





CONFIGURATION GUIDE

cnWave™ 5G Fixed

Release 4.2



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About This Guide

This document explains how to configure the **cnWave™ 5G Fixed** platform of products. It is intended for use by the system designer, system installer, and system administrator.

Purpose

Documents specific to the cnWave[™] 5G Fixed platform of products are intended to instruct and assist personnel in the operation, installation, and maintenance of the Point-to-MultiPoint (PMP) equipment (Cambium Networks) and ancillary devices of cnWave[™] 5G Fixed platform of products. It is recommended that all personnel engaged in such activities must be properly trained.

Cambium Networks disclaims all liability, whatsoever, implied or express - 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.

Cross references

References to external publications are shown in italics. Other cross references, emphasized in blue text in electronic versions, are active links to the references.

This document is divided into topics that are divided into sections. Sections are not numbered and are listed in the table of contents.

Feedback

We appreciate feedback from the users of our documents. This includes feedback on the structure, content, accuracy, or completeness of our documents. To provide feedback, visit the Cambium Networks <u>Support</u> site.

Warnings, cautions, and notes

The following sections describe how warnings, notes, and cautions are used in this document and in all documents of Cambium Networks:

Warnings

Warnings precede instructions that contain potentially hazardous situations. Warnings are used to alert the reader to possible hazards that could cause loss of life or physical injury. A warning has the following format:



Warning

Warning text and consequence for not following the instructions in the warning.

Cautions

Cautions precede instructions and are used when there is a possibility of damage to systems, software, or individual items of equipment within a system. However, this damage presents no danger to personnel. A caution has the following format:



Caution

Caution text and consequence for not following the instructions in the caution.

Notes

A note means that there is a possibility of an undesirable situation or provides additional information to help the reader understand a topic or concept. A note has the following format:



Note text.

Note

Important regulatory information

The cnWave[™] 5G Fixed platform of products are certified as an unlicensed device in frequency bands where it is not allowed to cause interference to licensed services (called primary users of the bands).

Complying with rules for the country of operation

USA specific information



Caution

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.



Note

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

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

Canada specific information



Caution

This device complies with ISEDC 's license-exempt RSSs. Operation is subject to the following two conditions:

- This device may not cause interference.
- This device must accept any interference, including interference that may cause undesired operation of the device. This device must accept any interference, including interference that may cause undesired operation of the device.



Note

Certification note from industry Canada: While this equipment meets the technical requirements for its operation in its rated paired block arrangement, this block arrangement is different than the 40 + 40 MHz block arrangement prescribed in documents RSS-191 and SRSP-324.25. The operation of this equipment IS NOT permitted if the out-of-band and spurious emission limits are not met at the edge of any contiguous licensed spectrum. It should be noted that all current relevant spectrum policies, licensing procedures, and technical requirements are still applicable. For additional information, contact the local Industry Canada office.

Renseignements spécifiques au Canada

Note

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

- L'appareil ne doit pas produire d'interférences; et
- L'utilisateur de l'appareil doit accepter toute interférence radioélectrique, même si elle est susceptible d'en compromettre le bon fonctionnement.

European specific information

The cnWave[™] 5G Fixed platform of products are compliant with applicable European Directives required for CE marking:

- 2014/53/EU of the European Parliament and of the Council of 16 April 2014 on the harmonization of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC; Radio Equipment Directive (RED).
- 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS Directive).

• Cambium Networks complies with the European Regulation 2023/988 of 10 May 2023 on General Product Safety. EU Authorized Representative: Cambium Networks Europe B.V., Muiderstraat 1, 1011PZ Amsterdam, Netherlands. Contact Information: <u>GPSR@cambiumnetworks.com</u>.

EU Declaration of Conformity

Hereby, Cambium Networks declares that the Cambium Networks cnWave[™] 5G Fixed Series of Wireless Ethernet Bridge complies with the essential requirements and other relevant provisions of Directive 2014/53/EU. The declaration of conformity may be consulted at <u>https://www.cambiumnetworks.com/</u>.

Application software (firmware)

Download the latest cnWave[™] 5G Fixed products' software and install it in the Base Transceiver System (BTS) and Customer Equipment Premise (CPE) before deploying the equipment. Instructions for installing software are provided in the *cnWave[™]* 5G Fixed Planning and Installation Guide (available at https://support.cambiumnetworks.com/files/28cnwave/).

Ethernet networking skills

The installer must have the ability to configure the IP address on a PC and to set up and control products using a web user interface (UI).

Lightning protection

To protect outdoor radio installations from the impact of lightning strikes, the installer must be familiar with the normal procedures for site selection, bonding, and grounding. Installation guidelines for the cnWave[™] 5G Fixed platform of products are available in the Lightning Protection Units (LPUs) section in the *cnWave[™]* 5G Fixed Planning and Installation Guide.

Specific expertise and training for professional installers

To ensure that the cnWave[™] 5G Fixed product series are installed and configured in compliance with the requirements of EU, ISEDC, and the FCC, installers must have the radio engineering skills and training described in this section.

Use the Training link to access the technical training programs (from Cambium Networks).

Legal and Open-Source Software statements

Refer to the cnWave[™] 5G Fixed Legal and Open-Source Guide for:

- Cambium Networks end user license agreement and
- Open-Source Software Notices.

Problems and warranty

Reporting problems

If any problems are encountered when installing or operating this equipment, follow this procedure to investigate and report:

- 1. Search this document and the software release notes of supported releases.
- 2. Visit the <u>Support</u> site of Cambium Networks.
- 3. Ask for assistance from the Cambium Networks product supplier.

- 4. Gather information from affected units, such as any available diagnostic downloads.
- 5. Escalate the problem by emailing or telephoning support.

Repair and service

If unit failure is suspected, obtain details of the Return Material Authorization (RMA) process from the <u>Support</u> site.

Hardware warranty

Cambium's standard hardware warranty is for one (1) year from the date of shipment from Cambium Networks or a Cambium distributor. Cambium Networks warrants that hardware will conform to the relevant published specifications and will be free from material defects in material and workmanship under normal use and service. Cambium shall within this time, at its own option, either repair or replace the defective product within thirty (30) days of receipt of the defective product. Repaired or replaced products will be subject to the original warranty period but not less than thirty (30) days.

To register PMP and PTP products or activate warranties, visit the support website. For warranty assistance, contact the reseller or distributor. The removal of the tamper-evident seal will void the warranty.



Caution

Using non-Cambium parts for repair could damage the equipment or void warranty. Contact Cambium for service and repair instructions.

Portions of Cambium equipment may be damaged from exposure to electrostatic discharge. Use precautions to prevent damage.

Security advice

Cambium Networks systems and equipment provide security parameters that can be configured by the operator based on their particular operating environment. Cambium Networks recommends setting and using these parameters following industry recognized security practices. Security aspects to be considered are protecting the confidentiality, integrity, and availability of information and assets. Assets include the ability to communicate, information about the nature of the communications, and information about the parties involved.

In certain instances, Cambium Networks makes specific recommendations regarding security practices, however the implementation of these recommendations and final responsibility for the security of the system lies with the operator of the system.

Caring for the environment

The following information describes national or regional requirements for the disposal of Cambium Networks supplied equipment and for the approved disposal of surplus packaging.

In EU countries

The following information is provided to enable regulatory compliance with the European Union (EU) directives identified and any amendments made to these directives when using Cambium Networks equipment in EU countries.

Disposal of Cambium equipment

European Union (EU) Directive 2012/19/EU Waste Electrical and Electronic Equipment (WEEE).

Do not dispose the Cambium Networks equipment at landfill sites. For disposal instructions, refer to https://www.cambiumnetworks.com/support/compliance/.

Disposal of surplus packaging

Do not dispose the surplus packaging in landfill sites. In the EU, it is the individual recipient's responsibility to ensure that packaging materials are collected and recycled according to the requirements of EU environmental law.

In non-EU countries

In non-EU countries, dispose of Cambium equipment and all surplus packaging in accordance with national and regional regulations.

Preparing for Configuration

This section provides basic information about the cnWave[™] 5G Fixed platform of products and prerequisite tasks. This information helps you to set up the system before proceeding with the configuration of the cnWave[™] 5G Fixed products and antenna alignment tasks.

This section covers the following topics:

- Basic information about the product
- Safety precautions
- Regulatory compliance
- Prerequisite tasks

Basic information about the products

The cnWave[™] 5G Fixed platform of products (from Cambium Networks) are a high-end Point-to-Multipoint (PMP) system providing easy, fast, and cost-effective wireless Gigabit connectivity for edge access solutions at a significantly lower cost than fiber infrastructure.

The cnWave[™] 5G Fixed platform consists of a B1000 Base Transceiver Station (BTS), which serves one or more C100 Customer Premises Equipment (CPE).

With the cnWave[™] 5G Fixed platform of products, operators and service providers have access to Gigabit for business and residential connectivity and backhaul for Wi-Fi access. These products enable carriers and service providers to offer high-speed broadband connectivity to subscribers in areas not reachable through full-fiber networks.

For more information about the product description and installation (including frequency bands and hardware requirements), refer to the *cnWave™ 5G Fixed Planning and Installation Guide*.

Safety precautions

All national and local safety standards must be followed while configuring the units and aligning the antennas.



Warning

Ensure that the personnel is not exposed to unsafe levels of RF energy. The units start to radiate RF energy as soon as they are powered up. Respect the safety standards defined in Legal and Open Sources Guide, in particular the minimum separation distances.

Observe the following guidelines:

- 1. Never work in front of the antenna when the Outdoor Unit (ODU) is powered.
- Always power down the Power Supply Unit (PSU) before connecting or disconnecting the drop cable from the PSU, ODU, or Lightning Protection Unit (LPU).

Regulatory compliance

All BTS and CPE specific radio regulations must be followed while configuring the units and aligning the antennas. For more information, refer to the Compliance with radio regulations section in the Legal and Open Sources Guide.

Prerequisite tasks

Before performing the configuration tasks, ensure that you have met the following hardware requirements (for example):

- A personal computer (PC) or laptop if you want to connect directly to either B1000 BTS or C100 CPE.
- B1000 BTS or C100 CPE with IP address configured (as described in the <u>Configuring the</u> management PC section).
- A RADIUS Server for CPE authentication and provisioning.

For more information about the main hardware requirements, cabling, and power related tasks, refer to the *cnWave™ 5G Fixed Planning and Installation Guide*.



Note

In the later sections of this guide, the term BTS is used to refer to B1000 BTS and the term CPE to refer to C100 CPE.

To put the whole system together, you must perform the following prerequisite tasks:

- 1. Connecting and configuring the BTS or the CPE device
- 2. Configuring the PC to set up the IP address for the BTS or the CPE
- 3. Accessing the user interface (UI)

These prerequisite tasks help you to ensure that each component of the system is working before the final integration.

Connecting and configuring the BTS or the CPE device

Using a laptop or PC, perform the following steps to configure the BTS or the CPE device:

- 1. Connect the 56V 240W PSU to the MAIN port on the BTS or the PC (in the case of CPE). For more details, refer to the *cnWave™* 5G Fixed Planning and Installation Guide.
- 2. For BTS, connect an Ethernet cable between the network port of the PC and MAIN from the BTS. In case of the CPE, connect an Ethernet cable between the PoE data port and the CPE data port.
- 3. Configure the Network adapter card of the PC or laptop to connect to the BTS or the CPE.

The BTS or the CPE can be accessed by using the default IP address (169.254.1.1). For information about configuring the IP address, refer to the Configuring the management PC section.



Note

For detailed information about assembling, connecting, and powering up the cnWave[™] 5G Fixed products (BTS or CPE), refer to the *cnWave[™]* 5G Fixed Planning and Installation Guide.

Configuring the management PC

You must configure the PC (for example, using Windows PC) or laptop to set up the IP address (169.254.1.1) for the BTS. This configuration enables the PC to communicate with the BTS and CPEs.



Note

For information on how to connect cables and connect to power, refer to the *cnWave™ 5G* Fixed Planning and Installation Guide.

To configure the PC, perform the following steps:

1. On Windows PC, click Start > Settings > Network & Internet.

The Network Status page appears with multiple options on the left navigation column.

2. Select Ethernet > Change adapter settings.

The Network Connections page appears.

3. Select Ethernet and right-click to select Properties.

The **Ethernet Properties** dialog box appears with the **Networking** and **Sharing** tabs, as shown in Figure 1.

Figure 1: The Ethernet Properties dialog box

Ethernet Properties	×
Networking Sharing	
Connect using:	
Intel(R) Ethemet Connection I219-LM	
<u>C</u> onfigure	
This connection uses the following items:	
Client for Microsoft Networks	
File and Printer Sharing for Microsoft Networks	
QoS Packet Scheduler	
✓ Internet Protocol Version 4 (TCP/IPv4)	
Microsoft Network Adapter Multiplexor Protocol	
Microsoft LLDP Protocol Driver	
✓ Internet Protocol Version 6 (TCP/IPv6)	
< >>	
Instal Uninstall Properties	
Description	
Transmission Control Protocol/Internet Protocol. The default wide area network protocol that provides communication across diverse interconnected networks.	
OK Cancel	

By default, the **Networking** tab is selected.

- 4. Select Internet Protocol Version 4 (TCP/IPv4) from the available list of connections (as shown in Figure 1).
- 5. Click **Properties**.

The Internet Protocol Version 4 (TCP/IPv4) Properties dialog box appears, as shown in Figure 2.

Figure 2: The Internet Protocol Version 4 Properties dialog box

Internet Protocol Version 4 (TCP/IPv4)	Properties ×
General	
You can get IP settings assigned autom this capability. Otherwise, you need to for the appropriate IP settings.	natically if your network supports ask your network administrator
Obtain an IP address automatical	у
• Use the following IP address:	
IP address:	169.254.1.100
Subnet mask:	255.255.255.0
Default gateway:	
Obtain DNS server address autom	atically
• Use the following DNS server add	resses:
Preferred DNS server:	
Alternate DNS server:	· · ·
Validate settings upon exit	Advanced
	OK Cancel

6. In the **Use the following IP address** section, type an appropriate IP address in the **IP address** text box. Example: 169.254.1.1

If you are using 169.254.1.1 as the default address, you must avoid using 169.254.0.0 and 169.254.1.1 IP addresses.

- 7. In the **Subnet mask** text box, type 255.255.255.0.
- 8. Leave the **Default gateway** text box blank and click **OK**.
- 9. Ensure that you can communicate with the BTS by running a continuous PING session at a command prompt.

Example: You must run a command prompt and type Ping -t 169.254.1.1. If the PING is successful, you can access the login page of B1000 (BTS) using the http://169.254.11 URL.

Accessing the B1000 UI

To access the B1000 UI, perform the following steps:

- 1. Use the default IP address (169.254.1.1) to connect to the BTS setup.
- 2. Ensure that your PC is set up to communicate with the required range of IP addresses.
- 3. Open a web browser and type the URL http://169.254.1.1 to access the B1000 UI.

The **Sign In** page appears, as shown in Figure 3.

Figure 3: The Sign In page for B1000 UI



4. Type an appropriate username and password.

Default username: admin

Default password: admin

You can use the show-password eye icon ((?)) to view the password characters.

5. Click Sign In.

The **Profile** page appears, as shown in Figure 4. This page allows you to change the password.



Note

Do not change the password every time when the **Profile** page appears. You must change the password only when it is required.

You can also access the **Profile** page by selecting **Profile** from the **admin** drop-down list on the top right side of the B1000 UI.

Figure 4: The Profile page

	Cam	nbium Networks │Cn Wave [™] 5	5G Fixed B1000			Undo 🖸 Save 🔒	O Administrator	💄 admin 👻
-14		Profile						
•		Change Passphrase		~ ⊞	Options			× 🗉 🗎
			admin			Highlight Changes		
\$		Account Name	The current passphrase for this account is expired and should be changed immediately.		Preferences	Login Page Background Image		
*		Current Passphrase	Current Passphrase	8				
		New Passphrase	New Passphrase	8				
		New Passphrase Confirm	New Passphrase Confirm	8				
			Change Passphrase					

Table 1 lists and describes the parameters available on the **Profile** page.

Parameter	Description			
Change Passphrase				
Account Name	The default name of the user account required for accessing the B1000 UI.			
	This is a read-only parameter.			
	The default password used for the first time log in or the old password used for the previous access.			
Current Passphrase	Enter the current password in the text box.			
	Default password: admin			
New Decembrace	Enter a new password in the text box.			
New Passphrase	Note : The maximum character limit for the password is eight.			
New Passphrase Confirm	Reenter the new password in the text box to confirm.			
Change Decembrace	An option to change the current password.			
Change Passphrase	Click Change Passphrase to change the current password.			
Options Used for the engineerin	g purpose.			
	An option to set your preferences in the UI.			
	The following options are supported:			
Preferences	 Highlight Change: Use this option to easily identify the new changes, which are highlighted in light yellow color on UI pages. These highlighted values help you quickly monitor the system changes. Example: The System > Interface UI page displays the highlighted values in light yellow color. 			
	• Login Page Background Image: Use this option to set the background image on the Sign In page of UI (as shown in Figure 3).			
	Select the required options.			

Table 1: List of parameters in the Profile page

6. On changing the password, log on to the B1000 UI using admin (username) and the new password (which you set on the **Profile** page).

The **Profile** page appears, as shown in Figure 4.

7. To view the main B1000 dashboard, click the icon (Dashboard) on the left navigation pane.

The **Dashboard** page appears. For more information about the B1000 dashboard page, refer to the Viewing the B1000 dashboard section.



Note

To log out from the UI, select **Logout** from the **admin** drop-down list at the top right side of the UI.

To change the password, select **Profile** from the **admin** drop-down list. For more information on changing the password and setting preferences, refer to Table 1.

When you log on to the B1000 UI, you can use the required UI controls (as described in Table 1) for configuring and managing BTS.



Note

For information on how to access the C100 (CPE) UI, refer to the <u>Accessing the C100 UI</u> section.

The B1000 Dashboard

This section provides information about UI controls and the main B1000 dashboard page. It also explains how to configure BTS using the B1000 UI.

This section covers the following topics:

- UI Controls
- Viewing the B1000 Dashboard
- Configuring B1000 (BTS)

UI Controls

Before configuring the UI of B1000 and C100, familiarize yourself with the UI controls (as described in Table 2). These UI controls are required for adding, viewing, and managing B1000 and C100 configurations.

UI Control	UI Control name	Description			
8	Dashboard	To open the main dashboard page of the required product.			
		Applicable to both B1000 and C100 Uls.			
	System	To configure the required system settings of cnWave™ 5G Fixed platform of products.			
		For BTS:			
		• General			
		Management			
		• Radio			
		Interface			
*		SFP Module			
		CPE Provisioning			
		Synchronisation			
		• Syslog			
		For CPE:			
		• General			
		Management			
		• Radio			

Table 2: List of UI controls

UI Control	UI Control name	Description				
		Interface				
		Session				
		RADIUS Authentication				
		Applicable to both B1000 and C100 UIs.				
4	Subscribers	To view (read-only) all the data related to CPE subscribers.				
		Applicable only to the B1000 UI.				
×	Tools	To update firmware and reboot the unit.				
		Applicable to both B1000 and C100 UIs.				
A	Setup Wizard	To configure the CPE (for example, frequencies, power, polarisation, and other configurations).				
		Applicable only to the C100 UI.				
Other common L	JI controls:					
	Expand or collapse	To expand or collapse the options in the left navigation column of the dashboard.				
~	Expand	To expand the parameters of a section.				
^	Collapse	To collapse the parameters of a section.				
B	Table	To view the parameters in a column format.				
5	Revert	To go back to the previous option.				
5	Undo	To undo the changes.				
•	Save	To save the changes.				
С С	Power	To restart or reboot the system from the UI.				
2	admin	To change the password of the UI and log out from the UI.				

Viewing the B1000 dashboard

When you log on to the B1000 UI (as described in the <u>Accessing the B1000 UI</u> section), the main B1000 dashboard page appears as shown in Figure 5.

Figure 5: The B1000 dashboard

Ca	mbium Networks	cn Wave ™ 5G Fixed B10	00				Undo 🖒 Save 🖥	Φ	Administrator	💄 admin 👻
÷H	General Device	Radio GNSS								
:	Device		Sessions							
	000456700188	8d 17h 47m	8	8						
*	ESN	Uptime	Connected CPEs	Registered CPEs						
4	Device Summary			~ E	Network					~ ⊞
14	Product Name	cnWave 5G Fixed B	ase Transceiver Station (BTS)	() MAC	00:04:56:70:01:88				
2	1 Release Name	4.1b2			IP Address	169.254.3.99				
	System Description	Cambium Networks	cnWave 5G Fixed Base Tran	sceiver Station (BTS) 4.0b2 aarch64	Prefix	24				
	Suctom Name	GNU/LINUX	wara		0 Default Gateway	169.254.3.253				
	System Location	D1 Lab	wale		M AN					
	System Contact	vassine								× 🖽
	System Time	2024-05-24 06:26:18	1		Management VID Priority	0				
	NTP Synchronized				VLAN Enabled	Enabled				
	cnMaestro Connection	Status Connected			O Q-in-Q Ether Type	0x8100				
	Subscribers			~ E	Radio					~ ⊞
	Connected CPEs	8			Calibration Status	Calibrated				
	Registered CPEs	8				Tx Enabled				_
					Tx State	Transmit control o	overridden by Engineerin	key		

The B1000 dashboard provides a simple representation of the number of CPEs connected and registered with BTS, and the connection status of CPEs. Example: Figure 5 shows the B1000 dashboard, which indicates the number of CPEs that are registered to and connected with BTS.



Note

Currently, the B1000 BTS device can support up to 120 CPE connections.

You can also use the **Dashboard** (1) icon to view the main B1000 dashboard page. The main B1000 dashboard page contains the following tabs:

- General
- Device
- Radio
- GNSS
- Accounts (visible and applicable only to engineer user roles)

General

The **General** page provides a summary (read-only) of the connected and registered devices. It also displays the subscriber status, VLAN, radio, and other system-related details of the BTS. Table 3 lists and describes parameters available on the **General** page.

Parameter	Description				
Device	Indicates the Electronic Serial Number (ESN) of the hardware device and its run time.				
Sessions	Total number of currently connected and registered CPEs.				
Device Summary					
Droduct Name	Name of the device that you have deployed.				
	Example: cnWave 5G Fixed Base Transceiver Station (BTS)				
Release Name	Release number of the operational software.				
System Description	A brief description of the system (device).				
System Name	An administratively assigned name of the device.				
Systemmanie	When using DNS, this name must be the device's fully qualified domain name (FQDN).				
System The physical location of the device node. Location					
SystemContact details of the device administrator.Contact					
System Time	Date and time (in YYYY-MM-DD 24-hour format) that are configured in the system.				
	Determines whether BTS is using Network Time Protocol (NTP) to receive time from a reference clock.				
	If the checkbox is selected, then the BTS is using NTP.				
Synchronized	You can set NTP on the Synchronisation page. For more details, refer to the <u>Synchronisation</u> section.				
	Note : NTP is a networking protocol that allows you to automatically sync your system date and time with a remote server. NTP sets the reference time and date in the BTS.				
cnMaestro	Indicates the connection status of cnMaestro™ (a network management platform).				
Connection Status	For more information on configuring cnMaestro, refer to the <u>cnMaestro Configuration</u> section.				
Subscribers					
Connected CPEs	Number of CPEs that are currently connected to the BTS.				
RegisteredNumber of CPEs that are currently registered and authenticated with the BTS.CPEs					
Network					
МАС	The Ethernet Media Access Control (MAC) address that is assigned to the network interface and used for the device management.				
IP Address	The IP address that is assigned to the network interface and used for the device management.				

Table 3: List of parameters on the General page

Parameter	Description					
Prefix	The IP network prefix that is assigned to the network interface and used for the device management.					
Default Gateway	The IP address of the default gateway (if any) that is used for the device management.					
VLAN						
	The VLAN ID that is used to communicate with BTS and CPE for management purpose.					
Management VID	The default value of this parameter is 1, which implies that there is no VLAN in the system.					
	You can set the VID value between 2 and 4094 on the General page. For more details, refer to the <u>Configuring system settings</u> section.					
Management VID Priority	The priority value that is set for the management VLAN ID.					
	Determines whether the VLAN functionality for the BTS and all linked CPEs is enabled.					
VLAN Enabled	Default value: Disabled					
	For more details, refer to the <u>Configuring system settings</u> section.					
	The Ether types for Q-in-Q (802.1ad) and outer tags (S-Tag).					
Q-in-Q Ether Type	Example: 0x88a8					
	You can configure this Ether type using the System > General page of the B1000 UI.					
Radio						
	Indicates the unit calibration status.					
Calibration Status	The calibrated status implies that BTS has been tested and calibrated for all the frequency ranges.					
	Note : A production unit showing an uncalibrated or a persistent uncalibrated state indicates a problem that requires factory repair.					
	Specifies the status of transmit control (Tx).					
	This is a read-only parameter. By default, this parameter is enabled.					
Tx State	Note : If the engineering keys (used for troubleshooting and support) are enabled, then this parameter displays a message (highlighted in orange) indicating that transmit control is overridden by the Engineering key. For more information about the engineering keys, refer to the <u>Engineering</u> section.					

Note

The Power icon (2), on the top right side of the page, allows you to restart (reboot) B1000 from the UI.

Device

The **Device** page displays information (read-only) about the device identifiers, system reboot, and the boot loader as shown in Figure 6.

Figure 6: The Device page

	Cam	bium Ne	etworks	cn Wa v	⁄e ™ 5G	Fixed B1000								Φ	Administrator	💄 admin 👻
ŧ		General	Device	Radio	GNSS											
:		Device Identifier		~		Power Supply							~ ⊞			
-		() MSN			V5YA0	12QT3091	Input Current 4.12 A									
•	• ESN 000456700183				1 Input Voltage		52.6 V									
		\rm SKU			C280500A101A											
12	6								Boot							~ ⊞
× .		Location					~		 Startup Reason 		Long Power C	lycle				
×	1 Latitude		50.523	805 DD			 Startup Count 		40							
		Longitude -3.74034 DD														
		 Altitude 			88.6 m	1			Shutdown							~ ⊞
									History	 Reason 		1 Date		Detail		
		Antenna (Drientation	ı			~	B	1	Power Loss		0000-00-00 00:00:0	0 6	loot afte	r long power cycl	
		 Antenna 	a Azimuth		90.0 °				2	Power Loss		0000-00-00 00:00:0	0 8	soot afte	r long power cycl	
		 Antenna 	a Tilt		-1.0 °				3	Power Loss		0000-00-00 00:00:0	0 E	oot afte	r long power cycl	2
									4	Power Loss		0000-00-00 00:00:0	0 E	loot afte	r long power cycl	2
		Boot Load	der				~		5	Power Loss		0000-00-00 00:00:0	0 E	oot afte	r long power cycl	
		🕕 Git Tag			develo	p/6/18			6	Firmware Upgrade		2024-11-08 13:30:0	7 0	nMaestr	o upgrade	
		Build Name BOO		BOOT	LOADER 18/2024-03-22 (W) 11:46:53 -0500			7	Configuration Char	nge	2024-10-11 13:07:0	0 F	Radio con	nfiguration chang	ed	
									8	Configuration Cha	nge	2024-10-11 12:22:4	6 F	Radio co	nfiguration chang	ed
		Hardware					~									
		1 Hardwa	re Version		Digits	P9.0 RF 6.0										
		0 RFID			X6057	0000202										

Table 4 lists and describes parameters available on the **Device** page.

Table 4	: Parameters	on the	Device page
---------	--------------	--------	-------------

Parameter	Description				
Device Identifier					
MSN	Manufacturer Serial Number (MSN) of the device that is used for device identification.				
ESN	Electronic Serial Number (ESN) of the device.				
SKU	Stock Keeping Unit (SKU) of the device.				
Location					
	Latitude (in DD) of the geographical location where the BTS device is located.				
Latitude	Note : Decimal degrees (DD) indicate latitude and longitude geographic coordinates in decimal fractions of a degree. Example: A positive latitude is north of the equator and a negative latitude is south of the equator. A DD to five decimal places is precise to approximately one metre.				
Longitudo	Longitude (in DD) of the geographical location where the BTS device is located.				
Longitude	Example: A positive longitude is east of the Prime Meridian and a negative longitude is west of the Prime Meridian.				

Parameter	Description					
Altitude	Altitude (in m) of the geographical location relative to mean sea level (MSL).					
Antenna Orientation						
	The direction in azimuth that the BTS is pointing towards.					
Antenna Azimuth	0.0, 90.0, 180.0, and 270.0 values (in degrees) correspond to magnetic North, East, South, and West, respectively.					
	Note : The radio does not use this value but reports the value to cnMaestro.					
	The tilt angle (in degrees) of the BTS antenna.					
Antenna Tilt	A positive value indicates that the antenna is pointing above the horizon.					
	Note : The radio does not use this value but reports the value to cnMaestro.					
Boot Loader						
Git Tag	ID of the software build version.					
Build Name	Build name of the BTS software.					
Hardware						
Hardware Version	Hardware version of the BTS device.					
RFID	The radio frequency (RF) module ID.					
Power Supply						
Input Current	The device measured input current (BTS only).					
Input Voltage	The device measured input voltage (BTS only).					
Boot						
	Indicates the reason for the previous system reboot.					
	The following reasons are supported:					
Startup Reason	• Non-Power Cycle: The device was reset without a power cycle.					
	• Short Power Cycle: Power to the device was briefly interrupted.					
	Long Power Cycle: Power to the device was interrupted.					
Startup Count	Indicates the counter that increments each time the device starts.					
Shutdown - Provides details of	the boot history.					
	Index of the boot history.					
History	The history for the most recent system reboot is always available in the first row.					

Parameter	Description
	Reasons specified for each boot history.
	The following boot reasons are supported:
	 Unspecified: The shutdown was not planned (for example, power loss or Watchdog reset).
	Shutdown: Shutdown due to a user action.
	 Firmware Upgrade: A firmware upgrade requiring a reboot to complete.
Reason	 Configuration Change: A configuration change requiring a reboot to complete.
	• User Action: A user action requiring a reboot.
	• Watchdog: A managed shutdown due to a fatal system fault.
	 Application Fatal: A managed shutdown due to an application managed error.
	 Application Panic: A managed shutdown due to an application fatal error.
Date	Date and time at which the system was rebooted.
Detail	A brief description of the reboot.

Radio

The **Radio** page displays information (read-only) about the key radio settings (as shown in Figure 7) configured using the **System > Radio** page. For more details about configuring the key radio settings, refer to the <u>Radio settings</u> section.

Figure 7: The Radio page

Can	nbium Networks │cn Wave ™	5G Fixed B1000							Ur	do 🖱 S	ave 🔒	c Ac	Iministrator	🔒 admin 👻
	General Device Radio G	INSS												
	Status	~ ⊞	MU-MIMO G	Group Ut	ilisation Ch	art							~	
	8 Frequency	27000.000 MHz		100										
:	Max EIRP	25.0 dBm		90										
	Polarisation	Horizontal		80										
	1 Link Symmetry	5:2		70										
٤	1 Bandwidth	112 MHz		60										
	UL Target Rx Power	-60 dBm		50										
	0 UL Tx Power Initial Adjust	Enabled		5e 50										
	UL Tx Power Continuous Adjust	Enabled		40										
	MUMIMO Control	Enabled		30										
				20		_								
	Radio Resource Control		~ ⊞	10										
	8 Rx RACH Counts	16		0			_							
	Tx SRB Messages	80			DL sec	DL min	DL hr	DL 24hr		UL	r	nin	UL hr	UL 24hr
	8 Rx SRB Messages	96												
		Reset RACH Counts		MUMIMO G	roup Util	lisation Det	ails							× 🖽
				Interval			DL sec	DL min	DL hr	DL 24hr	UL sec	UL min	UL hr	UL 24hr
	MU-MIMO Group Size Configuration	on	~ ⊞	() Idle (%)			1.1	45.8	97.1	99.6	23.5	57.6	96.4	98.4
	BL MUMIMO Max Group Size	6		O Ungroupe	d (%)		0.0	0.1	0.3	0.2	76.4	42.3	3.4	1.5
	UL MUMIMO Max Group Size	6		Groups of	2 (%)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				Groups of	13 (%)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				Groups of	4 (%)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				Groups of	5 (%)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				Groups of	16 (%)		98.8	54.0	2.4	0.1	0.0	0.0	0.0	0.0
				Groups of	P (9()		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				Groups of	o (/o)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				O Avg			6.0	6.0	5.4	2.4	1.0	1.0	1.0	1.0
				1 Max			6	6	6	6	1	1	5	5

In Figure 7, the DL MUMIMO utilisation in groups of six is shown as an example. The utilisation is expressed as the percentage of the available link capacity that has been utilised by the downlink scheduler. The measurement is updated every minute and shows the utilisation for the last second, one minute, one hour, and day (24 hours).

Table 5 lists and describes parameters available on the Radio page.

Parameter	Description				
Status					
Frequency	The operating frequency (in MHz) of the radio bearer.				
riequency	For more details on this parameter, refer to Table 10.				
Max EIRP	The maximum Effective Isotropic Radiated Power (EIRP) value in milliwatts (dBm).				
	For more details on this parameter, refer to Table 10.				
Delarisation	Determines the antenna polarisation settings.				
Polarisation	For more details on this parameter, refer to Table 10.				
Link Symmetry	The downlink (DL) or uplink (UL) ratio (symmetry) that is used for controlling the usage of signal slots.				
	For more details on this parameter, refer to Table 10.				
Bandwidth	Indicates the bandwidth (in MHz) of the radio channel spacing.				

