	Range	Default
Configuration > Hotspot2.0 / Passpoint			
Enable	Passpoint (Release 2) enables a secure hotspot network access, online sign up and Policy Provisioning.	–	Disabled
DGAF	Downstream Group Addressed Forwarding, when enabled the WLAN doesn't transmit any multicast and broadcast packets.	–	Disabled
ANQP Domain ID	ANQP domain identifier included when the HS 2.0 indication element is in Beacon and Probe Response frames.	0-65535	0
Comeback Delay	Comeback Delay in milliseconds.	100-2000	0

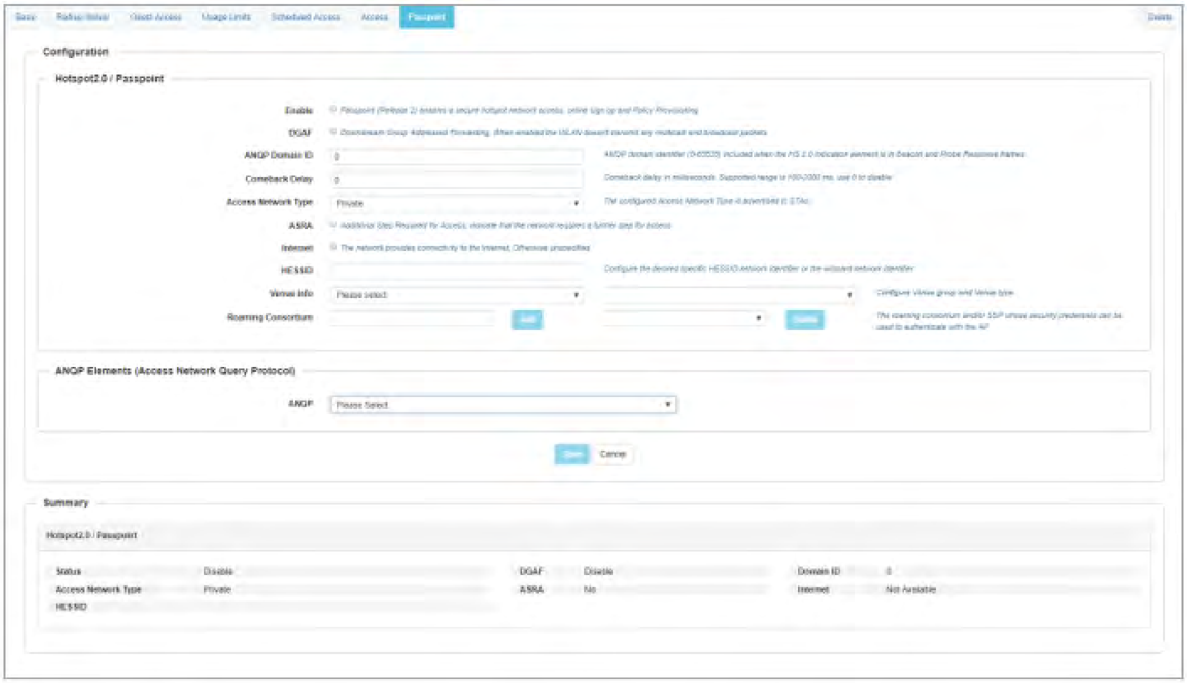
Parameters	Description	Range	Default
Access Network Type	The configured Access Network Type is advertised to STAs. Following are the different network types supported: ■ Private ■ Chargeable Public ■ Emergency Services ■ Free Public ■ Personal Device ■ Private with Guest ■ Test ■ Wildcard	–	Private
ASRA	Indicates that the network requires a further step for access.	–	Disabled
Internet	The network provides connectivity to the Internet if not specified.	–	Disabled
HESSID	Configures the desired specific HESSID network identifier or the wildcard network identifier.	–	–
Venue Info	Configure venue group and venue type.	–	–
Roaming Consortium	The roaming consortium and/or SSP whose security credentials can be used to authenticate with the AP.	–	–
ANQP Elements	Select any one of the following: • 3GPP Cellular Network Information • Connection Capability • Domain Name List • Icons • IP Address Type information • NAI Realm List • Network Authentication Type • Operating Class Indication • Operator Friendly Names • OSU Provider List • Venue Name Information • WAN Metrics	–	–

To configure the above parameter, navigate to the **Configure > WLAN > Passpoint** tab and provide the details as given below:

1. Select **Enable** checkbox to enable passpoint functionality.
2. Select **DGAF** checkbox to enable Downstream Group Addressed Forwarding functionality.

3. Enter the domain identifier value in **ANQP Domain ID** textbox.
4. Enter **Comeback Delay** in milliseconds in the textbox.
5. Choose the **Access Network Type** value from the drop-down list.
6. Enable **ASRA** checkbox if the network requires additional steps for access.
7. Enable **Internet** checkbox for the network to provide connectivity to the Internet.
8. Enter the **HESSID** to configure the desired specific HESSID network identifier or the wildcard network identifier.
9. Select **Venue** Info from the drop-down list.
10. To add Roaming Consortium value, enter the value in the textbox and click Add. To delete a **Roaming Consortium** value, select from the drop-down list and click **Delete**.
11. Click **Save**.

Figure 30: *Configure: WLAN > Passpoint parameters*



Configuration

Hotspot2.0 / Passpoint

Enable □ Passpoint (Release 2) enables a secure hotspot network access, online sign up and Policy Provisioning

DGAF □ Downstream Group Addressed Forwarding. When enabled the WLAN doesn't transmit any multicast and broadcast packets

ANQP Domain ID: 0 — ANQP domain identifier (0-65535) included when the HS 2.0 indicator element is in Beacon and Probe Response frames

Comeback Delay: 0 — Comeback delay in milliseconds. Supported range is 100-2000 ms, use 0 to disable

Access Network Type: Private — The configured Access Network Type is advertised to STAs

ASRA □ Additional Step Required for Access; indicate that the network requires a further step for access

Internet □ The network provides connectivity to the Internet. Otherwise unspecified

HESSID: — Configure the desired specific HESSID network identifier or the wildcard network identifier

Venue Info: Please select — Configure Venue group and Venue type

Roaming Consortium: Add Delete — The roaming consortium and/or SSP whose security credentials can be used to authenticate with the AP

ANQP Elements (Access Network Query Protocol)

ANQP: Please Select

Save Cancel

Summary

Hotspot2.0 / Passpoint

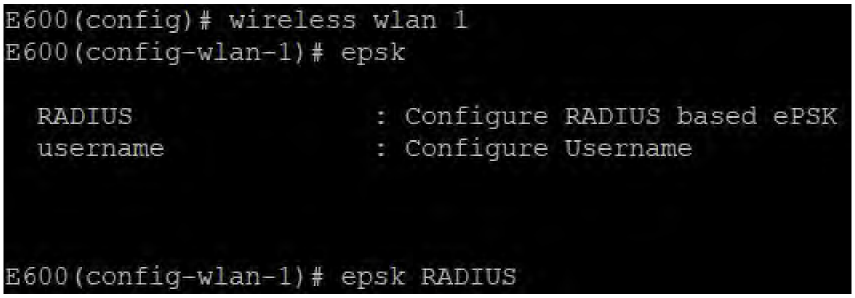
Status	Disable	DGAF	Disable	Domain ID	0
Access Network Type	Private	ASRA	No	Internet	Not Available
HESSID					

Radius based ePSK Premium feature

In Pre-shared key (PSK) authentication, a shared secret is used to authenticate the client. Each client will have the same Pre-shared key to access the network. Cambium has an ePSK feature, an extension of WPA2 PSK where multiple passphrases can assign to a single SSID. Which allows multiple clients to have different passphrase to access the network. The Wi-Fi clients can have unique passphrases to be used by each client using this feature.

The same feature (ePSK) is now extended to RADIUS. The RADIUS server can provide the matching PMK for a given client, and corresponding standard RADIUS attributes can be enforced as client session management.

Configuration CLI:



```
E600(config)# wireless wlan 1
E600(config-wlan-1)# epsk

  RADIUS                    : Configure RADIUS based ePSK
  username                  : Configure Username



E600(config-wlan-1)# epsk RADIUS
```

enhanced PSK (ePSK)

By using the ePSK feature, users can configure and support individual PSK keys for different clients. This feature can be configured under a given WLAN configuration in cnMaestro UI. For on devices, only CLI support is available.

This feature also supports individual VLAN assignments for a given key which helps to put client traffic on different VLANs for limiting broadcast traffic.

Note

ePSK scale is a Premium feature where users can configure more than 300 ePSK (up to 1024 ePSK) per WLAN and it is controlled by cnMaestro X.

Cambium Traffic Class Premium feature

Cambium Traffic Class attributes are supported for wireless guest clients. The device allows guest clients to communicate destinations (defined using IP/Network address) defined under traffic class names without completing the guest authentication. The RADIUS server can push traffic class name and data quota as part of the RADIUS accept packet or CoA update. AP keeps track of guest clients traffic usage against each traffic class and data utilization information is sent to the accounting server in RADIUS accounting packets (Account-Interim update and account stop messages).

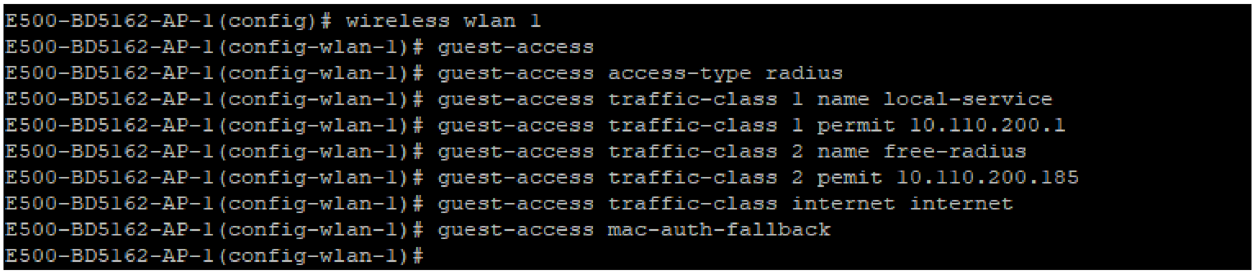
Traffic class can be defined under the WLAN profile and only three traffic classes are supported via CLI mode. If APs are managed from cnMaestro, traffic class can be configured in AP Group using User-Defined Overrides options. When the traffic class quota gets exhausted, user clients are redirected to the external captive portal server.

Cambium Networks Wi-Fi devices support the following Cambium vendor-specific (VSA 17713) Traffic Class attributes:

Table 29: Traffic Class attributes

Name	Number	Type
Cam-Vlan-Pool-Id	157	string
CAMB-Authorize-Classes	158	tlv
CAMB-Authorize-Class-Name	158.1	string
CAMB-Authorize-Bytes-Left	158.2	integer64
CAMB-Traffic-Classes-Acct	159	tlv
CAMB-Acct-Class-Name	159.1	string
CAMB-Acct-Input-Octets	159.2	integer64
CAMB-Acct-Output-Octets	159.3	integer64
CAMB-Acct-Input-Packets	159.4	integer64
CAMB-Acct-Output-Packets	159.5	integer64
CAMB-Walled-Garden-State	160	integer

CLI configuration:



```
E500-BD5162-AP-1(config)# wireless wlan 1
E500-BD5162-AP-1(config-wlan-1)# guest-access
E500-BD5162-AP-1(config-wlan-1)# guest-access access-type radius
E500-BD5162-AP-1(config-wlan-1)# guest-access traffic-class 1 name local-service
E500-BD5162-AP-1(config-wlan-1)# guest-access traffic-class 1 permit 10.110.200.1
E500-BD5162-AP-1(config-wlan-1)# guest-access traffic-class 2 name free-radius
E500-BD5162-AP-1(config-wlan-1)# guest-access traffic-class 2 pemit 10.110.200.185
E500-BD5162-AP-1(config-wlan-1)# guest-access traffic-class internet internet
E500-BD5162-AP-1(config-wlan-1)# guest-access mac-auth-fallback
E500-BD5162-AP-1(config-wlan-1)#
```

Chapter 9: Configuration - Network

This chapter describes the following topics:

- Overview
- Configuring Network parameters

Overview

This chapter gives an overview of cnPilot configurable parameters related to LAN, VLAN, Routes, DHCP server, Tunnel, ACL and Firewall.

Configuring Network parameters

cnPilot network configuration parameters are segregated into following sections:

- VLAN
- Routes
- Ethernet Ports
- Security
- DHCP
- Tunnel
- PPPoE
- VLAN Pool

IPv4 network parameters

VLAN

Table 30: Configure: Network > VLAN > IPv4 parameters

Parameters	Description	Range	Default
VLAN > IPv4			
Edit	Provision to select the VLAN interface that user is intended to view/update configuration.	–	VLAN 1
Address	Provision to configure mode of IPv4 address configuration for an interface selected. Two modes are supported: 1. DHCP This is the default mode in which cnPilot device tries to obtain IPv4 address from DHCP server. 2. Static IP	–	DHCP

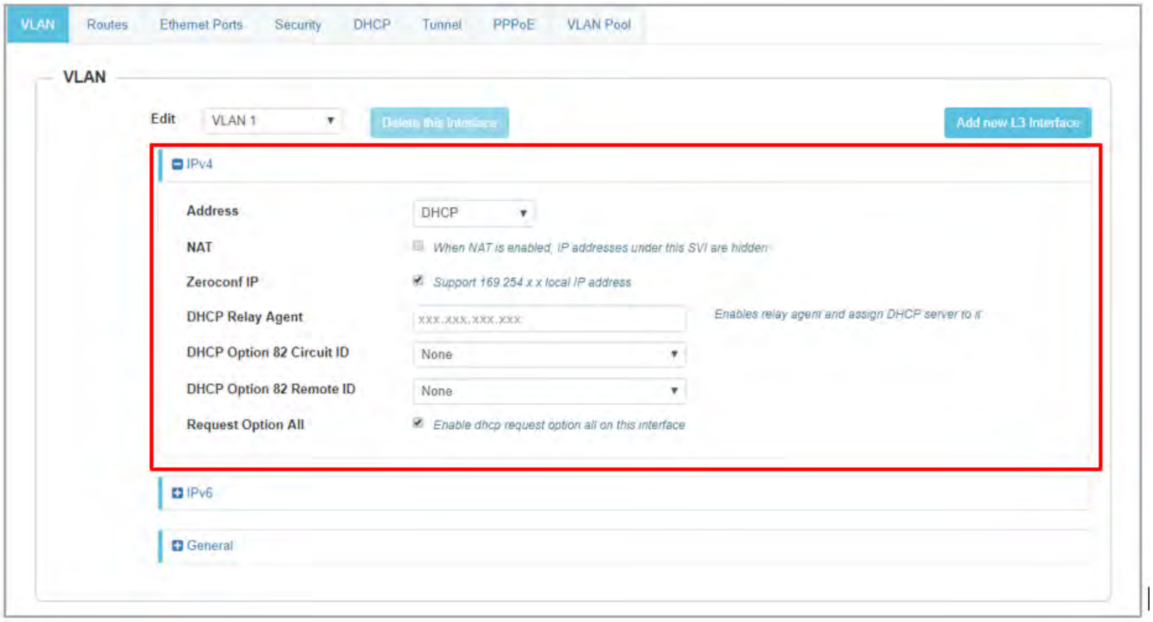
Parameters	Description	Range	Default
	User must explicitly configure IPv4 address and Netmask for a VLAN selected.		
NAT	This option is preferable when you defined local DHCP servers. This option when selected, traffic from wireless stations are NAT'ed to the default gateway interface IP.		Disabled
Zeroconf IP	Zeroconf IP is recommended to be enabled. This interface is available only on VLAN1 configuration section. If VLAN 1 is not allowed in Ethernet interfaces, this IP will not be accessible.	–	Enabled
DHCP Relay Agent	This option is enabled when DHCP server is hosted on a VLAN which is not same as client that is requesting for DHCP IP. Enabling this appends Option 82 in the DHCP packets. Following information is allowed to configure: 1. DHCP Option 82 Circuit ID Configurable parameters under this option are as follows: • Hostname • APMAC • BSSID • SSID • Custom 2. DHCP Option 82 Remote ID Configurable parameters under this option are as follows: • Hostname • APMAC • BSSID • SSID • Custom	–	Disabled
Request Option All	This configuration decides the interface on which cnPilot AP will learn the following: • IPv4 default gateway • DHCP client options like Option 43 and Option 15 (Controller discovery like controller host name / IPv4 address) • DNS Servers • Domain Name	–	Enabled on VLAN1

To configure the above parameter, navigate to the **Configure > Network > VLAN** tab and provide the details as given below:

To configure **VLAN IPv4**:

1. Select Edit checkbox to enable **VLAN1** functionality.
2. Enable DHCP or Static IP mode of IPv4 address configuration from the Address checkbox.
3. Enable **NAT** checkbox.
4. Enable **Zeroconf IP** checkbox.
5. Enter **DHCP Relay Agent** parameter in the textbox.
6. Select **DHCP Option 82 Circuit ID** from the drop-down list.
7. Select **DHCP Option 82 Remote ID** from the drop-down list.
8. Enable **Request Option All** checkbox.
9. Click **Save**.

Figure 31: *Configure: Network > VLAN > IPv4 parameters*



VLAN

Edit: VLAN 1

IPv4

Address	DHCP
NAT	□ *When NAT is enabled, IP addresses under this SVI are hidden*
Zeroconf IP	☑ *Support 169.254.x.x local IP address*
DHCP Relay Agent	xxx.xxx.xxx.xxx *Enables relay agent and assign DHCP server to it*
DHCP Option 82 Circuit ID	None
DHCP Option 82 Remote ID	None
Request Option All	☑ *Enable dhcp request option all on this interface*

MTU

cnPilot devices honour MTU advertised in DHCP Option 26. Below are the criteria for selecting MTU:

- By default, MTU is updated only if option 26 value is between 1500 – 1600 bytes.
- If user requires MTU less than 1500 bytes as advertised in option 26, enable MTU option as follows:

-
  ```
  E430-6E3A07(config)# interface vlan <VLAN ID>
  E430-6E3A07(config-vlan-<VLAN ID>)# ip dhcp mtu
  E430-6E3A07(config-vlan-<VLAN ID>)# save
  ```

DHCP Client Options

cnPilot devices learn multiple DHCP options for all VLAN interfaces configured on the device. Based on configured criteria, values of these options are used by the system. Below table lists the different DHCP options.

Table 31: DHCP Options

Options	Description	Usage	Reference CLI
Option 1	The subnet mask option specifies the client's subnet mask as per RFC 950.	Based on state of “Request Option All”, device chooses subnet mask from respective VLAN interface.	show ip route
Option 3	This option specifies a list of IP addresses for routers on the client's subnet.	Based on state of “Request Option All”, device chooses route learnt from respective VLAN interface. Only first route is honored	show ip route
Option 6	The domain name server option specifies a list of Domain Name System (STD 13, RFC 1035) name servers available to the client. Servers SHOULD be listed in order of preference.	Based on state of “Request Option All”, device chooses subnet mask from respective VLAN interface. Top two DNS servers are honored by cnPilot device.	show ip name-server
Option 15	This option specifies the domain name that client should use when resolving hostnames via the Domain Name System.	More details are provided in DHCP Option 15/24.	show ip dhcp-client info
Option 26	This option specifies MTU size in a network.	More details are provided in MTU.	show ip dhcp-client info
Option 28	This option specifies the broadcast address that client should use	Broadcast address learnt for all VLAN interfaces are used respectively as per standards	show ip dhcp-client-info
Option 43	This option is used to help the AP in obtaining cnMaestro IP address from the DHCP server while DHCP request to get an IP address is sent to the DHCP server.	More details are provided in IPv4 DHCP option 43	show ip dhcp-client info
Option 51	This option is used in a client request to allow the client to request a lease time for the IP address. In a server reply, a DHCP server uses this option to specify the lease time it is willing to offer.	cnPilot renew leases for all VLAN interfaces configured based on lease time that has been learned from DHCP server.	show ip dhcp-client info

Options	Description	Usage	Reference CLI
Option 54	DHCP clients use the contents of the 'server identifier' field as the destination address for any DHCP messages unicast to the DHCP server.	cnPilot learns DHCP server IP for all VLAN interfaces configured.	show ip dhcp-client info
Option 60	This option is used by DHCP clients to optionally identify the vendor type and configuration of a DHCP client.	For cnPilot device, value is updated as Cambium-WiFi-AP.	show ip dhcp-client info

Routing & DNS

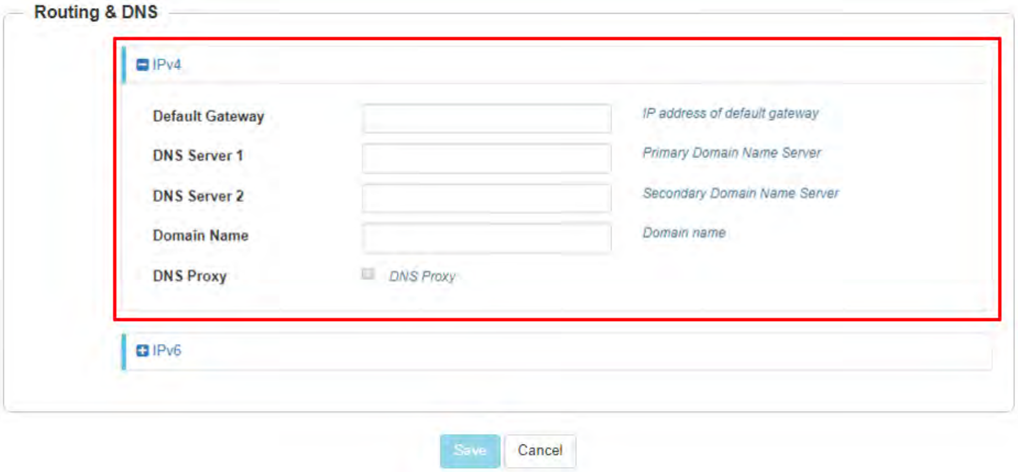
Table 32: Configure: Network > VLAN > Routing & DNS > IPv4 parameters

Parameters	Description	Range	Default
Default Gateway	Provision to configure default gateway. If this is provided, cnPilot device installs this gateway as this is the highest priority.	–	–
DNS Server	Provision to configure Static DNS server on cnPilot device. Maximum of two DNS servers can be configured.	–	–
Domain Name	Provision to configure Domain Name. If this is provided, cnPilot device installs this Domain Name as this is highest priority.	–	–
DNS Proxy	cnPilot device can acts as DNS proxy server when this parameter is enabled.	–	Disabled

To configure the above parameter, navigate to the **Configure > Network > VLAN > Routing & DNS** tab and provide the details as given below:

1. Enter **Default Gateway** IPv4 address in the textbox.
2. Enter **Domain Name** in the textbox.
3. Enter primary domain server name in the **DNS Server 1** textbox.
4. Enter secondary domain server name in the **DNS Server 2** textbox.
5. Enable **DNS Proxy** checkbox.
6. Click **Save**

Figure 32: *Routing & DNS > IPv4 parameters*



Routes

Table 33: Configure: Network > Routes> IPv4 parameters

Parameters	Description	Range	Default
Gateway Source Precendence	Provision to prioritize default gateway and DNS servers when cnPilot device has learnt from multiple ways. Default order is Static, DHCP and PPPoE.	–	Static
Add Multiple Route Entries	User has provision to configure static Routes. Parameters that are required to configure static Routes are as follows: • Destination IP • Mask • Gateway	–	–
Port Forwarding	This feature is required when wireless stations are behind NAT. User can access the services hosted on wireless stations using this feature. Following configurable parameters are required to gain the access of services hosted on wireless stations which are behind: • Port • IP Address • Type	–	–

To configure the above parameter, navigate to the **Configure > Network > Routes** tab and provide the details as given below:

To configure **Gateway Source Precedence**:

1. Select STATIC, DHCPC or PPPoE from the **Gateway Source Precedence** checkbox.
2. Click **Save**.

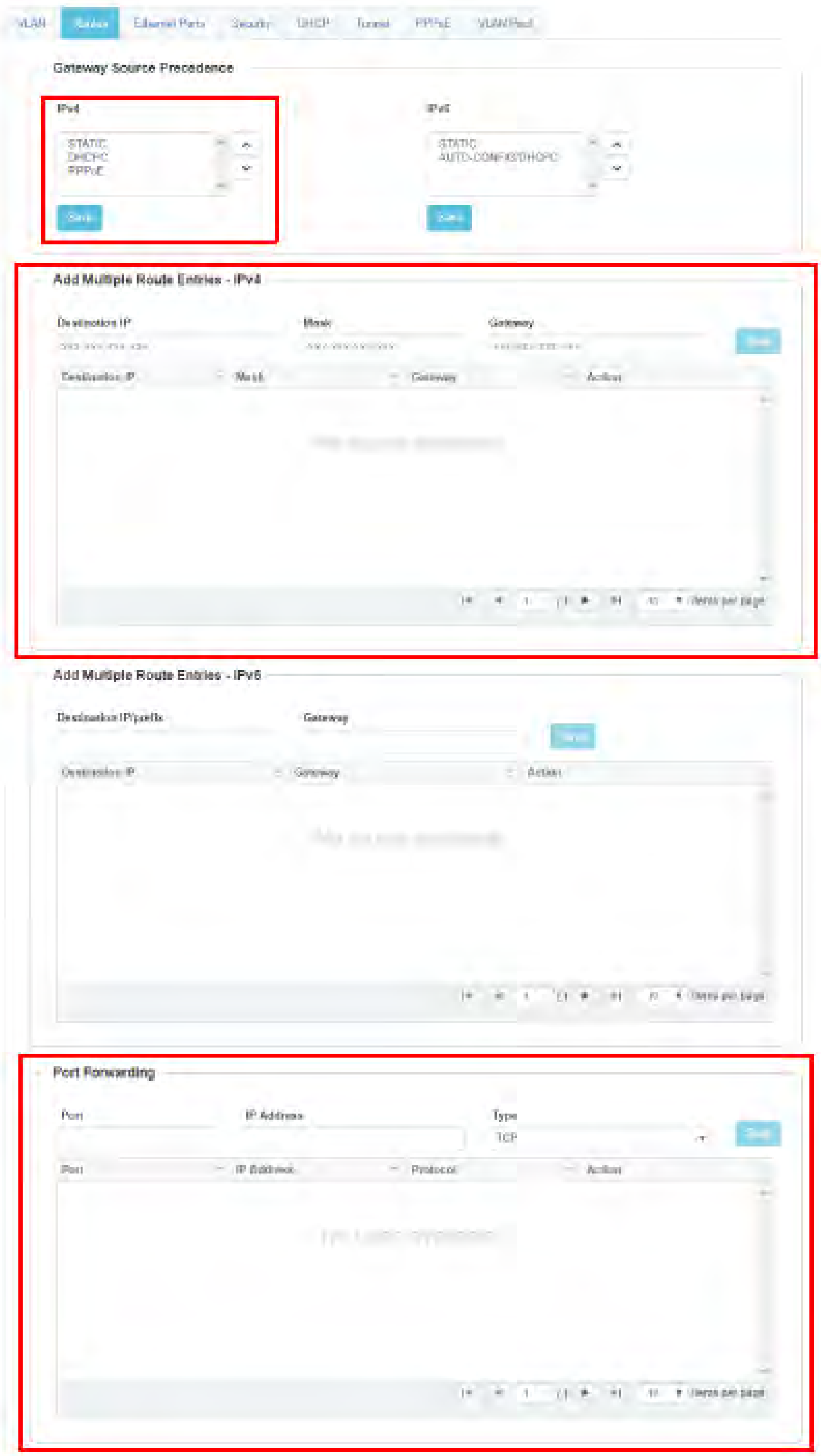
To configure Add Multiple Route Entries:

1. Enter **Destination IP address** in the textbox.
2. Enter **Mask IPv4 a**ddress in the textbox.
3. Enter **Gateway IPv4** address in the textbox.
4. Click **Save**.

To configure **Port Forwarding**:

1. Enter **Port** in the textbox.
2. Enter **IP Address** in the textbox.
3. Select **Type** from the drop-down list.
4. Click **Save**.

Figure 33: *Routes > IPv4 parameters*



Gateway Source Precedence

IPv4
STATIC
DHCPC
PPPoE

IPv6
STATIC
AUTO-CONFIG/DHCPC

Add Multiple Route Entries - IPv4

Destination IP | Mask | Gateway

Destination IP	Mask	Gateway	Action

Add Multiple Route Entries - IPv6

Destination IP/prefix | Gateway

Destination IP	Gateway	Action

Port Forwarding

Port | IP Address | Type: TCP

Port	IP Address	Protocol	Action

IPv6 network parameters

VLAN

Table 34: Configure: Network > VLAN > IPv6 parameters

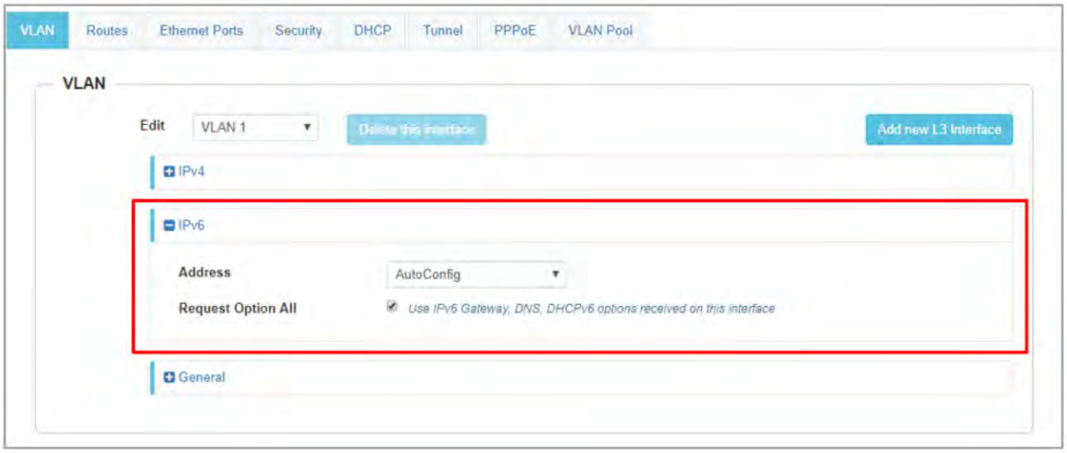
Parameters	Description	Range	Default
Address	Provision to configure mode of IPv6 address configuration for an interface selected. Five modes are supported: • Disabled • AutoConfig • Static • Stateless DHCPv6 • Stateful DHCpv6	–	AutoConfig
Request Option All	This configuration decides the interface on which cnPilot AP will learn the following: • IPv6 default gateway • DHCP client options like Option 52 and Option 24 (Controller discovery like controller host name / IPv6 address) • DNS Servers • Domain Name	–	Enabled on VLAN1

To configure the above parameter, navigate to the **Configure > Network > VLAN** tab and provide the details as given below:

To configure **VLAN IPv6**:

1. Select required IPv6 address configuration from the **Address** drop-down list.
2. Enable **Request Option All** checkbox.
3. Click **Save**.

Figure 34: *Configure: Network > VLAN > IPv6 parameters*



Edit: VLAN 1

Address: AutoConfig

Request Option All: ☑ *Use IPv6 Gateway, DNS, DHCPv6 options received on this interface*

Routing & DNS

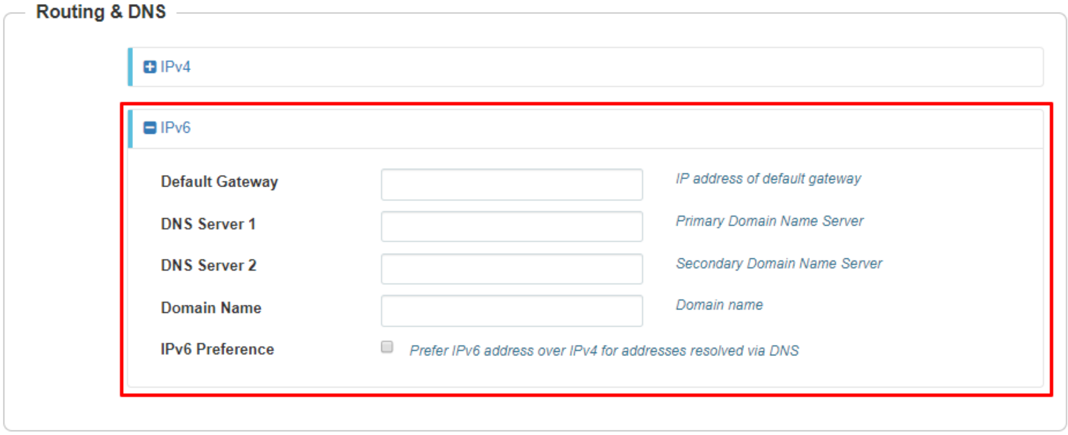
Table 35: Configure: Network > VLAN > Routing & DNS > IPv6 parameters

Parameters	Description	Range	Default
Default Gateway	Provision to configure default gateway. If this is provided, cnPilot device installs this gateway as this is the highest priority.	–	–
DNS Server	Provision to configure Static DNS server on cnPilot device. Maximum of two DNS servers can be configured.	–	–
Domain Name	Provision to configure Domain Name. If this is provided, cnPilot device installs this Domain Name as this is highest priority.	–	–
IPv6 Preference	When enabled, IPv6 is preferred over IPv4 bases on DNS response.	–	Disabled

To configure the above parameter, navigate to the Configure > Network > Routing & DNS tab and provide the details as given below:

1. Enter **Default Gateway IPv6** address in the textbox.
2. Enter primary domain server name in the **DNS Server 1** textbox.
3. Enter secondary domain server name in the **DNS Server 2** textbox.
4. Enter **Domain Name** in the textbox.
5. Enable **IPv6 Preference** checkbox.
6. Click **Save.**

Figure 35: *Routing & DNS > IPv6 parameters*



Routing & DNS

IPv4

IPv6

Default Gateway		IP address of default gateway
DNS Server 1		Primary Domain Name Server
DNS Server 2		Secondary Domain Name Server
Domain Name		Domain name
IPv6 Preference	□	Prefer IPv6 address over IPv4 for addresses resolved via DNS

Routes

Table 36: Configure: Network > Routes> IPv6 parameters

Parameters	Description	Range	Default
Gateway Source Precendence	Provision to prioritize default gateway and DNS servers when cnPilot device has learnt from multiple ways. Default order is Static and AUTO-CONFIG/DHCPC.	–	Static
Add Multiple Route Entries	User has provision to configure static Routes. Parameters that are required to configure static Routes are as follows: • Destination IP/prefix • Gateway	–	–

To configure the above parameter, navigate to the **Configure > Network > Routes** tab and provide the details as given below:

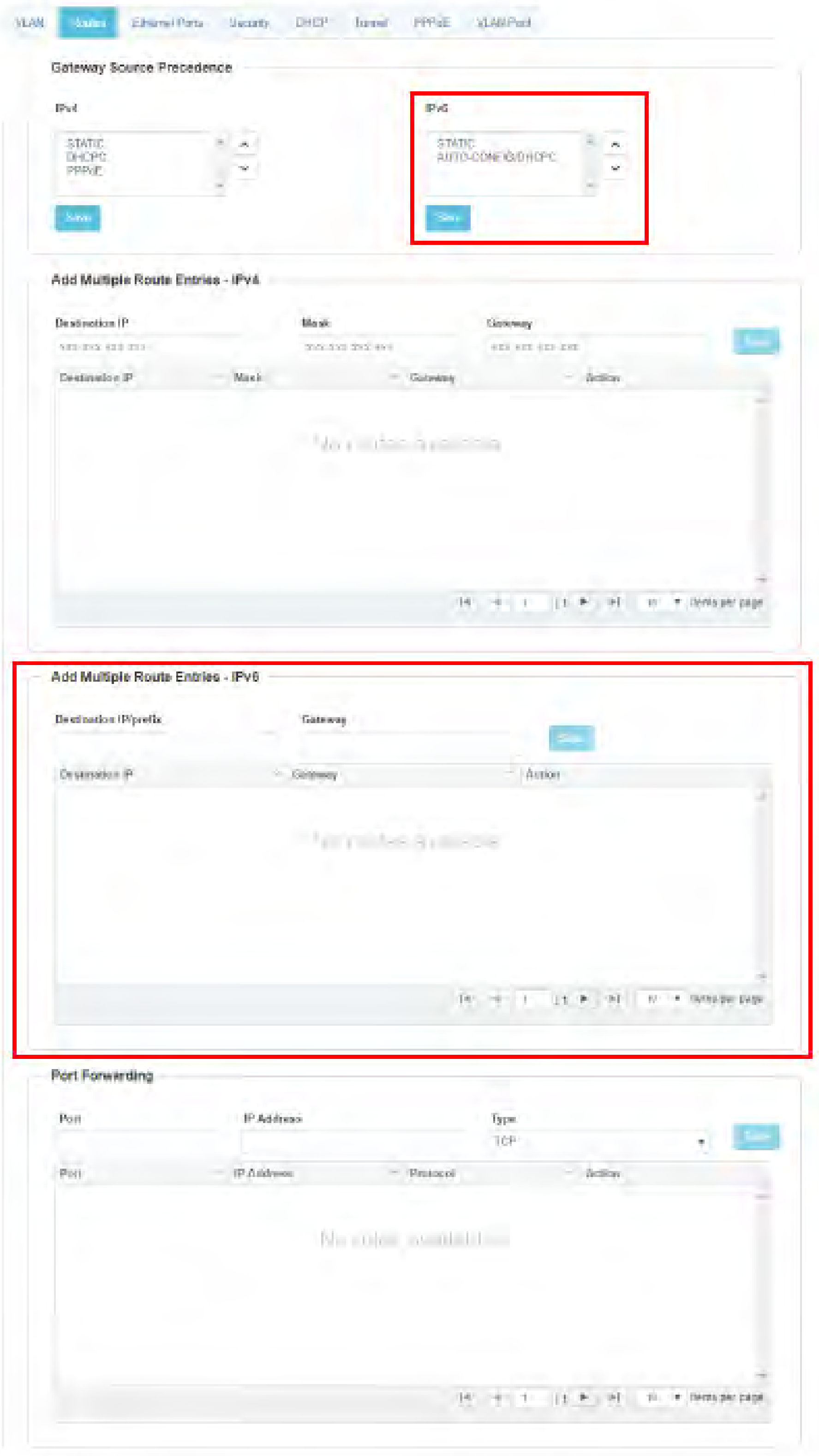
To configure **Gateway Source Precedence**:

1. Select STATIC or AUTO-CONFIG/DHCPC from the **Gateway Source Precedence** checkbox.
2. Click **Save**.

To configure **Add Multiple Route Entries**:

1. Enter **Destination IP/prefix** address in the textbox.
2. Enter **Gateway IPv6** address in the textbox.
3. Click **Save**.

Figure 36: *Figure 39 Routes > IPv6 parameters*



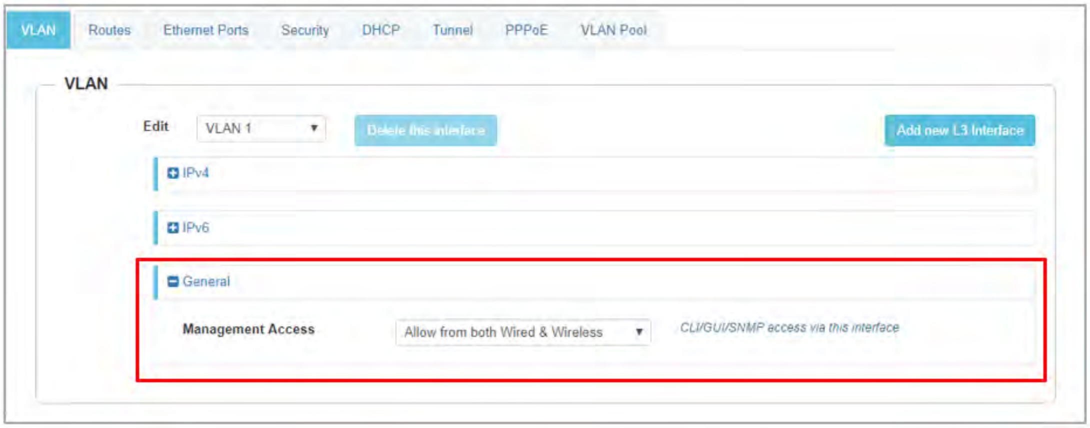
General network parameters

Table 37: Configure: Network > VLAN > General parameters

Parameters	Description	Range	Default
Management Access	Provision to restrict the access of device in all modes CLI (Telnet, SSH), GUI (HTTP, HTTPs) and SNMP. User can configure restriction of device access as follows: ▪ Block ▪ Allow from Wired ▪ Allow from both wired and wireless	–	Allow from both Wired and Wireless

Select Management Access to configure restriction of device from the drop-down list.

Figure 37: *Configure: Network > VLAN > General parameters*



Edit: VLAN 1

Management Access: Allow from both Wired & Wireless — CLI/GUI/SNMP access via this interface

Ethernet Ports

Table 38: Configure: Network > Ethernet Ports parameters

Parameters	Description	Range	Default
Ethernet	cnPilot devices Ethernet port is provisioned to operate in following modes: 1. Access Single VLAN Single VLAN traffic is allowed in this mode. 2. Trunk Multiple VLANs Multiple VLANs are supported in this mode. 3. Tunnel Mode Provision to enable L2GRE tunnel. It is applicable only for Ethernet 2/3/4 ports of the cnPilot devices based on model number.	-	Access

Parameters	Description	Range	Default
Port Speed	Provision to configure ethernet link speed. • Auto • 10 Mbps • 100 Mbps • 1000 Mbps	-	Auto
Port Duplex	Provision to configure ethernet link duplex settings.	Half Duplex/ Full Duplex	Full Duplex
MAC Authentication			
MAC Authentication	Provision to configure MAC Authentication.	-	-
MAC Auth Failed	Enabling this will allow traffic to pass on native VLAN when MAC Auth is rejected by RADIUS server.	-	-
MAC Authentication Policy	Provision to set MAC ACL policy from external RADIUS server. • Delimiter: Only colon (:) and hyphen (-) are accepted • Upper-Case: MAC address sent in upper case only	-	-
Radius Server			
Authentication Server	Provision to configure RADIUS Authentication server details such as Hostname/IPv4/IPv6, Shared Secret, Port Number and Realm. Maximum of three RADIUS server can be configured.	-	Disabled
Accounting Server	Provision to configure Accounting server details such as Hostname/IPv4/IPv6, Shared Secret, Port Number. Maximum of three RADIUS server can be configured.	-	Disabled
Timeout	Wait time period for response from AAA server.	1-30	3
Attempts	Parameter to configure number of attempts that a device should send AAA request to server if no response is received within configured timeout period.	1-3	1
Accounting Mode	This field is enabled based on customer requirement. Accounting packet is transmitted based on mode selected. 1. Start-Stop	-	None

Parameters	Description	Range	Default
	Accounting packets are transmitted by AP to AAA server when a wireless station is connected and then disconnects. 2. Start-Interim-Stop Accounting packets are transmitted by AP to AAA server when a wireless station connects and then at regular intervals of configured Interim Update Interval and then when it disconnects. 3. None Accounting mode will be disable.		
Server Pool Mode	User can configure multiple Authorization and Accounting servers. Based on number of wireless stations, user can choose either Failover or Load Balance mode. 1. Load Balance AP communicates with multiple servers and ensures that authorization and accounting are equally shared across configured servers. 2. Failover AP selects the RADIUS server which is up and running based on the order of configuration.	-	Load Balance
NAS Identifier	This is configurable parameter and is appended in RADIUS request packet. 1. AP-ETH0-MAC NAS identifier attribute will be ETH0 MAC address 2. AP-HOSTNAME NAS identifier attribute will be AP hostname 3. Custom: Any custom value	-	Hostname/ System Name
NAS IP	NAS-IP attribute for use in RADIUS request packets. Default is set to device IP and option to configure custom IP address with the option Custom.	-	AP-IP
Called Station ID	Following information can be communicated to RADIUS server:		

Parameters	Description	Range	Default
	• AP-MAC • AP-MAC: SITE-NAME • AP-NAME • AP-NAME: SITE-NAME • SITE-NAME • CUSTOM		
Interim Update Interval	This field is used when RADIUS accounting is enabled, and mode selected as Start-Interim-Stop.	10-65535	1800
Dynamic Authorization	This option is required, where there is a CoA requests from AAA/RADIUS server.	–	Disabled
ACL			
Precedence	Provision to configure index of ACL rule. Packets are validated and processed based on precedence value configured.	1-256	1
Policy	Provision to configure whether to permit or deny traffic.	Deny/Permit	Deny
Direction	Provision to apply the ACLs rules configured either in any direction or specific direction.	–	In
Type	cnPilot devices support three layers of ACLs. A rule can be configured as below: • IP • IPv6 • MAC • Proto • Protov6	–	IP
Source IP/Mask	This option is available when ACL type is configured to an IP address. This field helps user to configure if rule needs to be applied for a single IP address or range of IP addresses.	–	–
Destination IP/Mask	This option is available when ACL type is configured to an IP address. This field helps user to configure if rule needs to be applied for a single IP address or range of IP addresses.	–	–
Source MAC/Mask	This option is available when ACL type is configured to a MAC address. This field helps user to configure if rule needs to be applied for a single device MAC address or range of MAC addresses.	–	–

Parameters	Description	Range	Default
Destination MAC/Mask	This option is available when ACL type is configured to MAC address. This field helps user to configure if rule needs to be applied for a single device MAC address or range of MAC addresses.	–	–
Protocol	This option is available when user selects ACL type as proto. User can select following protocols: • TCP • UDP • ICMP • Any	–	TCP
Source Port	Provision to apply ACL with combination of protocol and port.	–	–
Destination Port	Provision to apply ACL with combination of protocol and port.	–	–
Description	To make administrator easy to understand, a text string can be added for each ACL rule.	–	–

To configure the above parameter, navigate to the **Configure > Network > Ethernet Ports** tab and provide the details as given below:

1. Select Access Single VLAN or Trunk Multiple VLANs from the **ETH1** drop-down list.
2. Enter **Access Mode** in the textbox.
3. Select **Port Speed** from the drop-down list.
4. Select **Port Duplex** from the drop-down list.
5. Click **Save**.

To Configure **MAC Authentication**:

1. Enable **MAC Authentication** checkbox
2. Click **Save**.

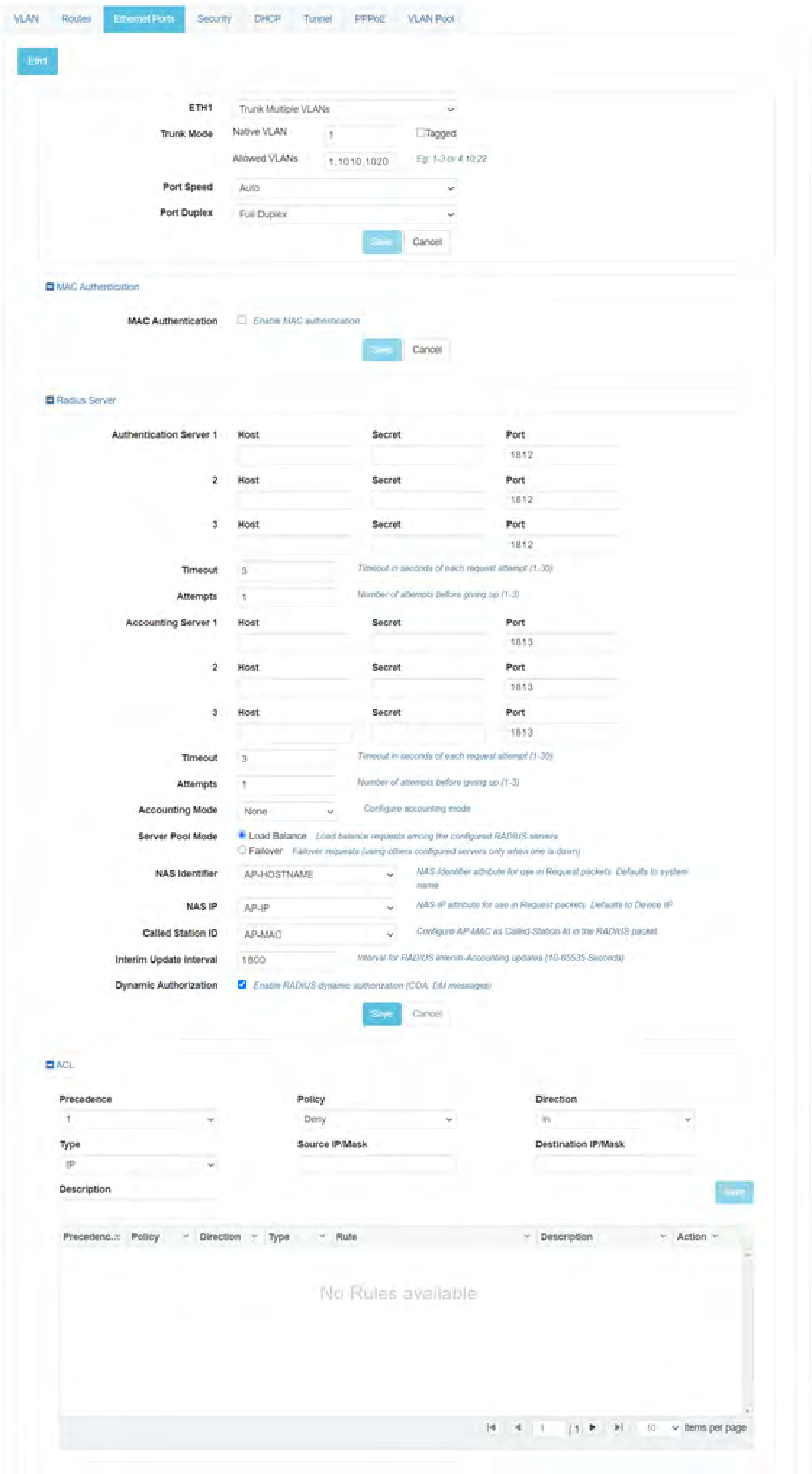
To configure **Radius Server**:

1. Enter the RADIUS Authentication server details such as Hostname/Shared Secret/Port Number/ Realm in the **Authentication Server 1** textbox.
2. Enter the time in seconds of each request attempt in Timeout textbox. 3. Enter the number of attempts before a request is given up in the **Attempts** textbox.
3. Enter the number of attempts before a request is given up in the **Attempts** textbox.
4. Select the configuring **Accounting Mode** from the drop-down list.
5. Enable Load Balance/Failover in the **Server Pool Mode** checkbox.
6. Enter the Interim Update Interval parameter value in the textbox. 7. Enable **Dynamic Authorization** checkbox to configure dynamic authorization for wireless clients.
7. Enable **Dynamic Authorization** checkbox to configure dynamic authorization for wireless clients
8. Click **Save**.

To configure **ACL:**

1. Select **Precedence** from the drop-down list.
2. Select type of **Policy** from the drop-down list.
3. Select **Direction** from the drop-down list.
4. Select **Type** from the drop-down list.
5. Enter IP address of source in the **Source IP/Mask** textbox.
6. Enter IP address of destination in the **Destination IP/Mask** textbox.
7. Enter **Description** in the textbox.
8. Click **Save**.

Figure 38: *Configure: Network > Ethernet Ports parameters*



ETH1: Trunk Multiple VLANs

Trunk Mode: Native VLAN 1 □ Tagged

Allowed VLANs 1,1010,1020 *Eg: 1-3 or 4,10,22*

Port Speed: Auto

Port Duplex: Full Duplex

MAC Authentication

MAC Authentication: □ *Enable MAC authentication*

Radius Server

Authentication Server 1 Host Secret Port 1812

2 Host Secret Port 1812

3 Host Secret Port 1812

Timeout: 3 *Timeout in seconds of each request attempt (1-30)*

Attempts: 1 *Number of attempts before giving up (1-3)*

Accounting Server 1 Host Secret Port 1813

2 Host Secret Port 1813

3 Host Secret Port 1813

Timeout: 3 *Timeout in seconds of each request attempt (1-30)*

Attempts: 1 *Number of attempts before giving up (1-3)*

Accounting Mode: None *Configure accounting mode*

Server Pool Mode: ● Load Balance *Load balance requests among the configured RADIUS servers*
○ Failover *Failover requests (using others configured servers only when one is down)*

NAS Identifier: AP-HOSTNAME *NAS-Identifier attribute for use in Request packets. Defaults to system name*

NAS IP: AP-IP *NAS-IP attribute for use in Request packets. Defaults to Device IP*

Called Station ID: AP-MAC *Configure AP-MAC as Called-Station-Id in the RADIUS packet*

Interim Update Interval: 1800 *Interval for RADIUS Interim-Accounting updates (10-65535 Seconds)*

Dynamic Authorization: ☑ *Enable RADIUS dynamic authorization (COA, DM messages)*

ACL

Precedence: 1

Policy: Deny

Direction: In

Type: IP

Source IP/Mask

Destination IP/Mask

Description

Precedenc...	Policy	Direction	Type	Rule	Description	Action

No Rules available

1 / 1 10 items per page

Security

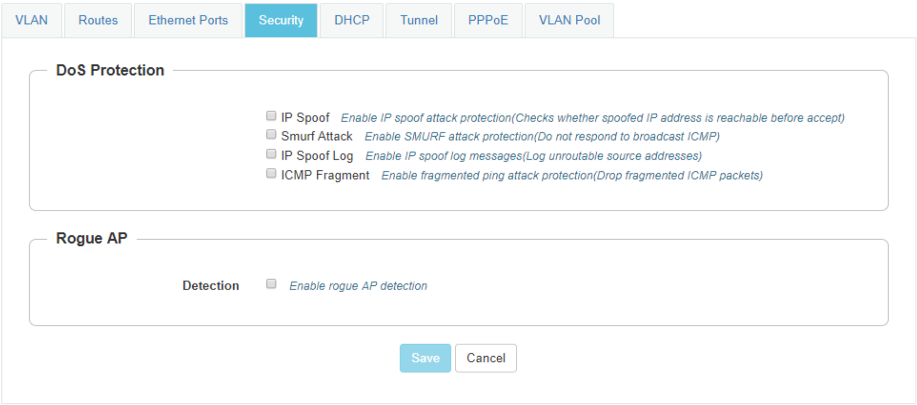
Table 39: Configure: Network > Security parameters

Parameters	Description	Range	Default
DoS Protection	cnPilot devices has inbuilt capability of detecting DoS attacks on wired network. Following are the attacks that are detected by cnPilot devices: • IP Spoof • Smurf Attack • IP Spoof Log • ICMP Fragment	–	Disabled
Rogue AP			
Detection	cnPilot devices in association with cnMaestro has capability of detecting Rogue APs. On enabling this all neighbor information is shared to cnMaestro and reports Rogue APs in the networks.	–	Disabled

To configure the above parameter, navigate to the **Configure > Network > Security** tab and provide the details as given below:

1. Select any of the following from DoS Protection checkbox
    - IP Spoof
    - Smurf Attack
    - IP Spoof Log
    - ICMP Fragment
2. Enable **Detection** checkbox.
3. Click **Save**.

Figure 39: *Configure: Network > Security parameters*



DoS Protection

□ IP Spoof *Enable IP spoof attack protection(Checks whether spoofed IP address is reachable before accept)*
□ Smurf Attack *Enable SMURF attack protection(Do not respond to broadcast ICMP)*
□ IP Spoof Log *Enable IP spoof log messages(Log unroutable source addresses)*
□ ICMP Fragment *Enable fragmented ping attack protection(Drop fragmented ICMP packets)*

Rogue AP

Detection □ *Enable rogue AP detection*

DHCP

Table 40: Configure: Network > DHCP parameters

Parameters	Description	Range	Default
Edit	Provision to select DHCP Pool if multiple Pools are defined on cnPilot device.	–	–
Address Range	User can configure start and end addresses for a DHCP Pool selected from the drop-down box.	–	–
Default Router	Provision to configure next hop for a DHCP pool selected from drop-down box.	–	–
Domain Name	Provision to configure domain name for a DHCP pool selected from drop-down box.	–	–
DNS Address	Provision to configure DNS server for a DHCP pool selected from drop-down box.	–	–
Network	Provision to configure Network ID for a DHCP pool selected from drop-down box.	–	–
Lease	Provision to configure lease for a DHCP pool selected from drop-down box.	–	–
Add Bind List			
	For every DHCP pool configured, user can bind MAC and IP from the address pool defined, so that wireless station gets same IP address every time they connect. Following parameters are required to bind IP address: • MAC Address • IP Address	–	–

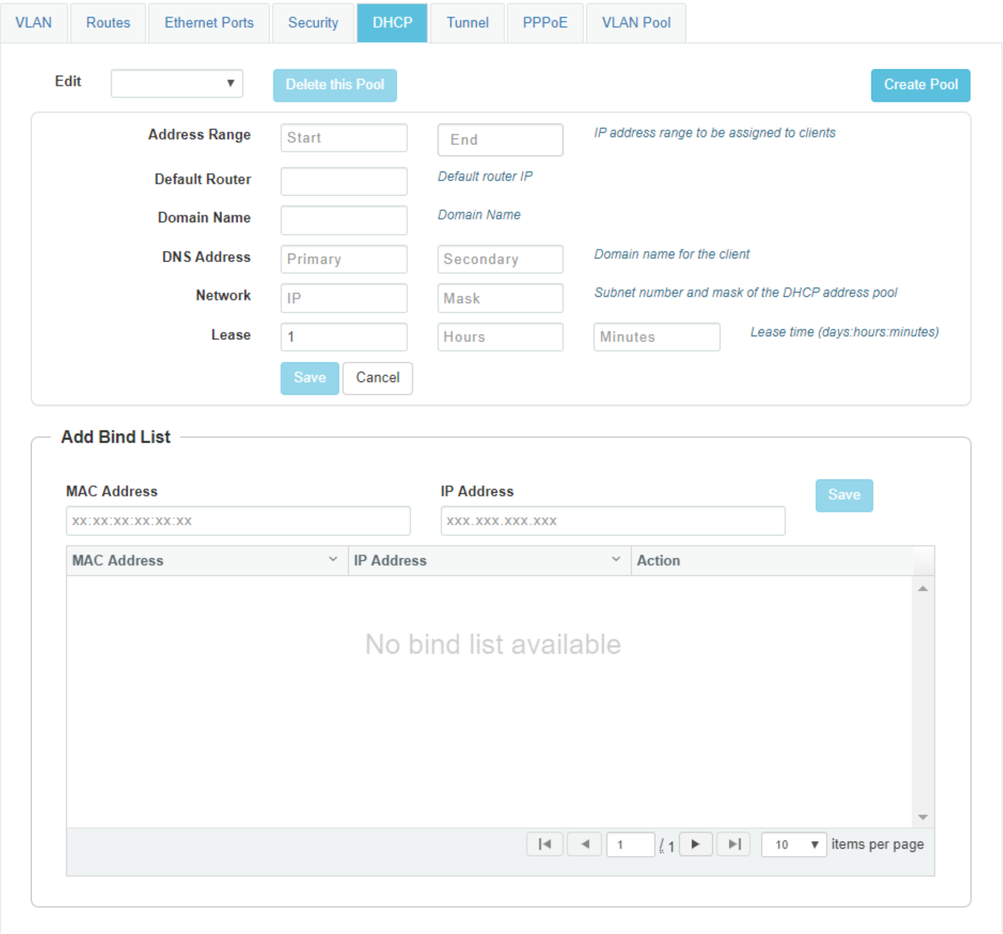
To configure the above parameter, navigate to the **Configure > Network > DHCP** tab and provide the details as given below:

1. Select **DHCP** pool from the Edit drop-down list.
2. Enter start and end IP addresses for a DHCP Pool selected from the **Address Range** textbox.
3. Enter **Default Router IP** address in the textbox.
4. Enter **Domain Name** for a DHCP pool selected in the textbox.
5. Enter **DNS Address** for a DHCP pool selected in the textbox.
6. Enter **Network ID** for a DHCP pool selected in the textbox.
7. Enter **Lease** for a DHCP pool selected in the textbox.
8. Click **Save**.

To configure **Add Bind List:**

1. Enter **MAC Address** for a DHCP pool selected in the textbox.
2. Enter **IP Address** for a DHCP pool selected in the textbox.
3. Click **Save**.

Figure 40: *Configure: Network > DHCP parameters*



Tunnel

Table 41: Configure: Network > Tunnel parameters

Parameters	Description	Range	Default
Tunnel Encapsulation	Provision to enable tunnel type. Following tunnel types are supported by cnPilot devices: • L2TP • L2GRE • OFF	–	OFF
L2TP			

Parameters	Description	Range	Default
Remote Host	Configure L2TP end point. Either IP or hostname of endpoint is supported.	–	–
Authentication Info	Provision to configure credentials required for L2TP authentication.	–	–
Auth Type	Provision to select the PPP authentication method. Following are the options available: • DEFAULT • CHAP • MS-CHAP • MS-CHAP v2 • PAP	–	Default
TCP MSS	Provision to configure TCP Maximum Segment Size.	422-1410	1400
PMTU Discovery	Provision to enable to discover PMTU in network.	–	Enabled
L2GRE			
Remote Host	Configure L2GRE end point. Either IPv4/IPv6 address or hostname of endpoint is supported.	–	–
DSCP	User can configure priority of GRE packets.	–	0
TCP MSS	Provision to configure TCP MSS value.	472-1460	1402
PMTU Discovery	Provision to enable to discover PMTU in network.	–	Enabled
MTU	Maximum Transmission Unit.	850-1460	1460
Cambium GRE	It’s a proprietary GRE protocol designed using RFC 8086 to establish tunnel between cnMaestro c4000 Controller and cnPilot devices.	-	Disabled
GRE in UDP	GRE protocol designed to establish tunnel between any third-party vendor which complies RFC 8086.	-	Disabled

To configure the above parameter, navigate to the **Configure > Network > Tunnel** tab and provide the details as given below:

1. Select Tunnel type from the **Tunnel Encapsulation** drop-down list.

To configure **L2TP:**

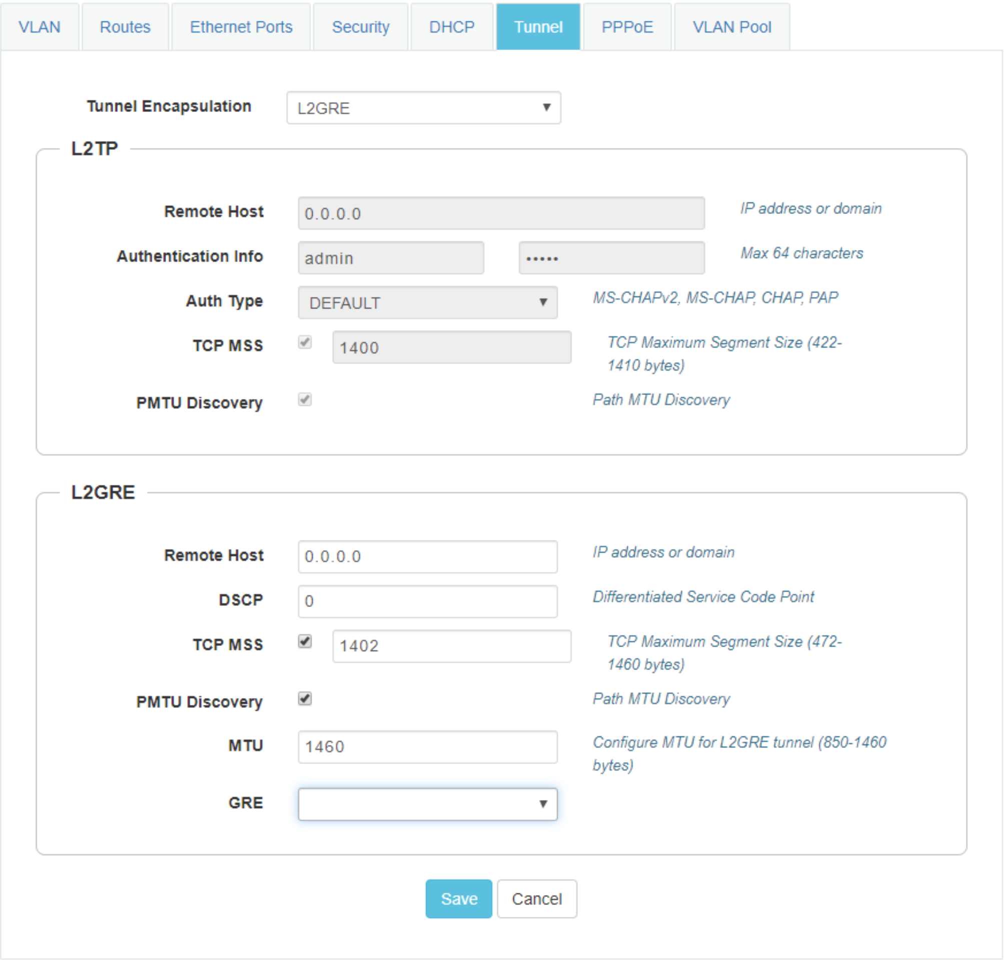
2. Enter IP address or domain name in the **Remote Host** textbox.
3. Enter credentials required for L2TP authentication in the **Authentication Info** textbox.
4. Select authentication type from the **Auth Type** drop-down list.

5. Enter TCP Maximum Segment Size in the **TCP MSS** textbox.
6. Enable **PMTU Discovery** checkbox.
7. Enter Maximum Transmission Unit in the **MTU** textbox.
8. Click **Save**.

To configure **L2GRE**:

9. Enter IP address or domain name in the **Remote Host** textbox.
10. Enter **DSCP** in the textbox.
11. Enter TCP Maximum Segment Size in the **TCP MSS** textbox.
12. Enable **PMTU Discovery** checkbox.
13. Enter Maximum Transmission Unit in the **MTU** textbox.
14. Enable **Cambium GRE** checkbox.
15. Enable **GRE in UDP** checkbox.
16. Click **Save**.

Figure 41: *Configure: Network > Tunnel parameters*



Tunnel Encapsulation: L2GRE

L2TP

Remote Host: 0.0.0.0 — *IP address or domain*

Authentication Info: admin ••••• — *Max 64 characters*

Auth Type: DEFAULT — *MS-CHAPv2, MS-CHAP, CHAP, PAP*

TCP MSS: ☑ 1400 — *TCP Maximum Segment Size (422-1410 bytes)*

PMTU Discovery: ☑ — *Path MTU Discovery*

L2GRE

Remote Host: 0.0.0.0 — *IP address or domain*

DSCP: 0 — *Differentiated Service Code Point*

TCP MSS: ☑ 1402 — *TCP Maximum Segment Size (472-1460 bytes)*

PMTU Discovery: ☑ — *Path MTU Discovery*

MTU: 1460 — *Configure MTU for L2GRE tunnel (850-1460 bytes)*

GRE:

PPPoE

Table 42: Configure: Network > PPPoE parameters

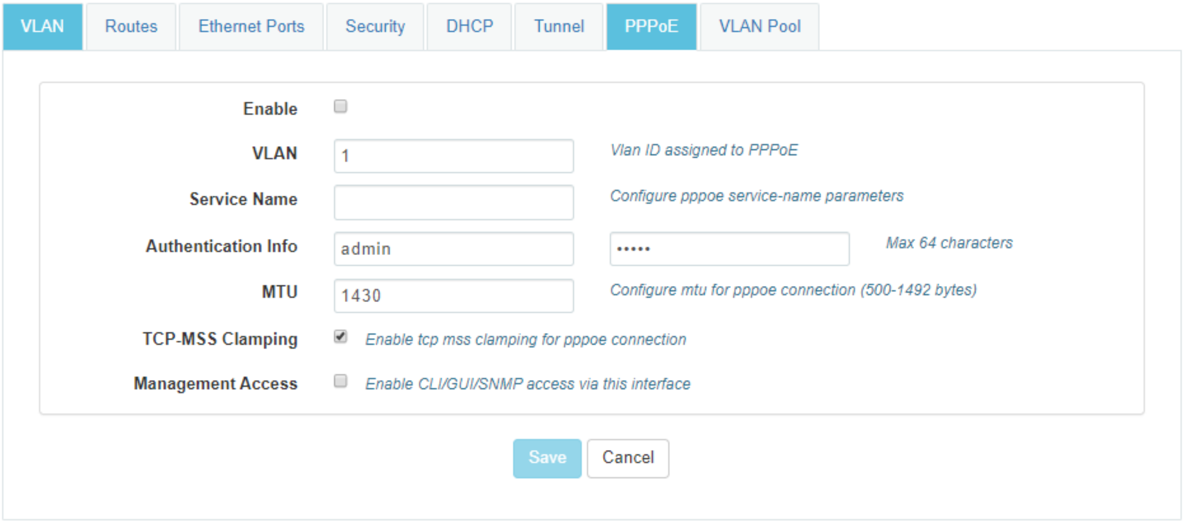
Parameters	Description	Range	Default
Enable	Provision to enable PPPoE client.	–	Disable
VLAN	User can configure VLAN ID where PPPoE client should obtain IP address.	–	–
Service Name	Configure PPPoE service name	–	–
Authentication Info	Provision to configure credentials required for PPPoE authentication.	–	–
MTU	Maximum Transmission Unit.	500-1492	1430

Parameters	Description	Range	Default
TCP MSS Clamping	Configure PPPoE end point. Either IP or hostname of endpoint is supported.	–	Enabled
Management Access	If enabled, user can access device either using UI or SSH with PPPoE IP.	–	Disabled

To configure the above parameter, navigate to the **Configure > Network > PPPoE** tab and provide the details as given below:

1. Select **Enable** checkbox to enable PPPoE functionality.
2. Enter the VLAN ID assigned to the PPPoE in the **VLAN** textbox.
3. Enter **Service Name** in the textbox.
4. Enter the username and password for the device in the **Authentication Info** textbox.
5. Enter the MTU value PPPoE connection in the **MTU** textbox.
6. Enable the **TCP MSS clamping** for the PPPoE connection.
7. Enable **Management Access.**
8. Click **Save.**

Figure 42: *Configure: Network > PPPoE parameters*



Enable □

VLAN 1 *Vlan ID assigned to PPPoE*

Service Name *Configure pppoe service-name parameters*

Authentication Info admin ••••• *Max 64 characters*

MTU 1430 *Configure mtu for pppoe connection (500-1492 bytes)*

TCP-MSS Clamping ☑ *Enable tcp mss clamping for pppoe connection*

Management Access □ *Enable CLI/GUI/SNMP access via this interface*

VLAN Pool

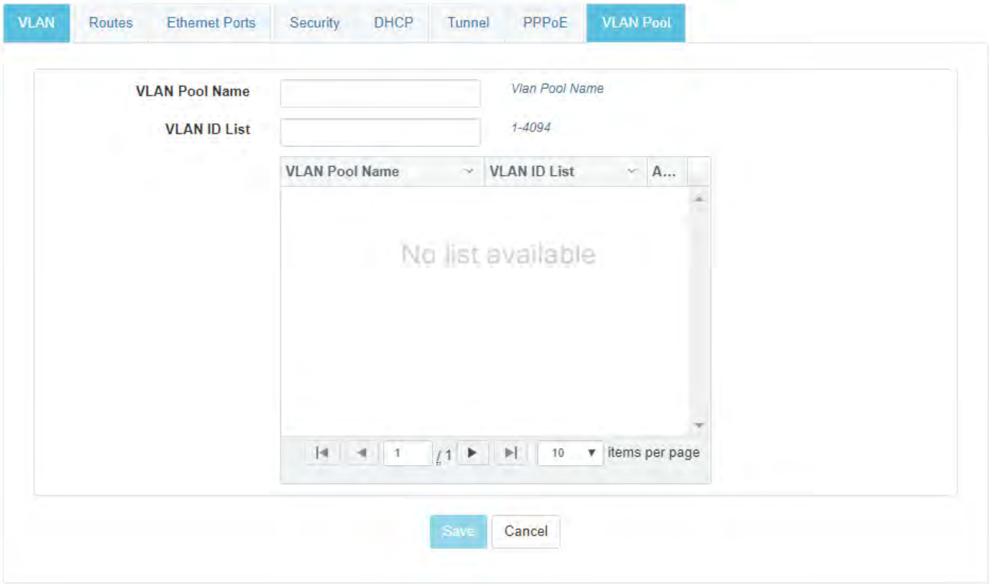
Table 43: Configure: Network > VLAN Pool parameters

Parameters	Description	Range	Default
Enable	Provision to enable PPPoE client.	–	Disable
VLAN	User can configure VLAN ID where PPPoE client should obtain IP address.	–	–
Service Name	Configure PPPoE service name	–	–
Authentication Info	Provision to configure credentials required for PPPoE authentication.	–	–
MTU	Maximum Transmission Unit.	500-1492	1430
TCP MSS Clamping	Configure PPPoE end point. Either IP or hostname of endpoint is supported.	–	Enabled
Management Access	If enabled, user can access device either using UI or SSH with PPPoE IP.	–	Enabled

To configure the above parameter, navigate to the **Configure > Network > VLAN Pool** tab and provide the details as given below:

1. Enter the name of the VLAN pool in the **VLAN Pool Name** textbox.
2. Enter the VLAN ID in the **VLAN ID List** textbox.
3. Click **Save**.

Figure 43: *Configure: Network > VLAN Pool parameters*



WWAN

Note

This feature is supported in cnPilot e600 platform only.

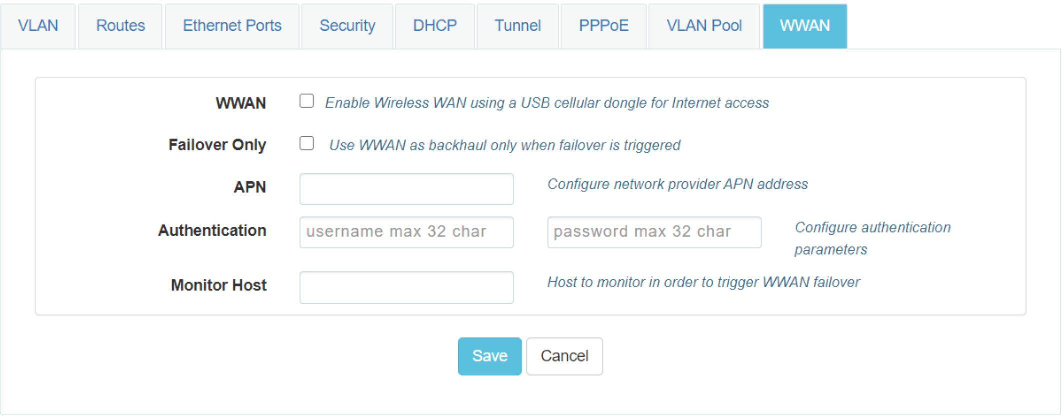
Table 44: Configure: Network > WWAN

Parameters	Description	Range	Default
WWAN	Provision to enable wireless WAN using a USB cellular dongle for internet access.	–	–
Failover Only	Failover only can be configured in two modes: • Checked: Ethernet will be the primary connection and WWAN will be backup. • Unchecked. 3G/4G (WWAN) will be the only working connection. **Note**: Cellular link can be configured as backup only to Ethernet connection.	Checked/ Unchecked	–
APN	Provision to configure network provider APN address.	–	–
Authentication	Provision to configure credentials required for WWAN authentication.	–	–
Monitor Host	Running a check in the background that constantly monitors a user configured IP address (Ex: 8.8.8.8) for reachability through ping.	IPv4 address	–

To configure the above parameter, navigate to the **Configure > Network > WWAN** tab and provide the details as given below:

1. 1. Enable **WWAN** checkbox to enable this functionality.
2. Check/Uncheck Failover Only to enable/disable.
3. Enter the **APN** address in the textbox.
4. Enter the **Authentication** credentials.
5. Enter any IPv4 address to monitor.
6. Click **Save**.

Figure 44: *Configure: Network > WWAN parameters*



WWAN	□ *Enable Wireless WAN using a USB cellular dongle for Internet access*		
Failover Only	□ *Use WWAN as backhaul only when failover is triggered*		
APN		*Configure network provider APN address*	
Authentication	username max 32 char	password max 32 char	*Configure authentication parameters*
Monitor Host		*Host to monitor in order to trigger WWAN failover*	

Chapter 10: Configuration - Services

This chapter describes the following topics:

- Overview
- Configuring Services

Overview

This chapter gives an overview of cnPilot configurable parameters related to LDAP, NAT Logging, Location API, Speed Test and DHCP Option 82.

Configuring Services

This section provides information on how to configure the following services on cnPilot AP.

- LDAP
- APIs
- Location API
- Speed Test
- DHCP Option 82

LDAP

Table 45 lists the fields that are displayed in the **Configuration > Services > LDAP** tab:

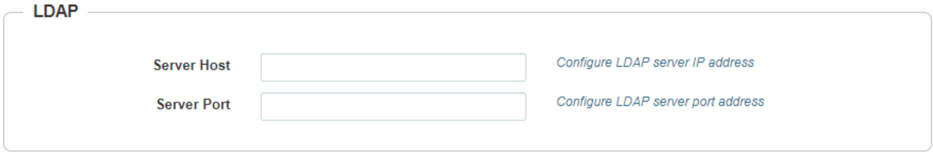
Table 45: Configure: Services > LDAP parameters

Parameters	Description	Range	Default
Server Host	Provision to configure IP/Hostname of LDAP server.	–	–
Server Port	Provision to configure custom port number for LDAP services.	–	–

To configure the above parameter, navigate to the **Configure > Services > LDAP** tab and provide the details as given below:

1. Enter the IP address of the LDAP server in the **Server Host** textbox.
2. Enter the Port address of the LDAP server in the **Server Port** textbox.
3. Click **Save**.

Figure 45: *Configure: Services > LDAP parameters*



LDAP

Server Host | | Configure LDAP server IP address

Server Port | | Configure LDAP server port address

APIs

cnPilot devices does support APIs w.r.t to Wi-Fi client presence, NAT information and BT client presence.

NAT Logging

NAT logging is same as the internet access log that is generated when NAT is enabled on AP. Each internet access log PDU consists of one or more internet access log data in TLV format. The packet format for the internet access log PDU is defined as below:

Table 46: PDU type code: 0x82

Type	Mandatory	Length	Default Value
0x01	N	32 Bytes	Includes IPv4 internet access log data structure.

Type 0x01 TLV includes the internet access log data structure as below:

Table 47: NAT Lo`gging Packet Structure

Length	Description
4 Bytes	NAT records UNIX time stamp which generates time in seconds from 1970-01-01 (00:00:00 GMT until now).
6 Bytes	The MAC address of the client.
1 Bytes	Reserved for future use.
1 Bytes	The protocol type. The supported protocol types are: • 0x06 TCP • 0x11 UDP
2 Bytes	The VLAN ID where the client is connected. If there is no VLAN ID, the value will be 0.
4 Bytes	The client internal or the private IP address.
2 Bytes	The internal port of the client.
4 Bytes	The Internet IP address which is translated by NAT.
2 Bytes	The Internet port which is translated by NAT.
4 Bytes	The IP address of the visited server.
2 Bytes	The port address of the visited server.

Table 48 lists the fields that are displayed in **Configuration > Services > NAT Logging** tab:

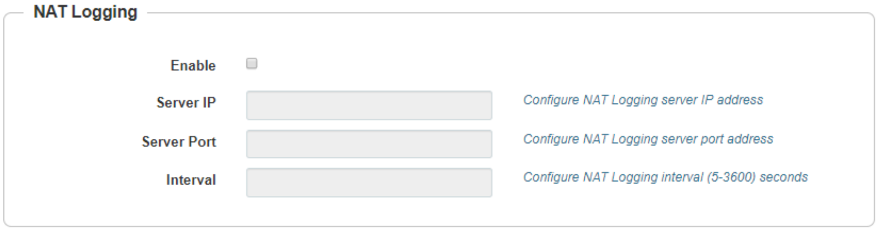
Table 48: Configure: Services > NAT Logging parameters

Parameters	Description	Range	Default
Enable	Provision to enable/disable NAT logging services.	–	–
Server IP	Provision to configure IP/Hostname of NAT logging server.	–	–
Server Port	Provision to configure custom port number for NAT Logging services.	–	–
Interval	Provision to configure frequency of logging.	5-3600	–

To configure the above parameter, navigate to the **Configure > Services > NAT Logging** tab and provide the details as given below:

1. Select the **Enable** checkbox to enable NAT Logging.
2. Enter the IP address of the server for NAT Logging in the **Server IP** textbox.
3. Enter the IP address of the server port for NAT Logging in the **Server Por**t textbox.
4. Enter the interval for NAT Logging in the **Interval** textbox.
5. Click **Save**.

Figure 46: *Configure: Services > NAT Logging parameters*



NAT Logging

Enable □

Server IP — Configure NAT Logging server IP address

Server Port — Configure NAT Logging server port address

Interval — Configure NAT Logging interval (5-3600) seconds

Location API

Location API is a method to send the discovered (Probed) clients list to a specified server address. The reports are sent as HTTP Post to the HTTP server every interval. The discovered client entries are deleted from the list if the entry is aged out. The client aging timeout is 2 times of location API interval configured. If there are no new probe requests from the client within 2xlocation API interval time, then the client entry will be removed from the list.

Table 49 lists the fields that are displayed in **Configuration > Services > Location API** tab:

Table 49: Configure: Services > Location API parameters

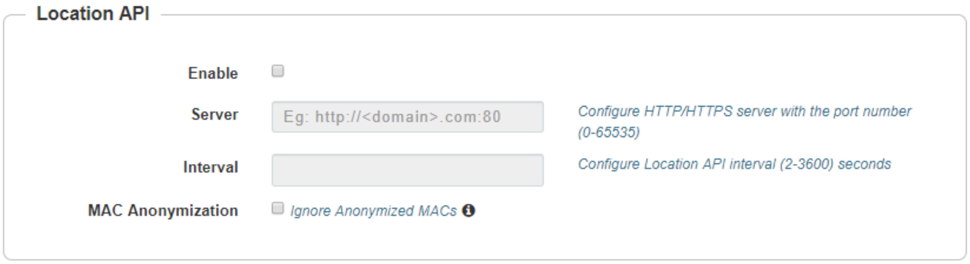
Parameters	Description	Range	Default
Enable	Provision to enable/disable Location API services.	–	–
Server	Provision to configure HTTP/HTTPs server to send report with the pot number.	0-65535	–

Parameters	Description	Range	Default
Interval	Provision to configure custom frequency of information to be shared to server.	2-3600	–
MAC Anonymization	Provision to detect fake clients and avoid populating it in Location API client list.	–	–

To configure the above parameter, navigate to the **Configure > Services > Location API** tab and provide the details as given below:

1. Select the Enable checkbox to enable **Location API**.
2. Enter the HTTP/HTTPs server and port number in the **Server** textbox.
3. Enter the interval for Location API in the **Interval** textbox.
4. Enable **MAC Anonymization** checkbox.
5. Click **Save**.

Figure 47: *Configure: Services > Location API parameters*



Location API

Enable □

Server Eg: http://<domain>.com:80 *Configure HTTP/HTTPS server with the port number (0-65535)*

Interval *Configure Location API interval (2-3600) seconds*

MAC Anonymization □ *Ignore Anonymized MACs* ℹ

Note

For further details about this feature and sample reference output, go to https://support.cambiumnetworks.com/files/cnpilot-tech-ref/ and download Wireless client Presence and Locationing API document.

BT Location API

Bluetooth Scanning

cnPilot Aps with an integrated Bluetooth Low Energy (BLE) radio can detect and locate nearby Bluetooth Low Energy devices. This data is then provided via API to third-party applications. Examples of such devices include smartwatches, battery-based beacons, Apple iBeacons, fitness monitors, and remote sensors.

Organization can create use cases for indoor wayfinding and mapping, asset tracking, and more.

Table 50 lists the fields that are required for configuring BT Location API.

Table 50: Configuring BT Location API parameters

Parameters	Description	Range	Default
Location-bt-api server	Provision to configure details of destined API server.	-	-
Location-bt-api interval	Provision to configure the interval at which the BT information is updated to destined API server.	2-3600	2
Ignore-anonymized-bt-mac	Ignore client BT addresses that are anonymized.	-	-

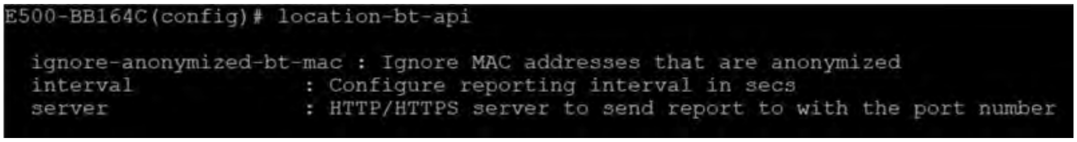
Sending Report

After enabling BLE Scanning on AP it will start processing:

1. Convert the scanned data to a JSON array
2. Send that data in one single HTTP/HTTPS POST

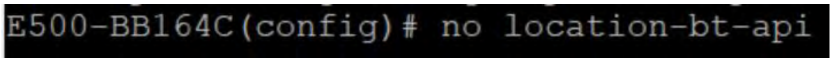
In the CLI

To configuring the BT Location-API:



```
E500-BB164C(config)# location-bt-api

  ignore-anonymized-bt-mac : Ignore MAC addresses that are anonymized
  interval                 : Configure reporting interval in secs
  server                   : HTTP/HTTPS server to send report to with the port number
```

To disable the BT Location-API:



```
E500-BB164C(config)# no location-bt-api
```

BT Location API data elements

Table 51: BT Location API data elements

Parameters	Description
apMac	MAC address of the observing AP.
API Version	API Version applied for particular data format.
AP Name	Host name of the observing AP.
Timestamp	Observation time in seconds seen by AP.
BT MAC	BLE device MAC seen by AP.
UUID	BLE device UUID seen by AP.
RSSI	BLE device RSSI as seen by AP.

HTTP POST Body Format:

```
{
 u'ap_mac': '00-04-56-A5-5A-EC',
 'version': '2.2',
 'ap_name': 'E600-A55AEC',
 'ble_discoverd_clients':{Array of 0-250 devices}
}
```

Bluetooth API Data Format

```
{
bt_rssi': u' -80 dBm ',
bt_mac': 14-8F-21-FD-37-18', u
'bt_uuids': Garmin International, Inc. (0xfe1f)\n',
'bt_timestamp': u' 1.811127'
}
```

Speed Test

Wifiperf is a speed test service available on cnPilot devices. This tool is interoperable with open source zapwireless tool (https://code.google.com/archive/p/zapwireless/)

The wifiperf speed test can be triggered by using zapwireless tool between two cnPilot Aps or between cnPilot AP and with other third-party devices (or PC) that is having zapwireless endpoint running.

Refer https://code.google.com/archive/p/zapwireless/ to download the zapwireless tool to generate zapwireless endpoint for third party device (or PC) and zap CLI to perform the test.

In this case, wifiperf endpoint should be enabled in cnPillot AP through UI shown below.

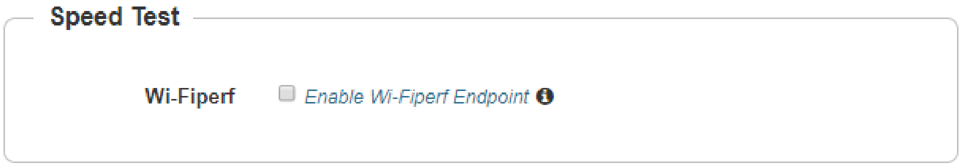
Below table lists the fields that are displayed in the **Configuration > Services > Speed Test** tab:

Table 52: Configure: Services > Speed Test parameters

Parameters	Description	Range	Default
wifiperf	Provision to enable wifiperf functionality.	–	Disabled

To configure the above parameter, navigate to the **Configure > Services > Speed Test** tab. Select Wifiperf checkbox to enable this functionality.

Figure 48: *Configure: Services > Speed Test parameters*



Speed Test

Wi-Fiperf □ Enable Wi-Fiperf Endpoint ℹ

DHCP Option 82

Global parameter to configure DHCP Option 82 parameters that will be appended to DHCP packets when a device is connected either from wireless or wired to a cnPilot device. This parameter is given first precedence and overwrites any configuration defined in VLAN or WLAN profiles.

Table 53 lists the fields that are displayed in the **Configuration > Services > DHCP Option 82** tab:

Table 53: Configure: Services > DHCP Option 82 parameters

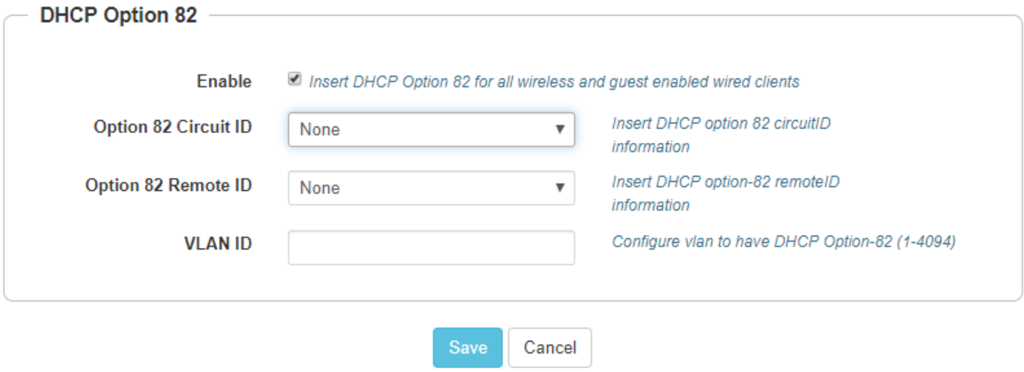
Parameters	Description	Range	Default
Enable	Provision to enable/disable DHCP Option 82 as global services.	–	–
Option 82 Circuit ID	When enabled, DHCP packets generated from wireless stations that are associated to APs are appended with Option 82 parameters. Option 82 provides provision to append Circuit ID and Remote ID. Following parameters can be selected in both Circuit ID and Remote ID: ▪ None ▪ All ▪ Hostname ▪ APMAC ▪ SSID ▪ VLAN ID ▪ SITEID ▪ Custom	–	None
Option 82 Remote ID	When enabled, DHCP packets generated from wireless stations that are associated to APs are appended with Option 82 parameters. Option 82 provides provision to append Circuit ID and Remote ID. Following parameters can be selected in both Circuit ID and Remote ID: ▪ None ▪ Hostname ▪ APMAC ▪ SSID ▪ VLAN ID ▪ SITEID ▪ Custom ▪ All	–	None

Parameters	Description	Range	Default
VLAN ID	User can configure VLAN IDs where DHCP Option 82 must be enabled.	1-4094	–

To configure the above parameter, navigate to the **Configure > Services** tab and select DHCP Option 82 tab and provide the details as given below:

1. Select the **Enable** checkbox to enable DHCP Option 82.
2. Select Option 82 Circuit ID to enable **DHCP Option-82 circuit ID** information from the drop-down list.
3. Select Option 82 Remote ID to enable **DHCP Option-82 remote ID** information from the drop-down list.
4. Enter VLAN ID parameter to configure VLAN to have **DHCP Option 82**.
5. Click **Save**.

Figure 49: *Configure: Services > DHCP Option 82 parameters*



DHCP Option 82

Enable ☑ *Insert DHCP Option 82 for all wireless and guest enabled wired clients*

Option 82 Circuit ID: None ▾ *Insert DHCP option 82 circuitID information*

Option 82 Remote ID: None ▾ *Insert DHCP option-82 remoteID information*

VLAN ID: *Configure vlan to have DHCP Option-82 (1-4094)*

Chapter 11: Operations

This chapter describes the following topics:

- Overview
- Firmware update
- System
- Configuration

Overview

This chapter gives an overview of cnPilot administrative functionalities such as Firmware update, System and Configuration.

Firmware update

The running software on the cnPilot Enterprise AP can be upgraded to newer firmware. When upgrading from the UI the user can upload the firmware file from the browser. The same process can be followed to downgrade the AP to a previous firmware version if required. Configuration is maintained across the firmware upgrade process.

> **Note**
>
> Once a firmware upgrade has been initiated, the AP should not be rebooted or power cycled until the process completes, as this might leave the AP inoperable.

Table 54lists the fields that are displayed in the **Operations > Firmware update** tab:

Table 54: Configure: Operations > Firmware update parameters

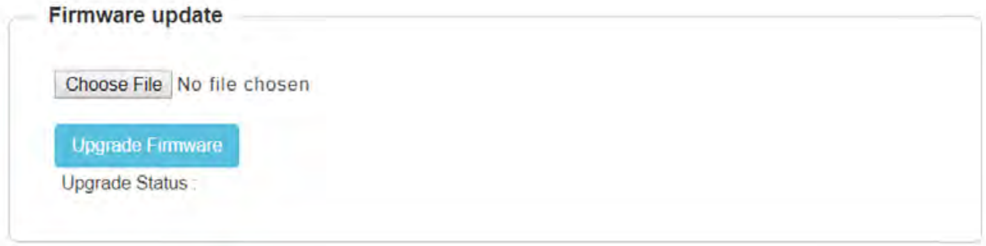
Parameters	Description	Range	Default
Choose File	Provisions to select upgrade file.	–	–
Upgrade Firmware	Provision to initiate upgrade once file is selected.	–	–

To configure the above parameter, navigate to **Operations > Firmware update** tab and provide the details as given below:

1. Click **Choose File** and select the downloaded image file to upgrade the firmware manually.
2. Click **Upgrade Firmware** and select the downloaded image file to upgrade the firmware automatically.

You can view the status of upgrade in the **Upgrade Status** field.

Table 55: Configure: Operations > Firmware update parameters



System

This section provides multiple troubleshooting tools provided by cnPilot Enterprises.

Table 56 lists the fields that are displayed in the **Operations > System** tab:

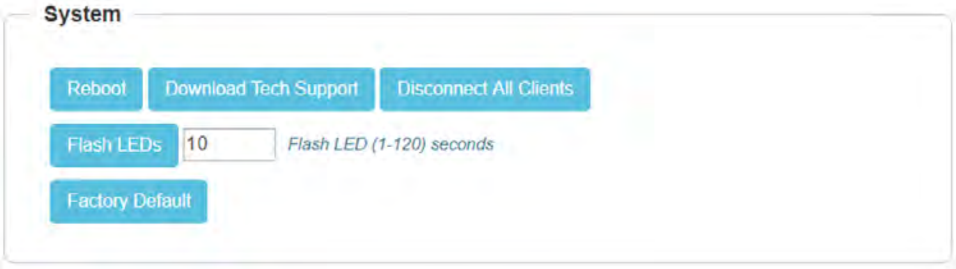
Table 56: Configure: Operations > System parameters

Parameters	Description	Range	Default
Reboot	User will be prompted with Reboot pop-up requesting for reboot. If Yes, device will go for reboot.	–	–
Download Tech Support	User will be prompted with permission to download tech-support from AP. If yes, file will be saved in your default download path configured on your system.	–	–
Disconnect All Clients	All clients connected to both the radios will be terminated by sending de-authentication packet to each client connected to radios.	–	–
Flash LEDs	LEDs on the device will toggle for configured time period.	1-120	10
Factory Default	A pop-up window appears requesting confirmation for factory defaults. If yes, device will delete all configuration to factory reset and reboots.	–	–

To configure the above parameter, navigate to **Operations > System** tab and provide the details as given below:

1. Click **Reboot** for rebooting the device.
2. Click **Download Tech Support** to generate a techsupport from the device and save it locally.
3. Click **Disconnect All Clients** to disconnect all wireless clients.
4. Select **Flash LEDs** value from the drop-down list to flash LEDs for the given duration of time.
5. Click **Factory Default** to delete all configuration on the device.

Figure 50: *Configure: Operations > System parameters*



Configuration

The device configuration can either be exported from the device as a text file or imported into the device from a previous backup. Ensure that when a configuration file is imported onto the device, a reboot is necessary to activate that new configuration.

Table 57 lists the fields that are displayed in the **Operations > Configuration** tab:

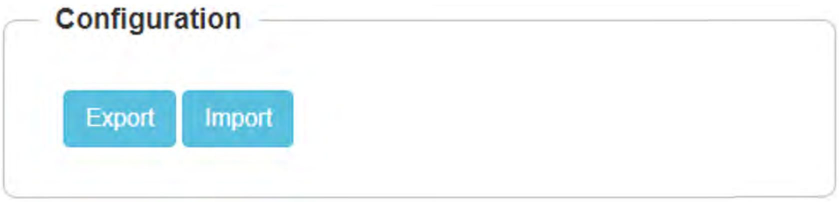
Table 57: Configure: Operations > Configuration parameters

Parameters	Description	Range	Default
Export	Provision to export configuration of device to default download path configured on system.	–	–
Import	Provision to import configuration of device.	–	–

To configure the above parameter, navigate to **Operations > Configuration** tab and provide the details as given below:

1. Click **Export** to export device configuration and save locally to the device.
2. Click **Import** to import device configuration to the device.

Figure 51: *Configure: Operations > Configuration parameters*



Chapter 12: Troubleshoot

This section provides detailed information about troubleshooting methods supported by cnPilot enterprise devices. Troubleshooting methods supported by cnPilot devices are categorized as below:

- Logging
  - Events
  - Debug Logs
- Radio Frequency
  - Wi-Fi Analyzer
  - Spectrum Analyzer
  - Unconnected Clients
- Packet Capture
- Performance
  - Wi-Fi Perf Speed Test
  - Connectivity

Logging

cnPilot devices supports multi-level logging, which will ease to debug issues.

Events

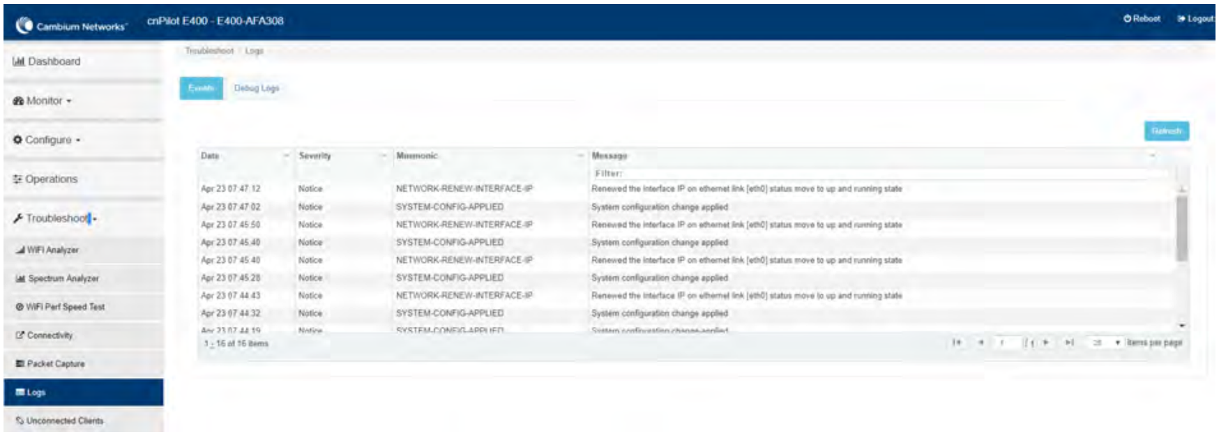
cnPilot devices generates events that are necessary for troubleshooting across various modules. Below is the list of modules, cnPilot device generates events for troubleshooting.

- Wireless station
  - Connectivity
- Configuration updates
- LDAP
  - Authentication
- RADIUS
  - Authentication
  - Accounting
  - CoA
- Mesh
- Roaming
  - Enhanced roaming
- Auto-RF
  - Channel change

- Tunnel state
- Reboot
- Guest Access
- Autopilot

Events are available at **Troubleshoot > Logs > Events**.

Figure 52: *Troubleshoot > Logs > Events*



Date	Severity	Mnemonic	Message
Apr 23 07 47 12	Notice	NETWORK-RENEW-INTERFACE-IP	Renewed the interface IP on ethernet link [eth0] status move to up and running state
Apr 23 07 47 02	Notice	SYSTEM-CONFIG-APPLIED	System configuration change applied
Apr 23 07 45 50	Notice	NETWORK-RENEW-INTERFACE-IP	Renewed the interface IP on ethernet link [eth0] status move to up and running state
Apr 23 07 45 40	Notice	SYSTEM-CONFIG-APPLIED	System configuration change applied
Apr 23 07 45 40	Notice	NETWORK-RENEW-INTERFACE-IP	Renewed the interface IP on ethernet link [eth0] status move to up and running state
Apr 23 07 45 28	Notice	SYSTEM-CONFIG-APPLIED	System configuration change applied
Apr 23 07 44 43	Notice	NETWORK-RENEW-INTERFACE-IP	Renewed the interface IP on ethernet link [eth0] status move to up and running state
Apr 23 07 44 32	Notice	SYSTEM-CONFIG-APPLIED	System configuration change applied
Apr 23 07 44 19	Notice	SYSTEM-CONFIG-APPLIED	System configuration change applied

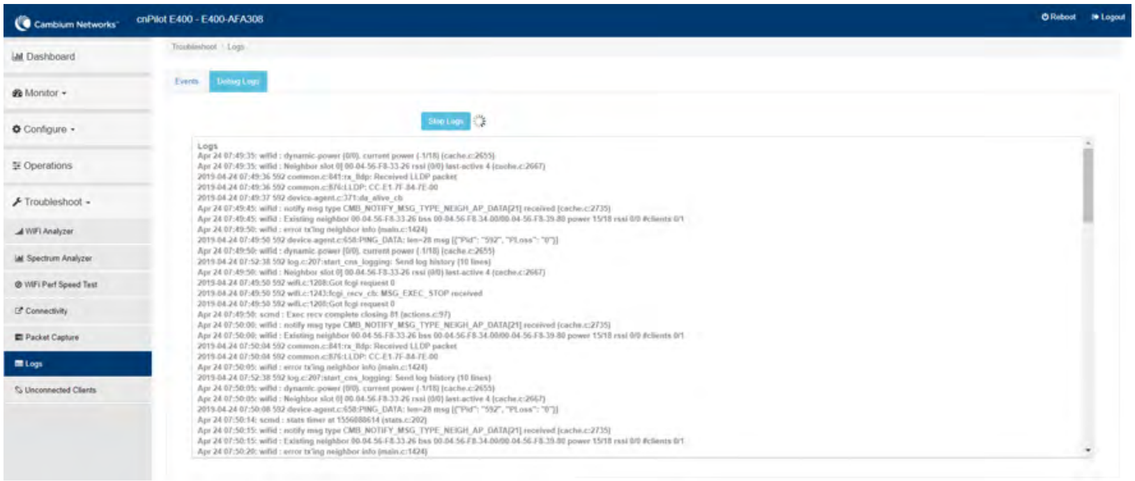
1 - 16 of 16 items

Debug Logs

cnPilot provisions enhanced debugging of each module as events generated by system and scope of debugging is limited. Debug logs can be triggered when user click Start Logs and can be terminated when clicked on Stop Logs. By default, debug logs auto terminate after 1 minute when clicked on Start Logs.

Debug logs are available at **Troubleshoot > Logs > Debug Logs**.

Figure 53: *Troubleshoot > Logs > Debug Logs*



```
Logs
Apr 24 07:49:35: wifid : dynamic-power (0/0). current power (-1/18) (cache.c:2655)
Apr 24 07:49:35: wifid : Neighbor slot 0] 00-04-56-F8-33-26 rssi (0/0) last-active 4 (cache.c:2667)
2019-04-24 07:49:36 592 common.c:841:rx_lldp: Received LLDP packet
2019-04-24 07:49:36 592 common.c:876:LLDP: CC-E1-7F-84-7E-00
2019-04-24 07:49:37 592 device-agent.c:371:da_alive_cb
Apr 24 07:49:45: wifid : notify msg type CMB_NOTIFY_MSG_TYPE_NEIGH_AP_DATA[21] received (cache.c:2735)
Apr 24 07:49:45: wifid : Existing neighbor 00-04-56-F8-33-26 bss 00-04-56-F8-34-00/00-04-56-F8-39-80 power 15/18 rssi 0/0 #clients 0/1
Apr 24 07:49:50: wifid : error tx'ing neighbor info (main.c:1424)
2019-04-24 07:49:50 592 device-agent.c:658:PING_DATA: len=28 msg [{"Pid": "592", "PLoss": "0"}]
Apr 24 07:49:50: wifid : dynamic-power (0/0). current power (-1/18) (cache.c:2655)
2019-04-24 07:52:38 592 log.c:207:start_cns_logging: Send log history (10 lines)
Apr 24 07:49:50: wifid : Neighbor slot 0] 00-04-56-F8-33-26 rssi (0/0) last-active 4 (cache.c:2667)
2019-04-24 07:49:50 592 wifi.c:1208:Got fcgi request 0
2019-04-24 07:49:50 592 wifi.c:1243:fcgi_recv_cb: MSG_EXEC_STOP received
2019-04-24 07:49:50 592 wifi.c:1208:Got fcgi request 0
Apr 24 07:49:50: scmd : Exec recv complete closing 81 (actions.c:97)
Apr 24 07:50:00: wifid : notify msg type CMB_NOTIFY_MSG_TYPE_NEIGH_AP_DATA[21] received (cache.c:2735)
Apr 24 07:50:00: wifid : Existing neighbor 00-04-56-F8-33-26 bss 00-04-56-F8-34-00/00-04-56-F8-39-80 power 15/18 rssi 0/0 #clients 0/1
2019-04-24 07:50:04 592 common.c:841:rx_lldp: Received LLDP packet
2019-04-24 07:50:04 592 common.c:876:LLDP: CC-E1-7F-84-7E-00
Apr 24 07:50:05: wifid : error tx'ing neighbor info (main.c:1424)
2019-04-24 07:52:38 592 log.c:207:start_cns_logging: Send log history (10 lines)
Apr 24 07:50:05: wifid : dynamic-power (0/0). current power (-1/18) (cache.c:2655)
Apr 24 07:50:05: wifid : Neighbor slot 0] 00-04-56-F8-33-26 rssi (0/0) last-active 4 (cache.c:2667)
2019-04-24 07:50:08 592 device-agent.c:658:PING_DATA: len=28 msg [{"Pid": "592", "PLoss": "0"}]
Apr 24 07:50:14: scmd : stats timer at 1556088614 (stats.c:202)
Apr 24 07:50:15: wifid : notify msg type CMB_NOTIFY_MSG_TYPE_NEIGH_AP_DATA[21] received (cache.c:2735)
Apr 24 07:50:15: wifid : Existing neighbor 00-04-56-F8-33-26 bss 00-04-56-F8-34-00/00-04-56-F8-39-80 power 15/18 rssi 0/0 #clients 0/1
Apr 24 07:50:20: wifid : error tx'ing neighbor info (main.c:1424)
```

Radio Frequency

Wi-Fi Analyzer

This tool provisions customer to scan the channels supported as per regulatory domain and provides information related to AP's presence in each channel. Wi-Fi analyzer graphs are available in two modes:

- Interference

This tool shares more information of each channel as below:

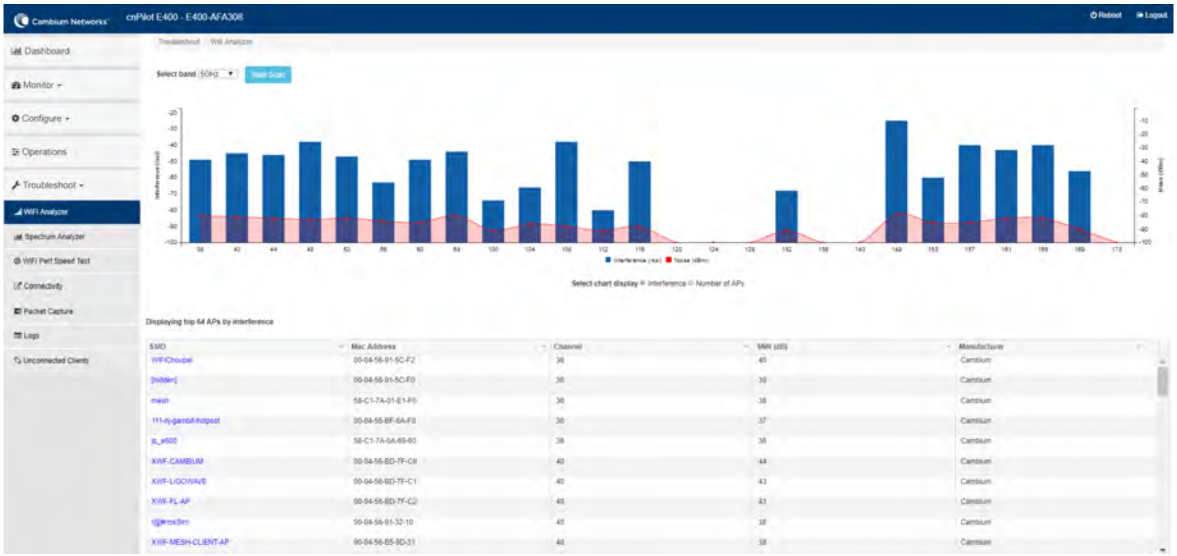
- Noise
- Interference measured in RSSI
- List of top 64 neighbor APs
- Number of APs

This tool shares more information of each channel as below:

- Noise
- Number of neighbor APs
- List of top 64 neighbor APs

Channel analyzer is available at **Troubleshoot > Wi-Fi Analyzer > Interference Mode**.

Figure 54: *Figure 58 Troubleshoot > Wi-Fi Analyzer > Interference Mode*



Select band 5GHz

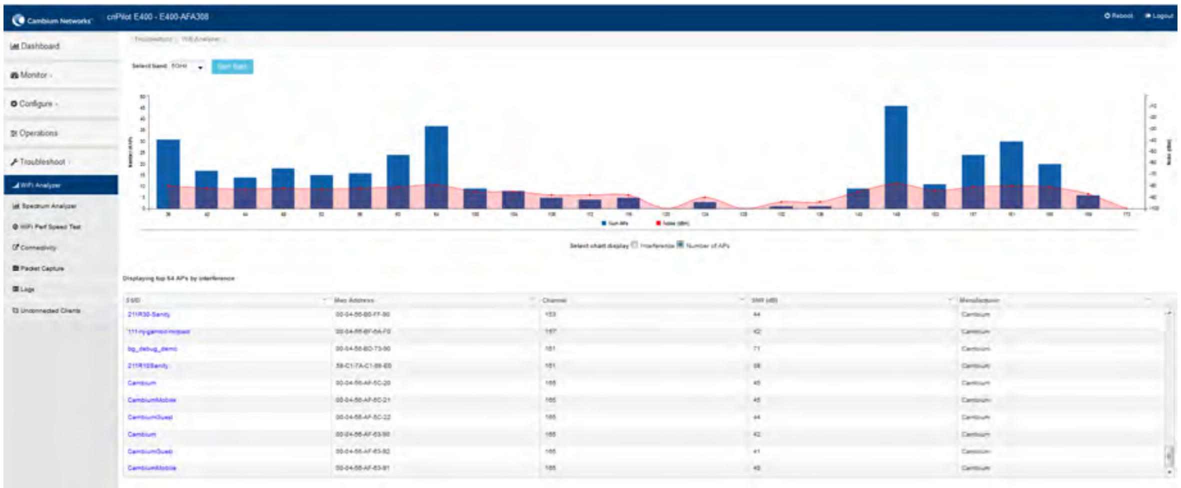
Select chart display ● Interference ○ Number of APs

Displaying top 64 APs by interference

SSID	Mac Address	Channel	SNR (dB)	Manufacturer
WiFiChoupal	00-04-56-91-5C-F2	36	40	Cambium
[hidden]	00-04-56-91-5C-F0	36	39	Cambium
mesh	58-C1-7A-01-E1-F0	36	38	Cambium
111-rj-gambit-hotspot	00-04-56-BF-6A-F0	36	37	Cambium
jp_e500	58-C1-7A-0A-69-60	36	36	Cambium
XWF-CAMBIUM	00-04-56-BD-7F-C0	40	44	Cambium
XWF-LIGOWAVE	00-04-56-BD-7F-C1	40	43	Cambium
XWF-FL-AP	00-04-56-BD-7F-C2	40	43	Cambium
t@rna3m	00-04-56-91-32-10	40	38	Cambium
XWF-MESH-CLIENT-AP	00-04-56-B5-9D-31	40	38	Cambium

Channel analyzer is available at **Troubleshoot > Wi-Fi Analyzer > Number of APs Mode**:

Figure 55: *Troubleshoot > Wi-Fi Analyzer > Number of APs Mode*



Displaying top 54 APs by interference

SSID	Mac Address	Channel	SNR (dB)	Manufacturer
211R30-Sanity	00-04-56-B0-FF-90	153	44	Cambium
111-ny-gameon-mopaw	00-04-56-BF-6A-F0	157	42	Cambium
bg_debug_demo	00-04-56-BD-73-90	161	71	Cambium
211R10Sanity	58-C1-7A-C1-89-E0	161	58	Cambium
Cambium	00-04-56-AF-5C-20	165	40	Cambium
CambiumMobile	00-04-56-AF-5C-21	165	45	Cambium
CambiumGuest	00-04-56-AF-5C-22	165	44	Cambium
Cambium	00-04-56-AF-63-90	165	42	Cambium
CambiumGuest	00-04-56-AF-63-92	165	41	Cambium
CambiumMobile	00-04-56-AF-63-91	165	40	Cambium

Spectrum analyzer

Due to heavy commercialization of Wi-Fi devices and wide range of non-Wi-Fi devices operating in the ISM band, interference in the ISM bands is unavoidable and imminent. The Wi-Fi performance can quickly degrade with the presence of these wide range of devices in the vicinity. The Wi-Fi network deployment is in need of more robust tools for RF spectrum analysis for determining potential Wi-Fi (and non-Wi-Fi) interferers for efficient planning of the network deployment.

Given the wide range deployment of high capacity Wi-Fi networks, it is inevitable that the devices come ready with automatic interference detection and mitigation. The spectral scan feature on cnPilot is the first step towards achieving the same.

Spectral analyzer is triggered on demand. Following options are required to trigger spectrum analyzer:

- Band

  This feature is available on both 2.4GHz and 5GHz. At an instance, any one band can be selected

- Continuous scan

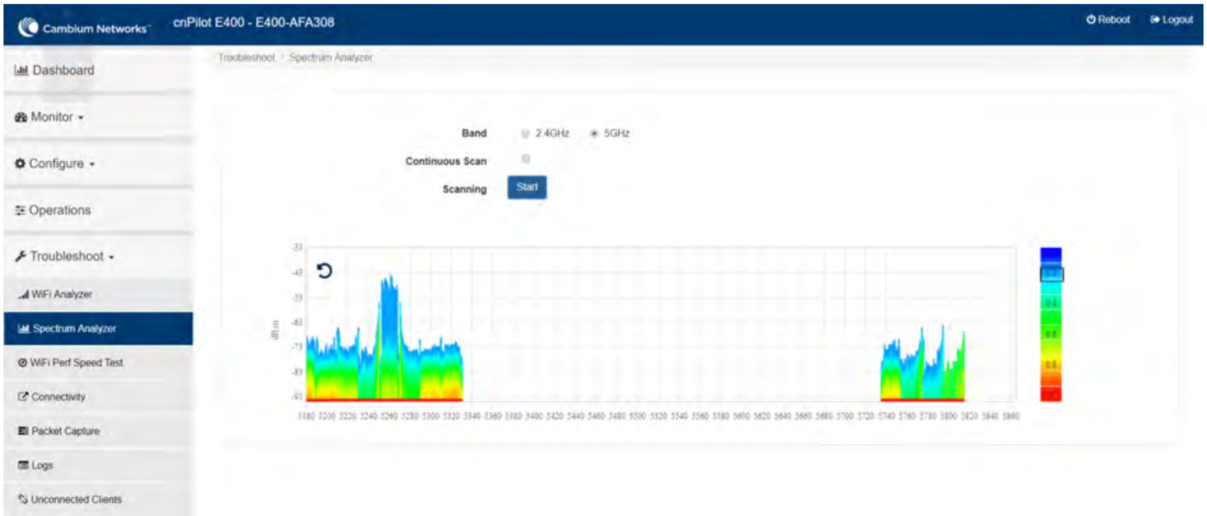
  If user is looking for continuous scan until stopped, this field has to be enabled.

- Scanning

  Option to start and stop the scan process.

Spectrum analyzer is available at **Troubleshoot > Spectrum Analyzer.**

Figure 56: *Troubleshoot > Spectrum Analyzer*



Band ○ 2.4GHz ● 5GHz

Continuous Scan □

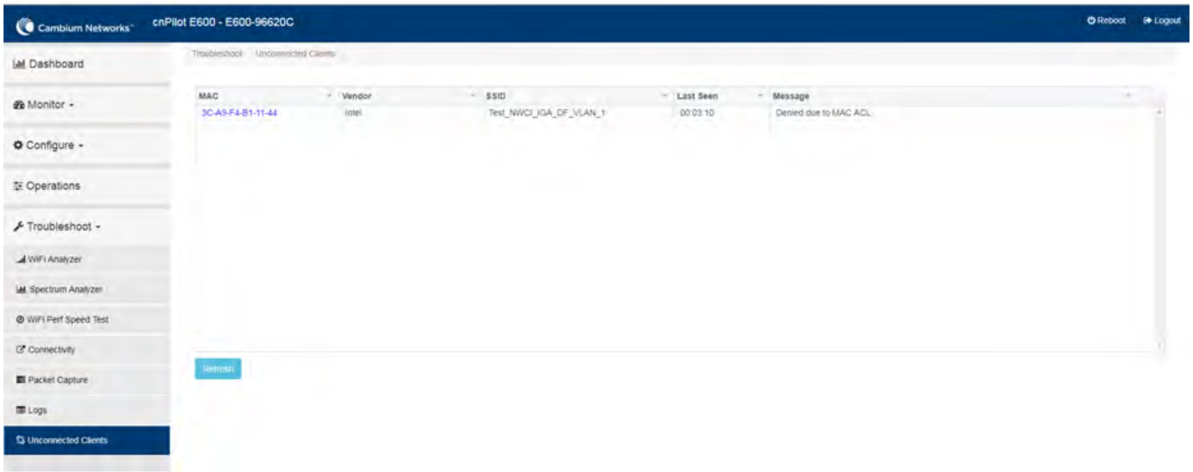
Scanning Start

Unconnected clients

Unconnected clients provides a list of clients that could not connect properly due to various reasons with the Aps. Currently the following failures are tracked:

- Invalid pre-shared key
- EAP authentication failure
- Denied due to MAC ACL
- Client disconnected by enhanced-roaming

Figure 57: *Unconnected clients*



MAC	Vendor	SSID	Last Seen	Message
3C-A9-F4-B1-11-44	Intel	Test_NWCI_IGA_DF_VLAN_1	00:03:10	Denied due to MAC ACL

Packet capture

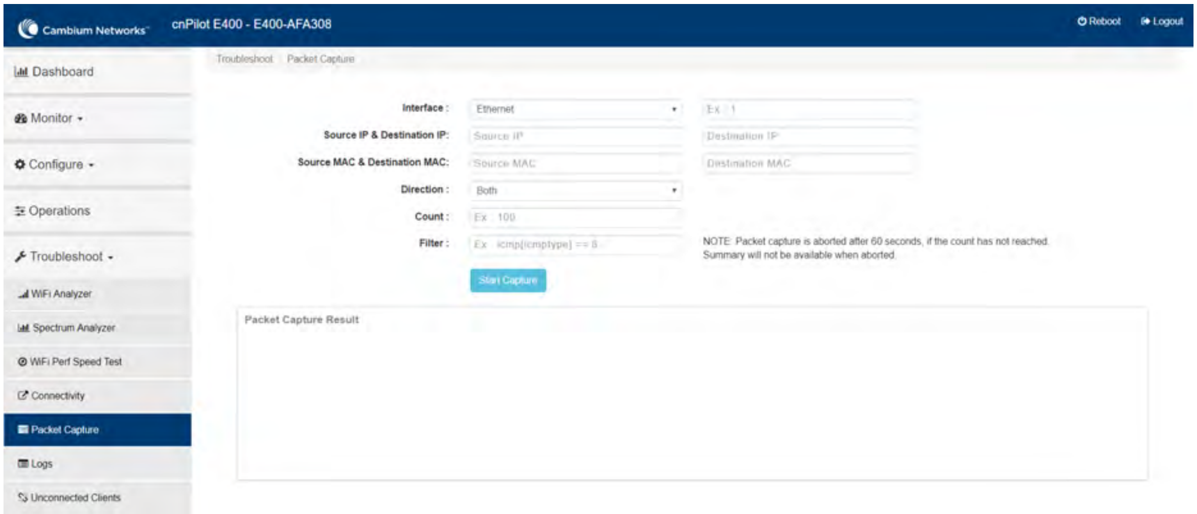
Allows the administrator to capture all packets on a specified interface. A decode of the packet indicating the network addresses, protocol types etc is displayed. The administrator can filter the packets being captured by specifying a particular MAC address, IP address, port number etc. The number of packets that are captured can also be capped, so the console or system is not overwhelmed. Packets captured on the ETH interfaces are packets that are being transmitted or received on the physical interface of the device.

cnPilot device allows packet capture on following interfaces:

- WLAN
- Ethernet
- VLAN
- SSID

Multiple options of filtering are provided and is available Troubleshoot > Packet Capture page:

Figure 58: *Troubleshoot > Packet Capture page*



Interface : Ethernet | Ex : 1

Source IP & Destination IP: Source IP | Destination IP

Source MAC & Destination MAC: Source MAC | Destination MAC

Direction : Both

Count : Ex : 100

Filter : Ex : icmp[icmptype] == 8

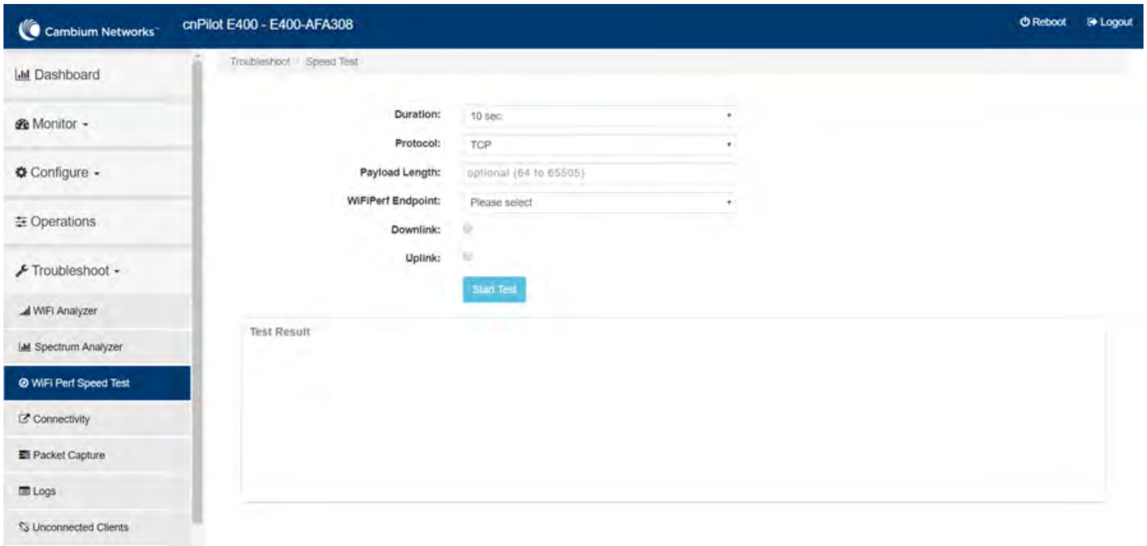
NOTE: Packet capture is aborted after 60 seconds, if the count has not reached. Summary will not be available when aborted.

Performance

Wi-Fi Perf speed test

The Wi-Fi Perf Speed Test feature helps to measure the bandwidth from AP to an end point. You can measure both TCP and UDP with variable payloads. To configure this feature:

1. Navigate to **Troubleshoot > Wi-Fi Perf Speed Test** page in the UI.
2. Provide the following details:
    - Select the **Duration** from the Duration drop-down list.
    - Select the P**rotocol as UDP** or TCP.
    - Enter the length of the payload in the **Payload Length** textbox.
    - Enter the IP of the payload length in the **Wi-FiPerf Endpoint** textbox.
    - Select **Downlink** or **Uplink Radio** button.
3. Click on **Start Test**.



Duration: 10 sec

Protocol: TCP

Payload Length: optional (64 to 65505)

WiFiPerf Endpoint: Please select

Downlink: ○

Uplink: ○

Test Result

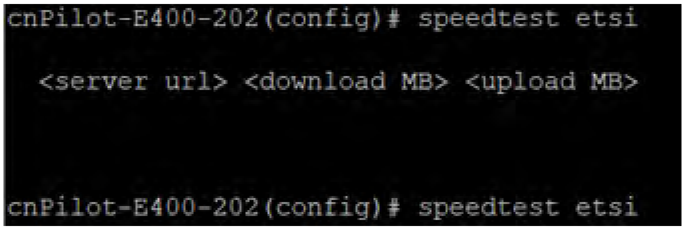
Figure 59: *Figure 63 Troubleshoot > Wi-Fi Perf Speed Test*

Speedtest on Access Point

Speedtest can be used to measure speed across the WAN to Cambium hosted servers. The CLI output displays uplink and downlink speed in Mbps. You can also host your own server in your data center and measure bandwidth to it using ETSI option and specifying the URL. The server software can be obtained from the LibreSpeed project https://github.com/librespeed/speedtest.

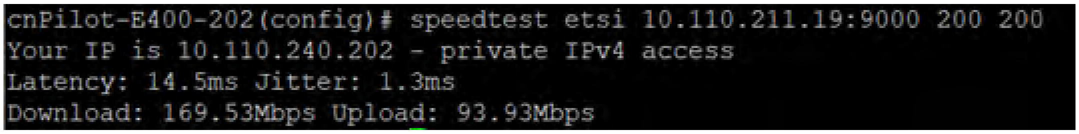
Configuration:

Syntax:



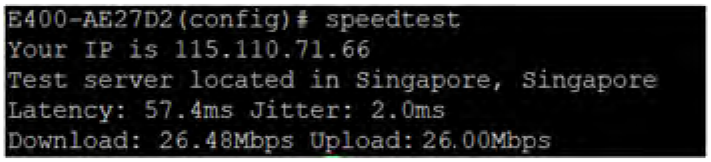
```
cnPilot-E400-202(config)# speedtest etsi

  <server url> <download MB> <upload MB>



cnPilot-E400-202(config)# speedtest etsi
```

Example 1:



```
cnPilot-E400-202(config)# speedtest etsi 10.110.211.19:9000 200 200
Your IP is 10.110.240.202 - private IPv4 access
Latency: 14.5ms Jitter: 1.3ms
Download: 169.53Mbps Upload: 93.93Mbps
```

Example 2:



```
E400-AE27D2(config)# speedtest
Your IP is 115.110.71.66
Test server located in Singapore, Singapore
Latency: 57.4ms Jitter: 2.0ms
Download: 26.48Mbps Upload: 26.00Mbps
```

Note

Cambium hosted server is chosen automatically

Connectivity

IPv4

This tool helps to check the accessibility of remote hosts from cnPilot device. Three types of tools are supported under this category:

- Ping
- DNS Lookup
- Traceroute

Table 58: Troubleshoot: Connectivity

Parameters	Description	Range	Default
Verbose	Provision to display the output of traceroute.	-	On
Traceroute Result	Displays the output of traceroute command.	-	-
Traceroute			
Trace Method	Provision to configure payload mechanism to check the reachability of destined IPv4Hostname.	-	ICMP Echo
Ping Result	Displays the ICMP results.	-	-
Ping			
Number of Packets	Provide number of request packets that are required to be transmitted to validate the reachability of destined Host.	1-10	3
IP Address or Hostname	Provide IPv4 address or Hostname to validate the reachability of the destined Host.	-	-
IP Address or Hostname	Provide IPv4 address or Hostname to validate the reachability of the destined Host.	-	-
Host Name	Provide Hostname whose IP must be resolved.	-	-
Fragmentation	Provision to allow or deny fragment packets.	-	Off
DNS Test Result	Displays the IP's that are associated with configured Hostname.	-	-
DNS Lookup			
Display TTL	Provision to customize TTL display.	-	On
Buffer Size	Configure ICMP packet size.	1-65507	56

To configure the above parameter, navigate to the **Troubleshoot > Connectivity** tab and provide the details as given below:

To configure Ping:

1. Select **Test** type from the drop-down list.
2. Enter **IP address** or **Hostname** in the textbox.
3. Enter the **Number** of packets in the textbox.
4. Select **Buffer Size** value from the drop-down list.
5. Start **Ping**.

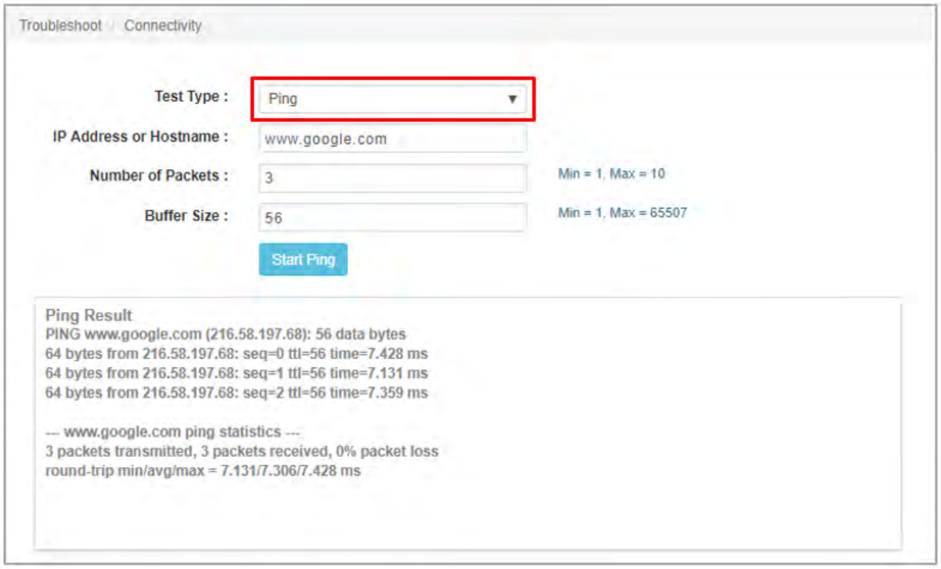
To configure **DNS Lookup**:

1. Enter the **Hostname** in the textbox.
2. Click **DNS Test**.

To configure **Traceroute**:

1. Enter **IP address** or **Hostname** in the textbox.
2. Click **Fragmentation** to ON/Off.
3. Select **Trace Method** to either ICMP Echo/UDP.
4. Click **Display TTL** to ON/Off.
5. Click **Verbose** to ON/Off.
6. Click **Start Traceroute**.

Figure 60: *Troubleshoot > Connectivity > Ping*



Test Type : Ping

IP Address or Hostname : www.google.com

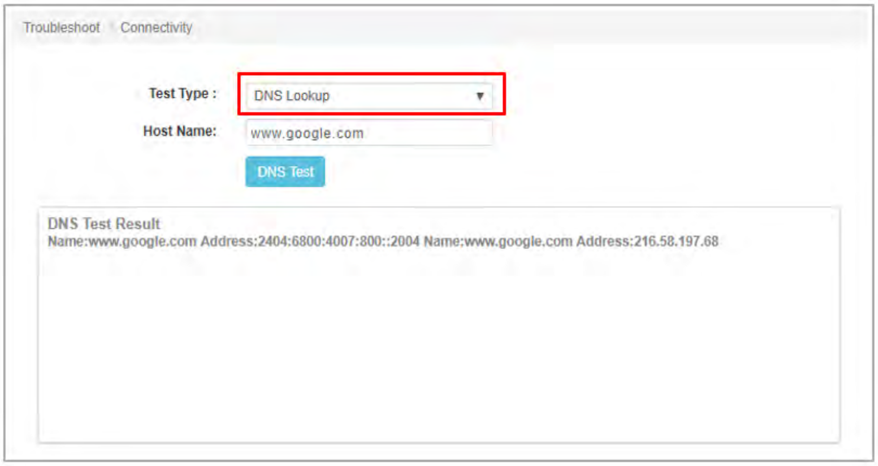
Number of Packets : 3 Min = 1, Max = 10

Buffer Size : 56 Min = 1, Max = 65507

Ping Result

```
PING www.google.com (216.58.197.68): 56 data bytes
64 bytes from 216.58.197.68: seq=0 ttl=56 time=7.428 ms
64 bytes from 216.58.197.68: seq=1 ttl=56 time=7.131 ms
64 bytes from 216.58.197.68: seq=2 ttl=56 time=7.359 ms

--- www.google.com ping statistics ---
3 packets transmitted, 3 packets received, 0% packet loss
round-trip min/avg/max = 7.131/7.306/7.428 ms
```

Figure 61: *Troubleshoot > Connectivity > DNS Lookup*



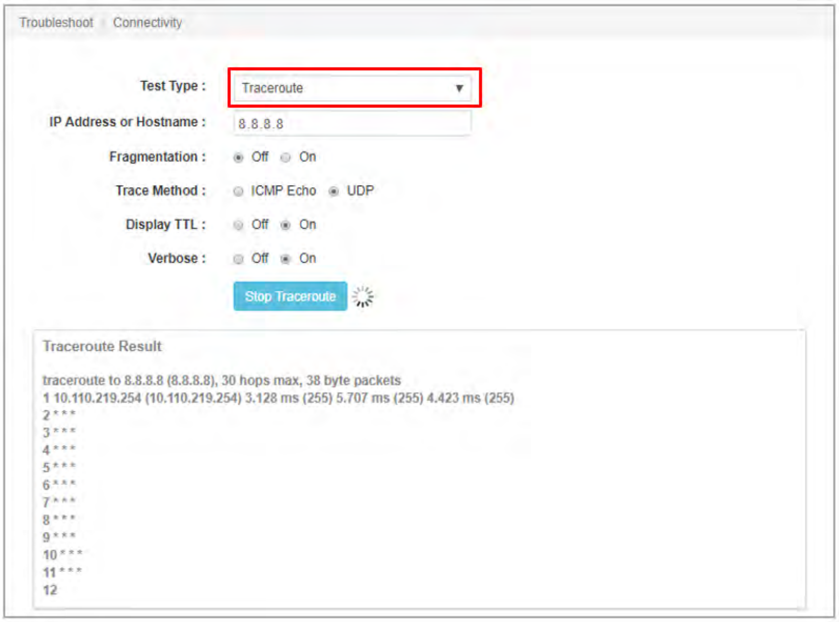
Test Type : DNS Lookup

Host Name: www.google.com

DNS Test Result

```
Name:www.google.com Address:2404:6800:4007:800::2004 Name:www.google.com Address:216.58.197.68
```

Figure 62: *Troubleshoot: Connectivity > Traceroute*



Test Type : Traceroute

IP Address or Hostname : 8.8.8.8

Fragmentation : ● Off ○ On

Trace Method : ○ ICMP Echo ● UDP

Display TTL : ○ Off ● On

Verbose : ○ Off ● On

Traceroute Result

```
traceroute to 8.8.8.8 (8.8.8.8), 30 hops max, 38 byte packets
1 10.110.219.254 (10.110.219.254) 3.128 ms (255) 5.707 ms (255) 4.423 ms (255)
2 * * *
3 * * *
4 * * *
5 * * *
6 * * *
7 * * *
8 * * *
9 * * *
10 * * *
11 * * *
12
```

IPv6

This tool helps to check the accessibility of remote hosts from cnPilot device. Three types of tools are supported under this category:

- Ping6
- DNS Lookup6
- Traceroute6

Table 59: Troubleshoot: Connectivity

Parameters	Description	Range	Default
Ping6			
IP Address or Hostname	Provide IPv6 address or Hostname to validate the reachability of the destined Host.	-	-
Number of Packets	Provide number of request packets that are required to be transmitted to validate the reachability of destined Host.	1-10	3
Buffer Size	Configure ICMP packet size.	1-65507	56
Ping Result	Displays the ICMP results.	-	-
DNS Lookup6			
Host Name	Provide Hostname whose IPv6 must be resolved.	-	-
DNS Test Result	Displays the IP's that are associated with configured Hostname.	-	-
Traceroute6			

Parameters	Description	Range	Default
IP Address or Hostname	Provide IPv6 address or Hostname to validate the reachability of the destined Host.	-	-
Fragmentation	Provision to allow or deny fragment packets.	-	Off
Trace Method	Provision to configure payload mechanism to check the reachability of destined IPv6/Hostname.	-	ICMP Echo
Display TTL	Provision to customize TTL display.	-	On
Verbose	Provision to display the output of traceroute.	-	On
Traceroute Result	Displays the output of traceroute command.	-	-

To configure the above parameter, navigate to the T**roubleshoot > Connectivity** tab and provide the details as given below:

To configure Ping6:

1. Select **Test** type from the drop-down list.
2. Enter **IP address or Hostname** in the textbox.
3. Enter the **Number** of packets in the textbox.
4. Select **Buffer Size** value from the drop-down list.
5. Start **Ping6**.

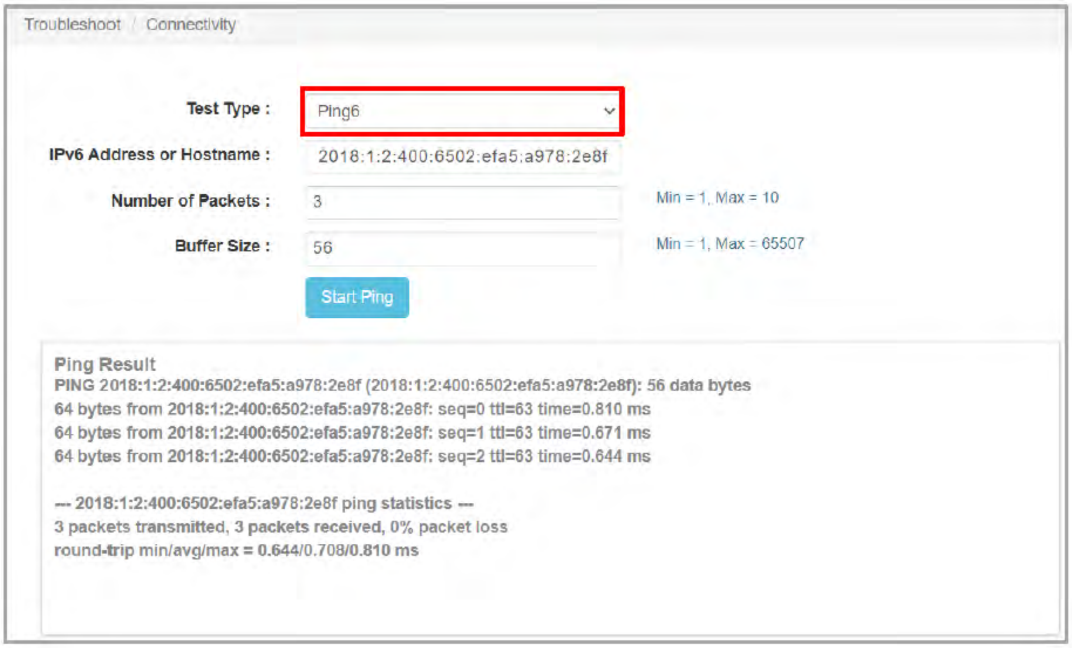
To configure **DNS Lookup6**:

1. Enter the **Hostname** in the textbox.
2. Click **DNS Test**.

To configure **Traceroute6**:

1. Enter **IP address** or Hostname in the textbox.
2. Click **Fragmentation** to ON/Off.
3. Select **Trace Method** to either ICMP Echo/UDP.
4. Click **Display** TTL to ON/Off.
5. Click **Verbose** to ON/Off.
6. Click **Start Traceroute**.

Figure 63: *Troubleshoot > Connectivity > Ping6*



Test Type : Ping6

IPv6 Address or Hostname : 2018:1:2:400:6502:efa5:a978:2e8f

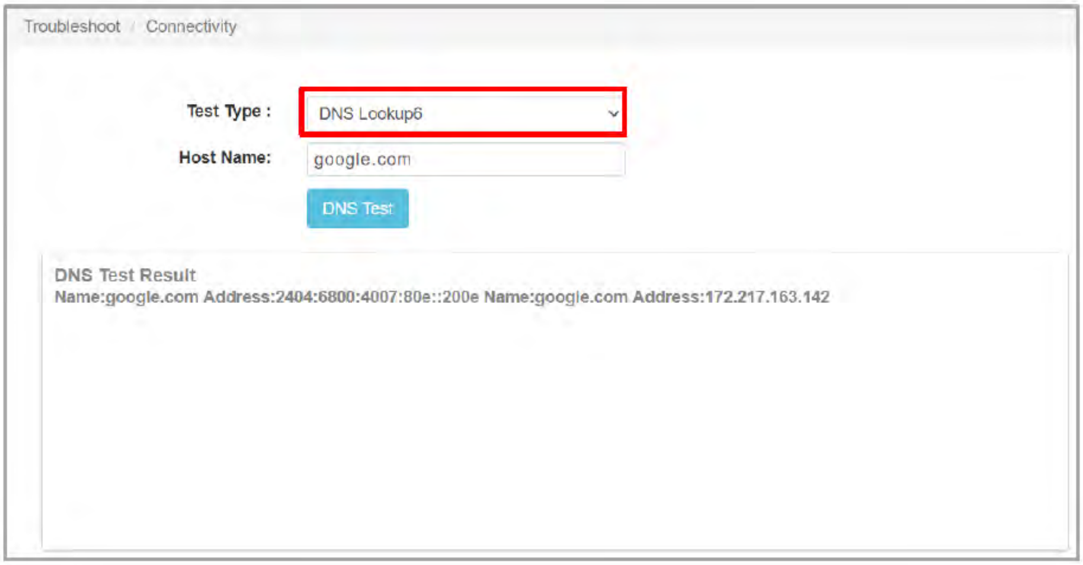
Number of Packets : 3 Min = 1, Max = 10

Buffer Size : 56 Min = 1, Max = 65507

Ping Result

```
PING 2018:1:2:400:6502:efa5:a978:2e8f (2018:1:2:400:6502:efa5:a978:2e8f): 56 data bytes
64 bytes from 2018:1:2:400:6502:efa5:a978:2e8f: seq=0 ttl=63 time=0.810 ms
64 bytes from 2018:1:2:400:6502:efa5:a978:2e8f: seq=1 ttl=63 time=0.671 ms
64 bytes from 2018:1:2:400:6502:efa5:a978:2e8f: seq=2 ttl=63 time=0.644 ms

--- 2018:1:2:400:6502:efa5:a978:2e8f ping statistics ---
3 packets transmitted, 3 packets received, 0% packet loss
round-trip min/avg/max = 0.644/0.708/0.810 ms
```

Figure 64: *Troubleshoot > Connectivity > DNS Lookup6*



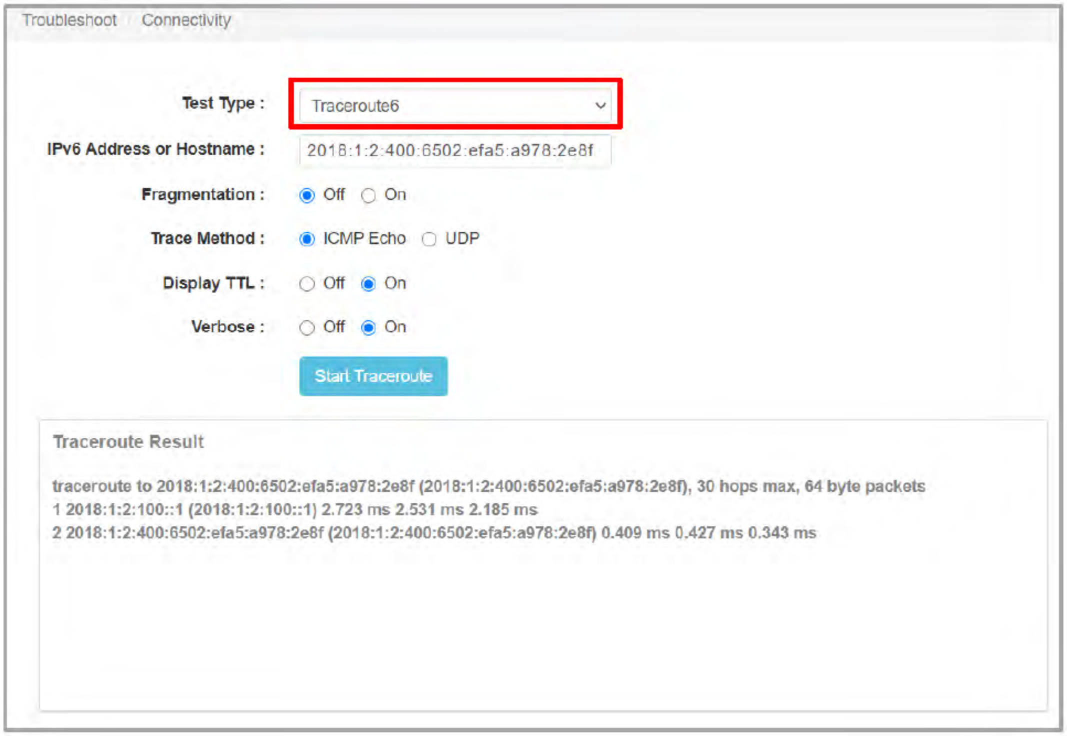
Test Type : DNS Lookup6

Host Name: google.com

DNS Test Result

```
Name:google.com Address:2404:6800:4007:80e::200e Name:google.com Address:172.217.163.142
```

Figure 65: *Troubleshoot: Connectivity > Traceroute6*



Test Type : Traceroute6

IPv6 Address or Hostname : 2018:1:2:400:6502:efa5:a978:2e8f

Fragmentation : ● Off ○ On

Trace Method : ● ICMP Echo ○ UDP

Display TTL : ○ Off ● On

Verbose : ○ Off ● On

Traceroute Result

```
traceroute to 2018:1:2:400:6502:efa5:a978:2e8f (2018:1:2:400:6502:efa5:a978:2e8f), 30 hops max, 64 byte packets
1 2018:1:2:100::1 (2018:1:2:100::1) 2.723 ms 2.531 ms 2.185 ms
2 2018:1:2:400:6502:efa5:a978:2e8f (2018:1:2:400:6502:efa5:a978:2e8f) 0.409 ms 0.427 ms 0.343 ms
```

Chapter 13: Management Access

This chapter describes different methods of authenticating users to access device UI. Following are the authentication methods supported by cnPilot devices:

- Local authentication
- SSH-Key authentication
- RADIUS authentication

Local authentication

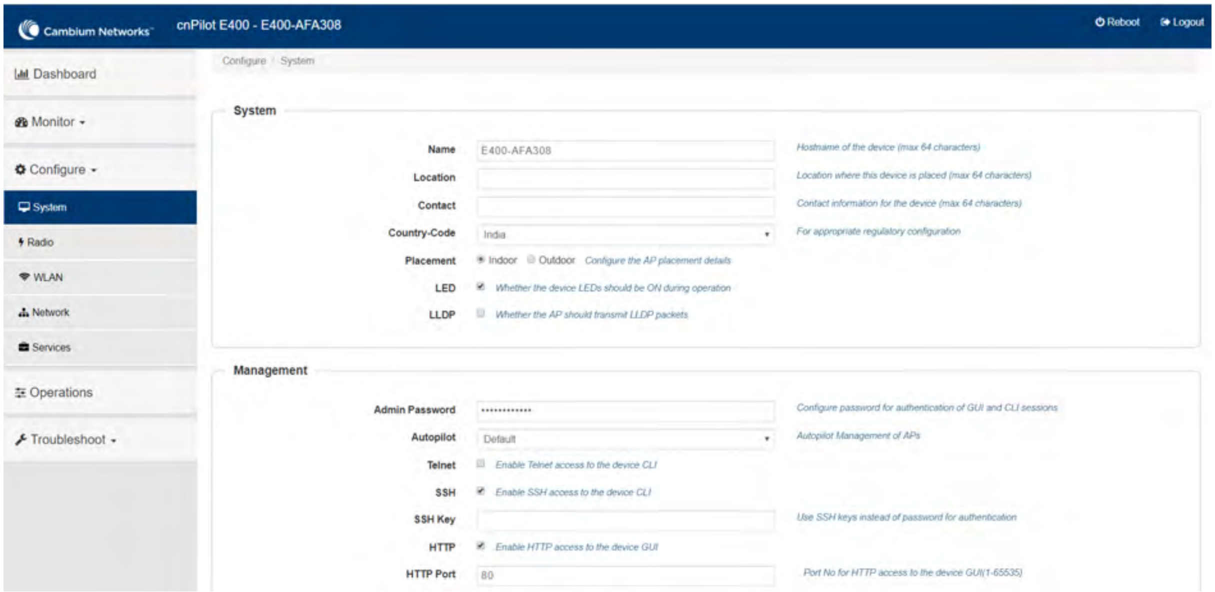
This is the default authentication mode enabled on device. Only one username is supported which is “admin”. Default password for “admin” username is “admin”. User has provision to configure/update password.

Device configuration

Configure/update default password of admin user shows how to configure/update default password of admin user.

1. Under Management, enter Admin Password.
2. Click Save.

Figure 66: *Configure/update default password of admin user*



System

Name: E400-AFA308 — Hostname of the device (max 64 characters)

Location: — Location where this device is placed (max 64 characters)

Contact: — Contact information for the device (max 64 characters)

Country-Code: India — For appropriate regulatory configuration

Placement: ● Indoor ○ Outdoor — Configure the AP placement details

LED: ☑ Whether the device LEDs should be ON during operation

LLDP: □ Whether the AP should transmit LLDP packets

Management

Admin Password: ••••••••••••• — Configure password for authentication of GUI and CLI sessions

Autopilot: Default — Autopilot Management of APs

Telnet: □ Enable Telnet access to the device CLI

SSH: ☑ Enable SSH access to the device CLI

SSH Key: — Use SSH keys instead of password for authentication

HTTP: ☑ Enable HTTP access to the device GUI

HTTP Port: 80 — Port No for HTTP access to the device GUI(1-65535)

SSH-Key authentication

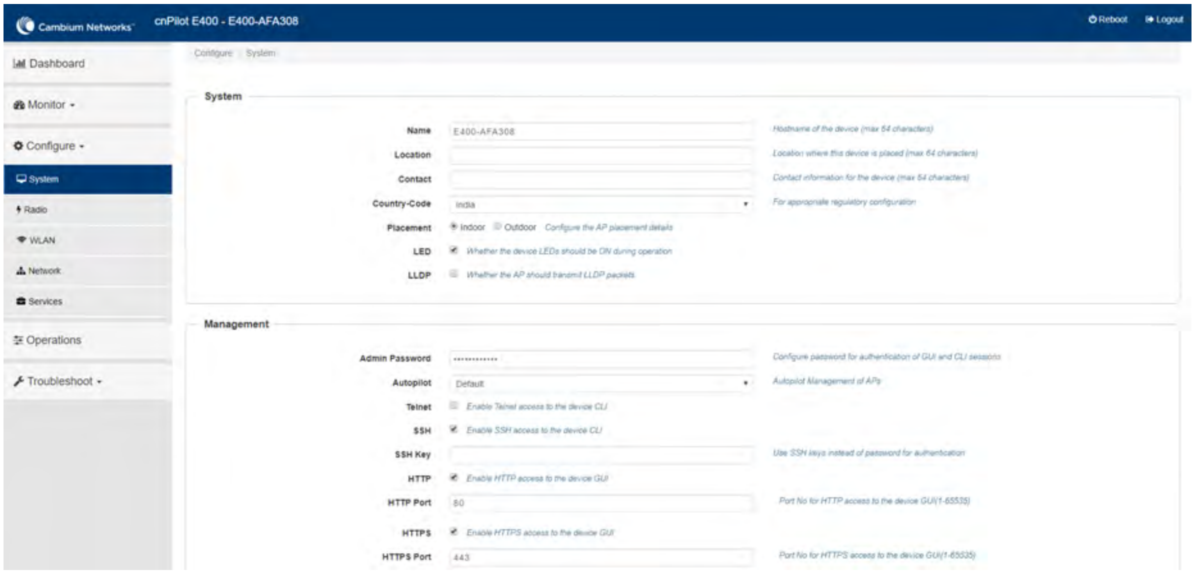
SSH keys are also used to connect remote machines securely. They are based on the SSH cryptographic network protocol, which is responsible for the encryption of the information stream between two machines. Ultimately, using SSH keys user can connect to remote devices without even entering a password and much more securely too. SSH works based on “public-key cryptography”. For simplicity, let us consider that SSH keys come in pairs. There is a private key, that is safely stored to the home machine of the user and a public key, which is stored to any remote machine (AP) the user wants to connect. So, whenever a user initiates an SSH connection with a remote machine, SSH first checks if the user has a private key that matches any of the public keys in the remote machine and if not, it prompts the user for password.