Parameter	Description					
	For more details on this parameter, refer to Table 10.					
LIL Target By Dewer	The UL target receive power in dBm.					
	For more details on this parameter, refer to Table 10.					
LIL Ty Dowor Initial Adjust	Determines the initial power adjust mode of CPEs.					
OL TX Power Initial Adjust	For more details on this parameter, refer to Table 10.					
UL Tx Power Continuous	Determines the continuous power adjust mode of CPEs.					
Adjust	For more details on this parameter, refer to Table 10.					
MUMIMO Control	Determines the Multiple User Multiple Input Multiple Output (MUMIMO) control mode of CPEs.					
	For more details on this parameter, refer to Table 10.					
Radio Resource Control						
	Number of registration requests received on uplink Random Access Channel (RACH).					
RX RACH Counts	An increase in the number of requests indicates that at least one CPE is requesting to attach to the BTS.					
	Number of Signalling Radio Bearer (SRB) request messages that are transmitted by the BTS.					
TX SKD Messages	An increase in the number of messages indicates that at least the BTS is sending data bearer establishment messages to at least one CPE.					
	Number of SRB response messages that are received by the BTS.					
Rx SRB Messages	An increase in the number of messages indicates that at least the BTS is receiving data bearer establishment response messages from at least one CPE.					
Reset RACH Counts	An option to reset the Rx RACH count from the Dashboard > Radio page.					
MU-MIMO Group Size Configura	tion					
DL MUMIMO Max Group Size	Maximum size of the downlink Multiple User Multiple Input Multiple Output (MUMIMO) group. This size indicates the number of data streams that can be formed in the downlink direction simultaneously.					
UL MUMIMO Max Group Size	Maximum size of the uplink MUMIMO group. This size indicates the number of data streams that can be formed in the uplink direction simultaneously.					
MU-MIMO Group Utilisation Char and UL MUMIMO group utilisatic	rt - This section displays a chart that indicates the percentage of DL on observed in the last second, minute, one hour, and day (24 hours).					
Note: When you place the curso utilisation.	r on the chart, you can view the details of the MUMIMO group					

Parameter	Description				
MUMIMO Group Utilisation Detai	ils				
ldle (%)	Percentage of idle or management slots observed in the last second, minute, one hour, and day (24 hours).				
Ungrouped (%)	Percentage of ungrouped slots observed in the last second, minute, one hour, and day (24 hours).				
Groups of 2 (%)	The MUMIMO utilisation (in percentage) for the group size of two observed in the last second, minute, one hour, and day (24 hours).				
Groups of 3 (%)	The MUMIMO utilisation (in percentage) for the group size of three observed in the last second, minute, one hour, and day (24 hours).				
Groups of 4 (%)	The MUMIMO utilisation (in percentage) for the group size of four observed in the last second, minute, one hour, and day (24 hours).				
Groups of 5 (%)	The MUMIMO utilisation (in percentage) for the group size of five observed in the last second, minute, one hour, and day (24 hours).				
Groups of 6 (%)	The MUMIMO utilisation (in percentage) for the group size of six observed in the last second, minute, one hour, and day (24 hours).				
Groups of 7 (%)	The MUMIMO utilisation (in percentage) for the group size of seven observed in the last second, minute, one hour, and day (24 hours).				
Groups of 8 (%)	The MUMIMO utilisation (in percentage) for the group size of eight observed in the last second, minute, one hour, and day (24 hours).				
Avg	The MUMIMO utilisation (in percentage) for the average group size observed in the last second, minute, one hour, and day (24 hours).				
Max	The MUMIMO utilisation (in percentage) for the maximum group size observed in the last second, minute, one hour, and day (24 hours).				

GNSS

The **GNSS** page displays satellite information (read-only) for the BTS device such as number of satellites that are in use, sky view details, and sky map (location of satellites in different directions).

Using this information (as shown in Figure 8), you can monitor the satellites and ensure the BTS installation in a clear sky for optimal GPS synchronisation.



Note

You can configure GNSS using the **System** > **Synchronisation** page of the B1000 UI. For more information, refer to the <u>Synchronisation</u> section.

For information on checking the BTS installation using satellite details, refer to the *cnWave* 5G Fixed Planning and Installation Guide.

Figure 8: The GNSS page

		under CoWa	we™ 5G Eived I B100	0			Units Die Cours Die Manietatates 🔍 adminis
	ambium Netv	works I CITWE	Serve Served Bloc				
÷H –	General	Device Radio	GNSS				
:	Satellites					× 🖽	Location Map V
	 Seen 		77				College
•	Visible		24				+ of organization of the second secon
	0 In Use		11				
	Fix					× 🖽	
×	0 Mode		3D Fix				Gallow Park
	 Duration 		13h 50m 21s				
	0 Time		2023-10-25 09:55	:02 +0:0			A38
	 Latitude 		50.52297 DD				and the second sec
	O Longitude		-3.74038 DD				
	 Altitude 		102.2 m				
	Statistics					× 🖽	terret and the second sec
	Fix Count		8				B3352 Dotrove Dotrove
	Sky View					✓ ⊞	
	O USI	Used	SNR (dB)	Azimuth (°)	Blevation (°)	Satellite	Sky Map V
	9			67	69	GPS 9	♀ Click a satellite for details
	66			55	1	GLONASS 2	Ν
	6	2		212	61	GPS 6	
	82			176	6	GLONASS 18	76 302
	11	Y		290	52	GPS 11	28
	67			66	16	GLONASS 3	
	7			153	37	GPS 7	
	4			60	35	GPS 4	3122 6771
	81			157	1	GLONASS 17	
	20	v		295	33	GPS 20	
	33			196	31	SBAS 120	W
	38			196	31	SBAS 125	69 6 3
	83			195	27	GLONASS 19	
	75	-		347	3	GLONASS 11	
	76			2	5	GLONASS 12	319
	20			38		GEONASS I	83
	26			33	6	GPS 30	(19) (328)
	3			105	5	GPS 3	
	29			343	4	GPS 29	17 823
	16			59	4	GPS 16	
	19	-		213	3	GPS 19	S
	17	U		213	J	UF0 17	

Table 5 lists and describes parameters available on the GNSS page.

Table 6: F	Parameters	on the	GNSS	page
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Parameter	Description
Satellites	
	Total number of individual GNSS satellites that have been detected by this BTS device.
Seen	This also indicates the number of satellites, which are currently visible or have previously been visible to this device in the last five days. This total number corresponds to the number of rows in the Sky View table.
	Note: GNSS stands for Global Navigation Satellite System.
Visible	Number of individual GNSS satellites that are currently visible to this BTS device.
In Use	Number of GNSS satellites that are in use by the device to calculate its latitude, longitude and the elevation (with a 3D fix).

Parameter	Description					
Fix						
	Indicates the GPS fix mode.					
Mode	A 2D fix is sufficient for the calculation of latitude and longitude. A 3D fix is required for the calculation of altitude.					
	Indicates the time elapsed since Fix Mode transitioned to or from No Fix (s) .					
Duration	This time duration is presented as a number of days, hours, minutes, or seconds (where only the significant two of these options are displayed).					
Time	The GPS reference clock time that is accompanying the latest fix.					
	Latitude (in DD) of the geographical location where the device is located.					
Latitude	Note : Decimal degrees (DD) indicate latitude and longitude geographic coordinates in decimal fractions of a degree. Example: A positive latitude is north of the equator and a negative latitude is south of the equator.					
	A DD to five decimal places is precise to approximately one metre.					
	Longitude (in DD) of the geographical location where the device is located.					
Longitude	Example: A positive longitude is east of the Prime Meridian and a negative longitude is west of the Prime Meridian.					
	A DD to five decimal places is precise to approximately one metre.					
Altitude	Altitude (in m) of the geographical location relative to the mean sea level (MSL).					
Statistics						
Fix Count	A count of the number of times a GPS Fix has been achieved since the system start-up.					
Fix Count	This value increments each time when Fix Mode transitions from No Fix to either 2D Fix or 3D Fix.					
Sky View - This section displays the following Space Vehicle (SV) related details for the satellites:						
	A Universal Satellite Identifier (USI), which is unique to each SV.					
	For this device, GNSS ID and PRN code are combined to form a USI.					
USI	Note : The SV timing signal is modulated by a pseudo-random noise (PRN) code, which is unique to each SV within its GNSS system. These PRN code numbers overlap between different systems.					
Used	Indicates whether the timing information from this Space Vehicle (SV) has been used to calculate the fix information.					
	This timing information is not used if SNR is too low.					

Parameter	Description				
SNR (dB)	The signal-to-noise ratio (SNR) of the timing signal from this SV (in dB). The signal cannot be used if the SNR is too low.				
	A value above 20 is a good SNR.				
Azimuth (°)	The compass angle of the SV measured clockwise starting with 0 at due North ((°).				
Elevation (°)	The elevation angle of the SV relative to the horizontal where 90° is directly above the zenith (°).				
Satellite	The GNSS identifier and the SV identifier.				
Location Man	Displays the location of the device on a map.				
	You can use the map settings to view the location.				
Sky Man	Displays the location of satellites in the sky in different directions. Green color indicates the satellites that are in use.				
σκύ παρ	When you click on any satellite, this section displays USI, satellite ID, azimuth, elevation, and SNR details for the selected satellite.				

Accounts



Note

The **Accounts** tab appears only when you log in with an engineer user role. This tab is not visible to other user roles on the B1000 UI.

The **Accounts** page displays information specific to sessions and status of the session, which are used by engineers only. Example: Session related details such as account name, ID, and role. Figure 9 is an example of the Accounts page.

Figure 9: The Accounts page for engineer user roles

	Can	nbium Ne	tworks	l cn Wave ™ 5G Fixed I	31000					Undo 🏷 🛛 Save 🖬	Ů Engineer ≗er	igineer -
÷		General	Device	Radio GNSS Accoun	ts							
•		Sessions										~ ⊞
		<u> </u>	Purge 🔒	Is Authenticated 🔒	ID 🔒	Account Name 🔒	🕕 Role 🔓	Pinged 🔒	Poked	XSRF Token 🔒	XSRF Token Time 🔓	
1		2			Sz9CJ0Bs+Jq5jxYVnS7e	engineer	Engineer	173094	173105	2WOSDG4QH/ZGt6lZbry1	173105	
Å		Status										~ ⊞
		Edit Sessio	n 🔒		*							

Configuring B1000 (BTS)

Using the B1000 UI, you can configure, view, and manage the BTS configurations. This section covers the following topics:

- <u>Configuring system settings</u>
- Viewing subscriber (CPE) data

Configuring tools

Configuring system settings

The **System** page in the B1000 UI allows you to configure the required settings for the device such as network, IP addresses of BTS, radio parameters, interfaces, and network services. You must use the **System** icon (2) to configure, view, and manage the system settings.

The **System** page contains the following tabs:

- General
- Management
- Radio
- Interfaces
- <u>QoS</u>
- SFP Module
- <u>CPE Provisioning</u>
- Synchronisation
- Syslog

General

The **General** page allows you to configure generic system settings such as system name, its location, contact details, IP, and other network-related settings.

To access and configure the system settings, perform the following steps:

1. Log on to the B1000 UI (as described in Accessing the B1000 UI).

The main B1000 dashboard page appears (as shown in Figure 1).

2. On the left navigation column, click the **System** icon (

A system setting-specific page appears, as shown in Figure 10. By default, the **General** tab is selected.

Figure 10: The System page

General Management	Radio Interfaces SFP Module	CPE Provisioning Sy	ynchronis	ation Syslog		
System		× 1	B V	LAN Configuration		
() System Name	POC-RIG_1 3.1 Software)	Activate saved VLAN configuration	
System Location	D1 Lab			Management VID	1	
System Contact	yassine			Management VID Priority	0	
Timezone	GMT (+00:00)	\$		VLAN Enabled	Oisabled O Enabled	
Antenna Orientation		~ 1	•) Q-in-Q Ether Type	○ 0x88a8 ○ 0x8100 ○ 0x ○ 0x9300	9100 🔾 0x9200
O Antenna Azimuth	90.0 °			nilacetro		
Antenna Tilt	-2.0 °			Remote Management	c 0	
Network Configuration		× 1	•			
IP Address	169.254.3.99					
9 Prefix	24					
3 Default Gateway	169.254.3.253					
IPv6 Enabled						
Primary DNS Server	8.8.8.8					
Secondary DNS Server	10.130.12.111					
	DNO Demais Name					

3. Set the values for each parameter, as described in Table 7.

Table 7: List of	parameters	in the	General	page
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Parameter	Description		
System			
System Name	An administratively assigned name of the device. When using DNS, this name must be the device's fully qualified domain name (FQDN).		
	Provide an appropriate name in the text box for the system.		
System Location	The physical location of the device node.		
System Location	Provide appropriate location details in the text box.		
	Contact details of the device administrator.		
System Contact	Enter appropriate details in the text box.		
	Time zone that you want to set for the system.		
Timezone	Select the required time zone from the drop-down list. Example: GMT (+00:00)		
Antenna Orientation			
Parameter	Description		
-----------------------	--	--	--
	The direction in azimuth that the BTS is pointing towards.		
Antenna Azimuth	0.0, 90.0, 180.0, and 270.0 values (in degrees) correspond to magnetic North, East, South, and West, respectively.		
	Note : The radio does not use this value but reports the value to cnMaestro.		
	The tilt angle (in degrees) of the BTS antenna.		
Antenna Tilt	A positive value indicates that the antenna is pointing above the horizon.		
	Note : The radio does not use this value but reports the value to cnMaestro.		
Network Configuration			
IP Address	The IPv4 address that is assigned to the network interface. This IP address is used for managing the device.		
	Type an appropriate value in the text box.		
	The IPv4 network prefix that is assigned to the network interface. This prefix is used for managing the device.		
Prefix	Type an appropriate value in the text box.		
	Example: 24		
Default Gateway	The IPv4 address of the default gateway (if any used for managing the device.		
	Type an appropriate value in the text box.		
	Determines whether IPv6 is enabled for BTS management (in addition to the always enabled IPv4 management access).		
	By default, this parameter is disabled.		
	Select the checkbox to enable IPv6 for device management.		
IPv6 Enabled	Note : When the select the IPv6 Enabled checkbox, the following IPv6-specific parameters appear (as shown in Figure 11):		
	IPv6 Address		
	• IPv6 Prefix		
	IPv6 Default Gateway		
	This parameter appears when the IPv6 Enabled checkbox is selected.		
IPv6 Address	Indicates the IPv6 address assigned to the network interface that is used for the device management.		
	Enter a valid IPv6 address.		

Parameter	Description	
	This parameter appears when the IPv6 Enabled checkbox is selected.	
Pv6 Prefix	Indicates the IPv6 network prefix assigned to the network interface that is used for the device management.	
	Enter an appropriate value.	
	Note : Any change to this setting is applicable when the device reboots next. The active value of this setting is currently 0.	
	This parameter appears when the IPv6 Enabled checkbox is selected.	
IPv6 Default Gateway	Indicates the IPv6 default gateway address used for the device management.	
	Enter an appropriate value.	
	Note : Any change to this setting is applicable when the device reboots next.	
Primary DNS Server	The IP address that is assigned to the primary Domain Name System (DNS) Server (if any). This IP address is used for managing the device.	
	Type an appropriate value in the text box.	
Secondary DNS Server	The IP address that is assigned to the secondary DNS Server (if any). This IP address is used for managing the device.	
	Type an appropriate value in the text box.	
DNS Domain Name	The domain name that is used for configuring the management DNS. This domain name may be concatenated to the DNS names configured for the management interface.	
	Type an appropriate value in the text box.	
	Determines whether the BTS forwards the Ethernet packets to CPEs on receiving the packet with a unicast destination address.	
Forward Unknown Unicast Packets	By default, the checkbox is not selected. This indicates that the BTS does not forward the Ethernet packets to any CPE on receiving the packet with a unicast destination address, which the BTS has not learned.	
	If you select the checkbox, then the BTS forwards the Ethernet packets to all registered CPEs on receiving the packet with a unicast destination address, which the BTS has not learned.	
VLAN Configuration		
Activate saved VLAN configuration	An action that updates the live VLAN configuration for using the currently saved settings unless they are overridden by RADIUS.	

Parameter	Description
	Note : If you have changed Management VID , then you will lose contact with the device until you make the corresponding changes.
	The VLAN ID that is used to communicate with BTS and CPE for management purpose.
	Default value: 1 - which implies that there is no VLAN in the system.
Management VID	You can set up an ID value between 2 and 4094.
	Type an appropriate value in the text box.
	To understand the concept of VLAN, refer to the <u>VLAN</u> section.
Management VID Priority	The priority value that is set for the management VLAN ID.
	Determines whether the VLAN functionality for the BTS and all linked CPEs is enabled.
	Default value: Disabled
VLAN Enabled	Select the required option.
	If you change the value of this parameter, reboot the device for applying the change.
	Note : If this parameter is disabled, then you cannot configure VLAN-related parameters on the C100 UI (CPE).
	The Ether type values used for Q-in-Q (802.1ad) and outer tag (S-Tag).
	The following values are supported:
	• 0x88a8
	• 0x8100
	• 0x9100
Q-In-Q Ether Type	• 0x9200
	• 0x9300
	Default value: 0x88a8
	Select the required Ether type tag.
	If you change the value of this parameter, reboot the device for applying the change.

arameter Description		
	Note : Generally, the Ether Type field in Ethernet frames is used to specify the protocol or format of the encapsulated data. With Q-in-Q (for instance, where you have an outer VLAN and inner VLAN), the Ether Type is used to distinguish the outer tag and the inner tag. For more information, refer to the Q-in- Q section.	
Note : Before enabling cnMaestro in the B1000 UI, ensure that cnMaestro is deployed and configured with a Cambium ID. For more details, refer to the <u>cnMaestro Configuration</u> section.		
cnMaestro		
	Determines whether the remote management of the BTS system through cnMaestro X is enabled.	
Remote Management	Select the checkbox if you want to manage the BTS system remotely through cnMaestro X.	
	When you select the checkbox, cnMaestro X-specific parameters appear as shown in Figure 11.	

Figure 11: An example of IPv6 Enabled and cnMaestro-specific parameters

Ca	ambium Networks │ Cn Wave ™ 5	5G Fixed B1000		Undo 🕤 Save 🖬 🕐 Administrator 🌲 admin +
-14	General Management Radio	Interfaces SFP Module CPE Provisioning Synchronisation Sy	slog	
:	System	× 🖽	VLAN Configuration	> ■
	3 System Name	POC-RIG_1 3.1 Software	0	Activate saved VLAN configuration
	System Location	D1 Lab	Management VID	1
	3 System Contact	yassine	Management VID Priority	0
~	Timezone	GMT (+00:00) \$	VLAN Enabled	O Disabled • Enabled
	Antenna Orientation	~ #	Q-in-Q Ether Type	○ 0x88a8 ○ 0x8100 ○ 0x9100 ○ 0x9200 ○ 0x9300
	Interna Azimuth	90.0 •	cnMaestro	
	Interna Tilt	-2.0 •	Remote Management	
			Connection Status	Connected
	Network Configuration	× 🖽	Address	qa.cloud.cambiumnetworks.com
	IP Address	169.254.3.99	Account ID	28GHZ_CNWAVE_PLATFORM_SIT
	1 Prefix	24	Cambium ID	Cambium ID
	Default Gateway	169.254.3.253	Onboarding Key	Onboarding Key 💘
	IPv6 Enabled	3 🖸	Validate Server Certificate	
	IPv6 Address		L	
		64		
	IPv6 Prefix	• This setting will apply when the device next boots. • The active value is currently '0'.		
		fec0::1		
	IPv6 Default Gateway	This setting will apply when the device next boots.		
	O Primary DNS Server	8.8.8.8		
	Secondary DNS Server	10.130.12.111		
	Primary IPv6 DNS Server			
	DNS Domain Name	DNS Domain Name		
	Forward Unknown Unicast Packets	0		

The following parameters (as listed in Table 8) appear only if you select the **Remote Management** checkbox in the **cnMaestro** section:

Parameter	Description		
cnMaestro			
	Indicates the connection status of the BTS device with the cnMaestro X server.		
	When you select the Remote Management checkbox, the BTS device tries to connect to the required cnMaestro X server and onboard automatically.		
	During this connecting and onboarding process, this parameter displays the connection status messages, as described:		
	• When BTS tries to connect to the cnMaestro X server, this parameter displays the status as Connecting .		
Connection Status	• When BTS connects to the cnMaestro X server and waits for an approval to onboard, then this parameter displays the status as Device Approval Pending .		
	• When BTS connects to the cnMaestro X server and receives an approval to onboard, this parameter displays the status as Onboarding .		
	 When BTS disconnects or cannot connect to the cnMaestro X server, then this parameter displays the status as Disconnected. 		
	 When BTS connects to the cnMaestro X server and onboards successfully, then this parameter displays the status as Connected. 		
	The IP address or the domain name of the required cnMaestro X server.		
Address	Type an appropriate address in the text box.		
	Note : The address can be either an IP or URL of the cnMaestro On-Premises instance.		
	The account ID of the required cnMaestro X server.		
Account ID	This is a read-only parameter that displays the value when BTS connects to the required cnMaestro X server.		
	The user account ID that is assigned and associated with the cnMaestro X server.		
Cambium ID	You can set a Cambium ID for a user using the Onboard > Settings page of the cnMaestro UI. For more information, refer to the <u>cnMaestro Configuration</u> section.		
	Type an appropriate value in the text box.		

Table 8: Parameters required for the cnMaestro configuration

Parameter	Description	
	The license key (or a password) that is set on purchasing the BTS device.	
Onboarding Key	You can set the onboarding key using the Onboard > Settings page of the cnMaestro UI. For more information, refer to the <u>cnMaestro Configuration</u> section.	
	Type an appropriate value in the text box.	
Validate Server Certificate	Indicates whether a server certificate is installed at the customer site for the validation purpose.	
	Select the checkbox if the server certificate is installed at the customer site.	

4. Click Save (located at the top right side of the page) to save the configuration changes.

VLAN

A V**irtual Local Area Network (VLAN)** is a networking technology that allows you to segment a physical network into multiple virtual networks. VLANs are primarily used for improving network efficiency, security, and management. Using the VLAN technology, you can perform the following functions:

- Segment a single physical network logically into multiple smaller networks.
- Isolate the traffic.
- Control the broadcast domains.
- Organize devices in a flexible manner and enhance security.
- Add the VLAN tags to the Ethernet frame header by following tagging protocols, such as IEEE 802.1Q.

When data packets move between switches, the VLAN to which the packet belongs must be identified. In such cases, VLAN tagging is helpful.

Q-in-Q

Q-in-Q (also known as double tagging or 802.1ad) is a networking technology that extends the capabilities of VLAN tagging. It's used for addressing some limitations of standard VLAN tagging, especially when dealing with service provider networks or complex network architectures.

In a normal scenario where a standard VLAN setup is using IEEE 802.1Q tagging, each Ethernet frame has a single VLAN tag added to its header. This tag contains information about the VLAN to which the frame belongs. In some scenarios where multiple VLAN domains have to be maintained within a single VLAN network or when passing VLAN traffic through service provider networks, a single VLAN tag might not be sufficient. This is where Q-in-Q is helpful.

Q-in-Q encapsulates a VLAN-tagged frame within another VLAN-tagged frame. This implies that two levels of VLAN tags are used. The outer tag represents a customer's VLAN, while the inner tag represents the VLAN of the service provider's network. This process allows for better isolation and segregation of traffic between different customers or network segments.

Q-in-Q allows service providers to create a Layer 2 Ethernet connection between two customer sites. Service providers can segregate different customers' VLAN traffic on a link (for example, if customers use overlapping VLAN IDs) or bundle different customer VLANs into a single service VLAN. Data centers can use Q-in-Q to isolate customer traffic within a single site or to enable customer traffic flows between cloud data centers in different geographic locations. Q-in-Q adds a service VLAN tag (802.1Q based) before the customer's 802.1Q VLAN tags.



Figure 12: Q-in-Q Frame format

When a packet travels from a customer VLAN (C-VLAN) to a service provider's or data center VLAN (S-VLAN), another 802.1Q tag for the appropriate S-VLAN is added before the C-VLAN tag. The C-VLAN tag remains and is transmitted through the network. As the packet leaves the S-VLAN in the downstream direction, the S-VLAN 802.1Q tag is removed.

Management

The **Management** page allows you to set multiple user accounts and SNMP configuration related information. This configuration allows the users to manage the B1000 dashboard (web UI) and BTS using SNMP.

To view and configure the management settings, perform the following steps:

1. From the main B1000 dashboard page, navigate to **System > Management**.

The Management page appears, as shown in Figure 13.

Figure 13: The Management page

General	lanagement Radio internaces	SEP Module CPE Provisioning Synchronisa	ation Syslog			
Web Server C	Configuration					
		HTTPS with HTTP redirect	¢			
Protocols		A valid Server Certification	te is not installed so this device will serve a se	elf-signed TLS certificate.		
 Certificate F 	file	Choose File No file chosen				
		Install Certificate				
User Account	.ts					
(Account Name 	Description	Role	Web Access Enable	Web Passphrase	
1	support	Description	Support 🖕		Web Passphrase	
P	engineer	engineer	Engineer ¢		Web Passphrase	
	Account Name	Description	Guest ¢			
1 2		Development			Web Describered	
	admin	Description		•	Web Passphrase	
SNMP Config	juration					
		□ v2c ⁵				
O Versions		🗆 v3				
Engine ID		0x8000453103000456700188				
SNMP Traps						
Enable		Cold Start Warm Start Authenti	.cation Error			
SNMP Trap R	leceivers					
Notificati	ion Type	1 IP Address	Port	1 Com	imunity	
SNMPv2c	Trap 🖕	10.130.150.129	10162			
SNMPv3 Acc	ounts					
 Account Nar 	.me		 Access Enable 			
support						
engineer O						

2. Set the values for each parameter, as described in Table 9.

Table 9: List of parameters in the Management page

Parameter	Description	
Web Server Configuration		
	Type of protocol that must be configured for accessing and managing the web UI of BTS.	
	This parameter supports the following options:	
Protocols	• HTTP Only: Indicates that only HTTP is available.	
	 HTTPS Only - Indicates that only HTTPS is available. 	
	 HTTP and HTTPS: Indicates that both HTTP and HTTPS are available. 	

Parameter	Description	
	• HTTPS with HTTP redirect: Indicates that both HTTP and HTTPS are available, but an incoming HTTP connection is automatically redirected to HTTPS.	
	Default value: HTTPS with HTTP redirect	
	Select the required protocol from the drop-down list.	
	Note : Except for the HTTP option, a message is visible for the rest of the options. The message indicates that a valid server certificate is not installed, and the device serves a self-assigned TLS certificate.	
	An option to browse and upload a certificate file (.PEM) from a location locally. This certificate file must contain a device private key and matching certificate that is signed by the trusted certificate authority (CA).	
	To upload a certificate file (.PEM) from the desired location locally, perform the following steps:	
	a. Click Choose File .	
	A file folder appears.	
Certificate File	b. Browse the location where you have saved the required certificate file (.PEM) on your machine.	
	c. Click Open .	
	The certificate file is selected, and the file name appears next to the Choose File button.	
	d. Click Install Certificate.	
	The selected certificate file is installed, which is authenticated and encrypted.	
User Accounts		
	Name of the account used for administering the BTS device. This name must be unique and start with a letter. An account name can contain lower case letters, numbers, and hyphens.	
Account Name	Provide an appropriate name in the text box. Example: admin or user1	
	The account name can belong to a guest, an administrator, an engineer, a support team member, or a user. You can add multiple names to the user account using the text boxes.	

Parameter	Description
	Note: To add a new user account row, use the icon located beside the Account name parameter (as shown in Figure 13). To delete a user account, use the icon located beside the corresponding account name.
	A brief description of the account.
Description	Provide a brief description for the user account that you want to add. Example: Super admin
	Specifies the role of the user who wants to access the device.
	This parameter supports the following roles, which have different capabilities and serve different functions:
	• Guest : This role has limited, read-only access to the device configuration and status. All fields in the web UI are read-only and some of them are also not available for guest roles. The guest roles have limited SNMP access with a read-only view of MIB-II.
	• User: This role has limited access to the device configuration and status. Some UI fields are read-only, and some fields are not available on the web UI. The user roles cannot change any parameters on the UI.
Role	• Administrator: This role has visibility of the device configuration and status. These roles can view, configure, and change everything in the UI, but cannot access the sensitive security information.
	• Security : This role (for example, a security officer) has visibility of the device configuration and status, including sensitive security information.
	• Support : This role (for example, a support agent) can access diagnostics information for the product support purpose.
	• Engineer : This role (for example, an engineer) has privileged write access to specific engineering settings and read access to engineering status information.
	• Factory : This role (for example, a factory operator) has privileged write access to the device customisation settings such as ESN and SKU.
	Select an appropriate option from the drop-down list.

Parameter	Description	
	Determines whether the access for web UI of the BTS device is enabled for the selected role.	
Web Access Enable	Select the checkbox if you want to enable web access for the required user role.	
	Note : Multiple users are allowed to access the UI simultaneously.	
Web Passphrase	The passphrase (password) that is assigned to the user role of this account for accessing the web UI.	
	Type an appropriate password in the text box.	
SNMP Configuration		
	The version of the SNMP protocol that is supported by the agent running on this BTS device.	
	The SNMP protocols are used for managing and monitoring the network devices.	
	The following SNMP protocol versions are supported:	
Versions	 V2c : A standard and simpler community-based security model. It is an obsolete version with weak security. 	
	 V3: An advanced version designed to address security, access control, privacy, and authentication issues. 	
	Choose the required SNMP version.	
	Unique ID that is used by the SNMP agent.	
Engine ID	It is used as part of the SNMPv3 security framework that includes authentication and encryption.	
Note : A message is visible after the Engine ID field, providing an option to download the SNMP Management Information Base (MIB) files directly from the device (as shown in Figure 14). Using the SNMP MIB files, you can access VLAN and QoS attributes of the device.		
	This parameter appears only when you select an SNMP version (V2c or V3).	
Port	Indicates the network port number assigned to the SNMP agent, which is running on the device.	
	Default value: 161	
	Provide an appropriate value in the text box.	
The following parameters appear only 14.	when you set V2c in the Versions field, as shown in Figure	
Read-Only Community	Name of the SNMP V2c community for read-only access to the device.	

Parameter	Description
	Provide an appropriate value in this text box.
Read/Write Community	Name of the SNMP V2c community for read-write access to the device.
	Provide an appropriate value in this text box.
SNMP Traps	
	Indicates the categories of SNMP traps sent by the device.
	This is a ready-only parameter.
Enable	Note : This is a Read-Only Community string used by the SNMP agent. It is recommended to choose a random string for security reasons. This string must be different from the Read-Write Community string.
SNMP Trap Receivers	
	The type of notification that the BTS device sends to the trap receiver.
	The following options are supported:
	 disabled: SNMP notifications are not sent to the trap receiver.
	• SNMPv2c Trap
	SNMPv2c Inform
	• SNMPv3 Trap
	SNMPv3 Inform
Notification Type	If Trap -specific notification is set, the BTS device sends the trap notification only once and does not wait for the trap receiver's acknowledgment. If Inform -specific notification is set, then the BTS device sends the information few times until it receives an acknowledgment from the receiver (such as password check).
	By default, the disabled option is selected.
	Select the required notification type from the drop-down list. To add a notification, click the + icon beside the Notification Type parameter column. To delete a notification, click the - icon.
	Note : This is a Read-Write Community string used by the SNMP agent. It is recommended to choose a random string for security reasons. This string must be different from the Read-Only Community string.

Parameter	Description
When you select a value (except for d following parameters appear (as show	isabled) from the Notification Type drop-down list, the vn in Figure 15):
	The IP address assigned to the server that receives SNMP traps.
IP Address	All enabled SNMP traps are sent to this address.
	Enter a valid IP address of the server.
	The network port assigned to the server that receives SNMP traps.
Port	Enter a valid network port number.
	Note : The zero (0) value is not valid.
	Applicable only when you select SNMPv2c Trap or SNMPv2c Inform from the Notification Type drop-down list.
Community	Indicates the SNMPv2c community name for providing access to the trap receiver.
	Enter an appropriate value in the text box.
	Note : A community name must contain at least eight characters in length.
	Applicable only when you select SNMPv3 Trap or SNMPv3 Inform from the Notification Type drop-down list.
	Specifies the account name used for authentication to the BTS device.
Account Name	Note : The account name must be unique and contain lower case letters, numbers, and hyphens. In addition, the account name must start with a letter.
	Enter a valid value in the text box.
	Applicable only when you select SNMPv3 Trap or SNMPv3 Inform from the Notification Type drop-down list.
	Indicates the authentication type to use.
	This parameter supports the following options:
Authentication Type	• None
	• MD5
	• SHA1
	Select the required option from the drop-down list.
Authentication Passphrase	Applicable only when you select SNMPv3 Trap or SNMPv3 Inform from the Notification Type drop-down list.