Device configuration

SSH Key based access method can be configured on device using standalone AP or from cnMaestro. Navigate to System > Management and configure the following:

1. Enable SSH checkbox.
2. Provide Public key generated from steps described in SSH Key Generation section.

Figure 67: *System > Management*



System

Name: E400-AFA308 — Hostname of the device (max 64 characters)
Location: — Location where this device is placed (max 64 characters)
Contact: — Contact information for the device (max 64 characters)
Country-Code: India — For appropriate regulatory configuration
Placement: ● Indoor ○ Outdoor — Configure the AP placement details
LED: ☑ Whether the device LEDs should be ON during operation
LLDP: □ Whether the AP should transmit LLDP packets

Management

Admin Password: ············ — Configure password for authentication of GUI and CLI sessions
Autopilot: Default — Autopilot Management of APs
Telnet: □ Enable Telnet access to the device CLI
SSH: ☑ Enable SSH access to the device CLI
SSH Key: — Use SSH keys instead of password for authentication
HTTP: ☑ Enable HTTP access to the device GUI
HTTP Port: 80 — Port No for HTTP access to the device GUI(1-65535)
HTTPS: ☑ Enable HTTPS access to the device GUI
HTTPS Port: 443 — Port No for HTTPS access to the device GUI(1-65535)

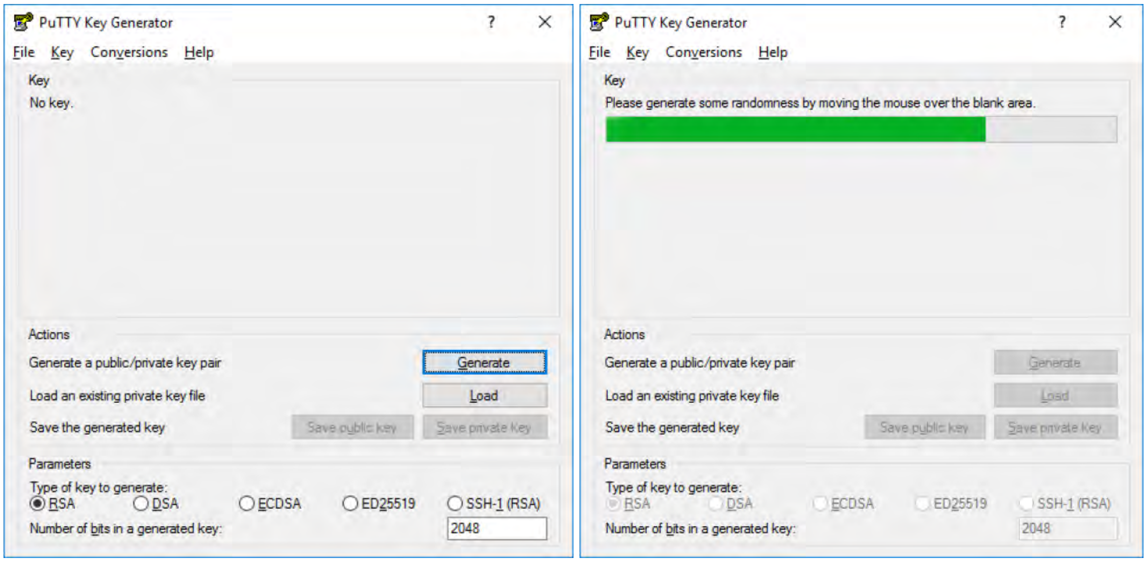
SSH Key Generation

Windows

PUTTY tool can be used to generate both Public and Private Key. Below is a sample demonstration of configuring cnPilot device and logging using SSH Key via UI.

1. Generate a key pair in PUTTY Key Generator (Figure 68) and save private and public key as shown in Figure 69.

Figure 68: *Generating public/private Key*



Key

No key.

Generate a public/private key pair

Load an existing private key file

Save the generated key

Type of key to generate:

● RSA ○ DSA ○ ECDSA ○ ED25519 ○ SSH-1 (RSA)

Number of bits in a generated key: 2048

Key

Please generate some randomness by moving the mouse over the blank area.

Generate a public/private key pair

Load an existing private key file

Save the generated key

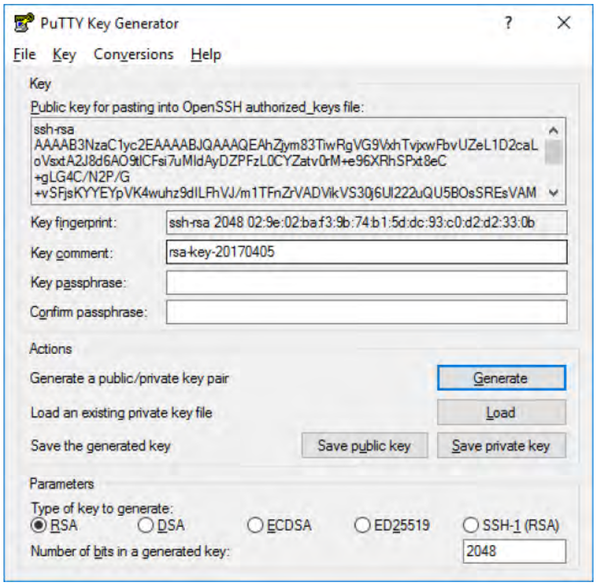
Type of key to generate:

● RSA ○ DSA ○ ECDSA ○ ED25519 ○ SSH-1 (RSA)

Number of bits in a generated key: 2048

2. Save the Public key and Private key once key pair is generated as shown in Public and Private Key.

Figure 69: *Public and Private Key*



Public key for pasting into OpenSSH authorized_keys file:

```
ssh-rsa
AAAAB3NzaC1yc2EAAAABJQAAAQEAhZjym83TiwRgVG9VxhTvjxwFbvUZeL1D2caL
oVsxtA2J8d6AO9tlCFsi7uMldAyDZPFzL0CYZatv0rM+e96XRhSPxt8eC
+gLG4C/N2P/G
+vSFjsKYYEYpVK4wuhz9dILFhVJ/m1TFnZrVADVikVS30j6UI222uQU5BOsSREsVAM
```

Key fingerprint: ssh-rsa 2048 02:9e:02:ba:f3:9b:74:b1:5d:dc:93:c0:d2:d2:33:0b

Key comment: rsa-key-20170405

Key passphrase:

Confirm passphrase:

Generate a public/private key pair

Load an existing private key file

Save the generated key

Type of key to generate:

● RSA ○ DSA ○ ECDSA ○ ED25519 ○ SSH-1 (RSA)

Number of bits in a generated key: 2048

3. Save the Public key generated in step above as described in Device configuration section.

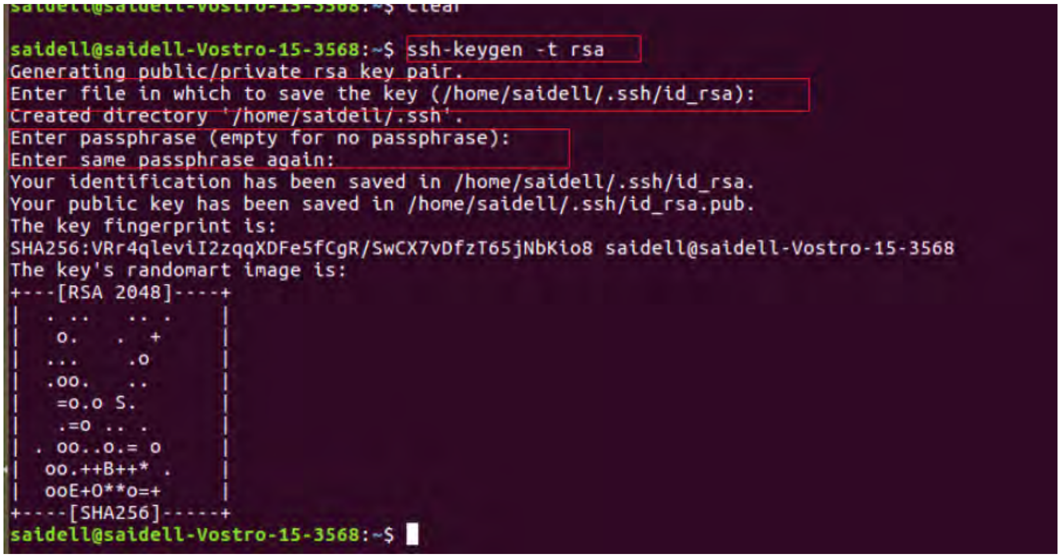
4. Login to device using Private key generated above with username as “admin”.

Linux

If using a Linux PC and SSH from the Linux host, then you can generate the keys with the following steps:

1. Generate key pair executing below command on Linux console as shown in Figure 70.

Figure 70: *Public Key location path*



```
saidell@saidell-Vostro-15-3568:~$ clear

saidell@saidell-Vostro-15-3568:~$ ssh-keygen -t rsa
Generating public/private rsa key pair.
Enter file in which to save the key (/home/saidell/.ssh/id_rsa):
Created directory '/home/saidell/.ssh'.
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/saidell/.ssh/id_rsa.
Your public key has been saved in /home/saidell/.ssh/id_rsa.pub.
The key fingerprint is:
SHA256:VRr4qleviI2zqqXDFe5fCgR/SwCX7vDfzT65jNbKio8 saidell@saidell-Vostro-15-3568
The key's randomart image is:
+---[RSA 2048]----+
|   . ..   .. .   |
|    o.    .  +   |
|   ...     .o    |
|   .oo.    ..    |
|    =o.o S.      |
|     .=o .. .    |
| .  oo..o.= o    |
|   oo.++B++* .   |
|   ooE+O**o=+    |
+----[SHA256]-----+
saidell@saidell-Vostro-15-3568:~$
```

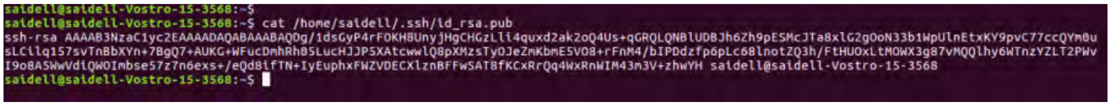
2. The Public key is now located in PATH mentioned in Figure 70.

- PATH = “Enter the file to which to save the key”

3. The private key (identification) is now saved in PATH as mentioned in Figure 71.

- PATH = “Your identification has saved in <>”

Figure 71: *Private Key saved path*



```
saidell@saidell-Vostro-15-3568:~$
saidell@saidell-Vostro-15-3568:~$ cat /home/saidell/.ssh/id_rsa.pub
ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAABAQDg/1dsGyP4rFOKH8UnyjHgCHGzLli4quxd2ak2oQ4Us+qGRQLQNBlUDBJh6Zh9pESMcJTa8xlG2gOoN33b1WpUlnEtxKY9pvC77ccQYm0u
sLCilq157svTnBbXYn+7BgQ7+AUKG+WFucDmhRh05LucHJJP5XAtcwwlQ8pXMzsTyOJeZmKbmE5VO8+rFnM4/bIPDdzfp6pLc68lnotZQ3h/FtHUOxLtMOWX3g87vMQQlhy6WTnzYZLT2PWv
I9o8A5WwVdiQWOImbse57z7n6exs+/eQd8ifTN+IyEuphxFWZVDECXlznBFFwSAT8fKCxRrQq4WxRnWIM43m3V+zhwYH saidell@saidell-Vostro-15-3568
saidell@saidell-Vostro-15-3568:~$
```

4. Save the Public key generated in step above as described in Device configuration section.

5. Login to device using Private key generated above with username as “admin”.

RADIUS authentication

Device management access using RADIUS authentication allows multiple users to access using unique credentials and is secured.

Device configuration

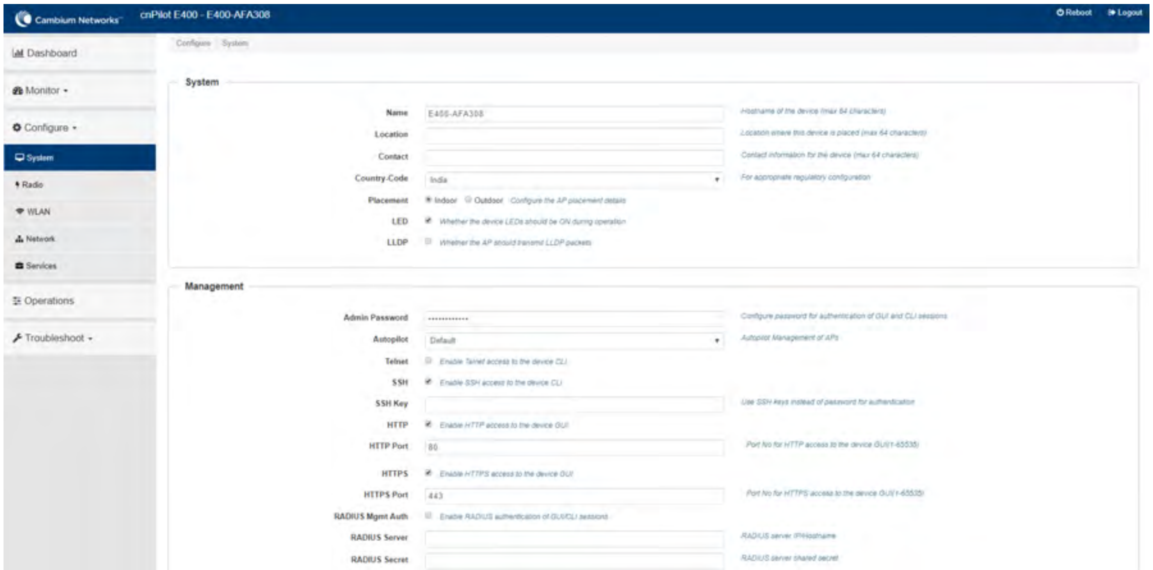
Management access using RADIUS authentication method can be configured on device using standalone AP or from cnMaestro. Navigate to System > Management and configure the following:

1. Enable RADIUS Mgmt Auth checkbox.

2. Configure RADIUS IPv4/IPv6/Hostname and shared secret in RADIUS Server and RADIUS Secret parameters respectively.

3. Click Save.

Figure 72: *System > Management: RADIUS Server and RADIUS Secret parameters*



System

Name: E400-AFA308 — *Hostname of the device (max 64 characters)*

Location: — *Location where this device is placed (max 64 characters)*

Contact: — *Contact information for the device (max 64 characters)*

Country-Code: India — *For appropriate regulatory configuration*

Placement: ● Indoor ○ Outdoor *Configure the AP placement details*

LED: ☑ *Whether the device LEDs should be ON during operation*

LLDP: ☐ *Whether the AP should transmit LLDP packets*

Management

Admin Password: ············· — *Configure password for authentication of GUI and CLI sessions*

Autopilot: Default — *Autopilot Management of APs*

Telnet: ☐ *Enable Telnet access to the device CLI*

SSH: ☑ *Enable SSH access to the device CLI*

SSH Key: — *Use SSH keys instead of password for authentication*

HTTP: ☑ *Enable HTTP access to the device GUI*

HTTP Port: 80 — *Port No for HTTP access to the device GUI(1-65535)*

HTTPS: ☑ *Enable HTTPS access to the device GUI*

HTTPS Port: 443 — *Port No for HTTPS access to the device GUI(1-65535)*

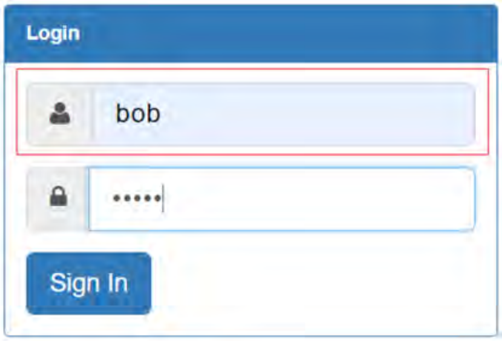
RADIUS Mgmt Auth: ☐ *Enable RADIUS authentication of GUI/CLI sessions*

RADIUS Server: — *RADIUS server IP/Hostname*

RADIUS Secret: — *RADIUS server shared secret*

4. Figure 73: *Login to device using appropriate credentials as shown in UI Login page.*

Figure 74: *UI Login page*



Login

bob

•••••

Chapter 14: Mesh

cnPilot Enterprise series Wi-Fi Aps support wireless mesh allowing the user to easily extend the range of their network and to cover areas where a cable run might be hard to do. Mesh support was added in software version 2.0.

cnPilot devices support mesh connections between radios. Mesh links can form between radios which are operating in the same band. Given the larger set of available channels and typically cleaner RF environment Cambium recommend using the 5GHz radio for mesh backhaul.

For a stable mesh link to be established, cnPilot mesh operates in three modes of operation:

1. Mesh Base (MB)

   cnPilot device that operates in MB mode is the key to Mesh topology. MB is usually connected to the wired network. The radio setup for MB will select a channel and start transmitting beacons as soon as the AP comes up.

2. Mesh Client (MC)

   cnPilot device that operates in MC mode, scans all available channels supported as per regulatory domain and establishes a link with MB.

3. Mesh Recovery (MR)

   This mode when enabled helps to maintain mesh link if there is a disruption in backhaul link established with MB and MC. Mesh link disruption can cause due to PSK mismatch or due to asynchronous configurations on MB and MC. This mode needs to be exclusively enabled on MB device.

   This mode can also help in Zero Touch Configuration of cnPilot device.

Mesh configurable parameters

Table 60 lists the configurable parameters that are exclusive to mesh:

Table 60: Configure: WLAN > Mesh parameters

Parameters	Description	Range	Default
Enable	Option to enable a WLAN profile. Once enabled, a Beacon is broadcasted with SSID and respective configured parameters in a WLAN profile.	–	–
Mesh	This parameter is required when a WDS connection is established with cnPilot devices. Four options are available under this parameter: 1. Base A WLAN profile configured with mesh-base will operate like a normal AP. Its radio will beacon on startup so its SSID can be seen by radios configured as mesh-clients. 2. Client	–	Off

Parameters	Description	Range	Default
	A WLAN profile configured with mesh-client will scan all available channels on startup, looking for a mesh-based AP to connect. 3. Recovery A WLAN profile configured as mesh-recovery will broadcast pre-configured SSID upon detection of mesh link failure after a successful connection. This needs to be exclusively configured on mesh-base device. Mesh-client will auto scan for mesh-recovery SSID upon failure of mesh link. 4. Off Mesh support disable on WLAN profile.		
SSID	SSID is the unique network name to which MC connects and establishes mesh link.	–	–
VLAN	Management VLAN to access all devices in mesh topology.	1-4094	1
Security	This parameter determines key values that is encrypted based on selected algorithm. Following security methods are supported by cnPilot devices: 1. Open This method is preferred when Layer 2 authentication is built in the network. With this configured on cnPilot device, any mesh link can be established. 2. WPA2-Pre-Shared Keys This mode is supported with AES encryption. 3. WPA2 Enterprise This security type uses 802.1x authentication to associate mesh devices. This is a centralized system of authentication method.	–	Open
Passphrase	String that is a key value to generate keys based on security method configured.	–	12345678
Radios	Each SSID can be configured to be transmitted as per the deployment requirement. For a mesh WLAN profile, options available to configure band: ▪ 2.4GHz ▪ 5GHz	–	2.4GHz

Parameters	Description	Range	Default
Max Clients	This specifies the maximum number of mesh clients that can be associated to a mesh WLAN profile. This varies based on cnPilot device model number. Refer Table 16 for more details.	1-512 (Refer Table 16)	128
Client Isolation	This feature needs to be enabled when there is a need for prohibition of inter mesh devices communication either over the network or on an AP. Three options are available to configure based on requirement: 1. Disable This option when selected disables client isolation feature. i.e. Inter Mesh client communication is allowed. 2. Local This options when selected enables client isolation feature. This option prevents inter mesh client communications connected to same device. 3. Network Wide This option when selected enables network wide client isolation feature. It prevents mesh client communications connected to different AP deployed in same network.	–	Disabled
Hide SSID	This is the basic security mode of a Wi-Fi device. This parameter when enabled, will not broadcast SSID.	–	Disabled
Mesh Vlan Tagging	Enable the VLAN tagging over mesh link. This is applicable only for Cambium mesh topology.	–	Enabled
Mesh Auto Detect Backhaul	1. Single Hop MC is configured on MB with same WLAN parameters. When enabled, this feature triggers when a MB losses Ethernet connectivity. MB profile will get disabled and MC profile will get enable and establishes mesh link with nearest MB. For MB profile to get auto disabled, uncheck Mesh Multi Hop. 2. Multi Hop MC is configured on MB with same WLAN parameters. When enabled, this feature triggers when a MB losses Ethernet connectivity. MB profile and MC profile will get enable and establishes mesh link with nearest MB.	–	Disabled
Drop Multicast Traffic	When enabled, will drop all multicast flowing in or out of that WLAN.	–	Disabled
Insert DHCP Option 82	Enabling this option appends Option 82 in the DHCP packets. Following information is allowed to configure:		Disabled

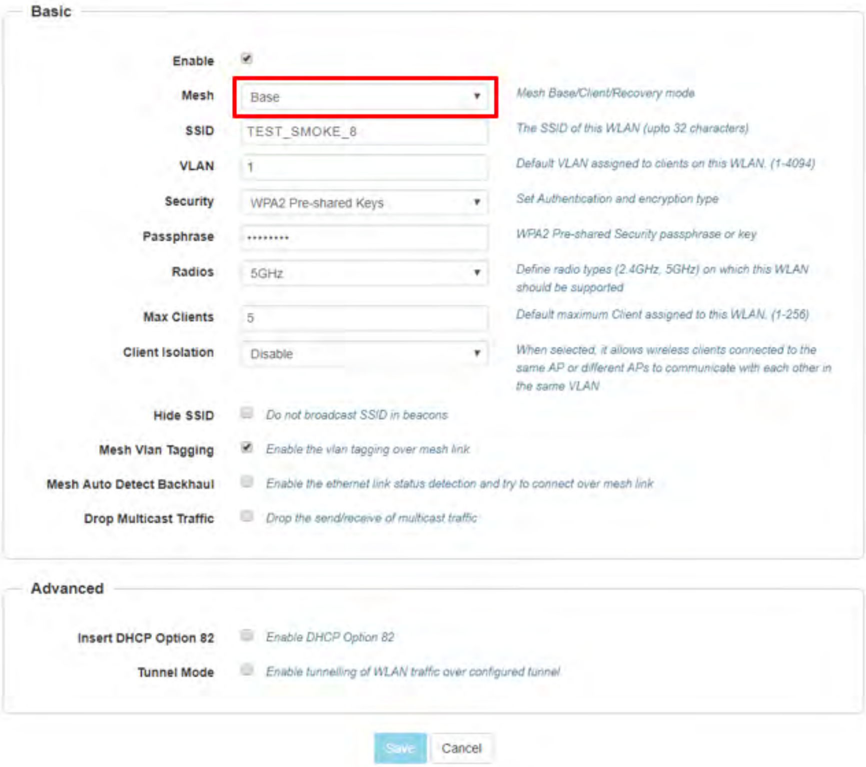
Parameters	Description	Range	Default
	1. DHCP Option 82 Circuit ID Configurable parameters under this option are as follows: • Hostname • APMAC • Site ID • BSSID • SSID • Custom 2. DHCP Option 82 Remote ID Configurable parameters under this option are as follows: • Hostname • APMAC • Site ID • BSSID • SSID • Custom		
Tunnel Mode	This option is enabled when user traffic is tunneled to central network either using L2TP or L2GRE.	–	Disabled
Mesh Monitored Host	This parameter is exclusive to MC device. Configure IP or Hostname to check the link status.	–	–
Mesh Monitor Duration	Configure the interval at which the ping is sent for the configured mesh monitored host.	5-60 Min	30
Mesh Recovery Interval	Configure the interval for the consecutive ping loss seen after which the mesh link is considered to be down and a reconnect is attempted. One can configure the duration and interval both to be the same at which case the first ping loss itself will result in triggering the reconnect.	5-30 Min	30

To configure the above parameters, navigate to the **Configure > WLAN > Basic** tab and provide the details as given below:

1. Select the **Enable** checkbox to enable the operations of this WLAN.
2. Select the operating parameters Base/Client/Recovery from the **Mesh** drop-down list.
3. Enter a name that uniquely identifies a wireless network in the **SSID** textbox.
4. Enter the **VLAN** parameter value in the textbox.
5. Select **Security** type from the drop-down list.
6. Enter WPA2 Pre-shared security passphrase or key in the **Passphrase** textbox.

7. Select the radio type (2.4GHz, 5GHz) on which the WLAN should be supported from the **Radios** drop-down list.
8. Select **Max Clients** parameter value from the drop-down list.
9. Select the required **Client Isolation** parameter from the drop-down list.
10. Enable **Hide SSID** checkbox.
11. Enable **Mesh Vlan Tagging** checkbox.
12. Enable **Mesh Auto Detect Backhaul** checkbox.
13. Enable **Drop Multicast Traffic** checkbox.
14. Enable **Insert DHCP Option 82** checkbox.
15. Select **Tunnel Mode** checkbox to enable tunnelling of WLAN traffic over configured tunnel.
16. Enter the IP or hostname name in the **Mesh Monitored Host** textbox.
17. Select the **Mesh** monitor duration time from the drop-down list.
18. Select the **Mesh recovery interval** time from the drop-down list.
19. Click **Save**.

Figure 75: *Base parameters*



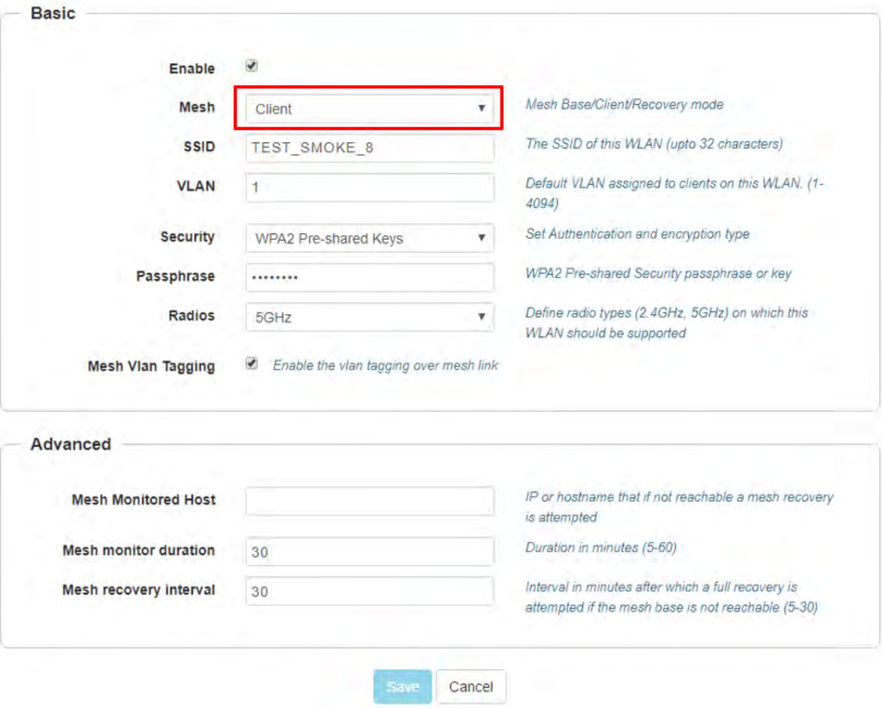
Basic

Enable	☑	
Mesh	Base ▾	Mesh Base/Client/Recovery mode
SSID	TEST_SMOKE_8	The SSID of this WLAN (upto 32 characters)
VLAN	1	Default VLAN assigned to clients on this WLAN. (1-4094)
Security	WPA2 Pre-shared Keys ▾	Set Authentication and encryption type
Passphrase	••••••••	WPA2 Pre-shared Security passphrase or key
Radios	5GHz ▾	Define radio types (2.4GHz, 5GHz) on which this WLAN should be supported
Max Clients	5	Default maximum Client assigned to this WLAN. (1-256)
Client Isolation	Disable ▾	When selected, it allows wireless clients connected to the same AP or different APs to communicate with each other in the same VLAN
Hide SSID	□ Do not broadcast SSID in beacons	
Mesh Vlan Tagging	☑ Enable the vlan tagging over mesh link	
Mesh Auto Detect Backhaul	□ Enable the ethernet link status detection and try to connect over mesh link	
Drop Multicast Traffic	□ Drop the send/receive of multicast traffic	

Advanced

Insert DHCP Option 82	□ Enable DHCP Option 82
Tunnel Mode	□ Enable tunnelling of WLAN traffic over configured tunnel

Figure 76: *Client parameters*



Basic

Enable	☑	
Mesh	Client ▾	Mesh Base/Client/Recovery mode
SSID	TEST_SMOKE_8	The SSID of this WLAN (upto 32 characters)
VLAN	1	Default VLAN assigned to clients on this WLAN. (1-4094)
Security	WPA2 Pre-shared Keys ▾	Set Authentication and encryption type
Passphrase	••••••••	WPA2 Pre-shared Security passphrase or key
Radios	5GHz ▾	Define radio types (2.4GHz, 5GHz) on which this WLAN should be supported
Mesh Vlan Tagging	☑ Enable the vlan tagging over mesh link	

Advanced

Mesh Monitored Host		IP or hostname that if not reachable a mesh recovery is attempted
Mesh monitor duration	30	Duration in minutes (5-60)
Mesh recovery interval	30	Interval in minutes after which a full recovery is attempted if the mesh base is not reachable (5-30)

Mesh link

This section briefs about configuration of device to get mesh link established with different deployment scenarios.

Order of Mesh profile configuration

If a device is configured as mesh base/client/recovery, recommended order of WLAN configuration should be as follows:

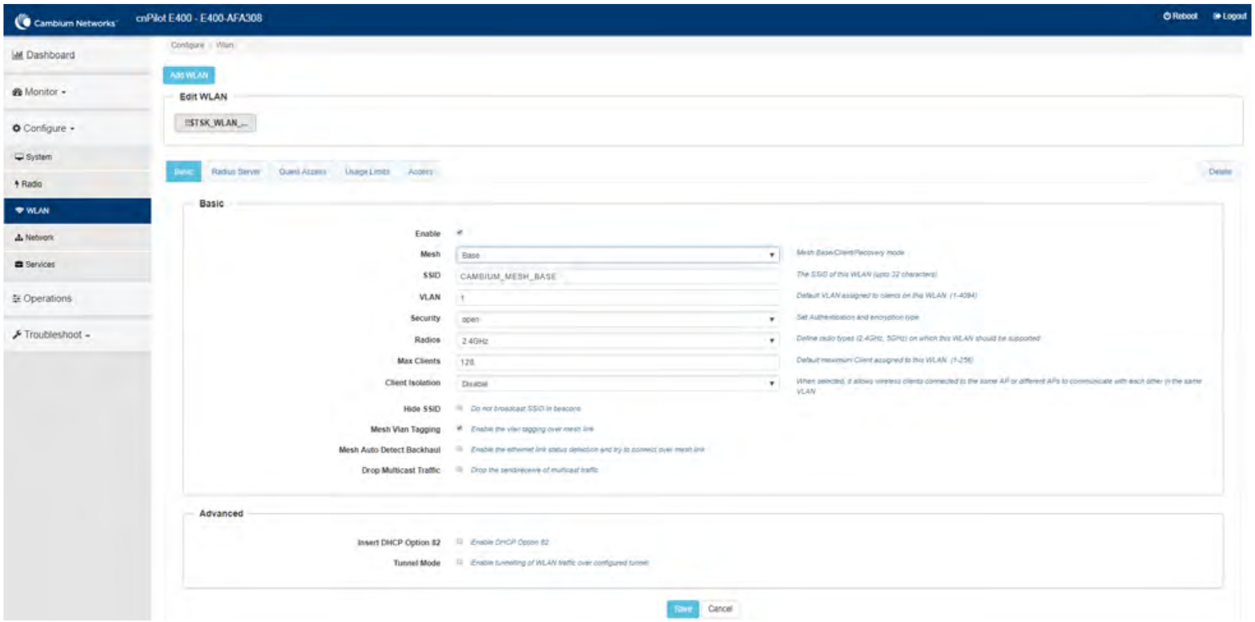
- WLAN profile 1: Mesh client
- WLAN profile 2: Mesh base
- WLAN profile 3: Mesh recovery

VLAN 1 as management interface

Follow the below steps to establish mesh link with VLAN 1 as management interface:

1. On MB, configure MB and MR. Follow the below steps to configure MB:
    - WLAN profile

Figure 77: *Mesh Base configuration with native VLAN 1*



Edit WLAN

!!STSK_WLAN_...

Basic

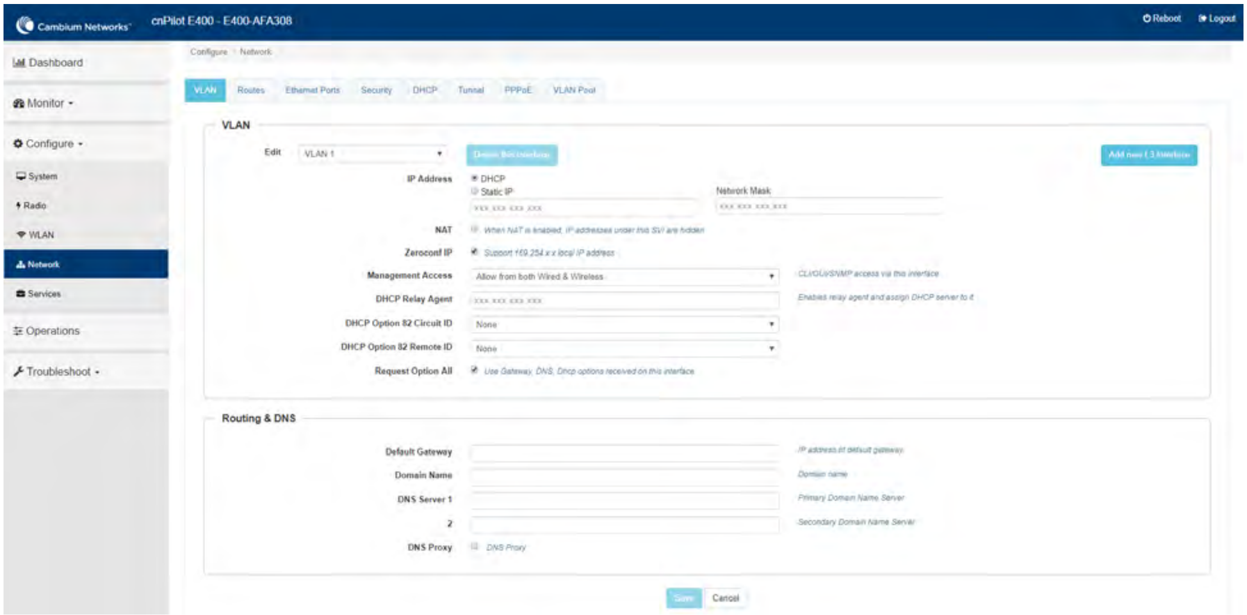
Enable	☑	
Mesh	Base	Mesh Base/Client/Recovery mode
SSID	CAMBIUM_MESH_BASE	The SSID of this WLAN (upto 32 characters)
VLAN	1	Default VLAN assigned to clients on this WLAN. (1-4094)
Security	open	Set Authentication and encryption type
Radios	2.4GHz	Define radio types (2.4GHz, 5GHz) on which this WLAN should be supported
Max Clients	128	Default maximum Client assigned to this WLAN. (1-256)
Client Isolation	Disable	When selected, it allows wireless clients connected to the same AP or different APs to communicate with each other in the same VLAN
Hide SSID	□ Do not broadcast SSID in beacons	
Mesh Vlan Tagging	☑ Enable the vlan tagging over mesh link	
Mesh Auto Detect Backhaul	□ Enable the ethernet link status detection and try to connect over mesh link	
Drop Multicast Traffic	□ Drop the send/receive of multicast traffic	

Advanced

Insert DHCP Option 82	□ Enable DHCP Option 82
Tunnel Mode	□ Enable tunneling of WLAN traffic over configured tunnel

2. Management VLAN interface

Figure 78: *Mesh Base configuration with management VLAN 1*



VLAN

Edit: VLAN 1

IP Address: ● DHCP ○ Static IP — xxx.xxx.xxx.xxx; Network Mask: xxx.xxx.xxx.xxx

NAT: □ When NAT is enabled, IP addresses under this SVI are hidden

Zeroconf IP: ☑ Support 169.254.x.x local IP address

Management Access: Allow from both Wired & Wireless — CLI/GUI/SNMP access via this interface

DHCP Relay Agent: xxx.xxx.xxx.xxx — Enables relay agent and assign DHCP server to it

DHCP Option 82 Circuit ID: None

DHCP Option 82 Remote ID: None

Request Option All: ☑ Use Gateway, DNS, Dhcp options received on this interface

Routing & DNS

Default Gateway: — IP address of default gateway

Domain Name: — Domain name

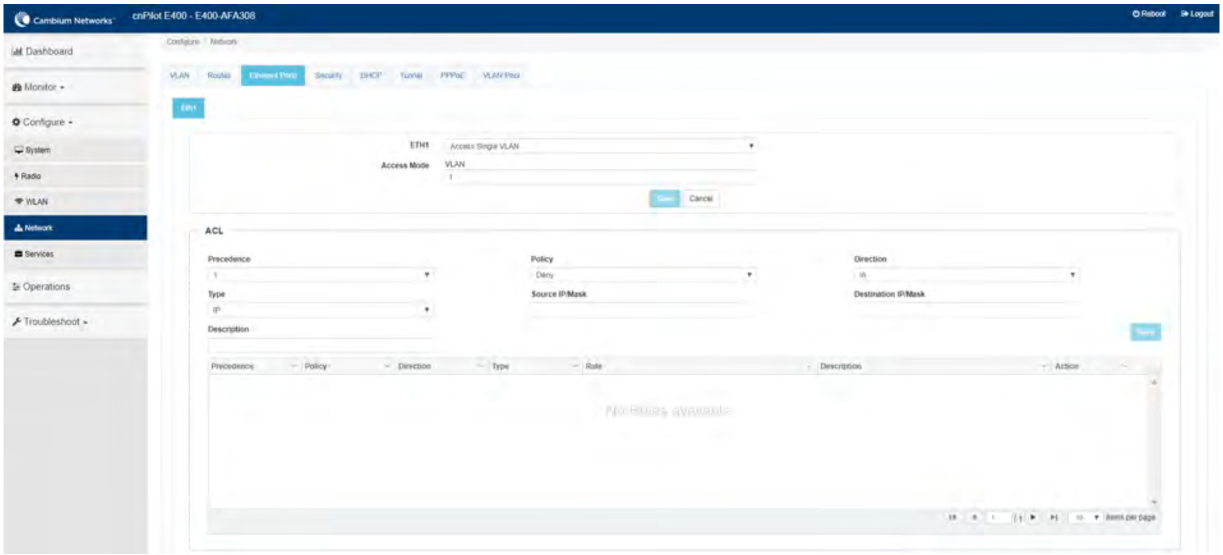
DNS Server 1: — Primary Domain Name Server

2: — Secondary Domain Name Server

DNS Proxy: □ DNS Proxy

3. Ethernet interface

Figure 79: *Mesh Base Ethernet configuration with Access VLAN 1*



ETH1: Access Single VLAN

Access Mode: VLAN 1

ACL

Precedence: 1 Policy: Deny Direction: IN

Type: IP Source IP/Mask Destination IP/Mask

Description

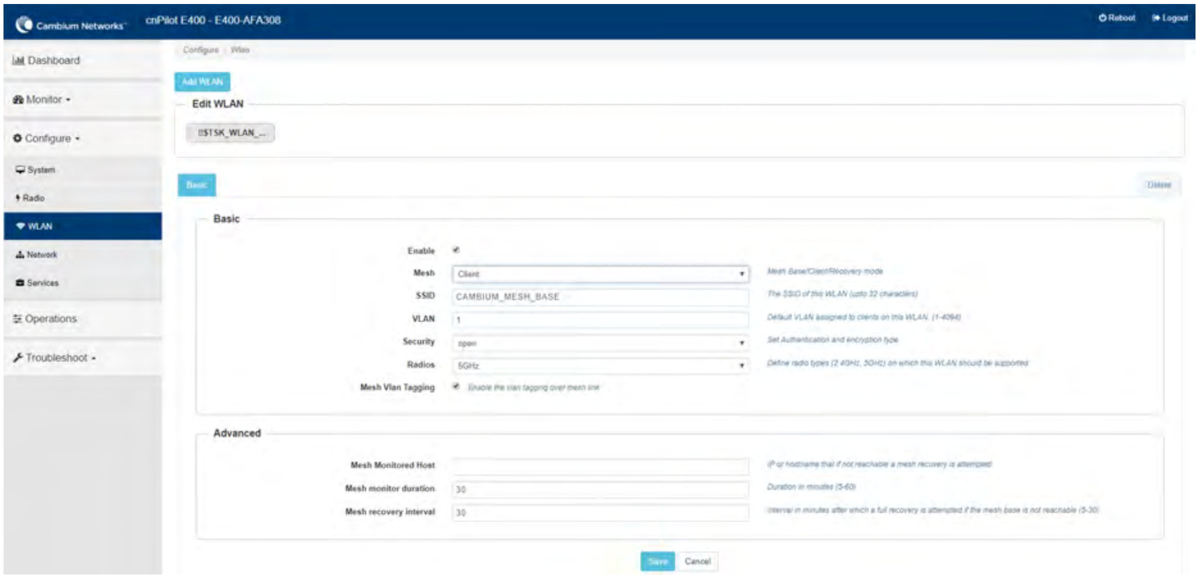
Precedence	Policy	Direction	Type	Rule	Description	Action

No Rules available

2. Configure MC as below:

WLAN profile

Figure 80: *Mesh Client configuration with VLAN 1*



Edit WLAN

!$TSK_WLAN_...

Basic

Enable ☑

Mesh: Client — Mesh Base/Client/Recovery mode

SSID: CAMBIUM_MESH_BASE — The SSID of this WLAN (upto 32 characters)

VLAN: 1 — Default VLAN assigned to clients on this WLAN. (1-4094)

Security: open — Set Authentication and encryption type

Radios: 5GHz — Define radio types (2.4GHz, 5GHz) on which this WLAN should be supported

Mesh Vlan Tagging ☑ Enable the vlan tagging over mesh link

Advanced

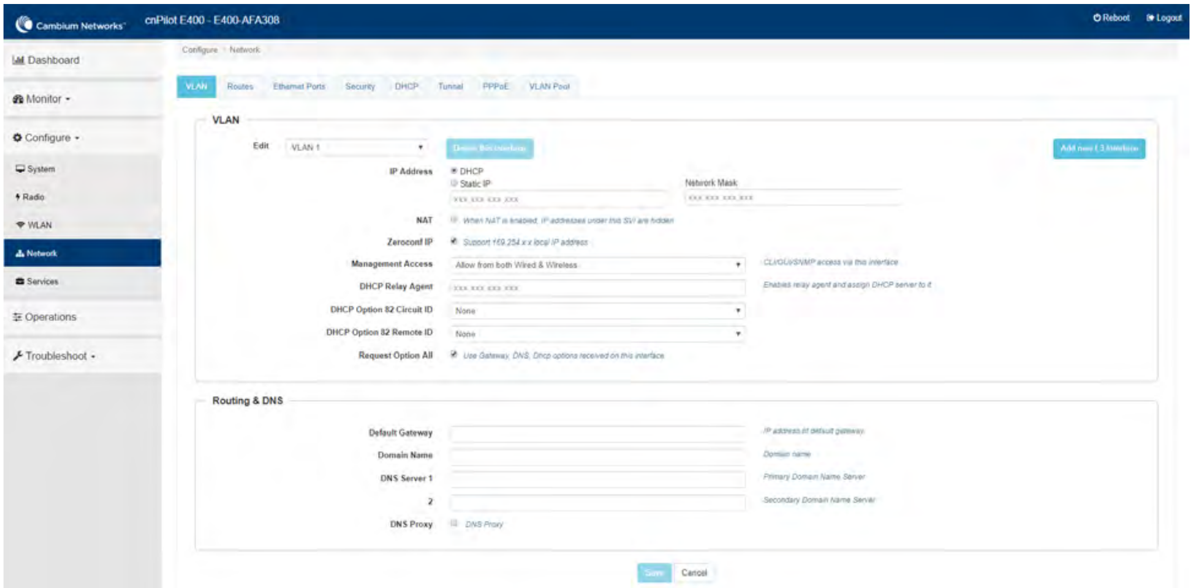
Mesh Monitored Host: — IP or hostname that if not reachable a mesh recovery is attempted

Mesh monitor duration: 30 — Duration in minutes (5-60)

Mesh recovery interval: 30 — Interval in minutes after which a full recovery is attempted if the mesh base is not reachable (5-30)

2. Management interface

Figure 81: *Mesh Client configuration with Management VLAN 1*



VLAN

Edit: VLAN 1

IP Address: ● DHCP ○ Static IP xxx.xxx.xxx.xxx Network Mask xxx.xxx.xxx.xxx

NAT ☐ When NAT is enabled, IP addresses under this SVI are hidden

Zeroconf IP ☑ Support 169.254.x.x local IP address

Management Access: Allow from both Wired & Wireless — CLI/GUI/SNMP access via this interface

DHCP Relay Agent: xxx.xxx.xxx.xxx — Enables relay agent and assign DHCP server to it

DHCP Option 82 Circuit ID: None

DHCP Option 82 Remote ID: None

Request Option All ☑ Use Gateway, DNS, Dhcp options received on this interface

Routing & DNS

Default Gateway: — IP address of default gateway

Domain Name: — Domain name

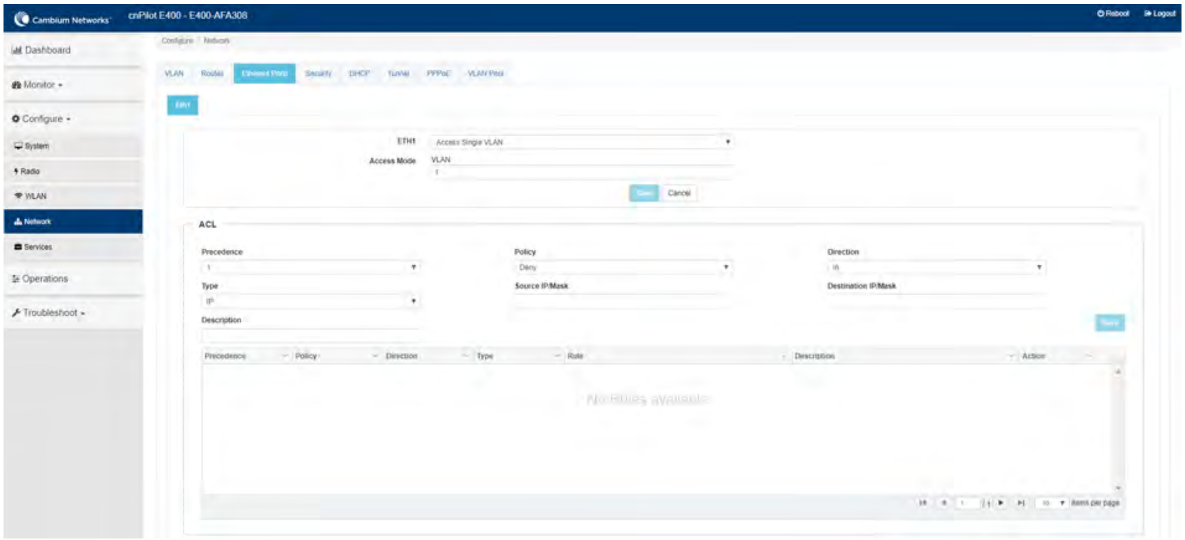
DNS Server 1: — Primary Domain Name Server

2: — Secondary Domain Name Server

DNS Proxy ☐ DNS Proxy

3. Ethernet interface

Figure 82: *Mesh Client Ethernet configuration with Access VLAN 1*



ETH1: Access Single VLAN

Access Mode: VLAN 1

ACL

Precedence: 1

Policy: Deny

Direction: In

Type: IP

Source IP/Mask

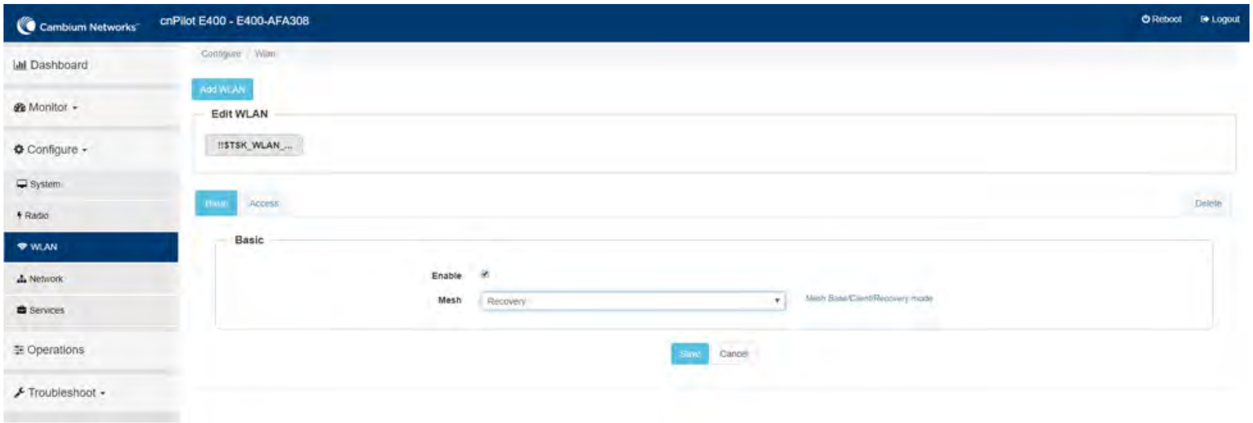
Destination IP/Mask

Description

Precedence	Policy	Direction	Type	Rule	Description	Action

3. Configure MR on MB device as follows on any WLAN profile:
    a. WLAN profile

Figure 83: *Mesh Recovery*



Edit WLAN

!!$TSK_WLAN_...

Basic

Enable: ☑

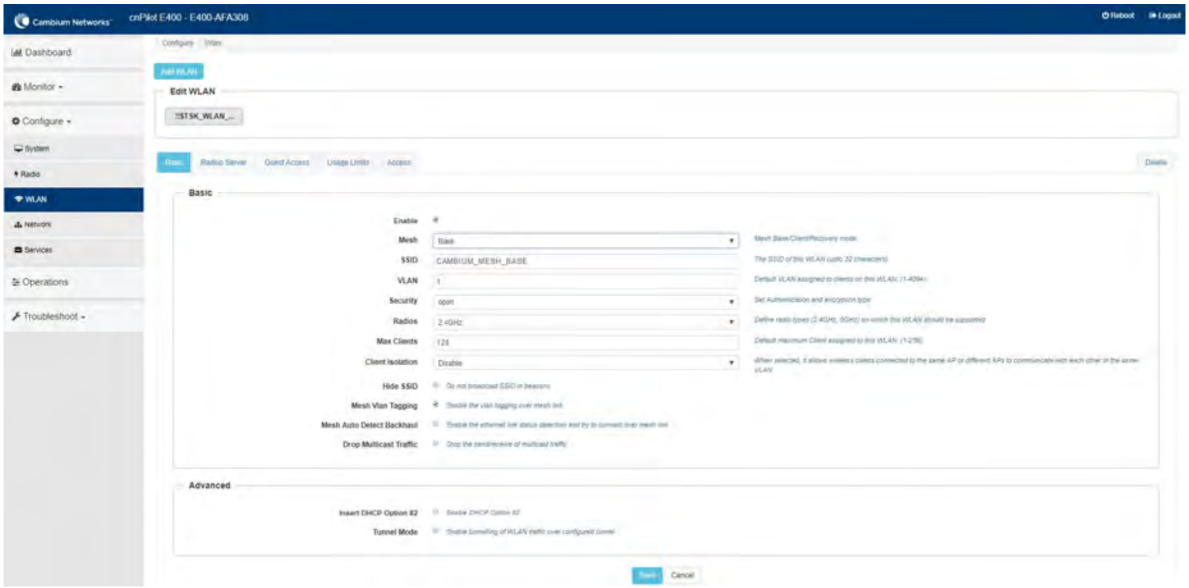
Mesh: Recovery — Mesh Base/Client/Recovery mode

Non-VLAN 1 as management interface

Follow the below steps to establish mesh link with Non-VLAN 1 as management interface:

1. On MB, configure MB and MR. Following are the steps to configure MB:
    a. WLAN profile

Figure 84: *Mesh Base configuration with non-VLAN 1*



Edit WLAN

Basic

Enable ●

Mesh: Base

SSID: CAMBIUM_MESH_BASE

VLAN: 1

Security: open

Radios: 2.4GHz

Max Clients: 128

Client Isolation: Disable

Hide SSID ○

Mesh Vlan Tagging ●

Mesh Auto Detect Backhaul ○

Drop Multicast Traffic ○

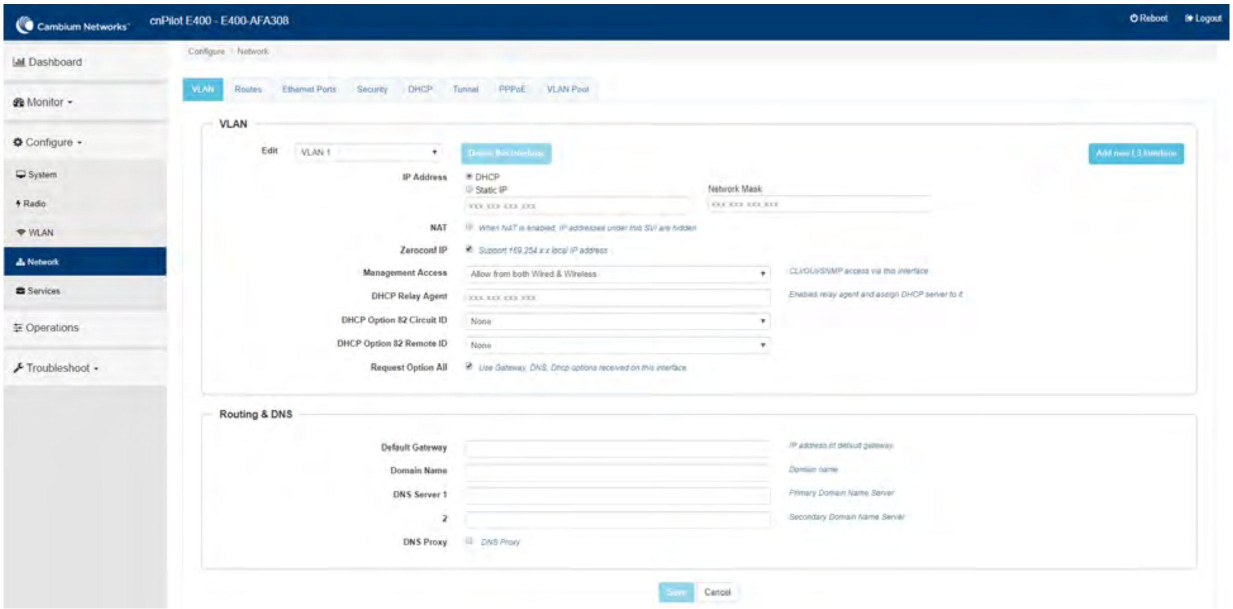
Advanced

Insert DHCP Option 82 ○

Tunnel Mode ○

2. Management VLAN interface

Figure 85: *Mesh Base configuration with Management non-VLAN 1*



VLAN

Edit: VLAN 1

IP Address: ● DHCP ○ Static IP

NAT ○ When NAT is enabled, IP addresses under this SVI are hidden

Zeroconf IP ☑ Support 169.254.x.x local IP address

Management Access: Allow from both Wired & Wireless

DHCP Relay Agent: xxx.xxx.xxx.xxx

DHCP Option 82 Circuit ID: None

DHCP Option 82 Remote ID: None

Request Option All ☑ Use Gateway, DNS, Dhcp options received on this interface

Routing & DNS

Default Gateway

Domain Name

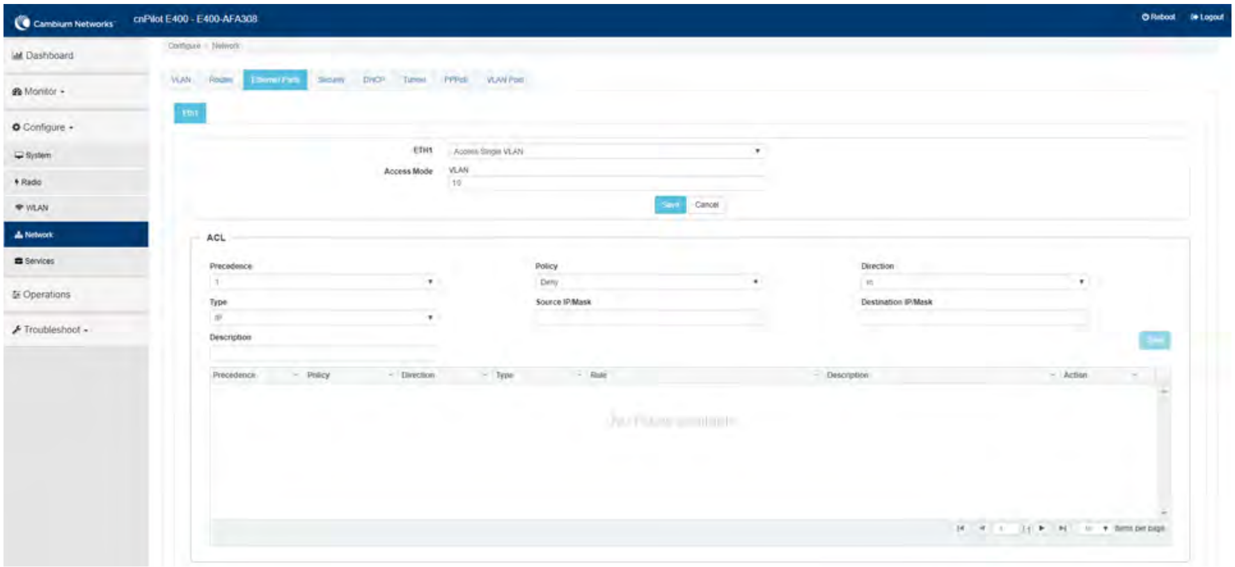
DNS Server 1

2

DNS Proxy □ DNS Proxy

3. Ethernet interface

Figure 86: *Mesh Base Ethernet configuration with Access non-VLAN 1*



ETH1: Access Single VLAN

Access Mode: VLAN 10

ACL

Precedence: 1

Policy: Deny

Direction: In

Type: IP

Source IP/Mask

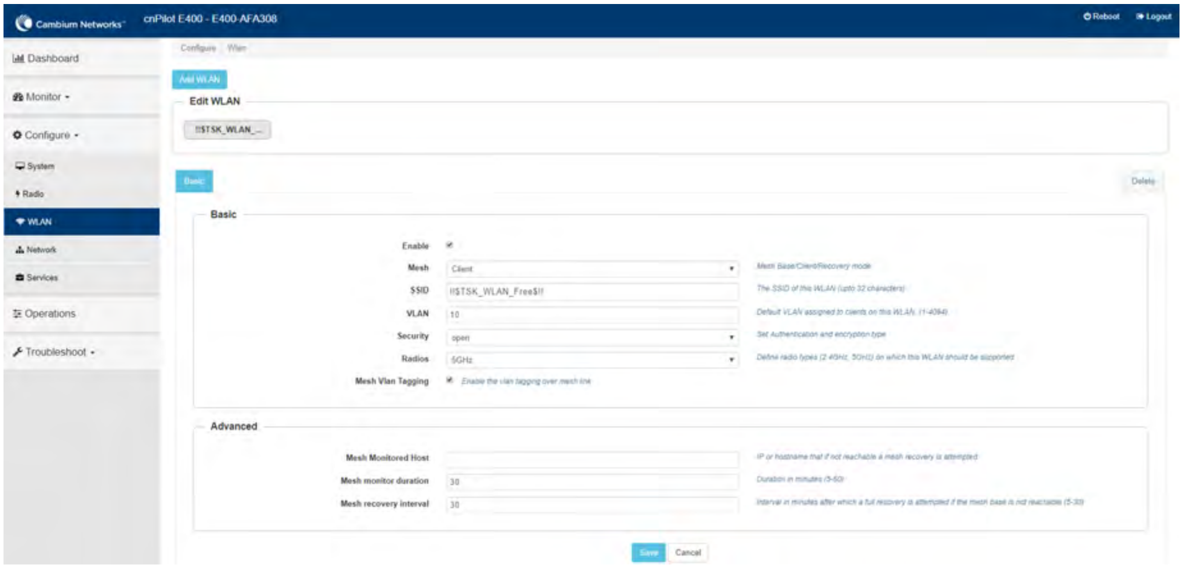
Destination IP/Mask

Description

Precedence	Policy	Direction	Type	Rule	Description	Action

2. Configure MC as below:
   a. WLAN profile

Figure 87: *Mesh Client configuration with non-VLAN 1*



Edit WLAN

Basic

Enable: ☑

Mesh: Client — Mesh Base/Client/Recovery mode

SSID: !!TSK_WLAN_Free!! — The SSID of this WLAN (upto 32 characters)

VLAN: 10 — Default VLAN assigned to clients on this WLAN. (1-4094)

Security: open — Set Authentication and encryption type

Radios: 5GHz — Define radio types (2.4GHz, 5GHz) on which this WLAN should be supported

Mesh Vlan Tagging: ☑ Enable the vlan tagging over mesh link

Advanced

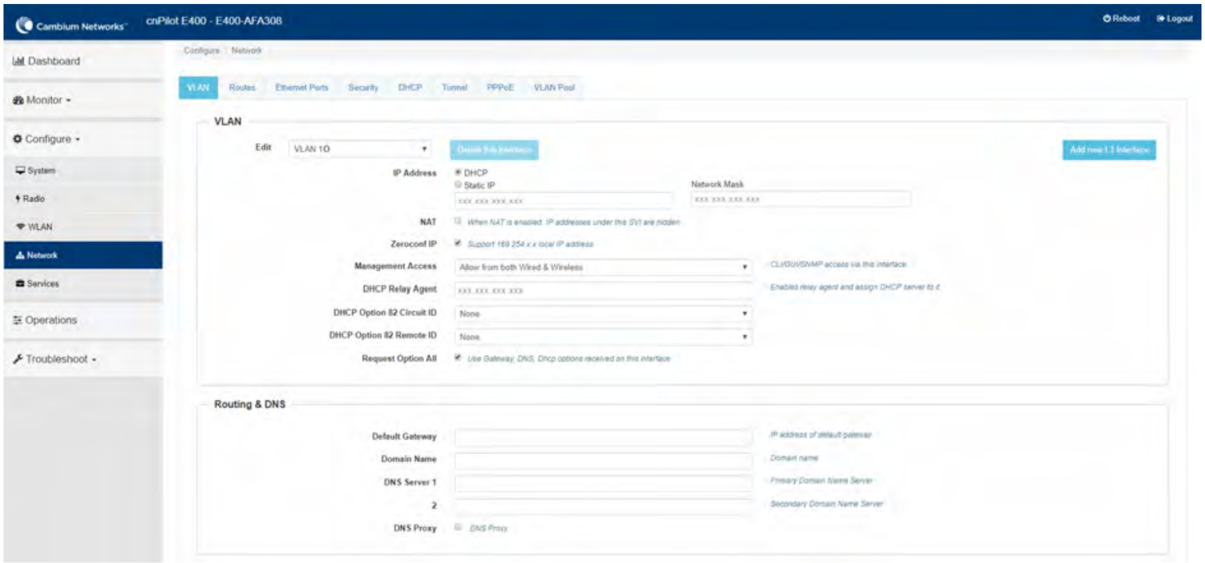
Mesh Monitored Host: — IP or hostname that if not reachable a mesh recovery is attempted

Mesh monitor duration: 30 — Duration in minutes (5-60)

Mesh recovery interval: 30 — Interval in minutes after which a full recovery is attempted if the mesh base is not reachable (5-30)

2. Management interface

Figure 88: *Mesh Client configuration with Management non-VLAN 1*



VLAN

Edit: VLAN 10

IP Address: ● DHCP ○ Static IP — xxx.xxx.xxx.xxx — Network Mask: xxx.xxx.xxx.xxx

NAT: □ When NAT is enabled, IP addresses under this SVI are hidden

Zeroconf IP: ☑ Support 169.254.x.x local IP address

Management Access: Allow from both Wired & Wireless — CLI/GUI/SNMP access via this interface

DHCP Relay Agent: xxx.xxx.xxx.xxx — Enabled relay agent and assign DHCP server to it

DHCP Option 82 Circuit ID: None

DHCP Option 82 Remote ID: None

Request Option All: ☑ Use Gateway, DNS, Dhcp options received on this interface

Routing & DNS

Default Gateway: — IP address of default gateway

Domain Name: — Domain name

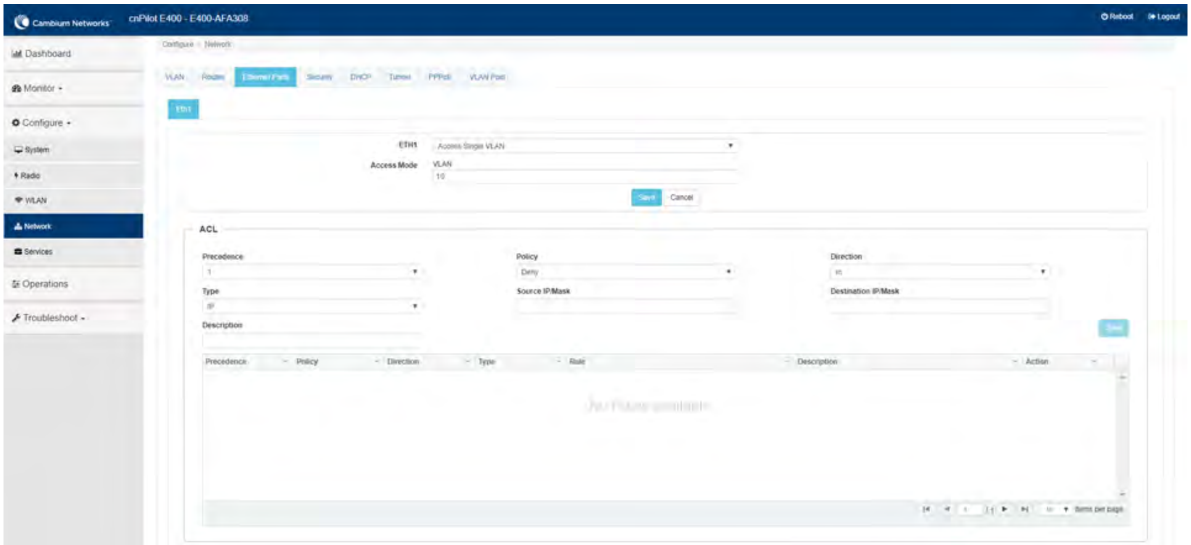
DNS Server 1: — Primary Domain Name Server

2: — Secondary Domain Name Server

DNS Proxy: □ DNS Proxy

3. Ethernet interface

Figure 89: *Mesh Client Ethernet configuration with Access non-VLAN 1*



ETH1: Access Single VLAN

Access Mode: VLAN 10

ACL

Precedence: 1 — Policy: Deny — Direction: in

Type: IP — Source IP/Mask — Destination IP/Mask

Description

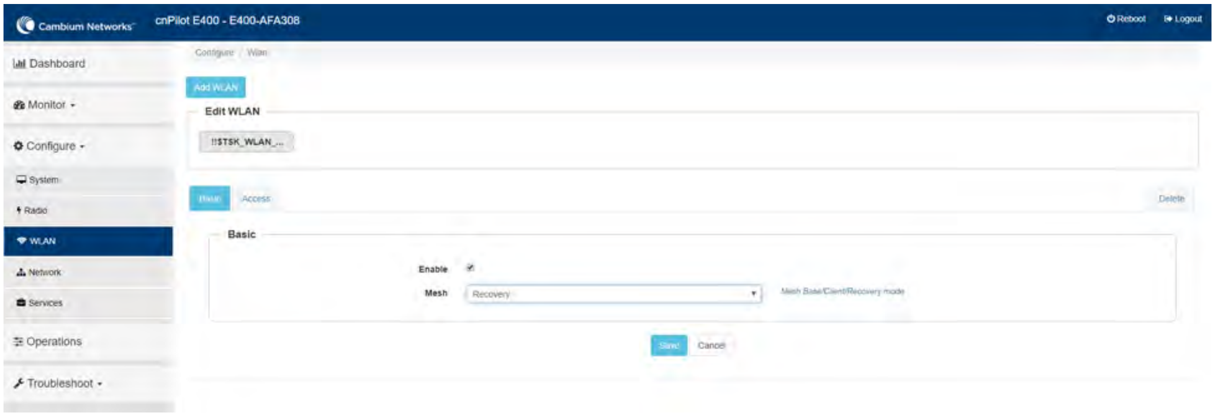
Precedence	Policy	Direction	Type	Rule	Description	Action

No Rules available

3. Configure MR on MB device on any WLAN profile as follows:

   a. WLAN profile

Figure 90: *Mesh Recovery*



Edit WLAN

!!$TSK_WLAN_...

Basic

Enable ☑

Mesh: Recovery — Mesh Base/Client/Recovery mode

Chapter 15: Autopilot

Autopilot is a feature on Cambium Enterprise Wi-Fi APs that allows one AP to be a controller of other APs in a network to manage:

- Configuration and Onboarding
- Manage Autopilot
- Dashboard
- Insight

Configuration and Onboarding

This section provides required information to:

- Configure member AP to Autopilot master
- Configuring WLAN in default WLAN Group
- Configuring WLANs with user created WLAN Group
- WLAN group override
- Configuring WPA2-Enterprise WLAN
- Onboard member APs to Autopilot master
- Connect clients to the WLANs and check statistics

Configure member AP to Autopilot master

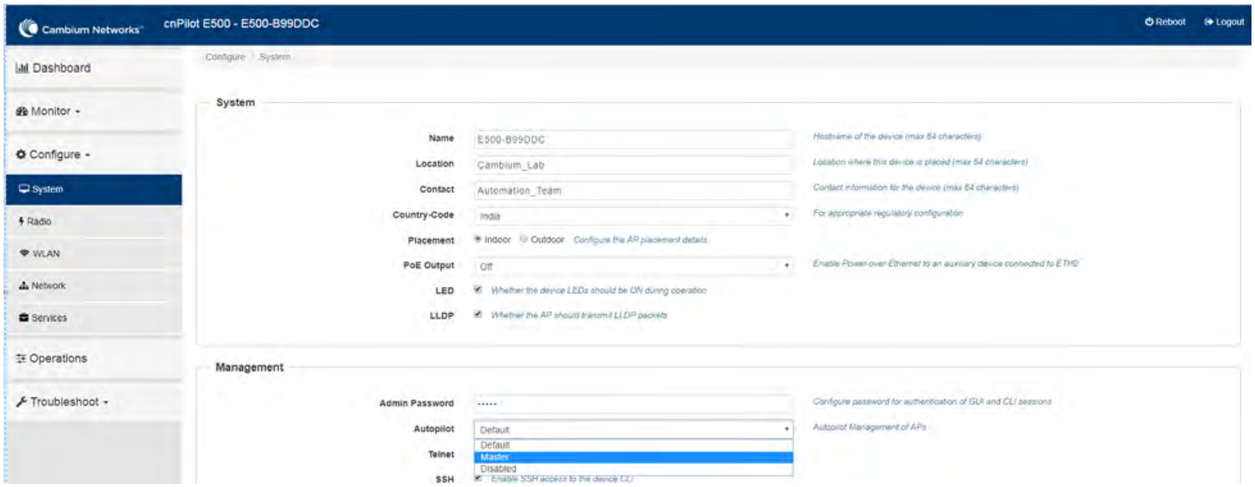
To configure member APs to a Master:

1. Open a web browser and browse the IP address of an AP in the network and access the AP's UI page.

> **Note**
>
> The AP needs to be upgraded with autopilot firmware.

2. Go to Configure > System > Management > Autopilot and select the AP as Master.

Figure 91: *Management _Autopilot*



System

Name: E500-B99DDC — Hostname of the device (max 64 characters)
Location: Cambium_Lab — Location where this device is placed (max 64 characters)
Contact: Automation_Team — Contact information for the device (max 64 characters)
Country-Code: India — For appropriate regulatory configuration
Placement: ● Indoor ○ Outdoor — Configure the AP placement details
PoE Output: Off — Enable Power-over-Ethernet to an auxiliary device connected to ETH2
LED: ☑ Whether the device LEDs should be ON during operation
LLDP: ☑ Whether the AP should transmit LLDP packets

Management

Admin Password: ····· — Configure password for authentication of GUI and CLI sessions
Autopilot: Default — Autopilot Management of APs

Telnet
SSH: ☑ Enable SSH access to the device CLI

3. Click **Save**.
4. Refresh the web page and AP brings up the Autopilot UI.

The configured Master AP can perform the following:

- Act as a controller and manage other member APs
- Configure approved APs
- Upgrade firmware
- Display combined statistics and events

Cambium Enterprise AP can be configured the following ways:

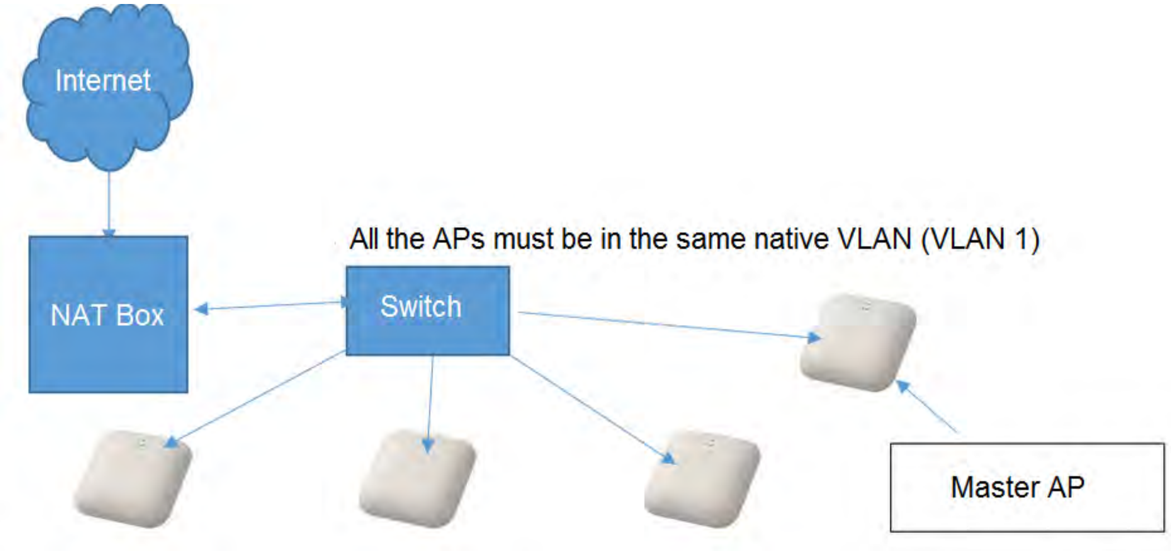
- Configuring an AP with Internal DHCP server
- Configuring an AP with External DHCP Server

Configuring an AP with Internal DHCP server

Network Topology

The initial network for installments with external NAT device and VLAN segregation (having two VLANs for the network) is shown in Autopilot.