Parameter	Description					
	Indicates the authentication passphrase assigned to the trap receiver.					
	The parameter can contain any combination of ASCII characters. The value must contain eight characters in length.					
	Type a valid value in the text box.					
	Applicable only when you select SNMPv3 Trap or SNMPv3 Inform from the Notification Type drop-down list.					
	Indicates the protocol that must be used for account privacy.					
	This parameter supports the following options:					
Privacy Protocol	• None					
	• DES					
	• AES					
	Select the required option from the drop-down list.					
	Note : If the value is set to None, the Privacy Passphrase parameter value is ignored.					
	Applicable only when you select SNMPv3 Trap or SNMPv3 Inform from the Notification Type drop-down list and Privacy Protocol is not set to None.					
	Specifies the privacy passphrase assigned to the trap receiver.					
Privacy Passphrase	The value of this parameter can contain any combination of ASCII characters. The value must consist of eight characters in length.					
	Type a valid value in the text box.					
	Note : If you do not provide any privacy passphrase in this text box, then the value is assumed to be same as the authentication passphrase.					
SNMPv3 Accounts - This section allow related properties for the roles selected	ys you to set access control, authentication, and privacy- ed in the User Accounts section.					
Account Name	The account name that is used for authentication to the BTS device.					
Account Name	This is read-only parameter that contains account names, which you added in the User Accounts section.					
Access Enable	Determines whether the permission is set for this account name to access the BTS device using SNMPv3 credentials (which are configured in this SNMPv3 Accounts section).					

Parameter	Description						
	Select the checkbox for the required account name. This setting permits the user account to access the BTS device using SNMP.						
	Note : To modify this parameter, you must enable V3 using the Versions parameter in the SNMP Configuration section.						
When you enable the access for the a following parameters specific to authe	ccount names using the Access Enable parameter, the entication appear (as shown in Figure 16):						
	Indicates the authentication type to use.						
	This parameter supports the following options:						
	• None						
Authentication Type	• MD5						
	• SHA1						
	Select the required option from the drop-down list.						
	The authentication passphrase assigned to the user role.						
	This passphrase must be same as the one that is set at the SNMP site for this user role.						
Authentication Passphrase	The value of this parameter can contain any combination of ASCII characters. The value must consist of eight characters in length.						
	Type a valid value in the text box.						
	The protocol that must be used for account privacy.						
	This parameter supports the following options:						
	• None						
Privacy Protocol	• DES						
	• AES						
	Select the required option from the drop-down list.						
	Note : If the value is set to None, the Privacy Passphrase parameter value is ignored.						
	The privacy passphrase that is assigned to the user role. This passphrase must be same as the one that is set at the SNMP site for this user.						
Privacy Passphrase	The value of this parameter can contain any combination of ASCII characters. Also, the value must consist of eight characters in length.						
	Type a valid value in the text box.						

Parameter	Description
	Note : If you do not provide any privacy passphrase in this text box, then the value is assumed to be same as the authentication passphrase.

When you select V2c in the **Versions** field, Read-Only Community and Read/Write Community parameters appear as shown in Figure 14.

Figure 14: SNMP configuration settings

SNMP Configuration		~ ⊞
	✓ v2c 5	
Versions	□ v3	
Veraiona	▲ There is at least one enabled SNMPv3 account but SNMPv3 is not enabled	
Engine ID	0x8000453103000456700188	
	An archive of all MIB modules for this device may be downloaded directly from this device here: mibs.tar.gz	
0 Port	161	
Read-Only Community	Read-Only Community	ষ
Read/Write Community		ষ

Figure 15 is an example of the SNMP Trap Receivers settings.

Figure 15: The SNMP Trap Receivers section

SNMP	Trap Receivers									~ =
0 O N	Notification Type	IP Address	 Port 	Community	Account Name	O Authentication Type	Authentication Passphrase	Privacy Protocol	O Privacy Passphrase	
= si	NMPv2c Trap 🔶	10.130.150.129	10162	*******						
	NMPv3 Trap	0.0.0.0	162		admin	SHA1 ¢	******	AES 💠	*****	»]
= si	NMPv3 Inform	0.0.0.0	162		Account Name	SHA1 ¢	Authentication Passphre	AES \$	Privacy Passphrase	8
							A Passphrase must be at least 8 characters in length		A Passphrase must b least 8 characters in length	be at

Figure 16 is an example of configuring the User Accounts section in the Management page.

Figure 16: The User Accounts section settings

SNMPv3 Accounts	i.				✓ Ξ
Account Name	 Access Enable 	 Authentication Type 	I Authentication Passphrase	 Privacy Protocol 	 Privacy Passphrase
support		SHA1 ¢	×******* 🕅	AES 🗢	۰۰۰۰۰۰ کې
engineer		SHA1 🗢	Authentication Passphrase	AES 🗢	Privacy Passphrase
			• The Authentication Passphrase must be at least 8 characters in length		An empty Privacy Passphrase requires a valid Authentication Passphrase
admin					

3. Click **Save** to apply the settings.

Radio

The Radio page allows you to configure transmit control and other radio settings. You can also enable or disable Multi-user Multiple Input Multiple Output (MU-MIMO) and Extended Range parameters.

To view and configure the key radio settings, perform the following steps:

1. From the main B1000 dashboard page, navigate to System > Radio.

The **Radio** page appears, as shown in Figure 17.

Figure 17: The Radio page

ambium Networks cn Wa	ave™ 5G Fixed I E	31000						Undo 🖒	Save 🖬	ወ	Administrator	💄 admir
General Management	Radio Interfaces	SFP Module	CPE Provisioning	Synchronisa	ation	Syslog						
Transmit Control				~ 🖪	MU	МІМО						~
① Tx State	Active O Mut	ted			0	DL MUMIMO Max Group Size	8					
					0	UL MUMIMO Max Group Size	8					
Configuration				~ ⊞	Lak	Testing						
6 Frequency	27000.000	N	1Hz		0	Near Field Corr	0					
Max EIRP	24.0	d	Bm		0	Near Field Corr Active	0					
Polarisation	• Horizontal	Vertical										
1 Link Symmetry	0 6:1 0 5:2	4:3										
 Bandwidth 	🔵 56 MHz 🗿 11	2 MHz 🔵 50	MHz 🔘 100 MHz									
0 UL Target Rx Power	-60	d	Bm									
0 UL Tx Power Initial Adjust	🔿 Disabled 💿 E	Enabled										
0 UL Tx Power Continuous Adju	ust 🔵 Disabled 🧿 E	Enabled										
MUMIMO Control	🔿 Disabled 🗿 E	Enabled										
Extended Range	🔾 Disabled 🔘 E	Inabled										

2. Set the values for each parameter, as described in Table 10.

Table 1	0.1	ist d	of	param	eters	in 1	the	Radio	page
	V . I	_13t \		pararri				I Laulo	page

Parameter	Description					
Transmit Control						
	Determines whether the transmitter is active or muted on the BTS.					
	This parameter supports the following options:					
	• Active					
Tx State	• Muted					
	If you select the Muted option, the transmitter is disabled allowing the BTS to be in a standby mode of operation. Then, all CPEs lose the connection with the BTS.					
	Select the required option.					
Configuration						
Frequency	The operating frequency (in MHz) of the radio bearer.					

Parameter	Description					
	Type an appropriate value in the text box.					
	Note : Ensure that the value must be greater than or equal to 24250.000 MHz (or 24.25 GHz).					
	The maximum Effective Isotropic Radiated Power (EIRP) value in milliwatts (dBm). This depends on the regulatory conditions of the country of operation.					
Max EIRP	Type an appropriate value in the text box.					
	Note : Ensure that the value is greater than 20 or equal to 48.					
	Determines the antenna polarisation settings.					
	This parameter supports the following polarisation settings:					
	• Horizontal					
	Vertical					
Delevication	Select the required polarisation for the antenna.					
Polarisation	When you configure and save the polarisation settings, CPE connects to the BTS using a similar polarization scan feature implemented in the cnWave™ 5G Fixed system. For more information about the CPE's polarisation scan feature, refer to the <u>Radio</u> section.					
	Note : When you change the value of this parameter, the connected CPEs get disconnected and prompts you to reboot the system.					
	The downlink (DL) or uplink (UL) ratio (symmetry) used for controlling the usage of signal slots.					
	BTS and CPE exchange data with each other by using the defined link symmetry.					
	This parameter supports the following options:					
	 6.1: Indicates 6 DL slots, 1 DL-to-UL transition, 1 UL slots 					
Link Symmetry	 5.2: Indicates 5 DL slots, 1 DL-to-UL transition, 2 UL slots 					
	 4.3: Indicates 4 DL slots, 1 DL-to-UL transition, 3 UL slots 					
	Select the required symmetry option.					
	Note : When you change the value of this parameter, the Enable Reboot parameter appears.					

Parameter	Description					
	Indicates the bandwidth (in MHz) of the radio channel spacing.					
	Set the required bandwidth value.					
	This parameter supports the following values.					
	• 50 MHz					
Bandwidth	• 56 MHz					
Banawiath	• 100 MHz					
	• 112 MHz					
	Select the required bandwidth value.					
	Note : When you change the value of this parameter, the connected CPEs get disconnected and prompts you to reboot the system.					
	The UL target receive power in dBm.					
UL Target Rx Power	Type an appropriate value in the text box.					
	This parameter supports values between -120 and 0. Typically, the best value for this parameter is -50.					
	Determines the initial power adjust mode of CPEs.					
	This parameter supports the following modes:					
	Disabled					
UL Tx Power Initial Adjust	Enabled					
	Select the required mode.					
	Note : In case of first installation, it is recommended to select Enabled .					
	Determines the continuous power adjust mode of CPEs.					
	This parameter supports the following modes:					
III. Ty Dower Continuous Adjust	Disabled					
OL TX Power Continuous Adjust	Enabled					
	Select the required mode.					
	Note: It is recommended to set to Enabled.					
	Determines the multi user-multiple input and multiple output (MU-MIMO) control mode of CPEs.					
MUMIMO Control	This parameter supports the following modes:					
	Disabled					

Parameter	Description				
	Enabled				
	Select the required mode.				
	Note : When you enable this parameter, the B1000 UI provides DL utilisation during the MUMIMO operation.				
	Determines whether the maximum distance range between a CPE and the BTS is extended up to 10 Km.				
	This parameter supports the following options:				
Extended Range	 Disabled: Indicates that the maximum distance range supported between a CPE and the BTS is five Km. By default, this option is selected. 				
	 Enabled: Indicates that the maximum distance range between a CPE and the BTS is extended up to 10 km. 				
	Select the required option.				
	An option to reboot the system when you change polarisation, bandwidth, and link symmetry parameters.				
Enable Reboot	Select the checkbox to enable the system reboot.				
	When the system reboots, the configuration changes that you made are effective.				
Μυμιμο					
DL MUMIMO Max Group Size	Maximum size of the downlink Multiple User Multiple Input Multiple Output (MUMIMO) group. This size indicates the number of data streams that can be formed in the downlink direction simultaneously.				
UL MUMIMO Max Group Size	Maximum size of the uplink MUMIMO group. This size indicates the number of data streams that can be formed in the uplink direction simultaneously.				
Lab Testing - This section is controlled	d by engineering only in lab environments at a short range.				
	Indicates the phase in degrees of edge columns.				
Near Field Corr	This is a one-time setting, and this parameter resets to default on each reboot.				
	Indicates the phase in degrees of edge columns.				
Near Field Corr Active	This parameter displays the currently active near field correction setting.				

3. Click **Save** to apply the settings.

Interfaces

The **Interfaces** page provides statistical information on all the BTS interfaces (for example, Copper or RJ45 MAIN, Small form-factor pluggable (SFP), Global Positioning System (GPS), Power ports, and Tx priority counters). The page also allows you to configure GNSS.

To view the interface settings, perform the following steps:

1. From the main B1000 dashboard page, navigate to **System > Interfaces**.

The Interfaces page appears, as shown in Figure 18.

Figure 18: The Interfaces page

🜔 c	ambium Networks Icn Wave" 5G Fixed B1000									Undo 🤉 Save	61 🔮 Administrator	≜admin +
Ŧ	General Management Radio Interfaces SFP M	lodule CPE Provisioning Syn	chronisation Syslog									
:	Configuration					× 8	Tx Rx Errors					× 8
-	SEP1 Sneed	Autorea 1000BASE-X @					If Name	Wireless	MainEth	SEP1	SFP2	
•							in Discards	0	0	0	0	
	SFP2 Speed	Autoneg 10GBASE-R 🗢					In Errors	0	0	0	0	
4							Out Discards	71	0	0	0	
56	Physical Port Status					× 8	Out Errors	0	0	0	0	
~	If Name	Wireless	MainEth	SFP1	SFP2							
	If Oper Status	Up	Down	Down	Up		Tx Priority Counters CPE Selection					× 8
	Duplex	Full Duplex			Full Duplex		Priority Counter RNTI Selector	25				
	If High Speed (Mbit/s)	3200			10000							
							Tx Priority Counters					× 00
	Counters Control					~ 8	Priority Level	0 Packets		O Octets		
	Reset Confirmation						Ultra High	3671424 +1		5542509856 +94		
							High	2581521		3635303914		
	Tx Rx Counters					~ 8	Medium	1981092		3019272298		
	If Name	Wireless	MainEth	SEP1	SEP2		Low	2489935		3780588722		
	Index	1	2	3	4							
	In Octors	246310863 +3666	0	0	16206656911 +334		GNSS Configuration					× 8
	In Unicest Peckets	1959749 +8	0	0	10684200 +4		Constellations	OPS + Galleo + GLONASS @				
	In Nulticant Packets	863	0	0	454							
	In Broadcast Packets	12	0	0	61184							
	Out Octets	16454807238 +668	0	0	125317380 +394							
	OUT UNICAST PACKAGE	11000407 +0	0	U	10/2/41 (+4)							
	Out Multicast Packets	4044	0	0	624							
	Out Broadcast Packets	455979	0	0	z							

2. View or monitor the data statistics of different interfaces.

Table 11 lists and describes each parameter in the Interfaces page.

Table 11: List of interface related para	meters
--	--------

Parameter	Description
Configuration	
	Data speed (10 Gbps) of the optical fiber port1.
	The following options are supported:
	Autoneg 1000BASE-X
	Forced 1000BASE-X
SFP1 Speed	Autoneg 10GBASE-R
	Select the required option from the drop-down list.
	Note : The auto negotiated (Autoneg) option is recommended for both 1000BASE-X and 10GBASE-R. The Forced 1000BASE-X option should be used only if it is specifically recommended by Cambium Networks.
SED2 Speed	Data speed (10 Gbps) of the optical fiber port2.
	The following options are supported:

Parameter	Description					
	Autoneg 1000BASE-X					
	Forced 1000BASE-X					
	Autoneg 10GBASE-R					
	Select the required option from the drop-down list.					
	Note : The auto negotiated (Autoneg) option is recommended for both 1000BASE-X and 10GBASE-R. The Forced 1000BASE-X option should be used only if it is specifically recommended by Cambium Networks.					
Physical Port Status						
If Oper Status	Indicates the working status (up or down) of wireless, Main Ethernet, or fiber ports for BTS.					
Duplex	Indicates the capability mode of wireless and Main Ethernet ports to send and receive data.					
lf High Speed (Mbit/s)	Indicates the data transmission speed of wireless and Main Ethernet ports (in Mbits per second).					
Counters						
	An option to reset the SNMP MIB-II interface counters.					
Deast Confirmation	Select the checkbox if you want to reset.					
Reset Confirmation	Note : When you select the checkbox, the Reset Counters button is available. You can use this button to reset the SNMP MIB-II interface counters.					
Tx Rx Counters - Applicable to all data	ports and wireless.					
The data report is listed in the followin	g columns:					
• Wireless - Indicates all the data	transmitted on the wireless link when it is up.					
• MainEth -Indicates the data tha	t is entering the Main Ethernet port.					
• SFP1 - Indicates the data that is	entering the SFP1 port.					
• SFP2 - Indicates the data that is	s entering the sFP2 port.					
Index	Index number assigned to each counter column.					
In Octets	Number of data bytes received by the BTS from the CPEs.					
	Number of data packets received by the BTS from a					

Parameter	Description						
In Broadcast Packets	Number of data packets received by the BTS from all the connected CPEs.						
Out Octets	Number of data bytes sent by the BTS to the CPEs.						
Out Unicast Packets	Number of data packets sent by the BTS to a specific CPE.						
Out Multicast Packets	Number of data packets sent by the BTS to specific two or more CPEs.						
Out Broadcast Packets	Number of data packets sent by the BTS to all the connected CPEs.						
Tx Rx Errors - Applicable to all data po described in <u>Tx Rx Counters</u> .	orts and wireless. The data report is listed in columns, as						
In Discards	Number of incoming data packets discarded by the BTS.						
In Errors	Number of incoming data packets that contain errors.						
Out Discards	Number of outgoing data packets (from BTS) that are marked or labelled as discarded by the BTS.						
Out Errors	Number of outgoing data packets (from BTS) that contain errors.						
Tx Priority Counters CPE Selection							
Priority Counter RNTI Selector	The index of the bearer for which the per-priority Transmit counters are displayed.						
Tx Priority Counters							
	Displays the priority level of the bearer relevant to each Transmit counter.						
	This parameter displays the following priority levels:						
	• Ultra High						
Priority Level	• High						
	• Medium						
	• Low						
	You can view the number of packets and octets transmitted at each priority level.						
Packets	Number of packets successfully delivered to the far end of the link based on priority.						
Octets	Number of Octets successfully delivered to the far end of the link based on priority.						
GNSS Configuration							

Parameter	Description					
	An option to choose a suitable combination of GNSS satellite constellation for the location of this device.					
Constellations	Several combinations of GNSS satellite constellations can be used.					
	Select the required combination from the drop-down list.					
	Note : You can monitor the satellites using the GNSS tab on the B1000 dashboard page. For more information, refer to the GNSS section.					
The following parameters specific to GNSS configuration are visible only to engineers who log in to the B1000 UI with an engineer user role:						
Timing only Fix						
Anti Jamming Mask						
Anti Jamming Threshold						
GNSS Stats - This section is visible only	y to engineers.					
Corrupt ZDA Count	Count of the number of times a corrupt ZDA GPS message has been received.					
Corrupt GGA Count	Count of the number of times a corrupt GGA GPS message has been received.					

QoS

The **QoS** page allows you to configure Quality of Service (QoS) settings for the BTS device.

To view the QoS settings, perform the following steps:

1. From the main B100 dashboard page, navigate to **System > QoS.**

The QoS page appears as shown in Figure 19.

Figure 19: The QoS page

Ca	mbium Networks cnWave ^w 5G Fixed B1000)	Undo "O Save 🖬 🕐 Administrator 🛔 admin -
	Quality of Service Controls	SPP Module CPE Provisioning Sy	Quality of Service VLAN ID Configuration YB
	Classification Method VLAN Priority VL	AN ID	Default Priority Low
	● Untagged Traffic Priority Low ◆		Activate saved Quality of Service VLAN ID Mapping
8	Quality of Service VLAN ID Mapping	✓ ■	
× .	C O VLAN ID	Priority	
	200	Low \$	
	300	Medium 🗢	
	400	High ¢	
	500	Ultra High 🗢	

2. View or configure the **QoS Classification** settings.

Table 12 lists and describes each parameter on the **QoS** page.

Table 12: List of parameters in QoS page

Parameter	Description					
Quality of Services Controls						
	This controls which field within the VLAN header is used to perform the packet classification.					
	The following options are supported:					
	VLAN Priority					
	• VLAN ID					
Classification Method	If VLAN Priority is selected, the packets transmitted over- the-air by the BTS are classified using the 3-bit Priority field of the VLAN ID, with the mapping from the Priority bit to the priority within the B1000 being as follows:					
	 0 or 1 -> Low Priority 					
	• 2 or 3 -> Medium Priority					
	• 4 or 5 -> High Priority					
	• 6 or 7 -> Very High Priority					
	If VLAN ID is selected, the packets transmitted over the air by the BTS are classified using the VLAN ID to the Priority level as defined below by the Quality of Service VLAN ID Mapping .					
	This controls which priority the BTS must assign to untagged traffic.					
	The following options are supported:					
Liptagood Traffic Priority	• Low					
ontagged frame friendy	• Medium					
	• High					
	• Very High					
Quality of Services VLAN ID Mapp	ing					
VI AN ID and Driavity	This section is only visible and relevant if the Classification Method above is set to "VLAN ID". This is a dynamic table that defines which priority to assign to a VLAN packet based on its VLAN ID.					
	Up to 32 entries can be specified. For each entry, a VLAN ID value between 1 and 4095 must be specified and a priority level of Low, Medium, High, and Very High must be selected for that VLAN ID.					

Parameter	Description						
Quality of Services VLAN ID Config	guration						
	This section is only visible and relevant if the Classification Method above is set to VLAN ID .						
	This controls what level of priority must be assigned to VLAN packets for which the VLAN ID could not be matched in the list provided in the VLAN ID and Priority section above.						
Default Priority	The following options are supported:						
	• Low						
	• Medium						
	• High						
	• Very High						
	This button is only visible and relevant if the Classification Method above is set to VLAN ID .						
Activate saved Quality of Service VLAN ID Mapping	It activates the Quality of Service VLAN ID Mapping entered in the section above. Please remember to click this button once you have made changes to the VLAN ID and Priority or Default Priority above.						

SFP Module

The **SFP Module** page provides information about the Small Form-Factor Pluggable (SFP) module used for the BTS device. This SFP module information helps you to monitor performance, analyze speed efficiency, and read other network related settings.

To view the SFP module information, perform the following steps:

1. From the main B1000 dashboard page, navigate to System > SFP Module.

The SFP Module page appears, as shown in Figure 20.

Figure 20: The SFP Module page

10-															
\bigcirc	Cambium N	etworks cn	Vave [™] 5	G Fixed I	31000								Φ		💄 admin 💌
	General	Management	Radio	Interfaces	SFP Module	CPE Provisioning	Synchronisation	Syslog							
•	Configura	ation					×	< ■	SFP Module Inform	ation					~ ⊞
	SFP1 Speed SFP2 Speed						IfName		SFP1	SFP2					
-	Autoneg	1000BASE-X 🚖			Autoneg 1	0GBASE-R 🖕			6 Fitted						
									EEPROM Read Sta	itus		SFP Read OK			
									O Vendor Name			Cambium Networks			
									O Vendor Part Number	er		SFP-10G-SR			
×									O Vendor Revision			1.0			
									Vendor Serial Num	ber		M2111170533			
									Date Code			211209			
									3 Laser Wavelength			850			
									 Optical Diagnostic 	s Support		7			
									1 Laser Output Power	ər		0.1259 mW / -9.00 dB	m		
									8 Receiver Signal Ty	pe		Average Optical Powe	r		
									Receiver Signal			0.4404 mW / -3.56 dB	m		
									6 Module Temperatu	re		61.37 degrees C / 142	.47 degre	es F	
									In Module Voltage			3.2464 V			
									0			Update Readings			
									Detailed SFP2 Mod	ule Information					^ ⊞

Table 13 lists and describes the parameters on the SFP Module page.

Parameter	Description
Configuration	
	Data speed (10 Gbps) of the optical fiber port1.
	The following options are supported:
	Autoneg 1000BASE-X
	Forced 1000BASE-X
	Autoneg 10GBASE-R
SFP1 Speed	Select the required option from the drop-down list.
	When you modify the value of this parameter, the changes are not applicable until the device is rebooted.
	Note : The auto negotiated (Autoneg) option is recommended for both 1000BASE-X and 10GBASE-R. The Forced 1000BASE-X option should be used only if it is specifically recommended by Cambium Networks.
	Data speed (10 Gbps) of the optical fiber port2.
	The following options are supported:
	Autoneg 1000BASE-X
SFP2 Speed	Forced 1000BASE-X
	Autoneg 10GBASE-R
	Select the required option from the drop-down list.

Table 13: List of parameters in the SFP Module page

Parameter	Description	
	When you modify the value of this parameter, the changes are not applicable until the device is rebooted.	
	Note : The auto negotiated (Autoneg) option is recommended for both 1000BASE-X and 10GBASE-R. The Forced 1000BASE-X option should be used only if it is specifically recommended by Cambium Networks.	
SFP Module Information		
lfName	Name of the SNMP MIB2 fixTable corresponding to this SFP module (SFP1 or SFP2) columns.	
Fitted	Indicates whether the SFP1 or SFP2 module was fitted and detected at the boot time.	
EEPROM Read Status	Indicates the status of reading the SFP EEPROM.	
Vendor Name	The vendor's name read from the SFP module.	
Vendor Port Number	The vendor port number read from the SFP module.	
Vendor Revision	The vendor revision number read from the SFP module.	
Vendor Serial Number	The vendor serial number read from the SFP module.	
Date Code	The date code read from the SFP module.	
Laser Wavelength	The laser wavelength (in mm) read from the SFP module.	
Optical Diagnostics Support	Indicates whether the installed SFP module supports optical diagnostics.	
Lasar Output Dower	The laser output power read from that SFP module.	
Laser Output Power	This parameter displays the value in both mW and dBm.	
	The Receiver signal type read from the SFP module.	
Receiver Signal Type	This parameter displays the value as OMA or Average Optical Power.	
Dessiver Signal	The Receiver signal read from the SFP module.	
Receiver Signal	This parameter displays the value in both mW and dBm.	
	The module temperature read from the SFP module.	
Module Temperature	This parameter displays the value in both degrees C and degrees F.	
Module Voltage	The module voltage read from the SFP module.	
Lindata Roadings	An option to trigger a re-read of the EEPROM for the SFP module.	
	When you click the Update Readings button, the dynamic readings are updated.	

2. To view the detailed SFP2 module information, click the < icon in the **Detailed SFP2 Module** Information section.

The Detailed SFP2 Module Information section displays the **Module Text Dump** parameter with detailed readings. This parameter displays a text dump of all the settings read from the SFP module (as shown in Figure 21). The output format is dependent on the features implemented by the SFP module.

Detailed SFP2 Module Information		~ ⊞
	Identifier	: 0x03 (SFP)
	Extended identifier	: 0x04 (GBIC/SFP defined by 2-w
	Connector	: 0x07 (LC)
	Transceiver codes	: 0x10 0x00 0x00 0x00 0x00 0x00
	Transceiver type	: 10G Ethernet: 10G Base-SR
	Encoding	: 0x06 (64B/66B)
	BR, Nominal	: 10300MBd
	Rate identifier	: 0x00 (unspecified)
	Length (SMF,km)	: 0km
	Length (SMF)	: Om
	Length (50um)	: 300m
	Length (62.5um)	: 300m
	Length (Copper)	: Om
	Length (OM3)	: Om
	Laser wavelength	: 850nm
	Vendor name	: Cambium Networks
	Vendor OUI	: 58:c1:7a
	Vendor PN	: SFP-10G-SR
	Vendor rev	: 1.0
	Option values	: 0x00 0x1a
	Option	: RX_LOS implemented
	Option	: TX_FAULT implemented
	Option	: TX_DISABLE implemented
	BR margin, max	: 0%
	BR margin, min	: 0%
Module Text Dump	Vendor SN	: M2111170533
Module lext builtp	Date code	: 211209
	Optical diagnostics support	: Yes
	Laser bias current	: 7.582 mA
	Laser output power	: 0.5305 mW / -2.75 dBm
	Receiver signal average optical power	: 0.4421 mW / -3.54 dBm
	Module temperature	: 61.37 degrees C / 142.47 degr
	Module voltage	: 3.2488 V
	Alarm/warning flags implemented	: Yes
	Laser bias current high alarm	: Off
	Laser bias current low alarm	: Off
	Laser bias current high warning	: Off
	Laser bias current low warning	: Off
8	Update Readings	

Figure 21: An example of the Module Text Dump output

CPE Provisioning

The CPE Provisioning page provides options to:

• Configure the RADIUS server and other network settings for CPEs.

A RADIUS server is used for remote authentication, provisioning, and configuration of users (CPEs). The cnWave[™] 5G Fixed BTS application supports (currently) up to three RADIUS authentication servers. The network RADIUS server contains one entry for each authorized CPE. For each entry, the CPE is identified by its IMSI. For each authorized CPE, the RADIUS contains configuration settings such as IP address, mask, gateway, QoS details, VLAN details, and forwarding of tag and/or untagged traffic.

Using the **CPE Provisioning** page in the B1000 UI, you can configure the RADIUS authentication server for CPEs.

- View and download logs specific to authentication.
- Enable and set the DHCP Option 82 configuration.

You can enable DHCP option 82 (also known as the DHCP relay agent information option) on cnWave[™] 5G fixed devices while operating in the L2 bridge mode. This implementation helps to protect the cnWave[™] 5G fixed devices against attacks, such as DHCP IP address starvation and spoofing (forging) of IP addresses and MAC addresses. The Option 82 standard This standard defines how the DHCP server can use the location of a DHCP client when assigning IP addresses or other parameters to the client.



Note

For more information about the DHCP relay agent information option, check http://tools.ietf.org/html/rfc3046.

When you enable the DHCP Option 82 feature using the **CPE Provisioning** page, the system intercepts DHCPv4 REQUEST and DISCOVER packets, and inserts the Option 82 fields. When Option 82 is implemented on a switching device, it comprises the following sub options (which are fields in the packet header):

- Circuit ID: Used for identifying the circuit (for example, interface or VLAN) on the node on which the request is received.
- Remote ID: Used for identifying the remote device that sends the DHCP request.

To configure the RADIUS server and other provisioning related parameters, perform the following steps:

1. From the main B1000 dashboard page, navigate to System > CPE Provisioning.

The CPE Provisioning page appears, as shown in Figure 22 (if RADIUS AAA settings are not set).

Figure 22: The CPE Provisioning page with no RADIUS AAA settings

	🕲 Cambium Networks cnWave* 5G Fixed B1000 Undo 🔊 Save B 🕐 Administrator 🛔 admin +			
-14	General Management Radio	Interfaces SFP Module CPE Provisioning Synchronisation Syslog		
•	Authentication	× 🗄	DHCP Option 82 Configuration	× 🖽
		None RADIUS AAA	DHCP Option 82 Enabled	0
\$ 4	0 Mode	Any CPE may connect to this BTS without authentication. User data traffic will be bridged unconditionally.	Authentication Logs	¥ B
Ж	RADIUS Authentication Server Sta	tus 🗸 🖉		315633044.083136: 315633044.083138: v@_hostapd: KAUIUS Keeeivia 315633044.083148: RADIUS message: code=2 (Access-Accept) iden 315633044.083167: 315633044.083169: v@_hostapd: STA 00:00:00:
	Auth Server Reachable			315633044.083179: CAMBIUM: Received RADIUS ACCESS-ACCEPT (2) 315633044.083189: RADIUS ALARM: received access accept
	Network Configuration	~ ⊞	authentication.log 🛓	315633044.083199: Radius message does not contain User Name at 315633044.083210: IEEE 802.1X: Could not find matching station
	CPE IP From DHCP	C True O False		315633044.083227: 315633044.083228: v0_hostapd: STA 00:00:(0 315633644.083462: 315633644.083467: v0_hostapd: RADIUS Sendint

2. Set the required parameter, as described in Table 14.

Parameter	Description		
Authentication			
	Determines the connection mode of CPEs.		
	This parameter supports the following options:		
Mode	 None: In this mode, any CPE can connect to BTS without authentication. Therefore, user data traffic is bridged unconditionally. By default, this option is selected. 		
	 RADIUS AAA: In this mode, CPEs are authenticated by a RADIUS Server (back-end server). User traffic is not bridged until the CPEs are authenticated. 		
	Choose the required mode.		
	You can use ⁵ to revert to None from the RADIUS AAA mode.		
RADIUS Authentication Server Sta	tus		
	This is a read-only parameter.		
Auth Server Reachable	Indicates whether at least one of the configured authentication servers is currently reachable. The authentication servers are polled every 10 minutes to update this status.		
Network Configuration			
	Determines whether the CPE IP network configuration is supplied by a DHCP server.		
	The following values are supported:		
CPE IP From DHCP	 True: When enabled, the CPE IP network configuration is supplied by a DHCP server. 		
	 False: When disabled and if the Authentication Mode is RADIUS AAA, the CPE IP network configuration is supplied by the configured RADIUS server. 		
	When disabled and if the Authentication Mode is None , the CPE IP network configuration is set locally at each CPE.		
	Select the required option.		
	Determines whether the CPE uses the local VLAN configuration or the RADIUS-supplied VLAN settings.		
	This parameter is applicable only when you choose RADIUS AAA as the authentication mode.		

Table 14: List of parameters in the CPE Provisioning page

Parameter	Description	
	The following options are supported:	
	 True: The CPE uses the local VLAN configuration. This control is applicable when the Authentication Mode is None and this control has no effect as CPEs always install their local VLAN configuration. 	
	 False: The CPE installs the RADIUS-supplied VLAN settings. This control is applicable when the Authentication Mode is RADIUS AAA. 	
	Select the required option.	
CPE Use Local QoS Config	Determines whether the CPE uses the local QoS configuration or the RADIUS-supplied QoS settings.	
	This parameter is applicable only when you choose RADIUS AAA as the authentication mode.	
	The following options are supported:	
	 True: The CPE uses the local QoS configuration. This control is applicable when the Authentication Mode is None and this control has no effect as CPEs always install their local QoS configuration. 	
	• False: The CPE installs the RADIUS-supplied QoS settings. This control is applicable when the Authentication Mode is RADIUS AAA .	
	Select the required option.	
DHCP Option 82 Configuration		
	Determines whether the DHCP Option 82 feature is enabled.	
	When this parameter is enabled, the system intercepts DHCPv4 REQUEST and DISCOVER packets, and inserts the Option 82 fields (Circuit ID and Remote ID information) to the packet header.	
DHCP Option 82 Enabled	Select the checkbox if you want to enable this feature.	
	Note : When you enable the DHCP Option 82 parameter, the following Option 82- specific fields appear (as shown in Figure 23):	
	Circuit ID	
	Remote ID	
Circuit ID	The circuit ID used for identifying the circuit (for example, interface or VLAN) on the node on which the request is received.	