Figure 92: *Configuring an AP with Internal DHCP server*



Configure an AP with default WLAN group

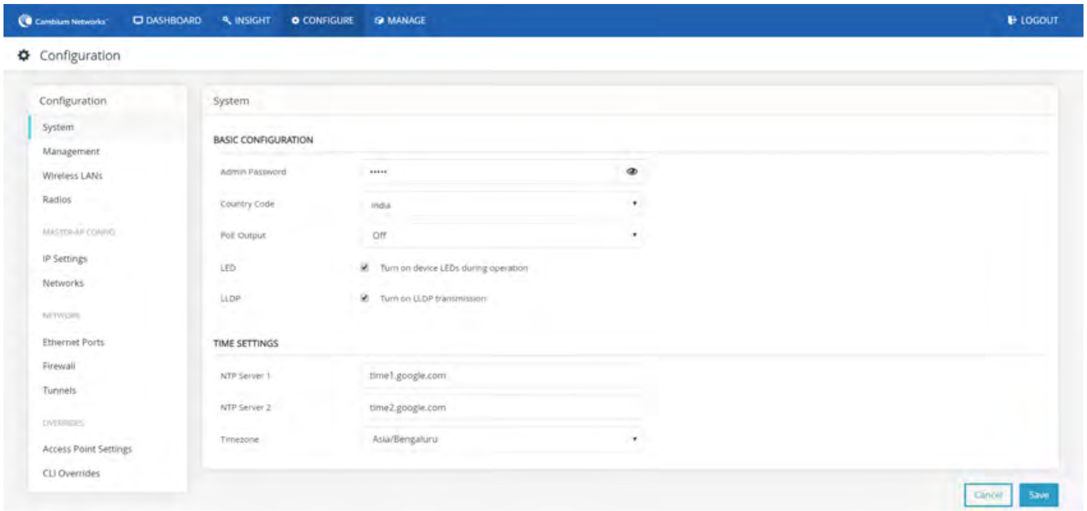
To configure an AP with default WLAN group:

1. Connect all the APs to the native VLAN; for example, VLAN 1 as shown above.
2. Configure all the ports of the switch as trunk with the native VLAN 1 where,
    1. Allowed VLAN: 10, 20
    2. Native VLAN: 1

To configure the Master AP:

1. Go to CONFIGURE > System and configure Country Code and NTP Servers.

Figure 93: *Configure > Systems*



System

BASIC CONFIGURATION

Admin Password: •••••

Country Code: India

PoE Output: Off

LED: ☑ Turn on device LEDs during operation

LLDP: ☑ Turn on LLDP transmission

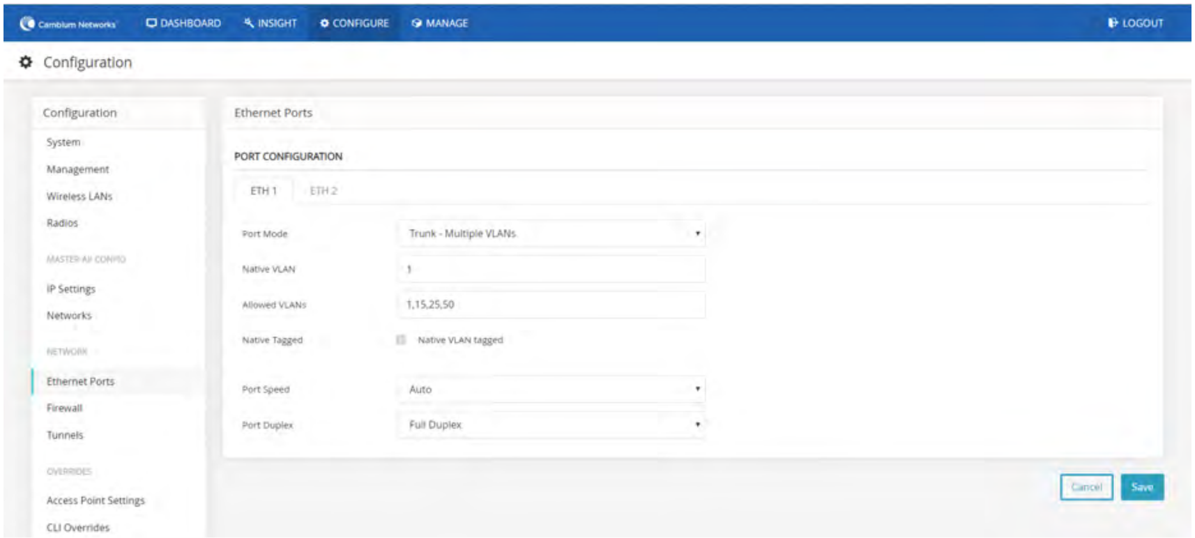
TIME SETTINGS

NTP Server 1: time1.google.com

NTP Server 2: time2.google.com

Timezone: Asia/Bengaluru

Figure 94: *Configure > Ethernet Ports*



Ethernet Ports

PORT CONFIGURATION

ETH 1 | ETH 2

Port Mode: Trunk - Multiple VLANs

Native VLAN: 1

Allowed VLANs: 1,15,25,50

Native Tagged: □ Native VLAN tagged

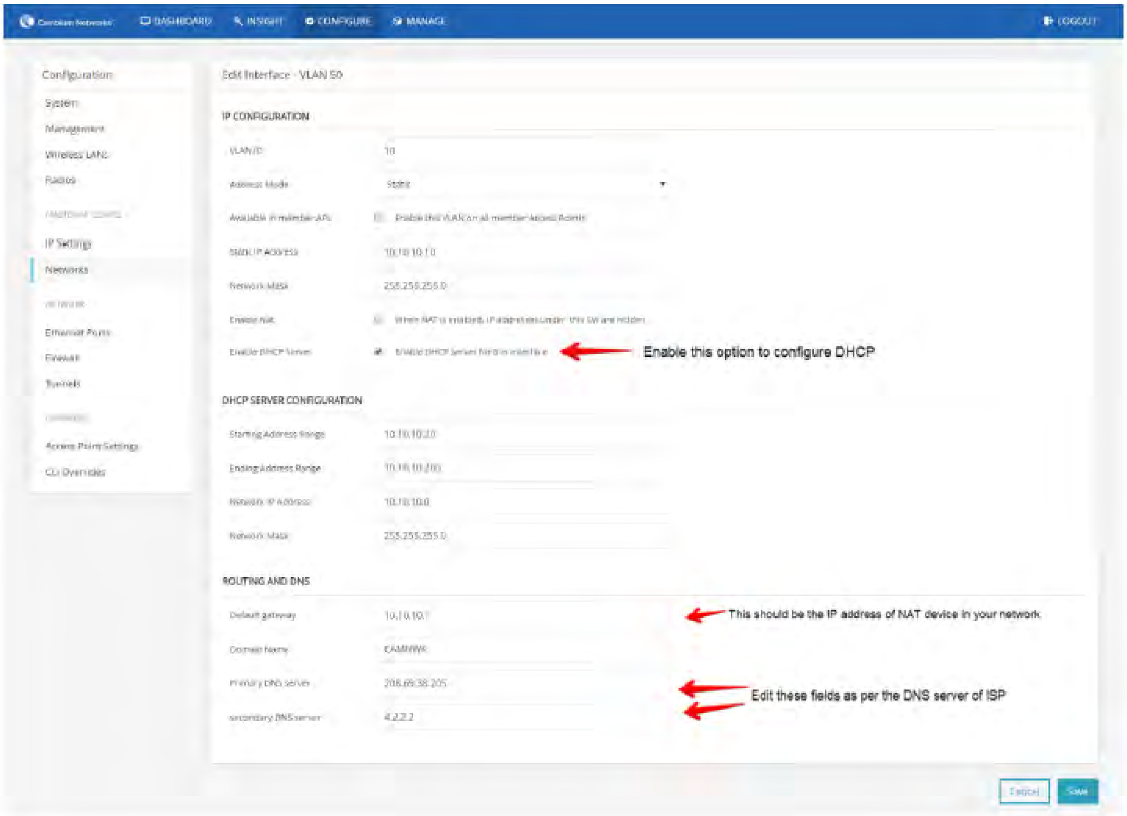
Port Speed: Auto

Port Duplex: Full Duplex

2. Go to CONFIGURE > MASTER AP CONFIG > Networks and configure the Static IP Address and the DHCP Server for VLAN 1 (native VLAN).

3. Enable DHCP Server and provide range of IP addresses. For example, when starting address range is give as 10.10.10.20 to 10.10.10.200, IP addresses can be assigned from 10.10.10.20 to 10.10.10.200 range.

Figure 95: *Configure > Networks*



Edit Interface - VLAN 50

IP CONFIGURATION

VLAN ID: 10

Address Mode: Static

Available in member APs: □ Enable this VLAN on all member Access Points

Static IP Address: 10.10.10.10

Network Mask: 255.255.255.0

Enable NAT: □ When NAT is enabled, IP addresses under this SVI are hidden

Enable DHCP Server: ☑ Enable DHCP Server for this interface

Enable this option to configure DHCP

DHCP SERVER CONFIGURATION

Starting Address Range: 10.10.10.20

Ending Address Range: 10.10.10.200

Network IP Address: 10.10.10.0

Network Mask: 255.255.255.0

ROUTING AND DNS

Default gateway: 10.10.10.1

This should be the IP address of NAT device in your network

Domain Name: CAMNWK

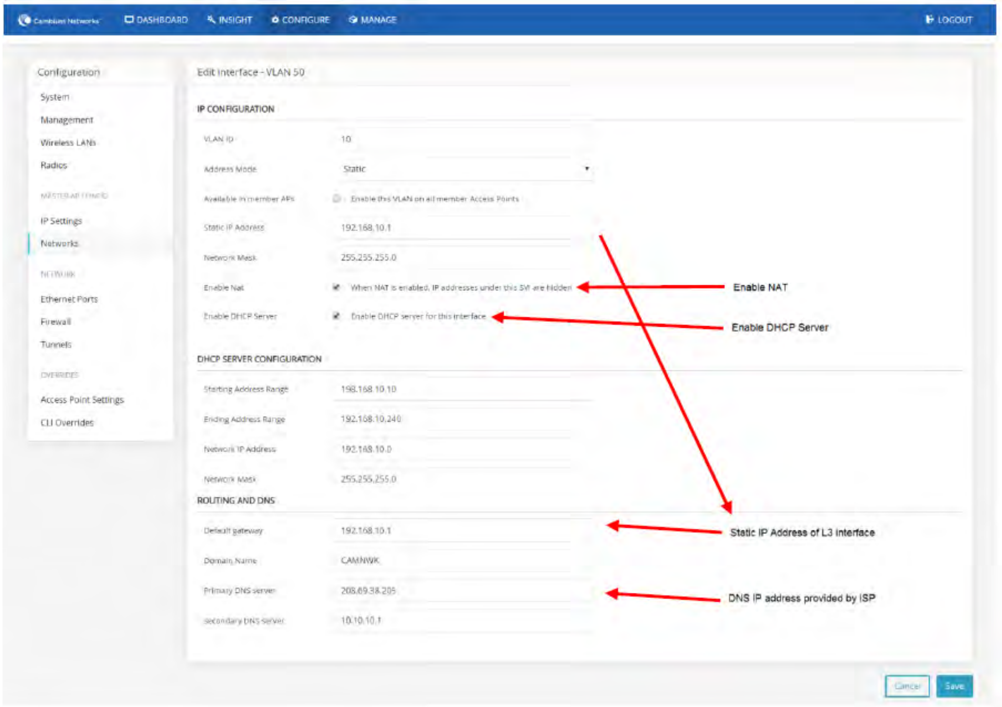
Primary DNS server: 208.69.38.205

secondary DNS server: 4.2.2.2

Edit these fields as per the DNS server of ISP

4. DHCP pool is used to provide IP addresses to all devices on VLAN 1. Add L3 interface of VLAN 10 and 20 under CONFIGURE > Networks.

    a. Enable NAT in this L3 interface.
    b. Enable DHCP server for this VLAN L3 interface.
    c. Default gateway needs to be Static IP Address of the L3 interface.Networks > VLAN 10



Edit Interface - VLAN 50

IP CONFIGURATION

VLAN ID	10
Address Mode	Static
Available in member APs	□ Enable this VLAN on all member Access Points
Static IP Address	192.168.10.1
Network Mask	255.255.255.0
Enable Nat	☑ When NAT is enabled, IP addresses under this SVI are hidden
Enable DHCP Server	☑ Enable DHCP server for this interface

DHCP SERVER CONFIGURATION

Starting Address Range	198.168.10.10
Ending Address Range	192.168.10.240
Network IP Address	192.168.10.0
Network Mask	255.255.255.0

ROUTING AND DNS

Default gateway	192.168.10.1
Domain Name	CAMNWK
Primary DNS server	208.69.38.205
Secondary DNS server	10.10.10.1

Enable NAT

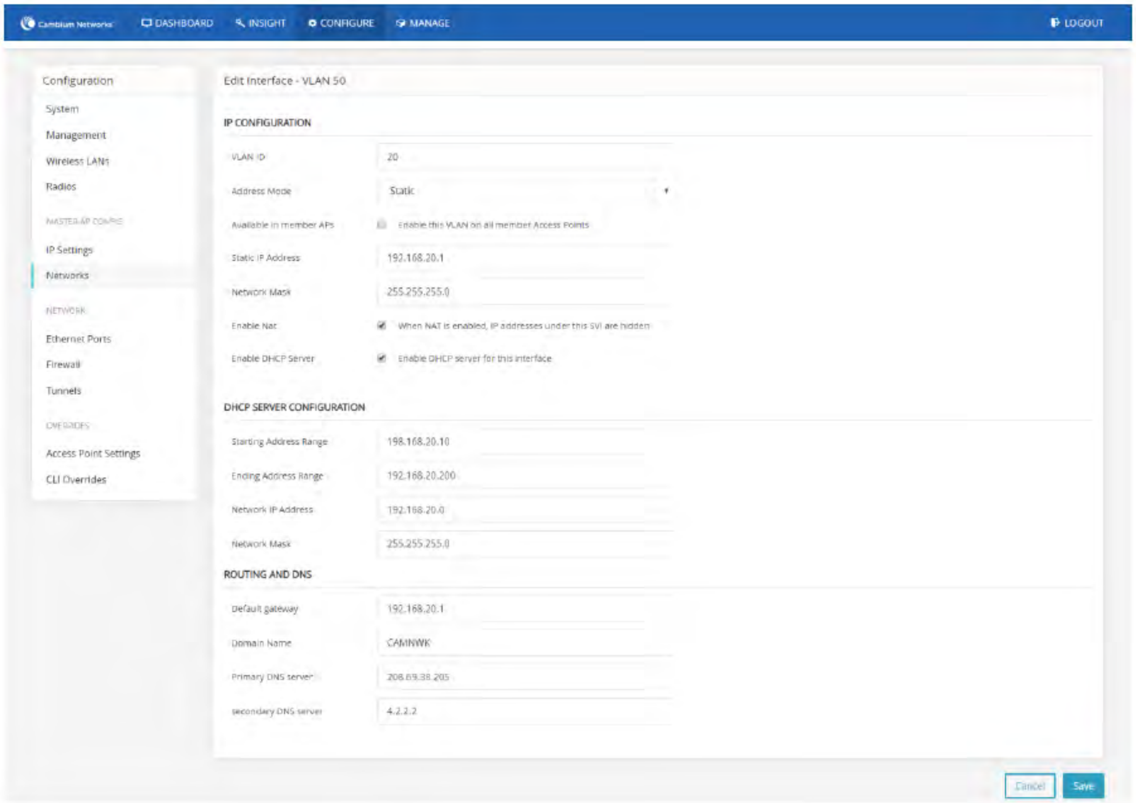
Enable DHCP Server

Static IP Address of L3 interface

DNS IP address provided by ISP

5. Add L3 interface of VLAN 20 and enable DHCP server and NAT as shown in Networks_VLAN 20.

Figure 96: *Networks_VLAN 20*



Edit Interface - VLAN 50

IP CONFIGURATION

VLAN ID: 20

Address Mode: Static

Available in member APs: □ Enable this VLAN on all member Access Points

Static IP Address: 192.168.20.1

Network Mask: 255.255.255.0

Enable Nat: ☑ When NAT is enabled, IP addresses under this SVI are hidden

Enable DHCP Server: ☑ Enable DHCP server for this interface

DHCP SERVER CONFIGURATION

Starting Address Range: 198.168.20.10

Ending Address Range: 192.168.20.200

Network IP Address: 192.168.20.0

Network Mask: 255.255.255.0

ROUTING AND DNS

Default gateway: 192.168.20.1

Domain Name: CAMNWK

Primary DNS server: 208.69.38.205

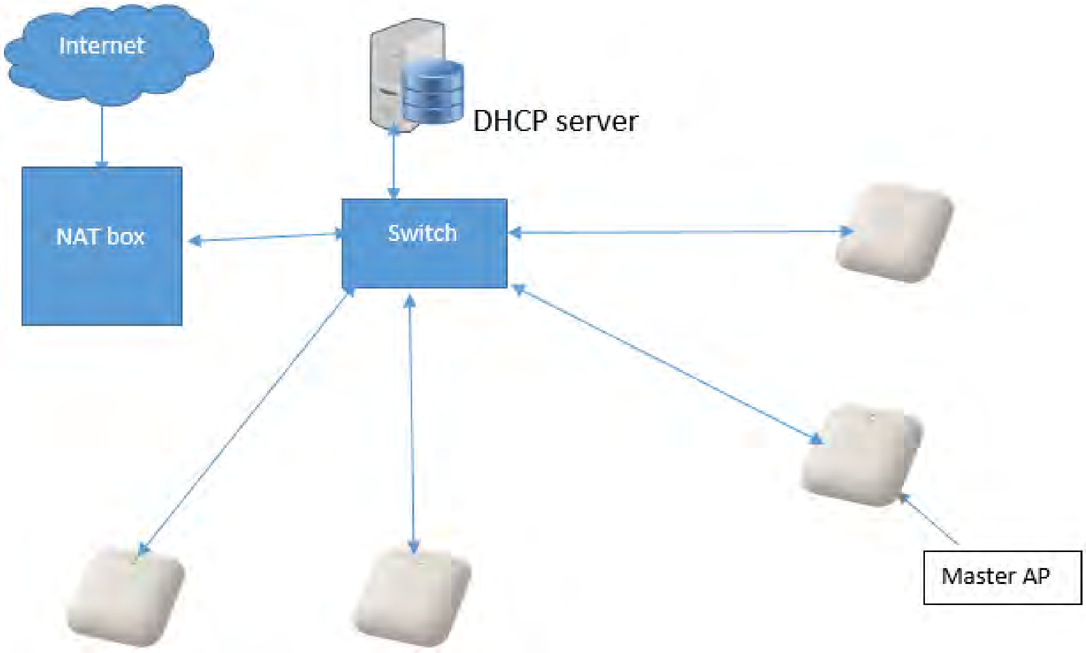
secondary DNS server: 4.2.2.2

Configuring an AP with External DHCP Server

Network Topology

Initial network installments with external DHCP server and NAT box. The complete network is connected to VLAN 1.

Figure 97: *Configuring an AP with External DHCP server*

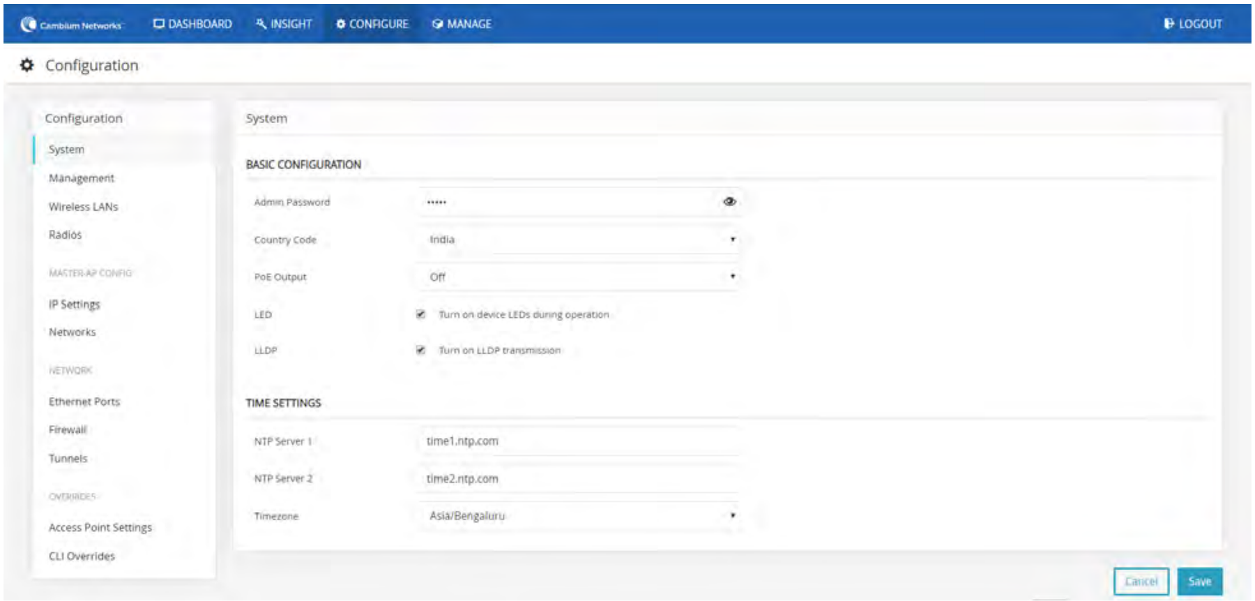


All the member APs are connected to ports of Switch. All the ports are mapped to VLAN 1.

To configure Master AP:

1. Configure country code, ntp server in master AP under System.

Figure 98: *Configure > Systems*



System

BASIC CONFIGURATION

Admin Password: •••••

Country Code: India

PoE Output: Off

LED: ☑ Turn on device LEDs during operation

LLDP: ☑ Turn on LLDP transmission

TIME SETTINGS

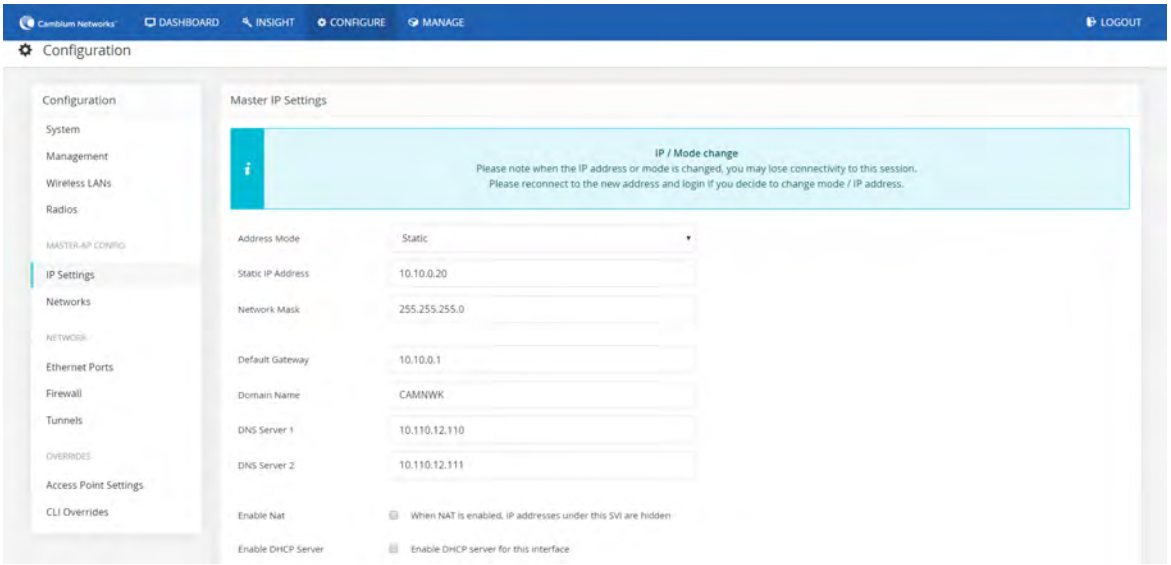
NTP Server 1: time1.ntp.com

NTP Server 2: time2.ntp.com

Timezone: Asia/Bengaluru

2. Configure static IP on Master.

Figure 99: *Configure > IP Settings*



Master IP Settings

IP / Mode change
Please note when the IP address or mode is changed, you may lose connectivity to this session.
Please reconnect to the new address and login if you decide to change mode / IP address.

Address Mode	Static
Static IP Address	10.10.0.20
Network Mask	255.255.255.0
Default Gateway	10.10.0.1
Domain Name	CAMNWK
DNS Server 1	10.110.12.110
DNS Server 2	10.110.12.111
Enable Nat	□ When NAT is enabled, IP addresses under this SVI are hidden
Enable DHCP Server	□ Enable DHCP server for this interface

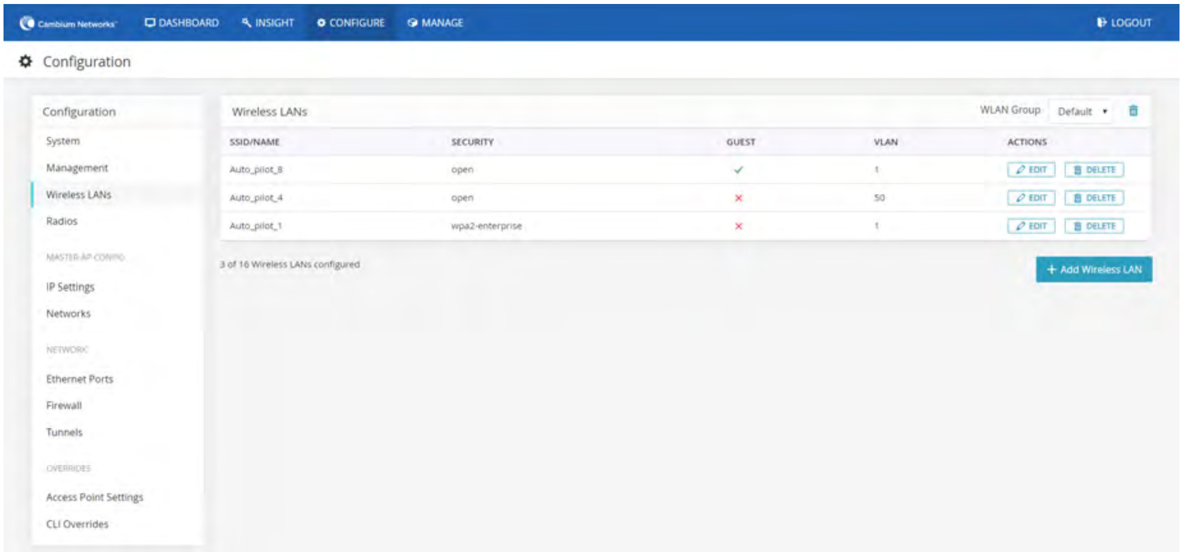
3. Refresh the page after saving with newly configured Ip address. In this example, open URL in browser http://10.10.10.25.

Configuring WLAN in default WLAN Group

To configure WLAN in default WLAN group:

1. Add a Wireless LAN.

Figure 100: *Configure > Wireless LANs*



Wireless LANs — WLAN Group: Default

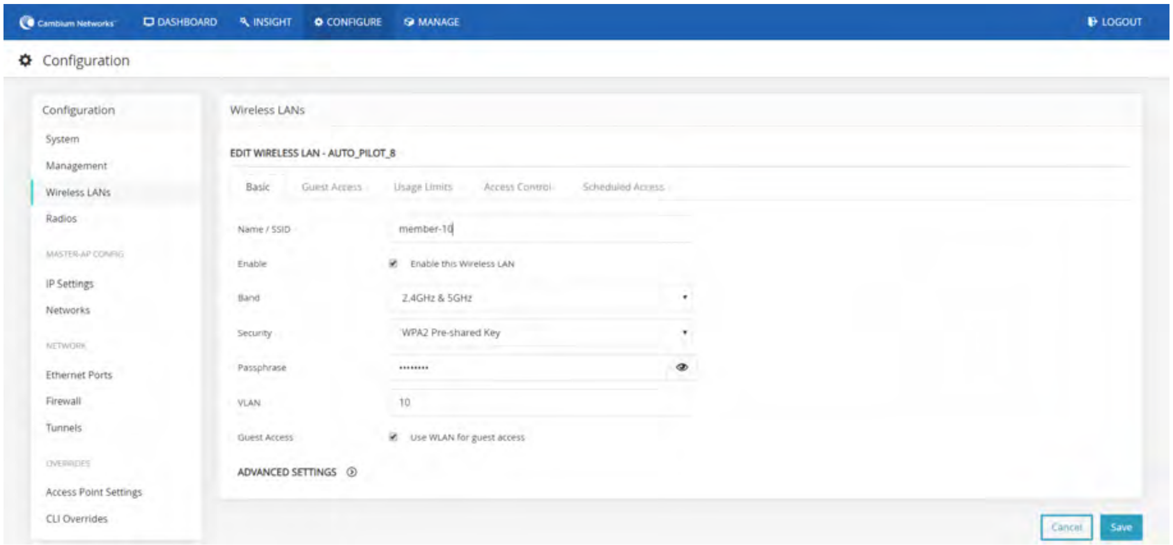
SSID/NAME	SECURITY	GUEST	VLAN	ACTIONS
Auto_pilot_8	open	✓	1	EDIT DELETE
Auto_pilot_4	open	✗	50	EDIT DELETE
Auto_pilot_1	wpa2-enterprise	✗	1	EDIT DELETE

3 of 16 Wireless LANs configured

2. Enter SSID and password in respective fields.

3. Configure VLAN as 10 and click Save.

Figure 101: *Wireless LANs > VLAN 10*



Wireless LANs

EDIT WIRELESS LAN - AUTO_PILOT_8

Name / SSID: member-10

Enable: ☑ Enable this Wireless LAN

Band: 2.4GHz & 5GHz

Security: WPA2 Pre-shared Key

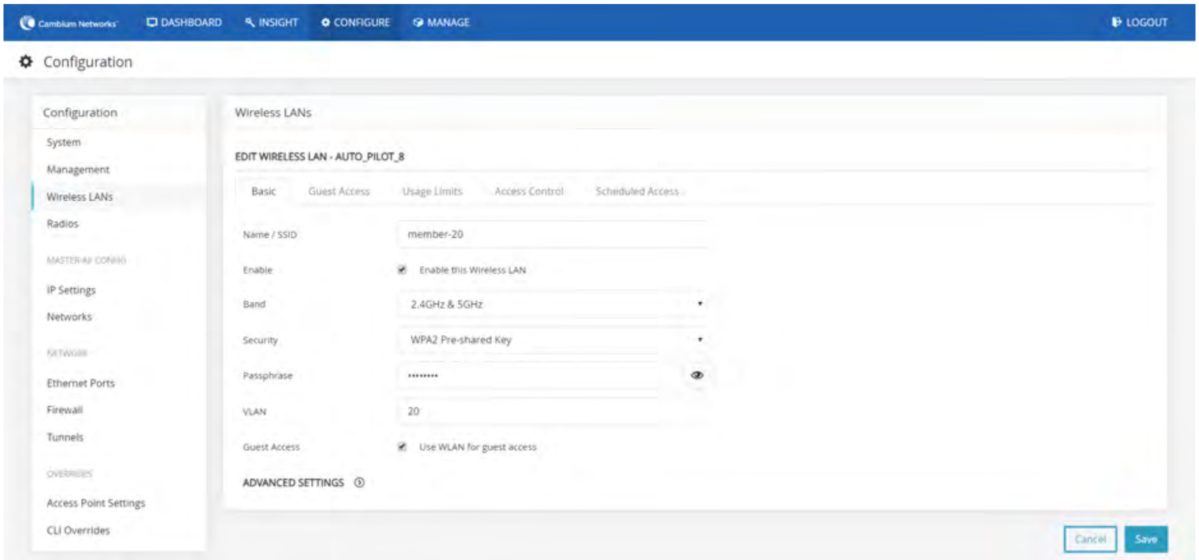
Passphrase: ••••••••

VLAN: 10

Guest Access: ☑ Use WLAN for guest access

4. Add another WLAN with VLAN 20. Enter SSID and password as required.
5. Configure VLAN as 20 and click Save.

Figure 102: *Wireless LANs > VLAN 20*



Wireless LANs

EDIT WIRELESS LAN - AUTO_PILOT_8

Name / SSID: member-20

Enable: ☑ Enable this Wireless LAN

Band: 2.4GHz & 5GHz

Security: WPA2 Pre-shared Key

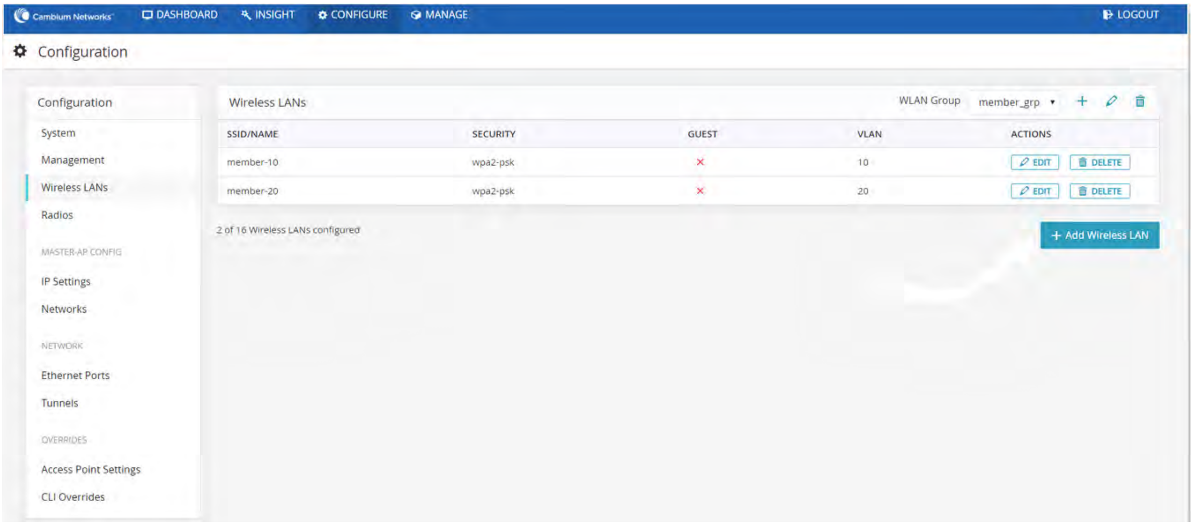
Passphrase: ••••••••

VLAN: 20

Guest Access: ☑ Use WLAN for guest access

6. Check the configured WLANs.

Figure 103: *Wireless LANs > VLAN 10 and 20*



Configuration

- System
- Management
- Wireless LANs
- Radios

MASTER-AP CONFIG

- IP Settings
- Networks

NETWORK

- Ethernet Ports
- Tunnels

OVERRIDES

- Access Point Settings
- CLI Overrides

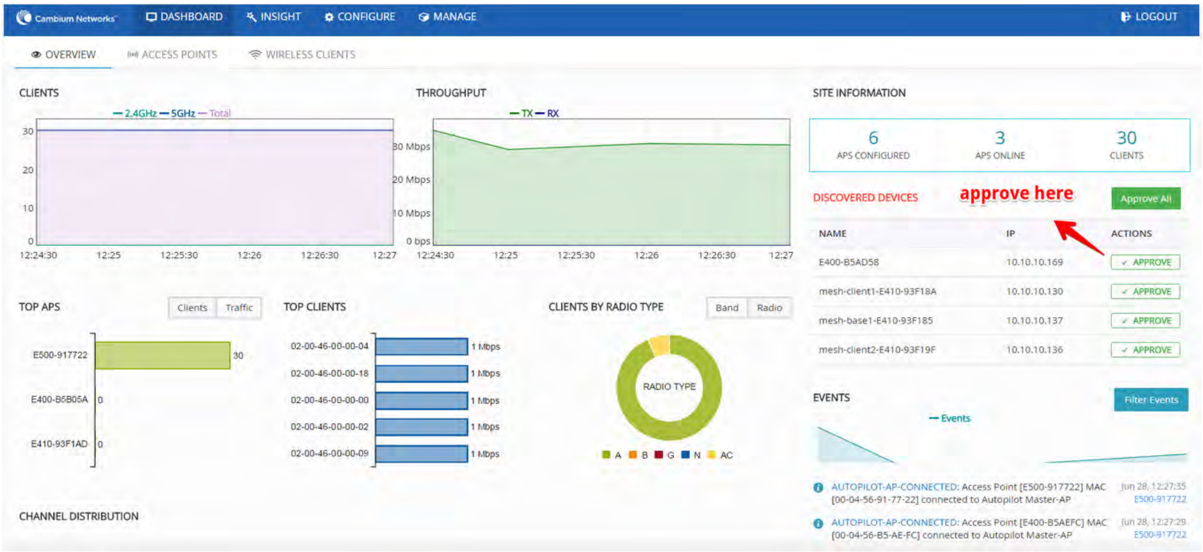
Wireless LANs — WLAN Group: member_grp

SSID/NAME	SECURITY	GUEST	VLAN	ACTIONS
member-10	wpa2-psk	✗	10	EDIT DELETE
member-20	wpa2-psk	✗	20	EDIT DELETE

2 of 16 Wireless LANs configured

7. Connect member APs to the Switch. The connected member APs receive IP from IP address from Master AP on VLAN 1. Once the member APs connect to the Master AP and they are approved, the configured WLANs are pushed to all the approved member APs and Master AP.

Figure 104: *Dashboard*



SITE INFORMATION

6 APS CONFIGURED | 3 APS ONLINE | 30 CLIENTS

DISCOVERED DEVICES — approve here — Approve All

NAME	IP	ACTIONS
E400-B5AD58	10.10.10.169	✓ APPROVE
mesh-client1-E410-93F18A	10.10.10.130	✓ APPROVE
mesh-base1-E410-93F185	10.10.10.137	✓ APPROVE
mesh-client2-E410-93F19F	10.10.10.136	✓ APPROVE

AUTOPILOT-AP-CONNECTED: Access Point [E500-917722] MAC [00-04-56-91-77-22] connected to Autopilot Master-AP — Jun 28, 12:27:35 E500-917722

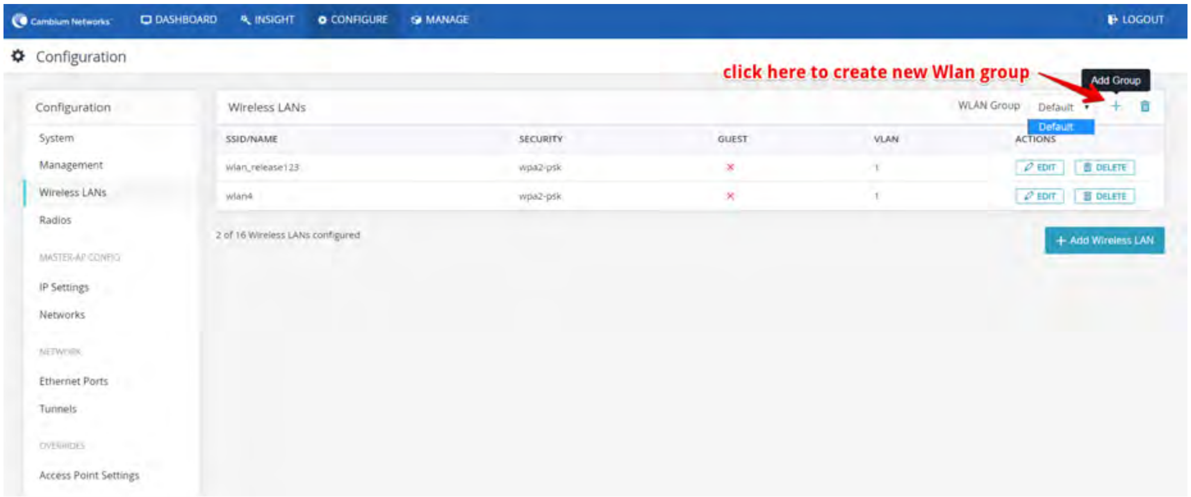
AUTOPILOT-AP-CONNECTED: Access Point [E400-B5AEFC] MAC [00-04-56-B5-AE-FC] connected to Autopilot Master-AP — Jun 28, 12:27:29 E500-917722

Configuring WLANs with user created WLAN Group

User can group one or multiple WLANs under a WLAN group and push the configuration to specific APs. WLAN group is used to push specific WLANs to specific selected APs.

1. Create a WLAN group.

Figure 105: *Create a WLAN group*

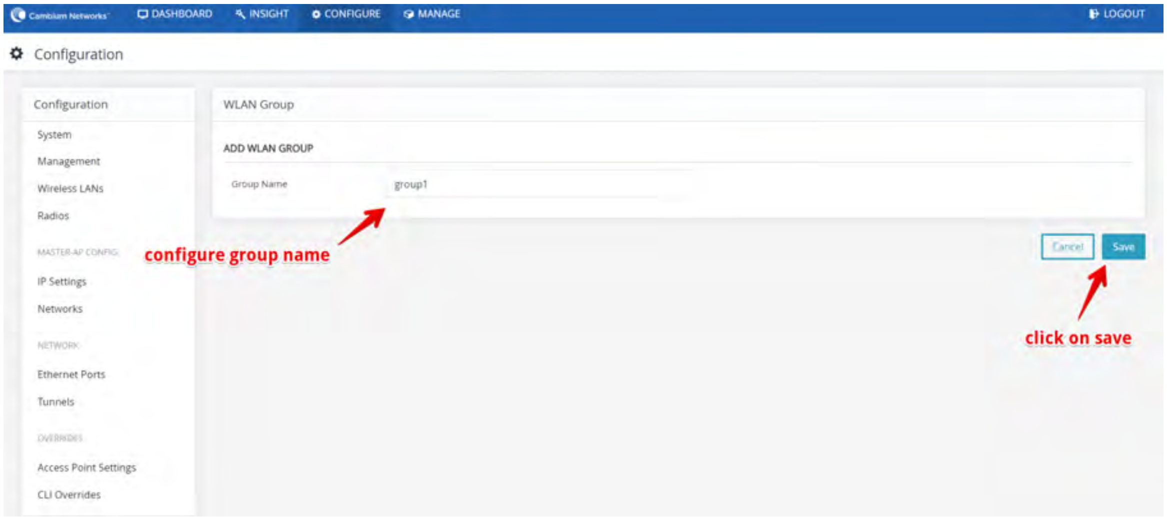


SSID/NAME	SECURITY	GUEST	VLAN	ACTIONS
wlan_release123	wpa2-psk	×	1	EDIT DELETE
wlan4	wpa2-psk	×	1	EDIT DELETE

2 of 16 Wireless LANs configured

2. Configure a new WLAN Group.

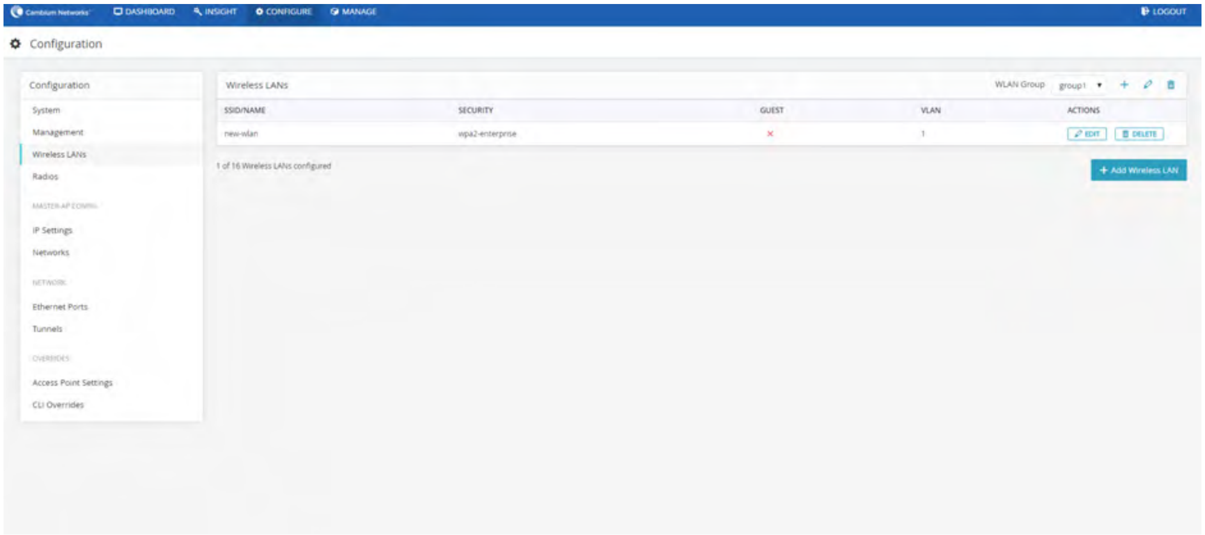
Figure 106: *Configure a new WLAN Group*



Group Name group1

3. Configure WLAN under the newly created WLAN Group.

Figure 107: *Configure WLAN under the newly created WLAN Group*



SSID/NAME	SECURITY	GUEST	VLAN	ACTIONS
new-wlan	wpa2-enterprise	✗	1	EDIT DELETE

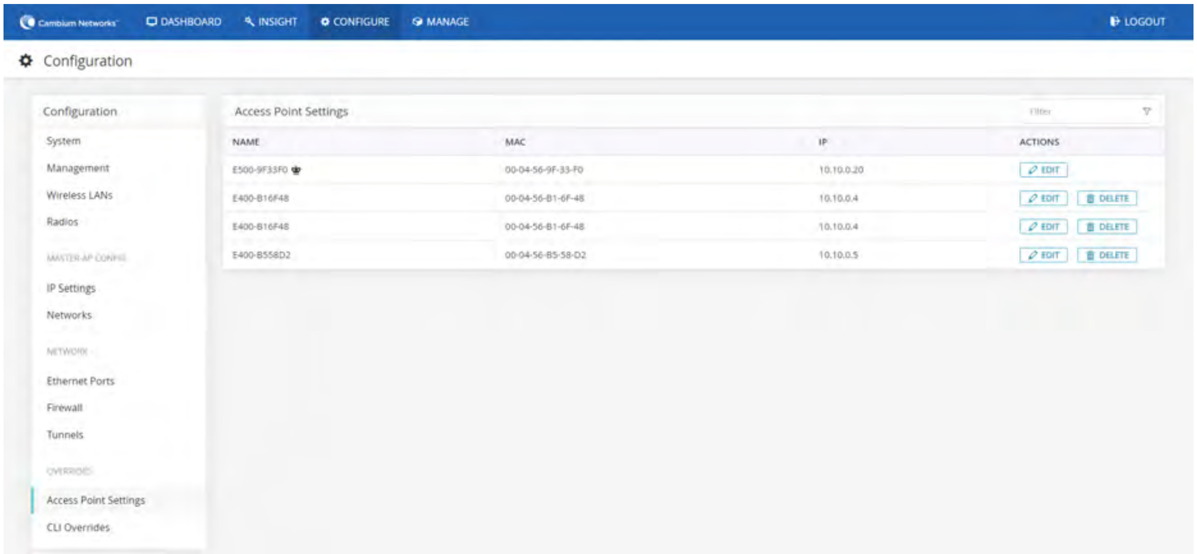
1 of 16 Wireless LANs configured

WLAN group override

This section is to describe how user can select device and configure user configured WLAN-group. By selecting device and overriding their WLAN-group, specific WLANs can be pushed to selected devices.

1. Select the device and click Edit button.

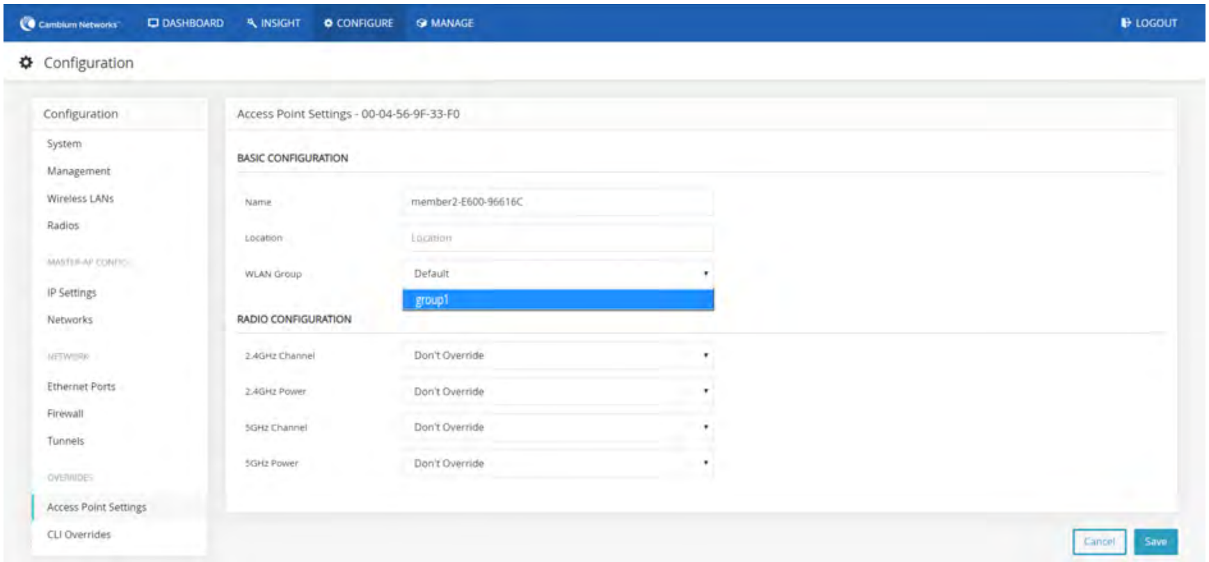
Figure 108: *Access Point settings*



NAME	MAC	IP	ACTIONS
E500-9F33F0 ♚	00-04-56-9F-33-F0	10.10.0.20	EDIT
E400-B16F48	00-04-56-B1-6F-48	10.10.0.4	EDIT DELETE
E400-B16F48	00-04-56-B1-6F-48	10.10.0.4	EDIT DELETE
E400-B558D2	00-04-56-B5-58-D2	10.10.0.5	EDIT DELETE

2. Choose the WLAN-group you had configured from the drop-down list and click Save button. This will push the WLANs configured under group1 to the selected AP.

Figure 109: *Access Point settings _WLAN Group*



Access Point Settings - 00-04-56-9F-33-F0

BASIC CONFIGURATION

Name: member2-E600-96616C

Location: Location

WLAN Group: Default (group1)

RADIO CONFIGURATION

2.4GHz Channel: Don't Override

2.4GHz Power: Don't Override

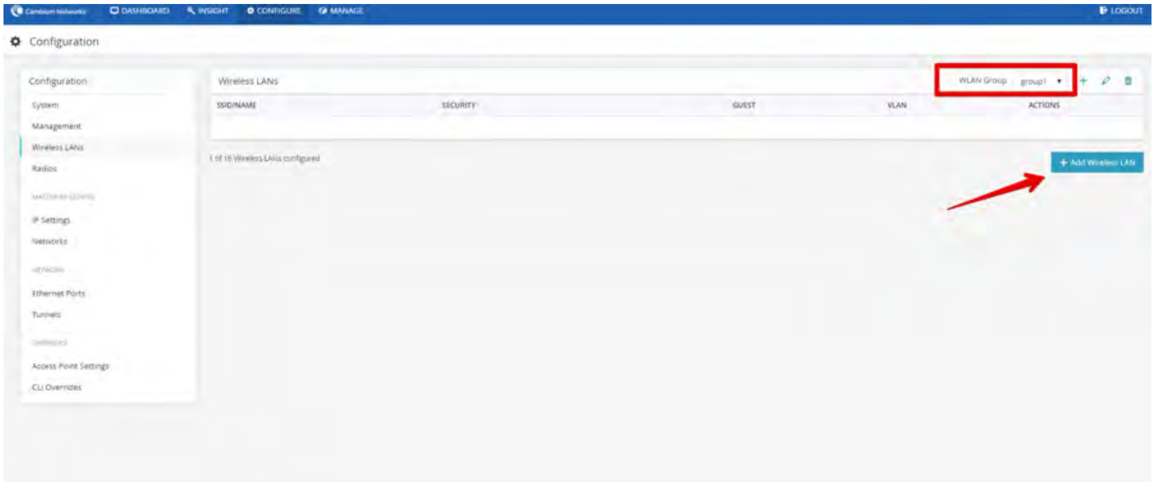
5GHz Channel: Don't Override

5GHz Power: Don't Override

Configuring WPA2-Enterprise WLAN

Follow the below steps to create a WLAN with Enterprise security under user created WLAN Group.

Figure 110: *Access Point settings > user created WLAN Group*



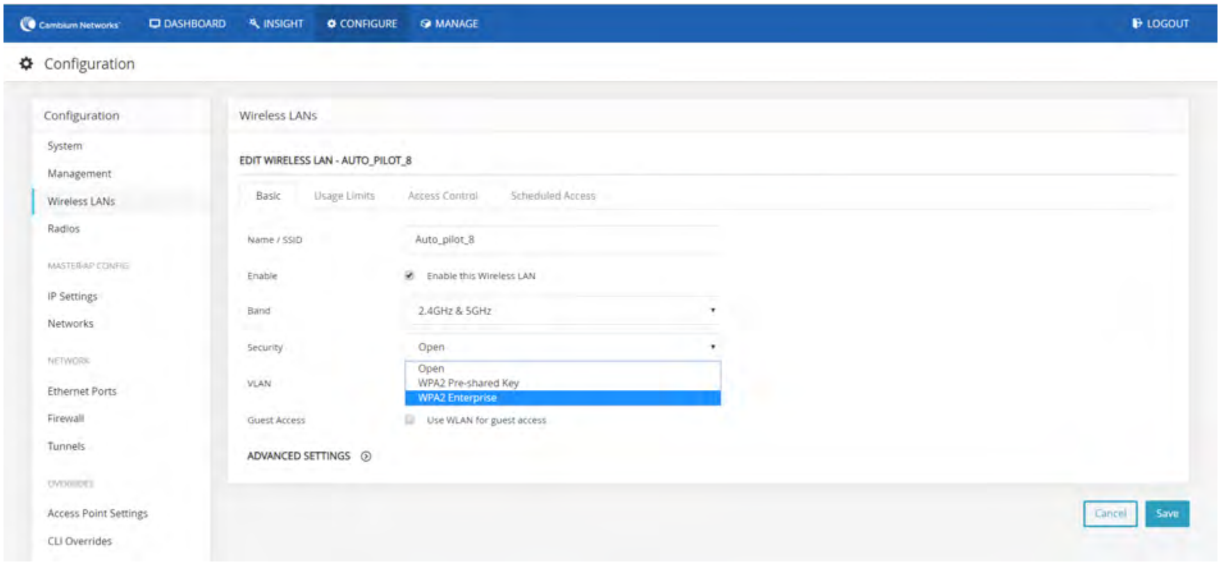
Wireless LANs — WLAN Group: group1

SSID/NAME	SECURITY	GUEST	VLAN	ACTIONS

1 of 16 Wireless LANs configured

1. Enter details in the WLAN page.
2. Select Security as WPA2-Enterprise from the drop-down list.
3. Keep VLAN as 1.
4. Do not press Save button before configuring Radius configurations for authentication.

Figure 111: *Wireless LANs > Security*

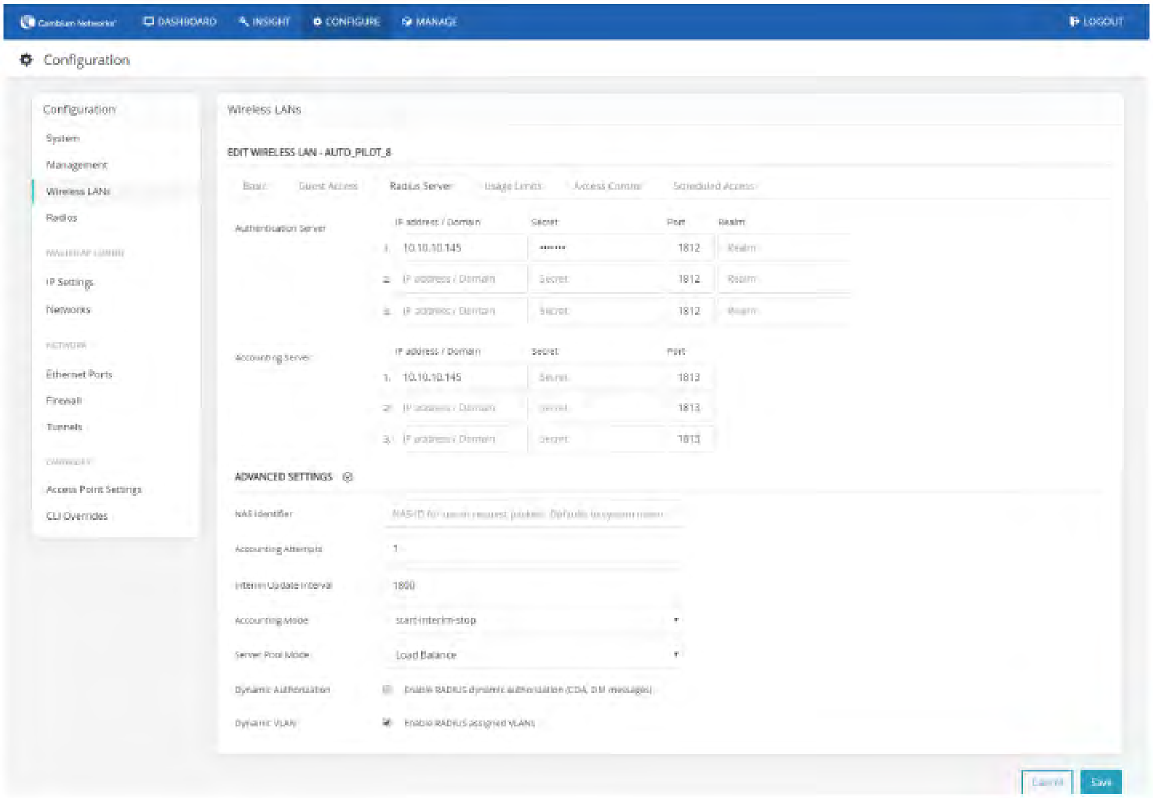


EDIT WIRELESS LAN - AUTO_PILOT_8

Name / SSID	Auto_pilot_8
Enable	☑ Enable this Wireless LAN
Band	2.4GHz & 5GHz
Security	Open Open WPA2 Pre-shared Key WPA2 Enterprise
VLAN	
Guest Access	☐ Use WLAN for guest access

5. Configure Radius Server details for Authentication and for Accounting if applicable. Authentication server details has to be filled before saving the WLAN configuration.

Figure 112: *Wireless LANs > Radius Server*



EDIT WIRELESS LAN - AUTO_PILOT_8

Authentication Server

	IP address / Domain	Secret	Port	Realm
1.	10.10.10.145	******	1812	Realm
2.	IP address / Domain	Secret	1812	Realm
3.	IP address / Domain	Secret	1812	Realm

Accounting Server

	IP address / Domain	Secret	Port
1.	10.10.10.145	Secret	1813
2.	IP address / Domain	Secret	1813
3.	IP address / Domain	Secret	1813

ADVANCED SETTINGS

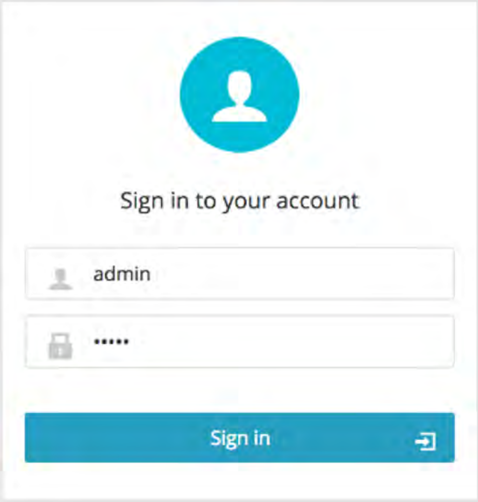
NAS Identifier	NAS-ID for users request packets. Defaults to system name
Accounting Attempts	1
Interim Update Interval	1800
Accounting Mode	start-interim-stop
Server Pool Mode	Load Balance
Dynamic Authorization	☐ Enable RADIUS dynamic authorization (COA, DM messages)
Dynamic VLAN	☑ Enable RADIUS assigned VLANs

Onboard member APs to Autopilot master

To onboard other member APs to Autopilot Master:

1. Access the Autopilot Master AP via web browser.
2. Login with the below credentials:
   - Username: admin
   - Password: admin

Figure 113: *Login page*



Sign in to your account

admin

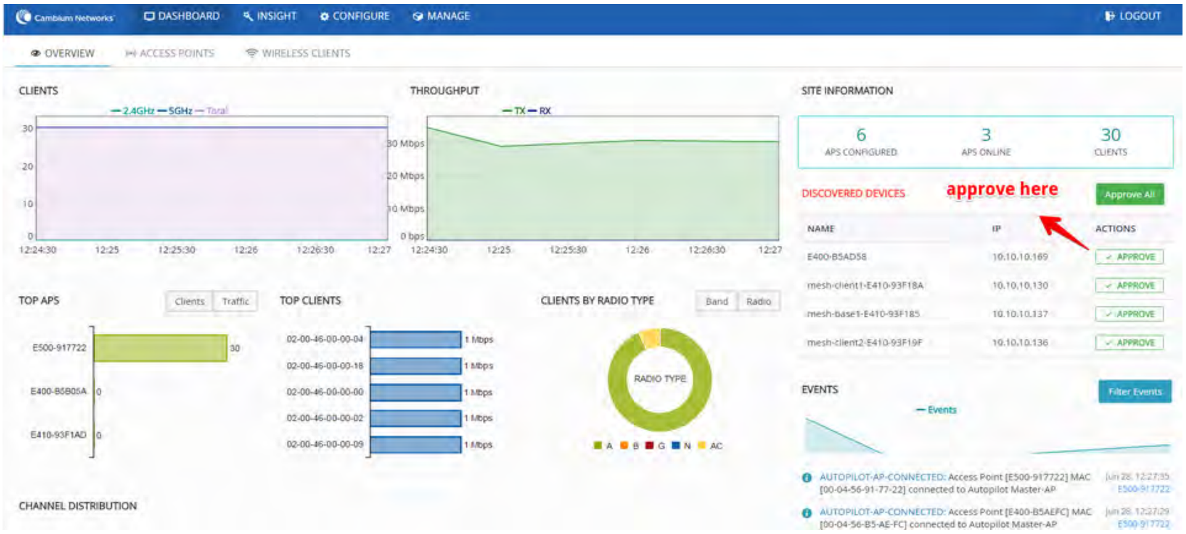
•••••

3. Go to the DASHBOARD tab of the Master AP which displays the list of member APs those have discovered the Master AP.

> **Note**
>
> The member AP needs to be upgraded with autopilot firmware.

4. Click APPROVE to approve and manage the desired member AP or click APPROVE ALL to approve and manage all the listed APs.

Figure 114: *Dashboard > Overview*



6	3	30
APS CONFIGURED	APS ONLINE	CLIENTS

DISCOVERED DEVICES

approve here

Approve All

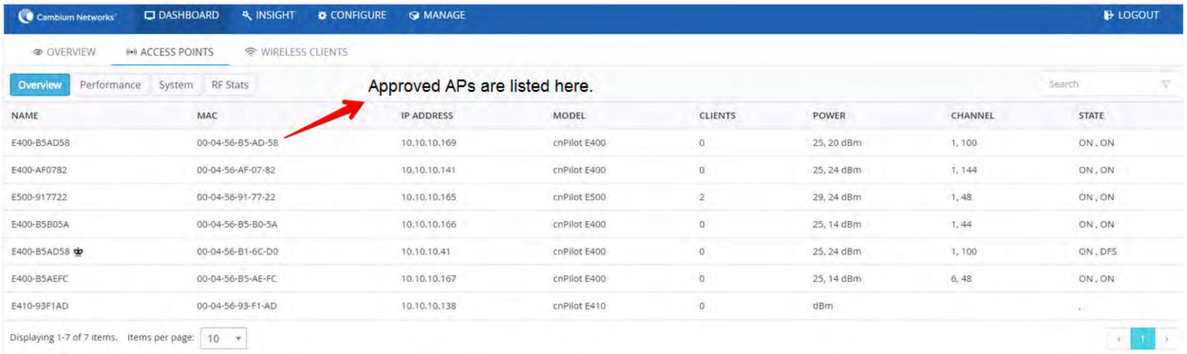
NAME	IP	ACTIONS
E400-B5AD58	10.10.10.169	✓ APPROVE
mesh-client1-E410-93F18A	10.10.10.130	✓ APPROVE
mesh-base1-E410-93F185	10.10.10.137	✓ APPROVE
mesh-client2-E410-93F19F	10.10.10.136	✓ APPROVE

AUTOPILOT-AP-CONNECTED: Access Point [E500-917722] MAC [00-04-56-91-77-22] connected to Autopilot Master-AP Jun 28, 12:27:35 E500-917722

AUTOPILOT-AP-CONNECTED: Access Point [E400-B5AEFC] MAC [00-04-56-B5-AE-FC] connected to Autopilot Master-AP Jun 28, 12:27:29 E500-917722

5. The approved member APs are listed under DASHBOARD > ACCESS POINTS tab.

Figure 115: *Dashboard > Access points*



Approved APs are listed here.

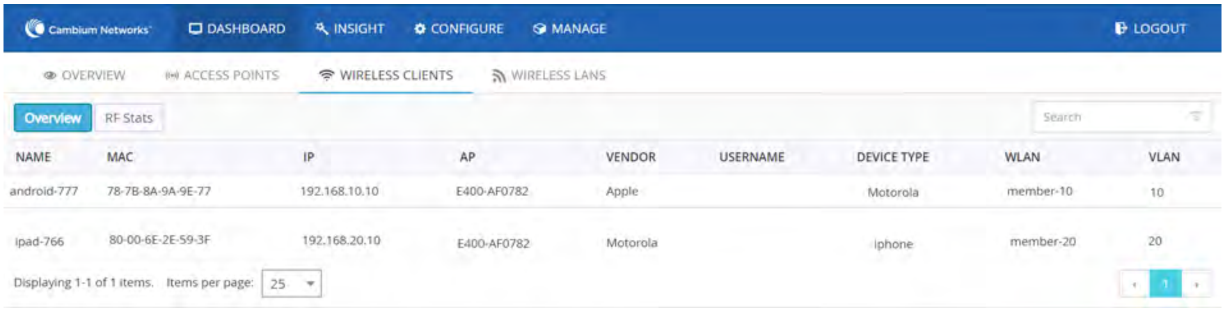
NAME	MAC	IP ADDRESS	MODEL	CLIENTS	POWER	CHANNEL	STATE
E400-B5AD58	00-04-56-B5-AD-58	10.10.10.169	cnPilot E400	0	25, 20 dBm	1, 100	ON , ON
E400-AF0782	00-04-56-AF-07-82	10.10.10.141	cnPilot E400	0	25, 24 dBm	1, 144	ON , ON
E500-917722	00-04-56-91-77-22	10.10.10.165	cnPilot E500	2	29, 24 dBm	1, 48	ON , ON
E400-B5B05A	00-04-56-B5-B0-5A	10.10.10.166	cnPilot E400	0	25, 14 dBm	1, 44	ON , ON
E400-B5AD58 ♚	00-04-56-B1-6C-D0	10.10.10.41	cnPilot E400	0	25, 24 dBm	1, 100	ON , DFS
E400-B5AEFC	00-04-56-B5-AE-FC	10.10.10.167	cnPilot E400	0	25, 14 dBm	6, 48	ON , ON
E410-93F1AD	00-04-56-93-F1-AD	10.10.10.138	cnPilot E410	0	dBm		.

Displaying 1-7 of 7 items. Items per page: 10

Connect clients to the WLANs and check statistics

1. Go to DASHBOARD > WIRELESS CLIENTS.
2. Connect the listed clients to the configured WLANs and check statistics.

Figure 116: *Dashboard > Wireless clients*



NAME	MAC	IP	AP	VENDOR	USERNAME	DEVICE TYPE	WLAN	VLAN
android-777	78-7B-8A-9A-9E-77	192.168.10.10	E400-AF0782	Apple		Motorola	member-10	10
ipad-766	80-00-6E-2E-59-3F	192.168.20.10	E400-AF0782	Motorola		iphone	member-20	20

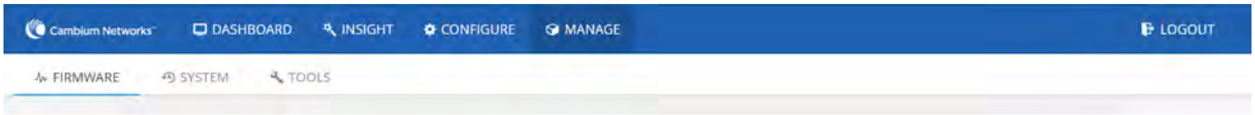
Displaying 1-1 of 1 items. Items per page: 25

Manage Autopilot

The Manage tab of Autopilot UI manages firmware upgrades, configuration file updates, and technical assistance of the master and member APs. Data is distributed in the following sub-sections:

- Firmware
- System
- Tools

Figure 117: *Manage > Firmware*



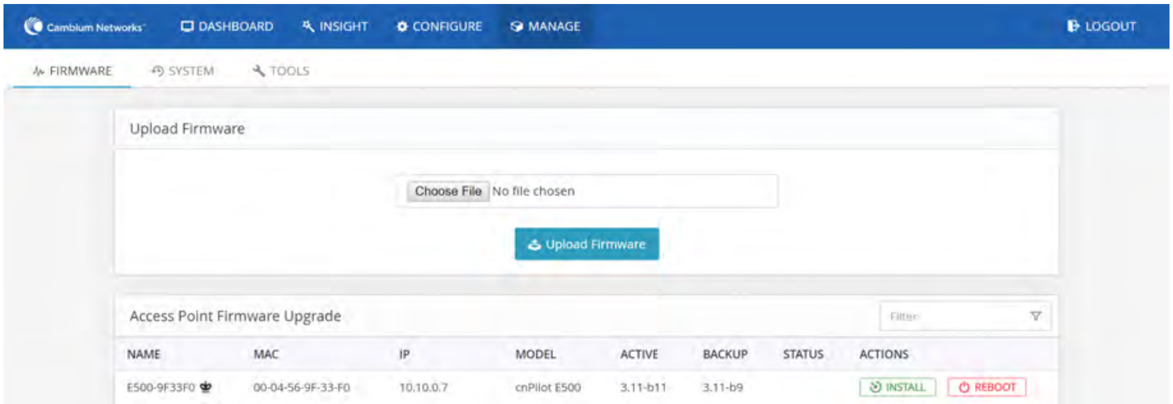
Firmware

This section supports uploading required firmware to master AP, and from master AP to the member APs.

To configure firmware:

1. Go to Manage > Firmware tab.
2. Click the Browse button to browse the firmware file.

Figure 118: *Manage > Upload Firmware*

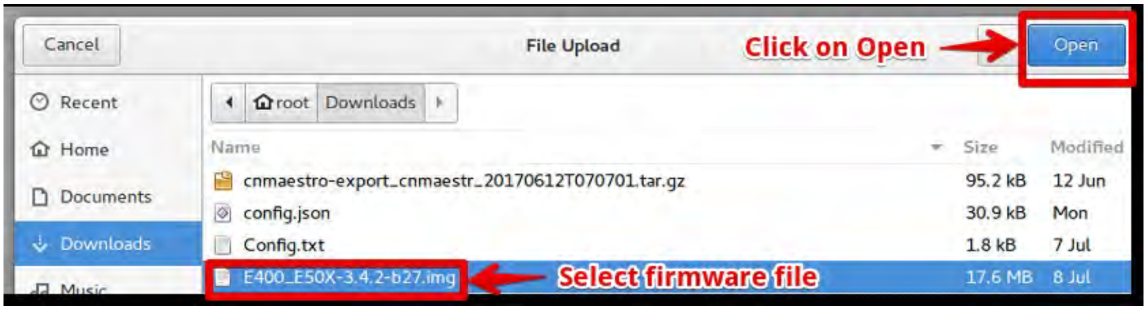


No file chosen

NAME	MAC	IP	MODEL	ACTIVE	BACKUP	STATUS	ACTIONS
E500-9F33F0	00-04-56-9F-33-F0	10.10.0.7	cnPilot E500	3.11-b11	3.11-b9		INSTALL REBOOT

3. Select the required firmware file and click Open. For example, firmware file: E400_E50X-3.4.2-b27.img.

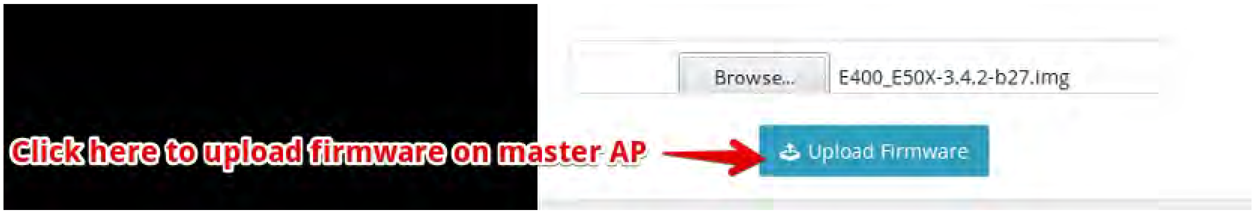
Figure 119: *To open required Firmware*



Name	Size	Modified
cnmaestro-export_cnmaestr_20170612T070701.tar.gz	95.2 kB	12 Jun
config.json	30.9 kB	Mon
Config.txt	1.8 kB	7 Jul
E400_E50X-3.4.2-b27.img	17.6 MB	8 Jul

4. Click Upload Firmware button and wait for upload.

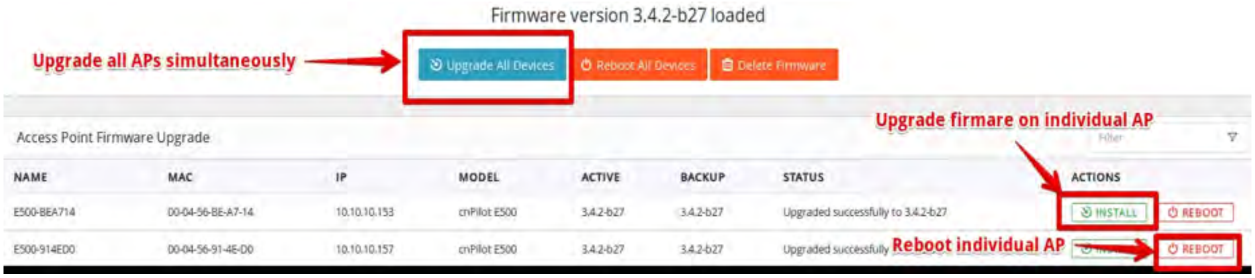
Figure 120: *Upload firmware on Master AP*



E400_E50X-3.4.2-b27.img

5. By clicking on Upgrade All Devices button, the firmware can be upgraded on all APs simultaneously or can be upgraded on each AP separately by clicking on Install button provided for every AP on the list.

Figure 121: *To upgrade firmware in all devices*



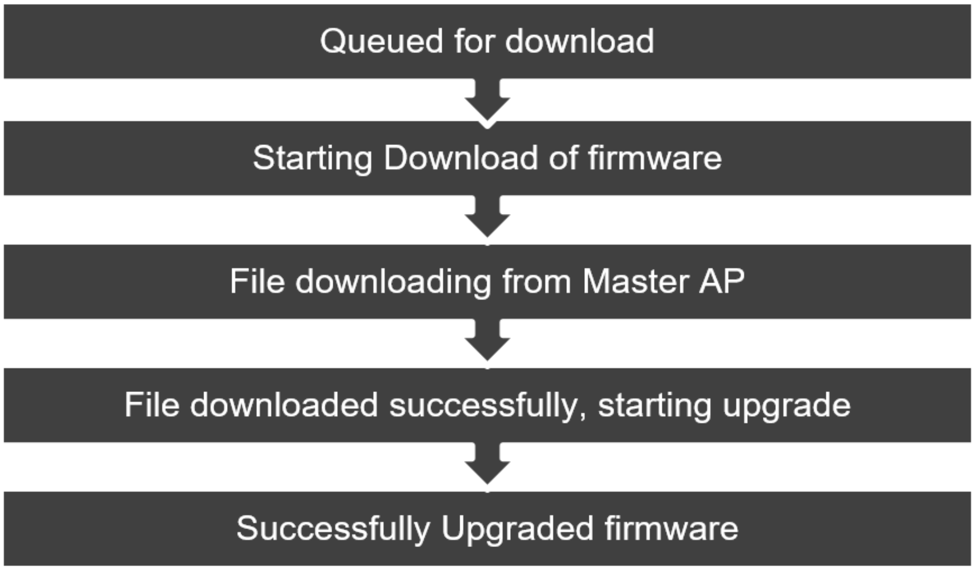
Firmware version 3.4.2-b27 loaded

Access Point Firmware Upgrade

NAME	MAC	IP	MODEL	ACTIVE	BACKUP	STATUS	ACTIONS
E500-BEA714	00-04-56-BE-A7-14	10.10.10.153	cnPilot E500	3.4.2-b27	3.4.2-b27	Upgraded successfully to 3.4.2-b27	INSTALL REBOOT
E500-914ED0	00-04-56-91-4E-D0	10.10.10.157	cnPilot E500	3.4.2-b27	3.4.2-b27	Upgraded successfully	REBOOT

Once step 5 is done, the following statuses during the Firmware upgrade can be seen in Firmware upgraded sequence.