Parameter	Description		
	When the DHCP Option 82 Enabled parameter is enabled, the system inserts this Circuit ID into the packet header.		
	Default value: <pre>\$btsMAC\$</pre>		
	Note: Use the following wildcards to configure Circuit ID and Remote ID fields:		
	 \$btsMAC\$: MAC address of the BTS in ASCII format without colons. \$btsMAC\$ is the default value of the Circuit ID field. 		
	 \$cpeMAC\$: MAC address of the CPE in ASCII format without colons. \$cpeMAC\$ is the default value of the Remote ID field. 		
	• \$cpeIMSI\$: IMSI of the CPE.		
	 \$btsSystemName\$: The configured system name of the BTS device. 		
	 \$cpeSystemName\$: The configured system name of the CPE device. 		
	You can combine multiple wildcards. The total length of the option (after replacing wildcards with corresponding values) must not exceed 255 characters. You can also configure a custom string, which must not start with a \$ character.		
	The remote ID used for identifying the remote device that sends the DHCP request.		
	When the DHCP Option 82 Enabled parameter is enabled, the system inserts this Remote ID tino the packet header.		
	Default value: \$cpeMAC\$		
Remote ID	For information about the supported wildcards, check the <u>Circuit ID</u> field description.		
	Note : You can combine multiple wildcards. The total length of the option (after replacing wildcards with corresponding values) must not exceed 255 characters. You can also configure a custom string, which must not start with a \$ character.		
DHCP Option 82 Statistics	Displays the count of DHCP Option 82-specific requests and replies that are received, discarded, and relayed, including other message discards.		
	This section appears only when you select the DHCP Option 82 Enabled checkbox.		
	This section displays the following statistics:		

Parameter	Description	
	• Requests Received : Number of DHCP requests received by DHCP Option 82 Relay.	
	 Requests Relayed: Number of DHCP requests relayed by DHCP Option 82 Relay. 	
	• Requests Discarded : Number of DHCP requests discarded by DHCP Option 82 Relay.	
	• Replies Received : Number of DHCP replies received by DHCP Option 82 Relay.	
	• Replies Relayed : Number of DHCP replies relayed by the DHCP Option 82 Relay.	
	• Replies Discarded : Number of DHCP replies discarded by DHCP Option 82 Relay.	
	• Untrusted Discards : Number of untrusted messages discarded by DHCP Option 82 Relay.	
	• Max Hop Discards: Number of messages discarded by DHCP Option 82 Relay due to exceeded max hop.	
	• Packet Too Big : Number of messages forwarded without relay information by DHCP Option 82 Relay when the relay information exceeded the maximum message size.	
	 Invalid Packet Discards: Number of messages discarded by DHCP Option 82 Relay due to invalid or corrupted packet. 	
Authentication Logs		
authentication.log	An option to view and download the authentication logs from the UI.	
	Click the 🛓 icon to download the authentication logs.	
The following parameters appear only when you select the RADIUS AAA mode (as shown in Figure 24):		
RADIUS Configuration		
	Used for billing purposes.	
Accounting	When the CPE authentication mode is set to RADIUS AAA , this RADIUS accounting-specific parameters are enabled in the RADIUS Accounting Server section (as shown in Figure 24).	

Parameter	Description		
	You must set these RADIUS accounting-specific parameters with appropriate values by configuring with at least one primary accounting server (as shown in Figure 24).		
RADIUS Accounting Server - This section appears only when you select the Accounting checkbox.			
	An option to designate one RADIUS server as primary and the others (if required) as secondary accounting servers.		
	This parameter supports the following options:		
	Primary		
Role	• Secondary		
	• None		
	Select the required option from the drop-down list.		
	Note : Ensure that at least one primary accounting server is configured (as shown in Figure 24).		
Inet Address	The IP address assigned to the server that performs RADIUS accounting.		
	Type an appropriate value in the text box.		
Port	The network port assigned to the server that performs RADIUS accounting.		
	Default value: 1813		
Secret	The shared secret that is used to authenticate transactions between the BTS device and the RADIUS accounting server.		
	Provide an appropriate value in the text box.		
RADIUS Authentication Server			
	An option to designate one RADIUS server as primary and the others (if required) as secondary authentication servers.		
	This parameter supports the following options:		
Role	Primary		
	• Secondary		
	• None		
	Select the required value from the drop-down lists.		
Inet Address	The IPv4 address of the RADIUS server used for identifying in standard dot notion.		
	Type an appropriate value in the text box.		

Parameter	Description
Port	The destination port used by the device for RADIUS communication, authorization, and configuration. Default value: 1812
Secret	The shared secret value that must contain up to 32 ASCII printable characters. These characters are used to authenticate transactions between the BTS and the RADIUS Authentication Server.
	The shared secret(s) must match those shared secret(s) configured in the RADIUS server(s) clients.conf file. For more information about the clients.conf file settings, refer to An example of configuring an Authentication Server.
	Provide an appropriate value in the text box.

Figure 23 shows the parameters specific to the DHCP Option 82 configuration.

Figure 23: DHCP Option 82 configuration and statistics

DHCP Option 82 Configuration		~	
OHCP Option 82 Enabled	ට ව		
Circuit ID	\$btsMac\$		
Remote ID	\$cpeMac\$		
DUCP Option 82 Statistics		~	
Dher Option 62 Statistics			
8 Requests Received	0		
Requests Relayed	0		
Requests Discarded	0		
Replies Received	0		
1 Replies Relayed	0		
Replies Discarded	0		
1 Untrusted Discards	0		
Max Hop Discards	0		
1 Packet Too Big	0		
Invalid Packet Discards	0		

Figure 24 is an example of the **CPE Provisioning** page when the CPE connection mode is set to RADIUS AAA.
General Management Radio Interfaces SFP Module CPE Provisio	oning Synchronisation Sys	og
Authentication	~ E	Network Configuration V 🖪
Mode None RADIUS AAA		CPE IP From DHCP True False
PADILIS Configuration		CPE Use Local VLAN Config True False
	× 1	CPE Use Local QoS Config True False
		DHCP Option 82 Configuration
RADIUS Authentication Server	× E	
Role Inet Address Port	Secret	
Primary \$ 169.254.2.253 1812		Authentication Logs 🗸 🖼
None ¢		1690374547.906038: Value: 79b3b80ac7154 1690374547.906047: Attribute 1 (User-Name) 1690374547.906056: Value: '888901007407 1690374547.906056: Attribute 8 (Framed-IP-, 1690374547.5275675 Attribute 8 (Framed-IP-,
RADIUS Accounting Server	~ =	authentication.log 1690374547,906084: Attribute 9 (?Unknown?)
Role Inet Address Port	B Secret	1690374547.906094: Attribute 26 (Vendor-Sp 1690374547.906108: Value: 000000311906a
Primary \$ 10.10.10.254 1813		169037457.900117: Attribute 26 (Vendor-Sp
None 🗢		

Figure 24: Parameters specific to the RADIUS AAA mode

3. Click Save to apply the changes.

An example of configuring an Authentication Server

This section explains an example of configuring FreeRADIUS 3.0 as an Authentication Server.

Use the clients.conf file to configure the credentials required for enabling the RADIUS server to authenticate the data flow from BTS to CPE or CPE to BTS. The default location of the file is /etc/freeradius/3.0/ (in a Linux-based PC).

The following is an example of a configuration:

client hawking-auth {

ipaddr = 10.10.10.150/24
secret = phn_shared_secret
shortname = hawking auth

Dictionary files:

Each dictionary file contains a list of Vendor Specific Attribute (VSAs) and values. The RADIUS server uses these VSAs and values to map descriptive names and on-the-wire data.

Default location of directories: /etc/freeradius/3.0/

To add dictionary.canopy and dictionary.hawking, add the following to the default dictionary file:

\$INCLUDE dictionary.canopy

\$INCLUDE dictionary.hawking

Ensure that all dictionaries are available in the default location.

Authorize file:

The authorize file within a FreeRADIUS server determines the network access and configuration for each user.

Default location of the authorize file: /etc/freeradius/3.0/mods-config/files/

Figure 25 is a screenshot of a section taken from an authorize file for a CPE with an IMSI - 208920007405736.

Figure 25: A sample configuration for a RADIUS Server

# CPEs 1							
# Fixed IMSIs							
208920007405736	C]	Cleartext-Password := "networks"					
Framed-IP-Address	=	"192.168.192.	31	L", # Assigned CPE Management IP Address			
Framed-IP-Netmask	=	255.255.255.0	,	# Assigned Management Netmask			
Cambium-Canopy-Gateway	=	10.10.10.254,		# The IP address acting as a gateway			
Cambium-Canopy-VLMGVID	=	1,		# VLAN Management VLAN ID			
Cambium-Canopy-VLSMMGPASS	=	Ο,	#	VLAN SM Management Passthrough			
			#	Enable(1=enable,0=disable)			
Cambium-Canopy-HPENABLE	=	Ο,	#	High Priority Channel Enable (1=enable,0=disable)			
Cambium-Canopy-ULBR	=	3072,	#	Uplink Bit Rate/Sustained Uplink Rate (kbps)			
Cambium-Canopy-ULBL	=	6144,	#	Uplink Bit Limit/Uplink Burst Allocation (kbps)			
Cambium-Canopy-DLBR	=	30720,	#	Downlink Bit Rate/Sustained Downlink Rate (kbps)			
Cambium-Canopy-DLBL	=	61440,	#	Downlink Bit Limit/Downlink Burst Allocation kbps)			
Cambium-Canopy-BCASTMIR	=	100,	#	Broadcast Traffic Maximum Information Rate (kbps)			
Cambium-Canopy-ULMB	=	6144,	#	Max Burst Uplink Rate (kbps)			
Cambium-Canopy-DLMB	=	61440,	#	Max Burst Downlink Rate (kbps)			
Cambium-Canopy-LPULCIR	=	1000,	#	Low Priority uplink CIR (kbps)			
Cambium-Canopy-HPULCIR	=	100,	#	High Priority uplink CIR (kbps)			
Cambium-Canopy-LPDLCIR	=	6000,	#	Low Priority downlink CIR (kbps)			
Cambium-Canopy-HPDLCIR	=	100,	#	High Priority downlink CIR (kbps)			
Cambium-Canopy-VLLEARNEN	=	Ο,	#	VLAN Learning Enable (1=enable, 0=disable)			
Cambium-Canopy-VLIGVID	=	50,	#	VLAN Ingress VLAN ID			
Cambium-Canopy-VLFRAMES	=	1,	#	Frames Types allowed(0=all/1=Tagged/2=Untagged)			
Cambium-Canopy-VLIDSET	=	103,	#	VLAN Membership (1-4094)			
Cambium-Canopy-VLIDSET	=	203	#	VLAN Membership (1-4094)			

Figure 26 shows various fields that indicate how the CPE uses RADIUS authentication to communicate with BTS.

RADIUS Session	
1 Phase	Authenticated
Connection	Connected
1 IP Address	169.254.3.1
1 IP Netmask	255.255.255.0
Prefix	24
Default Gateway	169.254.3.99
VLMGVID	1
CPE Management VID Pass- through	Disabled
1 ULBR	0 kbps
() ULBL	0 kbits
1 DLBR	0 kbps
1 DLBL	0 kbits
1 LPULCIR	0 kbps
1 MPULCIR	0 kbps
1 HPULCIR	0 kbps
1 UHPULCIR	0 kbps
1 LPDLCIR	0 kbps
MPDLCIR	0 kbps
I HPDLCIR	0 kbps
UHPDLCIR	0 kbps
VLLEARNEN	Enabled
VLAGETO	25
VLIGVID	50
1 VLFRAMES	Tagged Frames
 Primary DNS Server 	0.0.0.0
Secondary DNS Server	0.0.0.0
1 DNS Domain Name	
Bts_version	4-0-0-0

Figure 26: RADIUS authentication details in the C100 (CPE) dashboard

Details of RADIUS authentication-specific parameters (as shown in Figure 26) are described in Table 36 (in the <u>Viewing the C100 (CPE) dashboard</u> section).

Synchronisation

The **Synchronisation** page displays parameters required to configure and manage the TDD synchronization by using either an internal GPS or an external GPS source.

For more information about the TDD Synchronization and how to check the BTS installation using satellite details, refer to the $cnWave^{M}$ 5G Fixed Planning and Installation Guide.

To view the TDD synchronisation related settings, perform the following steps:

1. From the main B1000 dashboard page, navigate to System > Synchronisation.

The Synchronisation page appears, as shown in Figure 27.

Figure 27: The Synchronisation page

	Cambium Networks │ Cn Wave [™] 5G	6 Fixed B1000			Undo 🍤 Save 🖬	🖒 Administrator 💄 admin 👻
-	General Management Radio	Interfaces SFP Module CPE Provisioning	Synchronisation Syslog	3		
•	TDD Configuration		~ ⊞	NTP		✓ ■
-	Control	Disabled 🧿 Best Effort 🔘 In Sync Only			Address	1 Port
\$	Source	Internal GNSS O Sync Over Power		2 1	69.254.3.253	123
Ø	TDD Status		~ ⊞	3 р	ool.ntp.org	123
×	0 State Tir	ime Locked		4 p	ool.ntp.org	123
	TDD Stats		~ ⊞	5 p	ool.ntp.org	123
	Relock Counts 1					

2. Set the value of each parameter, as described in Table 15.

Parameter	Description
TDD Configuration	
	Determines the use of internal or external reference signal for TDD synchronisation.
	This parameter supports the following options:
	 Disabled: Indicates that an internal reference is used.
	• Best Effort: Indicates that an external one pulse per second (PPS) reference is used.
Control	 In Sync Only: Indicates that Tx is turned off when TDD is not in sync.
	Select the required option. For example, the Best Effort option indicates that the BTS device uses the satellite signal for the reference. Even if all satellites go down, the BTS device uses the reference time for a specific period (for example, 5 minutes) before it loses the reference signal.
	Note : When you select Best effort or In Sync only, the ⁵ icon appears indicating to select the Disabled option.

Table 15: List of parameters in the Synchronisation page

Parameter	Description		
	The sync source for TDD.		
	This parameter supports the following options:		
Source	 Internal GNSS: Indicates that the BTS device uses an integrated GPS as a reference for the operation of TDD. 		
	• Sync Over Power: Not supported in this release.		
	Select the required option.		
	Note : When you select Sync Over Power , the ⁵ icon appears indicating to select the Internal GNSS option.		
TDD Status			
	Indicates the state of TDD synchronisation process, which is reported by TDD Sync state.		
State	The BTS device can be synchronised to a one PPS source. The synchronisation process involves detecting a valid one PPS reference signal, acquiring frequency lock, and then acquiring and maintaining time lock.		
	When a PPS is detected, the frequency is locked and the TDD is synchronized (which is indicated by the Time Locked state).		
	Note : The Local state indicates that the local reference is used, and no PPS input is detected.		
TDD Stats			
Relock counts	Indicates the number of times the TDD Sync has entered the locked condition.		
NTP - Stands for Network Time Proto	pcol (NTP).		
A networking protocol that allows yo remote server. NTP sets the reference	ou to automatically sync your system date and time with a e time and date in the BTS.		
Address	IP address of the NTP server or a Domain Name System (DNS) name (using which the device is configured to use DNS).		
	Enter the required addresses or DNS names of the system in the text boxes.		
Port	The network port number that is assigned to the NTP server.		
	Note: The O value is not valid.		

3. Click **Save** to apply the changes.

Syslog

The **Syslog** page allows you to allocate the lowest syslog severity level and enable the remote syslog specific parameters for the BTS device. The syslog configuration helps you to record and view all events of the BTS device. Example: CPE connected or BTS connected to cnMaestro.

To configure and view the **Syslog** page, perform the following steps:

1. From the main B1000 dashboard page, navigate to **System > Syslog**.

The **Syslog** page appears, as shown in Figure 28.

Figure 28: The Syslog page

	ambium Ne	tworks cn	Vave ™ 5G Fi	ixed B1000					Undo 🖒 Save 🖬 🔱 Adm	ninistrator 🙎 admin 🔻
÷.	General	Management	Radio Inte	rfaces SFP Module	CPE Provisioning	Synchronisation	Syslog			
i	Configura	tion								~ ⊞
-	 Lowest 	Severity			Debu	•				
*	8 Remote	Enabled								
台	Pamota P	ecolyara								
*	C () Inet	Address			0 Port			() Standard	O Lowest Severity	· · · ·
	10.1 3	0.150.131			11514			RFC 5424 \$	Debug ¢	
	Device La									
	Device Lo	ព្វទ								× 8
					Jan Jan	1 00:00:29 B1000 1 00:00:43 B1000	-00045670	00183POC-RIG-2 syslogd[382]: syslogd v 00183POC-RIG-2 syslog: The radio trans	v2.5.2: restart. smitter has been enabled (powered on)	^
					Jan	1 00:01:02 B1000	-00045670	00183POC-RIG-2 syslog: Device Agent 4.	.143 is connected to cnMaestro server https://10.1	130.150.120/ c
					Jun	20 13:04:41 B1000 20 13:05:52 B1000	-00045670 -00045670	00183POC-RIG-2 syslog: This device is 00183POC-RIG-2 syslog: CPE 88890100740	synchronized with a NTP reference clock 07543 : has connected	
					Jun	20 13:05:57 B1000	-00045670	00183POC-RIG-2 syslog: CPE 88890100746	07456 : has connected	
					Jun	20 13:05:59 B1000	-00045670	00183POC-RIG-2 syslog: CPE 88890100740	07522 : has connected	
	local.log				Jun	20 13:06:01 B1000	-00045670	00183POC-RIG-2 syslog: The RADIUS AAA	authentication server is now reachable	
					Jun	20 13:06:15 B1000	-00045670	00183POC-RIG-2 syslog: CPE 88890100740	07527 : has connected	
					Jun	20 13:06:17 B1000	-00045670	00183POC-RIG-2 syslog: CPE 88890100740	07455 : has connected	
					Jun	20 13:06:22 B1000	-00045670	00183POC-RIG-2 syslog: CPE 88890100740	07458 : has connected	
					Jun	20 13:06:30 B1000	-00045670	00183POC-RIG-2 syslog: CPE 88890100740	07543 : CPE 5 Rig 2 Release 3.1 is now registered	
					Jun	20 13:06:35 B1000	-00045676	00183POC-RIG-2 syslog: CPE 88890100740	07456 : CPE 4 Rig 2 Release 3.1 is now registered	
					Jun	20 13:06:37 B1000	-00045670	00183POC-RIG-2 syslog: CPE 88890100746	07522 : CPE 2 Rig 2 Release 3.1 is now registered	*
					4					I 10

2. Set the value of each parameter, as described in Table 16.

Table 16: List of parameters in the Syslog page

Parameter	Description			
Configuration				
	Allows you to configure the lowest syslog severity that is logged locally on the BTS device.			
	The following syslog severity levels are supported:			
Lowest Severity	 Emergency - means system is unusable. 			
	 Alert - means action must be taken immediately. 			
	Critical - means critical conditions.			
	Error - means error conditions.			
	Warning - means warning conditions.			
	 Notice - means normal but significant conditions. 			

Parameter	Description			
	 Information - means informative messages. 			
	 Debug - means debug-level messages. 			
	Select the required severity from the drop-down list.			
	When you enable this remote syslog parameter, important system events are sent to the configured remote syslog receivers.			
	Syslog facilities include syslog, auth, and local0 thro local7.			
Remote Enabled	When you select the Remote Enabled checkbox, the Remote Receivers section appears with the following parameters:			
	Inet Address			
	• Port			
	• Standard			
	Lowest Severity			
Remote Receivers				
	IP address that is assigned to the remote syslog receiver.			
Inet Address	All enabled severity levels of syslog messages are sent to this address.			
	Type an appropriate value in the text box.			
	The network port that is assigned to the remote syslog receiver.			
Port	Type a valid value in the text box.			
	Note : The zero (0) value is not valid.			
	Indicates the syslog message format, which is determined by RFC 3164 and RFC 5424 standards.			
	The following options are supported:			
Standard	• RFC 3164			
	• RFC 5424			
	Select the required option from the drop-down list.			
	Allows you to configure the lowest syslog severity message that is sent to the remote syslog receiver.			
Lowest Severity	The following syslog severity levels are supported:			
	• Emergency - means system is unusable.			

Parameter	Description
	• Alert - means action must be taken immediately.
	Critical - means critical conditions.
	Error - means error conditions.
	Warning - means warning conditions.
	• Notice - means normal but significant conditions.
	 Information - means informative messages.
	 Debug - means debug-level messages.
	Select the required severity from the drop-down list.

3. Click **Save** to apply the changes.

The **Device Logs** section displays the events of the BTS device for the selected severity level. You can view and download the logs (if required) using the $\frac{1}{2}$ icon.

Viewing Subscriber (CPE) Data

This section describes how to view the CPE (device) performance for managing subscribers.

The **Subscribers** (1) icon in the B1000 dashboard page allows you to access the CPE subscriber list and data. Using the B1000 UI, you can view the following subscriber management-related data:

- <u>CPE status</u>
- CPE device data
- CPE radio data
- CPE configuration data
- <u>CPE QoS configuration data</u>
- CPE wireless port statistics
- <u>CPE Ethernet port statistics</u>

CPE status

The **CPE Status** page provides information about the number of CPEs registered with BTS and their connection state.

To view the CPE status data, perform the following steps:

1. Log on to the B1000 UI, by using the appropriate username and password.

The main B1000 dashboard page appears, as shown in Figure 2.

2. From the left navigation column, select the **Subscribers** (

A page appears with multiple tabs such as CPE Status, CPE Radio, CPE Auth, CPE Cfg, and CPE Data. By default, the **CPE Status** tab is selected (as shown in Figure 29).

Cambium Networks | cnWave[™] 5G Fixed | B1000 Save 🖬 😃 Administrator 💄 admin -11 CPE Status CPE Device CPE Radio Status CPE Cfg CPE QoS CPE Wireless Port Stats CPE Ethernet Port Stats Summary i Connected CPEs 8 \$ Registered CPEs 8 INTP Synchronized ~ 2 CPE Status × Sys Name 1 C-RNTI 1 Registration State 1 Registration Count 1 Link Uptime 1 IP Address 1 DL Rx Power 1 DL MCS 1 DL EVM (dB) 1 UL Rx Power UL MCS UL EVM (dB) (dBm) (dBm) 6d 14h 7m 169.254.3.6 -31.7 19 -32.0 CPE 6 47 Registered -41 23 -61 CPE 4 50 Registered 6d 14h 6m 169.254.3.4 -39 23 -31.3 -56 23 -28.7 -32.6 23 CPE 2 93 Registered 5 20h 42m 9s 169.254.3.2 -40 23 -61 -28.6 CPE 7 95 Registered 19h 33m 20s 169.254.3.7 -40 23 -30.5 -63 18 -28.2 5 17h 49m 57s CPE 1 101 Registered 11 169.254.3.1 -45 23 -33.3 -62 19 -28.8 CPE 8 109 Registered 17h 48m 13s 169.254.3.8 -41 23 -31.0 -61 19 -28.4 110 -57 CPE 5 Registered 17h 47m 46s 169.254.3.5 23 -32.1 23 -28.9 4 -41 CPE 3 111 Registered 5 17h 47m 41s 169.254.3.3 -38 23 -31.3 -65 16 -27.1

Figure 29: The CPE Status page

Table 17 lists and describes parame	eters available on the CPE Status page.
-------------------------------------	---

Table 17: List of CPE Status p	oarameters
--------------------------------	------------

Parameter	Description
Summary	
Connected CPEs	Total number of CPEs that are currently connected to BTS.
Registered CPEs	Total number of CPEs that are currently registered and authenticated with BTS.
NTP Synchronized	Indicates whether this device is using NTP to receive time from a reference clock.
CPE Status	
Sys Name	Name of the CPE system.
	Stands for Call-Radio Network Temporary Identifier (C-RNTI).
	Unique ID used for identifying RRC connection and scheduling. Each CPE device is associated with a dedicated C-RNTI.
	BTS uses the C-RNTI to:
C-RNTI	 Allocate a CPE with uplink grants, downlink assignments, Physical Downlink Control Channel (PDCCH) order, and others.
	 Differentiate uplink transmissions. Example: Physical Uplink Shared Channel (PUSCH) and Physical Uplink Control Channel (PUCCH) of a CPE from others.

Parameter	Description						
	In addition, a CPE promotes a temporary C-RNTI to permanent C-RNTI (if the CPE does not have a C-RNTI already) on completing the connection-based RFA procedure successfully.						
	Note : The RNTI is allocated by the BTS on the connection of a CPE. A CPE might be allocated with a different RNTI each time whenever it connects.						
	The RNTI is released when a CPE disconnects from the BTS. RNTI uniquely identifies a CPE connected to a given BTS or sector.						
	Indicates whether the CPE has made any progress to enter to the network.						
	This parameter supports the following device transition states:						
	• Down - Indicates that the device is yet to attach to a BTS.						
Registration State	 Attaching - Indicates the device has attached to the BTS radio. 						
	 Authenticating - Indicates the device is authenticating (using Radius) with the BTS. 						
	 Configuring - Indicates that the CPE is being configured. 						
	 Registered - Indicates that the CPE is ready to pass user traffic. 						
Desistantian Count	Number of times that the CPE has successfully registered with BTS.						
Registration Count	The value of this parameter is reset to 0 when the system starts up.						
Link Uptime	Time period (in seconds) at which the last successful registration of the CPE found with BTS.						
IP Address	The IP address that is assigned to the network interface. This IP address is used for managing the device.						
DL Rx Power (dBm)	The downlink received signal power (in dBm).						
	The Modulation and Coding Scheme (MCS) index value of the downlink.						
DEMOS	For more information about MCS, refer to the <u>Modulation</u> section.						
DL EVM (dB)	The EVM value (in dB) of the downlink.						
UL Rx Power (dBm)	The uplink received signal power (in dBm).						
	The MCS index value of the uplink.						
UL MCS	For more information about MCS, refer to the <u>Modulation</u> section.						

Parameter	Description						
UL EVM (dB)	The EVM value (in dB) of the uplink.						
The following parameters are visible only to engineers who log in to the B1000 UI with an engineer user role:							
	The downlink SNR (in dB).						
DE SINK (UB)	Note : SNR stands for signal-to-noise ratio.						
UL SNR (dB)	The uplink SNR (in dB).						

CPE device data

The **CPE Device** page provides information about the hardware device (CPE) that is connected to the BTS.

To view the CPE device data, perform the following steps:

1. From the left navigation column in the B1000 dashboard, navigate to **Subscribers < CPE Device**.

The **CPE Device** page appears, as shown in Figure 30.

Figure 30: The CPE Device page

Ca	mbium Netw	orks cnWa	ave ™ 5G Fixed E	31000					C obnU	Save 🖬 😃 Administrate	or 💄 admin 👻
-14	CPE Status CPE Device CPE Radio Status CPE C/g CPE QoS CPE Wireless Port Stats CPE Ethernet Port Stats										
:	CPE Device										× 🗉
-	Sys Name	11 IN	ISI	MSN		6 ESN	1 Release Name	SKU	Drop	Reset Network Counters	
	CPE 6	8889	01007407454	V5YG016K	H6DZ	0004567113F0	4.0b2	C280500C001A			
셤	CPE 4	8889	01007406574	V5YA01WA	/RXJ4	0004567103EE	4.0b2	C280500C001A			
×	CPE 2	888901007406429		V5YA01PQ	KV2W	00045671035D	4.0b2	C280500C001A			
	CPE 7	CPE 7 888901007406893		7 888901007406893 V5YA026676KB 00045671052D		00045671052D	4.0b2	C280500C001A			
	CPE 1	1 888901007406841		V5YA01XDV62D		0004567104F9	4.0b2	C280500C001A			
	CPE 8	8889	01007406344	V5YA01SP4QWW		000456710308	4.0b2	C280500C001A			
	CPE 5	8889	01007406869	V5YA02J5X411		000456710515	4.0b2	C280500C001A			
	CPE 3	8889	01007406348	V5YA01P3	BSW0	00045671030C	4.0b2	C280500C001A			
	Control										~ H
						Drop Selected Sessions					
	Drop All Sessi										
						Reset Selected CPE Network Cou	nters				
						Reset All CPE Network Counters]				

2. View the data of CPE device parameters, as described in Table 18.

Table 18: List of CPE device parameters

Parameter	Description
Sys Name	Name of the CPE system.

Parameter	Description				
IMSI	Unique number used for identifying a subscriber (CPE user) in a cellular network. Each subscriber is associated with a unique IMSI.				
MSN	MSN of the device.				
ESN	ESN of the device.				
Release Name	The release version of the embedded software running on the CPE device.				
SKU	SKU of the CPE device.				
	An option to drop the required CPE session from the B1000 UI.				
Drop	If you want to drop a CPE session, select the corresponding checkbox and click Drop Selected Sessions . The selected CPE session is dropped and there is no need for system reboot.				
	If you want to drop all the CPE sessions, click Drop All Sessions .				
	An option to reset the required CPE network counters from the B1000 UI.				
Reset Network Counters	If you want to drop a CPE network counter, select the corresponding checkbox and click Reset Selected CPE Network Counters . The selected CPE network counter is reset and there is no need for system reboot.				
	If you want to reset all the CPE network counters, click Reset All CPE Network Counters .				

CPE radio data

The **CPE Radio Status** page provides information that you can use to troubleshoot any issues with the radio link-related parameters at a deployment site.

To view the data of CPE radios, perform the following steps:

1. From the left navigation column in the B1000 dashboard, navigate to **Subscribers** > **CPE Radio Status**.

The CPE Radio Status page appears, as shown in Figure 31.

Figure 31: The CPE Radio Status page

	Camb	bium N	letworks	l cn W a	ave ™ 5G	Fixed B1	1000									Undo 🔊	Save 🔒	O Admini	strator 💄 admin 👻
÷.	С	PE Sta	tus CPE	Device	CPE Ra	dio Status	CPE Cfg CP	E QoS CPE	Wireless Port	Stats CP	'E Ethernet P	ort Stats							
:	CPE Radio Status																		
•	S	iys Iame	DL Rx Power (dBm)	OL EVM (dB)	OL MCS	DL Backoff (dB)	 DL Spatial Frequency 	 DL Channel Distortion (dB) 	DL Sounding State	Current EIRP (dBm)	UL Rx Power (dBm)	UL EVM (dB)	0 UL MCS	UL Backoff (dB)	UL Spatial Frequency	UL Channel Distortion (dB)	UL Sounding State	Range (km)	 Alignment Active
	с	PE 6	-41	-33.1	23	13	692	-17.3	Tracking	30	-61	-29.1	19	0	687	-17.4	Tracking	0.01	
	С	PE 4	-39	-31.8	23	13	958	-19.4	Tracking	48	-55	-29.3	23	4	957	-22.4	Tracking	0.01	
\$6	С	PE 2	-40	-32.7	23	13	212	-18.7	Tracking	18	-61	-28.7	22	0	213	-18.9	Tracking	0.02	
	С	PE 7	-40	-32.9	23	13	568	-17.1	Tracking	48	-62	-28.2	18	0	567	-18.3	Tracking	0.01	
	С	PE 1	-45	-32.6	23	13	327	-15.6	Tracking	48	-62	-28.5	19	0	331	-22.8	Tracking	0.02	
	С	PE 8	-40	-30.5	23	13	446	-17.0	Tracking	18	-61	-27.9	19	0	449	-18.3	Tracking	0.02	
	С	PE 5	-41	-33.3	23	13	822	-18.6	Tracking	48	-58	-28.8	23	1	818	-17.8	Tracking	0.01	
	С	PE 3	-38	-30.6	23	13	91	-18.4	Tracking	49	-65	-26.8	16	0	91	-21.3	Tracking	0.01	

2. View the data of CPE radio parameters, as described in Table 19.

Table 19: List of CPE radio parameters

Parameter	Description
Sys Name	Name of the CPE system.
DL Rx Power (dBm)	The downlink received signal power (in dBm).
DL EVM (dB)	The EVM value (in dB) of the downlink.
	The MCS index value of the downlink.
DLMCS	For more information about MCS, refer to the <u>Modulation</u> section.
	Indicates the amount (in dB) of power backoff for the downlink.
DL Backoff (dB)	This is the amount by which the BTS is currently reducing its power from the maximum configured EIRP when transmitting to the CPE. The BTS uses the greatest backoff that it can achieve while still maintaining the downlink throughput required by the CPE.
	Note : Backing off the BTS transmit power means that the power allocation can be maximized for the CPE and also for minimizing interference.
	Indicates the downlink spatial frequency.
DL Spatial Frequency	Spatial frequency is the plane advance of the wavefront from one antenna column to the next, which is caused by an angle at which the wavefront impinges on the array. This frequency is represented in integer units, with 1024 equating to 360 degrees per column.
	The 2048 value signifies a spatial frequency that is unknown or invalid.
	Note : For more information on how the spatial frequency is calculated, refer to the <u>Spatial frequency versus azimuth</u> section.
DL Channel Distortion (dB)	Value (in dB) that indicates the distortion (or degraded) length of the downlink Multiple Input Multiple Output (MIMO) channel, with respect to a perfect state.
	Note: Values that are less than -10 are considered good values.
	The current sounding state of the downlink MIMO channel.
	An over-the-air continuous sounding mechanism is used to access the MIMO channel state.
DL Sounding State	This parameter supports the following values:
	• ASSESSING
	• TRACKING
Current EIRP (dBm)	The current Effective Isotropic Radiated Power (EIRP) in dBm.
UL Rx Power (dBm)	The uplink received signal power (in dBm).

Parameter	Description					
UL EVM (dB)	The EVM value (in dB) of the uplink.					
	The MCS index value of the uplink.					
OL MCS	For more information about MCS, refer to the <u>Modulation</u> section.					
	Indicates the amount (in dB) of power backoff for the uplink.					
UL Backoff (dB)	The Tx Power is reduced if there is a link budget in the top modulation mode for improving spectral efficiency.					
	Indicates the uplink spatial frequency.					
UL Spatial Frequency	Spatial frequency is the plane advance of the wavefront from one antenna column to the next, which is caused by an angle at which the wavefront impinges on the array. This frequency is represented in integer units, with 1024 equating to 360 degrees per column.					
	The 2048 value signifies a spatial frequency that is unknown or invalid.					
LIL Chappel Distortion (dB)	Value (in dB) that indicates the distortion (or degraded) length of the uplink MIMO channel, with respect to a perfect state.					
	Note : Values that are less than -10 are considered as the good values.					
	The current sounding state of the uplink MIMO channel.					
	An over-the-air continuous sounding mechanism is used to access the MIMO channel state.					
UL Sounding State	This parameter supports the following values:					
	• ASSESSING					
	• TRACKING					
Range (Km)	Value (in kilometers) that indicates the measured distance between the BTS and the CPE.					
	Determines whether the antenna alignment mode is active.					
	This parameter supports the following options:					
Alignment Active	 If the checkbox is selected, then it implies that the antenna alignment mode is active. 					
	 If the checkbox is not selected, then it implies that the antenna alignment mode is not active. 					

Modulation

The Modulation and Coding Scheme (MCS) index values can be used in conjunction with the channel width values. This usage allows you to instantly calculate the available data rate of wireless hardware.

MCS depends on the quality of radio signals in a wireless link. If the signal quality is good, then the higher MCS is obtained. Bad signal quality results in lower MCS, which means that less useful data can be transmitted within a symbol. In other words, MCS depends on the Blocker Error Code (BLER).

Table 20 contains aggregate throughputs for each MCS mode and the Line of Sight (LoS)-specific theoretical ranges for the cnWave[™] 5G Fixed products.

MCS Mode	Aggregate throughput (in Mbps)							
	BW=112 MHz	BW=56 MHz						
MCS 24	-	212.9						
MCS 23	408.0							
MCS 22	390.3	195.1						
MCS 21	372.6							
MCS 20	354.8	177.4						
MCS 19	337.1							
MCS 18	319.3	159.7						
MCS 17	301.6							
MCS 16	283.9	141.9						
MCS 15	266.1							
MCS 14	248.4	124.2						
MSC 13	230.6							
MCS 12	212.9	106.4						
MSC 11	195.1							
MCS 10	177.4	88.7						
MCS 09	159.7							
MCS 08	141.9	71.0						
MCS 07	124.2							
MCS 06	106.4	53.2						

Table 20: MCS Modes and cnWave™ 5G Fixed throughputs

Spatial frequency versus azimuth

The nominal column spacing of the production Hawking BTS is 28 minutes. The calibration of the digital beamformer of a BTS associates a spatial frequency of 0 with a plane wave front on boresight. This results in the following idealized spatial versus azimuth (as shown in Figure 32).

Figure 32: Spatial frequency versus azimuth



Assuming a plane wave front incident on the BTS antenna array, the spatial frequency is a measure of the average phase difference of the front between adjacent columns. For a phase difference of $0 \le Ang \le 360$ degrees, the spatial frequency is reported as (1024 x Ang/360 degrees).

Near boresight, grating lobes appear every ~ 24 degrees. For MU-MIMO grouping, the minimum CPE spatial frequency separation is 128 and the minimum azimuth separation is approximately the grating lobe separation or columns. That is, ~ 3 degrees and columns =8.

CPE configuration data

The **CPE Cfg** page provides information about the CPEs names and other network configuration-related data of connected and registered CPEs (subscribers).

To view the configuration data of CPEs, perform the following steps:

1. From the left navigation column in the B1000 dashboard, navigate to **Subscribers** > **CPE Cfg**.

The CPE Cfg page appears, as shown in Figure 33.

Figure 33: The CPE Cfg page

Car	mbium Ne	tworks cr	t Wave ™ 5G	Fixed B	1000							Undo 🍤 Sar	ve 🖬 😃 Admin	istrator 🙎 admin 👻
÷H	CPE Statu	s CPE Devi	ice CPE Ra	dio Status	CPE Cfg	CPE QoS	CPE Wireles	s Port Stats	CPE Ethernet F	Port Stats				
;	CPE Cfg													~ =
	Sys Name	IP Address	IP Netmask	Default Gateway	(1) VI.	MGVID () CI	PE Management D Pass-through	1 VLLEARNEM	VLAGETO	VLIGVID	ULFRAMES	Primary DNS Server	Secondary DNS Server	ONS Domain Name
*	CPE 6	169.254.3.6	255.255.255.0	169.254.3.99	1	Disab	led	Enabled	25	50	Tagged Frames	0.0.0.0	0.0.0.0	<empty></empty>
4	CPE 4	169.254.3.4	255.255.255.0	169.254.3.99	1	Disab	led	Enabled	25	50	Tagged Frames	0.0.0.0	0.0.0.0	<empty></empty>
-	CPE 2	169.254.3.2	255.255.255.0	169.254.3.99	1	Disab	led	Enabled	25	50	Tagged Frames	0.0.0.0	0.0.0.0	<empty></empty>
×	CPE 7	169.254.3.7	255.255.255.0	169.254.3.99	1	Disab	led	Enabled	25	50	Tagged Frames	0.0.0.0	0.0.0.0	<empty></empty>
	CPE 1	169.254.3.1	255.255.255.0	169.254.3.99	1	Disab	led	Enabled	25	50	Tagged Frames	0.0.0.0	0.0.0.0	<empty></empty>
	CPE 8	169.254.3.8	255.255.255.0	169.254.3.99	1	Disab	led	Enabled	25	50	Tagged Frames	0.0.0.0	0.0.0.0	<empty></empty>
	CPE 5	169.254.3.5	255.255.255.0	169.254.3.99	1	Disab	led	Enabled	25	50	Tagged Frames	0.0.0.0	0.0.0.0	<empty></empty>
	CPE 3	169.254.3.3	255.255.255.0	169.254.3.99	1	Disab	led	Enabled	25	50	Tagged Frames	0.0.0.0	0.0.0.0	<empty></empty>

2. View the configuration data of CPEs, as described in Table 21.

Table 21: List of CPE configuration	parameters

Parameter	Description				
Sys Name	Name of the CPE system.				
IP Address	The IP address that is assigned to the network interface. This IP address is used for managing the device.				
IP Netmask	The netmask that is corresponding to the IP address of the CPE. This netmask IP address is used for the device management.				
Default Gateway	The IP address of a system (computer) in the current network that acts as a gateway. This IP address of the default gateway (if any) is used for managing the subscriber data service.				
VLMGVID	The VID that is used to communicate with BTS and CPE for the management purpose.				
	Determines whether the Management VID traffic (VLMGVID) is allowed to or from the CPE wired interface.				
CPE Management VID Pass- through	Default value: Enabled				
	Note : You can configure this parameter using the System > General page of C100 UI.				
	Determines whether the CPE must add the VLAN IDs (VIDs) of upstream frames to the VID table.				
	The parameter supports the following values:				
	 Enabled: Indicates that the CPE must add the VIDs to the VID table. 				
VLLEARNEN	• Disabled: Indicates that the CPE must not add the VIDs to the VID table.				
	Default value: Enabled				
	Note : The CPE drops frames with VIDs that are not stored in the VID table.				

Parameter	Description
	The period (in minutes) during which the CPE must dynamically keep learning about VIDs.
	This parameter supports values ranging from 5 to 1440 (in minutes).
VLAGETO	Default value: 25 (in minutes)
	You can configure this parameter using the System > General page of C100 UI.
	Note : VIDs that you set for the Untagged Ingress VID and Management VID parameters do not time out.
VLIGVID	The VID that is used for untagged frames. This VID corresponds either to the Q-tag for 802.1Q frames (if VLAN Port Type is Q) or the C-tag for 802.1ad frames (if VLAN Port Type is Q-in-Q).
VLFRAMES	Type of arriving frames to which the CPE must tag using the VID (which is set in the Untagged Ingress VID parameter).
	Default value: All frames
Primary DNS Server	IP address of the primary DNS server assigned by the RADIUS Server (if any).
Secondary DNS Server	IP address of the secondary DNS server assigned by the RADIUS Server (if any).
DNS Domain Name	Name of the DNS domain assigned by the RADIUS Server (if any).

CPE QoS configuration data

The **CPE QOS** page provides information about uplink and downlink related configuration data used for managing the services of CPEs.

To view the quality of service (QoS)-specific configuration data of CPEs, perform the following steps:

1. From the left navigation column in the B1000 dashboard, navigate to Subscribers > CPE QOS.

The CPE QOS page appears, as shown in Figure 34.

Figure 34: The CPE QOS page

	Cambium Netw	orks cn Wave	e™ 5G Fixed B	1000							Undo 🖱	Save 🖬 🕐	Administrator 🔒 admin -
-14	CPE Status	CPE Device (CPE Radio Status	CPE Cfg CPE	QoS CPE Wir	eless Port Stats	CPE Ethernet Port Stat	ts					
:	CPE QoS												× ⊞
	Sys Name	ULBR (kb)	ps) 0 ULBL (kbits) 0 DLBR (kbps)	0 DLBL (kbits)	1 LPULCIR (kbps)) O MPULCIR (kbps)	HPULCIR (kbps)	O UHPULCIR (kbps)	1 LPDLCIR (kbps)	MPDLCIR (kbps)	HPDLCIR (kbps)	UHPDLCIR (kbps)
•	CPE 6	0	0	0	0	0	0	0	0	0	0	0	0
	CPE 4	0	0	0	0	0	0	0	0	0	0	0	0
2	CPE 2	0	0	0	0	3500	6500	12500	15000	5000	10000	15000	20000
See. 1	CPE 7	0	0	0	0	0	0	0	0	0	0	0	0
20	CPE 1	0	0	0	0	0	0	0	0	0	0	0	0
	CPE 8	0	0	0	0	2500	5000	10000	15000	10000	20000	30000	40000
	CPE 5	0	0	0	0	4500	75000	10500	13500	20000	25000	30000	35000
	CPE 3	0	0	0	0	0	0	0	0	0	0	0	0

2. View the QoS configuration data of CPEs, as described in Table 22.

Parameter	Description
Sys Name	Name of the CPE system.
ULBR (kbps)	The uplink bit rate or sustained uplink rate (in kbps) at which each CPE has registered with the BTS. The BTS is replenished with credits for transmission.
	The uplink bit limit or uplink burst allocation (in kbits).
ULBL (kbits)	The maximum amount of data that each CPE is allowed to transmit before being recharged at the sustained uplink data rate (in kbps).
DLBR (kbps)	The downlink bit rate or sustained downlink rate (in kbps) at which the BTS is replenished with credits (tokens) for transmission to each of the CPEs in its sector.
	The downlink bit limit or downlink burst allocation (in kbits).
DLBL (kbits)	The maximum amount of data that the BTS is allowed to transmit to any registered CPE before it is replenished with the transmission credits at the sustained downlink data rate (in kbps).
LPULCIR (kbps)	The minimum rate (in kbps) at which a low priority traffic is sent over the uplink (unless Committed information rate (CIR) is oversubscribed, or the RF link quality is degraded).
MPULCIR (kbps)	The minimum rate (in kbps) at which a medium priority traffic is sent over the uplink (unless CIR is oversubscribed, or the RF link quality is degraded).
HPULCIR (kbps)	The minimum rate (in kbps) at which a high priority traffic is sent over the uplink (unless CIR is oversubscribed, or the RF link quality is degraded).
UHPULCIR (kbps)	The minimum rate (in kbps) at which an ultra-high priority traffic is sent over the uplink (unless CIR is oversubscribed, or the RF link quality is degraded).
LPDLCIR (kbps)	The minimum rate (in kbps) at which a low priority traffic is sent over the downlink (unless CIR is oversubscribed, or the RF link quality is degraded).
MPDLCIR (kbps)	The minimum rate (in kbps) at which a medium priority traffic is sent over the downlink (unless CIR is oversubscribed, or the RF link quality is degraded).
HPDLCIR (kbps)	The minimum rate (in kbps) at which a high priority traffic is sent over the downlink (unless CIR is oversubscribed, or the RF link quality is degraded).
UHPDLCIR (kbps)	The minimum rate (in kbps) at which an ultra-high priority traffic is sent over the downlink (unless CIR is oversubscribed, or the RF link quality is degraded).

Table 22: List of parameters in the CPE QOS page

CPE wireless port statistics

The **CPE Wireless Port Stats** page provides information about statistics of all the data transmitted on the wireless link when it is up.

To view the wireless port statistics, perform the following steps:

1. From the left navigation column in the B1000 dashboard, navigate to **Subscribers** > **CPE Wireless Port Stats**.

The CPE Wireless Port Stats page appears, as shown in Figure 35.

Figure 35: The CPE Wireless Port Stats page

() c	ambium Net	works cn Wa v	⁄e ™ 5G Fixed I I	B1000							C obnU	Save 🖻	Administra	tor 💄 admin 👻
-14	CPE Status	CPE Device	CPE Radio Status	CPE Cfg	CPE QoS CPE W	reless Port Stats	CPE Ethe	ernet Port Stats						
;	CPE Wireless Port Stats													
-	Sys Name	In Octets	In Ucast Pkts	In Multicast Pkts	In Broadcast Pkts	Out Octets		Out Ucast Pkts	Out Multicast Pkts	Out Broadcast Pkts	In Discards	In Errors	Out Discards	Out Errors
0	CPE 6	32772562724 +86	22459812 +1	478999	502877	551595353105 +15	5067957	375466076 +10251	475	3	0	0	313811 +1	0
	CPE 4	151892394291 +86	100974812 +1	478899	502876	1034221823330 +2	27726127	715520316 +18862	788	2	0	0	313959 +1	0
2	CPE 2	114776920119	76489070	477484	501374	858608935572 +24	767017	593558695 +16849	822	10	0	0	313811 +1	0
80.	CPE 7	34705247582 +86	23775457 +1	477283	501224	509565579876 +15	5076777	346875066 +10257	522	6	0	0	312956 +2	0
2	CPE 1	105799205630 +128	70532057 +2	477456	501128	597887991110 +164	402759	415276768 +11160	932	14	0	0	302487 +1	0
	CPE 8	34553035822 +86	23671545 +1	477585	501253	548296286751 +15	5070897	373222203 +10253	503	7	0	0	313136 +1	0
	CPE 5	34004099678 +86	23298170 +1	478698	502454	885368430234 +24	799357	602523434 +16871	505	1	0	0	313887 +1	0
	CPE 3	118903532268	79216727	477634	501343	505454878327		353237751	822	13	0	0	314550	0

2. View the wireless port statistics for CPEs, as described in Table 23.

Parameter	Description
Sys Name	Name of the CPE system.
In Octets	Number of data bytes received by the BTS from the CPEs.
In Ucast Pkts	Number of data packets received by the BTS from a specific CPE.
In Multicast Pkts	Number of data packets received by the BTS from specific two or more CPEs.
In Broadcast Pkts	Number of data packets received by the BTS from all the connected CPEs.
Out Octets	Number of data bytes sent by the BTS to the CPEs.
Out Ucast Pkts	Number of data packets sent by the BTS to a specific CPE.
Out Multicast Pkts	Number of data packets sent by the BTS to specific two or more CPEs.
Out Broadcast Pkts	Number of data packets sent by the BTS to all the connected CPEs.
In Discards	Number of incoming data packets discarded by the CPE.
In Errors	Number of incoming data packets that contain errors.

Table 23: List of parameters in the CPE Wireless Port Stats page

Parameter	Description
Out Discards	Number of outgoing data packets (from the CPE) that are marked or labeled as discarded by the CPE.
Out Errors	Number of outgoing data packets (from the CPE) that contain errors.

CPE Ethernet port statistics

The CPE Ethernet Port Stats page provides statistics of the data that is entering the main Ethernet port.

To view the Ethernet port statistics, perform the following steps:

1. From the left navigation column in the B1000 dashboard, navigate to **Subscribers** > **CPE Ethernet Port Stats**.

The CPE Ethernet Port Stats page appears, as shown in Figure 36.

Figure 36: The CPE Ethernet Port Stats page

() c	ambium Netv	vorks ∣cnWa	ve™ 5G Fixed	B1000								d Adminis	trator 🙎 admin 👻
ŧ	CPE Status	CPE Device	CPE Radio Status	CPE Cfg	CPE QoS	CPE Wireless Port Stats	CPE Ethernet Port S	tats					
;	CPE Ethemet Port Stats												
•	Sys Name	In Octets	In Ucast Pkts	In Multicast Pkts	In Broadcast	Pkts Out Octets	Out Ucast Pkts	Out Multicast Pkts	Out Broadcast Pkts	In Discards	In Errors	Out Discards	Out Errors
1	CPE 6	21886193 +53	11	303003 +1	11167	14809274	0	38294	35219	0	0	908290	0
-	CPE 4	884644325 +53	12323885	303468 +1	11161	2232628176	77866884	76586	70439	0	0	834677	0
	CPE 2	701105998 +53	9701729	303306 +1	11163	842660095	54310125	76351	70291	0	0	832170	0
SC.	CPE 7	21825559 +53	11	302164 +1	11143	14766654	0	38155	35192	0	0	905090	0
×	CPE 1	630260538 +53	8736112	302916 +1	42	2334854125	49632847	76532	70448	0	0	831544	0
	CPE 8	21829765 +53	11	302236 +1	11133	14768511	10	38178	35152	0	0	905478	0
	CPE 5	21886708 +53	11	303012 +1	11164	14825029	9	38365	35263	0	0	907530	0
	CPE 3	695520979 +53	9616532	303999 +1	11179	292081905	56776607	76433	70276	0	0	832248	0

2. View the Ethernet port statistics for CPEs, as described in Table 23.

Configuring tools

The **Tools** page in the B1000 UI allows you to upload new firmware (software) or reboot the unit. There are sets of tools, such as **Link Capacity Test**, which help to troubleshoot the radio links.

You must use the **Tools** icon (X) to configure, view, and manage the devices.

The **Tools** page contains the following tabs:

- Firmware
- Configuration
- Link Capacity Test
- Network Test
- MAC Learning Tables
- Engineering
- Logs

Firmware

The **Firmware** page allows you to upgrade or downgrade software firmware. This page also provides device summary, upload details, and upgrade status of a firmware image.

Before upgrading or downgrading a firmware, consider the requirements and compatibility matrix specific to cnWave[™] 5G Fixed products (BTS or CPE).

This topic covers the following sections:

- Requirements for firmware version upgrade or downgrade
- Compatibility matrix
- Upgrade or downgrade a firmware

Requirements for firmware version upgrade or downgrade

Consider the following minimum requirements related to BTS or CPE software version compatibility:

- An official BTS release version must be compatible with the previous official CPE release version.
- A beta BTS release version must be compatible with the previous official CPE release version.
- A BTS or CPE running with an official release software version can be upgraded to the following official release software version.
- A BTS or CPE running with an official release software version can be downgraded to the previous official release software version, except for when that version is lower than the factory version of the BTS or CPE.
- For the best results, the CPE software versions in a sector must match the BTS software version. A sector with one or more CPE running with a software version different from the BTS software version may not meet the performance specification claimed for the BTS software version.

Compatibility matrix

The following compatibility matrix is required for upgrading or downgrading official BTS or CPE software versions.

BTS	CPE									
	3.0	3.1	3.1.1	3.1.2	3.2	3.3	4.0	4.1		
3.0	ок	ОК	ОК	ОК	ок	ок	ок	ОК		
3.1	ок	ОК	ОК	ОК	ок	ок	ок	ОК		
3.1.1	ок	ОК	ОК	ОК	ок	ок	ок	ОК		
3.1.2	ок	ОК	ОК	ОК	ок	ок	ок	ОК		
3.2	ок	ОК	ОК	ОК	ок	ок	ок	ОК		
3.3	ок	ОК	ОК	ОК	ок	ок	ок	ОК		
4.0	ок	ОК	ОК	ОК	ок	ок	ок	ОК		
4.1	ок	ОК	ок	ок	ок	ок	ОК	ОК		

Table 24: Compatibility matrix required for upgrade or downgrade

The following are the two types of changes identified, which can cause version incompatibility:

- Air interface changes due to which a CPE of one release version cannot attach to a BTS of another version.
- Hardware or calibration changes so that a CPE or BTS with early software version does not handle correctly.



Note

There is no need for the compatibility matrix to account explicitly for the hardware or calibration version.

Upgrade or downgrade firmware

You can upgrade or downgrade firmware (BTS or CPE) using the **Tools** page of the respective UI (B1000 UI for BTS and C100 UI for CPE).

Note

Before upgrading or downgrading firmware, consider the following key points:

- To **upgrade** a sector with the BTS and all CPEs running with an official software release X, perform the following steps using the **Tools** page:
 - a. Upgrade the BTS first to the next official software release version Y.
 - b. Upgrade all CPEs to the next official software release version Y.
- To **downgrade** a sector with the BTS and all CPEs running with an official software release X, perform the following steps using the **Tools** page:
 - a. Downgrade all CPEs first to the previous BTS software version W.
 - b. Upgrade the BTS to the previous official software release version W.

Using the **Tools** page, perform the following steps to upgrade or downgrade a firmware:

1. Log on to the B1000 UI (as described in the Accessing the B1000 UI section).

The main B1000 dashboard page appears.

2. On the left navigation column, click the **Tools** icon (\bigotimes).

The **Tools** page appears with multiple tabs, as shown in Figure 37.

Figure 37: The Tool page - B1000 UI

🜔 Ca	mbium Networks 🕴 🕻	cn Wave ™ 5G Fixed B1000			Undo 🖒 Save 🖬 😃	Administrator 🔒 admin 👻
-14	Firmware Configurat	tion Link Capacity Test Network Te	st MAC Learning Tables Engineering Logs			
:	Device Information					× 🖽
•	O Product Name		cnWave 5G Fixed Base Transceiver Station (BTS)			
*	Release Name		4.1b2			
	Image Upload					~ 🖽
1	O Source		Local File			
~	1 Local File		Choose File No file chosen			
	O Destination		• Image 1 O Image 2			
			Start Upload			
	Unarada Statua					
	Upgrade Status					× 🖽
	Install Progress					
	mattin rogress					
	Reboot					~ ⊞
	 Enable Reboot 		A reboot will be required to install a firmware image			
	Installable Images					~ =
		Status	Description			· · ·
	Image 1	Valid Image	cnWave 5G Fixed (BTS) 4.0b2	Erase	Install	
	Image 2	Valid Image	cnWave 5G Fixed (BTS) 4.1b2	Erase	Install	

By default, the **Firmware** tab is selected.

3. Set the required parameters, as described in Table 25.

Table 25: List of parameters in the Firmware page

Parameter	Description
Device Information	
Product Name	Name of the device that you have deployed.
Product Name	Example: cnWave 5G Fixed Base Transceiver Station (BTS)
Release Name	Release number of the operational software.
Image Upload	
	An option to select the firmware image file from a location (stored).
	This parameter supports the following options:
Source	 Local File: Indicates the image file that you have stored locally on your machine.
	• Remote Server: Indicates the image file that you have stored on a remote server (for example, SharePoint).
	Select the required option.
	An option to upload or upgrade the firmware image file.
	This parameter is applicable only if you have selected Local File as the upload source.
Local File	This parameter supports options to upload or upgrade the required firmware image file. For more details on how to upload or upgrade the image file, refer to the <u>Uploading a firmware</u> <u>image file</u> section.
	This parameter is applicable only if you have selected Remote Server as the upload source.
Server URL	To upload the image file from a remote server, provide the server URL in the text box. Then, click Start Upload on the Firmware page.
Destination	An option to select the destination image in the Installable Images section.
	Select the required option.
	An option to upload the firmware image file.
Start Upload	On selecting the required image file (from a local file folder or a remote server), click Start Upload to begin the uploading process.

Parameter	Description					
Upgrade Status						
Upload Progress	Indicates the upgrade status of the firmware.					
Install Progress	Indicates the installation status of the firmware (if any).					
Reboot						
Enable Debeet	Determines whether to reboot the device on upgrading or installing the firmware.					
	Select the Enable Reboot checkbox to enable the device to reboot.					
	List of images that are recently uploaded, with details of the latest uploaded image at the top row.					
	You can upload multiple image files and manage them in this section.					
	This parameter displays the following details for the uploaded images:					
	 Status: Displays one of the following supported statuses of the image: 					
	• Empty : Indicates that the firmware image file is not present.					
Installable Images	 Invalid Image: Indicates that the firmware image file is not valid. The file might be truncated, damaged, or not an appropriate image of the device (wrong product or old). 					
	• Valid Image : Indicates that the firmware image file is valid and may be installed.					
	 Description: A brief description of the firmware image file such as device name, version, build number, and time of uploading. 					
	To install an image file that you uploaded, click Install in the corresponding row of the required image file.					
	To delete an image file that you uploaded, click Erase in the corresponding row of the required image file.					

4. Click **Save** to save the configuration changes.

Uploading a firmware image file

Using the **Firmware** page, you can upload the required firmware image file locally. You can also install the uploaded image file and reboot the system.



Note

You must first upgrade the BTS software image file. You can follow the same process to upload or upgrade the CPE-specific image file using the C100 Dashboard > Tools > Firmware page.

To upload a local image file (internally), perform the following steps:

1. From the main dashboard page, navigate to Tools > Firmware.

The Firmware page appears. By default, the Local File option is selected as the upload source as shown in Figure 38.

Image Upload 💿 Local File Remote Server Source Choose File No file chosen Local File Destination 오 Image 1 🔵 Image 2 Start Upload Upgrade Status Upload Progress Install Progress Reboot Enable Rebool A reboot will be required to install a firmware im Installable Images Status Image 1 Valid Image cnWave 5G Fixed (BTS) 4.0b2 Erase Install Image 2 Valid Image Erase Install

Figure 38: The Local File parameter in the Firmware page

2. Before uploading the required firmware image file, check the status of the previously uploaded image files (if any) in the Installable Images section (located at the bottom of the Firmware page).

cnWave 5G Fixed (BTS) 4.1b2

If there is any image file, which you do not want to use, you can manually remove that file by clicking on Erase in the corresponding row in the Installable Images section.

You can upload only two image files (in the disc image file format) as **Image 1** and **Image 2**, as shown in Figure 38. For more information about each parameter in the Firmware page, refer to Table 25.



Note

When you select an updated image file from a location to replace an existing image file (for example, Image 1), the selected file overwrites the existing image 1 file in the Installable Images section.

3. To upload an image file, click Choose File in the Local File field.

A file browser window appears, as shown in Figure 39.

× 8

Figure 39: A file browser window

-		0 Open			×	
	Fin	\leftarrow \rightarrow \checkmark \uparrow 📜 $<$ Deskto	op → tftpd64.400 v	ບ 🔎 Search tftpd64.400		
i	De	Organize • New folder			0	· · · · · · · · · · · · · · · · · · ·
¢ %	0	 This PC 3D Objects Desktop Documents ↓ Downloads ↓ Music ➡ Pictures ➡ Vicleos 	Name EUPL-EN ttpd32 ttpd32.chw ttpd32 ttpd32 ttpd32 ttpd64	Date modified 24/03/2009 15:34 08/05/2011 00:06 25/02/2016 10:37 09/07/2021 14:40 08/05/2011 00:05	3-5-	-g004cc3a780 It armv7l GNU/Linux
	lm	✓ windows (c.) ✓ builds (\\uk01-bl ✓ PHN Common (✓ ⊞
	0	v ∢ File name:	[All Files Open Cancel	×	

- 4. Browse the location where you have saved the required firmware image file on your machine, locally.
- 5. Select the required disc image file (for example, BTS 4.1b2 upgrade-app Disc Image File in case of upgrade) from your machine and click **Open**.

The local image file is selected, as shown in Figure 40.

Figure 40: The image file name in the Local File field

Image Upload	✓ ⊞
1) Source	● Local File O Remote Server
0 Local File	Choose File BTS 4 ttp2 upgapp.img
0 Destination	• Image 1 🔷 Image 2
	Start Upload

6. To upload the selected image file, click Start Upload.

A message appears in the **Upload Progress** field, indicating the status of the upload process, as shown in Figure 41.

Figure 41: Upload status details in the Upload Progress field

Image Upload		~ ⊞
1) Source	O Local File ○ Remote Server	
0 Local File	Choose File BTS 4.1b2 upgool-app.img	
0 Destination	• Image 1 O Image 2	
	3 Start Upload	
Upgrade Status		~ ⊞
Upload Progress	Uploading firmware image 1 (3672 KIB transferred)	
Install Progress		

Depending on the following actions, the Upload Progress field displays the status messages:

- When you upload a correct image file, a message appears indicating that the image is uploaded and validated successfully (as shown in Figure 42).
- When you upload an incorrect image file, a message appears indicating that the uploaded image is invalid.
- When you delete any image file from the **Installable Images** section (located at the bottom of the page), a message appears indicating that the firmware image is erased.
- 7. To install the uploaded image file, perform the following actions:
 - a. Select the Enable Reboot checkbox in the Reboot section, as shown in Figure 42.

When you enable the reboot option, the **Install** button is enabled in the **Installable Images** section as shown in Figure 42. By default, the **Install** button is disabled.

Image Upload						~ ⊞
 Source 			● Local File ○ Remote Server			
Local File			Choose File BTS 4.1b2 upgoot-app.img			
 Destination 			O Image 1 ◯ Image 2			
			Start Upload			
Upgrade Status						~ ⊞
Upload Progress			Image 1 uploaded and validated successfully			
Install Progress						
Reboot						~ ⊞
			2 5			
Inable Reboot			The device will reboot to install a firmware image			×
Installable Images						~ ⊞
	Status	Description				
Image 1	Valid Image	cnWave 5G Fixed (BTS) 4.1b2		Erase	Install	
Image 2	Valid Image	cnWave 5G Fixed (BTS) 4.0b2		Erase	Install	

Figure 42: The Enable Reboot and Install options

b. Click **Install** in the corresponding row of the required image file.

This action installs the selected firmware image file and reboots the system.

You have now uploaded and installed the required firmware image file using the UI. Similarly for downgrade, select the required previous software version file, upload the file, and install the image file.

Configuration

The **Configuration** page allows you to set the BTS to factory defaults. This page also allows you to import a saved configuration or export a BTS configuration for backup (restore). This Import feature exports or imports the date model configuration (and/or status) as a JSON file.

To view and manage the configuration tool-specific settings, perform the following steps:

1. From the main B1000 dashboard page, navigate to **Tools > Configuration**.

The **Configuration** page appears, as shown in Figure 43.

Figure 43: The Configuration page - B1000 UI

	ambium Networks cn V	Vave [™] 5G Fixed B1000			Undo 🏷 Save 🖬 😃	Administrator 🔒 admin 🝷
-14	Firmware Configuration	Link Capacity Test Network Test MAC Learning Tables	Engineering Logs			
•	Factory Defaults		× 🖽	Import		× 🖽
		 Local Management Access 		Import From	Local File	
\$	Do Not Reset	Radio Configuration		Local File	Choose File No file chosen	
Ø				Enable Reboot		
Ж	Enable Reboot	A reboot is required to complete a reset to factory defaults		0	Data Import	
		Reset Configuration			Import Log	
	Export		~ ⊞			
	0	Data Export		Import Log 🛓		
						h

2. Set the values for parameters, as described in Table 26.

Parameter	Description
Factory Defaults	
	Determines whether you want to reset the device to factory defaults.
	The following options are supported:
	Local Management Access
	Radio Configuration
	By default, the Local Management Access checkbox is selected.
Do not reset	If you do not select the Local Management Access checkbox, then all the configuration data, including IP address, is wiped out and reset to 169.254.1.1.
	You have a choice of keeping at least local access and IP address and wiping out all the other data. This means that you can access the CPE on your local network.
	If you select Radio Configuration , then all the configuration data is wiped out, except for the frequency data and local IP address.
Enable Reboot	Determines whether the device is enabled to reboot to complete the process of reset to factory defaults.
	Select the checkbox to enable the reboot for the device.

Table 26: List of parameters in the Configuration page

Parameter	Description
	An option to reset the system to factory defaults.
Reset Configuration	Click Reset Configuration if you want to reset the device to factory defaults.
Export	
Data Export	An option to export the data model configuration (and/or) status as a JSON file for backup (restore).
	When you click the Data Export button, the data model configuration is downloaded by the device.
Import	
	An option to select a location (stored) from where you want to import the required data configuration.
	This parameter supports the following options:
	 Local File: A local import file (which is saved locally) is uploaded by the browser.
Import From	• Remote Server : An import file that is saved on a remote server is downloaded by the device.
	Select the required option.
	Note : When you select Remote Server , the ⁵ icon appears indicating to select the Local File option (if required).
	To upload a local import file (internally), perform the following steps:
	a. Click Choose File in the Local File field.
	A file browser window appears.
Local File	b. Browse the location where you have saved the import file (for example, a JSON file) on your machine locally.
	c. Select the file and click Open .
	The local import file is selected.
	d. To upload the import file, click Data Import in the Configuration page.
Com or LIDI	This parameter is applicable only if you have selected Remote Server in the Import From field.
Server UKL	To select the import file from a remote server, provide the server URL in the text box. Then, click the Data import button.
Enable Reboot	Determines whether the device is enabled to reboot to complete the import configuration.