Figure 122: *Firmware upgraded sequence*



Queued for download

Starting Download of firmware

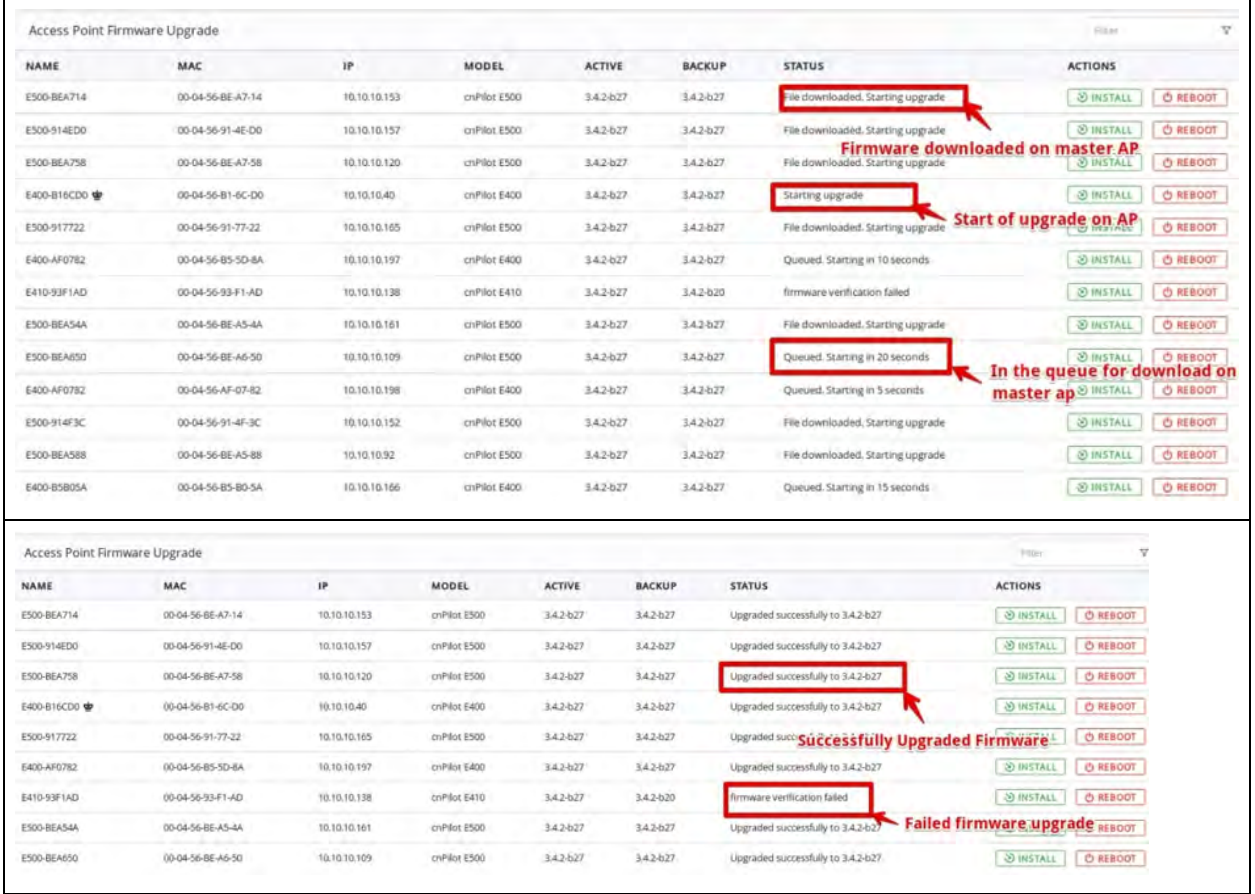
File downloading from Master AP

File downloaded successfully, starting upgrade

Successfully Upgraded firmware

6. Different statuses of the firmware upgrade can be seen in Firmware upgraded status.

Figure 123: *Firmware upgraded status*



Access Point Firmware Upgrade

NAME	MAC	IP	MODEL	ACTIVE	BACKUP	STATUS	ACTIONS
E500-BEA714	00-04-56-BE-A7-14	10.10.10.153	cnPilot E500	3.4.2-b27	3.4.2-b27	File downloaded. Starting upgrade	INSTALL REBOOT
E500-914ED0	00-04-56-91-4E-D0	10.10.10.157	cnPilot E500	3.4.2-b27	3.4.2-b27	File downloaded. Starting upgrade	INSTALL REBOOT
E500-BEA758	00-04-56-BE-A7-58	10.10.10.120	cnPilot E500	3.4.2-b27	3.4.2-b27	File downloaded. Starting upgrade	INSTALL REBOOT
E400-B16CD0 ♛	00-04-56-B1-6C-D0	10.10.10.40	cnPilot E400	3.4.2-b27	3.4.2-b27	Starting upgrade	INSTALL REBOOT
E500-917722	00-04-56-91-77-22	10.10.10.165	cnPilot E500	3.4.2-b27	3.4.2-b27	File downloaded. Starting upgrade	INSTALL REBOOT
E400-AF0782	00-04-56-B5-5D-8A	10.10.10.197	cnPilot E400	3.4.2-b27	3.4.2-b27	Queued. Starting in 10 seconds	INSTALL REBOOT
E410-93F1AD	00-04-56-93-F1-AD	10.10.10.138	cnPilot E410	3.4.2-b27	3.4.2-b20	firmware verification failed	INSTALL REBOOT
E500-BEA54A	00-04-56-BE-A5-4A	10.10.10.161	cnPilot E500	3.4.2-b27	3.4.2-b27	File downloaded. Starting upgrade	INSTALL REBOOT
E500-BEA650	00-04-56-BE-A6-50	10.10.10.109	cnPilot E500	3.4.2-b27	3.4.2-b27	Queued. Starting in 20 seconds	INSTALL REBOOT
E400-AF0782	00-04-56-AF-07-82	10.10.10.198	cnPilot E400	3.4.2-b27	3.4.2-b27	Queued. Starting in 5 seconds	INSTALL REBOOT
E500-914F3C	00-04-56-91-4F-3C	10.10.10.152	cnPilot E500	3.4.2-b27	3.4.2-b27	File downloaded. Starting upgrade	INSTALL REBOOT
E500-BEA588	00-04-56-BE-A5-88	10.10.10.92	cnPilot E500	3.4.2-b27	3.4.2-b27	File downloaded. Starting upgrade	INSTALL REBOOT
E400-B5B05A	00-04-56-B5-B0-5A	10.10.10.166	cnPilot E400	3.4.2-b27	3.4.2-b27	Queued. Starting in 15 seconds	INSTALL REBOOT

Filter
Firmware downloaded on master AP
Start of upgrade on AP
In the queue for download on master ap

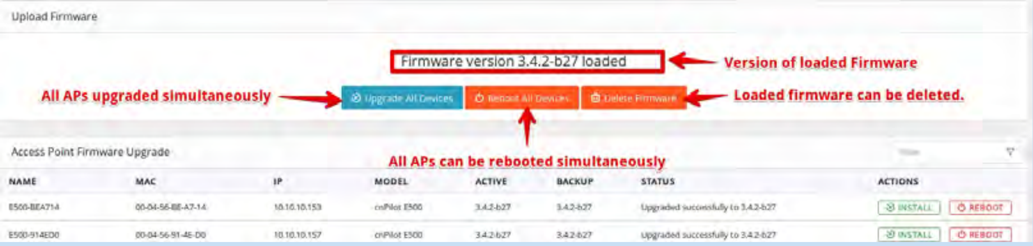
Access Point Firmware Upgrade

NAME	MAC	IP	MODEL	ACTIVE	BACKUP	STATUS	ACTIONS
E500-BEA714	00-04-56-BE-A7-14	10.10.10.153	cnPilot E500	3.4.2-b27	3.4.2-b27	Upgraded successfully to 3.4.2-b27	INSTALL REBOOT
E500-914ED0	00-04-56-91-4E-D0	10.10.10.157	cnPilot E500	3.4.2-b27	3.4.2-b27	Upgraded successfully to 3.4.2-b27	INSTALL REBOOT
E500-BEA758	00-04-56-BE-A7-58	10.10.10.120	cnPilot E500	3.4.2-b27	3.4.2-b27	Upgraded successfully to 3.4.2-b27	INSTALL REBOOT
E400-B16CD0 ♛	00-04-56-B1-6C-D0	10.10.10.40	cnPilot E400	3.4.2-b27	3.4.2-b27	Upgraded successfully to 3.4.2-b27	INSTALL REBOOT
E500-917722	00-04-56-91-77-22	10.10.10.165	cnPilot E500	3.4.2-b27	3.4.2-b27	Upgraded succ	INSTALL REBOOT
E400-AF0782	00-04-56-B5-5D-8A	10.10.10.197	cnPilot E400	3.4.2-b27	3.4.2-b27	Upgraded successfully to 3.4.2-b27	INSTALL REBOOT
E410-93F1AD	00-04-56-93-F1-AD	10.10.10.138	cnPilot E410	3.4.2-b27	3.4.2-b20	firmware verification failed	INSTALL REBOOT
E500-BEA54A	00-04-56-BE-A5-4A	10.10.10.161	cnPilot E500	3.4.2-b27	3.4.2-b27	Upgraded successfully to 3.4.2-b27	REBOOT
E500-BEA650	00-04-56-BE-A6-50	10.10.10.109	cnPilot E500	3.4.2-b27	3.4.2-b27	Upgraded successfully to 3.4.2-b27	INSTALL REBOOT

Note

In case of any error/failure in upgrade status such as Firmware verification failed is shown in status column:

1. APs can be rebooted individually by using Reboot option.
2. All the APs can be rebooted simultaneously using Reboot All Devices option.
3. The loaded firmware can be deleted from the master AP using Delete Firmware option.



Upload Firmware

Firmware version 3.4.2-b27 loaded

Version of loaded Firmware
All APs upgraded simultaneously
Upgrade All Devices
Reboot All Devices
Delete Firmware
Loaded firmware can be deleted.
All APs can be rebooted simultaneously
Filter

Access Point Firmware Upgrade

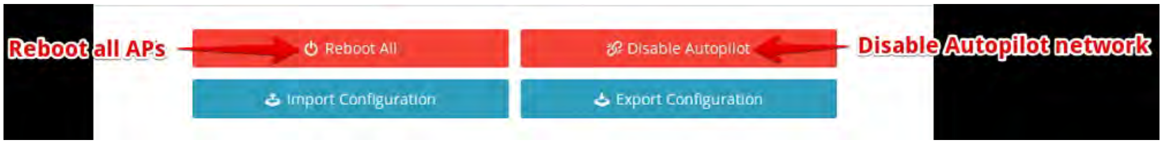
NAME	MAC	IP	MODEL	ACTIVE	BACKUP	STATUS	ACTIONS
E500-BEA714	00-04-56-BE-A7-14	10.10.10.153	cnPilot E500	3.4.2-b27	3.4.2-b27	Upgraded successfully to 3.4.2-b27	INSTALL REBOOT
E500-914ED0	00-04-56-91-4E-D0	10.10.10.157	cnPilot E500	3.4.2-b27	3.4.2-b27	Upgraded successfully to 3.4.2-b27	INSTALL REBOOT

System

This section provides the following options:

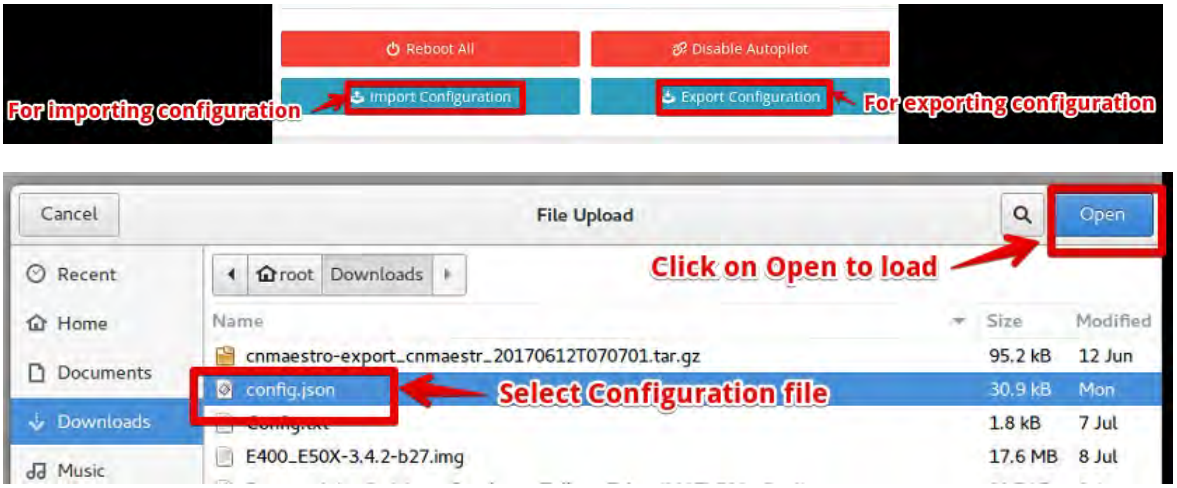
- Reboot All: This option is used to reboot all the APs including the master AP simultaneously.
- Disable Autopilot: This button is used to disable Autopilot and the entire network of master AP.

Figure 124: *System*



- Import Configuration: This button is used to load any essential configuration and configure Autopilot. Configuration files are stored in .json format.
- Export configuration: This button is used to export any new or essential configuration from Autopilot setup and store in .json format for future use.

Figure 125: *Import/Export Configuration*



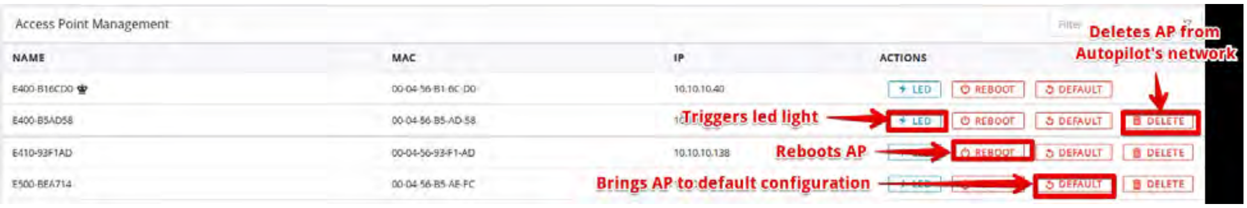
Name	Size	Modified
cnmaestro-export_cnmaestr_20170612T070701.tar.gz	95.2 kB	12 Jun
config.json	30.9 kB	Mon
Config.txt	1.8 kB	7 Jul
E400_E50X-3.4.2-b27.img	17.6 MB	8 Jul

Access Point Management

This section provides the following options:

- LED: This button triggers the LED light on the AP (Hardware) for easy identification.
- Reboot: This button is used to individually reboot APs in Autopilot network.
- Default: This button is used to set the APs to their default configuration.
- Delete: This button is used to delete member APs from the Autopilot network.

Figure 126: *Access Point management*



Access Point Management

Filter

NAME	MAC	IP	ACTIONS
E400-B16CD0 ♛	00-04-56-B1-6C-D0	10.10.10.40	LED REBOOT DEFAULT
E400-B5AD58	00-04-56-B5-AD-58	10[illegible]	LED REBOOT DEFAULT DELETE
E410-93F1AD	00-04-56-93-F1-AD	10.10.10.138	LED REBOOT DEFAULT DELETE
E500-BEA714	00-04-56-B5-AE-FC	[illegible]	LED REBOOT DEFAULT DELETE

Deletes AP from Autopilot's network

Triggers led light

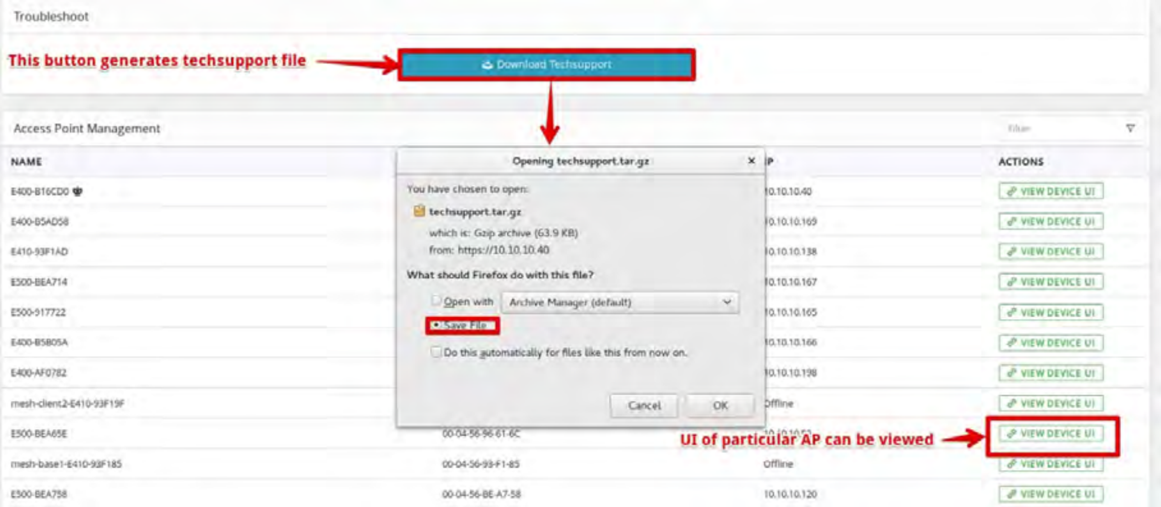
Reboots AP

Brings AP to default configuration

Tools

This section supports downloading technical support file for troubleshooting and viewing User Interfaces of APs.

Figure 127: *Troubleshoot*



Troubleshoot

This button generates techsupport file

Download Techsupport

Access Point Management

Filter

NAME	MAC	IP	ACTIONS
E400-B16CD0 ♛		10.10.10.40	VIEW DEVICE UI
E400-B5AD58		10.10.10.169	VIEW DEVICE UI
E410-93F1AD		10.10.10.138	VIEW DEVICE UI
E500-BEA714		10.10.10.167	VIEW DEVICE UI
E500-917722		10.10.10.165	VIEW DEVICE UI
E400-B5B05A		10.10.10.166	VIEW DEVICE UI
E400-AF0782		10.10.10.198	VIEW DEVICE UI
mesh-client2-E410-93F19F		Offline	VIEW DEVICE UI
E500-BEA65E	00-04-56-96-61-6C	[illegible]	VIEW DEVICE UI
mesh-base1-E410-93F185	00-04-56-93-F1-85	Offline	VIEW DEVICE UI
E500-BEA758	00-04-56-BE-A7-58	10.10.10.120	VIEW DEVICE UI

Opening techsupport.tar.gz

You have chosen to open:

techsupport.tar.gz

which is: Gzip archive (63.9 KB)

from: https://10.10.10.40

What should Firefox do with this file?

○ Open with Archive Manager (default)

● Save File

□ Do this automatically for files like this from now on.

Cancel OK

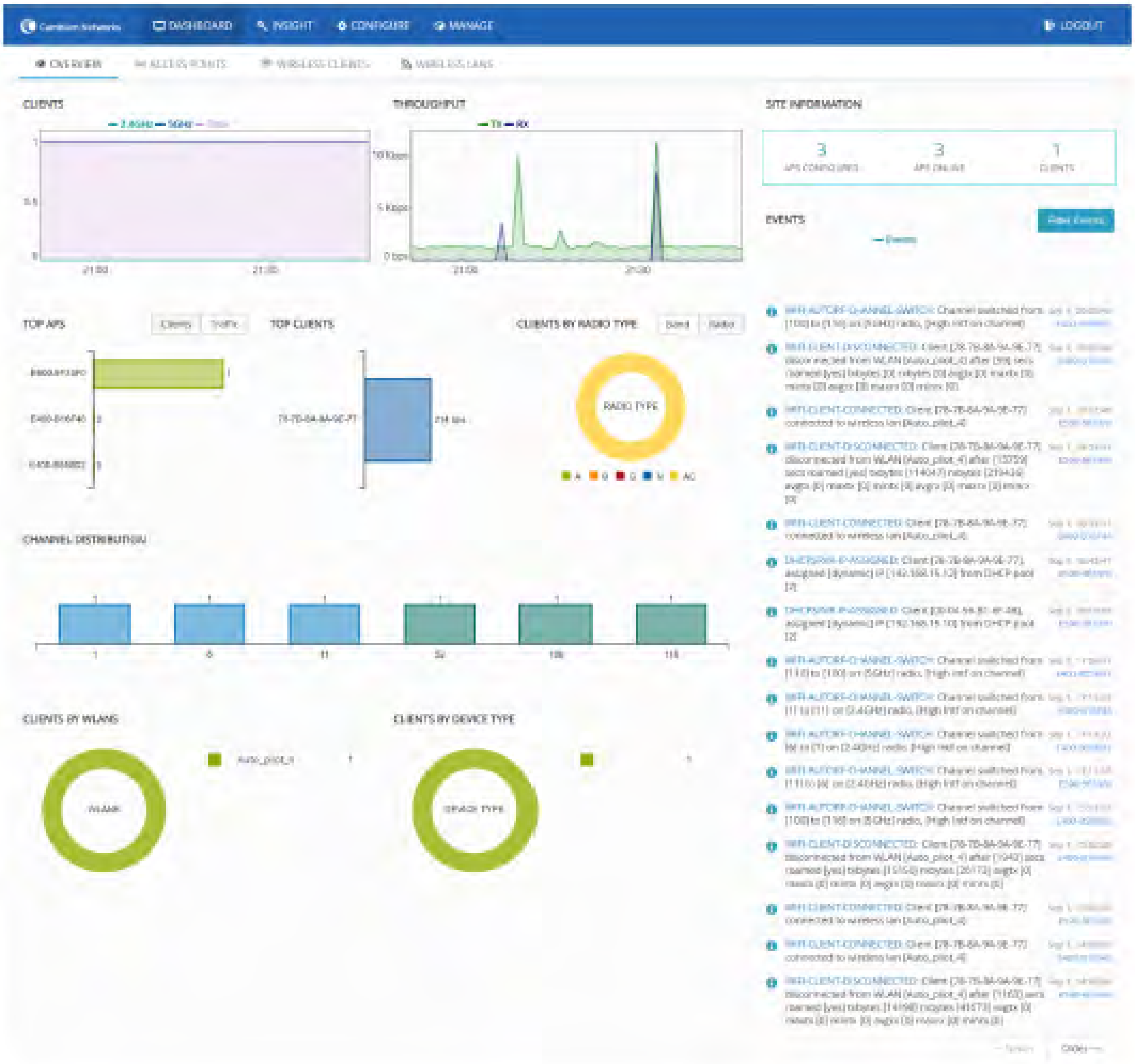
UI of particular AP can be viewed

Dashboard

The Dashboard of Autopilot UI provides excellent monitoring capability of the complete setup.

Various graphs and statistics of events, performance, and system information of clients and application is evidently made available to the user. It comprises of following components through which the data is available for monitoring.

Figure 128: *Dashboard*



WIFI-AUTORF-CHANNEL-SWITCH: Channel switched from [100] to [116] on [5GHz] radio, [High intf on channel] Sep 1, [illegible]

WIFI-CLIENT-DISCONNECTED: Client [78-7B-8A-9A-9E-77] disconnected from WLAN [Auto_pilot_4] after [59] secs roamed [yes] txbytes [0] rxbytes [0] avgtx [0] maxtx [0] mintx [0] avgrx [0] maxrx [0] minrx [0] Sep 1, [illegible]

WIFI-CLIENT-CONNECTED: Client [78-7B-8A-9A-9E-77] connected to wireless lan [Auto_pilot_4] Sep 1, [illegible]

WIFI-CLIENT-DISCONNECTED: Client [78-7B-8A-9A-9E-77] disconnected from WLAN [Auto_pilot_4] after [15759] secs roamed [yes] txbytes [114047] rxbytes [219436] avgtx [0] maxtx [0] mintx [0] avgrx [0] maxrx [0] minrx [0] Sep 1, [illegible]

WIFI-CLIENT-CONNECTED: Client [78-7B-8A-9A-9E-77] connected to wireless lan [Auto_pilot_4] Sep 1, [illegible]

DHCPSRVR-IP-ASSIGNED: Client [78-7B-8A-9A-9E-77], assigned [dynamic] IP [192.168.15.12] from DHCP pool [2] Sep 1, [illegible]

DHCPSRVR-IP-ASSIGNED: Client [30-04-5A-B1-4F-48], assigned [dynamic] IP [192.168.15.10] from DHCP pool [2] Sep 1, [illegible]

WIFI-AUTORF-CHANNEL-SWITCH: Channel switched from [116] to [100] on [5GHz] radio, [High intf on channel] Sep 1, [illegible]

WIFI-AUTORF-CHANNEL-SWITCH: Channel switched from [1] to [11] on [2.4GHz] radio, [High intf on channel] Sep 1, [illegible]

WIFI-AUTORF-CHANNEL-SWITCH: Channel switched from [6] to [1] on [2.4GHz] radio, [High intf on channel] Sep 1, [illegible]

WIFI-AUTORF-CHANNEL-SWITCH: Channel switched from [11] to [6] on [2.4GHz] radio, [High intf on channel] Sep 1, [illegible]

WIFI-AUTORF-CHANNEL-SWITCH: Channel switched from [100] to [116] on [5GHz] radio, [High intf on channel] Sep 1, [illegible]

WIFI-CLIENT-DISCONNECTED: Client [78-7B-8A-9A-9E-77] disconnected from WLAN [Auto_pilot_4] after [1940] secs roamed [yes] txbytes [15150] rxbytes [26173] avgtx [0] maxtx [0] mintx [0] avgrx [0] maxrx [0] minrx [0] Sep 1, [illegible]

WIFI-CLIENT-CONNECTED: Client [78-7B-8A-9A-9E-77] connected to wireless lan [Auto_pilot_4] Sep 1, [illegible]

WIFI-CLIENT-CONNECTED: Client [78-7B-8A-9A-9E-77] connected to wireless lan [Auto_pilot_4] Sep 1, [illegible]

WIFI-CLIENT-DISCONNECTED: Client [78-7B-8A-9A-9E-77] disconnected from WLAN [Auto_pilot_4] after [1160] secs roamed [yes] txbytes [14198] rxbytes [41573] avgtx [0] maxtx [0] mintx [0] avgrx [0] maxrx [0] minrx [0] Sep 1, [illegible]

← Newer Older →

Overview

The Dashboard tab comprises of data and various graphs as follows:

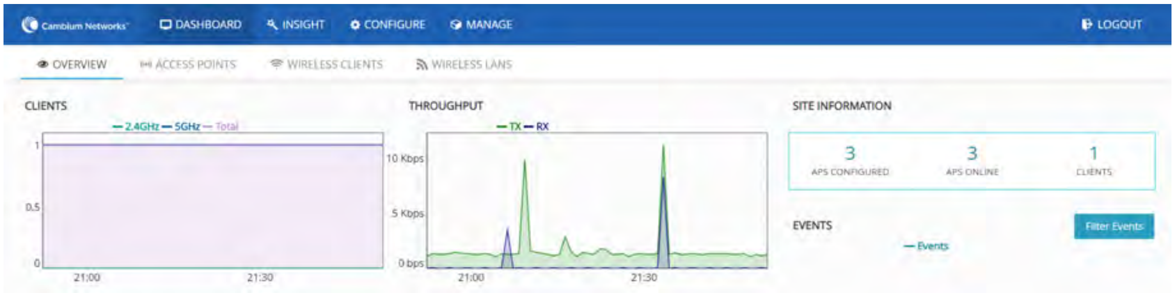
- Site information
- Discovered devices
- Events
- Clients
- Throughput
- Top Apps
- Top clients

- Clients by Band/Radio type
- Channel distribution
- Clients by WLANs
- Clients by device type

Site information

This section provides the information of number of configured APs, online APs, and number of clients provided.

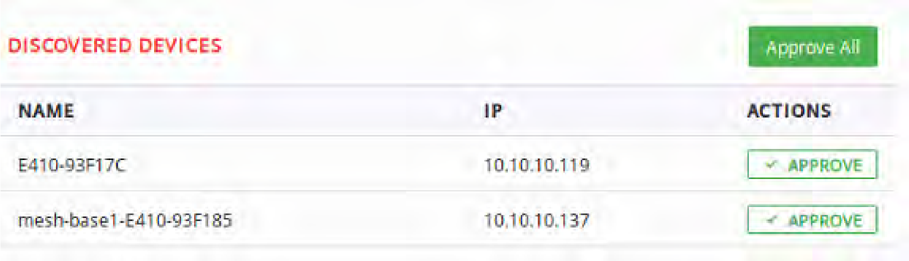
Figure 129: *Site information*



Discovered devices

This table lists all the discovered devices with their names, IP addresses, and actions performed over them. Every device discovered and displayed here should be APPROVED for it to be connected to APs network and ready for configuration.

Figure 130: *Discovered devices*



DISCOVERED DEVICES

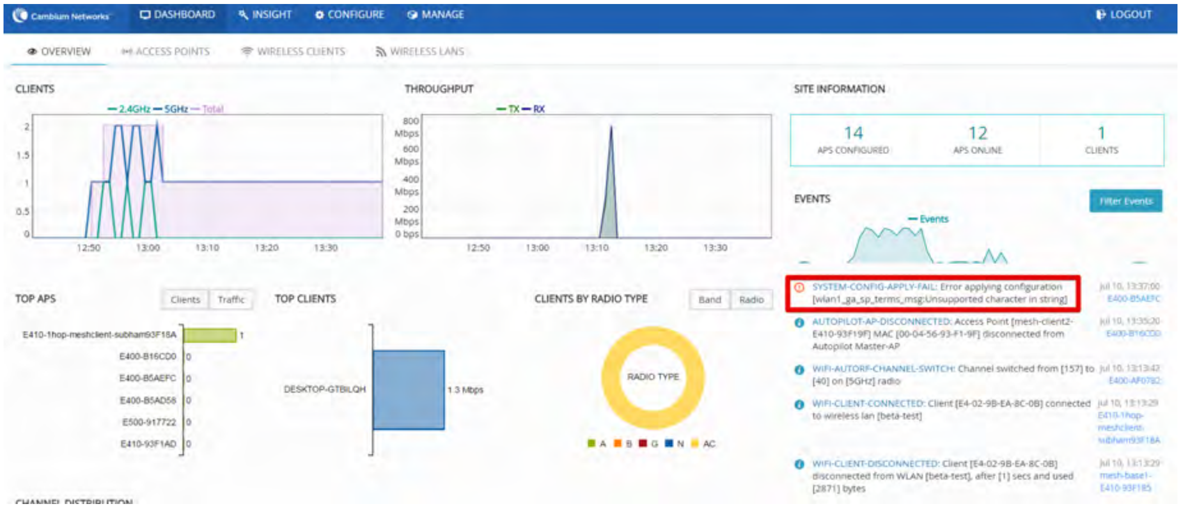
Approve All

NAME	IP	ACTIONS
E410-93F17C	10.10.10.119	✓ APPROVE
mesh-base1-E410-93F185	10.10.10.137	✓ APPROVE

Events

This section continuously streams all the events occurring on the network of AP both graphically and digitally. Graphical spikes can be helpful in representing the network to know how the network is behaving. Any configuration error is also displayed as an event with the reasons mentioned due to which the application of respective configuration failed. For example, check the highlighted event in the below figure.

Figure 131: *Events*



SYSTEM-CONFIG-APPLY-FAIL: Error applying configuration [wlan1_ga_sp_terms_msg:Unsupported character in string] — Jul 10, 13:37:00 E400-B5AEFC

AUTOPILOT-AP-DISCONNECTED: Access Point [mesh-client2-E410-93F19F] MAC [00-04-56-93-F1-9F] disconnected from Autopilot Master-AP — Jul 10, 13:35:20 E400-B16CD0

WIFI-AUTORF-CHANNEL-SWITCH: Channel switched from [157] to [40] on [5GHz] radio — Jul 10, 13:13:42 E400-AF0782

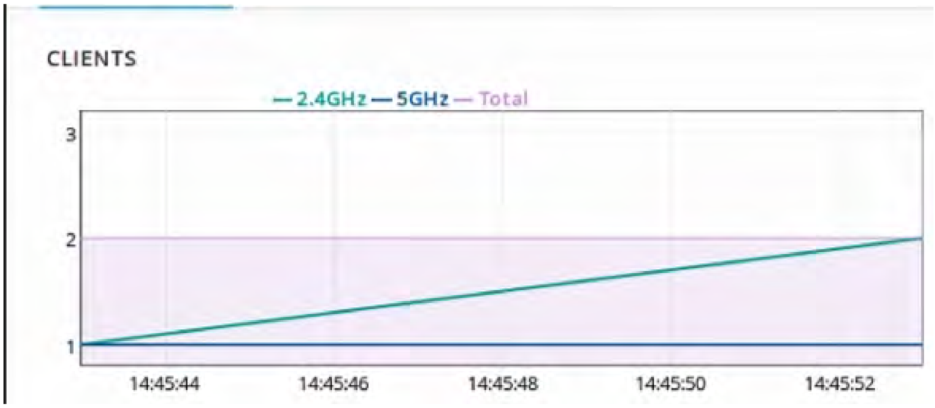
WIFI-CLIENT-CONNECTED: Client [E4-02-9B-EA-8C-0B] connected to wireless lan [beta-test] — Jul 10, 13:13:29 E410-1hop-meshclient-subham93F18A

WIFI-CLIENT-DISCONNECTED: Client [E4-02-9B-EA-8C-0B] disconnected from WLAN [beta-test], after [1] secs and used [2871] bytes — Jul 10, 13:13:29 mesh-base1-E410-93F185

Clients

This section graphically streams information about the number of clients connected to specific frequency (2.4 Hz or 5 Hz) and total number of clients at a given time on the present day.

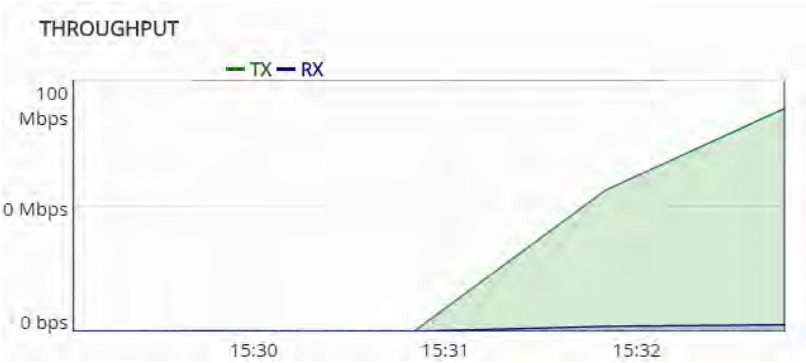
Figure 132: *Clients*



Throughput

This section graphically represents the TX, RX of each client and total Throughput of all clients against each channel. User can hover over the graph and get more granular details.

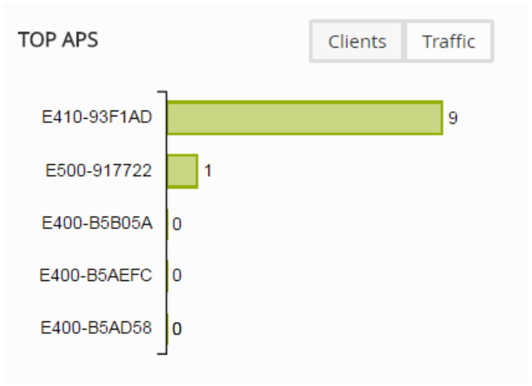
Figure 133: *Throughput*

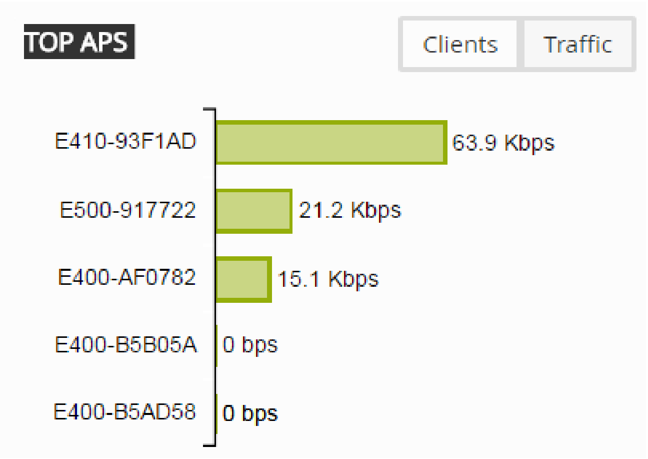


Top Aps

This section graphically displays the top five APs connected to Autopilot's network along with numbers of clients and traffic in respective frequencies (2.4 Hz or 5 Hz).

Figure 134: *Top APs*

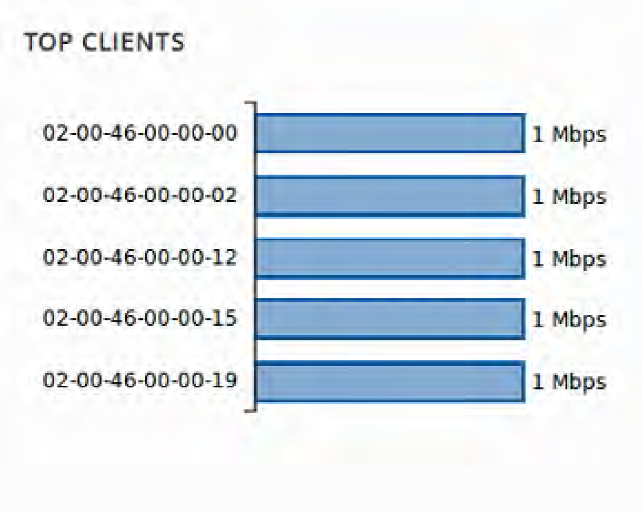




Top clients

This section graphically represents the top five clients connected to APs with highest traffic flow.

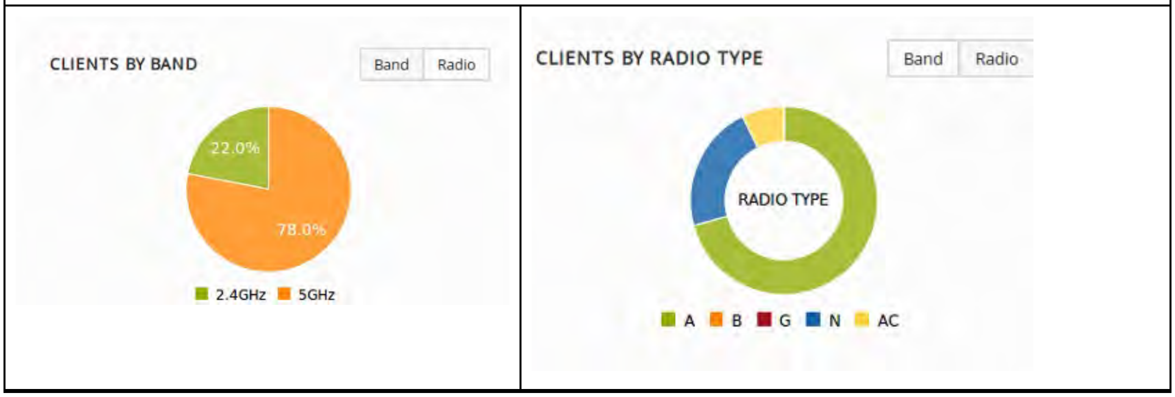
Figure 135: *Top clients*



Clients by Band/Radio type

This section provides pie chart representation of the radio types of clients. This shows pie chart based on the percentage of 2.4 GHz and 5 GHz clients connected to Autopilot network. Another pie chart is plotted based on types of clients such as 802.11a, 802.11b/g/n, 802.11ac.

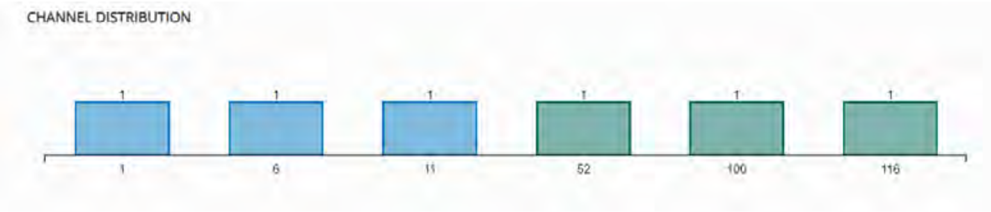
Figure 136: *Clients by Band/Radio*



Channel distribution

This section plots and displays the channel distribution between master and member APs as shown below. This helps to know which channels are being used and how many APs are using the channels.

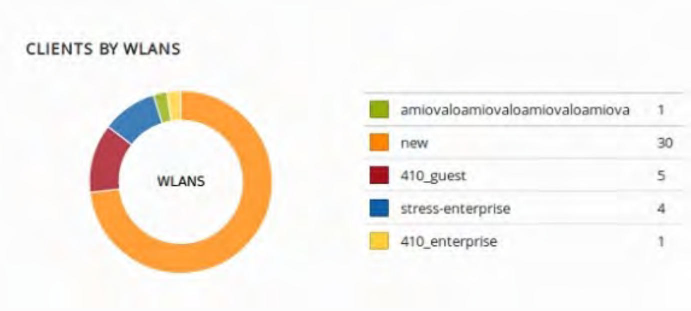
Figure 137: *Channel distribution*



Clients by WLANs

This section provides a pie chart representation of all the Clients and WLANs. This helps to instantly know the load on the WLANs.

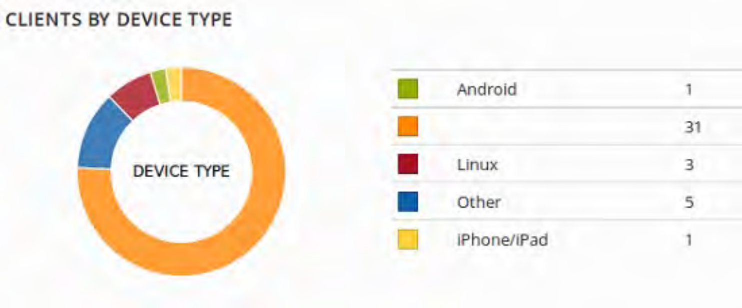
Figure 138: *Clients by WLANs*



Clients by device type

This section provides a pie chart representation of device type (Respective Platforms) of the Clients. This classifies the clients based on type such as Android, Windows clients, Linux, Ipad, Iphone clients, and so on.

Figure 139: *Clients by device type*



Access Points

This tab contains details such as Performance, System details, Client details, and so on of all the APs connected to Autopilot. Under Access Point tab, there are four tabs which are as follows:

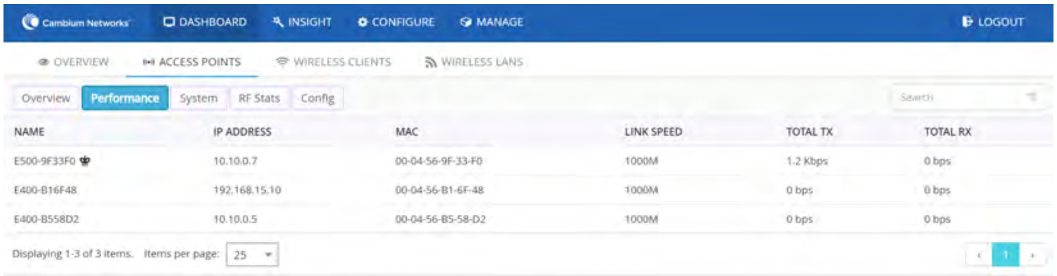
Overview

This tab provides information such as Name, MAC address, IP Address, Model, number of Clients, Power, Channels, and State of radio of all the APs'.

Performance

This tab displays MAC, IP, Link speed, Total TX (Transmit from APS), and Total RX (Received to APS). For example, if AP transmits data at the speed of 10mbps, then its TX is equal to 10mbps.

Figure 140: *Access Points_Performance*



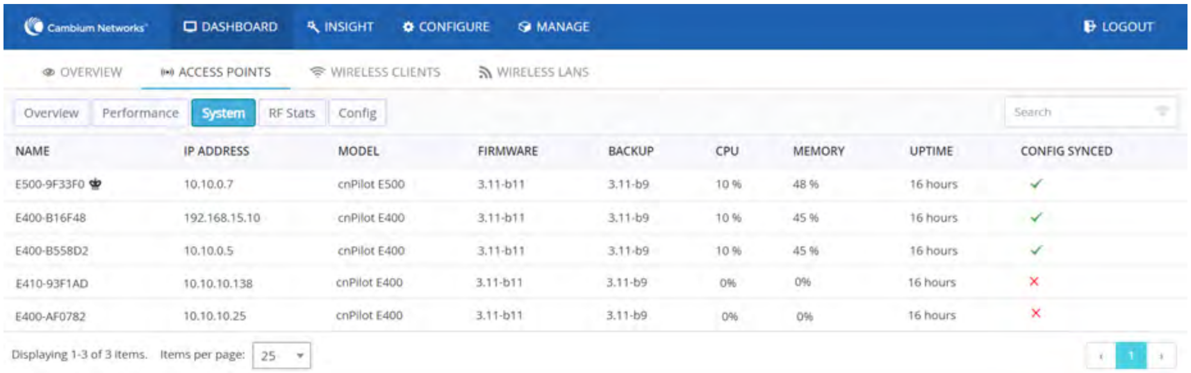
NAME	IP ADDRESS	MAC	LINK SPEED	TOTAL TX	TOTAL RX
E500-9F33F0 ♚	10.10.0.7	00-04-56-9F-33-F0	1000M	1.2 Kbps	0 bps
E400-B16F48	192.168.15.10	00-04-56-B1-6F-48	1000M	0 bps	0 bps
E400-B558D2	10.10.0.5	00-04-56-B5-58-D2	1000M	0 bps	0 bps

Displaying 1-3 of 3 items. Items per page: 25

System

This tab displays name, IP address, model, firmware, backup, CPU usage, memory, uptime, and synced configurations of all APs. This helps to know the performance of the APs. Config synched option lets a user to know whether the configuration of an AP is synched with the configuration done on Master. If there is any config sync issue, a red x is displayed as shown in Access Points_System.

Figure 141: *Access Points_System*



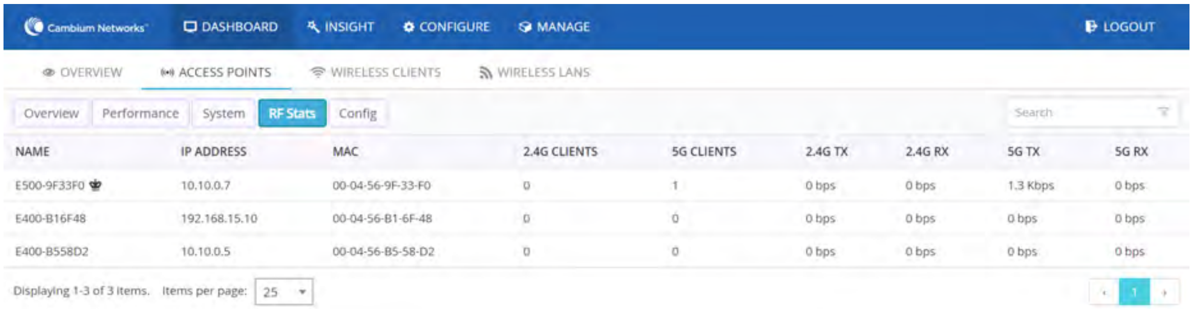
NAME	IP ADDRESS	MODEL	FIRMWARE	BACKUP	CPU	MEMORY	UPTIME	CONFIG SYNCED
E500-9F33F0 ♚	10.10.0.7	cnPilot E500	3.11-b11	3.11-b9	10 %	48 %	16 hours	✓
E400-B16F48	192.168.15.10	cnPilot E400	3.11-b11	3.11-b9	10 %	45 %	16 hours	✓
E400-B558D2	10.10.0.5	cnPilot E400	3.11-b11	3.11-b9	10 %	45 %	16 hours	✓
E410-93F1AD	10.10.10.138	cnPilot E400	3.11-b11	3.11-b9	0%	0%	16 hours	✗
E400-AF0782	10.10.10.25	cnPilot E400	3.11-b11	3.11-b9	0%	0%	16 hours	✗

Displaying 1-3 of 3 items. Items per page: 25

RF stats

This tab displays the number of 2.4G Clients, 5G Clients, TX to 2.4G clients, TX to 5G clients, RX from 2.4G clients, RX from 5G clients. Tx statistic signifies the downlink data speed to the client and Rx signifies uplink data speed from the client.

Figure 142: *Access Points_RF Status*



NAME	IP ADDRESS	MAC	2.4G CLIENTS	5G CLIENTS	2.4G TX	2.4G RX	5G TX	5G RX
E500-9F33F0 ♛	10.10.0.7	00-04-56-9F-33-F0	0	1	0 bps	0 bps	1.3 Kbps	0 bps
E400-B16F48	192.168.15.10	00-04-56-B1-6F-48	0	0	0 bps	0 bps	0 bps	0 bps
E400-B558D2	10.10.0.5	00-04-56-B5-58-D2	0	0	0 bps	0 bps	0 bps	0 bps

Displaying 1-3 of 3 items. Items per page: 25

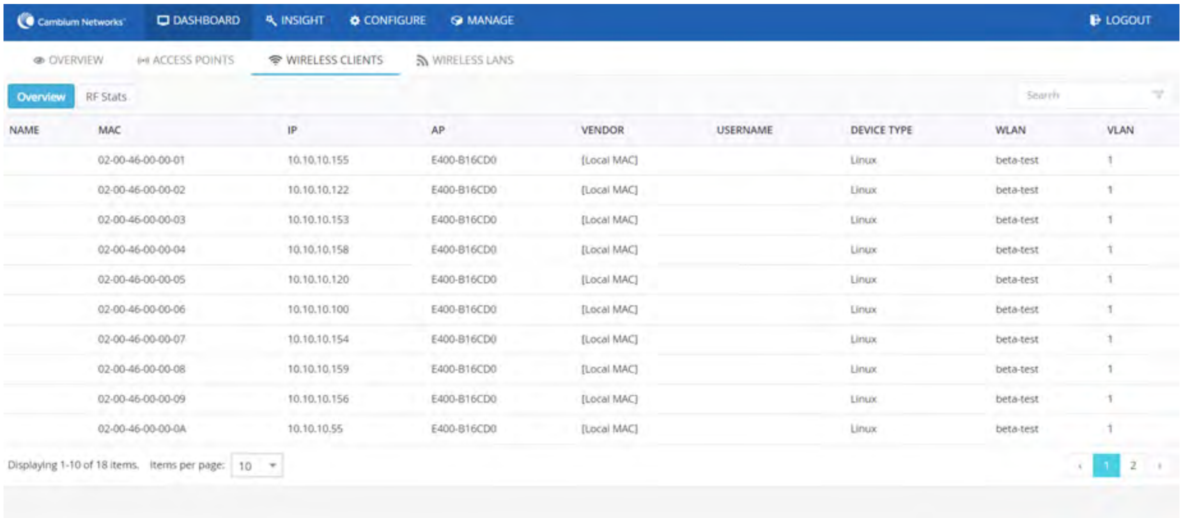
Wireless clients

This tab represents details of wireless clients such as vendor type, WLANs, VLANs, RF Stats, and so on.

Overview

The details in this tab include Name, MAC, IP, Vendor type of clients, Usernames (WPA2 enterprise and guest access), Device type (Platform) of Clients, list of WLANs to which clients are connected, and VLAN information of respective WLANs.

Figure 143: *Dashboard > Wireless clients*



NAME	MAC	IP	AP	VENDOR	USERNAME	DEVICE TYPE	WLAN	VLAN
	02-00-46-00-00-01	10.10.10.155	E400-B16CD0	[Local MAC]		Linux	beta-test	1
	02-00-46-00-00-02	10.10.10.122	E400-B16CD0	[Local MAC]		Linux	beta-test	1
	02-00-46-00-00-03	10.10.10.153	E400-B16CD0	[Local MAC]		Linux	beta-test	1
	02-00-46-00-00-04	10.10.10.158	E400-B16CD0	[Local MAC]		Linux	beta-test	1
	02-00-46-00-00-05	10.10.10.120	E400-B16CD0	[Local MAC]		Linux	beta-test	1
	02-00-46-00-00-06	10.10.10.100	E400-B16CD0	[Local MAC]		Linux	beta-test	1
	02-00-46-00-00-07	10.10.10.154	E400-B16CD0	[Local MAC]		Linux	beta-test	1
	02-00-46-00-00-08	10.10.10.159	E400-B16CD0	[Local MAC]		Linux	beta-test	1
	02-00-46-00-00-09	10.10.10.156	E400-B16CD0	[Local MAC]		Linux	beta-test	1
	02-00-46-00-00-0A	10.10.10.55	E400-B16CD0	[Local MAC]		Linux	beta-test	1

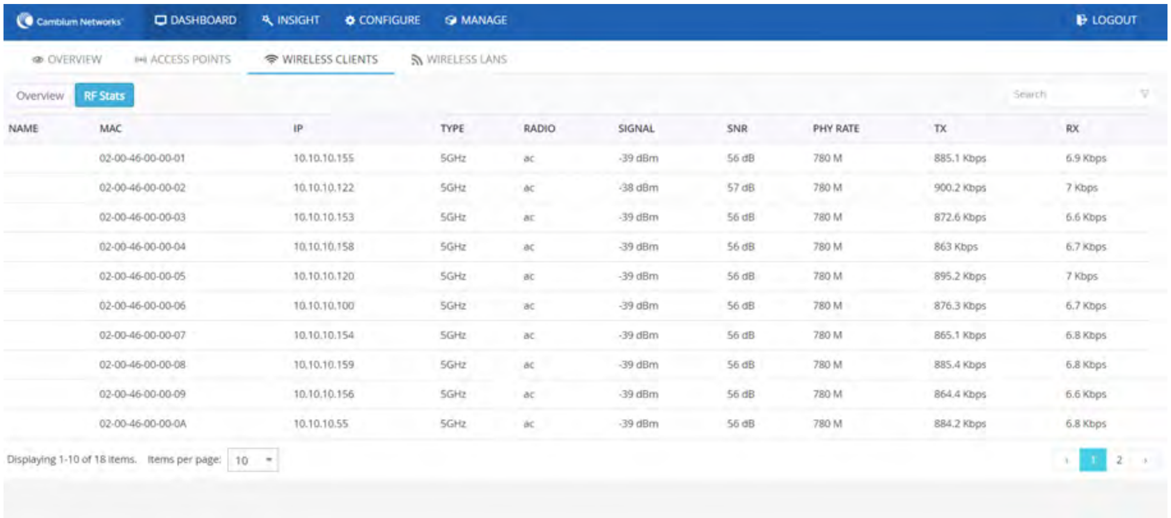
Displaying 1-10 of 18 items. Items per page: 10

RF Stats

This tab includes details such as frequency type, radio type, signal, Signal to Noise (SNR), physical rate, TX and RX of clients along with names, MAC, and IP addresses of clients.

> **Note**
>
> Less the number in signal better is the signal. For example, -20 is better signal than -70. Similarly, more the SNR better is the signal quality.

Figure 144: *Wireless clients > RF status*



NAME	MAC	IP	TYPE	RADIO	SIGNAL	SNR	PHY RATE	TX	RX
	02-00-46-00-00-01	10.10.10.155	5GHz	ac	-39 dBm	56 dB	780 M	885.1 Kbps	6.9 Kbps
	02-00-46-00-00-02	10.10.10.122	5GHz	ac	-38 dBm	57 dB	780 M	900.2 Kbps	7 Kbps
	02-00-46-00-00-03	10.10.10.153	5GHz	ac	-39 dBm	56 dB	780 M	872.6 Kbps	6.6 Kbps
	02-00-46-00-00-04	10.10.10.158	5GHz	ac	-39 dBm	56 dB	780 M	863 Kbps	6.7 Kbps
	02-00-46-00-00-05	10.10.10.120	5GHz	ac	-39 dBm	56 dB	780 M	895.2 Kbps	7 Kbps
	02-00-46-00-00-06	10.10.10.100	5GHz	ac	-39 dBm	56 dB	780 M	876.3 Kbps	6.7 Kbps
	02-00-46-00-00-07	10.10.10.154	5GHz	ac	-39 dBm	56 dB	780 M	865.1 Kbps	6.8 Kbps
	02-00-46-00-00-08	10.10.10.159	5GHz	ac	-39 dBm	56 dB	780 M	885.4 Kbps	6.8 Kbps
	02-00-46-00-00-09	10.10.10.156	5GHz	ac	-39 dBm	56 dB	780 M	864.4 Kbps	6.6 Kbps
	02-00-46-00-00-0A	10.10.10.55	5GHz	ac	-39 dBm	56 dB	780 M	884.2 Kbps	6.8 Kbps

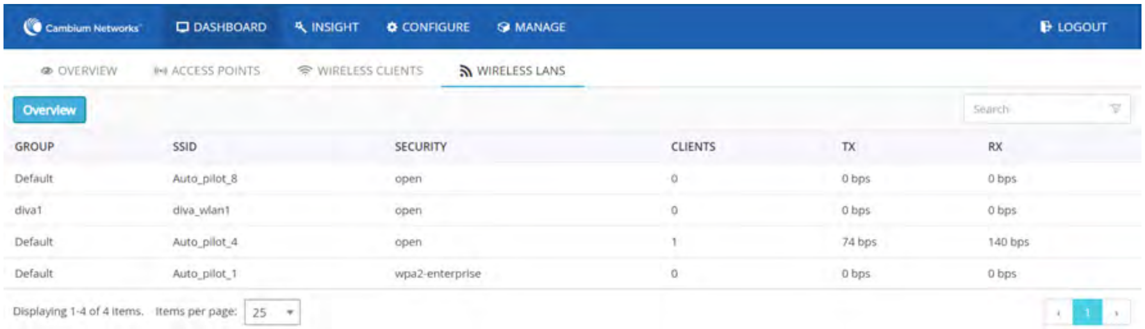
Displaying 1-10 of 18 items. Items per page: 10

Wireless LANs

This tab provides details of all the configured WLANs as follows:

- GROUP: Name of the group under which the WLAN is created. WLAN group is used to club single or multiple WLANs and then push the WLAN configurations to selected APs.
- SSID: SSID of the WLAN.
- SECURITY: Security of the WLAN which can be WPA2-PSK, WPA2-Enterprise, or Open.
- Tx: The actual data speed of downlink data. AP to clients.
- Rx: The actual data speed of uplink data. Clients to AP.

Figure 145: *Dashboard > Wireless LANs*



GROUP	SSID	SECURITY	CLIENTS	TX	RX
Default	Auto_pilot_8	open	0	0 bps	0 bps
diva1	diva_wlan1	open	0	0 bps	0 bps
Default	Auto_pilot_4	open	1	74 bps	140 bps
Default	Auto_pilot_1	wpa2-enterprise	0	0 bps	0 bps

Displaying 1-4 of 4 items. Items per page: 25

Insight

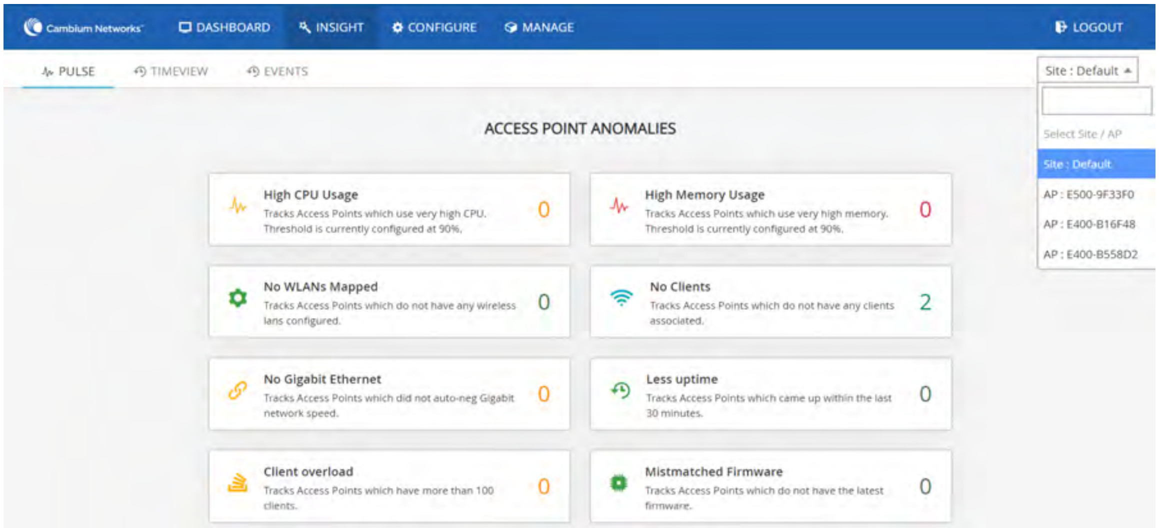
Insight option of Autopilot UI provides accurate insights on an AP anomalies which are distributed on the sub tabs as follows:

- Pulse
- Timeview

- Events

On the top left corner of the page the master and the member APs can be selected from the drop-down list. Site default gives overall details.

Figure 146: *Insight > Pulse*



ACCESS POINT ANOMALIES

High CPU Usage
Tracks Access Points which use very high CPU. Threshold is currently configured at 90%. 0

High Memory Usage
Tracks Access Points which use very high memory. Threshold is currently configured at 90%. 0

No WLANs Mapped
Tracks Access Points which do not have any wireless lans configured. 0

No Clients
Tracks Access Points which do not have any clients associated. 2

No Gigabit Ethernet
Tracks Access Points which did not auto-neg Gigabit network speed. 0

Less uptime
Tracks Access Points which came up within the last 30 minutes. 0

Client overload
Tracks Access Points which have more than 100 clients. 0

Mistmatched Firmware
Tracks Access Points which do not have the latest firmware. 0

Pulse

This tab provides the detailed information of the following:

- High CPU usage: On clicking, this option leads to TIMEVIEW page of Insight tab and tracks the CPU usage of all APs graphically.
- No WLANs mapped: This option leads to APs page of Dashboard tab and tracks number of APs without wireless LANs configured.
- No Gigabit ethernet: This option leads to APs page of Dashboard tab and tracks APs which do not auto negotiate Gigabit network speed.
- Client overload: This option leads to AP page of Dashboard and gives the number of clients connected to every AP and also points the AP connected by highest number of clients.
- High memory usage: Tracks the memory usage of all APs and the highest memory usage and leads to TIMEVIEW page of the Insight tab, when clicked upon.
- No clients: Tracks the APs which do not have any clients connected to them along with their details like IP Address, Mac Address, and Model etc. On clicking leads to APs page on Dashboard.
- Less uptime: Lists all the APs which were activated within the last 30 minutes along with their details and leads to Overview page on Dashboard.
- Mismatched firmware: Provides information related to mismatch of software with respect to Master device.

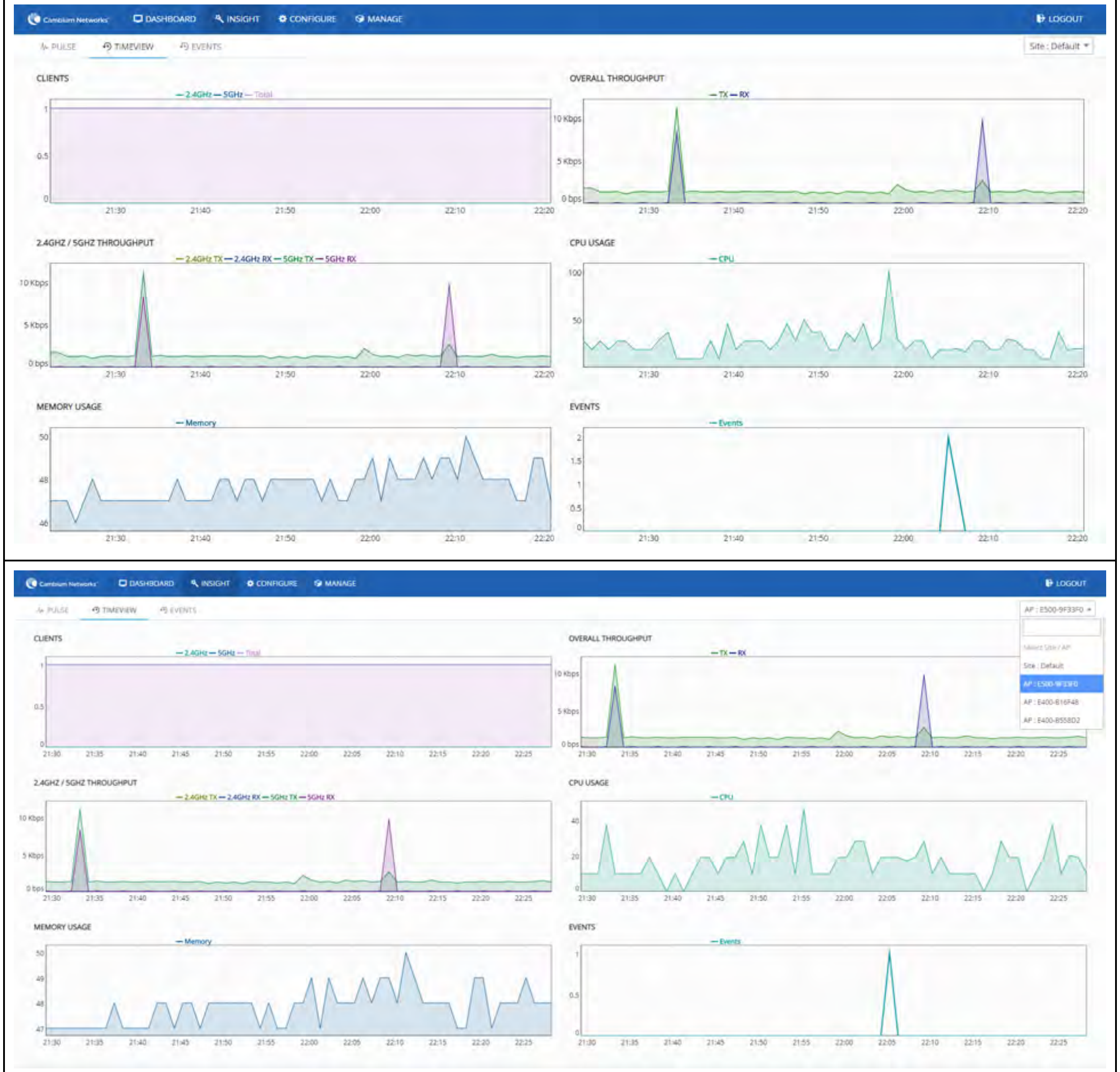
Note

In current version not all of these options are supported.

Timeview

This tab provides the graphical interpretation of CPU usage, Memory Usage, Clients, Overall Throughput, and Throughput by frequencies and Events. Also, the maximum (Graphical Peaks) and minimum values of all the mentioned components can be tracked accurately.

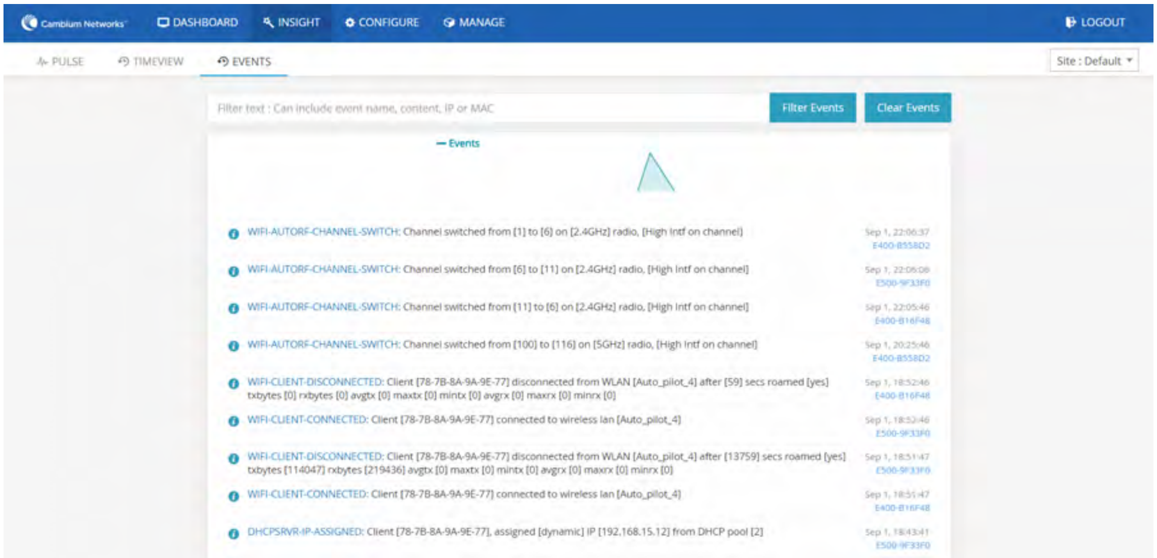
Figure 147: *Insight > Timeview*



Events

This tab provides the list of all the latest events of master and member APs. Events can be filtered for specific APs based on their event name, content, Mac or IP address. All the old events can be cleared to start afresh.

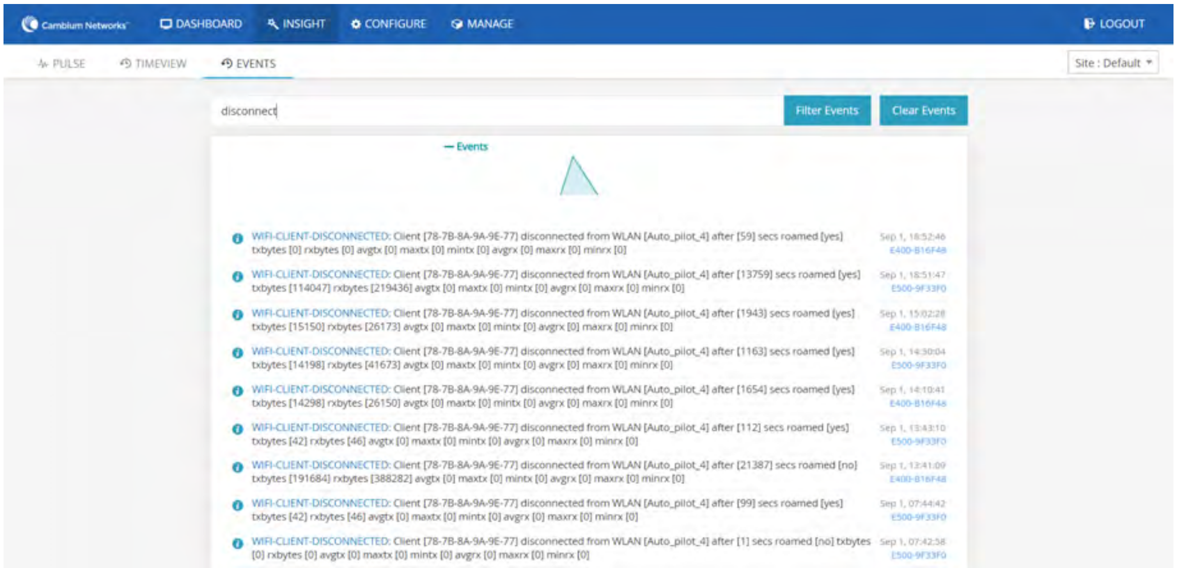
Figure 148: *Insight > Unfiltered Events*



Filter text : Can include event name, content, IP or MAC

```
WIFI-AUTORF-CHANNEL-SWITCH: Channel switched from [1] to [6] on [2.4GHz] radio, [High Intf on channel]    Sep 1, 22:06:37
                                                                                                            E400-B558D2
WIFI-AUTORF-CHANNEL-SWITCH: Channel switched from [6] to [11] on [2.4GHz] radio, [High Intf on channel]   Sep 1, 22:06:08
                                                                                                            E500-9F33F0
WIFI-AUTORF-CHANNEL-SWITCH: Channel switched from [11] to [6] on [2.4GHz] radio, [High Intf on channel]   Sep 1, 22:05:46
                                                                                                            E400-B16F48
WIFI-AUTORF-CHANNEL-SWITCH: Channel switched from [100] to [116] on [5GHz] radio, [High Intf on channel]  Sep 1, 20:25:46
                                                                                                            E400-B558D2
WIFI-CLIENT-DISCONNECTED: Client [78-7B-8A-9A-9E-77] disconnected from WLAN [Auto_pilot_4] after [59] secs roamed [yes]  Sep 1, 18:52:46
txbytes [0] rxbytes [0] avgtx [0] maxtx [0] mintx [0] avgrx [0] maxrx [0] minrx [0]                          E400-B16F48
WIFI-CLIENT-CONNECTED: Client [78-7B-8A-9A-9E-77] connected to wireless lan [Auto_pilot_4]                Sep 1, 18:52:46
                                                                                                            E500-9F33F0
WIFI-CLIENT-DISCONNECTED: Client [78-7B-8A-9A-9E-77] disconnected from WLAN [Auto_pilot_4] after [13759] secs roamed [yes]  Sep 1, 18:51:47
txbytes [114047] rxbytes [219436] avgtx [0] maxtx [0] mintx [0] avgrx [0] maxrx [0] minrx [0]                E500-9F33F0
WIFI-CLIENT-CONNECTED: Client [78-7B-8A-9A-9E-77] connected to wireless lan [Auto_pilot_4]                Sep 1, 18:51:47
                                                                                                            E400-B16F48
DHCPSRVR-IP-ASSIGNED: Client [78-7B-8A-9A-9E-77], assigned [dynamic] IP [192.168.15.12] from DHCP pool [2]  Sep 1, 18:43:41
                                                                                                            E500-9F33F0
```

Figure 149: *Insight > Filtered Events*



disconnect

```
WIFI-CLIENT-DISCONNECTED: Client [78-7B-8A-9A-9E-77] disconnected from WLAN [Auto_pilot_4] after [59] secs roamed [yes]  Sep 1, 18:52:46
txbytes [0] rxbytes [0] avgtx [0] maxtx [0] mintx [0] avgrx [0] maxrx [0] minrx [0]                          E400-B16F48
WIFI-CLIENT-DISCONNECTED: Client [78-7B-8A-9A-9E-77] disconnected from WLAN [Auto_pilot_4] after [13759] secs roamed [yes]  Sep 1, 18:51:47
txbytes [114047] rxbytes [219436] avgtx [0] maxtx [0] mintx [0] avgrx [0] maxrx [0] minrx [0]                E500-9F33F0
WIFI-CLIENT-DISCONNECTED: Client [78-7B-8A-9A-9E-77] disconnected from WLAN [Auto_pilot_4] after [1943] secs roamed [yes]  Sep 1, 15:02:28
txbytes [15150] rxbytes [26173] avgtx [0] maxtx [0] mintx [0] avgrx [0] maxrx [0] minrx [0]                  E400-B16F48
WIFI-CLIENT-DISCONNECTED: Client [78-7B-8A-9A-9E-77] disconnected from WLAN [Auto_pilot_4] after [1163] secs roamed [yes]  Sep 1, 14:30:04
txbytes [14198] rxbytes [41673] avgtx [0] maxtx [0] mintx [0] avgrx [0] maxrx [0] minrx [0]                  E500-9F33F0
WIFI-CLIENT-DISCONNECTED: Client [78-7B-8A-9A-9E-77] disconnected from WLAN [Auto_pilot_4] after [1654] secs roamed [yes]  Sep 1, 14:10:41
txbytes [14298] rxbytes [26150] avgtx [0] maxtx [0] mintx [0] avgrx [0] maxrx [0] minrx [0]                  E400-B16F48
WIFI-CLIENT-DISCONNECTED: Client [78-7B-8A-9A-9E-77] disconnected from WLAN [Auto_pilot_4] after [112] secs roamed [yes]  Sep 1, 13:43:10
txbytes [42] rxbytes [46] avgtx [0] maxtx [0] mintx [0] avgrx [0] maxrx [0] minrx [0]                        E500-9F33F0
WIFI-CLIENT-DISCONNECTED: Client [78-7B-8A-9A-9E-77] disconnected from WLAN [Auto_pilot_4] after [21387] secs roamed [no]  Sep 1, 13:41:09
txbytes [191684] rxbytes [388282] avgtx [0] maxtx [0] mintx [0] avgrx [0] maxrx [0] minrx [0]                E400-B16F48
WIFI-CLIENT-DISCONNECTED: Client [78-7B-8A-9A-9E-77] disconnected from WLAN [Auto_pilot_4] after [99] secs roamed [yes]  Sep 1, 07:44:42
txbytes [42] rxbytes [46] avgtx [0] maxtx [0] mintx [0] avgrx [0] maxrx [0] minrx [0]                        E500-9F33F0
WIFI-CLIENT-DISCONNECTED: Client [78-7B-8A-9A-9E-77] disconnected from WLAN [Auto_pilot_4] after [1] secs roamed [no] txbytes  Sep 1, 07:42:58
[0] rxbytes [0] avgtx [0] maxtx [0] mintx [0] avgrx [0] maxrx [0] minrx [0]                                  E500-9F33F0
```

Chapter 16: Guest Access Portal-INTERNAL

Introduction

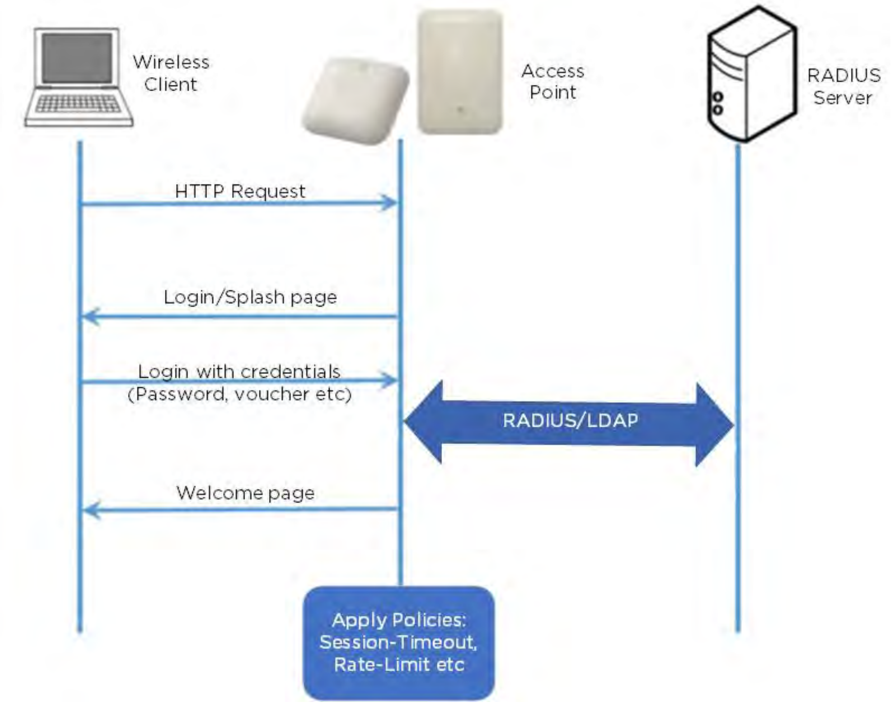
Guest Access Portal services offers a simple way to provide secure access to internet for users and devices using a standard web browser. Guest access portal allows enterprises to offer authenticated access to the network by capturing and re-directing a web browsers session to a captive portal login page where the user must enter valid credentials to be granted access to the network.