Parameter	Description
	Select the checkbox to enable the reboot for the device.
	When you select the checkbox, a message appears indicating that the device may reboot immediately after the required configuration is imported.
	Note : Only some configuration changes require a reboot.
Data Import	An option to import the required data model configuration from a JSON file.
	An option to view and download the import logs from the UI.
Import Log	Click the 🛓 icon to download the import logs.

3. Click **Save** to apply the changes.

Link Capacity Test

The Link Capacity Test page allows you to test the links (uplink, downlink, or both) and analyze the link performance for a subscriber (CPE). The test summary and statistics help in managing the traffic and troubleshooting the links for the subscriber.

To test and view the link capacity, perform the following steps:

1. From the main B1000 dashboard page, navigate to Tools > Link Capacity Test.

The Link Capacity Test page appears, as shown in Figure 44.

Figure 44: The Link Capacity Test page

🜔 Ca	mbium Networks cn W	/ave [™] 5G Fixed B1000			Undo 💆 Sa	ve 🖬 😃 Administrator 💄 admin 🝷		
-14	Firmware Configuration L	ink Capacity Test Network Test	MAC Learning Tables Engineering Logs					
•	Test Settings					✓ III		
1	Registered CPEs		8					
	1 Traffic Direction		🔵 Downlink 🔿 Uplink 🗿 Bi	Obwnlink Uplink Bidirectional				
숌	0 CPE Under Test		CPE Under Test					
×	1 Mode		Single-Shot ○ Free Running	ng				
	Traffic Duration		100	s				
			Start Test					
	Test Summary					✓ III		
	0 CPE Under Test		All					
	DL Throughput		1488.58 Mbit/s					
	UL Throughput		507.21 Mbit/s					
	Aggregate Throughput		1995.79 Mbit/s	1995.79 Mbit/s				
	DL Utilisation UL Utilisation Traffic Duration		98 %	98 % 99 % 100 s				
			99 %					
			100 s					
	Time		2024-02-06 11:15:33					
	Detailed Test Statistics					✓ ■		
	OPE Under Test		DL Throughput (Mbit/s)		UL Throughput (Mbit/s)			
	169.254.3.6		247.53		37.93			
	169.254.3.8		102.23		46.56			
	169.254.3.7		182.45		66.32			
	169.254.3.5		248.38		117.25			
	169.254.3.4		255.79		91.35			
	169.254.3.3		199.65		29.80			
	169.254.3.1		102.14		52.21			
	169.254.3.2		150.42		65.07			
	Test History					✓ ■		
	1 Time	OPE Under Test	 Total DL Throughput (Mbit/s) 	 Total UL Throughput (Mbit/s) 	O L Utilisation (%)	 UL Utilisation (%) 		
	2024-02-06 11:15:33	All	1488.58	507.21	98	99		
	2024-02-05 12:03:41	All	1486.67	513.86	98	99		
	2024-02-05 11:55:44	All	1484.44	516.38	98	99		
	2024-02-02 09:41:19	All	1472.96	490.29	98	99		
	2024-02-01 12:22:32	All	1481.08	564.74	98	99		

The Link Capacity Test page displays Test Summary, Detailed Statistics, and Test History sections that contain results for the previous tests.

2. To run the link capacity test, set the values of parameters as described in Table 27.

Table 27: List of parameters in the Link Capacity Test page

Parameter	Description
Test Settings	
Registered CPEs	Indicates the current number of CPEs connected and authenticated to the BTS.
	Direction of the transmission of the traffic that you want to test.
Traffic Direction	This parameter supports the following options:
	• Downlink
	• Uplink

Parameter	Description
	Bidirectional
	Select the required traffic direction.
	IMSI or IP address of a registered CPE, which is used as the remote device, for which you want to test the link.
	Type an appropriate value in the text box.
CPE Under Test	If you provide an incorrect value in the text box, a message appears, indicating that the provided value is unknown or invalid.
	Note : You can provide multiple comma-separated IMSIs or IP addresses and/or hyphenated IP addresses. If you test without any IMSI or IP address, Test Summary and Test History sections display results for all the connected CPEs.
	Determines the mode for testing the link traffic.
	This parameter supports the following options:
	• Single-Shot
Mode	Free Running
	By default, the Single-Shot option is selected.
	Note : When you select Free Running , the ⁵ icon appears indicating to select the Single-Shot option.
Traffic Duration	Duration (in seconds) of the transmission of the traffic that you want to test.
	Type an appropriate value in the text box.

3. Click Start Test.

You can click **Stop Test** after running the test for the required period.

The **Test Summary** section displays the test results for the selected subscriber modules (CPEs). The **Detailed Test Statistics** section displays DL throughput and UL throughput (in Mbit/s) for tested CPEs. The **Test History** section displays the results of the current test (as shown in Figure 45) and the previously tested modules (if any).

Figure 45 is an example of a link capacity test done for IMSIs with the following settings, where:

- MU MIMO Control is set to Disabled in the System > Radio page of the B1000 UI.
- Traffic Direction is set to Bidirectional in the Tools > Link Capacity Test page of the B1000 UI.

Firmware Configuration Link Capacity Test Network Test MAC	Clearning Tables Engineering Logs	
Tast Sattings	and and a second s	. m
Besister d 005-	A	× 00
Registered CPEs	8	
1 Traffic Direction	O Downlink O Uplink O Bidirectional	
0 CPE Under Test	888901007406841,888901007406348,888901007406344,888901007406574,888901007406869,888901007406429,888901007406893,888901007406429	9010
0 Mode	O Single-Shot ○ Free Running	
1 Traffic Duration	100 s	
	Start Test	
(νζ	
Test Summary		× 🖽
1 CPE Under Test	888901007406841,888901007406348,888901007406344,888901007406574,888901007406869,888901007406429,888901007406893,888901007407454	
DL Throughput	315.58 Mbit/s	
UL Throughput	127.21 Mbi//s	
Aggregate Throughput	442.79 Mbit/s	
0 DL Utilisation	98 %	
0 UL Utilisation	99.%	
1 Traffic Duration	100 s	
Time	2024-02-07 07:11:24	
Detailed Test Statistics		~ ⊞
CPE Under Test	DL Throughput (Mbit/s) UL Throughput (Mbit/s)	
169.254.3.6	39.44 15.89	
169.254.3.7	39.44 15.91	
169.254.3.2	39.45 15.90	
169.254.3.5	39.44 15.90	
169.254.3.4	39.45 15.91	
169.254.3.8	39.46 15.90	
169.254.3.3	39.45 15.89	
169.254.3.1	39.45 15.91	
Test History		
lest History		~ ⊞
Time O CPE Under Test	Total DL O Total UL O DL Utilisation UL Utilis Throughput Throughput (%) (Whitis)	ation
2024-02- 888901007406841,888901007406348,888901007406344,888 07 07:11:24	901007406574,888901007406869,888901007406429,888901007406893,888901007407454 315.58 127.21 98 99	
2024-02- 888901007406841,888901007406348,888901007406344,8889 07 07:07:44	901007406574,888901007406869,888901007406429,888901007406693,888901007407454 1495 84 0.11 98 76	

Figure 45: Link capacity test with MU MIMO disabled

Figure 46 is an example of a link capacity test done for the same IMSIs with the following settings, where:

- MU MIMO Control is set to Enabled in the System > Radio page of the B1000 UI.
- Traffic Direction is set to Downlink in the Tools > Link Capacity Test page of the B1000 UI.
| · · · · · · · · · · · · · · · · · · · | | |
|--|---|---|
| Firmware Configuration Link Capacity Test Network | k Test MAC Learning Tables Engineering Logs | |
| Test Settings | | × 8 |
| Registered CPEs | 8 | |
| Traffic Direction | 🧿 Downlink 🔿 Uplink 🔿 Bidirectional | |
| 0 CPE Under Test | 888901007406841,888901007406348,888901 | 007406344,888901007406574,888901007406869,888901007406429,888901007406893,8889010 |
| 0 Mode | • Single-Shot 🔘 Free Running | |
| Traffic Duration | 100 s | |
| | Start Test | |
| Test Summary | | ~ E |
| 1 CPE Under Test | 888901007406841,888901007406348,88890100740634 | 4,888901007406574,888901007406869,888901007406429,888901007406893,888901007407454 |
| DL Throughput | 1495.84 Mbit/s | |
| UL Throughput | 0.11 Mbit/s | |
| Aggregate Throughput | 1495.95 Mbit/s | |
| 0 DL Utilisation | 98 % | |
| 0 UL Utilisation | 76 % | |
| Traffic Duration | 100 s | |
| Time | 2024-02-07 07:07:44 | |
| Detailed Test Statistics | | ✓ 8 |
| CPE Under Test | DL Throughput (Mbit/s) | UL Throughput (Mbit/s) |
| 169.254.3.6 | 248.67 | 0.01 |
| 169.254.3.7 | 190.27 | 0.01 |
| 169.254.3.2 | 151.58 | 0.01 |
| 169.254.3.5 | 248.48 | 0.01 |
| 169.254.3.4 | 254.62 | 0.01 |
| 169.254.3.8 | 102.71 | 0.01 |
| 169.254.3.3 | 197.35 | 0.01 |
| 169.254.3.1 | 102.14 | 0.01 |
| Test History | | ~ 8 |
| Time O CPE Under Test | | Total DL Throughput (Mbit/s) (Mbit/s) |
| 2024-02-
888901007406841,888901007406348,88890
07 07:07:44 | 1007406344,888901007406574,888901007406869,888901007406429,888901 | 007406893,888901007407454 1495.84 0.11 98 76 |

Figure 46: Link capacity test with MU MIMO enabled

Table 28 lists and describes each parameter of the **Test Summary** and **Test History** sections in the **Link Capacity Test** page.

Table 28: List of test summary an	nd history-specific parameters
-----------------------------------	--------------------------------

Parameter	Description
Test Summary	
	IMSI or IP address of the CPE that you used for testing.
CPE Under Test	Note : If you have provided multiple IMSIs or IP addresses, then this parameter displays those values for which the test was conducted.
DL Throughput	The DL throughput (in Mbit/s) of the tested CPE.
UL Throughput	The UL throughput (in Mbit/s) for the tested CPE.
Aggregate Throughput	The aggregate throughput (in Mbit/s) for the tested CPE.
DL Utilisation	The percentage of the available link capacity that has been utilised by the downlink scheduler.
UL Utilisation	The percentage of the available link capacity that has been utilised by the uplink scheduler.
Traffic Duration	Duration (in seconds) of the transmission of the tested traffic.

Parameter	Description
Time	Date and time (YYYY-MM-DD 24-hour format format) at which the traffic was tested for a CPE.
Detailed Test Statistics	
CPE Under Test	The IP addresses or IMSIs of the CPE that is used as the remote device for the test.
DL or UL Throughout (Mbit/s)	The DL or UL throughput (in Mbit/s) for the tested CPE based on the value selected in the Traffic Direction parameter.
Test History	
Time	Date and time (in YYYY-MM-DD 24-hour format) at which the link capacity test was conducted.
	IMSI or IP address of the CPEs (used as remote device) for which the test statistics are available.
CPE Under Test	Note : If you have provided multiple IMSIs or IP addresses then this parameter displays those values for which the test was conducted.
Total DL Throughput (Mbit/s)	Total value (in Mbps) of the downlink throughput.
Total UL Throughput (Mbit/s)	Total value (in Mbps) of the uplink throughput.
DL Utilisation (%)	The percentage of the available link capacity that has been utilised by the downlink scheduler.
UL Utilisation (%)	The percentage of the available link capacity that has been utilised by the uplink scheduler.

Network Test

The **Network Test** is a network tool that helps you to test connectivity and accessibility of BTS to a radio network. This page allows you to ensure whether BTS is correctly connected to your network. Example: BTS connectivity with cnMaestro or a RADIUS server. This network test helps in troubleshooting network connection issues.

To test and view the BTS connectivity, perform the following steps:

1. From the main B1000 dashboard page, navigate to **Tools** > **Network Test**.

The Network Test page appears, as shown in Figure 47.

Figure 47: The Network Test page

Firmware Configuration Link Capacity Te	est Network Test MAC Learning Tables Engineering Logs	
Test Configuration		
Туре	o ping ⊖ traceroute	
	Destination	
0 Destination	Enter a valid IPv4 address or DNS name	
Packet Size	56	
1 Count	3	
Test Results		
	networktests.log	
networktests.log 초		

2. View and set the values for parameters, as described in Table 29.

Parameter	Description
Test Configuration	
	Determines the method used for testing a network. The following options are supported:
	 ping: BTS pings the required destination (for example, cnMaestro, RADIUS Server, DNS, or a radio network) to ensure its connectivity.
	If the ping is successful, this implies that BTS can reach the network or the required destination.
Туре	• traceroute : BTS traces the source (IP address) of the required destination (for example, if the BTS is connected to a switch, which is connected to another application such as a host Server) by identifying the number of hops connected to the radio network.
	If the trace is successful, BTS finds out the IP address of the networks in 30 hops. If the trace fails in 6 to 7 hops, this implies that BTS cannot reach the network.
	Choose the required testing type. Figure 48 and Figure 49 are examples of ping and traceroute types.
Destination	The valid IPv4 address or a DNS name of the required destination.
	Provide an appropriate value in the text box.
Packet Size	Number of data bytes that have to be sent to the network.

Table 29: List of parameters in the Network Test page

Parameter	Description
	Default value: 56 data bytes, which are translated into 64 ICMP data bytes when combined with the 8 bytes of ICMP header data.
	Provide the required value in the text box.
	Note : This parameter is not applicable if you select traceroute in the Type field.
	Number of ping packets that has to be sent to the network.
	Default value: 3
Count	Provide the required value in the text box.
	Note : This parameter is not applicable if you select Traceroute in the Type field.
	An option to run the test.
Run Test	This option appears only when you provide a value in the Destination text box.
Chan Tash	An option to stop the test that has begun.
Stop Test	This option appears only when you run the test.
Test Results	
	Displays the test results for the required destination.
networktests.log	By default, this field is disabled. When you run the test, this field displays the test results.
	You can use the 🛓 icon to download the log file.

Figure 48 is an example of a test result for the **ping** type:

Figure 48: Test result - ping

() c	ambium Networks ∣cn Wave ™ 5G F	ixed B1000 Undo "D Save E O Administ	rator 💄 admin 👻
H	Firmware Configuration Link Capacity Test N	twork Test MAC Learning Tables Engineering Logs	
:	Test Configuration		~ ⊞
	Туре	🧿 ping 🔘 traceroute	
•	0 Destination	10.130.159.80	
Ê	Packet Size	56	
*	0 Count	3	
		Run Test	
	Test Results		× 🗄
	networktests (on \$	PING 10.130.159.80 (10.130.159.80): 56 data bytes 64 bytes from 10.130.159.80: seq=0 ttl=63 time=4.721 ms 64 bytes from 10.130.159.80: seq=1 ttl=63 time=5.168 ms 64 bytes from 10.130.159.80: seq=2 ttl=63 time=5.999 ms	
		10.130.159.80 ping statistics 3 packets transmitted, 3 packets received, 0% packet loss round-trip min/avg/max = 4.721/5.629/6.168 ms	ĥ

Figure 49 is an example of a test result for the **traceroute** type:

Figure 49: Test result - traceroute

	Ca	mbium Networks ∣ cn Wave [™] 5G Fixed	I B1000 Unde	0 D	Save 🔒	ወ	Administrator	💄 admin 👻
+		Firmware Configuration Link Capacity Test Network 1	est MAC Learning Tables Engineering Logs					
		Test Configuration						~ ⊞
		Туре	ping • traceroute					
×,		 Destination 	10.130.159.82					
É			Run Test					
X	÷	Test Results						~ ⊞
		networktests.log 📩	traceroute to 10.130.159.82 (10.130.159.82), 30 hops max, 46 byte p. 1 10.130.159.82 (10.130.159.82) 12.450 ms 3.120 ms 3.938 ms	acket	S			

MAC Learning Tables

The **MAC Learning Tables** page allows you to dump the MAC addresses of equipment (or other devices) connected to the BTS and CPE radio units. You can also download the dumped MAC addresses in .txt file format.

To dump the MAC addresses for BTS and CPEs, perform the following steps:

1. From the main B1000 dashboard page, navigate to **Tools > MAC Learning Tables**.

The MAC Learning Tables page appears, as shown in Figure 50.

Figure 50: The MAC Learning Tables page

	l Cambium Networks │CnWave [™] 5G Fixed B1000		C ^d obnU	Save 🔒	Φ	Administrator	🛔 admin 👻
÷H.	Firmware Configuration Link Capacity Test Network Test MAC L	ning Tables Engineering Logs					
i	Configuration						~ ⊞
		Dump BTS Learning Table					
	Registered CPEs						
Ø	CPE To Dump	SPE To Dump					
≫		Dump CPE Learning Table					

2. Set the parameters, as described in Table 30.

Parameter	Description			
Configuration				
	An option to dump the MAC addresses of equipment connected to BTS.			
Dump BTS Learning Table	When you click on this option, the MAC Learning Table Dump parameter appears with the output (which contains all the dumped MAC addresses) in the Results section (as shown in Figure 51). You can also download the output in .txt format.			
Registered CPEs	The current number of CPEs that are connected and authenticated to this BTS.			
	This is a read-only parameter.			
	The IP address, IMSI, or C-RNTI of the CPE from which you want to display the MAC learning table.			
CPE To Dump	You can enter only a single IP address, IMSI, or C-RNTI in this field.			
	Note : Leave this field empty or blank to dump the MAC addresses for all CPEs.			
	An option to dump MAC addresses of equipment connected to the CPE (s).			
Dump CPE Learning Table	When you click on this option, the MAC Learning Table Dump parameter displays the output, which contains MAC addresses of equipment connected to the CPE (s).			

Table 30: Parameters on the Mac Learning Tables page

Figure 51 is an example of using the **Dump BTS Learning Table** option.

Figure 51: A sample MAC table dump for BTS

Firmware Configuration Link Capacity Test Network Test MAC Learning Tables Engineer	ering Logs
Configuration	• B
	Dump BTS Learning Table
0 Registered CPEs	8
O CPE To Dump	CPE To Dump
	Dump CPE Learning Table
Results	× 8
() MAC Learning Table Dump	With Prof. Learning Halk at 2004-0-13 1004113 D' HOJALOP, Dys Bew PC-0-12, 1-13 forbare HOJALOP, Dys Bew PC-0-12, 1-13 forbare Link port Lawring Halk at 2004-0-13 1004113 Link port Lawring Halk at 2004-0-13 1004113 D' HOJALOP, Dys Bew PC-0-12, 1-13 forbare Mith port Lawring Halk at 2004-0-13 1004113 D' HOJALOP, Dys Bew PC-0-12, 1-13 forbare Mith port Lawring Halk at 2004-0-13 1004113 D' HOJALOP, Dys Bew PC-0-12, 1-13 forbare Mith port Lawring Halk at 2004-0-13 1004113 D' HOJALOP, Dys Bew PC-0-12, 1-13 forbare Mith port Lawring Halk at 2004-0-13 1004114 Mith port Lawring Halk At 2004-0-13

Engineering

The **Engineering** page allows engineers (of Cambium Networks) to access the BTS radio remotely. Engineers can allow the users to access the radio using Telnet, SSH, and console secured cable (HTTP is not allowed).



Note

The **Engineering** page is configured and applicable only for troubleshooting and support purposes.

To view and set the **Engineering** page, perform the following steps:

1. From the main B1000 dashboard page, navigate to **Tools > Engineering**.

The **Engineering** page appears, as shown in Figure 52.

Figure 52: The Engineering page - B1000 UI

C C	ambium Networks	cnWave ™ 5G Fixed	B1000				Φ	💄 admin 👻
-11	Firmware Configuration	on Link Capacity Test	Network Test MAC Learning	Tables Engin	eering Log	J 5		
;	Device Identifier		✓ E	Engineer	ing Key			~ ⊞
	1 MSN	V5YA02QBG1	ICJ	I) PIN		485827		
	I ESN	8	1 New K	ey	New Key			
	0 SKU	C280500A101	IA					
8	I MAC	00:04:56:70:0	1:88			Validate		
14								
<i>~</i>				Engineer	ing Status			~ ⊞
				Active Ke	/			
				Valid Key				

If the engineers (from Cambium Networks) have not removed any engineering keys from the UI, then the **Engineering Status** section in the **Engineering** page displays all the configured engineering keys as shown in Figure 53.

Figure 53: The Engineering page with all the key details

🜔 c	ambium Netw	vorks cnWa	ave™ 5G Fixed B1	000				Undo 🖒 Save 🔒	Φ	Administrator	💄 admin 👻
-14	Firmware	Configuration	Link Capacity Test	Network Test	MAC Learning Tables	Engineering	Logs				
:	Device Ident	lifier				~ ⊞	Engineering Status				~ ⊞
-	0 MSN		V5YA02QLDSVS				Active Key	*****			
-	0 ESN		000456700193				Valid Key				
	0 SKU		C280500A101A				Serial Console Active				
	0 MAC		00:04:56:70:01:93				SSH Active				
86							Telnet Active				
~	Engineering	Key				~ ⊞					
	1 PIN		265562								
	 New Key 		New Key								
			Remove								
	Access Per	rmitted									

2. View and set the values for parameters, as described in Table 31.

Parameter	Description
Device Identifier	
MSN	MSN of the BTS device that is used for identification.
ESN	ESN of the BTS device.
SKU	SKU of the BTS device.
МАС	The MAC address that is assigned to the network interface and used for the BTS management.
Engineering Key	
PIN	Unique six-digit number used by the Engineering team of Cambium Networks to generate an engineering key for the BTS device.
	This is a read-only field.
	The new engineering key generated and provided by the Engineering team of Cambium Networks using PIN.
New Key	This new engineering key allows privileged engineering access to the BTS device.
	Enter the engineering key in the text box.
Demove	An option to remove the installed key and access the BTS device.
Kemove	If you click Remove , then the installed new key and access (using SSH, Serial Console, and Telnet) are removed.
Access Dormitted	Determines whether the new key enables engineering access to the BTS device.
	Select the checkbox to enable engineering access for the new key.

Table 31: List of parameters in the Engineering page

Parameter	Description
	Note : By default, the engineering access is enabled when a new key is installed.
Engineering Status - The followir	ng are the read-only parameters:
Active Key	Indicates whether the new generated key is accessible.
Valid Key	Indicates whether the generated key is valid.
Serial Console Active	Indicates whether the serial console is accessible for the users.
SSH Active	Indicates whether SSH is accessible for the users.
Telnet Active	Indicates whether the Telnet is accessible for the users.

Logs

The Logs page allows you to view and download local.log and authentication.log files of the BTS. You can use these logs for troubleshooting.

To view and download the logs, complete the following steps:

1. From the main B1000 dashboard page, navigate to **Tools** > **Logs**.

The Logs page appears, as shown in Figure 54. You can view the logs.

Figure 54: The Logs page - B1000 UI

() o	ambium Networks	l cnWave [™] 5G Fixed	I B1000										U	ndo 🕤 S	ave 🖬	ወ 🔺	vdministrator	🚨 admin 👻
-14	Firmware Conf	guration Link Capacity Test	Network Test	MAC Learning Tables	Engineering	Logs												
i	Device Logs																	✓ ■
⇔ 4 ×	local.log 🛓			local.1	log													
	authentication.log 🛓			315727 315727 315727 315727 315727 315727 315727 315727 315727	244.229875: 315 244.229904: 315 244.229904: 315 244.229917: RAD 244.229936: 315 244.229948: CAM 244.229958: RAD 244.229958: RAD 244.229978: IEEE 244.229996: 315	727244.2 727244.2 IUS mess 727244.2 BIUM: Re IUS_ALAR ius mess E 802.1X 727244.2	229878: v 229906: v sage: cod 229938: v eceived R RM: recei sage does (: Could 229997: v	v0_hostapd: v0_hostapd: de=2 (Acces v0_hostapd: RADIUS ACCE ived access s not conta not find m v0_hostapd:	: RADIUS Re : RADIUS Re ss-Accept) : STA 00:00 ESS-ACCEPT s accept ain User Nam matching st : STA 00:00	cceived 20 cceived RAI identifie 0:00:00:00 (2) mme attribu cation for 0:00:00:00	bytes fro DIUS messa r=195 leng :00 RADIUS :00 RADIUS :00 RADIUS	m RADIUS ge th=20 : Receive US messag : No RADI	server d RADIUS p e US RX hanc	backet mat	ched with (type=0	h a pe code=	nding req 2 id=195)	uest,

2. Click the $\stackrel{1}{\sim}$ icon to download the logs.

The C100 Dashboard

This section provides information on accessing the C100 dashboard. It also explains how to configure the C100 dashboard for managing CPEs.

This section covers the following topics:

- Accessing the C100 UI
- Viewing the C100 dashboard
- <u>Configuring C100 (CPE)</u>

Accessing the C100 UI

This section explains how to log on to the C100 (CPE) UI and view the C100 dashboard.

To access the C100 UI, perform the following steps:

- 1. Use the default IP address (169.254.1.1) to connect to the CPE setup.
- 2. Ensure that your PC is set up to communicate with the required range of IP addresses.
- 3. Open a web browser and type the URL http://169.254.1.1 to access the C100 UI.

The Sign In page appears, as shown in Figure 55.

Figure 55: The Sign In page for C100 UI (CPE)



4. Type an appropriate username and password.

Default username: admin

Default password: admin

You can use the show-password eye icon ((?)) to view the password characters.

5. Click Sign In.

The **Profile** page appears, as shown in Figure 56. This page allows you to change the password.



Note

Do not change the password every time when the **Profile** page appears. You must change the password only when it is required.

You can also access the **Profile** page by selecting **Profile** from the **admin** drop-down list on the top right side of the C100 UI.

Figure 56: The Profile page

	Car	mbium Networks │Cn Wave [™]	5G Fixed C100			Undo 🏷 Save 🖬 😃 Admin	nistrator 🙎 admin 👻
÷H.		Profile					
:		Change Passphrase		~ ⊞	Options		× ⊞
•			admin			Highlight Changes	
٠		Account Name	The current passphrase for this account is expired and should be changed immediately		Preferences	Login Page Background Image	
Ж							
A		Current Passphrase	Current Passphrase	8			
		New Passphrase	New Passphrase	8			
		New Passphrase Confirm	New Passphrase Confirm	8			
			Change Passphrase				

Table 32 lists and describes the parameters on the Profile page of C100 UI.

Parameter	Description			
Change Passphrase				
Account Name	The default name of the user account required for accessing the C100 UI.			
	This is read-only parameter.			
	The default password used for the first time log in or for the previous access.			
Current Passphrase	Default password: admin			
	Enter the current password in the text box.			
Now Passabrasa	Enter a new password in the text box.			
	Note : The maximum character limit for the password is eight.			
New Passphrase Confirm	Reenter the new password in the text box to confirm.			
Change Desembrase	An option to change the current password.			
Change Passphrase	Click on Change Passphrase to change the current password.			
Options Used for the engineerir	ng purpose.			
Droforoncoc	An option to set your preferences in the UI.			
Freierences	Following options are supported:			

Table 32: List of parameters in the Profile page

Parameter	Description
	 Highlight Change: Use this option to easily identify the new changes, which are highlighted in light yellow color on UI pages. These highlighted values help you quickly monitor the system changes. Example: The System > Interface UI page displays the highlighted values in light yellow color.
	• Login Page Background Image: Use this option to set the background image on the Sign In page of UI (as shown in Figure 55).
	Select the required option.

6. On changing the password, log on to the C100 UI using admin (username) and the new password (which you set on the **Profile** page).

The **Profile** page appears, as shown in Figure 56.

7. To view the main C100 dashboard, click the 1 icon (Dashboard) on the left navigation pane.

The main **Dashboard** page appears, as shown in Figure 57.

Figure 57:	The C100	dashboard	page
------------	----------	-----------	------

Device		IMSI	Session		Radio		
0004567104F9	6d 14h 44m	888901007406841	Registered	18h 44m 24s	-44 dBm	-32.7 dB	
ESN	Uptime	IMSI	Registration State	Link Uptime	Rx Power	EVM	
Device Summary		× E	Session				
I Product Name	cnWave 5G Fixe	d Consumer Premises Equipment (CPE)	Registration State	Registered			
8 Release Name	4.1b2		Registration Count	11			
System Description	Cambium Netwo	rks cnWave 5G Fixed Consumer Premises Equipment (CPE) 4.0b2	Ink Uptime	18h 44m 24s			
-,	armv7l GNU/Linu	IX	Auth Mode	RADIUS AAA			
 System Name 	CPE 1						
 System Location 	D1 Lab		Network				
 System Contact 	Yassine Poc Rig	1	0 MAC	00:04:56:71:04:19			
System Time	2024-05-30 05:5	5:30	IP Address	169.254.3.1			
Dedia			O Prefix	24			
Radio		× E	O Default Gateway	169.254.3.99			
Current Frequency Rx Rower	27000.000 MHz		10.00				
	-43 GDM		VLAN				
	-33.0 GD		VLAN Configured By	RADIUS 🗹			
O DL MCS	20			Management VID: Management VID Pri	1 onity: 0	[from RADIUS]	
	13 05			Allow Frame Types:	Tagged I	Frames [from RADIUS]	
UL MUS	17			Accept Q-in-Q Fram	es: True	d [from PADTUS]	
	U GB		Active VI AN Configur	VLAN Enabled:	Enabled	[From BTS]	
U Galibratión Status	Calibrated		- ACUTE VEAN CONINGU	Q-in-Q Ether Type:	0×8100	[From BTS]	
	Tx Enabled			VLAN Port Type:	Q		

For more information about the C100 dashboard page, refer to the <u>Viewing the C100 (CPE)</u> dashboard section.

You can now use the required UI controls (as described in Table 1) for configuring and managing CPEs.



Note

To log out from the UI, select **Logout** from the **admin** drop-down list on the top right side of the UI.

For information on UI controls available on the C100 dashboard, refer to Table 2.

Viewing the C100 (CPE) dashboard

The C100 dashboard (as shown in Figure 57) provides comprehensive information about the link status, radio parameters, RADIUS session settings, and other network details. Example: In Figure 57, the dashboard indicates that the CPE is up for more than 15000 seconds and that the Receive Power is -46 dBm.

The main C100 dashboard page contains the following tabs:

- General
- Device
- Radio
- Session

General

When you access the C100 UI, the main C100 dashboard appears with the General tab (by default).

The **General** page provides a summary (read-only) of the connected devices (as shown in Figure 57) and registered sessions. It also displays details of IMSI, Rx Power, VLAN, and the other system related details. Table 33 lists and describes parameters available on the **General** page.

Table 33:	Parameters	in the	General page
-----------	------------	--------	--------------

Parameter	Description
Device	The Electronic Serial Number (ESN) of the hardware device (CPE), which is the same as the MAC address.
	This parameter also indicates the uptime of the CPE device.
IMSI	IMSI that is associated with the CPE (subscriber).
	IMSI is a number that uniquely identifies the user of a cellular network.
Session	The registration state and the time elapsed after the last successful registration of the CPE.
Radio	Indicates the Rx Power (data) and the Error Vector Magnitude (EVM) of the radio downlink signal.
Device Summary	
	Name of the device that you have deployed.
Product Name	Example: cnWave 5G Fixed Consumer Premises Equipment (CPE)
Release Name	Release number of the operational software.
System Description	A brief description of the CPE system (device).
System Name	An administratively assigned name of the CPE device.

Parameter	Description				
	When using DNS, this name must be the device's fully qualified domain name (FQDN).				
System Location	The physical location of the device node.				
System Contact	Contact details of the device administrator.				
System Time	Date and time (in YYYY-MM-DD 24-hour format) that are configured in the system.				
Radio					
Current Frequency	The current operating frequency in MHz.				
Rx Power	The Receive power of data symbols in dBm.				
EVM	The EVM of the radio downlink signal (in dB).				
DL MCS	MCS of the downlink.				
	Indicates the amount (in dB) of power backoff for the downlink.				
DL Backoff	This is the amount by which the BTS is currently reducing its power from the maximum configured EIRP when transmitting to the CPE. The BTS uses the greatest backoff that it can achieve while still maintaining the downlink throughput required by the CPE.				
	Note : Backing off the BTS transmit power means the power allocation maximized for the CPE, which also requires for minimizing interference.				
UL MCS	MCS of the uplink.				
	Indicates the amount (in dB) of power backoff for the uplink.				
UL Backoff	The Tx Power is reduced if there is link budget during the top modulation mode to improve the spectral efficiency.				
	Indicates the unit calibration status.				
Calibration Status	The calibrated status implies that CPE has been tested and calibrated for all the frequency ranges.				
	Note : A production unit showing an uncalibrated or a persistent uncalibrated state indicates a problem that requires factory repair.				
	Specifies the status of transmit control (Tx).				
	This is a read-only parameter. By default, this parameter is enabled.				
Tx State	Note : If the engineering keys (used for troubleshooting and support) are enabled, then this parameter displays a message (highlighted in orange) indicating that transmit control is overridden by the Engineering key. For more information about the engineering keys, refer to the Engineering section.				

Parameter	Description				
	If CPE cannot connect to BTS due to frequency or any other reason, this parameter displays a message (highlighted in red) indicating that the frequency is not locking.				
Session					
Registration State	Indicates the progress that a CPE (device) has made to enter the network.				
	For more information about this parameter, refer to Table 36.				
Registration Count	Number of times that the CPE has successfully registered with the BTS.				
	For more information about this parameter, refer to Table 36.				
Link Uptime	The time elapsed after the last successful registration of the link for the CPE. This parameter displays the time in days or hours, minutes, and seconds.				
Auth Mode	Indicates the CPE authentication mode.				
Authmode	For more information about this parameter, refer to Table 36.				
Network - Based on the RADIUS config	guration, this section (in the C100 UI) populates values.				
МАС	The Ethernet MAC address that is assigned to the network interface and used for managing the device.				
IP Address	The IP address that is assigned to the network interface and used for managing the device.				
Prefix	The IP network prefix that is assigned to the network interface and used for managing the device.				
Default Gateway	The IP address of the default gateway (if any) that is used for managing the device.				
VLAN					
	Determines whether the VLAN configuration is set through RADIUS AAA.				
VLAN Configured by RADIUS	At the time of boot, the CPE network configuration uses the locally configured VLAN settings, and these settings may be overridden by the RADIUS-specific settings during registration.				
	For more details, refer to the <u>Configuring system settings</u> section.				
Active VLAN Configuration	Displays details of the VLAN configuration that is currently active for the CPEs. For more details on configuring the VLAN, refer to the <u>Configuring system settings</u> section.				

Device

When you click on the **Device** tab in the main C100 dashboard page, the **Device** page appears.

The **Device** page provides details (read-only) of the device identifiers, reboot history, reboot reasons, and the hardware version of the device (as shown in Figure 58).

Figure 58: The Device page - C100 UI

	Cambium Networks	l cnWave ™ 5G Fixed	I C100					Save 🖬 🔇	Administrator	💄 admin 👻
÷H.	General Device	Radio Session								
•	Device Identifier			~ ⊞	Boot					~ ⊞
-	1 MSN	V5YA01XDV62D			Startup Reason	Non-	Power Cycle			
1	6 ESN	0004567104F9			Startup Count	1691				
	0 SKU	C280500C001A								
×					Shutdown					~ 🖽
	Boot Loader			~ ⊞	 History 	 Reason 	 Date 	0 0	etail	
A	Git Tag	develop/4/111			1	Unspecified	0000-00-00 00:00:0	0 Boot	after commanded re	eset
	Build Name	BOOTLOADER 1	111/2023-09-25 (W) 11:19:15 -0500		2	Unspecified	0000-00-00 00:00:0	0 Boot	after commanded re	eset
					3	Application Fatal	1980-01-01 00:31:24	4 Regi	stration Timeout	
	Hardware			~ ⊞	4	Application Fatal	1980-01-01 00:31:3	1 Regi	stration Timeout	
	Hardware Version	Digits P7.0 RF 8.0	0		5	Application Fatal	1980-01-01 00:31:3	6 Regi	stration Timeout	
	0 RFID	X60610000481			6	Application Fatal	1980-01-01 00:31:4	0 Regi	stration Timeout	
					7	Application Fatal	1980-01-01 00:31:4	6 Regi	stration Timeout	
					8	Application Fatal	1980-01-01 00:32:0	4 Regi	stration Timeout	

Table 34 lists and describes parameters available on the **Device** page.

Table 34: Parameters in the Device pa	neters in the Device page	; ir	Parameters	34:	Table	Т
---------------------------------------	---------------------------	------	------------	-----	-------	---

Parameter Description				
Device Identifier				
MSN	Manufacturer Serial Number (MSN) of the device that is used for device identification.			
ESN	ESN of the device.			
SKU	Stock Keeping Unit (SKU) of the device.			
Boot Loader				
Git Tag	ID of the software build version.			
Build Name	Build name of the software.			
Hardware				
Hardware Version	Hardware version of the CPE.			
RFID	The radio frequency (RF) module ID.			
Boot				
	Indicates the reason for the previous system reboot.			
	The following reasons are supported:			
Startup Reason	Non-Power Cycle: The device was reset without a power cycle.			
	• Short Power Cycle: Power to the device was briefly interrupted.			
	Long Power Cycle: Power to the device was interrupted.			
Startup Count	Indicates the counter that is incremented each time when the device			

Parameter	Description					
	starts.					
Shutdown - Provides details of	the boot history.					
	Index of the boot history.					
History	The history for the most recent system reboot is always available in the first row.					
	Reasons specified for each boot history.					
	The following boot reasons are supported:					
	 Unspecified: The shutdown was not planned (for example, power loss or Watchdog reset). 					
	Shutdown - Shutdown due to a user action.					
	 Firmware Upgrade: A firmware upgrade requiring a reboot to complete. 					
Reason	 Configuration Change: A configuration change requiring a reboot to complete. 					
	 User Action: A user action requiring a reboot. 					
	• Watchdog: A managed shutdown due to a fatal system fault.					
	 Application Fatal: A managed shutdown due to an application managed error. 					
	 Application Panic: A managed shutdown due to an application fatal error. 					
Date	Date and time at which the system was rebooted.					
Detail	A brief description of the reboot.					

Radio

When you click on the **Radio** tab in the main C100 dashboard page, the **Radio** page appears.

The **Radio** page provides information (read-only) about the status of operating frequency, receive power levels, EIRP, and the range (distance) to BTS (as shown in Figure 59). You can monitor the C100 (CPE) dashboard to ensure that a connection has been authenticated and established with the desired BTS.

Figure 59: The Radio page - C100 UI

() o	ambium Networks cn	Wave™ 5G Fixed C100			C obnU	Save 🖥	ወ	Administrator	💄 admin 👻
÷H.	General Device Rac	dio Session							
:	Summary		~ ⊞	Downlink Details					~ ⊞
-	Current Frequency	27000.000 MHz		Rx Power	-45 dBm				
0	Scan State	Tracking		1 DL MCS	23				
	Current EIRP	33.0 dBm		DL Backoff	13 dB				
×	Current Polarisation	Horizontal		Spatial Frequency	513				
	Bandwidth	112 MHz		IDL Channel Distortion	-17.2 dB				
	Extended Range	Disabled		DL Multipath Distortion	-26.8 dB				
	8 Range	0.01 km							
				Uplink Details					~ ⊞
				Max EIRP	52.0 dBm				
				Ourrent EIRP	33.0 dBm				
				UL MCS	23				
				UL Backoff	5 dB				

Table 35 lists and describes parameters available on the Radio page.

Table 35	: Parameters	in the	Radio	page
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Parameter Description				
Summary				
Current Frequency	The current operating frequency (in MHz).			
Scan State	The current status of the BTS signal specific acquisition state machine.			
	The following states are supported:			
	• Scanning			
	Scanning - Fine			
	Acquiring			
	• Tracking			
	Note : The acquisition state machine must reach the Tracking state to establish a wireless connection.			
Current EIRP	The current Effective Isotropic Radiated Power (EIRP) in dBm.			
Current Polarisation	The current antenna polarisation.			
Bandwidth	The bandwidth of an active radio channel.			
	The bandwidth is automatically determined from the signal received from the BTS.			
Extended Range	The extended range status for operating the BTS.			
	You can set the Extended Range parameter using the System > Radio page of the B1000 UI. For more information, refer to the <u>Radio</u> section.			

Parameter	Description			
Range	The distance measured between BTS and CPE (in Km).			
Downlink Details				
Rx Power	The receive power of data symbols (in dBm).			
DL MCS	MCS of the downlink.			
DL Backoff	Indicates the amount (in dB) of power backoff for the downlink.			
	For more details about this parameter, refer to Table 33.			
Spatial Frequency	Indicates the spatial frequency for the downlink multi-user multi- input-multi-output (MU-MIMO).			
DL Channel Distortion	Indicates the channel distortion (in dB) for the downlink MU-MIMO			
DL Multipath Distortion	Indicates the downlink MIMO multipath distortion (in dB).			
	The value of this parameter indicates how suitable the downlink MIMO channel is for the MU-MIMO operation.			
Uplink Details				
Max EIRP	The maximum EIRP configured for the uplink.			
Current EIRP	The current EIRP in dBm.			
UL MCS	MCS of the uplink.			
UL Backoff	Indicates the amount (in dB) of power backoff for the uplink.			
	The Tx Power is reduced if there is link budget during the top modulation mode to improve the spectral efficiency.			

Session

When you click on the **Session** tab on the C100 dashboard page, the **Session** page appears (as shown in Figure 60).

The **Session** page provides information (read-only) about the registration state of CPEs, registration count of CPEs, and the RADIUS session details.

Figure 60: The Session page

Ca	ambium Networks cn Wa	ve ™ 5G Fixed C100		Undo 🏷 Save 🖬 😃 🗸	Administrator 🙎 admin 🝷
	General Device Radio	Session			
1	Session	× *	Quality Of Service		✓ 田
i	Registration State	Registered	Oos Configured By RADIUS		
_	 Registration Count 	11	0 ULBR	0 kbps	
	Link Uptime	19h 16m 51s	0 ULBL	0 kbits	
56	 Auth Mode 	RADIUS AAA	1 DLBR	0 kbps	
\gg	() IMSI	888901007406841	1 DLBL	0 kbits	
A			1 LPULCIR	0 kbps	
	RADIUS Session	N	1 MPULCIR	0 kbps	
	B Phase	Authenticated	1 HPULCIR	0 kbps	
	Connection	Connected	1 UHPULCIR	0 kbps	
	IP Address	169.254.3.1	1 LPDLCIR	0 kbps	
	 IP Netmask 	255.255.255.0	MPDLCIR	0 kbps	
	Prefix	24	1 HPDLCIR	0 kbps	
	 Default Gateway 	169.254.3.99	0 UHPDLCIR	0 kbps	
	VLMGVID	1			
	CPE Management VID Pass- through	Disabled			
	1 ULBR	0 kbps			
	1 ULBL	0 kbits			
	1 DLBR	0 kbps			
	1 DLBL	0 kbits			
	1 LPULCIR	0 kbps			
	1 MPULCIR	0 kbps			
	1 HPULCIR	0 kbps			
	1 UHPULCIR	0 kbps			
	1 LPDLCIR	0 kbps			
	1 MPDLCIR	0 kbps			
	1 HPDLCIR	0 kbps			
	1 UHPDLCIR	0 kbps			
	1 VLLEARNEN	Enabled			
	1 VLAGETO	25			
	1 VLIGVID	50			
	1 VLFRAMES	Tagged Frames			
	Primary DNS Server	0.0.0.0			
	Secondary DNS Server	0.0.0.0			
	DNS Domain Name				
	Bts_version	4-0-0-0			

Table 36 lists and describes parameters available on the **Session** page.

Table 36: Parameters	s in the	Session	page
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Parameter	Description	
Session		
Registration State	Indicates the progress that a CPE (device) has made to enter the network.	
	This parameter supports the following device transition states:	
	 Down - Indicates that the device is yet to attach to a BTS. 	
	 Attaching - Indicates the device has attached to the BTS radio. 	
	 Authenticating - Indicates the device is authenticating (using Radius) with the BTS. 	

Parameter	Description		
	 Configuring - Indicates that the CPE is being configured. 		
	 Registered - Indicates that the CPE is ready to pass user traffic. 		
Registration Count	Number of times that the CPE has successfully registered to the BTS.		
	Note : The value of this parameter is reset to zero at the time of restarting the system.		
Link Uptime	Time (in seconds) at which the last successful registration of the link is available for the CPE.		
Auth Mode	Indicates the CPE authentication mode.		
	This parameter supports the following values:		
	 None: CPEs are allowed to connect to the BTS without authentication. In this mode, user traffic is bridged when the CPE gets connected. 		
	• RADIUS AAA: CPEs are authenticated to a RADIUS AAA back- end server. A CPE might not bridge the user traffic until it is authenticated.		
IMSI	Unique number used for identifying a subscriber in a cellular network. Each subscriber is associated with a unique IMSI. The IMSI is usually obtained from a CPE's SIM card. If there is no SIM for a CPE, then it is derived from the CPE's serial number.		
RADIUS Session			
Phase	Indicates the authentication phase.		
Connection	Determines the connection state.		
IP Address	The Radius-supported IP address that is assigned to the network interface and used for managing the device.		
IP Netmask	The Radius-supported netmask for the IP address, which is assigned to the network interface and used for managing the device.		
Prefix	The IP network prefix, which is derived from the Radius-supported IP netmask (assigned to the network interface and used for the device management).		
Default Gateway	The Radius-supported IP address of a system (computer) in the current network, which acts as a gateway.		
VLMGVID	The VLAN ID that is used to communicate with BTS and CPE for the management purpose.		
CPE Management VID Pass- through	Determines whether the Management VID traffic (VLMGVID) is allowed to or from the CPE wired interface.		
	Default value: Enabled		

Parameter	Description	
	Note : You can configure this parameter using the System > General page of C100 UI.	
ULBR	The uplink bit rate or sustained uplink rate (in kbps) at which each CPE has registered with the BTS. This BTS is replenished with credits for transmission.	
ULBL	Indicates the uplink bit limit or uplink burst allocation (in kbits).	
	The maximum amount of data that each CPE is allowed to transmit before being recharged at the sustained uplink data rate (in kbps).	
DLBR	The downlink bit rate or sustained downlink rate (in kbps) at which the BTS is replenished with credits (tokens) for transmission to each of the CPEs in its sector.	
DLBL	Indicates the downlink bit limit or downlink burst allocation (in kbits).	
	The maximum amount of data that the BTS is allowed to transmit to any registered CPE before it is replenished with the transmission credits at the sustained downlink data rate (in kbps).	
LPULCIR	The minimum rate (in kbps) at which a low priority traffic is sent ov the uplink (unless Committed information rate (CIR) is oversubscribed or the RF link quality is degraded).	
MPULCIR	The minimum rate (in kbps) at which a medium priority traffic is sen over the uplink (unless CIR is oversubscribed or the RF link quality is degraded).	
HPULCIR	The minimum rate (in kbps) at which a high priority traffic is sent over the uplink (unless CIR is oversubscribed or the RF link quality is degraded).	
UHPULCIR	The minimum rate (in kbps) at which an ultra-high priority traffic is sent over the uplink (unless CIR is oversubscribed or the RF link quality is degraded).	
LPDLCIR	The minimum rate (in kbps) at which a low priority traffic is sent over the downlink (unless CIR is oversubscribed or the RF link quality is degraded).	
MPDLCIR	The minimum rate (in kbps) at which a medium priority traffic is sent over the downlink (unless CIR is oversubscribed or the RF link quality is degraded).	
HPDLCIR	The minimum rate (in kbps) at which a high priority traffic is sent over the downlink (unless CIR is oversubscribed or the RF link quality is degraded).	
UHPDLCIR	The minimum rate (in kbps) at which an ultra-high priority traffic is sent over the downlink (unless CIR is oversubscribed or the RF link quality is degraded).	
VLLEARNEN	Determines whether the CPE must add the VLAN IDs (VIDs) of upstream frames to the VID table (VLAN learning).	

Parameter	Description		
	This parameter supports the following values:		
	• Enabled: Indicates that the CPE must add the VIDs to the VID table.		
	• Disabled: Indicates that the CPE must not add the VIDs to the VID table.		
	Default value: Enabled		
	Note : The CPE might drop any frames with VIDs that are not stored in the VID table.		
VLAGETO	The period (in minutes) during which the CPE must dynamically keep learning about VIDs.		
	This parameter supports values ranging from 5 to 1440 (in minutes).		
	Default value: 25 (in minutes)		
	You can configure this parameter using the System > General page of C100 UI.		
	Note : VIDs that you set for the Untagged Ingress VID and Management VID parameters do not time out.		
VLIGVID	The VLAN ingress VID that is used for incoming untagged frames. This VID corresponds to the Qtag for 802.1Q frames (if the VLAN port type is Q) or the C-tag for 802.1ad frames (if the VLAN port type is Q-in-Q).		
VLFRAMES	Indicates the allowed frame types (all, untagged, or tagged).		
	The type of arriving frames that the CPE must tag by using the VID, which is stored in the Untagged Ingress VID parameter.		
	Default value: All Fames		
Primary DNS Server	IP address of the primary DNS server assigned by RADIUS Server (if any).		
Secondary DNS Server	IP address of the secondary DNS server assigned by RADIUS Server (if any).		
DNS Domain Name	Name of the DNS domain assigned by RADIUS Server (if any).		
Bts_Version	Specifies the build version number of BTS.		
	Example: 3-1-0-0		
	This parameter supports numerical values.		
	The value of this parameter is determined based on the following points specific to release types:		
	 Major: This release type is not frequent and implies a significant feature addition or an architectural change. 		

Parameter	Description	
	 Minor: This release type is often and implies incremental improvements and corrections. 	
	• Point: This release type implies a collection of bug fixes from the previous minor release.	
	 Dot: This release type implies an emergency bug fix or a customer-specific change. 	
	Note : A dot release is not posted publicly, and a bug fix gets rolled into the next point release.	
Quality of Service		
QoS Configured by RADIUS	Determines whether the QoS configuration is set through RADIUS AAA.	
	At boot, locally configured settings are used for the QoS network configuration. These settings are overridden by RADIUS-supplied settings during registration.	
For the following parameter descriptions, refer to the <u>RADIUS Session</u> section of this table:		
ULBR		
ULBL		
DLBR		
DLBL		
LPULCIR		
MPULCIR		
HPULCIR		
UHPULCIR		
LPDLCIR		
MPDLCIR		
HPDLCIR		
UHPDLCIR		

Configuring C100 (CPE)

Using the C100 UI, you can configure, view, and manage the CPE configurations. This section covers the following CPE-specific configurations:

- Configuring System settings
- Configuring tools
- Setting up a wizard

Configuring system settings

The **System** page in the C100 UI allows you to view and configure the required settings for the device such as radio, interface, and session related parameters.

You must use the **System** icon (^(C)) in the C100 dashboard to configure, view, and manage the system settings for CPEs.

The **System** page in the C100 dashboard contains the following tabs:

- General
- VLAN
- Management
- Radio
- Interface
- Session
- RADIUS Authentication
- Syslog

General

The **General** page allows you to configure generic system settings such as system name, its location, and contact person details. You can also configure the network settings such as IP address, prefix, and default gateway.

To access and configure the system settings, perform the following steps:

1. Log on to the C100 UI (as described in the Accessing the C100 UI section).

The main C100 dashboard page appears (as shown in Figure 57).

2. On the left navigation column, click the **System** icon (

A system setting-specific page appears, as shown in Figure 61. By default, the **General** tab is selected.

Cam	bium Networks │ cn Wave ™ 5	G Fixed C100				Undo 🕤 Save 🖬 Ů Administrator 🛔	admin 👻
-	Conoral VIAN Management	Padio Intorfacos Sos	PADILIS Authoritication	Syslog			
	System	Tradio Interfaces 36:	Sion NADIOS Addientication	Sysiog	Network Configuration		~ ⊞
1	System Name	CDE 1			CPE IP From DHCP	False	
*	U system Name	GIET				169.254.1.1	
26	O System Location	D1 Lab			1 IP Address		
×	3 System Contact	Yassine Poc Rig 1				• This value is overridden by the RADIUS server.	
A	Timezone	GMT (+00:00)	¢			16	
	Geographic Location			~ ⊞	O Prefix	This value is overridden by the RADIUS server.	
	1 Latitude	44.88889	DD			0.0.0.0	
	1 Longitude	7.88889	DD		3 Default Gateway	This value is overridden by the RADIUS server.	
	Altitude	8.0	m		1 IPv6 Enabled	0	_
						· · · · ·	
					Primary DNS Server	0.0.0.0	
					Secondary DNS Server	0.0.0.0	
					ONS Domain Name	DNS Domain Name	
					Allow Local Management		
					3 Add Alternate LAN IP Address		
					Active Network		× 🖽
					IPv4 Configured By RADIUS		
					IP Address	169.254.3.1	
					0 Prefix	24	
					Default Gateway	169.254.3.99	
					Secondary DNS Server	0000	
					DNS Domain Name		
					VLAN Configured By RADIUS		

Figure 61: The System page - General settings

3. Set the values for each parameter, as described in Table 37.

Table 37: Parameters on the General page

Parameter	Description	
System		
System Name	An administratively assigned name of the device. When using DNS, this name must be the device's fully qualified domain name (FQDN).	
	Provide an appropriate name in the text box for the CPE system.	
System Location	The physical location of the device node.	
System Location	Provide appropriate location details in the text box.	
System Contact	Contact details of the device administrator.	
	Enter appropriate details in the text box.	
	Time zone that you want to set for the system.	
Timezone	Select the required time zone from the drop-down list. Example: GMT (+00:00)	

Parameter	Description	
Geographic Location		
	Latitude (in DD) of the geographical location where the CPE is located.	
	Enter an appropriate value in the text box.	
Latitude	Note : Decimal degrees (DD) indicate latitude and longitude geographic coordinates in decimal fractions of a degree. Example: A positive latitude is north of the equator and a negative latitude is south of the equator. A DD to five decimal places is precise to approximately one metre.	
	Longitude (in DD) of the geographical location where the CPE is located.	
Longitude	Enter an appropriate value in the text box.	
	Example: A positive longitude is east of the Prime Meridian and a negative longitude is west of the Prime Meridian.	
Altitude	Altitude (in m) of the geographical location relative to mean sea level (MSL).	
	Enter an appropriate value in the text box.	
Network Configuration		
	Determines whether the CPE's IP network configuration is supplied by a DHCP server.	
	The following values are supported:	
	 True: If enabled, the DHCP server supplies the CPE's IP network configuration. 	
CPE IP From DHCP	 False: If disabled and the Authentication Mode is RADIUS AAA, the configured RADIUS server supplies the CPE's IP network configuration. 	
	If disabled and the Authentication Mode is None , the CPE's IP network configuration is set locally at each CPE.	
	You can configure this parameter using the CPE Provisioning page of the B1000 UI.	
	The IPv4 address that is assigned to the network interface and used for the device management.	
IP Address	Provide appropriate value in the text box.	
	Note : The value of this parameter is overridden by the RADIUS server (if connected).	
Prefix	The IPv4 network prefix that is assigned to the network interface and used for the device management.	
	Provide appropriate value in the text box.	

Parameter	Description	
	Note : The value of this parameter is overridden by the RADIUS server (if connected).	
	The IPv4 address of the default gateway (if any) that is used for device management.	
Default Gateway	Provide appropriate value in the text box.	
	Note : The value of this parameter is overridden by the RADIUS server (if connected).	
	Determines whether IPv6 is enabled for CPE management (in addition to the always enabled IPv4 management access).	
	By default, this parameter is disabled.	
	Select the checkbox to enable IPv6 for device management.	
IPv6 Enabled	Note : When the select the IPv6 Enabled checkbox, the following IPv6-specific parameters appear:	
	IPv6 Address	
	• IPv6 Prefix	
	IPv6 Default Gateway	
	This parameter appears when the IPv6 Enabled checkbox is selected.	
IPv6 Address	Indicates the IPv6 address assigned to the network interface that is used for the device management.	
	Enter a valid IPv6 address.	
Pv6 Prefix	This parameter appears when the IPv6 Enabled checkbox is selected.	
	Indicates the IPv6 network prefix assigned to the network interface that is used for the device management.	
	Enter an appropriate value.	
	Note : Any change to this setting is applicable when the device reboots next. The active value of this setting is currently 0.	
	This parameter appears when the IPv6 Enabled checkbox is selected.	
IPv6 Default Gateway	Indicates the IPv6 default gateway address used for the device management.	
	Enter an appropriate value.	
	Note : Any change to this setting is applicable when the device reboots next.	

Parameter	Description	
Primary DNS Server	IP address assigned to the primary DNS server (if any) that is used for device management.	
	Enter a valid value in the text box.	
	IP address assigned to the secondary DNS server (if any) that is used for device management.	
Secondary DNS Server	Enter a valid value in the text box.	
	Note : This parameter can always have an IPv4 address. But it can alternatively have an IPv6 if IPv6 Enabled is selected.	
	The domain name to use for managing DNS configuration.	
	This domain name may be concatenated to DNS names configured for the management interface.	
DNS Domain Name	Enter an appropriate name in the text box.	
	Note : This parameter can always have an IPv4 address. But it can alternatively have an IPv6 if IPv6 Enabled is selected.	
Allow Local Management	Determines whether you want to manage this device through the local management interface or the radio link.	
	By default, the checkbox is selected (enabled), indicating that the local management interface is used for this device management.	
	If you disable or uncheck the Allow Local Management checkbox, all local management traffic is dropped, and the device management is possible only through the radio link.	
	Note : If you disable this checkbox, this setting can only be re- enabled by remote management or by resetting to factory defaults.	
	Determines whether you want to configure or add a second IP address (alternate LAN IP address) for the device management. This alternate LAN IP address is accessible only when connected to the Ethernet port.	
Add Alternate LAN IP Address	If you select the checkbox, the following parameters appear:	
	Alternate LAN IP Address	
	Alternate LAN Prefix	
Alternate LAN IP Address	The alternate management IP address that is accessible only when connected to the Ethernet port. The management performed using this interface may be untagged traffic only. The system does not implement any configured management VID.	

Parameter	Description	
	Note : The alternate LAN IP configuration is not installed if it intersects with the primary management IP address configuration (which is assigned by DHCP or RADIUS).	
	Type the alternate LAN IP address in the text box (if required). By default, this text box displays the primary IP address that is currently used by the management agent for the operation.	
	A warning message is visible, indicating that the alternate LAN IP address is installed. When the CPE next registers on reboot or the Activate Saved Alternate LAN IP Configuration button is clicked. Otherwise, it overlaps with the primary IP address (which is assigned by DHCP or RADIUS) and the alternate LAN IP address is not installed.	
	The IP network prefix of the alternate LAN IP address.	
	Default value: 16	
Alternate LAN Prefix	A warning message is visible, indicating that the alternate LAN prefix is installed. When the CPE next registers on reboot or the Activate Saved Alternate LAN IP Configuration button is clicked.	
	Type an appropriate value in the text box (if required).	
Activate Saved Alternate LAN	An option to update the alternate LAN IP configuration and use the currently saved settings.	
IP Configuration	Note : If you are currently managing the device using the previous alternate LAN IP address, then the contact with the device is lost until you use the new alternate IP address.	
Active Network - Specifies the parameters that are configured using the RADIUS Server. The following are the read-only parameters:		
	Indicates whether the IPv4 network configuration is set through RADIUS AAA.	
	The checkbox is selected if the IPv4 network configuration is set through RADIUS AAA.	
IPv4 Configured by RADIUS	Note : On a CPE that is configured for RADIUS authentication, the IPv4 network configuration uses the locally configured settings and swaps to the Radius-supported settings when the RADIUS authentication takes place.	
	The locally configured settings may be overridden by the Radius-supported settings during registration.	
IP Address	The IPv4 address that is assigned to the network interface and used for the device management.	
Prefix	The IPv4 network prefix that is assigned to the network interface and used for the device management.	

Parameter	Description
Default Gateway	The IPv4 address of the default gateway (if any) that is used for the device management.
Primary DNS Server	IP address assigned to the primary DNS server (if any) that is used for the device management.
Secondary DNS Server	IP address assigned to the secondary DNS server (if any) that is used for the device management.
DNS Domain Name	The domain name to use for managing DNS configuration.
	This domain name may be concatenated to DNS names configured for the management interface.
VLAN Configured by RADIUS	Indicates whether the VLAN configuration is set through RADIUS AAA.
	At boot, locally configured settings are used for the VLAN network configuration. These settings are overridden by RADIUS-supplied settings during registration.
	The checkbox is selected if the network configuration is set through RADIUS AAA.

4. Click **Save** (located at the top right side of the page) to save the configuration changes.

VLAN

The **VLAN** page allows you to configure VLANs and related settings for the CPE device. This page also displays the active VLAN configuration.

To access and configure the VLAN settings, perform the following steps:

1. From the main C100 dashboard page, navigate to **System** > **VLAN**.

The VLAN page appears, as shown in Figure 62.

Figure 62: The VLAN page

			cnWave™	5G Eiver	11 C100					Linda D	Cours D. (A desinistrator	9 admin -
Ca	mbium Ne	etworks	Cliwave	JG FIXet	11010					0000 5	Save 🖬 🤇	Administrator	≧ aomin ¥
-14	General	VLAN	Management	Radio	Interfaces	Session	RADIUS Authentication	Syslog					
;	Configuration 0		✓ ■			VLAN Membership Configuration							
			Activate saved VLAN configuration					Dynamic Learning	Disabled O Enabled				
*	3 Management VID		1					VLAN Aging Timeout	25				
⋇	Management VID Priority			0				Permanent VID Members: 50					
¥	Allow Frame Types		O All Frames • Tagged Frames O Untagged					O VLAN Membership Table	101 141 201				
	O Accept Q-in-Q Frames		O Disabled • Enabled						241				
	O CRE M			O Disabled • Enabled					Status				~ ⊞
	CFE management vib Pass-unougn		This value is overridden by the RADIUS server.						Management VID: Management VID Priority:	1 0	[from RADIUS]]	
	VLAN Enabled			Enabled						Allow Frame Types: Accept 0-in-0 Frames:	Tagged Frames	s [from RADIUS]]
	Q-in-Q Ether Type		0x8100						CPE Management VID Pass-through	: Disabled	[from RADIUS	1	
	VLAN Port Type		• a ○ a-in-a			Active VLAN Configuration	n Q-in-Q Ether Type: VIAN Port Type:	Enabled 0x8100 0	[From BTS] [From BTS]				
				1						Default Port VID: Default Port VID Priority:	50 0	[from RADIUS]]
	1 Default Port VID		This value is overridden by the RADIUS server.				Dynamic Learning: VLAN Aging Timeout:	Enabled 25	[from RADIUS [from RADIUS	1			
	Default Port VID Priority		0										
	Provider VID		1										
	0 Provide	er VID Priorit	у	0									

2. Set the values for each parameter, as described in Table 37.

Table 38: Parameters on the VLAN page

Parameter	Description			
Configuration				
	An action that updates the live VLAN configuration to use the currently saved settings unless they are overridden by RADIUS.			
Activate Saved VLAN Configuration	Note : If you have changed Management VID , then you will lose contact with the device until you make the corresponding changes.			
	If you change any parameter in this VLAN Configuration section, you must save the changes and then click the Activate Saved VLAN Configuration button. When the CPE reboots, it uses the saved VLAN configuration.			
	The VLAN ID used to communicate with BTS and CPE for the management purpose.			
Management	Type an appropriate value in the text box.			
Management VID	Default value: 1 - which implies that there is no VLAN in the system.			
	You can set up an ID value between 2 and 4094.			
Management VID Priority	The priority value that is set for the management VLAN ID.			

Parameter	Description				
	Type of incoming or arriving frames that the CPE must tag using the VID, which is stored in the Untagged Ingress VID parameter.				
	The following options are supported:				
	• All Frames				
Allow Frame Types	Tagged Frames				
	Untagged				
	Select the required incoming frame type.				
	Default value: All Frames				
	Note : The value of this parameter is overridden by the RADIUS server (if connected).				
	Determines whether a Q-in-Q frames are accepted or blocked.				
	This option is valid for the Q-in-Q port as you might force the blocking of existing 802.1ad Q-in-Q frames. Then, only untagged or single tagged packets come in and go out of the Ethernet interface.				
	if a Q-in-Q frame is about to ingress or egress the Ethernet interface and if this parameter is disabled , then the Q-in-Q frames are dropped.				
Accept Q-In-Q Frames	This parameter supports the following options:				
	• Disabled				
	• Enabled				
	Default value: Disabled				
	Select the required option.				
	Note : To apply the changes to this setting, reboot the device.				
	Determines whether the Management VID traffic (VLMGVID) is allowed to or from the CPE wired interface.				
	The following options are supported:				
	• Disabled				
CPE Management VID Pass-	• Enabled				
through	Default value: Enabled				
	Select the required option. To apply the changes to this setting, reboot the device.				
	Note : The value of this parameter is overridden by the RADIUS server (if connected).				

Parameter	Description				
	Determines whether the VLAN functionality for the BTS and all linked CPEs is enabled.				
VLAN Enabled	If this parameter is disabled, then you cannot modify VLAN- related parameters on this C100 UI. You must enable the VLAN using the System > General page of the B1000 UI. For more details, refer to Table 7.				
	The Ether types for Q-in-Q (802.1ad) and outer tag (S-Tag).				
	Default value: 0x88a8				
Q-in-Q Ether Type	You can configure this option using the System > General page of the B1000 UI. For more details, refer to Table 7. To understand how Q-in-Q works, refer to the $Q-in-Q$ section.				
	Indicates the VLAN tunnel technique or port type used by the Ethernet service provider for segregating the traffic.				
	The following options are supported:				
	• Q: Indicates that it operates on 802.1q C-tags only.				
VLAN Port Type	 Q-in-Q: Indicates that it must add and remove the S-tag and add a C-tag (if necessary) for untagged packets. 				
	Note : The VLAN port type configures the behaviour of the local Ethernet only and the internal management interfaces always operate as Q ports.				
	Default value: Q				
	Select the required port type.				
	VID that is used for untagged frames and corresponds to the Q-tag for 802.1Q frames (if the VLAN Port Type is Q) or the C tag for the 802.1ad frames (if the VLAN Port Type is Q-in-Q).				
Default Port VID	Default value: 1				
	Note : The value of this parameter is overridden by the RADIUS server (if connected).				
	The priority value that is set for the default VID VLAN.				
	Default value: 0				
	The provider VID that is used for the S-tag. This VID is used only if the Port Type is q-in-Q and for the S-tag.				
Provider VID	If an existing 802.1Q frame arrives, the provider VID is used for adding and removing the outer S-tag. If an untagged frame arrives at a Q-om-Q port, the provider VID is the S-tag and the Default Port VID (or the port VID MAC address mapping, if valid) is used for the C-tag.				
	Default value: 1				

Parameter	Description			
	The priority value that is set for the default VID VLAN.			
Provider VID Priority	Default value: 0			
VLAN Membership Configuratio	n			
	Determines whether the CPE must add the VLAN IDs (VIDs) of upstream frames to the VID table.			
	The following options are supported:			
	• Disabled: The CPE does not add the VIDs.			
	Enabled: The CPE adds the VIDs.			
Dynamic Learning	The CPE drops frames with VIDs, which are not stored in the VID table.			
	Default value: Enabled			
	Select the required option.			
	Note : If you modify the values of this parameter, the value is overridden during RADIUS AAA registration.			
	Specifies the period (in minutes) during which the CPE must dynamically keep learning about VIDs.			
	This parameter supports values ranging from 5 to 1440 (in minutes).			
VLAN Aging Timeout	Default value: 25 (in minutes)			
	Provide an appropriate value in the text box.			
	Note : VIDs that you set for the Untagged Ingress VID and Management VID parameters do not time out.			
VI AN Mambarahin Tabla	Lists the permanent VID members.			
	This is a read-only parameter.			
Status				
Active VLAN Configuration	Details of a summary of the active VLAN configuration.			