Modes of Captive Portal Services supported by cnPilot devices:

- **Internal Access:** Captive Portal server is hosted on access point and is local to access point.
- **External Access**: cnPilot is integrated with multiple third-party Captive Portal services vendor. Based on the vendor, device needs to be configured. More details on this Guest Access Portal method is described in Chapter 17.
- **cnMaestro**: Captive Portal services are hosted on cnMaestro where various features like Social login, Voucher login, SMS login and Paid login is supported. More details on this Guest Access Portal method is described in Chapter 18.

Here in this chapter we will brief about Internal Captive Portal services supported by cnPilot Access Points. Below figure displays the basic topology of testing Internal Captive Portal Service.

Figure 150: *Topology*

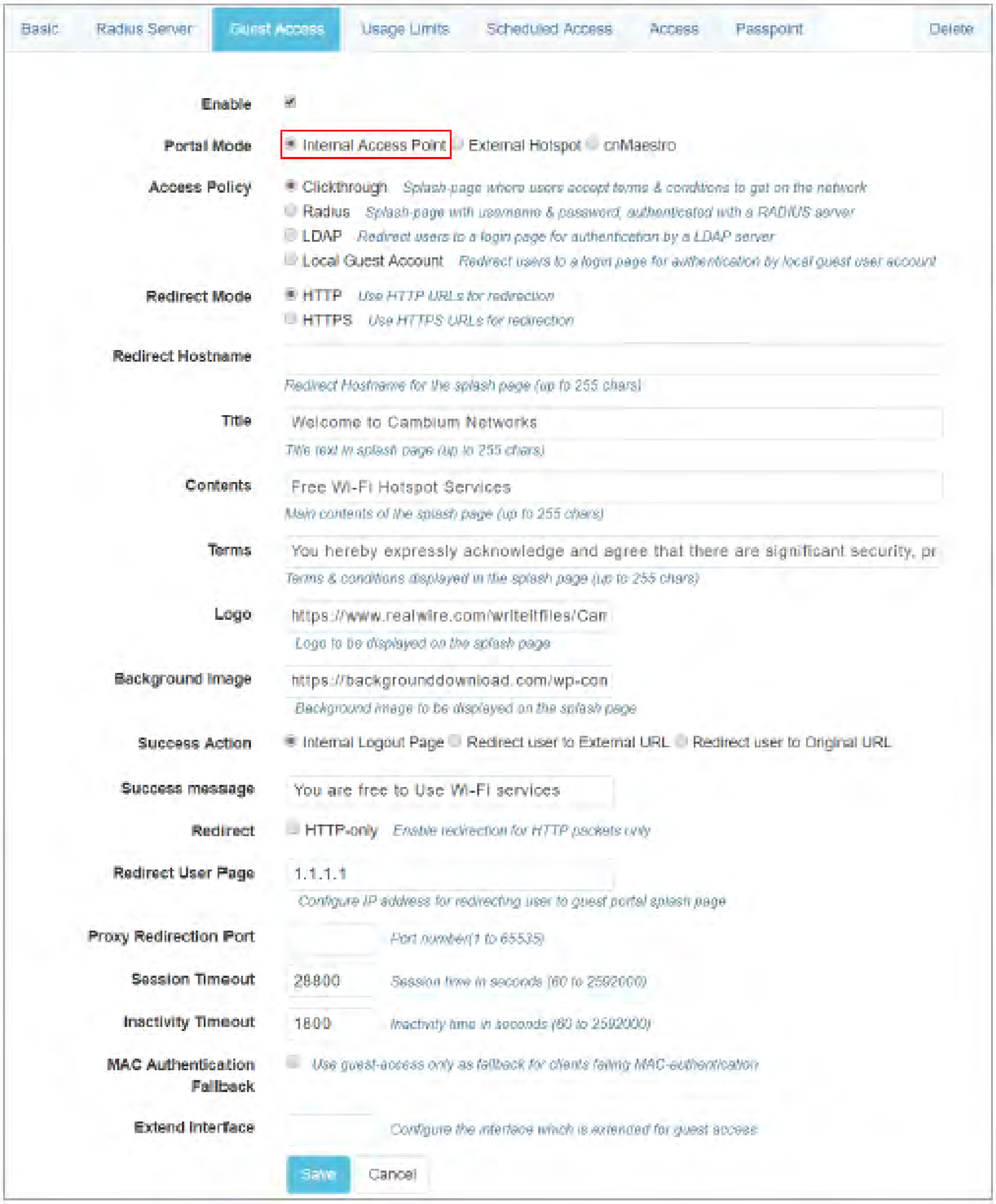


Configurable Parameters

Chapter 16 displays multiple configurable parameters supported for Internal Guest Access hosted on AP.

Access Policy – Clickthrough

Figure 151: *Internal Access Point parameter*



Enable	☑
Portal Mode	● Internal Access Point ○ External Hotspot ○ cnMaestro
Access Policy	● Clickthrough *Splash-page where users accept terms & conditions to get on the network* ○ Radius *Splash-page with username & password, authenticated with a RADIUS server* ○ LDAP *Redirect users to a login page for authentication by a LDAP server* ○ Local Guest Account *Redirect users to a login page for authentication by local guest user account*
Redirect Mode	● HTTP *Use HTTP URLs for redirection* ○ HTTPS *Use HTTPS URLs for redirection*
Redirect Hostname	*Redirect Hostname for the splash page (up to 255 chars)*
Title	Welcome to Cambium Networks *Title text in splash page (up to 255 chars)*
Contents	Free Wi-Fi Hotspot Services *Main contents of the splash page (up to 255 chars)*
Terms	You hereby expressly acknowledge and agree that there are significant security, pr *Terms & conditions displayed in the splash page (up to 255 chars)*
Logo	https://www.realwire.com/writeitfiles/Cam *Logo to be displayed on the splash page*
Background Image	https://backgrounddownload.com/wp-con *Background image to be displayed on the splash page*
Success Action	● Internal Logout Page ○ Redirect user to External URL ○ Redirect user to Original URL
Success message	You are free to Use Wi-Fi services
Redirect	□ HTTP-only *Enable redirection for HTTP packets only*
Redirect User Page	1.1.1.1 *Configure IP address for redirecting user to guest portal splash page*
Proxy Redirection Port	*Port number(1 to 65535)*
Session Timeout	28800 *Session time in seconds (60 to 2592000)*
Inactivity Timeout	1800 *Inactivity time in seconds (60 to 2592000)*
MAC Authentication Fallback	□ *Use guest-access only as fallback for clients failing MAC-authentication*
Extend Interface	*Configure the interface which is extended for guest access*

Save Cancel

Access policy

- Click through

  When this policy is selected, user will get a login page to accept “Terms and Conditions” to get access to network. No additional authentication is required.

- RADIUS

  When this policy is selected, user will be prompted for credentials, which is authenticated by Radius server. Radius server details can be configured on device at Configure > WLAN > RADIUS.

- LDAP

  When this policy is selected, user will be prompted for credentials, which is authenticated by LDAP/AD server. LDAP server details can be configured on device at Configure > WLAN > Guest Access > LDAP.

- Local Guest Account

  When this policy is selected, username and password is configured on device and it can be used as credentials for all wireless users connected to this WLAN profile to gain internet access.

Splash page

Title

You can configure the contents of splash page using this field. Contents should not exceed more than 255 characters.

Contents

You can configure the contents of splash page using this field. Contents should not exceed more than 255 characters.

Terms and conditions

Terms and conditions to be displayed on the splash page can be configured using this field. Terms and conditions should not exceed more than 255 characters.

Logo

Displays the logo image updated in URL http(s)://<ipaddress>/<logo.png>. Either PNG or JPEG format of logo are supported.

Background image

Displays the background image updated in URL http(s)://<ipaddress>/background>/<image.png>. Either PNG or JPEG format of logo are supported.

Redirect Parameters

Redirect hostname

User can configure a friendly hostname, which is added in DNS server and is resolvable to cnPilot IP address. This parameter once configured will be replaced with IP address in the redirection URL provided to wireless stations.

Success action

Provision to configure redirection URL after successful login to captive portal services. User can configure three modes of redirection URL:

- Internal logout Page

After successful login, Wireless client is redirected to logout page hosted on AP.

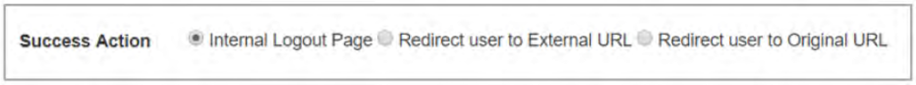
- Redirect users to external URL

  Here users will be redirected to URL which we configured on device as below:

- Redirect users to Original URL

  Here users will be redirected to URL that is accessed by user before successful captive portal authentication.

Figure 152: *Success action*

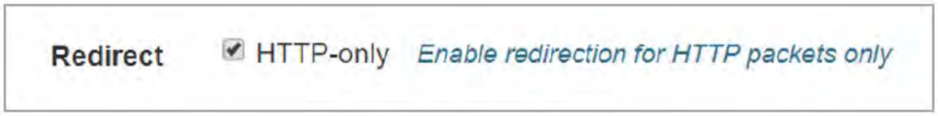


Success Action ● Internal Logout Page ○ Redirect user to External URL ○ Redirect user to Original URL

Redirect

By default, captive portal redirection is trigger when user access either HTTP or HTTPs WWW. If enabled, redirection to Captive Portal Splash Page is triggered when a HTTP WWW is accessed by end user.

Figure 153: *Redirect*



Redirect ☑ HTTP-only *Enable redirection for HTTP packets only*

Redirect Mode

There are two redirect modes available:

- HTTP Mode

  When enabled, AP sends a HTTP POSTURL to the client.

- HTTP(s) Mode

  When enabled, AP sends HTTPS POST URL to the client

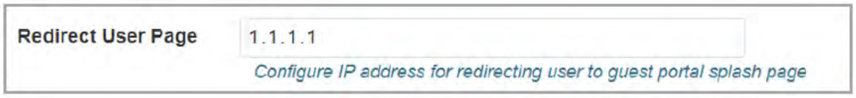
Proxy redirection port

Proxy redirection port can be configured with which proxy server is enabled. This allows URL's accessed with proxy port to be redirected to login page.

Redirect user page

IP address configured in this field is used as logout URL for Guest Access sessions. IP address configured should be not reachable to internet.

Figure 154: *Redirect user page*



Redirect User Page 1.1.1.1

Configure IP address for redirecting user to guest portal splash page

Logout re-direction URLs are as follows:

- http(s)://<Redirect user Page>/logout

Success Message

This we can configure so that we can display success message on the splash page after successful authentication

Figure 155: *Success Message*

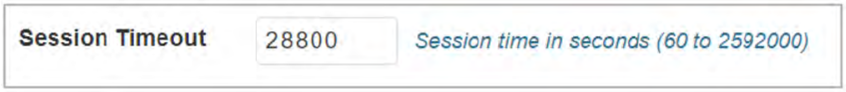
Success message

Timeout

Session

This is the duration of time which wireless client will be allowed internet after guest access authentication.

Figure 156: *Session timeout*

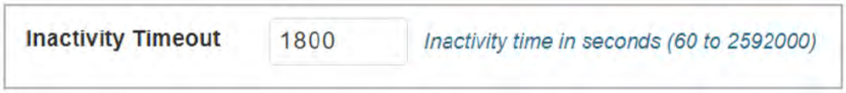


Session Timeout 28800 Session time in seconds (60 to 2592000)

Inactivity

This is the duration of time after which wireless client will be requested for re-login.

Figure 157: *Inactivity timeout*

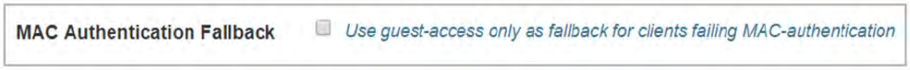


Inactivity Timeout 1800 Inactivity time in seconds (60 to 2592000)

MAC Authentication fallback

It is a fall back mechanism in which wireless clients will be redirected to Guest access login Page after Radius based Mac authentication failure. This means When AP detects RADIUS authentication has failed for a wireless client, AP will send a HTTTP Post redirection URL to the client for guest access authentication

Figure 158: *MAC Authentication fallback*

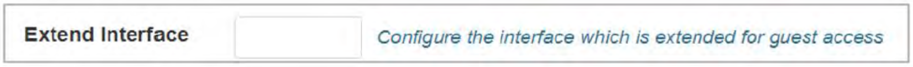


MAC Authentication Fallback □ *Use guest-access only as fallback for clients failing MAC-authentication*

Extended interface

Provision to support Guest Access on Ethernet interface.

Figure 159: *Extended interface*



Extend Interface *Configure the interface which is extended for guest access*

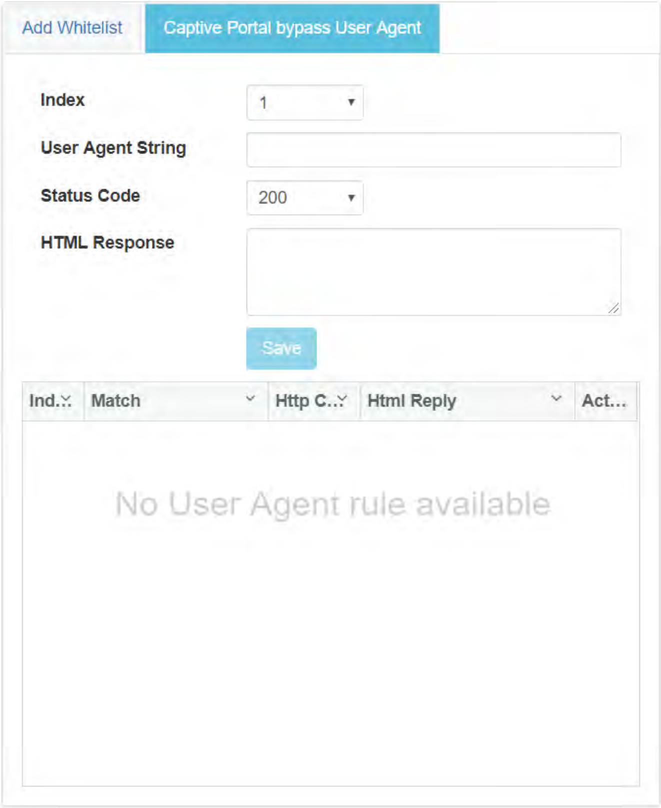
Whitelist

Provision to configure either Ips or URLs to bypass traffic, therefor user can access those Ips or URLs without Guest Access authentication.

Captive portal bypass user agent

Provision to limit the auto-popup to a certain browser as configured based on User-agent of browsers.

Figure 160: *Captive portal bypass user agent*



Index 1

User Agent String

Status Code 200

HTML Response

Ind..	Match	Http C..	Html Reply	Act...

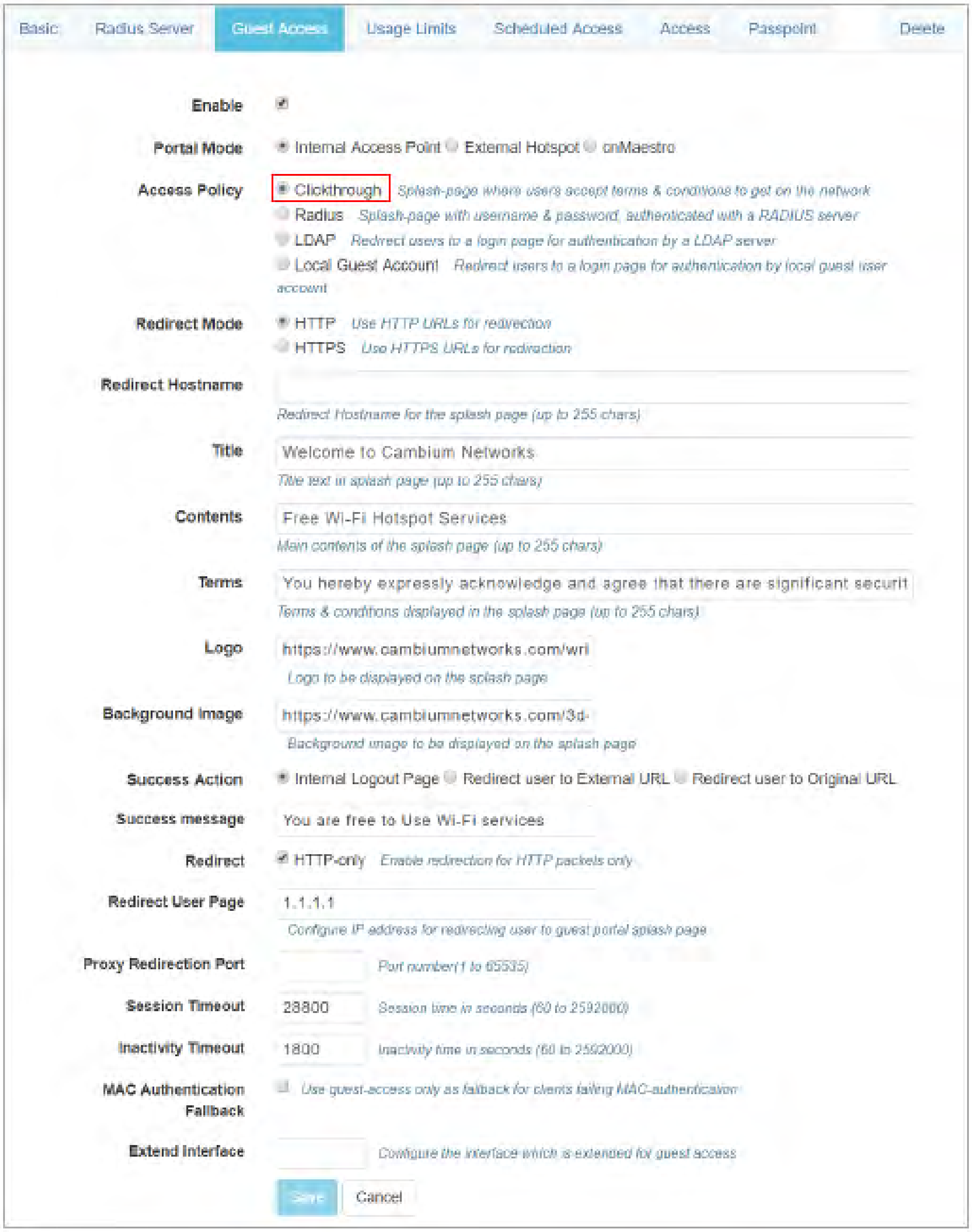
No User Agent rule available

Configuration examples

This section briefs about configuring different methods of Internal Guest Access captive portal services hosted on AP.

Access Policy – Clickthrough

Configuration



Enable ☑

Portal Mode ● Internal Access Point ○ External Hotspot ○ cnMaestro

Access Policy
● Clickthrough *Splash-page where users accept terms & conditions to get on the network*
○ Radius *Splash-page with username & password, authenticated with a RADIUS server*
○ LDAP *Redirect users to a login page for authentication by a LDAP server*
○ Local Guest Account *Redirect users to a login page for authentication by local guest user account*

Redirect Mode
● HTTP *Use HTTP URLs for redirection*
○ HTTPS *Use HTTPS URLs for redirection*

Redirect Hostname
Redirect Hostname for the splash page (up to 255 chars)

Title Welcome to Cambium Networks
Title text in splash page (up to 255 chars)

Contents Free Wi-Fi Hotspot Services
Main contents of the splash page (up to 255 chars)

Terms You hereby expressly acknowledge and agree that there are significant securit
Terms & conditions displayed in the splash page (up to 255 chars)

Logo https://www.cambiumnetworks.com/wri
Logo to be displayed on the splash page

Background Image https://www.cambiumnetworks.com/3d-
Background image to be displayed on the splash page

Success Action ● Internal Logout Page ○ Redirect user to External URL ○ Redirect user to Original URL

Success message You are free to Use Wi-Fi services

Redirect ☑ HTTP-only *Enable redirection for HTTP packets only*

Redirect User Page 1.1.1.1
Configure IP address for redirecting user to guest portal splash page

Proxy Redirection Port *Port number(1 to 65535)*

Session Timeout 28800 *Session time in seconds (60 to 2592000)*

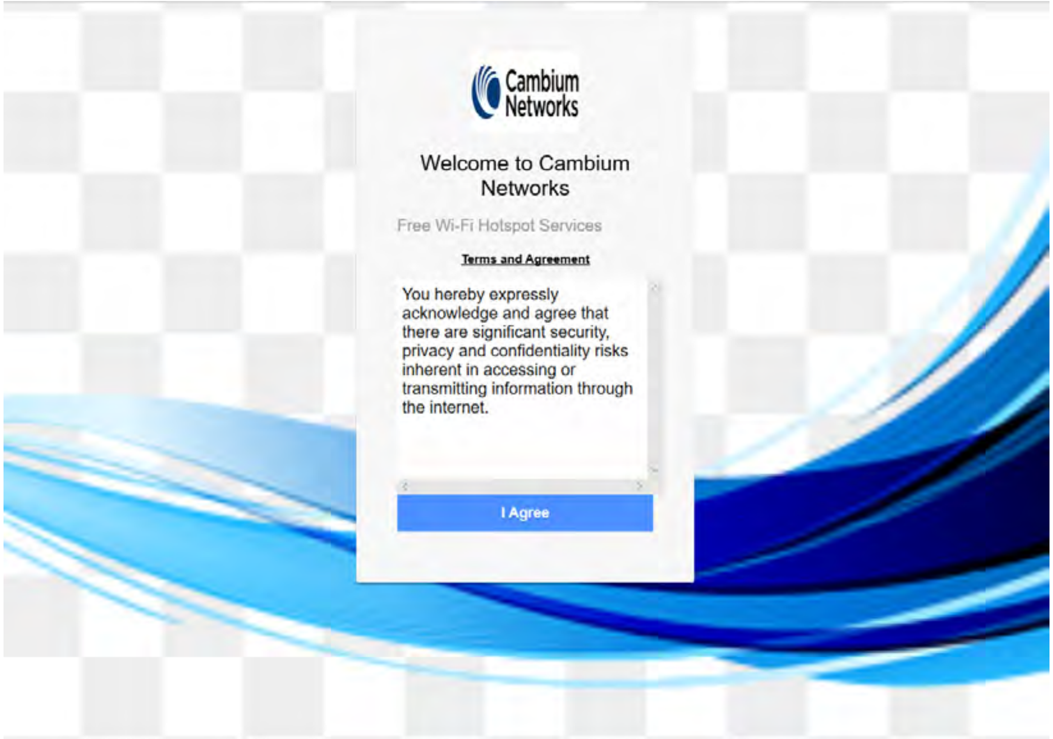
Inactivity Timeout 1800 *Inactivity time in seconds (60 to 2592000)*

MAC Authentication Fallback □ *Use guest-access only as fallback for clients failing MAC-authentication*

Extend Interface *Configure the interface which is extended for guest access*

Save Cancel

Authentication – Redirected Splash Page



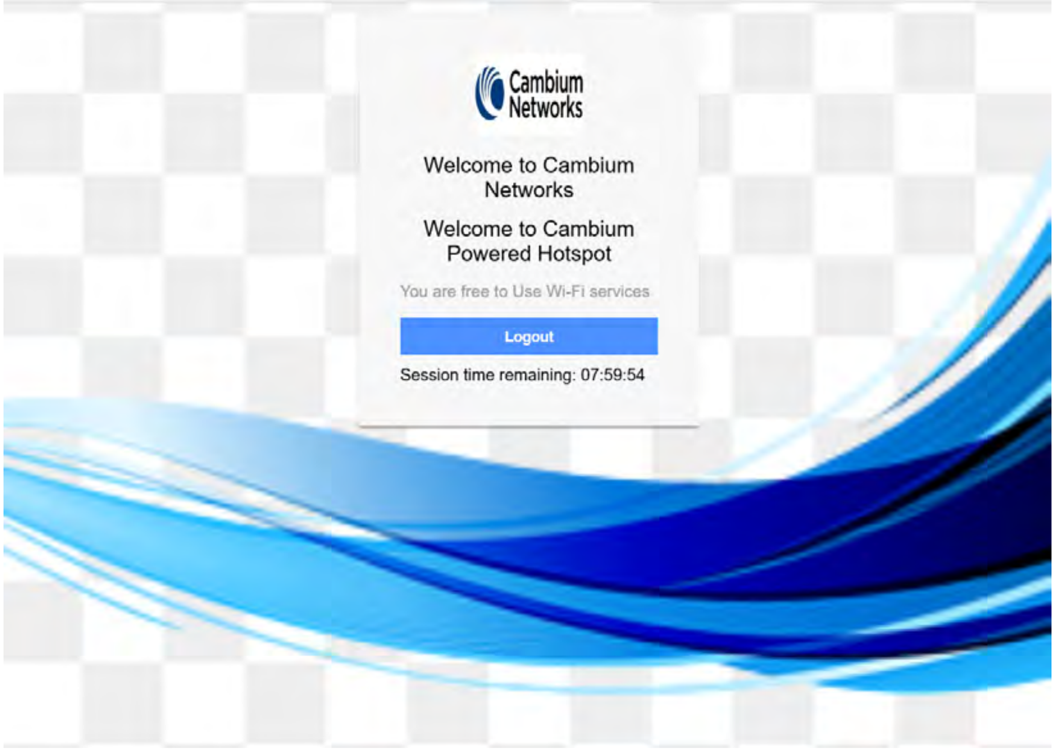
Welcome to Cambium Networks

Free Wi-Fi Hotspot Services

Terms and Agreement

You hereby expressly acknowledge and agree that there are significant security, privacy and confidentiality risks inherent in accessing or transmitting information through the internet.

Successful Login – Redirected Splash Page



Welcome to Cambium Networks

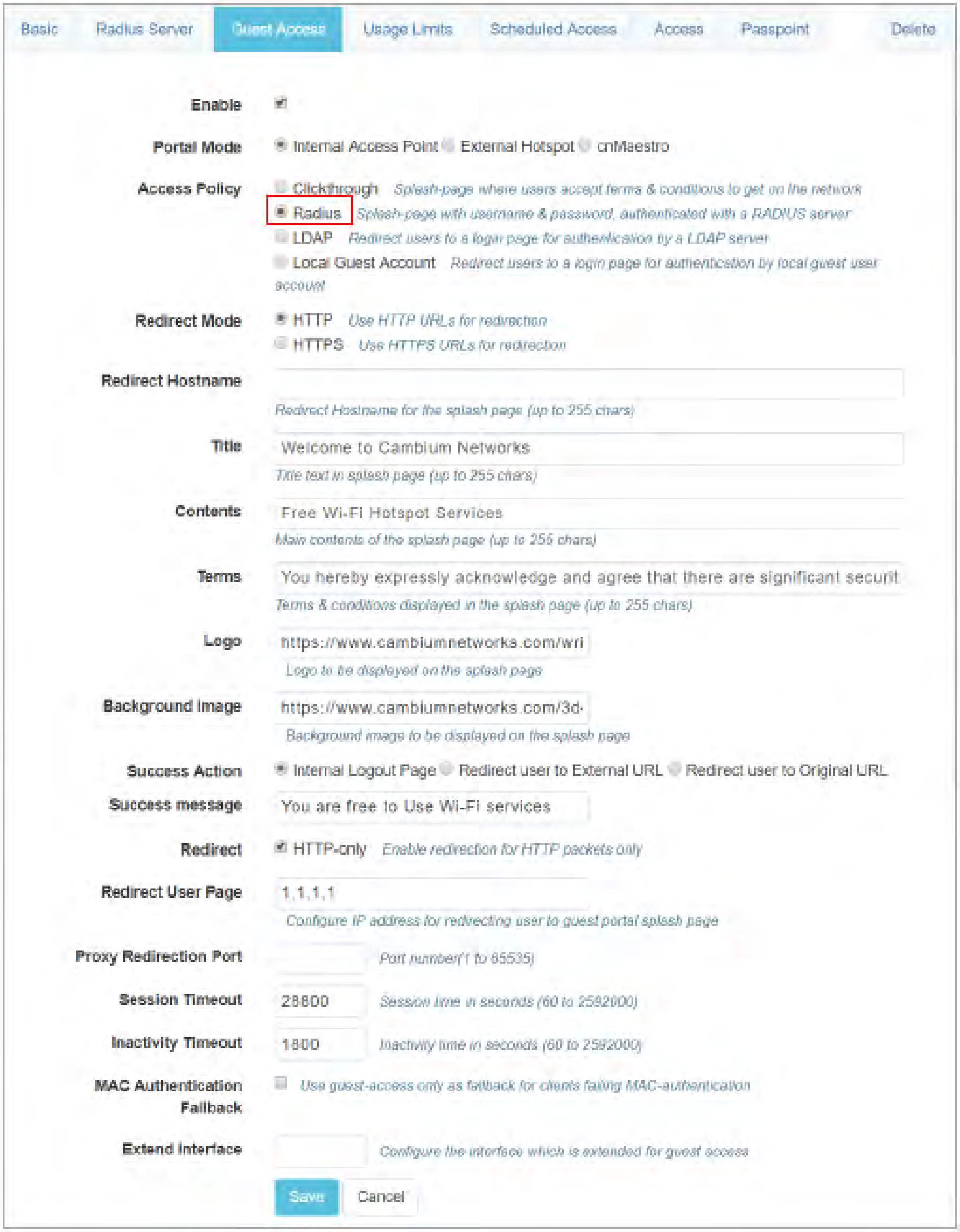
Welcome to Cambium Powered Hotspot

You are free to Use Wi-Fi services

Session time remaining: 07:59:54

Access Policy – Radius

Configuration



Enable ☑

Portal Mode ● Internal Access Point ○ External Hotspot ○ cnMaestro

Access Policy
○ Clickthrough *Splash-page where users accept terms & conditions to get on the network*
● Radius *Splash-page with username & password, authenticated with a RADIUS server*
○ LDAP *Redirect users to a login page for authentication by a LDAP server*
○ Local Guest Account *Redirect users to a login page for authentication by local guest user account*

Redirect Mode
● HTTP *Use HTTP URLs for redirection*
○ HTTPS *Use HTTPS URLs for redirection*

Redirect Hostname
Redirect Hostname for the splash page (up to 255 chars)

Title Welcome to Cambium Networks
Title text in splash page (up to 255 chars)

Contents Free Wi-Fi Hotspot Services
Main contents of the splash page (up to 255 chars)

Terms You hereby expressly acknowledge and agree that there are significant securit
Terms & conditions displayed in the splash page (up to 255 chars)

Logo https://www.cambiumnetworks.com/wri
Logo to be displayed on the splash page

Background Image https://www.cambiumnetworks.com/3d-
Background image to be displayed on the splash page

Success Action ● Internal Logout Page ○ Redirect user to External URL ○ Redirect user to Original URL

Success message You are free to Use Wi-Fi services

Redirect ☑ HTTP-only *Enable redirection for HTTP packets only*

Redirect User Page 1.1.1.1
Configure IP address for redirecting user to guest portal splash page

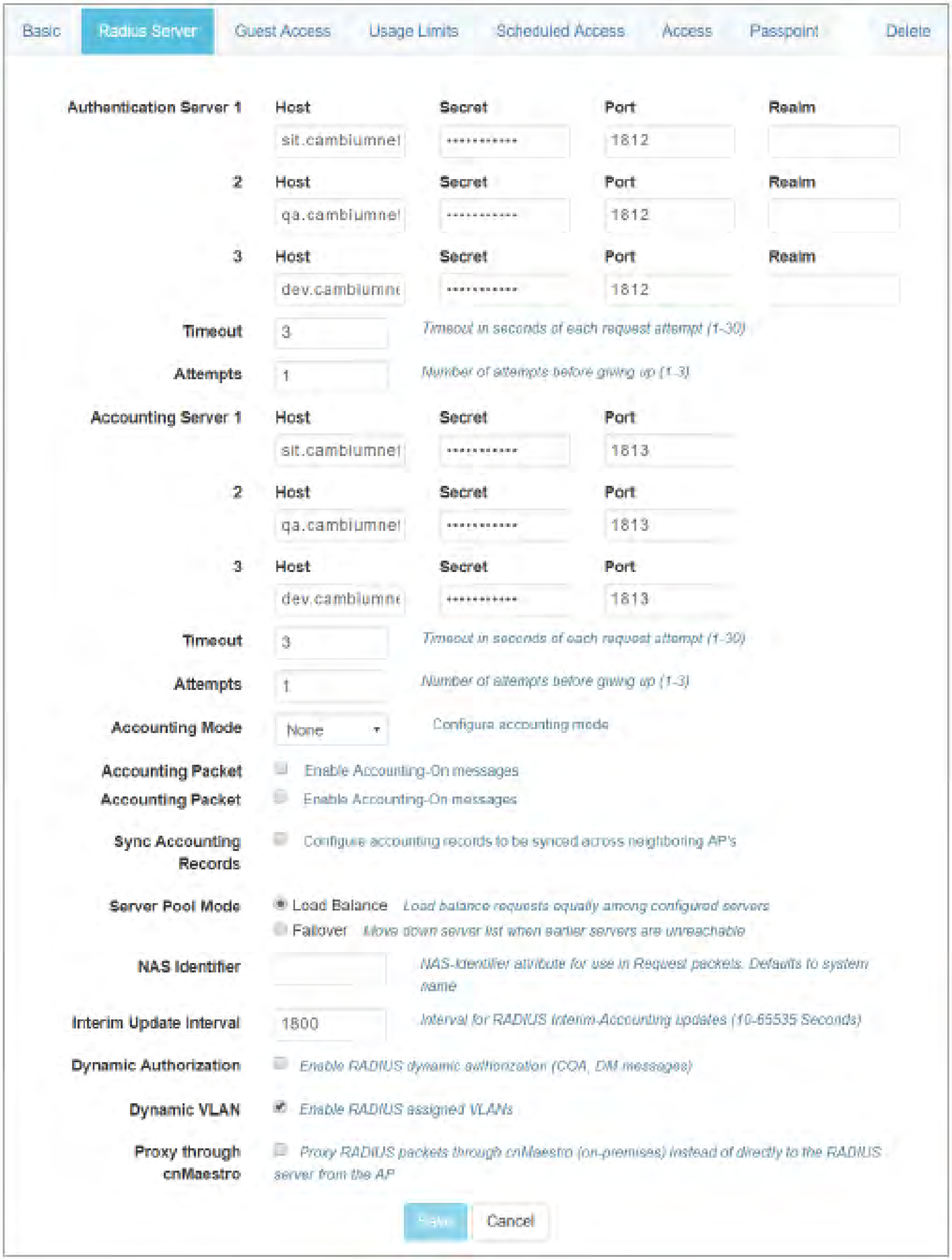
Proxy Redirection Port *Port number(1 to 65535)*

Session Timeout 28800 *Session time in seconds (60 to 2592000)*

Inactivity Timeout 1800 *Inactivity time in seconds (60 to 2592000)*

MAC Authentication Fallback □ *Use guest-access only as fallback for clients failing MAC-authentication*

Extend Interface *Configure the interface which is extended for guest access*



Authentication Server 1	Host sit.cambiumnet	Secret ••••••••••••	Port 1812	Realm
2	Host qa.cambiumnet	Secret •••••••••••	Port 1812	Realm
3	Host dev.cambiumne	Secret ••••••••••••	Port 1812	Realm
Timeout	3	*Timeout in seconds of each request attempt (1-30)*		
Attempts	1	*Number of attempts before giving up (1-3)*		
Accounting Server 1	Host sit.cambiumnet	Secret ••••••••••••	Port 1813	
2	Host qa.cambiumnet	Secret ••••••••••••	Port 1813	
3	Host dev.cambiumne	Secret ••••••••••••	Port 1813	
Timeout	3	*Timeout in seconds of each request attempt (1-30)*		
Attempts	1	*Number of attempts before giving up (1-3)*		

Accounting Mode None ▾ Configure accounting mode

Accounting Packet □ Enable Accounting-On messages

Accounting Packet □ Enable Accounting-On messages

Sync Accounting Records □ Configure accounting records to be synced across neighboring AP's

Server Pool Mode
● Load Balance *Load balance requests equally among configured servers*
○ Failover *Move down server list when earlier servers are unreachable*

NAS Identifier *NAS-Identifier attribute for use in Request packets. Defaults to system name*

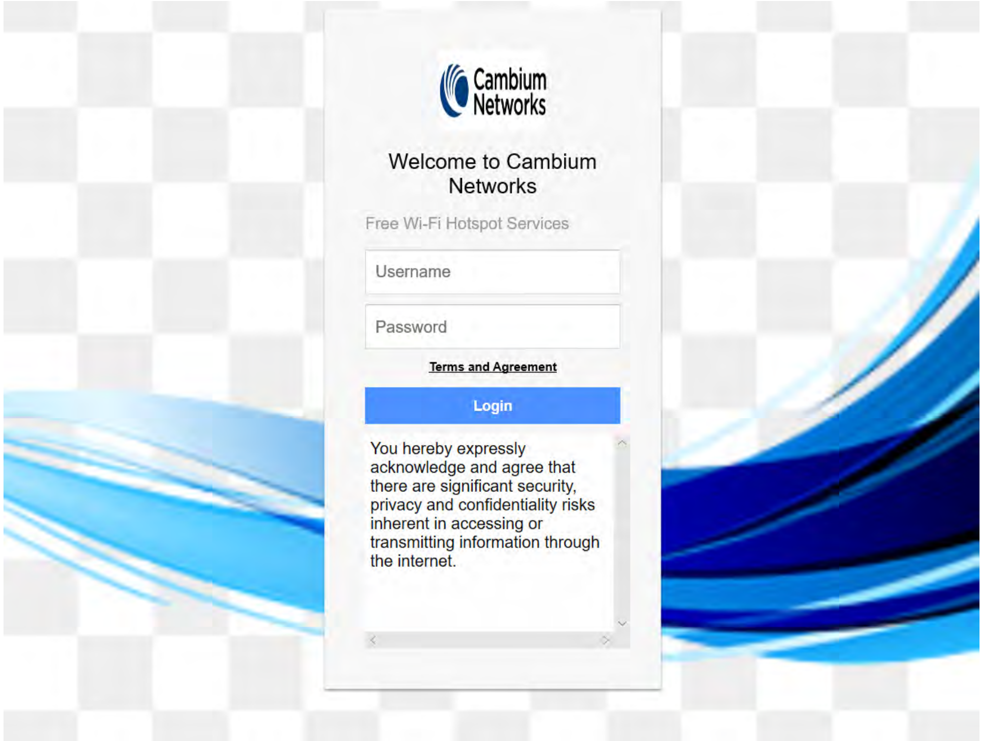
Interim Update Interval 1800 *Interval for RADIUS Interim-Accounting updates (10-65535 Seconds)*

Dynamic Authorization □ *Enable RADIUS dynamic authorization (COA, DM messages)*

Dynamic VLAN ☑ *Enable RADIUS assigned VLANs*

Proxy through cnMaestro □ *Proxy RADIUS packets through cnMaestro (on-premises) instead of directly to the RADIUS server from the AP*

Authentication – Redirected Splash Page



Welcome to Cambium Networks

Free Wi-Fi Hotspot Services

Username

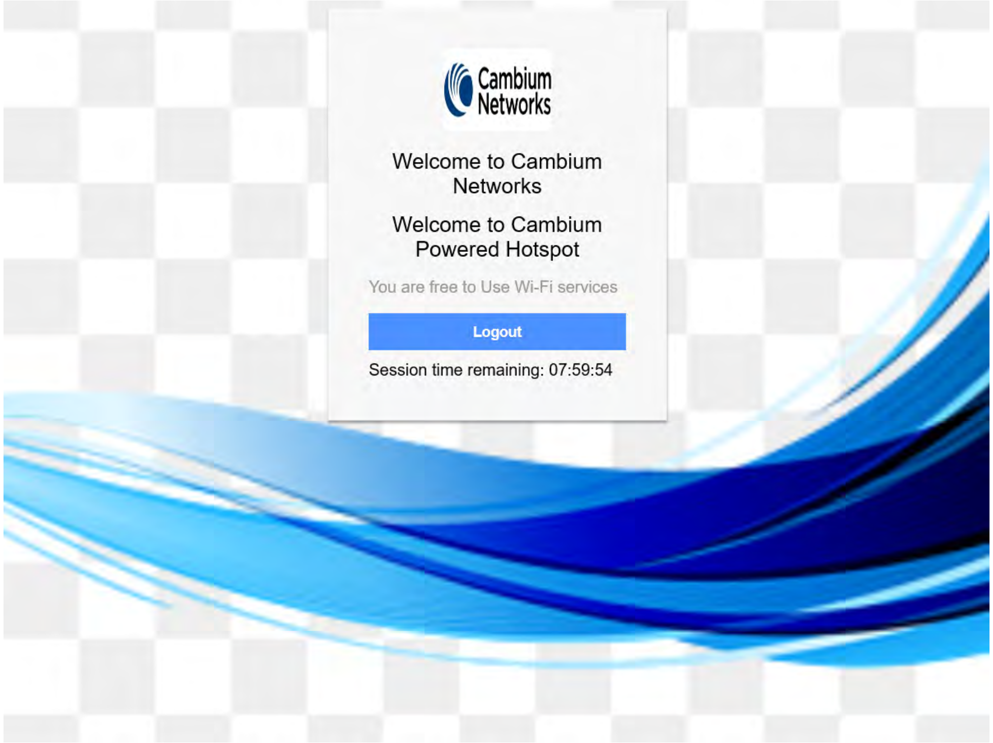
Password

Terms and Agreement

Login

You hereby expressly acknowledge and agree that there are significant security, privacy and confidentiality risks inherent in accessing or transmitting information through the internet.

Successful Login Redirected Splash Page



Welcome to Cambium Networks

Welcome to Cambium Powered Hotspot

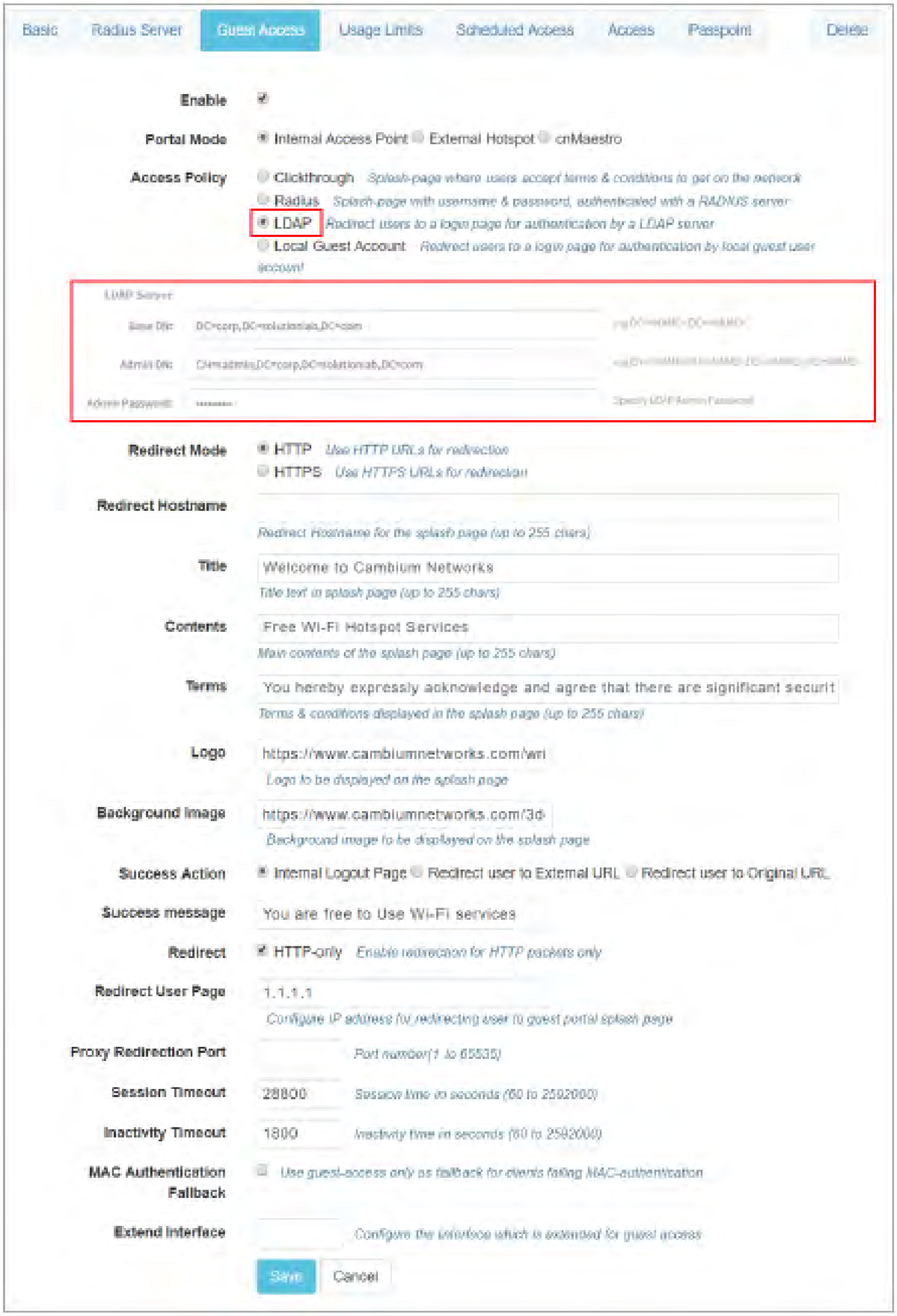
You are free to Use Wi-Fi services

Logout

Session time remaining: 07:59:54

Access Policy – LDAP

Configuration



Enable ☑

Portal Mode ● Internal Access Point ○ External Hotspot ○ cnMaestro

Access Policy
○ Clickthrough *Splash-page where users accept terms & conditions to get on the network*
○ Radius *Splash-page with username & password, authenticated with a RADIUS server*
● LDAP *Redirect users to a login page for authentication by a LDAP server*
○ Local Guest Account *Redirect users to a login page for authentication by local guest user account*

LDAP Server:

Base DN: DC=corp,DC=solutionlab,DC=com e.g DC=NAME,DC=NAME

Admin DN: CN=admin,DC=corp,DC=solutionlab,DC=com e.g [illegible]

Admin Password: ******** Specify LDAP Admin Password

Redirect Mode
● HTTP *Use HTTP URLs for redirection*
○ HTTPS *Use HTTPS URLs for redirection*

Redirect Hostname
Redirect Hostname for the splash page (up to 255 chars)

Title Welcome to Cambium Networks
Title text in splash page (up to 255 chars)

Contents Free Wi-Fi Hotspot Services
Main contents of the splash page (up to 255 chars)

Terms You hereby expressly acknowledge and agree that there are significant securit
Terms & conditions displayed in the splash page (up to 255 chars)

Logo https://www.cambiumnetworks.com/wi
Logo to be displayed on the splash page

Background Image https://www.cambiumnetworks.com/3d
Background image to be displayed on the splash page

Success Action ● Internal Logout Page ○ Redirect user to External URL ○ Redirect user to Original URL

Success message You are free to Use Wi-Fi services

Redirect ☑ HTTP-only *Enable redirection for HTTP packets only*

Redirect User Page 1.1.1.1
Configure IP address for redirecting user to guest portal splash page

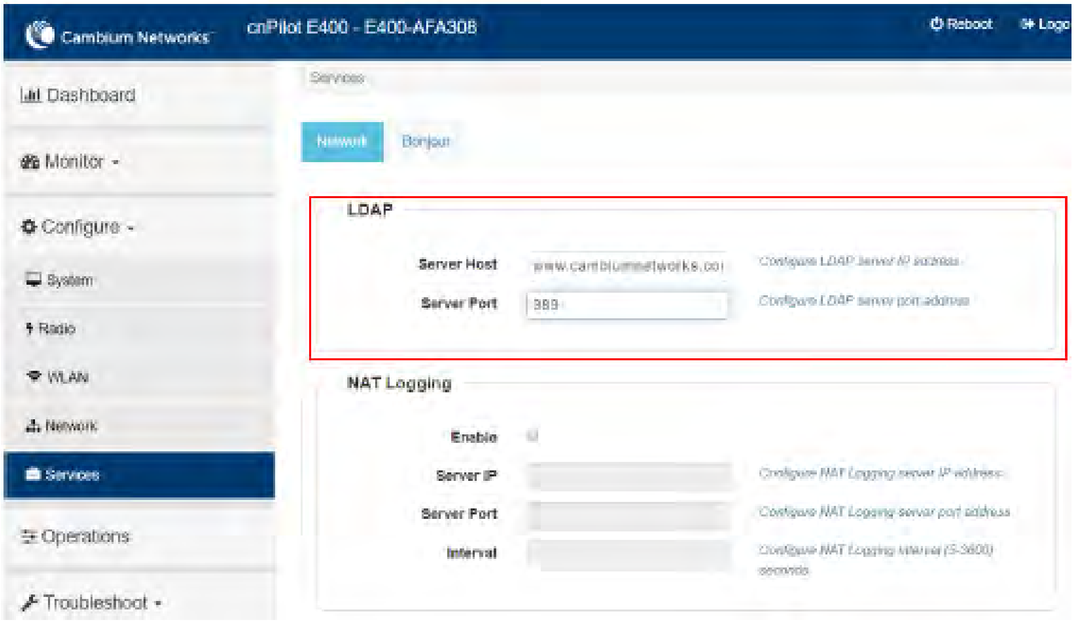
Proxy Redirection Port *Port number(1 to 65535)*

Session Timeout 28800 *Session time in seconds (60 to 2592000)*

Inactivity Timeout 1800 *Inactivity time in seconds (60 to 2592000)*

MAC Authentication Fallback □ *Use guest-access only as fallback for clients failing MAC-authentication*

Extend Interface *Configure the interface which is extended for guest access*



LDAP

Server Host: www.cambiumnetworks.co — Configure LDAP server IP address

Server Port: 389 — Configure LDAP server port address

NAT Logging

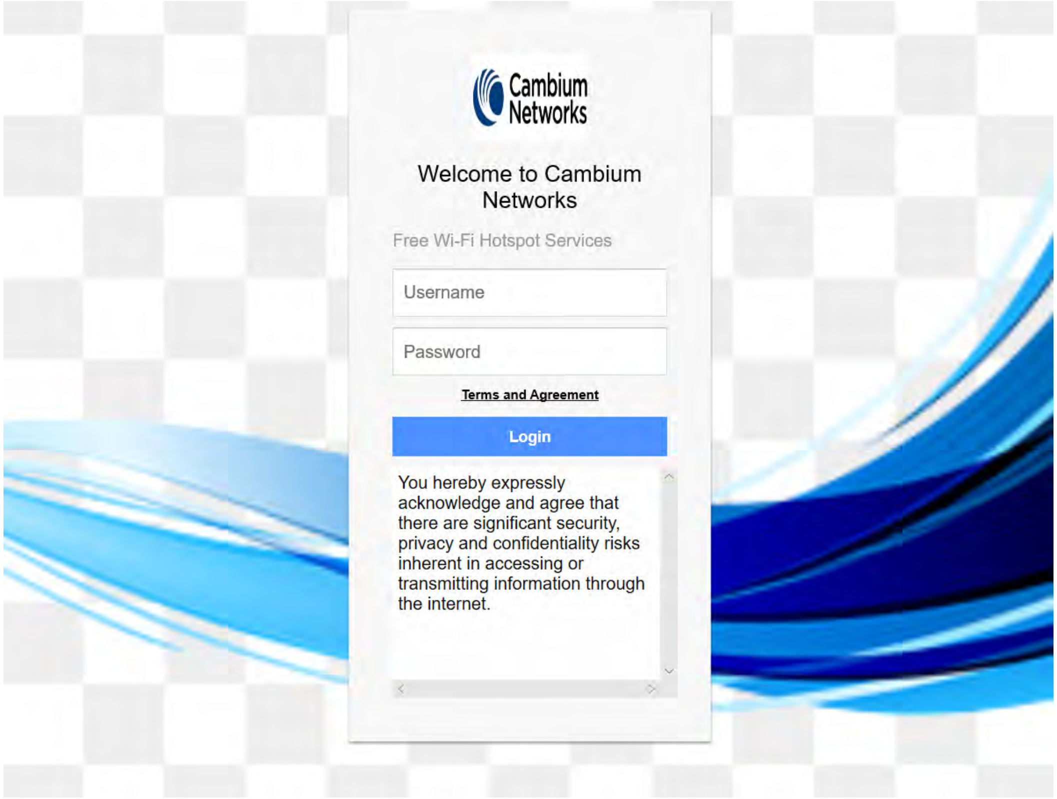
Enable: □

Server IP — Configure NAT Logging server IP address

Server Port — Configure NAT Logging server port address

Interval — Configure NAT Logging interval (5-3600) seconds

Authentication – Redirected Splash Page



Welcome to Cambium Networks

Free Wi-Fi Hotspot Services

Username

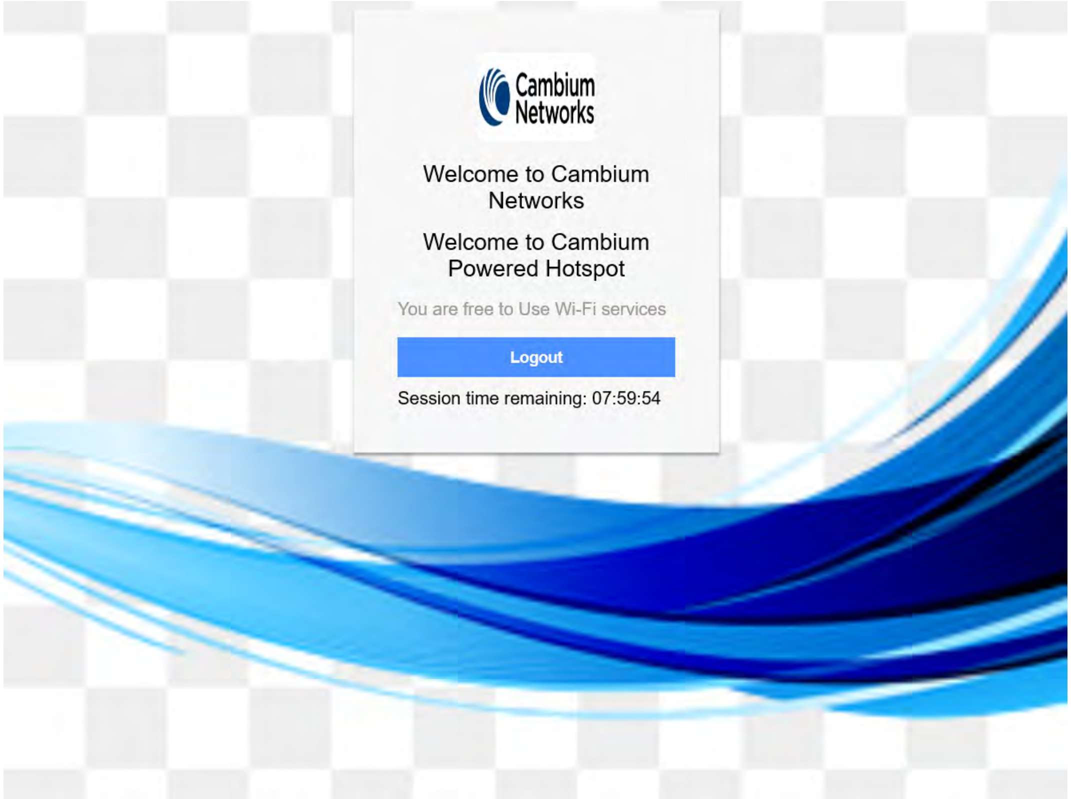
Password

Terms and Agreement

Login

You hereby expressly acknowledge and agree that there are significant security, privacy and confidentiality risks inherent in accessing or transmitting information through the internet.

Successful Login – Redirected Splash Page



Welcome to Cambium Networks

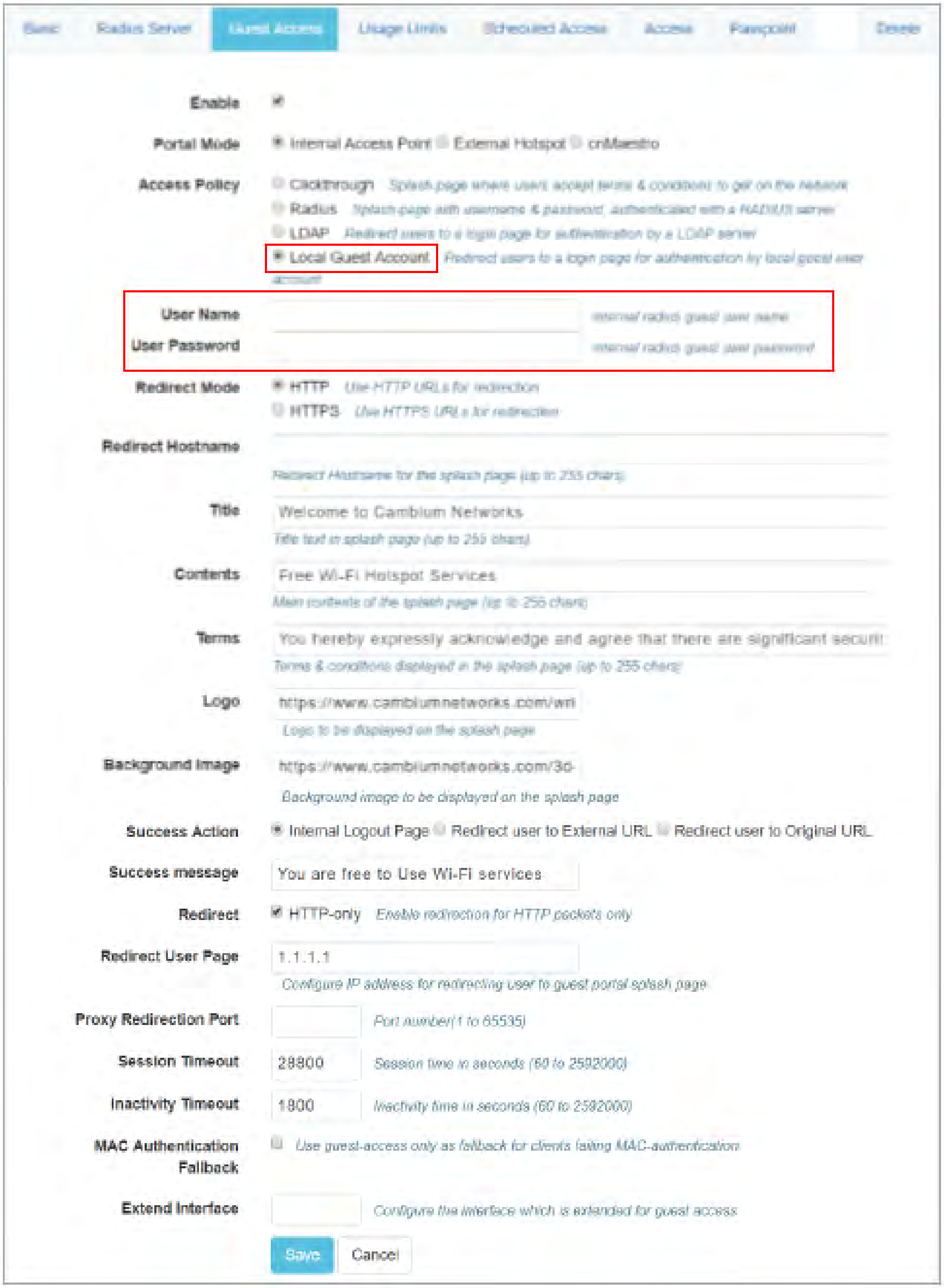
Welcome to Cambium Powered Hotspot

You are free to Use Wi-Fi services

Session time remaining: 07:59:54

Access Policy – Local Guest Account

Configuration



Enable ☑

Portal Mode ● Internal Access Point ○ External Hotspot ○ cnMaestro

Access Policy
○ Clickthrough *Splash page where users accept terms & conditions to get on the network*
○ Radius *Splash page with username & password, authenticated with a RADIUS server*
○ LDAP *Redirect users to a login page for authentication by a LDAP server*
● Local Guest Account *Redirect users to a login page for authentication by local guest user account*

User Name *internal radius guest user name*

User Password *internal radius guest user password*

Redirect Mode
● HTTP *Use HTTP URLs for redirection*
○ HTTPS *Use HTTPS URLs for redirection*

Redirect Hostname
Redirect Hostname for the splash page (up to 255 chars)

Title: Welcome to Cambium Networks
Title text in splash page (up to 255 chars)

Contents: Free Wi-Fi Hotspot Services
Main contents of the splash page (up to 256 chars)

Terms: You hereby expressly acknowledge and agree that there are significant securit
Terms & conditions displayed in the splash page (up to 255 chars)

Logo: https://www.cambiumnetworks.com/wri
Logo to be displayed on the splash page

Background Image: https://www.cambiumnetworks.com/3d-
Background image to be displayed on the splash page

Success Action ● Internal Logout Page ○ Redirect user to External URL ○ Redirect user to Original URL

Success message: You are free to Use Wi-Fi services

Redirect ☑ HTTP-only *Enable redirection for HTTP packets only*

Redirect User Page: 1.1.1.1
Configure IP address for redirecting user to guest portal splash page

Proxy Redirection Port *Port number(1 to 65535)*

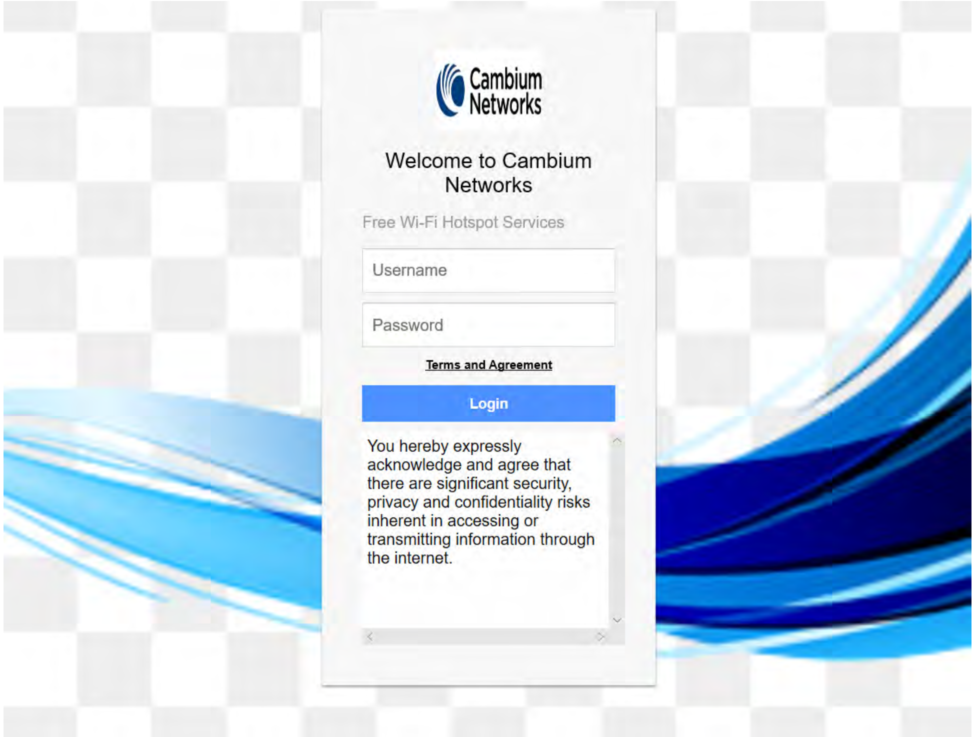
Session Timeout: 28800 *Session time in seconds (60 to 2592000)*

Inactivity Timeout: 1800 *Inactivity time in seconds (60 to 2592000)*

MAC Authentication Fallback ☐ *Use guest-access only as fallback for clients failing MAC-authentication*

Extend Interface *Configure the interface which is extended for guest access*

Authentication – Redirected Splash Page

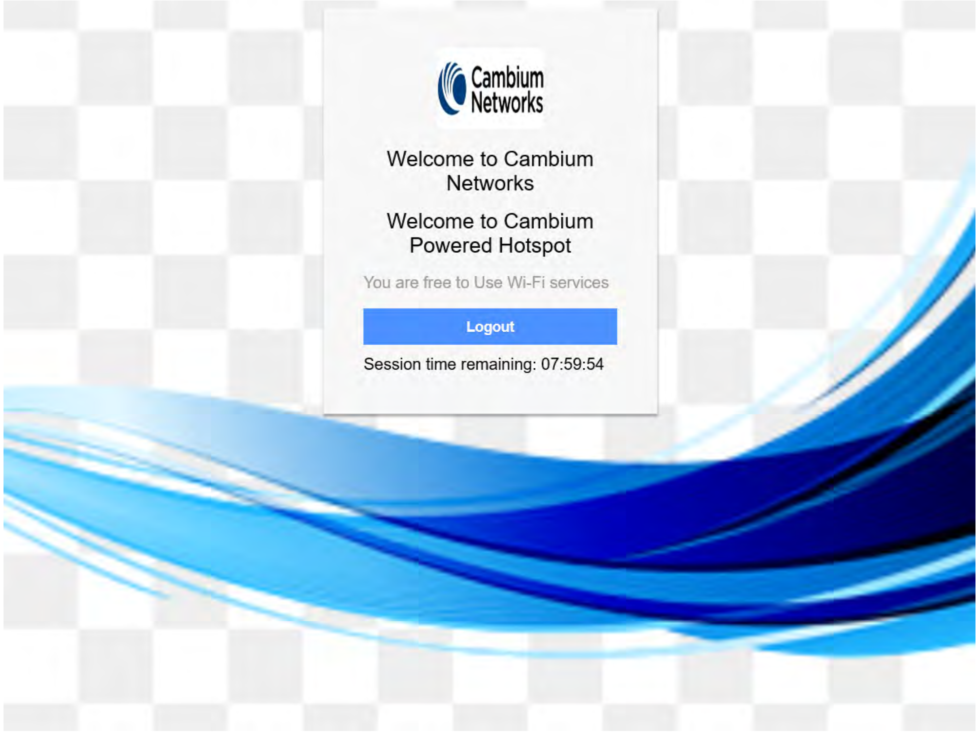


Welcome to Cambium Networks

Free Wi-Fi Hotspot Services

You hereby expressly acknowledge and agree that there are significant security, privacy and confidentiality risks inherent in accessing or transmitting information through the internet.

Successful Login – Redirected Splash Page



Welcome to Cambium Networks

Welcome to Cambium Powered Hotspot

You are free to Use Wi-Fi services

Session time remaining: 07:59:54

Chapter 17: Guest Access Portal- EXTERNAL

Introduction

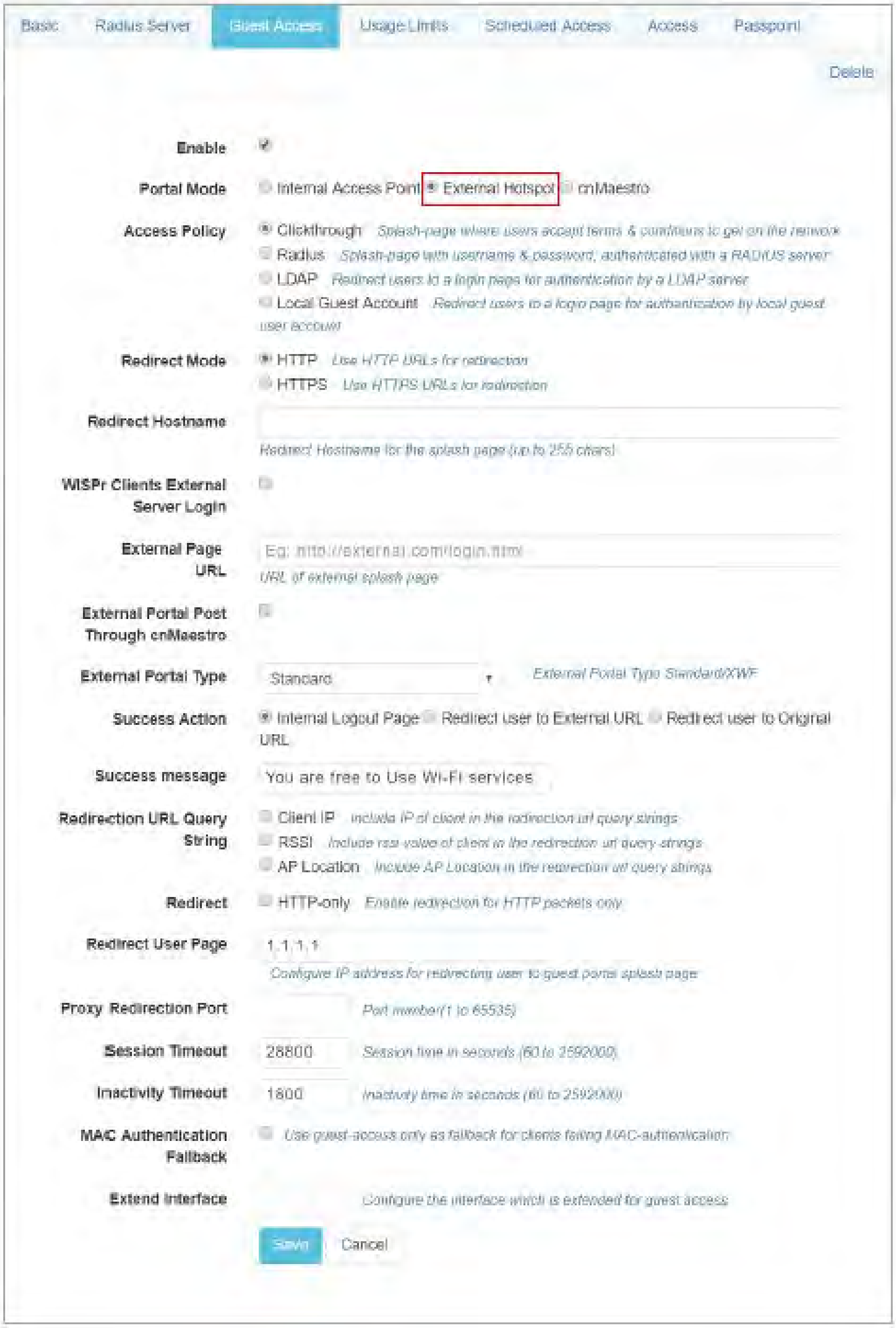
Guest access WLAN is designed specifically for BYOD (Bring your own device) setup, where large organizations have both staff and guests running on same WLAN or similar WLANs. Cambium Networks provides different options to the customers to achieve this based on where the captive portal page is hosted and who will be validating and performing authentication process.

External Hotspot is a smart Guest Access provision supported by cnPilot devices. This method of Guest Access provides a flexibility of integrating an external 3rd party Web/Cloud hosted captive portal, fully customized. More details on third party vendors who are integrated and certified with Cambium are listed in the URL https://www.cambiumnetworks.com/wifi_partners/.

Configurable Parameters

Figure 161 displays multiple configurable parameters supported for External Guest Access hosted on AP.

Figure 161: *Guest Access_External Access Point parameter*



Enable	☑
Portal Mode	○ Internal Access Point ● External Hotspot ○ cnMaestro
Access Policy	● Clickthrough *Splash-page where users accept terms & conditions to get on the network* ○ Radius *Splash-page with username & password, authenticated with a RADIUS server* ○ LDAP *Redirect users to a login page for authentication by a LDAP server* ○ Local Guest Account *Redirect users to a login page for authentication by local guest user account*
Redirect Mode	● HTTP *Use HTTP URLs for redirection* ○ HTTPS *Use HTTPS URLs for redirection*
Redirect Hostname	*Redirect Hostname for the splash page (up to 255 chars)*
WISPr Clients External Server Login	□
External Page URL	Eg: http://external.com/login.html *URL of external splash page*
External Portal Post Through cnMaestro	□
External Portal Type	Standard ▾ *External Portal Type Standard/XWF*
Success Action	● Internal Logout Page ○ Redirect user to External URL ○ Redirect user to Original URL
Success message	You are free to Use Wi-Fi services
Redirection URL Query String	□ Client IP *include IP of client in the redirection url query strings* □ RSSI *Include rssi value of client in the redirection url query strings* □ AP Location *Include AP Location in the redirection url query strings*
Redirect	□ HTTP-only *Enable redirection for HTTP packets only*
Redirect User Page	1.1.1.1 *Configure IP address for redirecting user to guest portal splash page*
Proxy Redirection Port	*Port number(1 to 65535)*
Session Timeout	28800 *Session time in seconds (60 to 2592000)*
Inactivity Timeout	1800 *Inactivity time in seconds (60 to 2592000)*
MAC Authentication Fallback	□ *Use guest-access only as fallback for clients failing MAC-authentication*
Extend Interface	*Configure the interface which is extended for guest access*

Access policy

- Click through

  When this policy is selected, user will get a login page to accept "Terms and Conditions" to get access to network. No additional authentication is required.

- RADIUS

  When this policy is selected, user will be prompted for credentials, which is authenticated by Radius server. Radius server details can be configured on device at Configure > WLAN > RADIUS.

- LDAP

  When this policy is selected, user will be prompted for credentials, which is authenticated by LDAP/AD server. LDAP server details can be configured on device at Configure > WLAN > Guest Access > LDAP.

- Local Guest Account

  When this policy is selected, username and password is configured on device and it can be used as credentials for all wireless users connected to this WLAN profile to gain internet access.

WISPr

WISPr Clients External Server Login

Provision to enable re-direction of guest access portal URL obtained through WISPr.

External Portal Post Through cnMaestro

This is required when HTTPS is only supported by external guest access portal. This option when enabled minimizes certification. Certificate is required to install only in cnMaestro On-Premises.

External Portal Type

Two modes of portal types are supported by cnPilot products.

Standard

This mode is selected, for all third-party vendors whose Guest Access services is certified and integrated with cnPilot products.

XWF

This mode is selected for Facebook Express Wi-Fi deployment.

Redirect Parameters

Redirect hostname

User can configure a friendly hostname, which is added in DNS server and is resolvable to cnPilot IP address. This parameter once configured will be replaced with IP address in the redirection URL provided to wireless stations.

Note

This can be used to mask the IP address of the AP with some string.

Success action

Provision to configure redirection URL after successful login to captive portal services. User can configure three modes of redirection URL:

- Internal logout Page

After successful login, Wireless client is redirected to logout page hosted on AP.

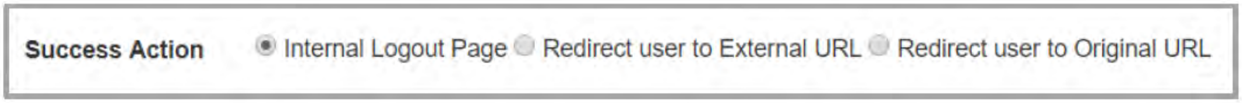
- Redirect users to external URL

  Here users will be redirected to URL which we configured on device as below:

- Redirect users to Original URL

  Here users will be redirected to URL that is accessed by user before successful captive portal authentication.

Figure 162: *Success action*

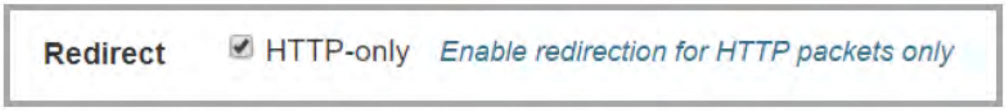


Success Action ● Internal Logout Page ○ Redirect user to External URL ○ Redirect user to Original URL

Redirect

By default, captive portal redirection is trigger when user access either HTTP or HTTPs WWW. If enabled, redirection to Captive Portal Splash Page is triggered when a HTTP WWW is accessed by end user.

Figure 163: *Redirect*



Redirect ☑ HTTP-only *Enable redirection for HTTP packets only*

Redirect Mode

There are two redirect modes available:

- **HTTP Mode**

  When enabled, AP sends a HTTP POSTURL to the client.

- **HTTP(s) Mode**

  When enabled, AP sends HTTPS POST URL to the client

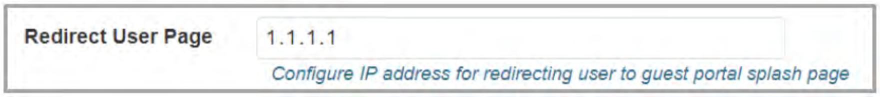
Proxy redirection port

Proxy redirection port can be configured with which proxy server is enabled. This allows URL's accessed with proxy port to be redirected to login page.

Redirect user page

IP address configured in this field is used as logout URL for Guest Access sessions. IP address configured should be not reachable to internet.

Figure 164: *Redirect user page*



Redirect User Page 1.1.1.1

Configure IP address for redirecting user to guest portal splash page

Logout re-direction URLs are as follows:

- http(s)://<Redirect user Page>/logout

Redirection URL Query String

Following information is appended in the redirection URL, if “Prefix Query Strings in Redirect URL” is enabled.

- Client IP
- RSSI
- AP Location

Success Message

This we can configure so that we can display success message on the splash page after successful authentication

Figure 165: *Success Message*

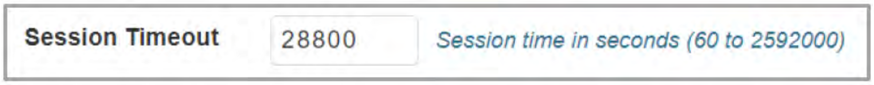
Success message

Timeout

Session

This is the duration of time which wireless client will be allowed internet after guest access authentication.

Figure 166: *Session timeout*

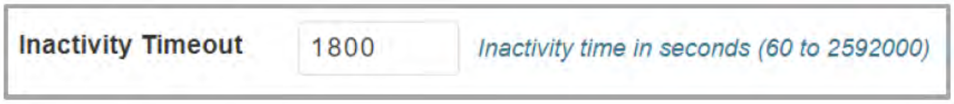


Session Timeout 28800 Session time in seconds (60 to 2592000)

Inactivity

This is the duration of time after which wireless client will be requested for re-login.

Figure 167: *Inactivity timeout*

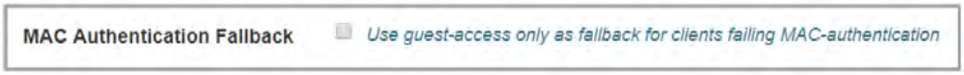


Inactivity Timeout 1800 *Inactivity time in seconds (60 to 2592000)*

MAC Authentication fallback

It is a fall back mechanism in which wireless clients will be redirected to Guest access login Page after Radius based Mac authentication failure. This means When AP detects RADIUS authentication has failed for a wireless client, AP will send a HTTTP Post w.r.t redirection URL to the client for guest access authentication

Figure 168: *MAC Authentication fallback*

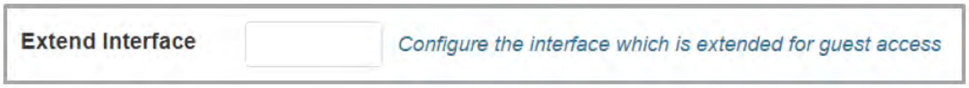


MAC Authentication Fallback □ *Use guest-access only as fallback for clients failing MAC-authentication*

Extended interface

Provision to support Guest Access on Ethernet interface.

Figure 169: *Extended interface*



Extend Interface *Configure the interface which is extended for guest access*

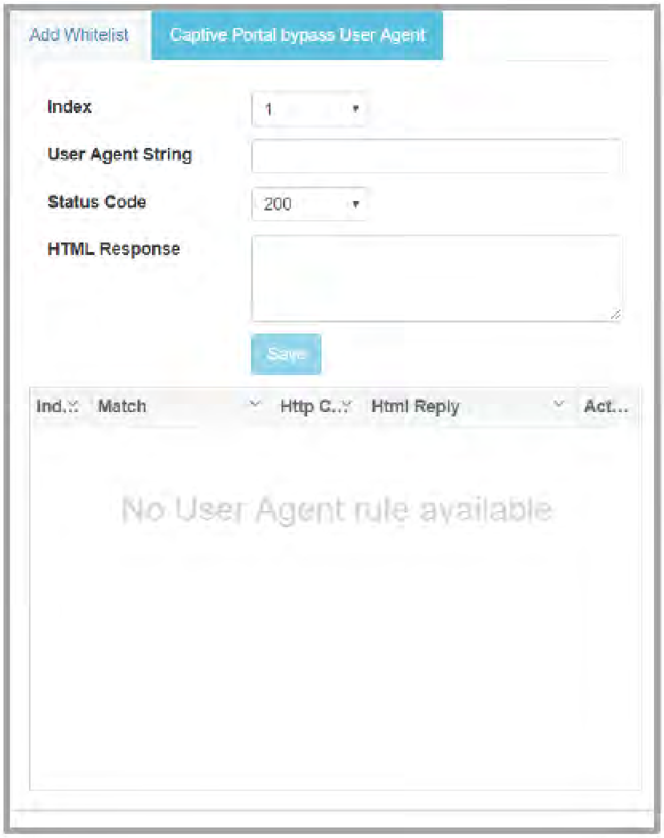
Whitelist

Provision to configure either Ips or URLs to bypass traffic, therefor user can access those Ips or URLs without Guest Access authentication.

Captive portal bypass user agent

Provision to limit the auto-popup to a certain browser as configured based on User-agent of browsers.

Figure 170: *Captive portal bypass user agent*



Index: 1

User Agent String:

Status Code: 200

HTML Response:

Ind...	Match	Http C...	Html Reply	Act...

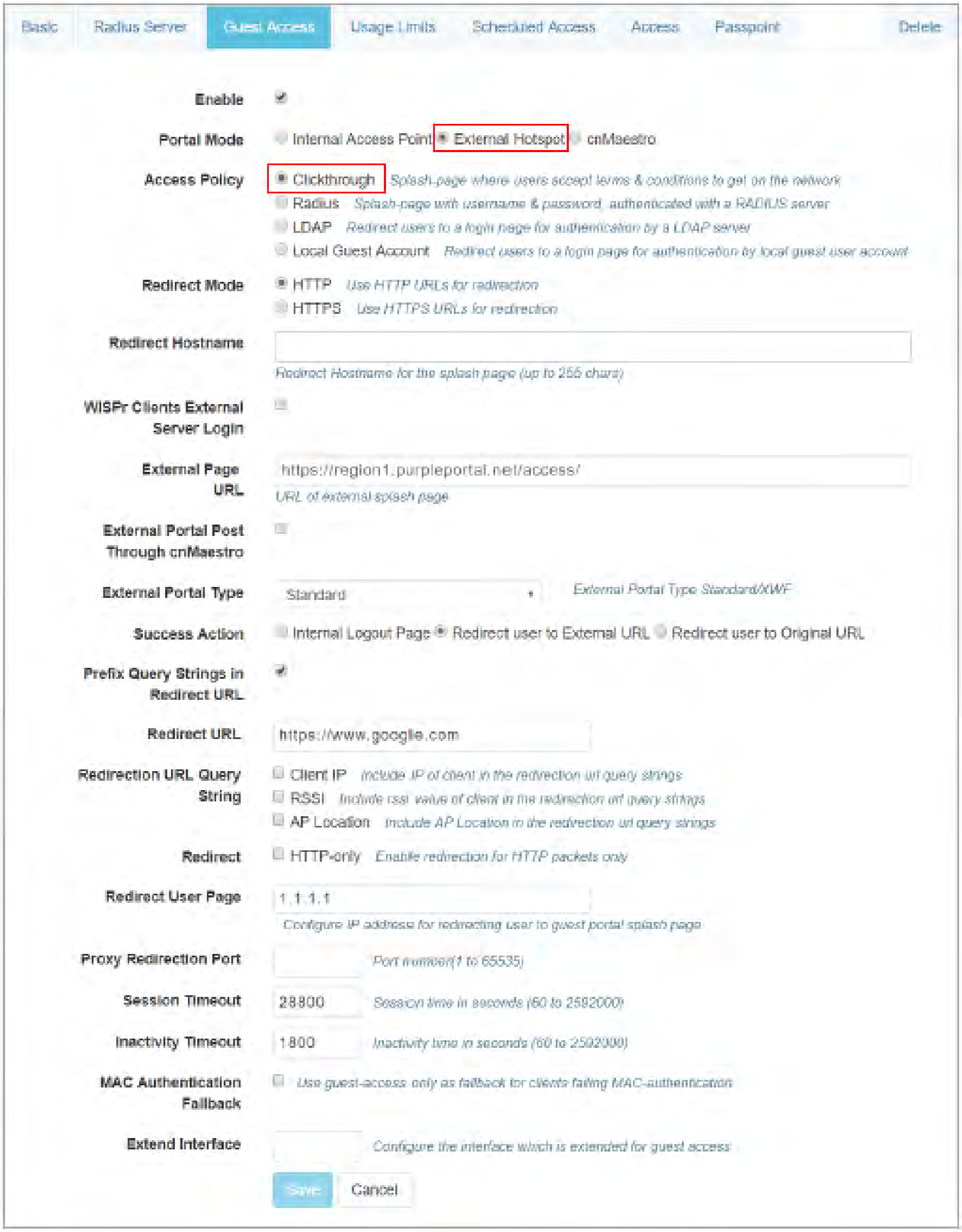
No User Agent rule available

Configuration examples

This section briefs about configuring different methods of External Guest Access captive portal services hosted on AP.

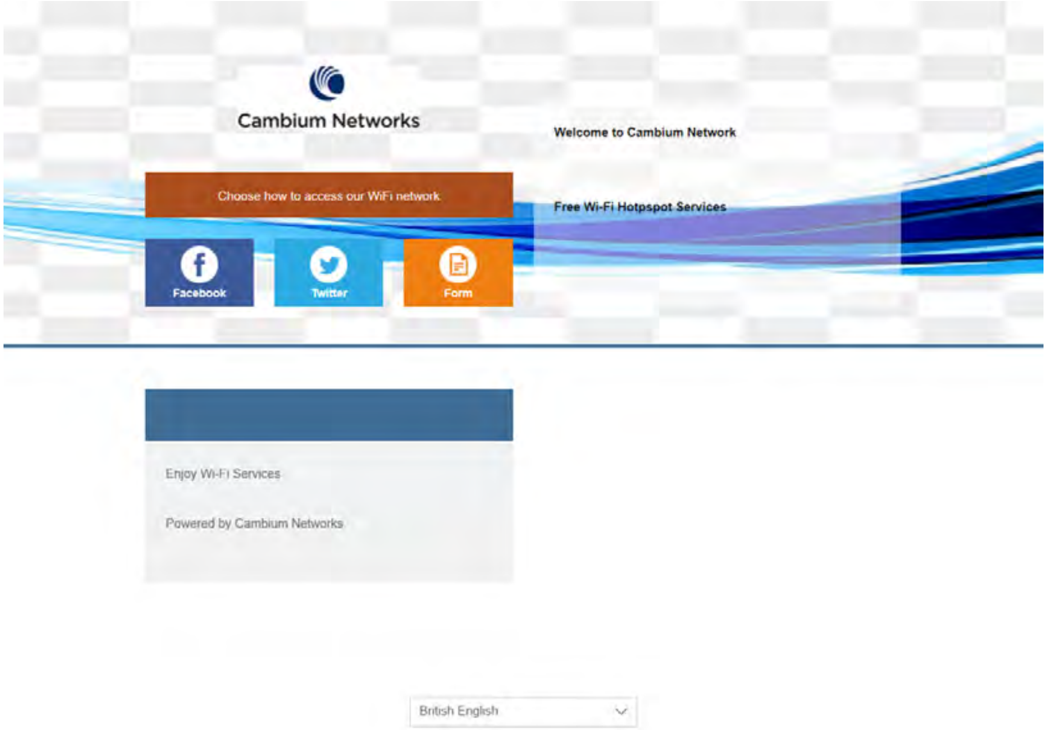
Access Policy – Clickthrough

Configuration



Enable	☑
Portal Mode	○ Internal Access Point ● External Hotspot ○ cnMaestro
Access Policy	● Clickthrough *Splash-page where users accept terms & conditions to get on the network* ○ Radius *Splash-page with username & password, authenticated with a RADIUS server* ○ LDAP *Redirect users to a login page for authentication by a LDAP server* ○ Local Guest Account *Redirect users to a login page for authentication by local guest user account*
Redirect Mode	● HTTP *Use HTTP URLs for redirection* ○ HTTPS *Use HTTPS URLs for redirection*
Redirect Hostname	*Redirect Hostname for the splash page (up to 255 chars)*
WISPr Clients External Server Login	□
External Page URL	https://region1.purpleportal.net/access/ *URL of external splash page*
External Portal Post Through cnMaestro	□
External Portal Type	Standard *External Portal Type Standard/XWF*
Success Action	○ Internal Logout Page ● Redirect user to External URL ○ Redirect user to Original URL
Prefix Query Strings in Redirect URL	☑
Redirect URL	https://www.google.com
Redirection URL Query String	□ Client IP *include IP of client in the redirection url query strings* □ RSSI *Include rssi value of client in the redirection url query strings* □ AP Location *Include AP Location in the redirection url query strings*
Redirect	□ HTTP-only *Enable redirection for HTTP packets only*
Redirect User Page	1.1.1.1 *Configure IP address for redirecting user to guest portal splash page*
Proxy Redirection Port	*Port number(1 to 65535)*
Session Timeout	28800 *Session time in seconds (60 to 2592000)*
Inactivity Timeout	1800 *Inactivity time in seconds (60 to 2592000)*
MAC Authentication Fallback	□ *Use guest-access only as fallback for clients failing MAC-authentication*
Extend Interface	*Configure the interface which is extended for guest access*

Authentication – Redirected Splash Page



Cambium Networks

Welcome to Cambium Network

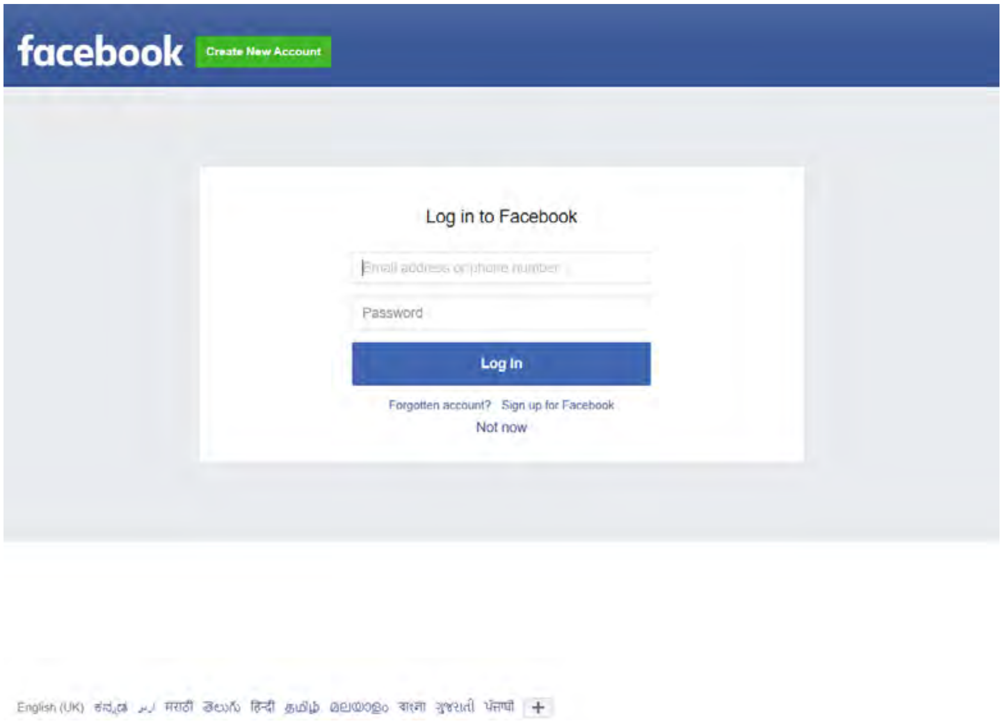
Choose how to access our WiFi network

Free Wi-Fi Hotpspot Services

Enjoy Wi-Fi Services

Powered by Cambium Networks

Successful Login – Redirected Splash Page



facebook
Create New Account

Log in to Facebook

Email address or phone number
Password
Log In
Forgotten account?
Sign up for Facebook
Not now
English (UK) ಕನ್ನಡ اردو मराठी తెలుగు हिन्दी தமிழ் മലയാളം বাংলা ગુજરાતી ਪੰਜਾਬੀ +

Chapter 18: Guest Access – cnMaestro

Cambium supports end-to-end Guest Access Portal services with combination of cnPilot and cnMaestro. cnMaestro supports various types of authentication mechanism for wireless clients to obtain Internet access. Following is an overview of types of Guest Access Portal services supported in cnMaestro:

a. Free

- Authentication Mechanisms
  - Social Login
    - Google
    - Twitter
    - Facebook
    - Office365
  - SMS Authentication
    - SMS Country
    - SMS Gupchup
    - Twilio
    - Victory Link SMS
    - Fast SMS

b. Paid

- Paypal Payment Gateway
- Ippay Gateway
- Quickpay Gateway
- Orange Gateway
- mPesa Gateway
- Voucher

This section describes how to configure Guest Access using cnMaestro.

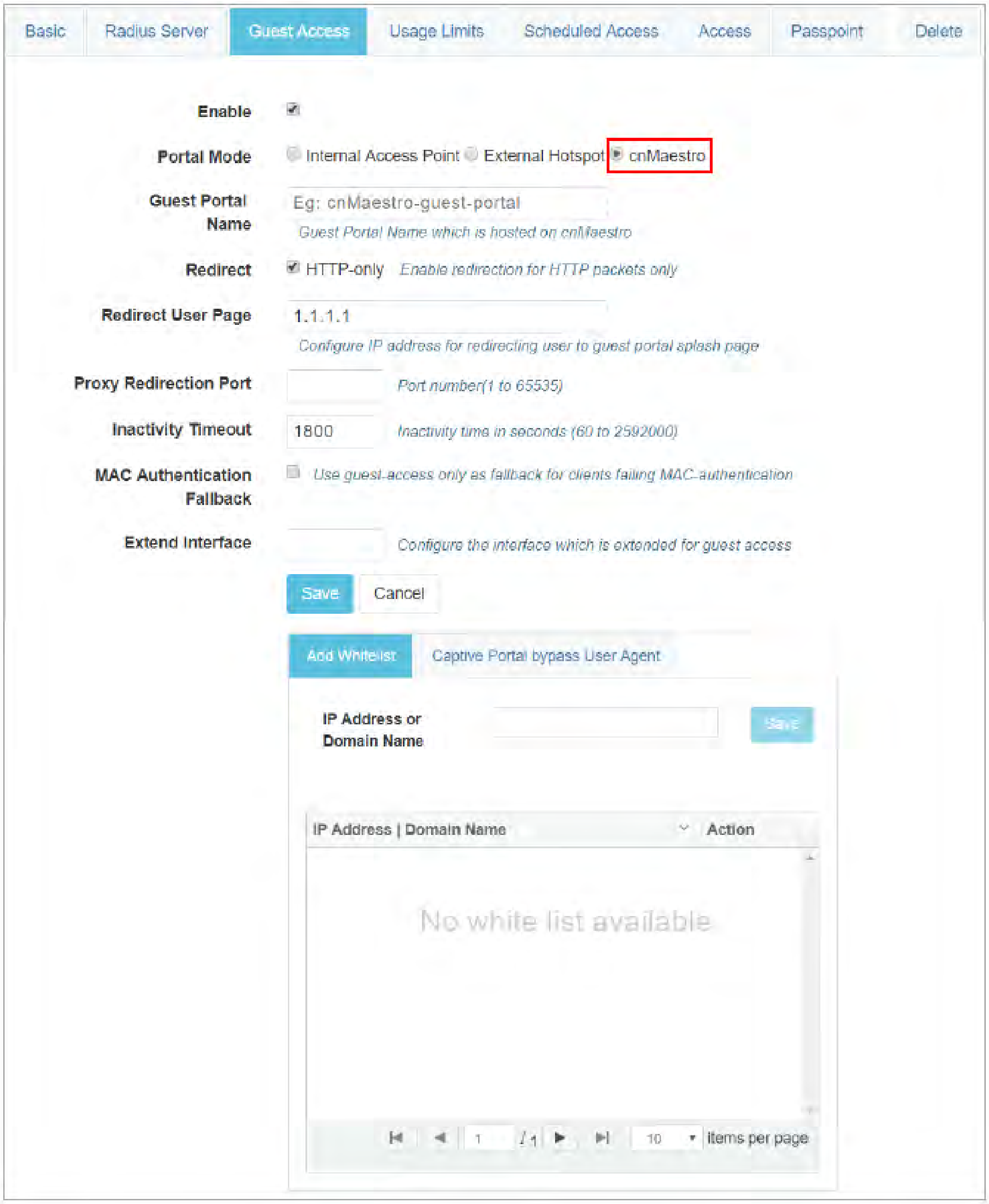
Configurable Parameters

For Guest Access to be operational, both cnPilot and cnMaestro has to be configured for Guest Access Portal services. Below are the configurable parameters:

cnPilot

Figure 171 displays multiple configurable parameters supported for cnMaestro Guest Access hosted on AP.

Figure 171: *Guest Access_cnMaestro parameter*



Enable	☑
Portal Mode	○ Internal Access Point ○ External Hotspot ● cnMaestro
Guest Portal Name	Eg: cnMaestro-guest-portal *Guest Portal Name which is hosted on cnMaestro*
Redirect	☑ HTTP-only *Enable redirection for HTTP packets only*
Redirect User Page	1.1.1.1 *Configure IP address for redirecting user to guest portal splash page*
Proxy Redirection Port	*Port number(1 to 65535)*
Inactivity Timeout	1800 *Inactivity time in seconds (60 to 2592000)*
MAC Authentication Fallback	□ *Use guest-access only as fallback for clients failing MAC-authentication*
Extend Interface	*Configure the interface which is extended for guest access*

IP Address or Domain Name

IP Address | Domain Name	Action

No white list available

1 / 1 10 items per page

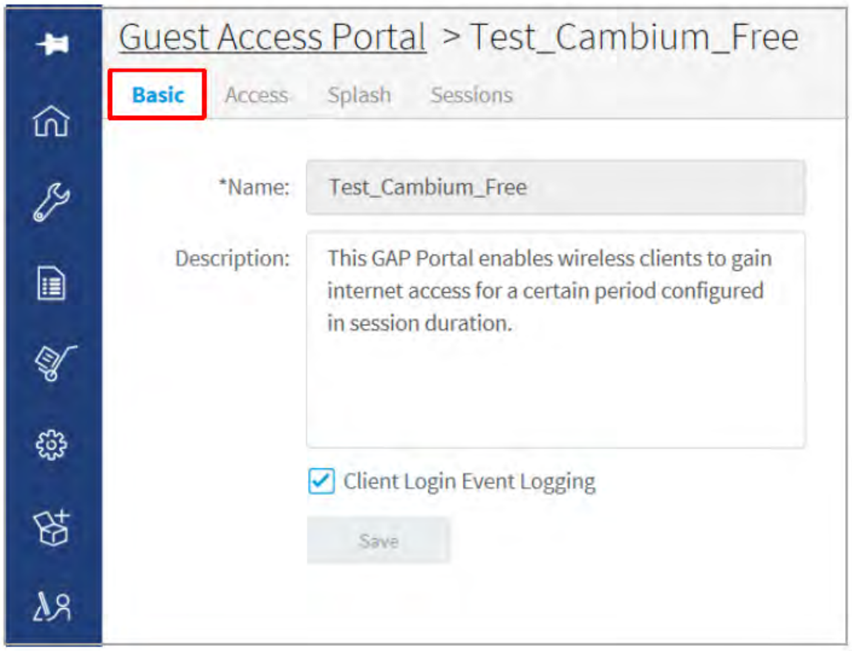
cnMaestro

Table 61 lists configurable parameters that are available under Services > Guest Access Portal tab:

Table 61: Guest Access_Basic parameters

Parameters	Description	Range	Default
Services > Guest Access Portal > <GAP Profile> Basic			
Name	Provision to configure the name of the Guest Access Portal services	–	–
Description	Provision to add brief details as per customer requirement	-	–
Client Login Event Logging	Enabling this will provision cnMaestro to record all the client events and their details. Client details available when this is enabled are as follows: • Client MAC • Portal • WLAN • Access Point • Voucher Code • Login Time • Access Type • Email • Mobile Number	–	Disabled

Figure 172: *Guest Access_Basic parameters*



Guest Access Portal > Test_Cambium_Free

*Name: Test_Cambium_Free

Description: This GAP Portal enables wireless clients to gain internet access for a certain period configured in session duration.

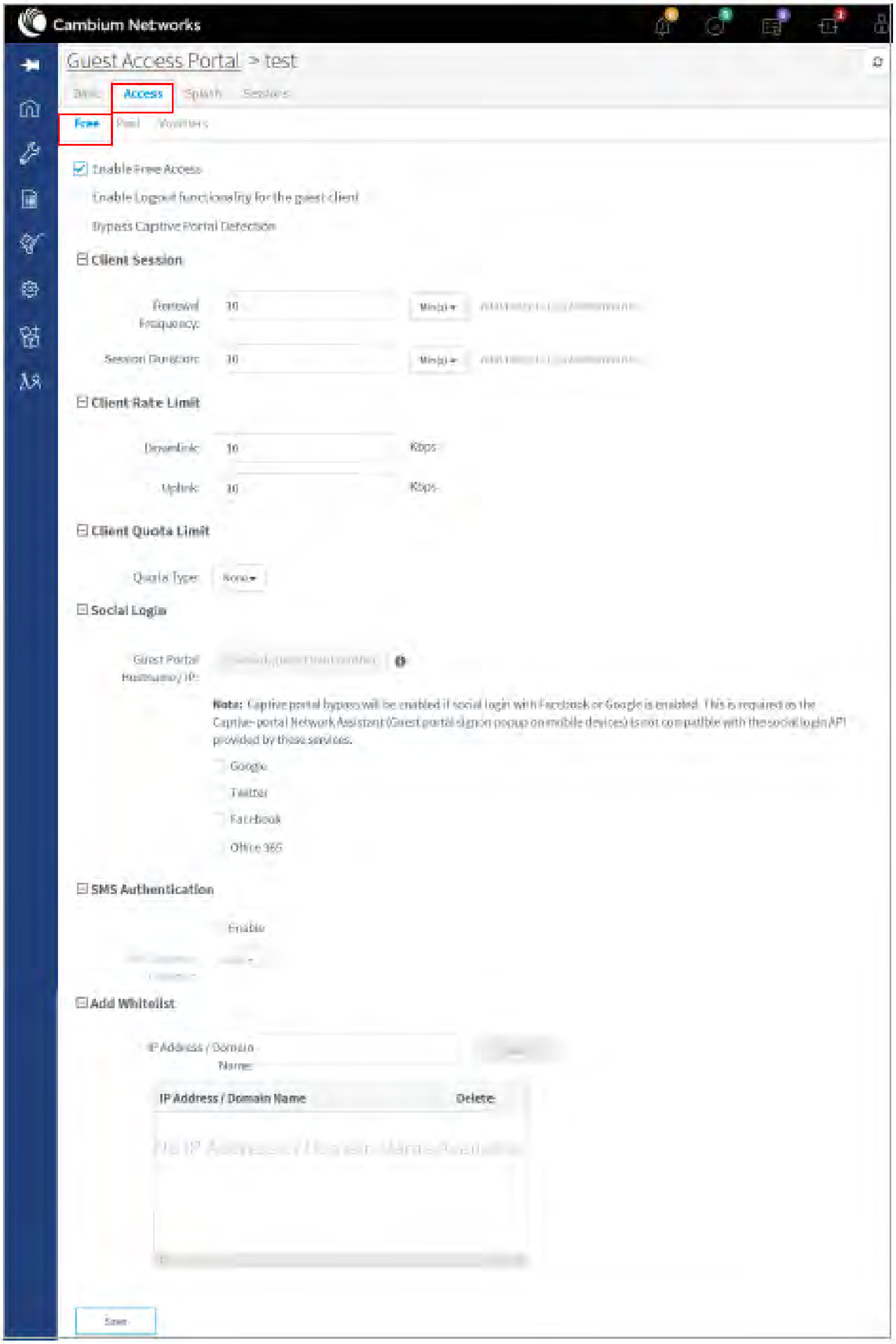
☑ Client Login Event Logging

Table 62: Configure: Services > Guest Access > Access > Free parameters

Parameters	Description	Range	Default
Services > Guest Access Portal > <GAP Profile> Access > Free			
Enable Free Access	Provision to enable free internet access.	–	Disabled
Enable Logout Functionality for the guest client	Provision to provide user Internet access for complete session duration within renewal frequency. Internet access timer is calculated based on real time user has used. User can logout multiple times within renewal frequency.	–	Disabled
Bypass Captive Portal Detection	Provision to disable Captive Network Assistant (I).	–	Disabled
Services > Guest Access Portal > <GAP Profile> Access > Free > Client Session			
Session Duration	The duration for which the client is provided internet access.	1-2628000	–
Renewable Frequency	Once the session duration for the client expires, the client needs to wait for the period specified by renewal frequency before logging in again to obtain internet access.	1-2628000	–
Services > Guest Access Portal > <GAP Profile> Access > Free > Client Rate Limit			
Downlink	Provision to limit downlink speed from Access Point to wireless client when client is authenticated to gain internet access.	–	–

Parameters	Description	Range	Default
Uplink	Provision to limit uplink speed from wireless client to Access Point when client is authenticated to gain internet access.	–	–
Services > Guest Access Portal > <GAP Profile> Access > Free > Client Quota Limit			
Quota Type	Provision to limit the bandwidth of wireless client. Two categories are supported based on Data quantity: • Directional • Downlink • Uplink • Total	–	None
Services > Guest Access Portal > <GAP Profile> Access > Free > Social Login			
Guest Portal Hostname / IP	Provision to configure the hostname that is share with supported social login website APIs. More details on supported social logins are provided in Social Login. For each type of Social login required, respective configuration parameters needs to be configured. These parameters vary based on Social Login.	-	Disabled
Services > Guest Access Portal > <GAP Profile> Access > Free > SMS Authentication			
Enable	Provision to enable SMS Authentication	-	Disabled
SMS Gateway Provider	Provision to configure SMS gateway. More details on supported SMS gateway are provided in SMS Authentication. For each type of Gateway vendors, configuration parameters vary and needs to be configured as per requirement.	-	-
Services > Guest Access Portal > <GAP Profile> Access > Free > Add Whitelist			
IP Address / Domain Name	Provision to allow internet traffic, when user is not authenticated.	-	-

Figure 173: *Access _Free parameters*



Cambium Networks

Guest Access Portal > test

Basic | Access | Splash | Sessions

Free | Paid | Vouchers

☑ Enable Free Access

Enable Logout functionality for the guest client

Bypass Captive Portal Detection

⊟ Client Session

Renewal Frequency: 10 Min(s)

Session Duration: 10 Min(s)

⊟ Client Rate Limit

Downlink: 10 Kbps

Uplink: 10 Kbps

⊟ Client Quota Limit

Quota Type: None

⊟ Social Login

Guest Portal Hostname / IP:

Note: Captive portal bypass will be enabled if social login with Facebook or Google is enabled. This is required as the Captive- portal Network Assistant (Guest portal signon popup on mobile devices) is not compatible with the social login API provided by those services.

□ Google

□ Twitter

□ Facebook

□ Office 365

⊟ SMS Authentication

□ Enable

⊟ Add Whitelist

IP Address / Domain Name:

IP Address / Domain Name	Delete
No IP Addresses / Domain Name Available	

Save

Table 63: Configure: Services > Guest Access > Access > Free > SMS

Parameter	Description	SMS Gateway Provider						
		Fast SMS	SMS Country	SMS Gupshup	Twilio	Victory Link SMS	SMS API	Generic SMS API
Enable	It indicates to enable the SMS Authentication feature.	✓	✓	✓	✓	✓	X	X
Username	Indicates the username of the vendor.	✓	✓	✓	X	✓	X	X
Sender ID/Name	It is the name or number which flashes on the recipients mobile phone when they receive SMS. This is optional not mandatory.	✓	✓	✓	X	✓	✓	X
API Key	It's a token which is provided by vendors.	✓	X	X	X	X	X	X
Account Type	It shows type of accounts such as International, OTP, Promotional and Transaction.	✓	X	X	X	X	X	X
OTP Template	The template with which SMS has to be sent.	✓	✓	✓	✓	✓	✓	X
Password	It indicates the password.	X	✓	✓	X	✓	X	X
Country Code	It enables to select country code based on deployments.	X	✓	✓	X	X	✓	X
Auth Token	It acts as a password.	X	X	X	✓	X	✓	X
Account SID	It acts as a username.	X	X	X	✓	X	X	X

Parameter	Description	SMS Gateway Provider						
		From	It enables to select the country code.	X	X	X	✓	X
Language	It indicates the Language.	X	X	X	X	✓	X	X
Fast Delivery		X	X	X	X		✓	
Template Name		X	X	X	X	X	✓	
SMS Gateway Provider Name		X	X	X	X	X	X	✓
HTTP Request Type		X	X	X	X	X	X	✓
HTTP Request Header Key		X	X	X	X	X	X	✓
HTTP Request Header Key Value		X	X	X	X	X	X	✓
API URL		X	X	X	X	X	X	✓
API URL Information		X	X	X	X	X	X	✓
Message Parameter Name		X	X	X	X	X	X	✓
Mobile Number Parameter Name		X	X	X	X	X	X	✓

Table 64: Configure: Services > Guest Access > Access > Paid parameters

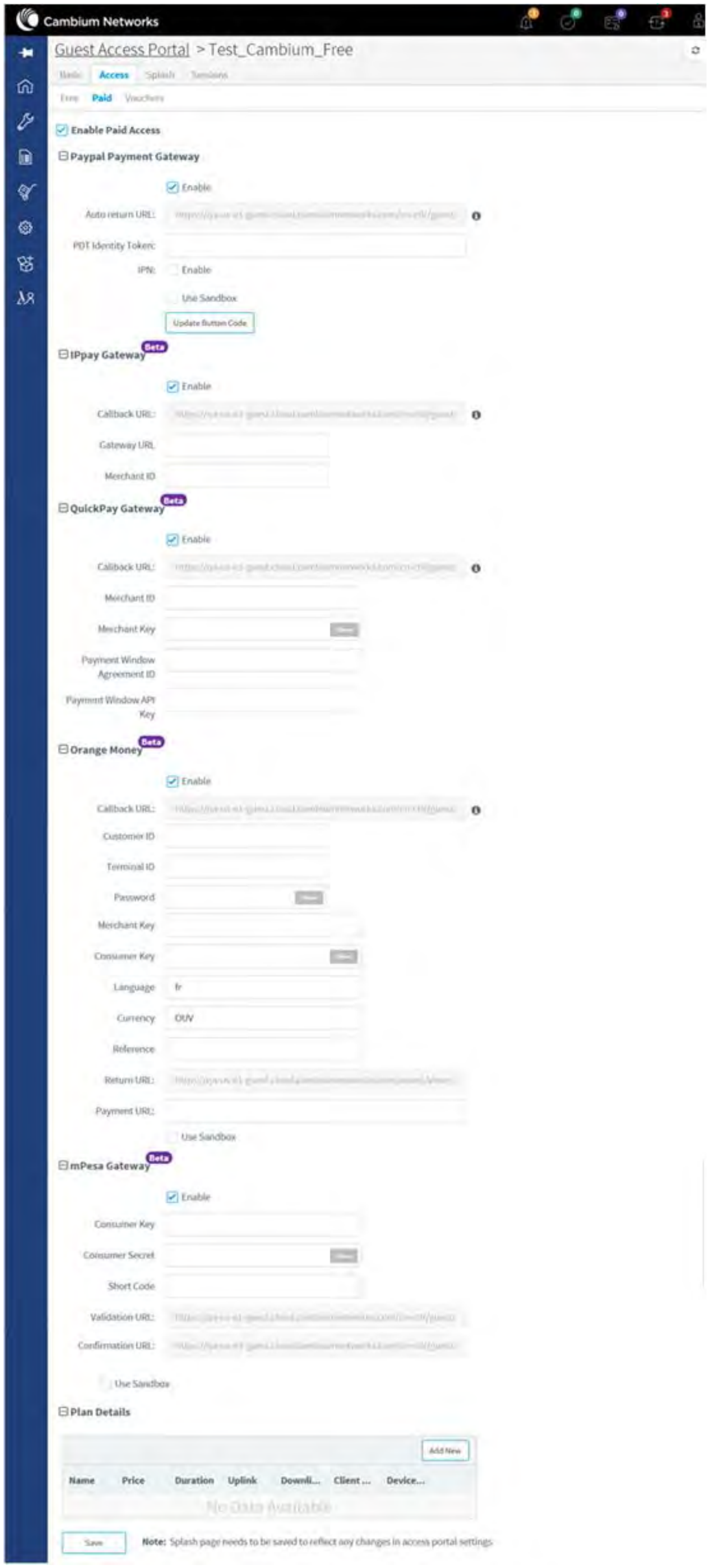
Parameters	Description	Range	Default
Services > Guest Access Portal > <GAP Profile> Access > Paid			

Parameters	Description	Range	Default
Enable Paid Access	Provision to enable payment gateway services	-	Disabled
Services > Guest Access Portal > Access > Paid > Paypal Payment Gateway			
Enable	Provision to enable Paypal payment gateway services	-	Disabled
Configuration Parameters	For successful Paypal transactions, following parameters needs to be configured: • Auto Return URL • PDT Identity token • IPN	-	-
Services > Guest Access Portal > Access > Paid > Ippay Gateway			
Enable	Provision to enable Ippay payment gateway services	-	Disabled
Configuration Parameters	For successful Ippay transactions, following parameters needs to be configured: • Callback URL • Gateway URL • Merchant ID • Customer ID • Terminal ID • Password	-	-
Services > Guest Access Portal > Access > Paid > QuickPay Gateway			
Enable	Provision to enable Quickpay gateway services	-	Disabled
Configuration Parameters	For successful Ippay transactions, following parameters needs to be configured: • Callback URL • Merchant ID • Merchant Key • Payment Window Agreement ID • Payment Window API Key	-	-
Services > Guest Access Portal > Access > Paid > Orange Money			
Enable	Provision to enable Orang Money gateway services	-	Disabled

Parameters	Description	Range	Default
Configuration Parameters	For successful Orange Money transactions, following parameters needs to be configured: • Callback URL • Merchant Key • Consumer Key • Language • Currency • Reference • Return URL • Payment URL	-	-
Services > Guest Access Portal > Access > Paid > mPesa Money			
Enable	Provision to enable Orang Money gateway services	-	Disabled
Configuration Parameters	For successful Orange Money transactions, following parameters needs to be configured: • Consumer Key • Consumer Secret • Short Code • Validation URL • Confirmation URL	-	-
Services > Guest Access Portal > Access > Paid > Plan Details			
Plan Name	Configure Internet Plan with name	-	-
Plan Cost	Cost of Internet plan. This field supports to configure various currency types and user can select appropriate currency as per location.	-	USD
Session Duration	Period in which user is provisioned with Internet access. Following attributes are supported: • Minutes • Hours • Days	-	Minutes
Uplink Rate Limit	Configurable wireless rate limit for the traffic flowing from user to Access Point.	-	-

Parameters	Description	Range	Default
Downlink Rate Limit	Configurable wireless rate limit for the traffic flowing from Access Point to User.	-	-
Quota Type	Configurable parameter to limit the amount of Internet data transfer. User data can be limited using either of the following options: 1. None There is no limit on Quota. User can use internet for whole duration configured. 2. Directional ▪ Uplink Quota ▪ Downlink Quota 3. Total Provision to limit Quota which includes total of downlink and uplink traffic.	-	None
Device Limit	Number of devices User can connect with current plan. For unlimited client sessions, user has provision to enable unlimited checkbox.	-	1

Figure 174: *Access_Paid parameters*



☑ Enable Paid Access

⊟ Paypal Payment Gateway

☑ Enable

Auto return URL:

PDT Identity Token:

IPN: □ Enable

□ Use Sandbox

⊟ IPpay Gateway

☑ Enable

Callback URL:

Gateway URL

Merchant ID

⊟ QuickPay Gateway

☑ Enable

Callback URL:

Merchant ID

Merchant Key

Payment Window Agreement ID

Payment Window API Key

⊟ Orange Money

☑ Enable

Callback URL:

Customer ID

Terminal ID

Password

Merchant Key

Consumer Key

Language fr

Currency OUV

Reference

Return URL:

Payment URL:

□ Use Sandbox

⊟ mPesa Gateway

☑ Enable

Consumer Key

Consumer Secret

Short Code

Validation URL:

Confirmation URL:

□ Use Sandbox

⊟ Plan Details

Name	Price	Duration	Uplink	Downli...	Client ...	Device...
No Data Available						

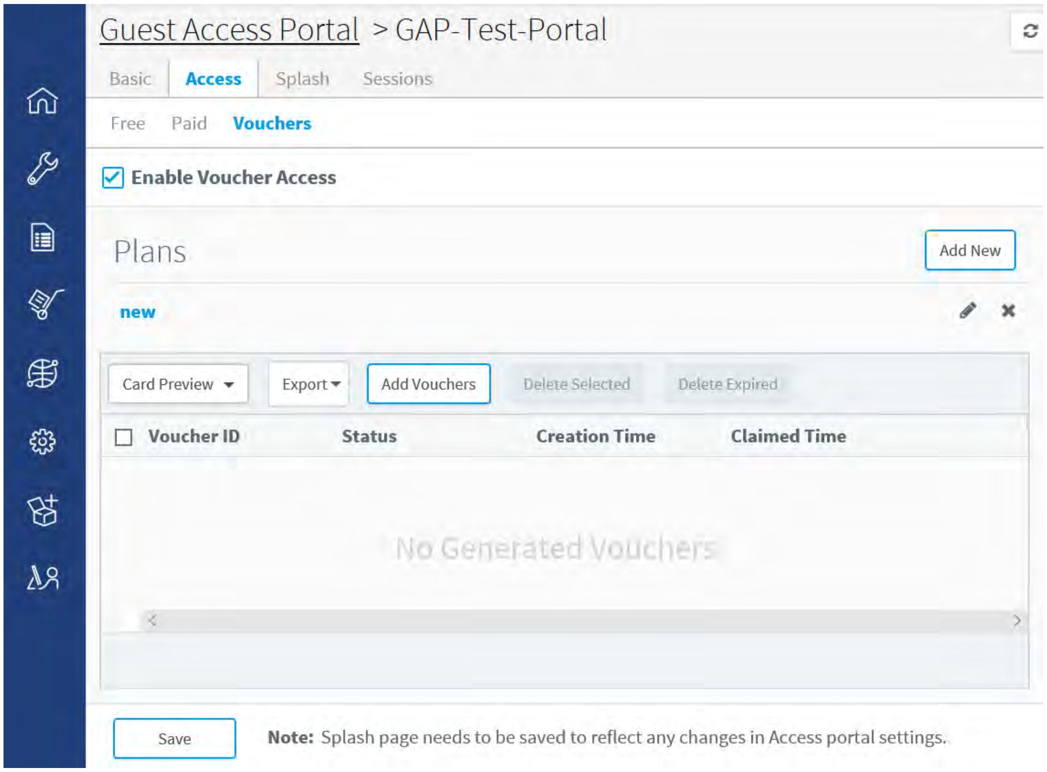
Note: Splash page needs to be saved to reflect any changes in access portal settings.

Table 65: Access_Vouchers parameters

Parameters	Description	Range	Default
Services > Guest Access Portal > <GAP Profile> Access > Vouchers			
Enable Voucher Access	Provision to support Voucher based Guest Access Services	-	Disabled
Plans	Provision to add custom user plans. Following are the parameters that are user configurable: 1. Plan Details • Name: Configure user-friendly name to plan. • Session Duration: Duration of time user can access Internet. Duration can be specified in terms of Minutes, Hours and Days. • Voucher Expiry: Expiry details of voucher, which can be configured for Minutes, Days and Hours. Once voucher expires, user will not be granted internet. • Rate Limit: ◦ Downlink Rate Limit: User can be restricted with downlink speed. If not configured, unlimited speed is provided to user. ◦ Uplink Rate Limit: User can be restricted with uplink speed. If not configured, unlimited speed is provided to user. • Quota Type: Configurable parameter to limit the amount of Internet data transfer. User data can be limited using either of the following options: ◦ None: There is no limit on Quota. User can use internet for whole duration configured. ◦ Directional ▪ Uplink Quota ▪ Downlink Quota ◦ Total: Provision to limit Quota which includes total of downlink and uplink traffic. • Voucher Device Limit: Number of devices allowed to connect using same voucher code. User has provision to configure unlimited. This will allow user to use same voucher for unlimited clients. • Bind Voucher to Device: Provision to bind single device to voucher. 2. Voucher Design • Title Color • Message Color	-	-

Parameters	Description	Range	Default
	• Code Color • Background Color • Background Image • Title • Message • Access Code Message		
Card Preview	User can preview the format of Voucher access token that has been configured in Plans section, which shall be distributed to customers.	-	-
Export	User can export Vouchers created for a plan and can provide to customers on demand. Both PDF and CSV formats are supported.	-	-
Add Vouchers	User can add more Vouchers if required in the plan selected.	-	-
Delete	User can delete vouchers based on requirement: ▪ Delete Selected: This option provisions user to delete only selected vouchers. ▪ Delete Expired: This option provisions user to delete all expired vouchers.	-	-

Figure 175: *Access _Vouchers parameters*


Guest Access Portal > GAP-Test-Portal

☑ Enable Voucher Access

Plans

□ Voucher ID	Status	Creation Time	Claimed Time

No Generated Vouchers

Note: Splash page needs to be saved to reflect any changes in Access portal settings.

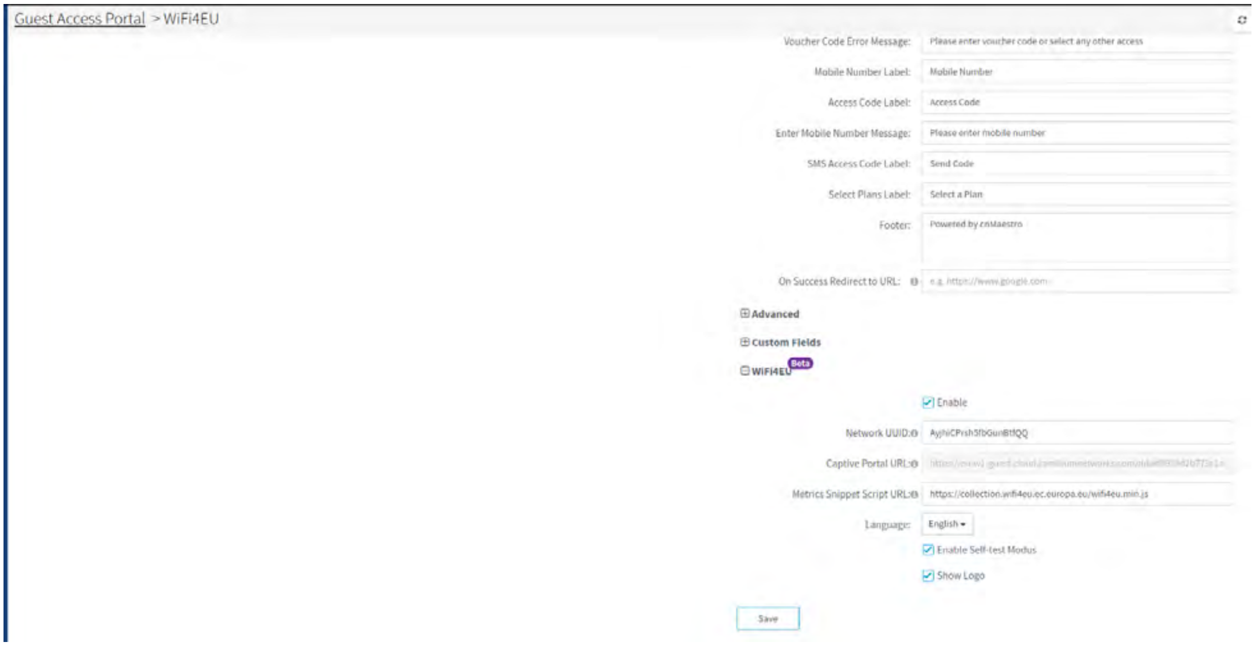
Table 66: Configure: Services > Guest Access > Splash parameters

Parameters	Description	Range	Default
Services > Guest Access Portal > Splash > Logo			
Logo	User has provision to select Logo and selected background color that will be appeared in Splash page.	-	-
Services > Guest Access Portal > Splash > Background			
Background	• Background Image Provision to select background image. • Opacity Transparency of background image. • Repeat Background When enabled, background image will be repeated • Background Placement Flexibility to place image at selective locations in splash page.	-	-
Services > Guest Access Portal > Splash > Text Design			

Parameters	Description	Range	Default
Text Design	Flexibility to change text design that is displayed in splash page.	-	-
Services > Guest Access Portal > Splash > Content			
Page Title	Text to appear as the title of the page.	-	-
Message	Text to appear as the welcome text. You can choose the font style and size for the welcome text.	-	-
Login Title	Text to appear for login.	-	Access Internet
Accept Terms Message	Text to appear as the accept terms message.	-	Please accept Terms and Conditions before signing in!
Terms & Conditions Title	Text to appear as the title for the terms and the conditions.	-	-
Terms & Conditions	Provision to add list of terms and conditions that needs to be shared with end user before accepting.	-	-
Login Success Message	Message to appear after successful login.	-	Congratulations, your login is successful
Login Failure Message	Message to appear after login failure.	-	Login Failure
Server Error Message	Text to appear if there is an error while contacting server.	-	Error Contacting Server
Please Wait Message	Message to appear when contacting server.	-	Please Wait
Terms Agree Button	Prefix message that appends to Terms and Conditions Agree option in splash page.	-	I Agree with the
Terms Cancel Button	Message that appears to Terms and Conditions Cancel option in splash page.	-	Cancel
Login Button	Enter the text that should appear on the button to submit in splash page.	-	Login
Select Plans Label	User defined text to guide user to select plans.	-	Select a Plan
Footer	Enter the text to appear as the footer of the page. You can choose the font style and size for the footer.	-	-
On Success Redirect to URL	Provision to configure URL that appears on successful Guest Access authentication.	-	-

Parameters	Description	Range	Default
Services > Guest Access Portal > Splash > Advanced			
Customer CSS Design	Provision to upload custom Splash page in CSS format.	-	-
Download Sample CSS	User can download sample CSS files supported.	-	-
Services > Guest Access Portal > Splash > Custom Fields			
Name	Provision to configure user friendly name to customers.	-	
Type	Five options are provided, so that they can appear in splash page. ▪ String ▪ Number ▪ Email ▪ Phone ▪ Date	-	String
Mandatory	If above selected types needs to be entered by customer, enable this field else it is optional to users.	-	Disabled
Services > Guest Access Portal > Splash > WiFi4EU			
Enable	Provision to enable WiFi4EU configuration.	-	Disabled
Network UUID	The provided wifi4eu NetworkIdentifier should be of type string and should correspond to the unique identifier (UUID) of the WiFi4EU network installation as indicated in the installation report.	-	-
Captive Portal URL	URL of the captive portal page where in the snippet will be integrated. The EC will verify the compliance of this page with the WiFi4EU requirements.	-	-
Metrics Snippet Script URL	A WiFi4EU supplier can test if the snippet is correctly installed and if its portal is compliant by enabling the snippet self-test modus.	-	-
Language	Provision to set to the correct language code in which the content of the portal page is served. The language code should be one of the 24 predefined language codes (1).	-	-
Enable Self-test Modus	Provision to enable self-validation of the portal.	-	-
Show Logo	Provision to display WiFi4EU logo.	-	-

Figure 176: *Splash parameters*



Guest Access Portal > WiFi4EU

Voucher Code Error Message: Please enter voucher code or select any other access

Mobile Number Label: Mobile Number

Access Code Label: Access Code

Enter Mobile Number Message: Please enter mobile number

SMS Access Code Label: Send Code

Select Plans Label: Select a Plan

Footer: Powered by cnMaestro

On Success Redirect to URL: e.g. https://www.google.com

⊞ Advanced

⊞ Custom Fields

⊟ WIFI4EU Beta

☑ Enable

Network UUID: AyjhiCPrsh3fbGunBtfQQ

Captive Portal URL: [illegible]

Metrics Snippet Script URL: https://collection.wifi4eu.ec.europa.eu/wifi4eu.min.js

Language: English ▾

☑ Enable Self-test Modus

☑ Show Logo

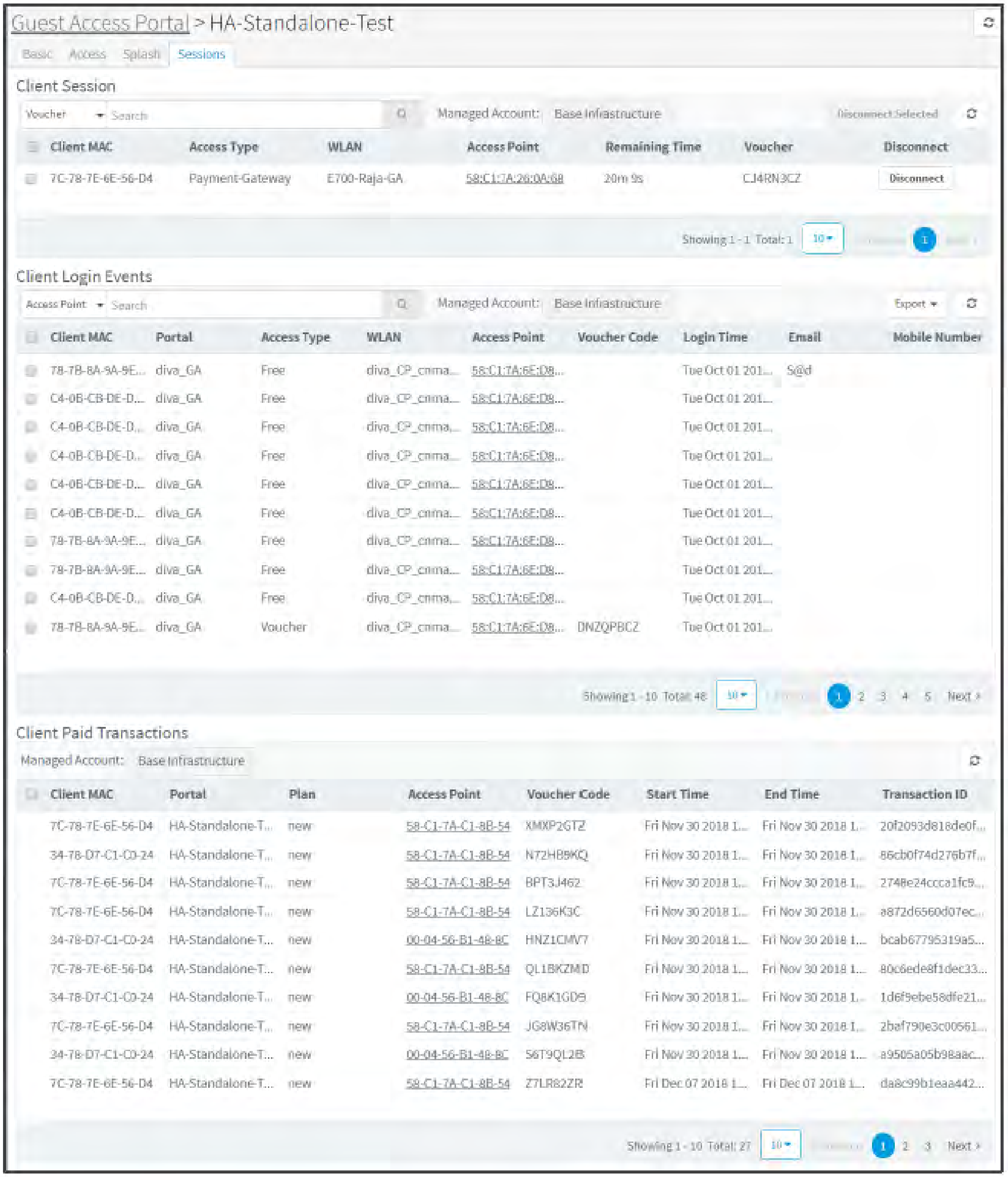
Table 67: Configure: Services > Guest Access > Sessions parameters

Parameters	Description	Range	Default
Services > Guest Access Portal > <GAP Profile> Access > Sessions > Client Session			
Client MAC	Provides the MAC address of wireless client whose session is valid.	-	-
Access Point	Provides BSSID of radio to which wireless client is associated.	-	-
Access Type	Provides type of Guest Access Portal services enabled on wireless client. Following are the types: • Free • Type of Social Login • SMS • Type of Payment Gateway • Vouchers		
WLAN	Displays SSID of WLAN to which wireless client is associated.	-	-
Remaining Time	The time left for the client to access the internet. It depends upon the session duration configured in the Access Portal.	-	-

Parameters	Description	Range	Default
Voucher	Displays Voucher code that has been used by wireless client for internet access.	-	-
Disconnect	Provision to disconnect wireless client on demand.	-	-
Services > Guest Access Portal > <GAP Profile> Access > Sessions > Client Login Events			
Client MAC	Provides the MAC address of wireless client whose session is valid.		
Portal	Displays Guest Access Portal associated with wireless client.		
WLAN	Displays SSID of WLAN to which wireless client is associated.		
Access Point	Provides BSSID of radio to which wireless client is associated.		
Voucher Code	Displays Voucher code that has been used by wireless client for internet access.		
Login Time	Displays time stamp of wireless client after a successful.		
Access Type	Provides type of Guest Access Portal services enabled on wireless client. Following are the types: • Free • Type of Social Login • SMS • Type of Payment Gateway • Vouchers		
Email	Displays email address as provided by user during guest access portal authentication.		
Mobile Number	Displays mobile number as provided by user during guest access portal authentication.		
Services > Guest Access Portal > <GAP Profile> Access > Sessions > Client Paid Transactions			
Client MAC	Provides the MAC address of wireless client whose session is valid.		
Portal	Displays Guest Access Portal associated with wireless client.		
Plan	Displays plan name activated for user.		
Access Point	Provides BSSID of radio to which wireless client is associated.		
Voucher Code	Displays Voucher code that has been used by wireless client for internet access.		
Start Time	Displays timestamp when wireless client is successfully authenticated using Guest Access portal services.		

Parameters	Description	Range	Default
End Time	Displays valid session time based on configuration in Plan. This value is always equal to (Start Time + Duration).		
Transaction ID	Displays random value generated during payment process and can be used as reference for any debugging.		

Figure 177: *Sessions parameters*



Guest Access Portal > HA-Standalone-Test

Client Session

Managed Account: Base Infrastructure

Client MAC	Access Type	WLAN	Access Point	Remaining Time	Voucher	Disconnect
7C-78-7E-6E-56-D4	Payment-Gateway	E700-Raja-GA	58:C1:7A:28:0A:68	20m 9s	CJ4RN3CZ	Disconnect

Showing 1 - 1 Total: 1 10 1

Client Login Events

Managed Account: Base Infrastructure

Client MAC	Portal	Access Type	WLAN	Access Point	Voucher Code	Login Time	Email	Mobile Number
78-7B-8A-9A-9E...	diva_GA	Free	diva_CP_cnma...	58:C1:7A:6E:D8...		Tue Oct 01 201...	S@d	
C4-0B-CB-DE-D...	diva_GA	Free	diva_CP_cnma...	58:C1:7A:6E:D8...		Tue Oct 01 201...		
C4-0B-CB-DE-D...	diva_GA	Free	diva_CP_cnma...	58:C1:7A:6E:D8...		Tue Oct 01 201...		
C4-0B-CB-DE-D...	diva_GA	Free	diva_CP_cnma...	58:C1:7A:6E:D8...		Tue Oct 01 201...		
C4-0B-CB-DE-D...	diva_GA	Free	diva_CP_cnma...	58:C1:7A:6E:D8...		Tue Oct 01 201...		
C4-0B-CB-DE-D...	diva_GA	Free	diva_CP_cnma...	58:C1:7A:6E:D8...		Tue Oct 01 201...		
78-7B-8A-9A-9E...	diva_GA	Free	diva_CP_cnma...	58:C1:7A:6E:D8...		Tue Oct 01 201...		
78-7B-8A-9A-9E...	diva_GA	Free	diva_CP_cnma...	58:C1:7A:6E:D8...		Tue Oct 01 201...		
C4-0B-CB-DE-D...	diva_GA	Free	diva_CP_cnma...	58:C1:7A:6E:D8...		Tue Oct 01 201...		
78-7B-8A-9A-9E...	diva_GA	Voucher	diva_CP_cnma...	58:C1:7A:6E:D8...	DNZQPBCZ	Tue Oct 01 201...		

Showing 1 - 10 Total: 48 10 1 2 3 4 5 Next ›

Client Paid Transactions

Managed Account: Base Infrastructure

Client MAC	Portal	Plan	Access Point	Voucher Code	Start Time	End Time	Transaction ID
7C-78-7E-6E-56-D4	HA-Standalone-T...	new	58-C1-7A-C1-8B-54	XMXP2GTZ	Fri Nov 30 2018 1...	Fri Nov 30 2018 1...	20f2093d818de0f...
34-78-D7-C1-C0-24	HA-Standalone-T...	new	58-C1-7A-C1-8B-54	N72HB9KQ	Fri Nov 30 2018 1...	Fri Nov 30 2018 1...	86cb0f74d276b7f...
7C-78-7E-6E-56-D4	HA-Standalone-T...	new	58-C1-7A-C1-8B-54	BPT3J462	Fri Nov 30 2018 1...	Fri Nov 30 2018 1...	2748e24ccca1fc9...
7C-78-7E-6E-56-D4	HA-Standalone-T...	new	58-C1-7A-C1-8B-54	LZ136K3C	Fri Nov 30 2018 1...	Fri Nov 30 2018 1...	a872d6560d07ec...
34-78-D7-C1-C0-24	HA-Standalone-T...	new	00-04-56-B1-48-8C	HNZ1CMV7	Fri Nov 30 2018 1...	Fri Nov 30 2018 1...	bcab67795319a5...
7C-78-7E-6E-56-D4	HA-Standalone-T...	new	58-C1-7A-C1-8B-54	QL1BKZMD	Fri Nov 30 2018 1...	Fri Nov 30 2018 1...	80c6ede8f1dec33...
34-78-D7-C1-C0-24	HA-Standalone-T...	new	00-04-56-B1-48-8C	FQ8K1GD9	Fri Nov 30 2018 1...	Fri Nov 30 2018 1...	1d6f9ebe58dfe21...
7C-78-7E-6E-56-D4	HA-Standalone-T...	new	58-C1-7A-C1-8B-54	JG8W36TN	Fri Nov 30 2018 1...	Fri Nov 30 2018 1...	2baf790e3c00561...
34-78-D7-C1-C0-24	HA-Standalone-T...	new	00-04-56-B1-48-8C	56T9QL2B	Fri Nov 30 2018 1...	Fri Nov 30 2018 1...	a9505a05b98aac...
7C-78-7E-6E-56-D4	HA-Standalone-T...	new	58-C1-7A-C1-8B-54	Z7LR82ZR	Fri Dec 07 2018 1...	Fri Dec 07 2018 1...	da8c99b1eaa442...

Showing 1 - 10 Total: 27 10 1 2 3 Next ›

Configuration examples

Prerequisites:

- Create Guest Access Portal

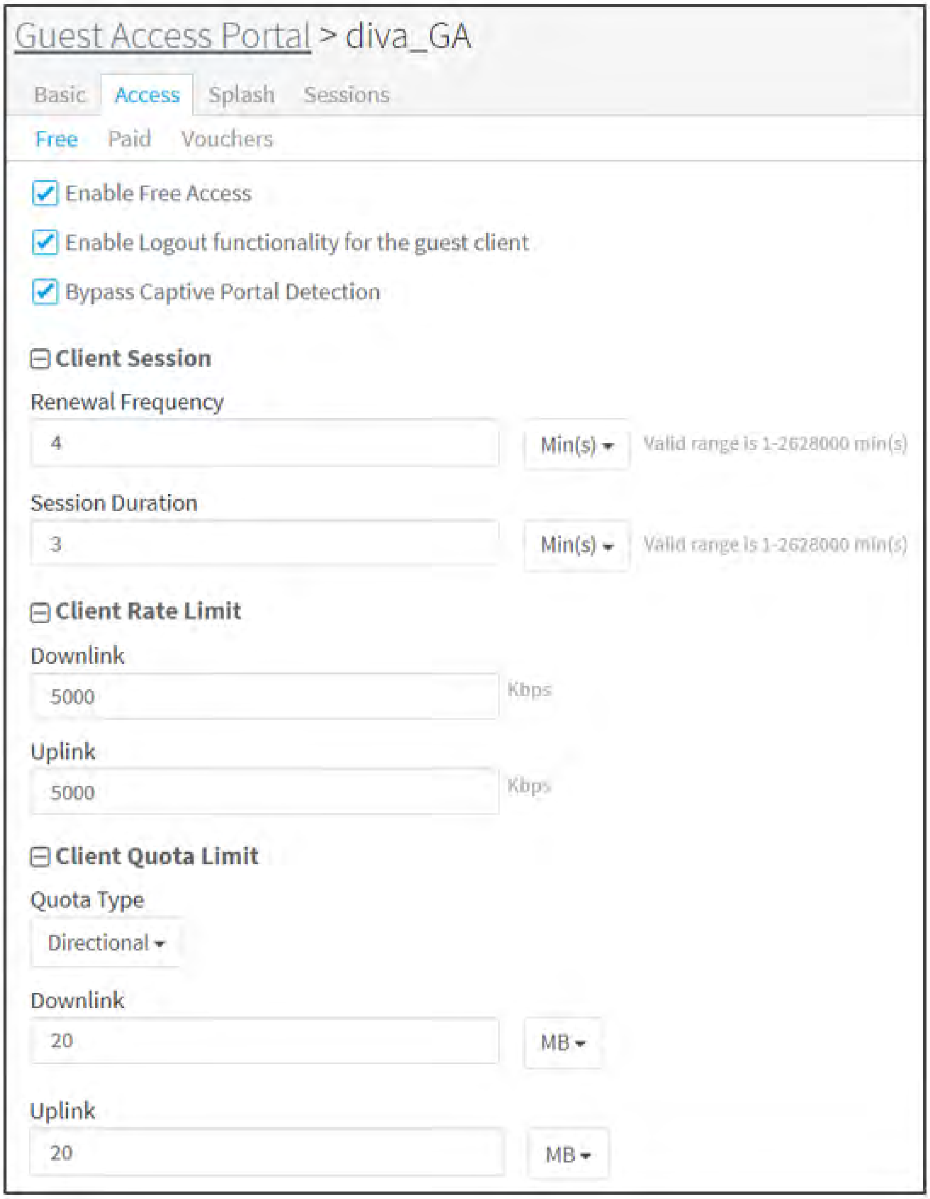
- Login to cnMaestro > Navigate to Services > Guest Access Portal > Add Portal.

- Enter Portal Name, Description, enable Client Login Event Logging and click on Save.

Free

Configuration

1. Configure Guest Access portal enabled in pre-requisites for free internet access with pre-defined self-registration parameters.



Guest Access Portal > diva_GA

☑ Enable Free Access

☑ Enable Logout functionality for the guest client

☑ Bypass Captive Portal Detection

⊟ Client Session

Renewal Frequency: 4 Min(s) Valid range is 1-2628000 min(s)

Session Duration: 3 Min(s) Valid range is 1-2628000 min(s)

⊟ Client Rate Limit

Downlink: 5000 Kbps

Uplink: 5000 Kbps

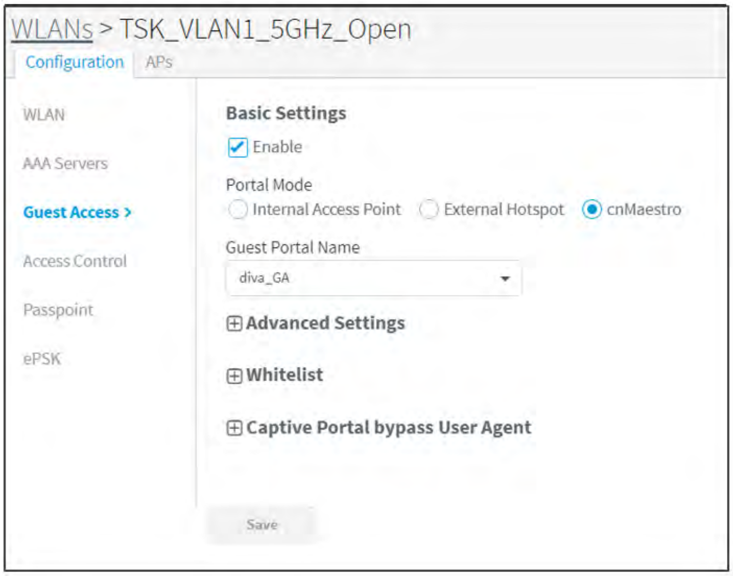
⊟ Client Quota Limit

Quota Type: Directional

Downlink: 20 MB

Uplink: 20 MB

2. Map the above profile to a WLAN profile and sync the configuration.



WLANs > TSK_VLAN1_5GHz_Open

Basic Settings

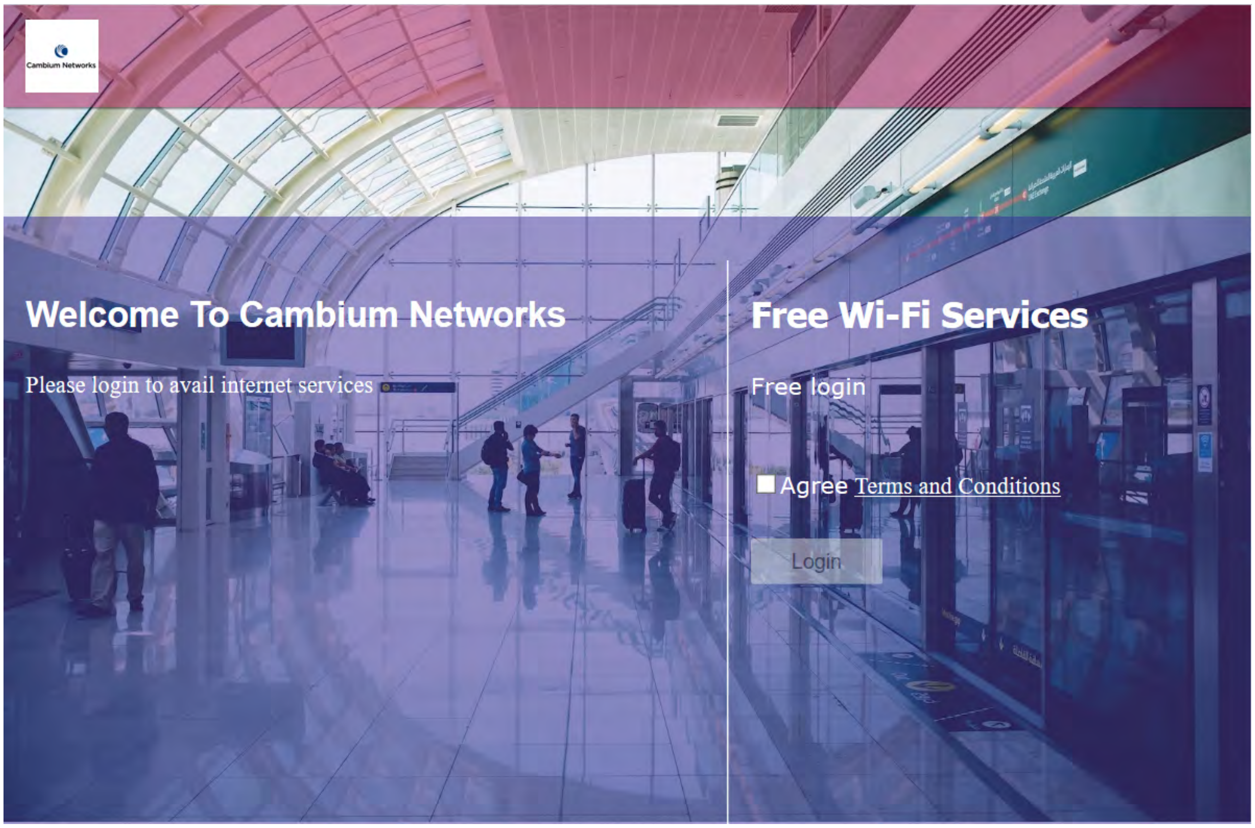
☑ Enable

Portal Mode

○ Internal Access Point ○ External Hotspot ● cnMaestro

Guest Portal Name: diva_GA

Authentication – Redirected Splash Page



Welcome To Cambium Networks

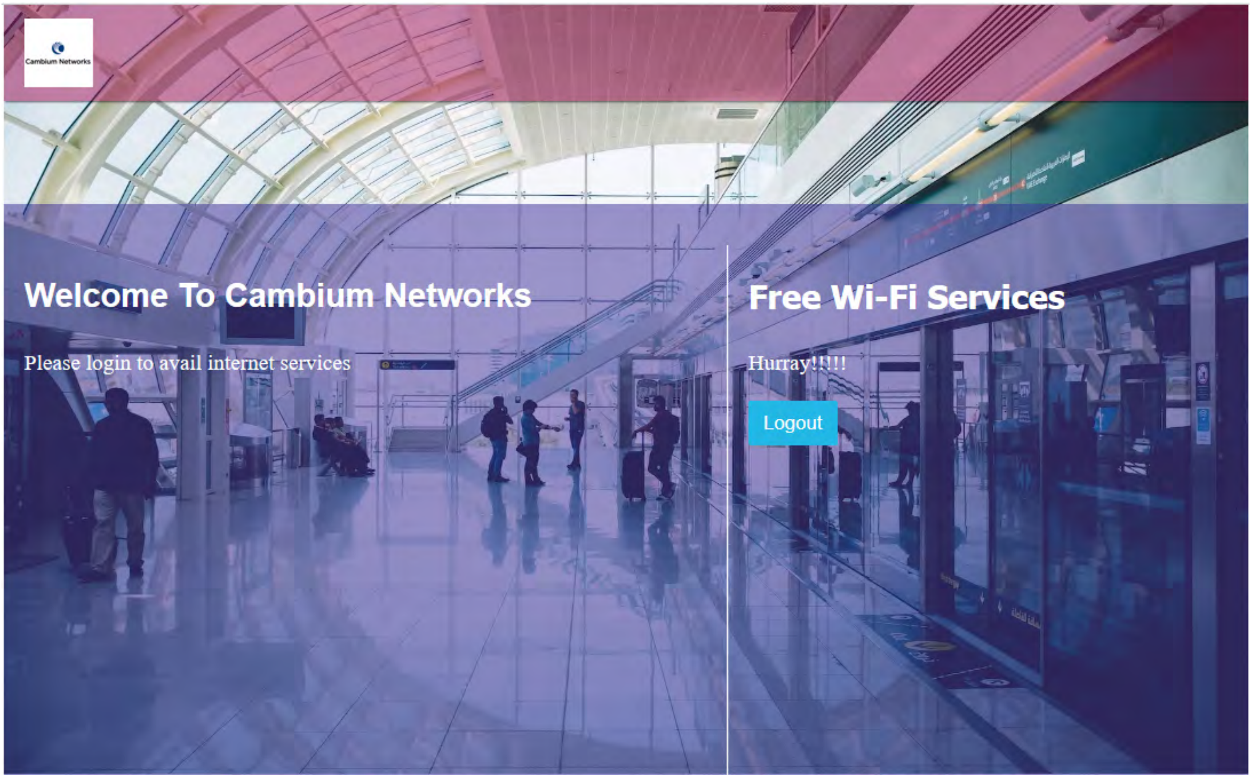
Please login to avail internet services

Free Wi-Fi Services

Free login

□ Agree Terms and Conditions

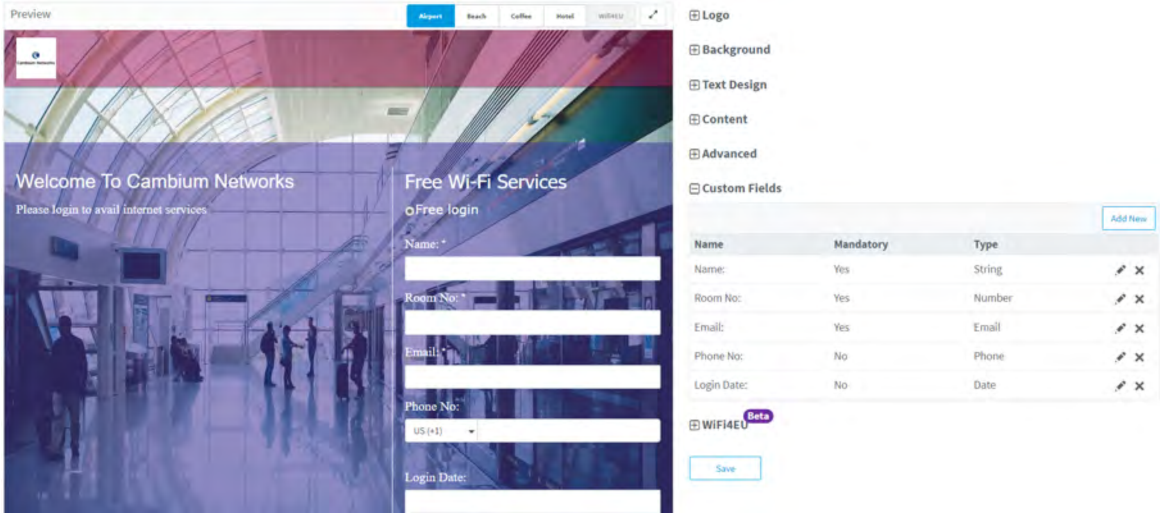
Successful Login – Redirected Splash Page


Cambium Networks
Welcome To Cambium Networks
Please login to avail internet services
Free Wi-Fi Services
Hurray!!!!!
Logout

Free – Custom fields

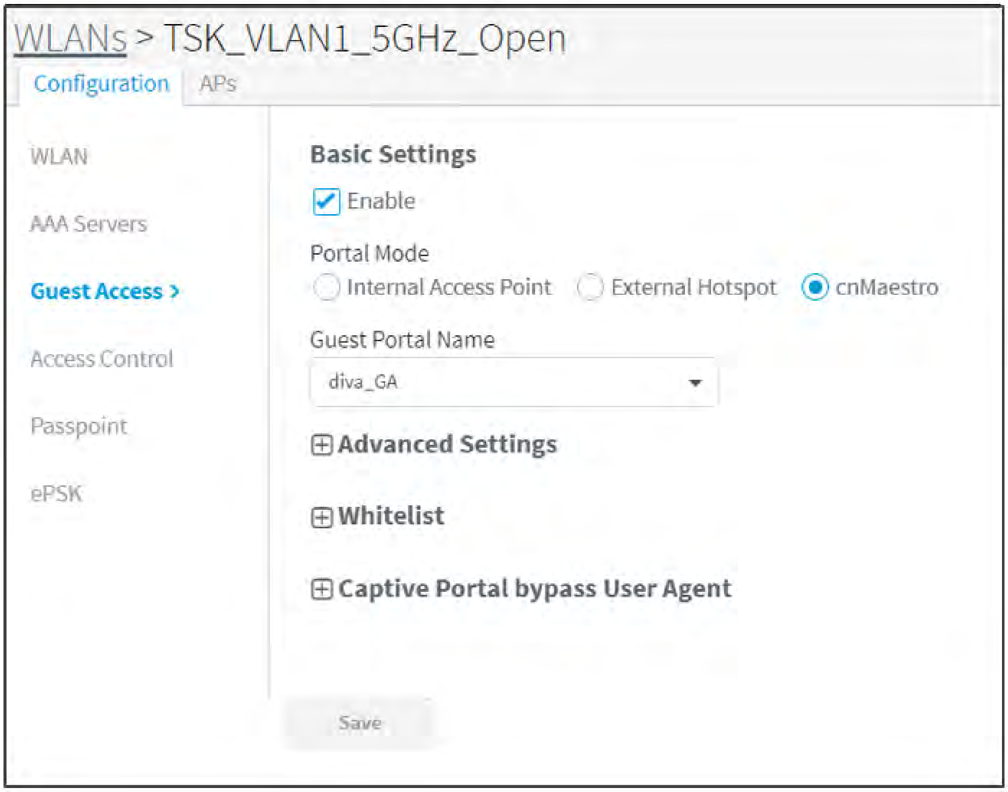
Configuration

1. Configure Guest Access portal enabled in pre-requisites for free with self-registration parameters.



Name	Mandatory	Type
Name:	Yes	String
Room No:	Yes	Number
Email:	Yes	Email
Phone No:	No	Phone
Login Date:	No	Date

2. Map the above profile to a WLAN profile and sync the configuration.



WLANs > TSK_VLAN1_5GHz_Open

Basic Settings

☑ Enable

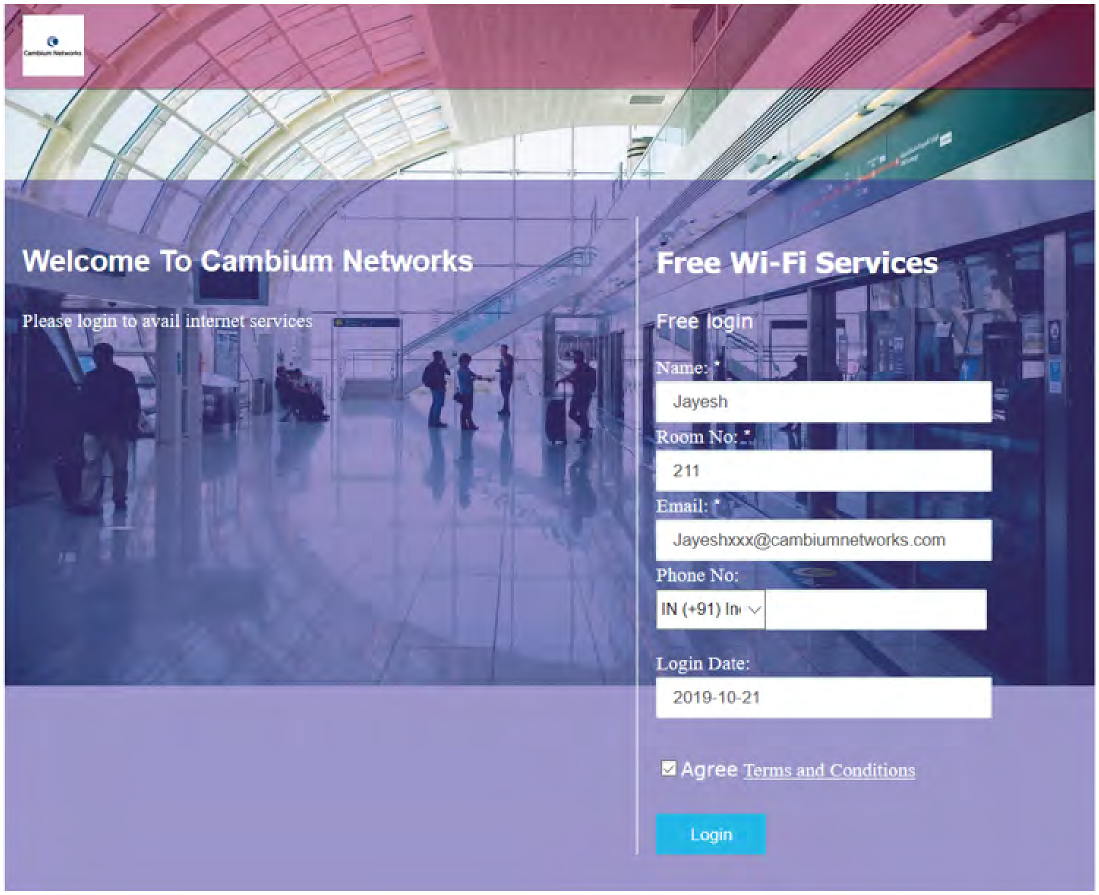
Portal Mode

○ Internal Access Point ○ External Hotspot ● cnMaestro

Guest Portal Name

diva_GA

Authentication – Redirected Splash Page



Welcome To Cambium Networks

Please login to avail internet services

Free Wi-Fi Services

Free login

Name: * Jayesh

Room No: * 211

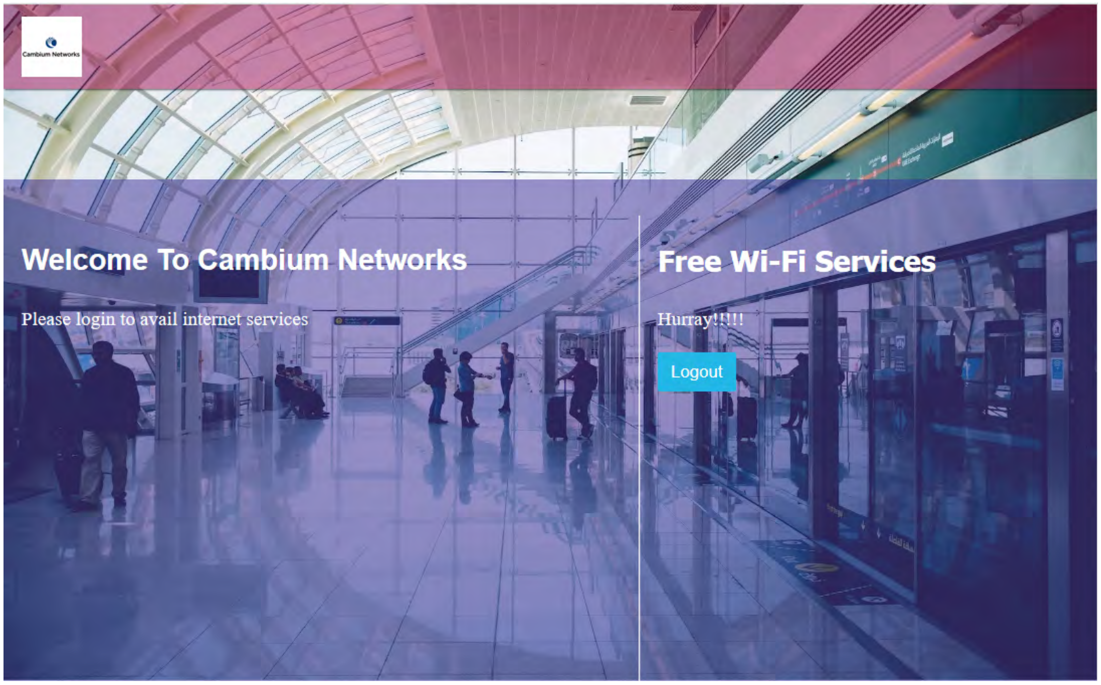
Email: * Jayeshxxx@cambiumnetworks.com

Phone No: IN (+91) In

Login Date: 2019-10-21

☑ Agree Terms and Conditions

Successful Login – Redirected Splash Page



Welcome To Cambium Networks

Please login to avail internet services

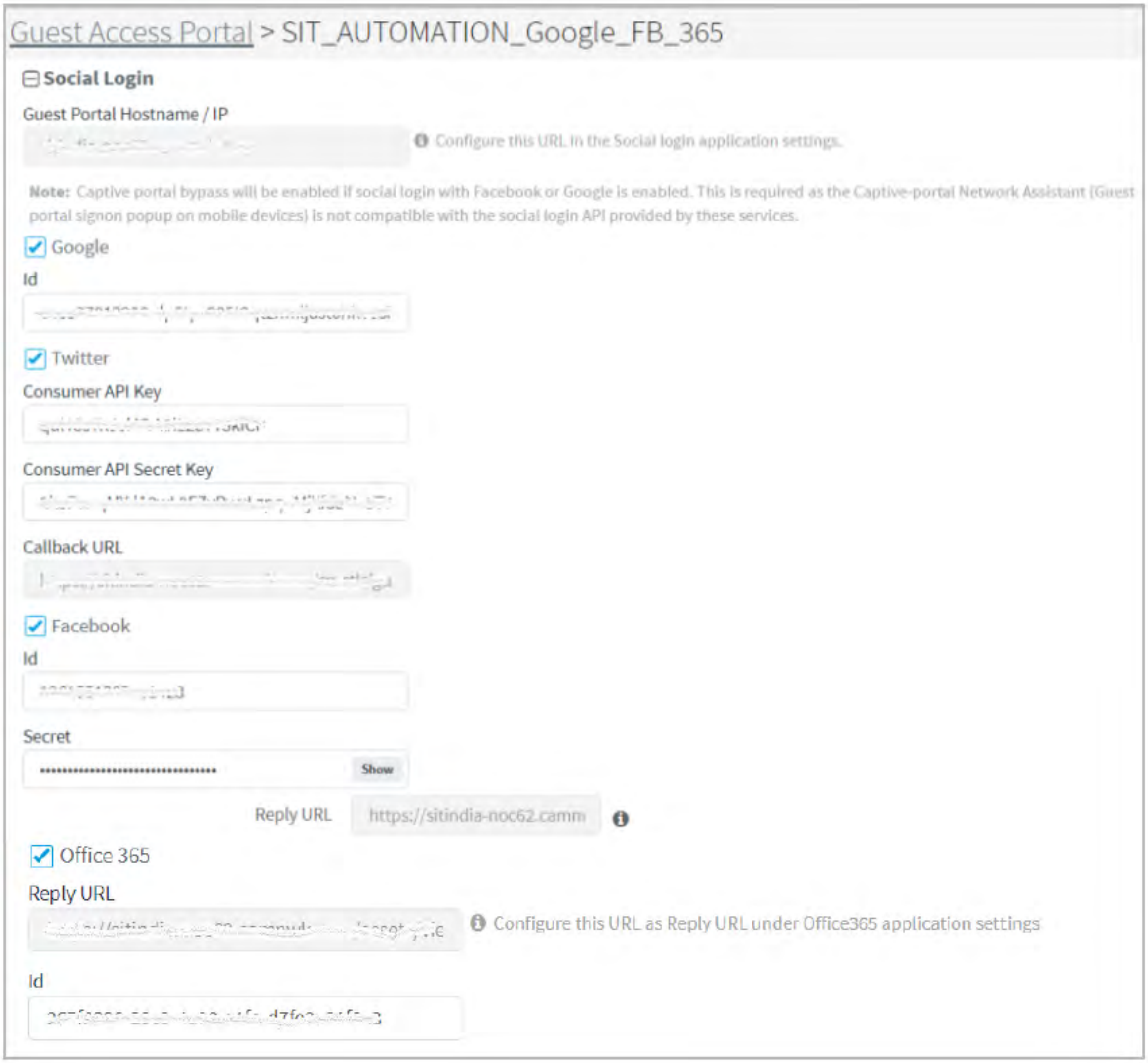
Free Wi-Fi Services

Hurray!!!!!

Free – Social Login

Configuration

1. Configure Guest Access portal enabled in pre-requisites for free internet access with social login.



Guest Access Portal > SIT_AUTOMATION_Google_FB_365

⊟ **Social Login**

Guest Portal Hostname / IP

[redacted]

Configure this URL in the Social login application settings.

Note: Captive portal bypass will be enabled if social login with Facebook or Google is enabled. This is required as the Captive-portal Network Assistant (Guest portal signon popup on mobile devices) is not compatible with the social login API provided by these services.

☑ Google

Id

[redacted]

☑ Twitter

Consumer API Key

[redacted]

Consumer API Secret Key

[redacted]

Callback URL

[redacted]

☑ Facebook

Id

[redacted]

Secret

•••••••••••••••••••••••••••••••• Show

Reply URL https://sitindia-noc62.camm

☑ Office 365

Reply URL

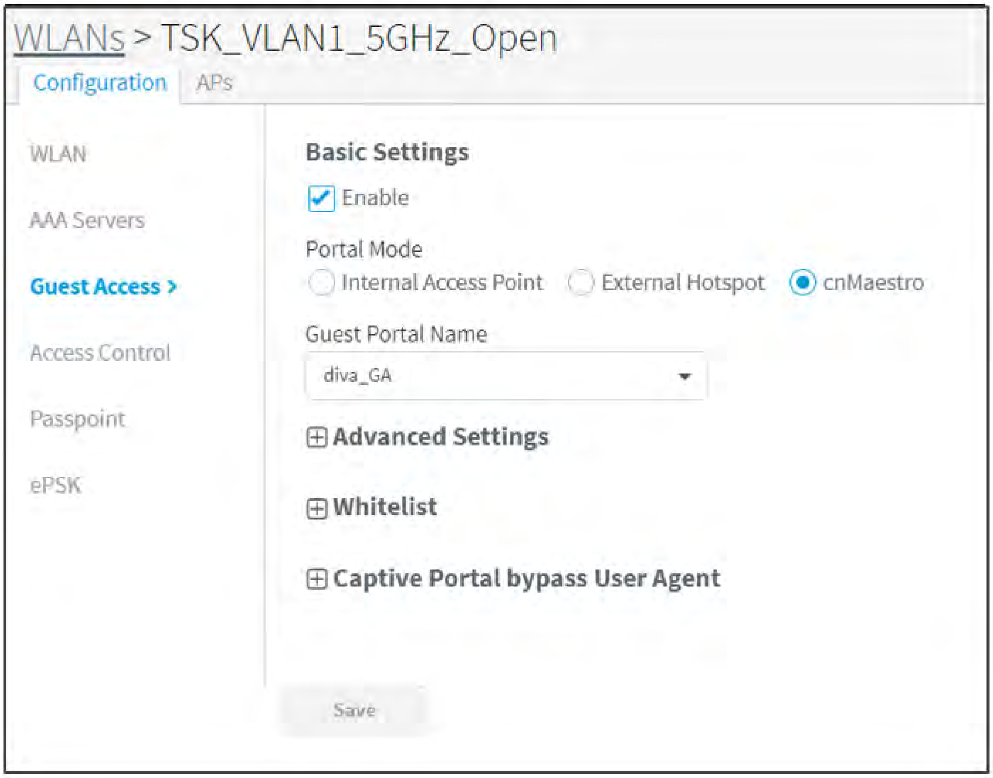
[redacted]

Configure this URL as Reply URL under Office365 application settings

Id

[redacted]

2. Map the above profile to a WLAN profile and sync the configuration.



WLANs > TSK_VLAN1_5GHz_Open

Basic Settings

☑ Enable

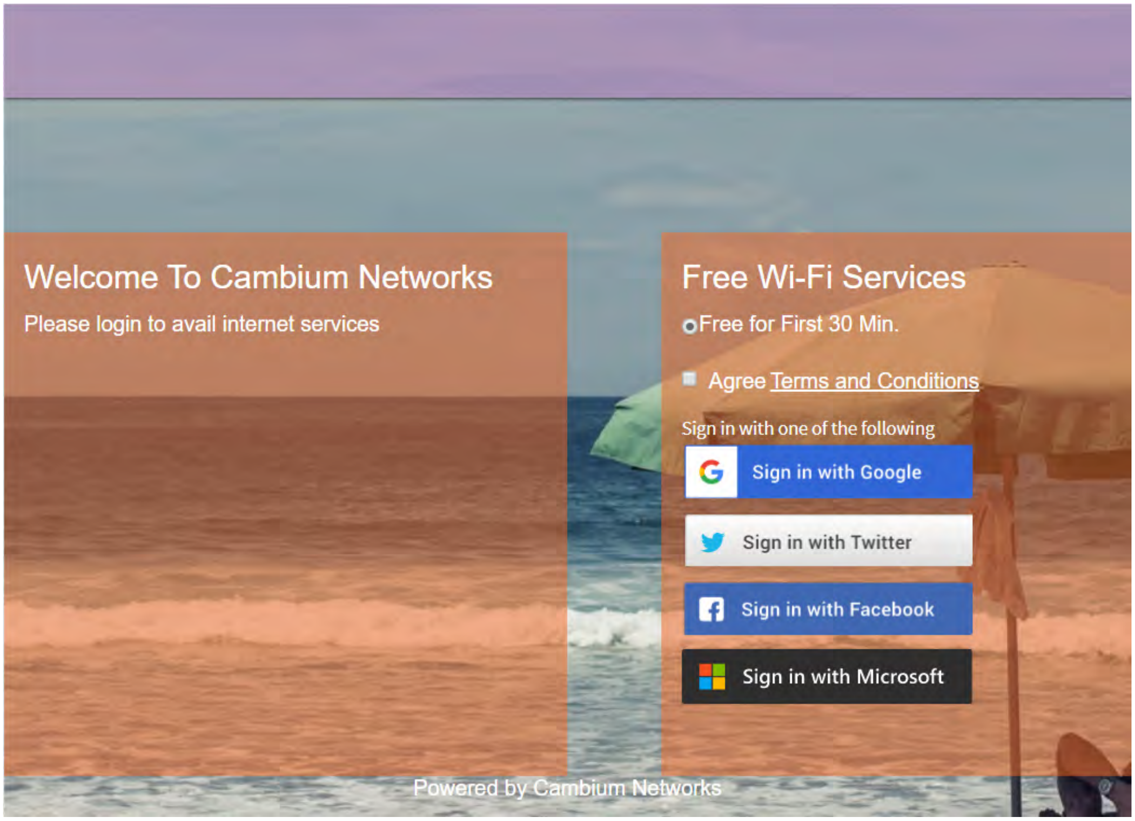
Portal Mode

○ Internal Access Point ○ External Hotspot ● cnMaestro

Guest Portal Name

diva_GA

Authentication – Redirected Splash Page



Welcome To Cambium Networks

Please login to avail internet services

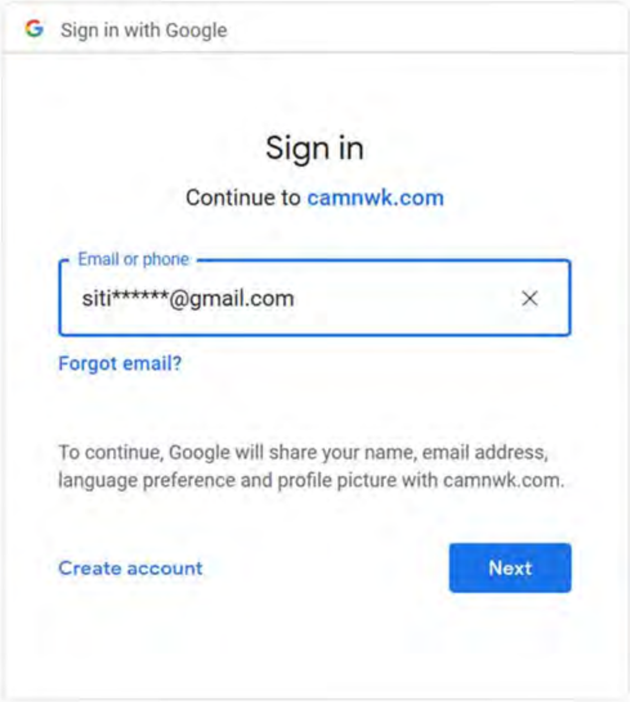
Free Wi-Fi Services

○Free for First 30 Min.

□ Agree Terms and Conditions

Sign in with one of the following

Successful Login – Redirected Splash Page



Sign in with Google

Sign in

Continue to camnwk.com

Email or phone

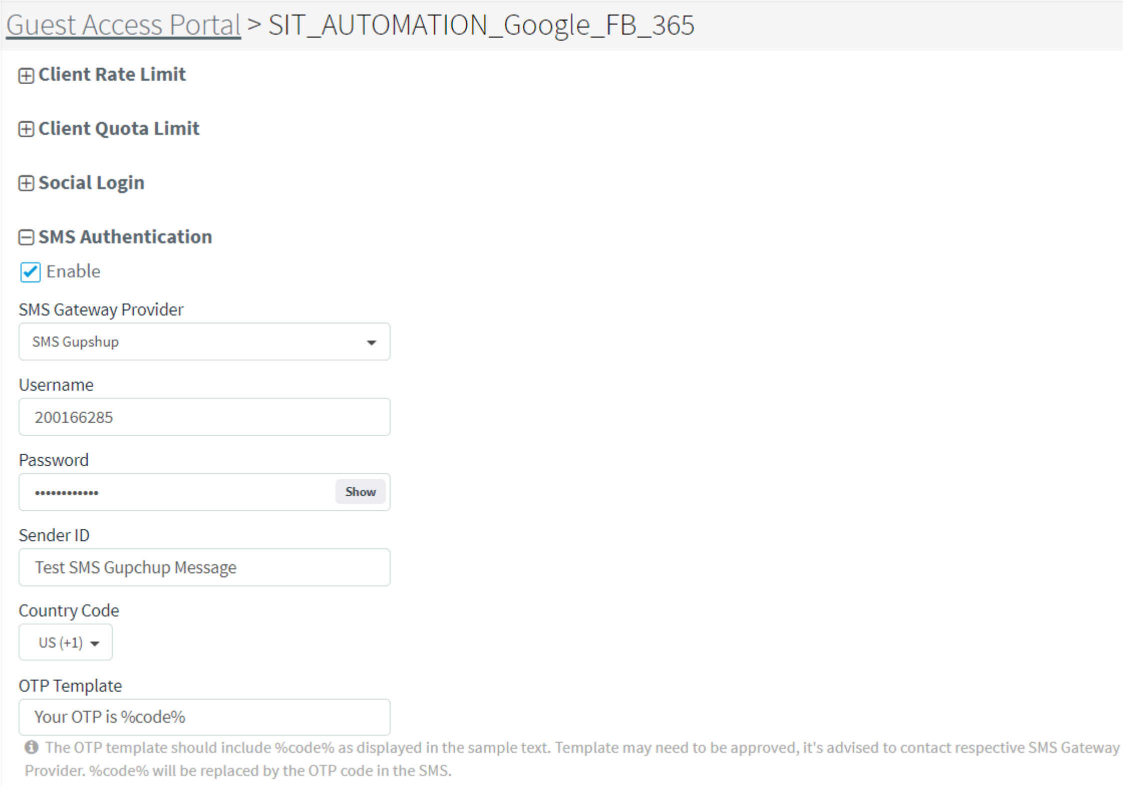
siti******@gmail.com

To continue, Google will share your name, email address, language preference and profile picture with camnwk.com.

Free – SMS Authentication

Configuration

1. Configure Guest Access portal enabled in pre-requisites for free internet access with SMA authentication.



Guest Access Portal > SIT_AUTOMATION_Google_FB_365

⊞ Client Rate Limit

⊞ Client Quota Limit

⊞ Social Login

⊟ SMS Authentication

☑ Enable

SMS Gateway Provider: SMS Gupshup

Username: 200166285

Password: •••••••••••• Show

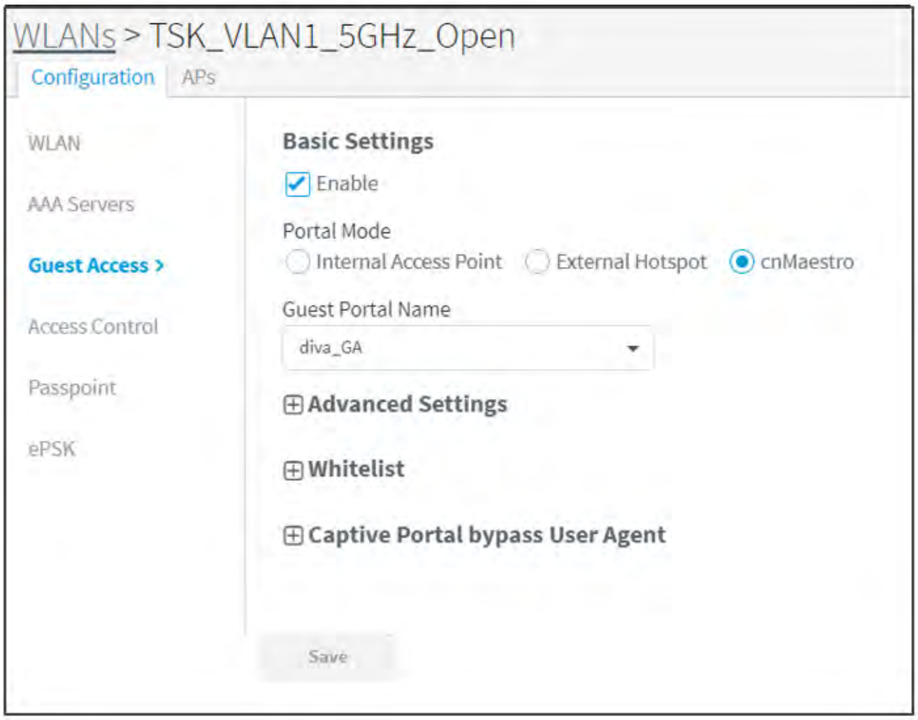
Sender ID: Test SMS Gupchup Message

Country Code: US (+1)

OTP Template: Your OTP is %code%

The OTP template should include %code% as displayed in the sample text. Template may need to be approved, it's advised to contact respective SMS Gateway Provider. %code% will be replaced by the OTP code in the SMS.

2. Map the above profile to a WLAN profile and sync the configuration.



WLANs > TSK_VLAN1_5GHz_Open

Basic Settings

☑ Enable

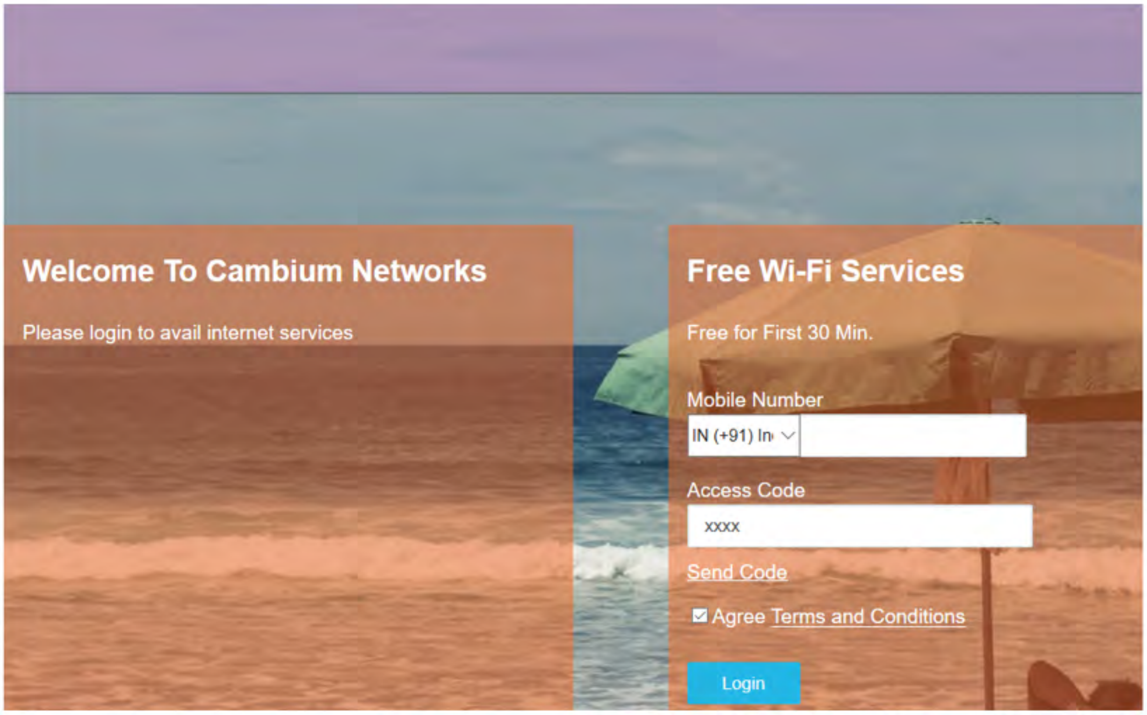
Portal Mode

○ Internal Access Point ○ External Hotspot ● cnMaestro

Guest Portal Name

diva_GA

Authentication – Redirected Splash Page



Welcome To Cambium Networks

Please login to avail internet services

Free Wi-Fi Services

Free for First 30 Min.

Mobile Number

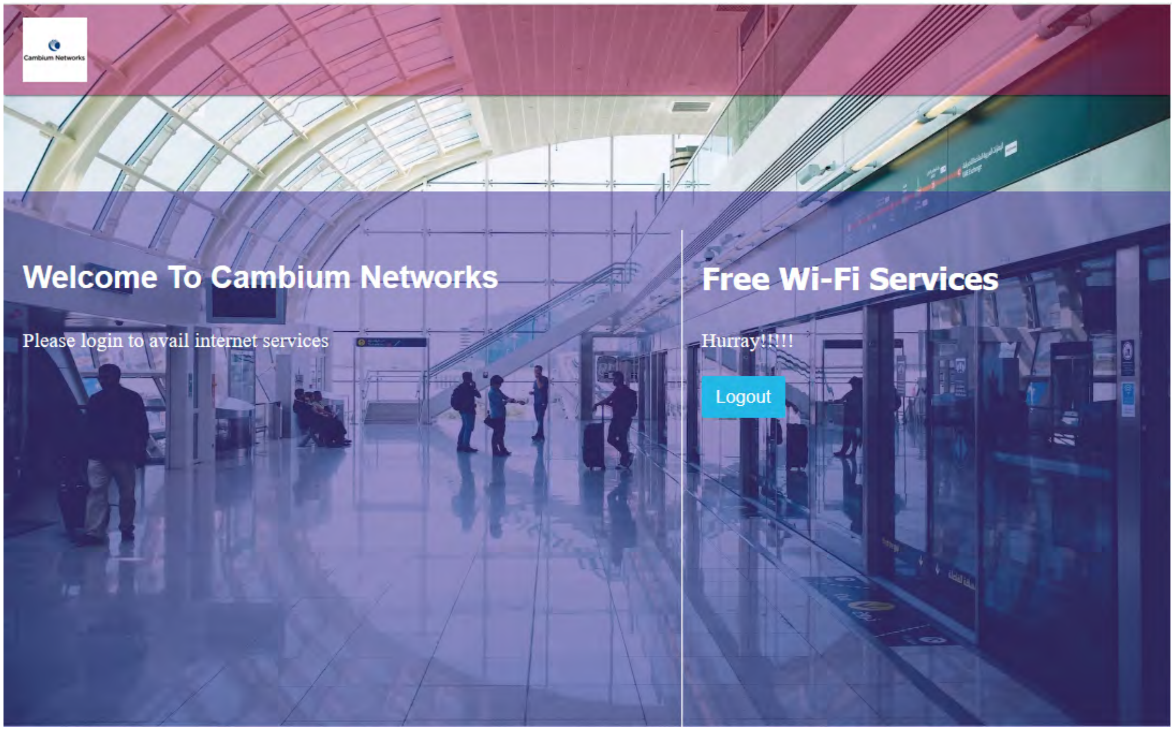
IN (+91) In

Access Code

xxxx

☑ Agree Terms and Conditions

Successful Login – Redirected Splash Page



Welcome To Cambium Networks

Please login to avail internet services

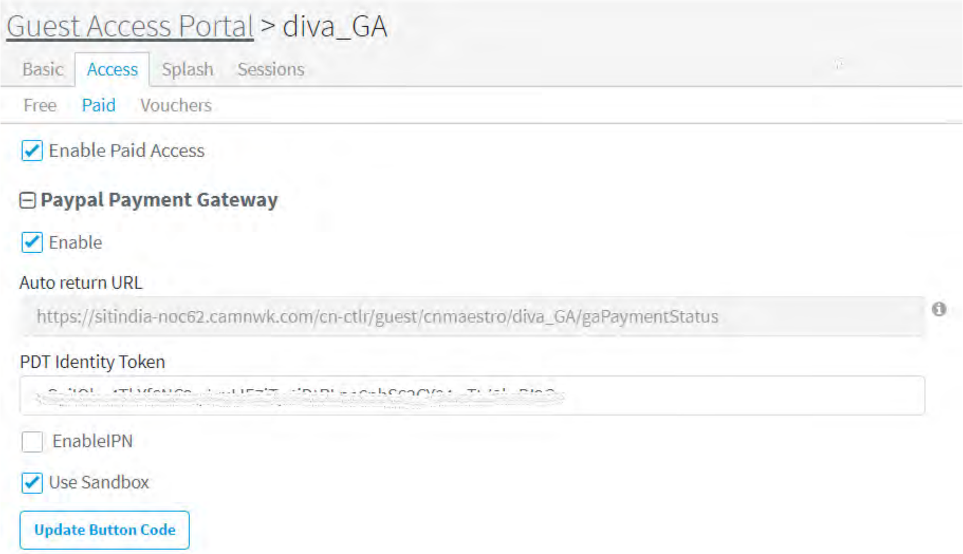
Free Wi-Fi Services

Hurray!!!!!

Paid – Payment Gateway

Configuration

1. Configure Guest Access portal enabled in pre-requisites for free internet access with paid payment gateway.



Guest Access Portal > diva_GA

☑ Enable Paid Access

⊟ **Paypal Payment Gateway**

☑ Enable

Auto return URL

https://sitindia-noc62.camnwk.com/cn-ctlr/guest/cnmaestro/diva_GA/gaPaymentStatus

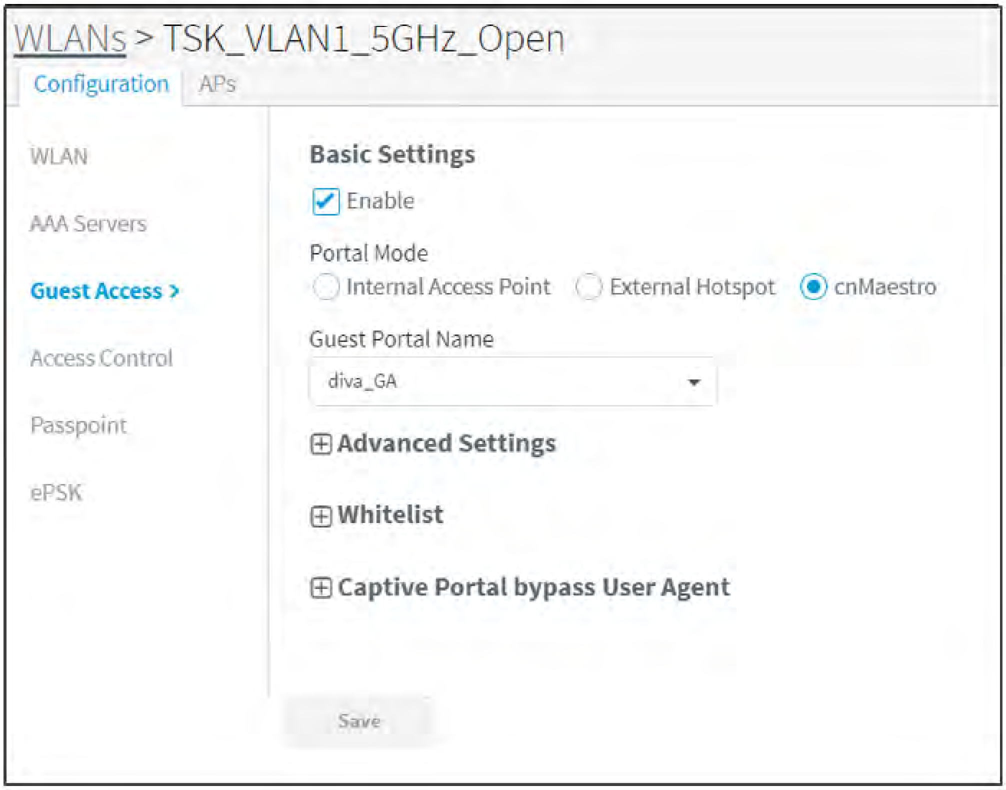
PDT Identity Token

[redacted]

☐ EnableIPN

☑ Use Sandbox

2. Map the above profile to a WLAN profile and sync the configuration.



WLANs > TSK_VLAN1_5GHz_Open

Basic Settings

☑ Enable

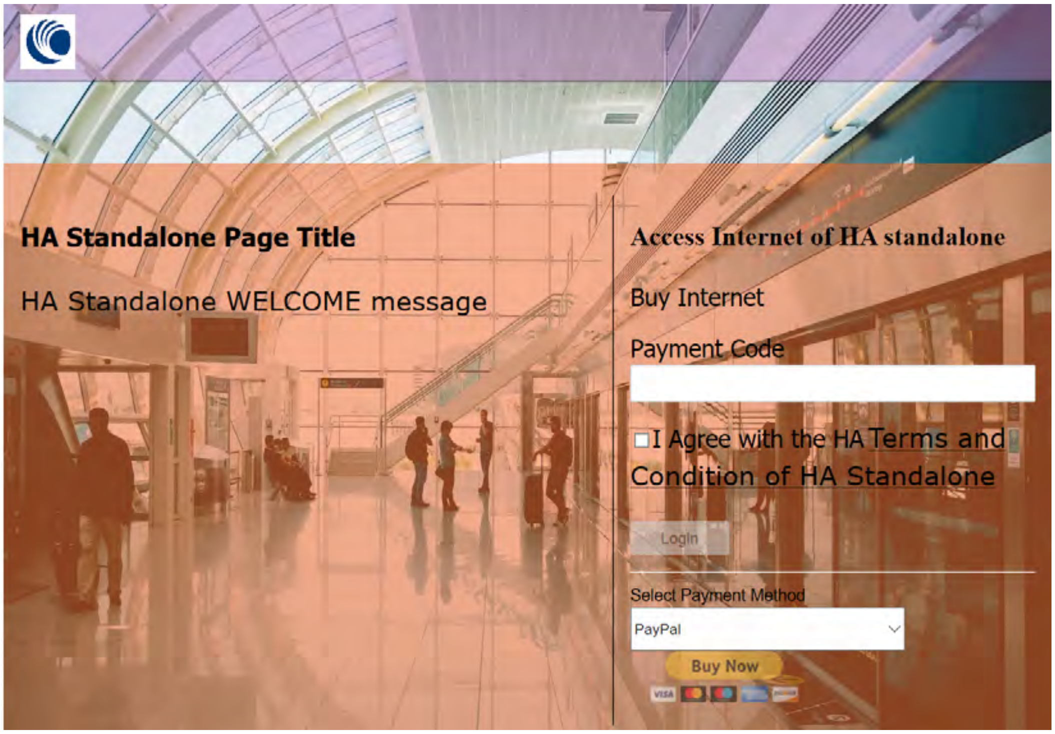
Portal Mode

○ Internal Access Point ○ External Hotspot ● cnMaestro

Guest Portal Name

diva_GA

Authentication – Redirected Splash Page



HA Standalone Page Title

HA Standalone WELCOME message

Access Internet of HA standalone

Buy Internet

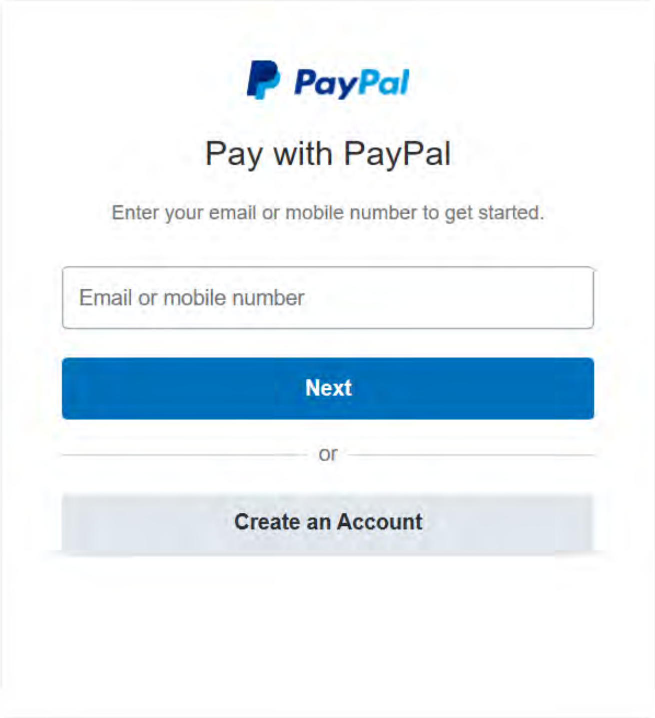
Payment Code

□ I Agree with the HA Terms and Condition of HA Standalone

Select Payment Method

PayPal

PayPal payment page



Pay with PayPal

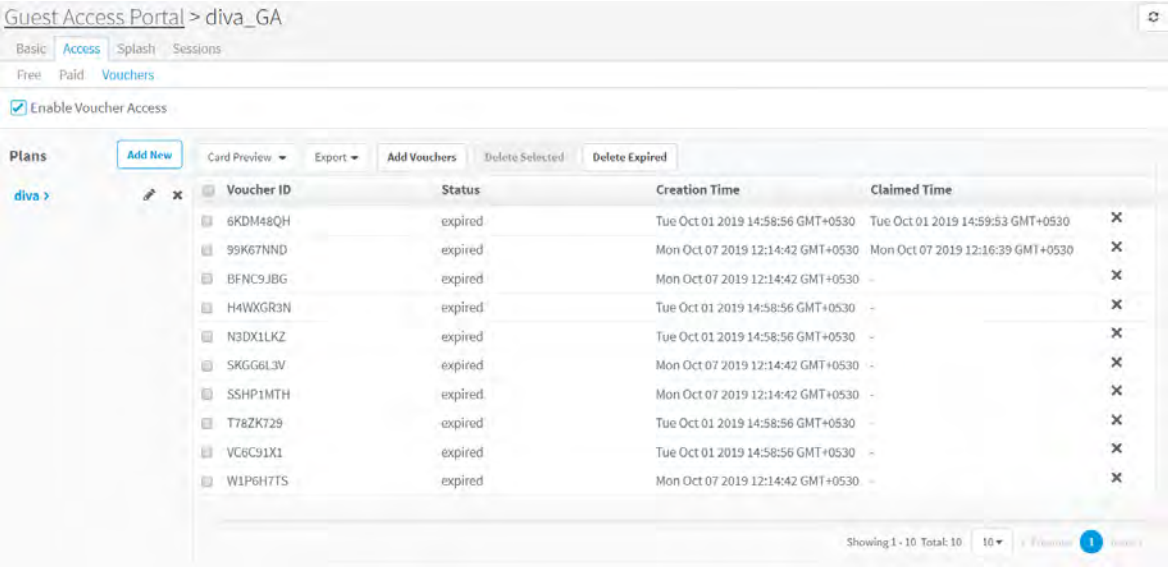
Enter your email or mobile number to get started.

Email or mobile number

Vouchers

Configuration

1. Configure Guest Access portal enabled in pre-requisites for free internet access with Vouchers.



Guest Access Portal > diva_GA

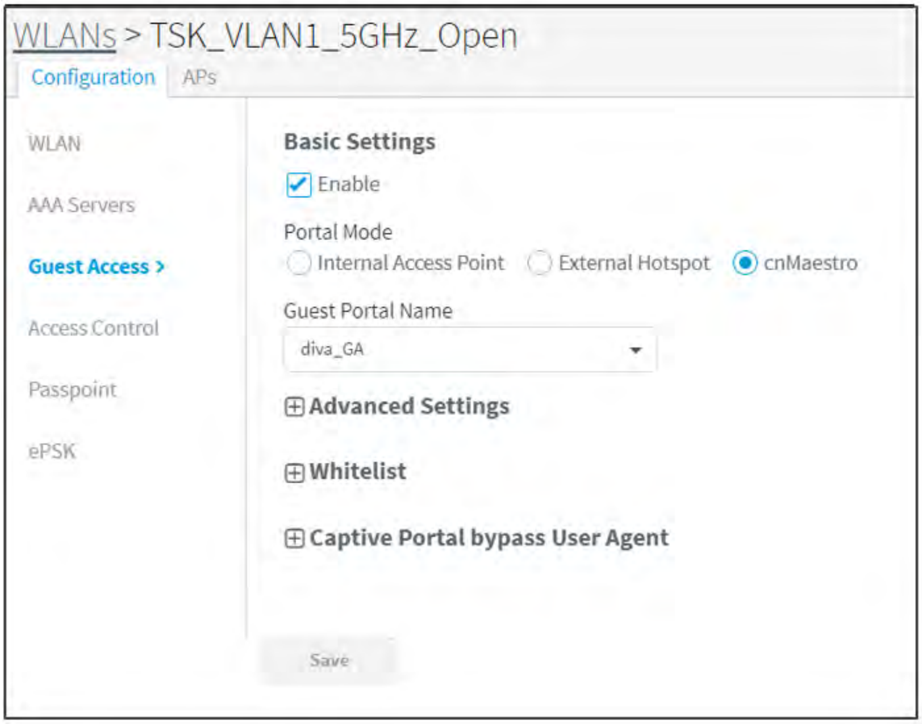
☑ Enable Voucher Access

Plans: diva

Voucher ID	Status	Creation Time	Claimed Time
6KDM48QH	expired	Tue Oct 01 2019 14:58:56 GMT+0530	Tue Oct 01 2019 14:59:53 GMT+0530
99K67NND	expired	Mon Oct 07 2019 12:14:42 GMT+0530	Mon Oct 07 2019 12:16:39 GMT+0530
BFNC9JBG	expired	Mon Oct 07 2019 12:14:42 GMT+0530	-
H4WXGR3N	expired	Tue Oct 01 2019 14:58:56 GMT+0530	-
N3DX1LKZ	expired	Tue Oct 01 2019 14:58:56 GMT+0530	-
SKGG6L3V	expired	Mon Oct 07 2019 12:14:42 GMT+0530	-
SSHP1MTH	expired	Mon Oct 07 2019 12:14:42 GMT+0530	-
T78ZK729	expired	Tue Oct 01 2019 14:58:56 GMT+0530	-
VC6C91X1	expired	Tue Oct 01 2019 14:58:56 GMT+0530	-
W1P6H7TS	expired	Mon Oct 07 2019 12:14:42 GMT+0530	-

Showing 1 - 10 Total: 10

2. Map the above profile to a WLAN profile and sync the configuration.



WLANs > TSK_VLAN1_5GHz_Open

Basic Settings

☑ Enable

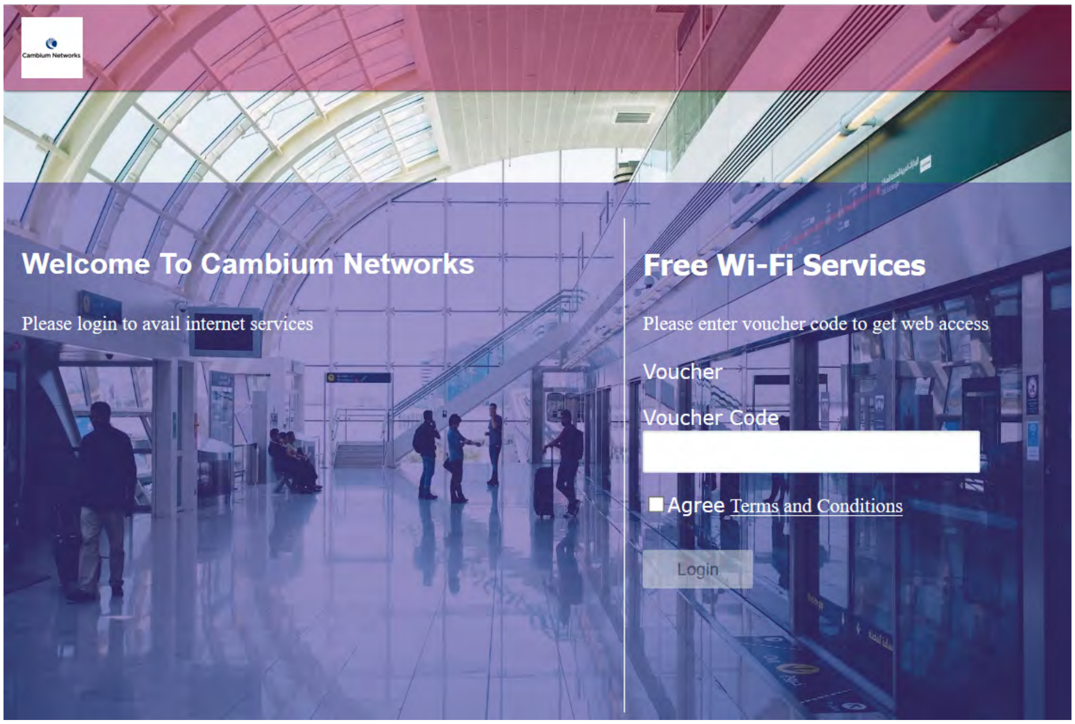
Portal Mode

○ Internal Access Point ○ External Hotspot ● cnMaestro

Guest Portal Name

diva_GA

Authentication – Redirected Splash Page



Welcome To Cambium Networks

Please login to avail internet services

Free Wi-Fi Services

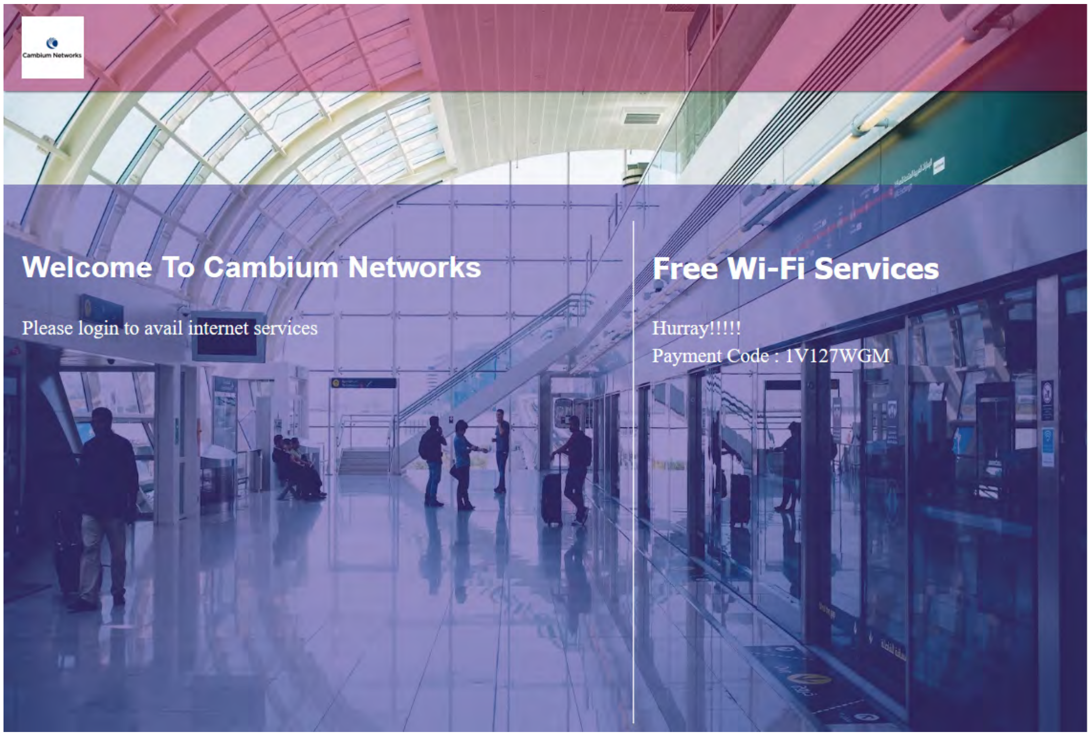
Please enter voucher code to get web access

Voucher

Voucher Code

□ Agree Terms and Conditions

Successful Login – Redirected Splash Page



Welcome To Cambium Networks

Please login to avail internet services

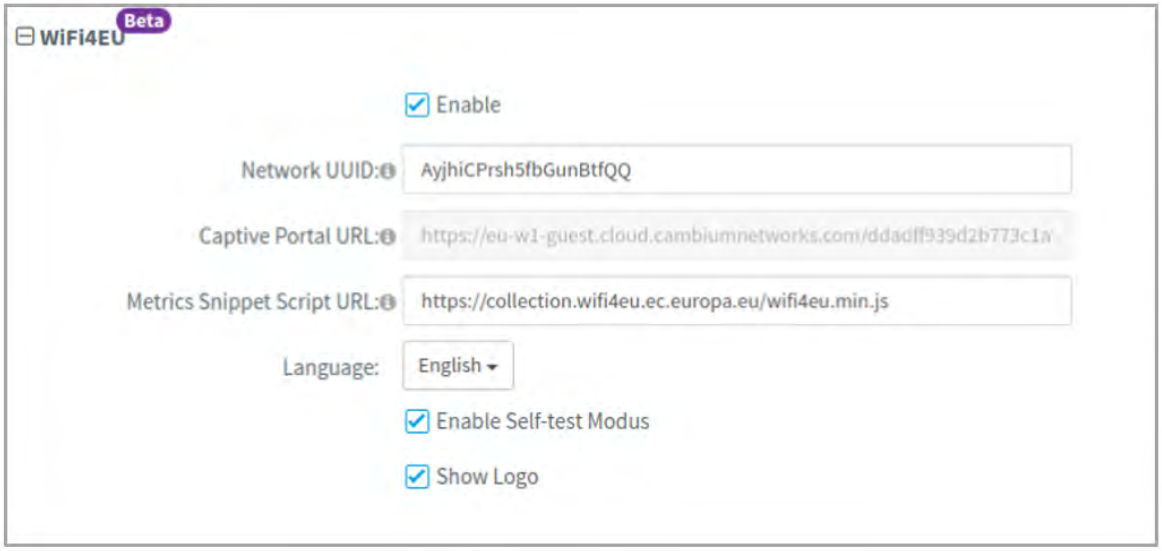
Free Wi-Fi Services

Hurray!!!!!
Payment Code : 1V127WGM

WiFi4EU

Configuration

1. Configure Guest Access portal enabled in pre-requisites for WIFI4EU compatibility.



⊟ WiFi4EU Beta

☑ Enable

Network UUID: AyjhiCPrsh5fbGunBtfQQ

Captive Portal URL: https://eu-w1-guest.cloud.cambiumnetworks.com/ddadff939d2b773c1a

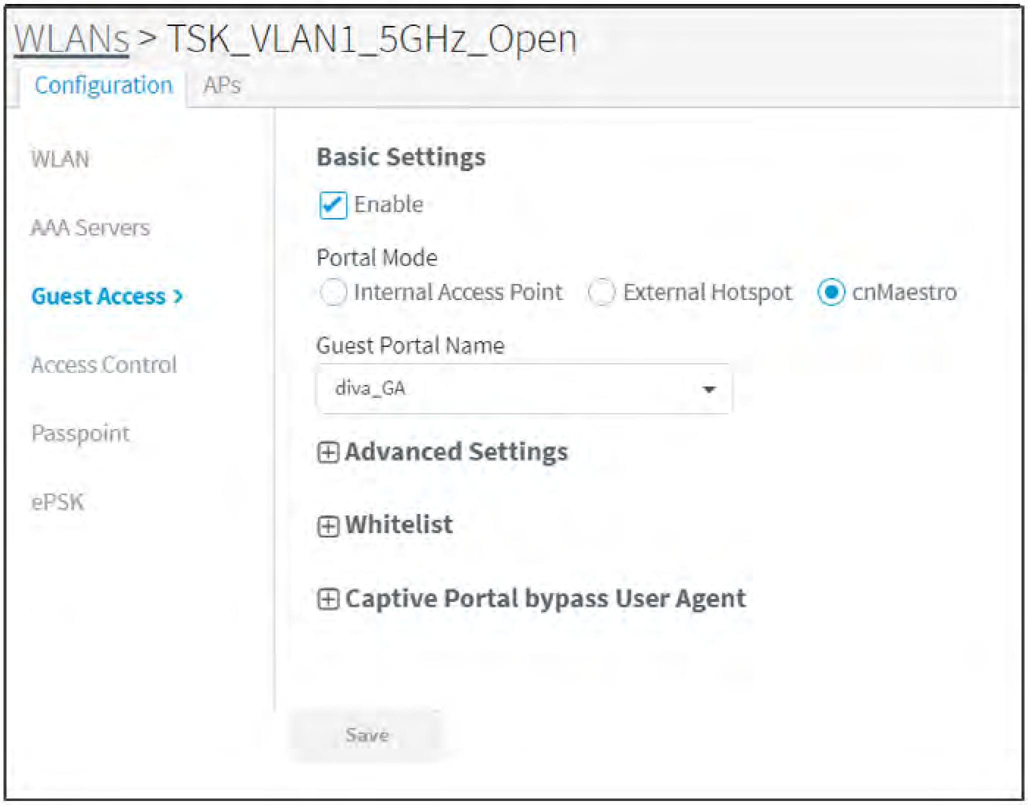
Metrics Snippet Script URL: https://collection.wifi4eu.ec.europa.eu/wifi4eu.min.js

Language: English

☑ Enable Self-test Modus

☑ Show Logo

2. Map the above profile to a WLAN profile and sync the configuration.



WLANs > TSK_VLAN1_5GHz_Open

Basic Settings

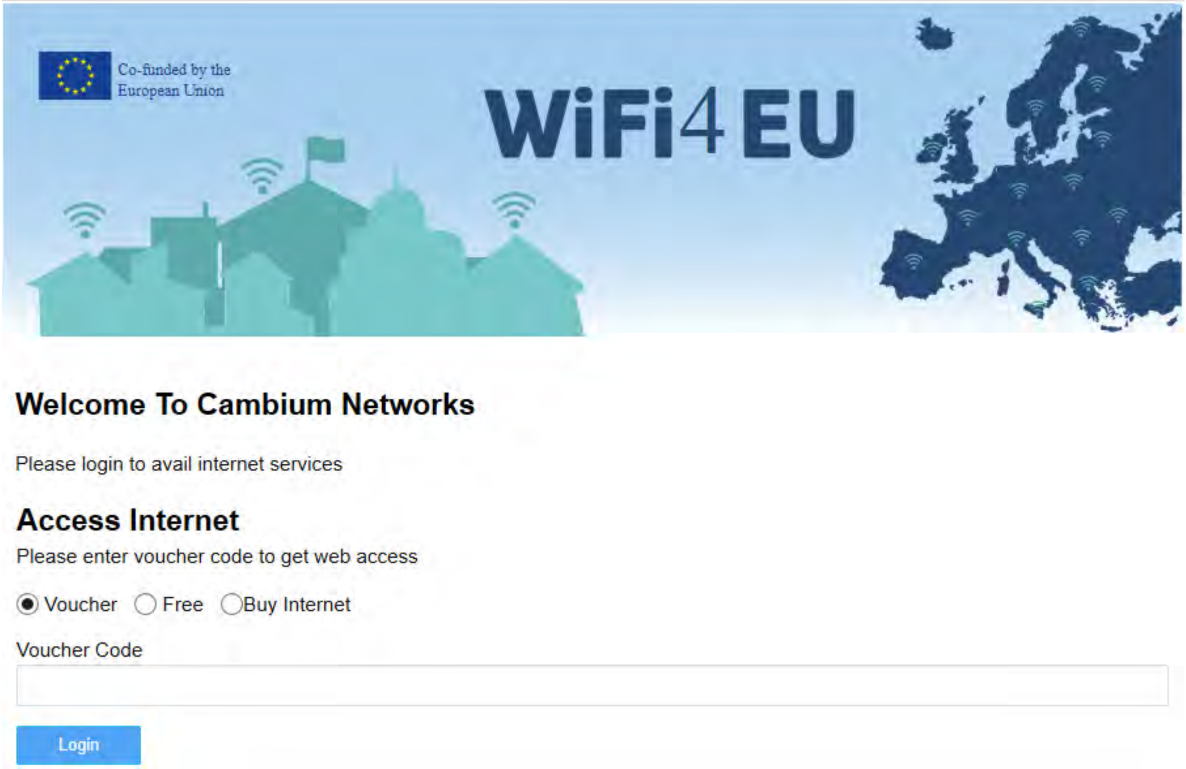
☑ Enable

Portal Mode

○ Internal Access Point ○ External Hotspot ● cnMaestro

Guest Portal Name: diva_GA

Authentication – Redirected Splash Page



Welcome To Cambium Networks

Please login to avail internet services

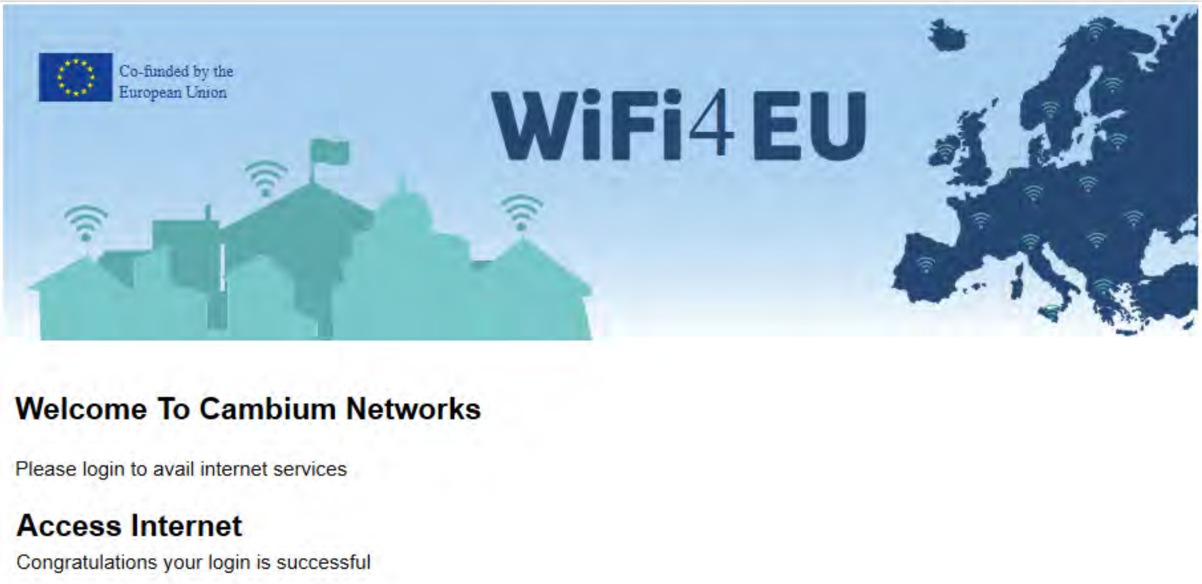
Access Internet

Please enter voucher code to get web access

● Voucher ○ Free ○ Buy Internet

Voucher Code

Successful Login – Redirected Splash Page



Welcome To Cambium Networks

Please login to avail internet services

Access Internet

Congratulations your login is successful

Chapter 19: Policy Based VLAN Assignment (PBA)

Introduction

The PBA is intended to support zero-touch detection and configuration for connected Cambium devices (cnPilot AP's). New Cambium vendor specific LLDP TLVs are introduced starting with cnMatrix Release 2.1.0 to support "pushing" PBA policy data from Cambium devices (e.g., cnPilot) to cnMatrix. The new PBA TLVs are implemented as an extension to the LLDP standard, using its flexible extension mechanism. From a functional perspective, cnMatrix, acting as the upstream device, includes the PBA Authentication TLV in the regularly generated LLDPDUs for a port. The downstream device (e.g., cnPilot) receives the PBA Authentication TLV and, if policy action data (e.g., VLANs, native VLAN) is present to be pushed to cnMatrix, a PBA device settings TLV is constructed and added to the LLDPDU for the port.

Table 68 lists the fields that are required for configuring PBA:

Table 68: Configuring PBA parameters

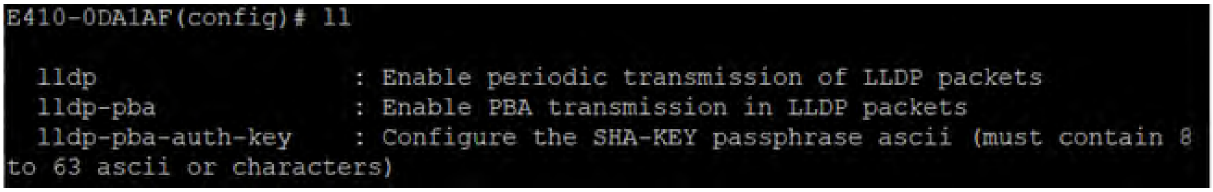
Parameters	Description	Range	Default
lldp-pba	New PBA TLVs will be shared with cnMatrix switch.	-	Enabled
lldp-pba-auth-key	The shared private key used during PBA TLV authentication can be updated or reset from its default value (by using the 'no' option).	-	Enabled

Note

lldp-pba-auth-key is by default enabled; key value cannot be shared due to security concerns.

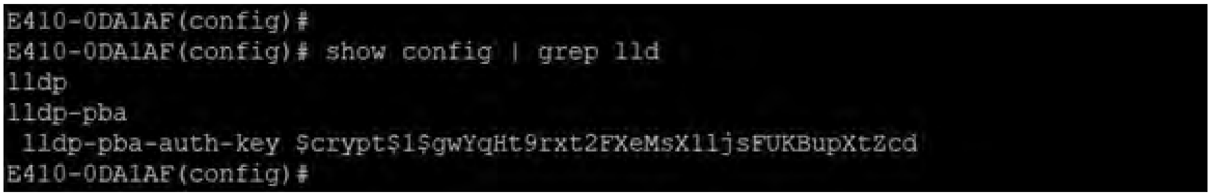
Configuration:

Syntax:



```
E410-0DA1AF(config)# ll

  lldp                    : Enable periodic transmission of LLDP packets
  lldp-pba                : Enable PBA transmission in LLDP packets
  lldp-pba-auth-key       : Configure the SHA-KEY passphrase ascii (must contain 8
to 63 ascii or characters)
```

Example:

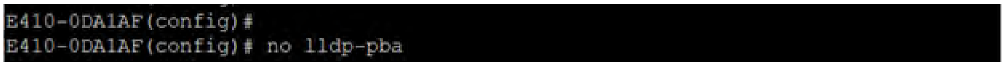


```
E410-0DA1AF(config)#
E410-0DA1AF(config)# show config | grep lld
lldp
lldp-pba
 lldp-pba-auth-key $crypt$1$gwYqHt9rxt2FXeMsX1ljsFUKBupXtZcd
E410-0DA1AF(config)#
```

Note

PBA will not be functioning if more than 20 VLANs are configured on the AP.

To disable PBA:



```
E410-0DA1AF(config)#
E410-0DA1AF(config)# no lldp-pba
```

Chapter 20: Device Recovery Methods

Factory reset via ‘RESET’ button

Table 69: Factory reset via RESET button

cnPilot Access Point	Procedure	LED Indication
e400	Press and hold Reset button for 15 seconds	Both LEDs will be OFF and turned onto Amber
e410	Press and hold Reset button for 25 seconds	LED will be OFF and turned onto Amber
e600	Press and hold Reset button for 20 seconds	LED will be OFF and turned onto Amber
e430	Press and hold Reset button for 25 seconds	LED will be OFF and turned onto Amber
e700	Press and hold Reset button for 25 seconds	Both LEDs will be OFF and turned onto Amber
E500	Press and hold Reset button for 25 seconds	Both LEDs will be OFF and turned onto Amber
E501S	Press and hold Reset button for 25 seconds	Both LEDs will be OFF and turned onto Amber
e502S	Press and hold Reset button for 25 seconds	Both LEDs will be OFF and turned onto Amber
e425H	Press and hold Reset button for 20 seconds	LED will be OFF and turned onto Amber
e505	Press and hold Reset button for 20 seconds	LED will be OFF and turned onto Amber
e510	Press and hold Reset button for 20 seconds	Both LEDs will be OFF and turned onto Amber

Factory reset via power cycle

Table 70: Factory reset via power cycle

cnPilot Access Point	Procedure
E400	Not Applicable
e410	Not Applicable
e600	Not Applicable
e430	Not Applicable
e700	Not Applicable
E500	Follow power ON and OFF for 5 times with interval of 7 Sec (ON) and 5 Sec (OFF)
E501S	Follow power ON and OFF for 5 times with interval of 7 Sec (ON) and 5 Sec (OFF)
e502S	Follow power ON and OFF for 5 times with interval of 7 Sec (ON) and 5 Sec (OFF)
e425H	Not Applicable
e505	Not Applicable
e510	Not Applicable

To disable factory reset when above power sequence occurs, run the following CLI command:

```
E500-Factory_Reset(config)# no service powercycle-factory-default
```

```
E500-Factory_Reset(config)# save
```

Boot partition change via power cycle

Table 71: Boot partition change via power cycle

cnPilot Access Point	Procedure
E400	Follow power ON and off for 9 times with interval of 7 Sec (ON) and 5 Sec (OFF)
e410	Follow power ON and off for 9 times with interval of 15 Sec (ON) and 5 Sec (OFF)
e600	Follow power ON and off for 9 times with interval of 7 Sec (ON) and 5 Sec (OFF)
e430	Follow power ON and off for 9 times with interval of 15 Sec (ON) and 5 Sec (OFF)
e700	Follow power ON and off for 9 times with interval of 15 Sec (ON) and 5 Sec (OFF)
E500	Follow power ON and off for 9 times with interval of 7 Sec (ON) and 5 Sec (OFF)

cnPilot Access Point	Procedure
E501S	Follow power ON and off for 9 times with interval of 7 Sec (ON) and 5 Sec (OFF)
e502S	Follow power ON and off for 9 times with interval of 7 Sec (ON) and 5 Sec (OFF)
e425H	Follow power ON and off for 9 times with interval of 9 Sec (ON) and 5 Sec (OFF)
e505	Follow power ON and off for 9 times with interval of 9 Sec (ON) and 5 Sec (OFF)
e510	Follow power ON and off for 9 times with interval of 15 Sec (ON) and 5 Sec (OFF)

Glossary

Term	Definition
AP	Access Point Module. One module that distributes network or Internet services to subscriber modules.
API	Application Program Interface
ARP	Address Resolution Protocol. A protocol defined in RFC 826 to allow a network element to correlate a host IP address to the Ethernet address of the host.
BHM	Backhaul Timing Master (BHM)- a module that is used in a point to point link. This module controls the air protocol and configurations for the link.
BHS	Backhaul Timing Slave (BHS)- a module that is used in a point to point link. This module accepts configuration and timing from the master module.
BT	Bluetooth
DFS	See Dynamic Frequency Selection
DHCP	Dynamic Host Configuration Protocol defined in RFC 2131. Protocol that enables a device to be assigned a new IP address and TCP/IP parameters, including a default gateway, whenever the device reboots. Thus, DHCP reduces configuration time, conserves IP addresses, and allows modules to be moved to a different network within the system.
Ethernet Protocol	Any of several IEEE standards that define the contents of frames that are transferred from one network element to another through Ethernet connections.
FCC	Federal Communications Commission of the U.S.A.
GPS	Global Positioning System. A network of satellites that provides absolute time to networks on earth, which use the time signal to synchronize transmission and reception cycles (to avoid interference) and to provide reference for troubleshooting activities.
UI	User interface.
HTTP	Hypertext Transfer Protocol, used to make the Internet resources available on the World Wide Web.
HTTPS	Hypertext Transfer Protocol Secure
HT	High Throughput
IP Address	32-bit binary number that identifies a network element by both network and host. See also Subnet Mask.
IPv4	Traditional version of Internet Protocol, which defines 32-bit fields for data transmission.
LUID	Logical Unit ID. The final octet of the 4-octet IP address of the module.
MAC Address	Media Access Control address. The hardware address that the factory assigns to the module for identification in the Data Link layer interface of the Open Systems Interconnection system. This address serves as an electronic serial number.

Term	Definition
Maximum Information Rate (MIR)	The cap applied to the bandwidth of an SM or specified group of SMs. In the Cambium implementation, this is controlled by the Sustained Uplink Data Rate, Uplink Burst Allocation, Sustained Downlink Data Rate, and Downlink Burst Allocation parameters.
MIB	Management Information Base. Space that allows a program (agent) in the network to relay information to a network monitor about the status of defined variables (objects).
MIR	See Maximum Information Rate.
PPPoE	Point to Point Protocol over Ethernet. Supported on SMs for operators who use PPPoE in other parts of their network operators who want to deploy PPPoE to realize per-subscriber authentication, metrics, and usage control.
Proxy Server	Network computer that isolates another from the Internet. The proxy server communicates for the other computer, and sends replies to only the appropriate computer, which has an IP address that is not unique or not registered.
SLA	Service Level Agreement
VLAN	Virtual local area network. An association of devices through software that contains broadcast traffic, as routers would, but in the switch-level protocol.
VPN	Virtual private network for communication over a public network. One typical use is to connect remote employees, who are at home or in a different city, to their corporate network over the Internet. Any of several VPN implementation schemes is possible. SMs support L2TP over IPSec (Level 2 Tunneling Protocol over IP Security) VPNs and PPTP (Point to Point Tunneling Protocol) VPNs, regardless of whether the Network Address Translation (NAT) feature enabled.
VHT	Very High Throughput