3. Click **Save** to apply the changes.

Management

The **Management** page allows you to set up user account and SNMP configuration related information. This configuration allows the users to manage the C100 dashboard and the CPEs using SNMP.

To view and configure the management settings, perform the following steps:

1. From the main C100 dashboard page, navigate to **System > Management**.

The Management page appears, as shown in Figure 63.

Figure 63: The Management page

General VLA	AN Management Radio	Interfaces Sessi	on RADIUS Authentication	Syslog						
Web Server Cor	nfiguration									
			HTTPS with HTTP redirect	;						
Protocols			A valid Server Certificate	A valid Server Certificate is not installed so this device will serve a self-signed TLS certificate						
				Of the Deter Debugge of the Holling Control detection being the debugging the Collingator						
Certificate File	•		Choose File No file chosen							
			Install Certificate	Install Certificate						
User Accounts										
0	 Account Name 	Dr	escription	Role	Web Access Enable	0 Web Passphrase				
	admin		Administrator	Administrator 🗢		Web Passphrase				
2	Account Name		Description	Guest 💠						
SNMP Configur	ration									
			□ v2c							
Versions			□ v3	□ v3						
Engine ID			0x80004531030004567104f9							
SNMP Traps										
Enable			Cold Start/Warm Start/Authentic	ation Error						
SNMPv3 Accou	ints									
 Account Name 	2			Access Enable						

2. Set the values for each parameter, as described in Table 39.

Table 39: Parameters in the Management page

Parameter	Description						
Web Server Configuration							
	Type of protocol that must be configured for accessing and managing the web UI of CPE.						
	This parameter supports the following options:						
	• HTTP Only : Indicates that only HTTP is available.						
	 HTTPS Only - Indicates that only HTTPS is available. 						
Protocols	 HTTP and HTTPS: Indicates that both HTTP and HTTPS are available. 						
	 HTTPS with HTTP redirect: Indicates that both HTTP and HTTPS are available, but an incoming HTTP connection is automatically redirected to HTTPS. 						
	Default value: HTTPS with HTTP redirect						
	Select the required protocol from the drop-down list.						
Parameter	Description						
------------------	---	--	--	--	--	--	--
	Note : Except for the HTTP option, a message is visible for the rest of the options. This message indicates that a valid server certificate is not installed, and the device serves a self-assigned TLS certificate.						
	An option to browse and upload a certificate file (.PEM) from a location locally. This certificate file must contain a device private key and matching certificate that is signed by the trusted CA.						
	To upload a certificate file (.PEM) from the desired location locally, perform the following steps:						
	a. Click Choose File .						
	A file folder appears.						
Certificate File	b. Browse the location where you have saved the required certificate file (.PEM) on your machine.						
	c. Click Open .						
	The certificate file is selected, and the file name appears next to the Choose File button.						
	d. Click Install Certificate.						
	The selected certificate file is installed, which is authenticated and encrypted.						
User Accounts							
	Name of the account used for administering the CPE device. This name must be unique and start with a letter. An account name can contain lower case letters, numbers, and hyphens.						
	Provide an appropriate name in the text box. Example: admin						
Account Name	The account name can belong to a guest, an administrator, an engineer, a support team member, or a user. You can add multiple names to the user account using the text boxes.						
	Note: To add a new user account row, use the icon located beside the Account name parameter (as shown in Figure 63). To delete a user account, use the icon located beside the corresponding account name.						
	A brief description of the account.						
Description	Provide a brief description for the user account that you want to add. Example: Super admin						

Parameter	Description
	Specifies the role of the user who wants to access the CPE device.
	This parameter supports the following roles, which have different capabilities and serve different functions:
	• Guest : This role has limited, read-only access to the device configuration and status. All fields in the web UI are read-only and some of them are also not available for guest roles. The guest roles have limited SNMP access with a read-only view of MIB-II.
	• User: This role has limited access to the device configuration and status. Some UI fields are read-only, and some fields are not available on the web UI. The user roles cannot change any parameters on the UI.
Role	• Administrator: This role has visibility of the device configuration and status. These roles can view, configure, and change everything in the UI, but cannot access the sensitive security information.
	• Security : This role (for example, a security officer) has visibility of the device configuration and status, including sensitive security information.
	• Support : This role (for example, a support agent) can access diagnostics information for the product support purpose.
	• Engineer : This role (for example, an engineer) has privileged write access to specific engineering settings and read access to engineering status information.
	• Factory : This role (for example, a factory operator) has privileged write access to the device customisation settings such as ESN and SKU.
	Select an appropriate option from the drop-down list.
	Determines whether the access for web UI of the CPE device is enabled for the selected role.
Web Access Enables	Select the checkbox if you want to enable web access for the required user role.
	Note : Multiple users are allowed to access the UI simultaneously.
Web Passphrase	The passphrase (password) that is assigned to the user role of this account for accessing the web UI.

Parameter	Description					
	Type an appropriate password in the text box.					
SNMP Configuration						
	The version of the SNMP protocol that is supported by the agent running this CPE device.					
	The SNMP protocols are used for managing and monitoring the network devices.					
	The following SNMP protocol versions are supported:					
Versions	 V2c : A standard and simpler community-based security model. It is an obsolete version with weak security. 					
	 V3: An advanced version designed to address security, access control, privacy, and authentication issues. 					
	Choose the required SNMP version.					
Engine ID	Unique ID that is used by the SNMP agent.					
Note : A message is visible after the Er MIB files directly from the device (as s access VLAN and QoS attributes of C	ngine ID field, providing an option to download the SNMP shown in Figure 64). Using the SNMP MIB files, you can PEs.					
	This parameter appears only when you select an SNMP version (V2c or V3).					
Port	Indicates the network port number assigned to the SNMP agent, which is running on the device.					
	Default value: 161					
	Provide an appropriate value in the text box.					
The following parameters appear only	when you set V2c in the Versions field:					
Read/Only Community	Name of the SNMP V2c community for read-only access to the device.					
	Provide an appropriate value in this text box.					
Read/Write Community	Name of the SNMP V2c community for read-write access to the device.					
	Provide an appropriate value in this text box.					
SNMP Traps						
Enable	Indicates the categories of SNMP traps sent by the device.					
	This is a ready-only parameter.					
SNMPv3 Account - This section allows	s you to set access control, authentication, and privacy-					

Parameter	Description					
related properties (as shown in Figure	e 64) for the roles selected in the User Accounts .					
	The account name that is used for authentication of the CPE device.					
Account Name	This is read-only parameter that contains account names, which you added in the User Accounts section.					
	Determines whether the permission is set for this account name to access the CPE device using SNMPv3 credentials (which are configured in this SNMPv3 Accounts section).					
Access Enable	Select the checkbox for the required account names. This setting permits the user role to access the CPE device using SNMP.					
	Note : To modify this parameter, you must enable V3 using the Versions parameter in the SNMP Configuration section.					
When you enable the access for the a following parameters specific to author	ccount names using the Access Enable parameter, the entication appear (as shown in Figure 64):					
	Indicates the authentication type to use.					
	This parameter supports the following options:					
	• None					
Authentication Type	• MD5					
	• SHA1					
	Select the required option from the drop-down list.					
	The authentication passphrase that is assigned to the user. This passphrase must be the same one that is set at the SNMP site for the user.					
Authentication Passphrase	The value of this parameter can contain any combination of ASCII characters. The value must consist of eight characters in length.					
	Type a valid value in the text box.					
	Specifies the protocol that must be used for account privacy.					
	This parameter supports the following options:					
Privacy Protocol	• None					
	• DES					
	• AES					
	Select the required option from the drop-down list.					

Parameter	Description
	The privacy passphrase that is assigned to the user. This passphrase must be the same one that is set at the SNMP site for the user.
Privacy Passphrase	The value of this parameter can contain any combination of ASCII characters. Also, the value must consist of eight characters in length.
	Type a valid value in the text box.
	If you do not provide any privacy passphrase in this text box, then the value is assumed to be the same as the authentication passphrase.

Figure 64 is an example of configuring the **Management** page for the CPE.

Figure 6	<u>4</u> ∙ The	Management page	- C100 UI
i igule o	4. IIIC	management page	- 000 01

General	VLAN	Management	Radio Interfaces	Ses	ssion	RADIUS Authentication	Syslog					
Web Serve	er Config	uration										~ ⊞
						HTTPS with HTTP redirect	\$					
Protocol	ls					C A valid Server Certifica	ite is not installed	so this device will s	serve a self-signed TLS	certificate.		
Certifica	te File					Choose File No file chosen						
						Install Certificate						
User Acco	ounts											~ ⊞
0	6	Account Name			Descriptio	on		1 Role		Web Access Enable	Web Passphrase	
1		admin			Admin	istrator		Administrator	\$		Web Passphrase	8
2		engineer		_ `	Engine	eer1	מ	Engineer	<u>ී</u>	් ව	Web Passphrase	8
SNMP Cor	nfiguratio	'n										✓ III
						✓ v2c 5						
						v3						
Versions	5											
						A v2c is an obsolete version with weak security						
Engine II	D					0x8000453103000456710419						
						An archeve of all MIB modules for this device may be downloaded directly from this device here: mittes lar.gz.						
Port						161						
8 Read-On	nly Commu	inity				Read-Only Community						8
8 Read/Wr	rite Commu	unity				Read/Write Community						
SNMD T	22											
	hə					Cold ChallMarm Shallhubanication Error						
SNMPv3 A	ccounts											~ ⊞
Account	t Name	Access Enable	Authentication Typ	e (Authent	ication Passphrase			Privacy Protoc	ol () Privacy Passphras	9	
admin		✓ 5	SHA1 💠		Authenti	ication Passphrase			AES 💠	Privacy Passphras	;e	8
					1 The J	uthentication Passphrase must be at least 8 characters in length • • • • • • • • • • • • • • • • • • •					Passphrase	
engineer												

3. Click **Save** to apply the settings.

Radio

This **Radio** page allows you to configure the radio configuration parameters and radio scan frequencies. It also provides information about the radio scan status and statistics.

To view and configure the radio settings, perform the following steps:

1. From the main C100 dashboard page, navigate to **System > Radio**.

The Radio page appears, as shown in Figure 65.

Figure 65: The Radio page - C100 UI

nbium Netv	works	l cn Wave ™ 5	5G Fixed	d C100					Undo 🕽	Save 🖥	ወ	Administrator	占 adm
General	VLAN	Management	Radio	Interfaces	Session	RADIUS Authentica	ation	Syslog					
Radio Confi	iguratio	n				~ 🖽	Ra	adio Scan Advanced					
1 Max EIRP		52.0)		dBm		0	Rescan Delay	15		s		
Olarisatio	on	\bigcirc Ho	rizontal	Vertical 🧿	Auto Deteo	et	Br	ndia Raan Statua					
0 UL Tx Pow	ver Initial	Adjust O Dis	abled 🧿	Enabled			Ra		07000.000 MU-				
•				Enabled				Current Frequency	27000.000 MHz				
Radio Scan	Freque	ncies				✓ ■		Current Polarisation	Honzontai				
 Enable 		0 Fi	requency (M	1Hz)				Scan State	Tracking				
		M					Ra	adio Stats					
		MI	12				0	Rx Power	-45 dBm				
~		27	000.000		MHz		0	Rx Power (SI-RNTI)	-43 dBm				
-							0	Rx Power PSS	-58 dBm				
		26	500.000		MHz		0	PSS SNR	16 dB				
		29	450 000		MHz		0	DLMCS	23				
							0	ULMCS	23				
		ME	lz				0	DL Backoff	13 dB				
			la.				0	UL Backoff	4 dB				
		ME	12				0	Range	0.01 km				
		ME	lz				0	Current EIRP	24.0 dBm				
							0	Max EIRP Boost	0.0 dB				
		ME	lz				0	EVM	-27.0 dB				
		ME	17				0	DL Channel Distortion	-17.4 dB				
			14.				0	DL Multipath Distortion	-25.9 dB				

2. Set the values for each parameter, as described in Table 40.

Table 40: Parameters on the Radio page

Parameter	Description					
Radio Configuration						
	The maximum EIRP configured value (in dBm).					
Max EIRP	Type an appropriate value in the text box.					
	Note : Ensure that the value is greater than or equal to 20.0 dBm.					
	Determines the antenna polarisation settings.					
	This parameter supports the following polarisation settings:					
Polarisation	• Horizontal					
	• Vertical					

Parameter	Description			
	Auto Detect (recommended value for the CPE)			
	Select the required polarisation for the antenna.			
	Indicates the uplink initial transmit power control mode for CPEs.			
	This parameter supports the following options:			
LIL Ty Dowor Initial Adjust	 Disabled - If this parameter is disabled, CPEs use their configured maximum transmit power. 			
	 Enabled - If this parameter is enabled, CPEs adjust their transmit power to reach the BTS target receive power before starting transmission. 			
	By default, this parameter is Enabled .			
	Select the required option.			
	List of required frequencies (in MHz) that the CPE can use.			
	You can also enable the configured frequency, for effective by selecting the corresponding frequency checkbox.			
Radio Scan Frequencies	Type appropriate frequency values (in MHz) and select the checkbox in the corresponding row.			
	Note : A CPE can have a number of frequencies that can be enabled or disabled per sector. However, the BTS can have only one frequency.			
Radio Scan Advanced				
Rescan Delay	The delay period (in seconds) before rescanning radio frequencies when the signal is lost.			
	Type an appropriate value in the text box.			
Following parameters are read-	only:			
Radio Scan Status				
Current Frequency	Value (in MHz) of the current operating frequency.			
Current Polarisation	The current antenna polarization.			
Scop State	Indicates the radio scan state.			
Scan State	Example: Tracking			
Radio Stats				
Rx Power	The Receive power of data symbols (in dBm).			
Rx Power (SI-RNTI)	Indicates the Receive power (in dBm) for the SI-RNTI on the strongest beam.			

Parameter	Description				
	This Receive power might be lower than received data. This is due to CPE being within the 6 dB bandwidth of the selected SIRNTI beam and not necessarily on its peak.				
	Note : The CPE reports the SI-RNTI statistics such as bandwidth (in MHz) and DL Rx Power (SI-RNTI) in dBm.				
Rx Power PSS	The Receive power for the PSS symbols (in dBm) at the CPE.				
PSS SNR	The SNR of the PSS symbols (in dB) at the CPE.				
DL MCS	The Modulation and Coding Scheme (MCS) index of the downlink.				
UL MCS	The MCS index of the uplink.				
	Indicates the amount (in dB) of power backoff for the downlink.				
DL Backoff	This is the amount by which the BTS is currently reducing its power from the maximum configured EIRP when transmitting t the CPE. The BTS uses the greatest backoff that it can achieve while still maintaining the downlink throughput required by the CPE.				
	Note : Backing off the BTS transmit power means the power allocation maximized for the CPE, which also requires for minimizing interference.				
	Indicates the amount (in dB) of power backoff for the uplink.				
UL Backoff	The Tx Power is reduced if there is link budget during the top modulation mode to improve the spectral efficiency.				
Range	The distance measured between BTS and CPE (in Km).				
Current EIRP	The current EIRP value in dBm.				
Max EIRP Boost	The maximum EIRP boost that the device is currently allowed to use (in dB).				
EVM	EVM (in dB) of the downlink signal.				
DL Channel Distortion	Value (in dB) that indicates the distortion (or degraded) length of the downlink MU-MIMO.				
	Note : Values that are less than -10 are considered good values.				
	Indicates the downlink MIMO multipath distortion (in dB).				
DL Multipath Distortion	The value of this parameter indicates how suitable the downlink MIMO channel is for the MU-MIMO operation.				

3. Click **Save** to save the configuration changes.

Interface

The **Interface** page allows you to configure the local management of interfaces. It also provides statistical information about all the CPE interfaces (such as Copper).

To configure and view the interface settings, perform the following steps:

1. From the main C100 dashboard page, navigate to **System > Interface**.

The Interface page appears, as shown in Figure 66.

Figure 66: The Interface page

🕐 Ca	mbium Networks CnWave" 5G Fixed C100						Undo 🖱 Save 🖯 🛛 Administrator	🛓 admin 🔹
-11	General VLAN Management Radio Interfaces	Session RADIUS Authentication Syslog						
	Configuration			~ в	Tx Rx Errors			× 8
1	Allow Local Management	•			If Name	Wreless	Dh	
•	Add Allowada I AM IR Addama				In Discards	0	•	
					In Errors	0	•	
× 1	Physical Port Status			× B	Out Discards	37792 •1	52170	
	If Name	Wireless	Fb		Out Errors	0	•	
▲	If Oper Status	Up	Up					
	Duplex	Full Duplex	Full Duplex		Tx Phonty Counters			× =
	If High Speed (Mbit/s)	440	1000		Priority Level	0 Packets	0 Octeta	
					Ultra High	266476 +1	00200315 +465	
	Counters Control		✓ B	* ⊞	High	156341	20019128	
	Reset Confirmation				seessim	123802	23159126	
			LOW					
	Tx Rx Counters				VLAN Counters Uplink			× B
	If Name	Wretess	Eth		Allow Frame Types Drops	37740 •1		
	Index	1	2		Q-in-Q Drops	0		
	In Octobs	16191798921 +86	110105023 +425		Non-VLAN-member Drops	0		
	In Unicest Peckets	10606885 +1	1626622 +6		CPE Management VID Pass-through Drops	0		
	In Multicast Packets	407	37171 +1					
	In Broadcast Packets	60400	756		VLAN Counters Downlink			× 8
	Out Octets	129066071 +457	3296447804 +648		Allow Frame Types Drops	8010		
	Out Unicast Packets	1664635 +1	10662405 +5		Q-in-Q Drops	0		
	Out Multicast Packats	172	76		Non-VLAN-member Drops	43524		
	Out Broadcast Packets	2	8633		Missing VLAN Tag Drops	0		
					CPE Management VID Pass-through Drops	0		

2. View or monitor the interface related parameters, as described in Table 41.

Table 41:	Parameters	in the	Interface	page
TODOTO TH	1 0101100010		1110011000	PG SO

Parameter	Description
Configuration	
	Determines whether you want to manage this device through the local management interface or the radio link.
	By default, the checkbox is selected (enabled), indicating that the local management interface is used for this device management.
Allow Local Management	If you disable or uncheck the Allow Local Management checkbox, all local management traffic is dropped and the device management is possible only through the radio link.
	Note : If you disable this checkbox, this setting can only be re-enabled by remote management or by resetting to factory defaults.
Add Alternate LAN IP Address	Determines whether you want to configure or add a second IP address (alternate LAN IP address) for the device management. This alternate LAN IP address is accessible only when connected to the Ethernet port.
	If you select the checkbox, the following parameters appear:

Parameter	Description			
	Alternate LAN IP Address			
	Alternate LAN Prefix			
	The alternate management IP address that is accessible only when connected to the Ethernet port. The management performed using this interface may be untagged traffic only. The system does not implement any configured management VID.			
	Note : The alternate LAN IP configuration is not installed if it intersects with the primary management IP address configuration (which is assigned by DHCP or RADIUS).			
Alternate LAN IP Address	Type the alternate LAN IP address in the text box (if required). By default, this text box displays the primary IP address that is currently used by the management agent for the operation.			
	A warning message is visible, indicating that the alternate LAN IP address is installed When the CPE next registers on reboot or the Activate Saved Alternate LAN IP Configuration button is clicked. Otherwise, it overlaps with the primary IP address (which is assigned by DHCP or RADIUS) and the alternate LAN IP address is not installed.			
	The IP network prefix of the alternate LAN IP address.			
	Default value: 16			
Alternate LAN Prefix	A warning message is visible, indicating that the alternate LAN prefix is installed. When the CPE next registers on reboot or the Activate Saved Alternate LAN IP Configuration button is clicked.			
	Type an appropriate value in the text box (if required).			
	An option to update the alternate LAN IP configuration and use the currently saved settings.			
Activate Saved Alternate LAN IP Configuration	Note : If you are currently managing the device using the previous alternate LAN IP address, then the contact with the device is lost until you use the new alternate IP address.			
Physical Port Status				
lf Oper Status	Indicates the working status (up or down) of wireless and Ethernet ports for CPE.			
Duplex	Indicates the capability mode of wireless and Ethernet ports to send and receive data.			
lf High Speed (Mbit/s)	Indicates the data transmission speed of wireless and Ethernet ports (in Mbits per second).			

Parameter	Description		
Counters			
	An option to reset the SNMP MIB-II interface counters.		
Reset Confirmation	When you select the checkbox, the Reset Counters button appears. You can use this button to reset the SNMP MIB-II interface counters.		

Tx Rx Counters - Applicable to data ports and wireless.

The data report is listed in the following columns:

- Wireless Indicates all the data transmitted on the wireless link when it is up.
- Eth -Indicates the data that is entering the main Ethernet port.

Index	Index number assigned to each counter column.		
In Octets	Number of data bytes received by the CPE from a particular connected BTS.		
In Unicast Packets	Number of data packets received by the CPE from the BTS.		
In Multicast Packets	Number of data packets received by specific two or more CPEs from the BTS.		
In Broadcast Packets	Number of data packets received by all the connected CPEs from the BTS.		
Out Octets	Number of data bytes sent by the CPEs to the BTS.		
Out Unicast Packets	Number of data packets sent by a specific CPE to the BTS.		
Out Multicast Packets	Number of data packets sent by specific two or more CPEs to the BTS.		
Out Broadcast Packets	Number of data packets sent by all the connected CPEs to the BTS.		
Tx Rx Errors - Applicable to data ports and wireless.			
In Discards	Number of incoming data packets discarded by the CPEs.		
In Errors	Number of incoming data packets that contain errors.		
Out Discards	Number of outgoing data packets (from CPEs) that are marked or labeled as discarded by the CPEs.		
Out Errors	Number of outgoing data packets (from CPEs) that contain errors.		
Tx Priority Counters			
Priority Level	Displays the priority level of the bearer relevant to each Transmit counter.		

Parameter	Description			
	This parameter displays the following priority levels:			
	• Ultra High			
	• High			
	• Medium			
	• Low			
	You can view the number of packets and octets transmitted at each priority level.			
Packets	Number of packets successfully delivered to the far end of the link based on priority.			
Octets	The number of Octets successfully delivered to the far end of the link based on priority.			
VLAN Counters Uplink - Displays the s	tatistics for VLAN counters UL.			
Allow Frame Types Drops	Count of allowed frames type events that are dropped by the CPE in the uplink direction.			
Q-in-Q Drops	Count of Q-in-Q events that are dropped by the CPE in the uplink direction.			
Non-VLAN-member Drops	Count of non-VLAN member events that are dropped by the CPE in the uplink direction.			
CPE Management VID Pass-through Drops	Count of CPE management VID pass-thorough events that are dropped by the CPE in the uplink direction.			
VLAN Counters Downlink - Displays the statistics of VLAN counters DL.				
Allow Frame Types Drops	Count of allowed frames type events that are dropped by the CPE in the downlink direction.			
Q-in-Q Drops	Count of Q-in-Q events that are dropped by the CPE in the downlink direction.			
Non-VLAN-member Drops	Count of non-VLAN member events that are dropped by the CPE in the downlink direction.			
	Count of downlink frames with no tags that are dropped by the CPE.			
Missing VLAN Tag Drops	When CPE runs with an VLAN enabled mode, the DL traffic must be tagged as default port VID (in Q and Q-in-Q modes) and provider VID (in the Q-in-Q mode only) are added to any untagged ingress frames before transmitting them to the BTS. Therefore, reciprocal tags are expected to be present on any downlink frames received from the BTS.			
CPE Management VID Pass-through Drops	Count of CPE management VID pass-through events that are dropped by the CPE in the downlink direction.			

3. Click **Save** to apply the settings.

Session

The Session page allows you to enable the Watchdog to monitor the registration sessions of the CPE.

To view the session settings, perform the following steps:

1. From the main C100 dashboard page, navigate to **System > Session**.

The **Session** page appears as shown in Figure 67.

Figure 67: The Session page - C100 UI

	ambium Networks cnWave" 5G Fixed C100				Undo 🖱 Save 🖬 🙂 Administrator 🛔 admin -
-	General VLAN Management Radio Interfaces Session RADIUS Authentication	Syslog			
:	Quality of Service Controls	× 🖽	Quality Of Service Limits		✓ ■
*	Classification Method VLAN Priority VLAN ID		0 ULBR	0	kbps
** **	Untagged Traffic Priority Low		0 ULBL	0	kbits
×	Quality of Service VLAN ID Mapping	× 🖽	0 DLBR	0	kbps
<u>A</u>	C O VLAN ID O Priority		0 DLBL	0	kbits
			0 LPULCIR	0	kbps
			0 MPULCIR	0	kbps
			0 HPULCIR	0	kbps
	400 Umarnyn V		0 UHPULCIR	0	kbps
	Quality of Service VLAN ID Configuration	× 🖩	0 LPDLCIR	0	kbps
	Default Priority Low Control Default Priority		0 MPDLCIR	0	kbps
	Activate saved Quality of Service VLAVID Mapping		0 HPDLCIR	0	kbps
			0 UHPDLCIR	0	kbps
			0	Apply saved QoS Configuration	

2. View the session related settings, as described in Table 42.

Table 42: List of parameters in the Session page

Parameter	Description
Quality of Services Controls	
	This controls which field within the VLAN header is used to perform the packet classification.
	The following options are supported:
	VLAN Priority
	• VLAN ID
Classification Method	If VLAN Priority is selected, the packets transmitted over- the-air by the BTS are classified using the 3-bit Priority field of the VLAN ID, with the mapping from the Priority bit to the priority within the B1000 being as follows:
	 0 or 1 -> Low Priority
	• 2 or 3 -> Medium Priority

Parameter	Description			
	• 4 or 5 -> High Priority			
	• 6 or 7 -> Very High Priority			
	If VLAN ID is selected, the packets transmitted over the air by the BTS are classified using the VLAN ID to the Priority level as defined below by the Quality of Service VLAN ID Mapping .			
	This controls which priority the BTS must assign to untagged traffic.			
	The following options are supported:			
Untagged Traffic Priority	• Low			
	• Medium			
	• High			
	• Very High			
Quality of Services VLAN ID Mapping				
	This section is only visible and relevant if the Classification Method above is set to "VLAN ID". This is a dynamic table that defines which priority to assign to a VLAN packet based on its VLAN ID.			
VLAN ID and Priority	Up to 32 entries can be specified. For each entry, a VLAN ID value between 1 and 4095 must be specified and a priority level of Low, Medium, High, and Very High must be selected for that VLAN ID.			
Quality of Services VLAN ID Config	guration			
	This section is only visible and relevant if the Classification Method above is set to VLAN ID .			
	This controls what level of priority must be assigned to VLAN packets for which the VLAN ID could not be matched in the list provided in the VLANID and Priority section above.			
Default Priority	The following options are supported:			
	• Low			
	• Medium			
	• High			
	• Very High			
Activate saved Quality of Service VLAN ID Mapping	This button is only visible and relevant if the ClassificationMethod above is set to VLAN ID .			

Parameter	Description
	It activates the Quality of Service VLAN ID Mapping entered in the section above. Please remember to click this button once you have made changes to the VLAN ID and Priority or Default Priority above.

3. Click **Save** to apply the settings.

RADIUS Authentication

The **RADIUS Authentication** page allows you to configure the RADIUS server specific certificate authority (CA) certificate (for security purposes) required for the RADIUS authentication.

To configure the RADIUS server certificates, perform the following steps:

1. From the main C100 dashboard page, navigate to **System > RADIUS Authentication**.

The RADIUS Authentication page appears, as shown in Figure 68.

Figure 68: The RADIUS Authentication page - C100 UI

	Cambium Networks │Cn Wave ™	5G Fixed C100			Undo 🖒 Save 🖬	🛈 Administrator 🚨 admin	•
+ i ¢ X <u>∢</u>	General VLAN Management Radio Interfaces Session RADIUS Authentication Systog Configuration Password Image: Configuration Image: Configuration <th colspan="2">Authentication Logs upa_eventd(4023):2023-10-25_16:04:12 1 upa_eventd(4023):2023-10-25_16:04:12 1</th> <th>✓ E 12 1698249852 Set sessi 12 169824952 got attr 12 169824952 Set sessi 12 169824952 Set sessi</th> <th colspan="2">✓ ■ 1698249852 Set sessi ▲ 1698249852 got attr 1698249852 got attr 1698249852 got attr 1698249852 got attr 1698249852 got attr 1698249852 got attr 1698249852 set sessi</th>		Authentication Logs upa_eventd(4023):2023-10-25_16:04:12 1 upa_eventd(4023):2023-10-25_16:04:12 1		✓ E 12 1698249852 Set sessi 12 169824952 got attr 12 169824952 Set sessi 12 169824952 Set sessi	✓ ■ 1698249852 Set sessi ▲ 1698249852 got attr 1698249852 got attr 1698249852 got attr 1698249852 got attr 1698249852 got attr 1698249852 got attr 1698249852 set sessi	
	Status Upload Progress Fingerprint Common Name Organization		× 🖽		wpa_eventd(4023):2023-10-25_16:04:	12 1698249852 RADIUS se ↓	

2. Set the parameters, as described in Table 43.

Table 43: List of RADIUS Authentication-related parameters

Parameter	Description	
Configuration		
Password	The RADIUS password used for the authentication.	
	An option to select an appropriate CA certificate file that you want to use for RADIUS authentication.To select the local CA certificate, perform the following	
Local File	steps: a. Click Choose File in the Local File field.	
	A file browser window appears.	

Parameter	Description				
	b. Browse the location where you have saved the CA certificate on your system locally.				
	c. Select the certificate file and click Open .				
	The local file is selected.				
	d. To upload the selected local file, click Upload CA Certificate on the RADIUS Authentication page.				
Upload CA Certificate	An option to upload the selected CA certificate from your system.				
Erase CA Certificate	An option to delete the selected CA certificate from the RADIUS Authentication page.				
Status					
Upload Progress	Indicates the upload status of the CA certificate.				
Fingerprint	Indicates the unique identifier of the certificate.				
Common Name	Indicates the domain name of the RADIUS server that you want to secure with the certificate.				
	Name of the trusted CA organization.				
Organization	The CA organization validates identities and binds them to cryptographic key pairs with digital certificates.				
Authentication Logs					
authentication.log	An option to view and download the authentication logs from the C100 UI.				
	Click the 🛓 icon to download the authentication logs.				

3. Click **Save** to apply the settings.

Syslog

The **Syslog** page allows you to allocate the lowest syslog severity level and enable the remote syslog specific parameters for the CPE device. The syslog configuration helps you to record and view all events of the CPE device. Example: CPE connected to BTS.

To configure and view the **Syslog** page, perform the following steps:

1. From the main C100 dashboard page, navigate to **System > Syslog**.

The **Syslog** page appears, as shown in .

Figure 69: The Syslog page - C100 UI

	ambium Ne	tworks	l cn Wave ™ S	5G Fixed	d C100												C obnU	Save 🔒	Φ	Administrato	🔒 admin 👻
-14	General	VLAN	Management	Radio	Interfaces	Session	RADIUS Authentication	Syslog													
•	Configura	tion																			~ ⊞
-	Lowest	Severity					Debug 🗘														
** **	8 Remote	Enabled																			
×	Remote R	eceivers																			~ ⊞
A																					
	Device Lo	gs																			~ ⊞
	local.log 🛓						Jan 1 00:00:23 Jan 1 00:01:40 Jan 1 00:01:40 Jan 1 00:01:40 Jan 1 00:01:40 Jan 1 00:01:50 Jan 1 00:02:00 Jan 1 00:02:00 Jan 1 00:02:00 Jan 1 00:02:00 Jan 1 00:02:00	CPE-1-Ri CPE-1-Ri CPE-1-Ri CPE-1-Ri CPE-1-Ri CPE-1-Ri CPE-1-Ri CPE-1-Ri	ig-2-Re ig-2-Re ig-2-Re ig-2-Re ig-2-Re ig-2-Re ig-2-Re ig-2-Re	elease-3 elease-3 elease-3 elease-3 elease-3 elease-3 elease-3 elease-3	syslogd[7 syslog: 1 syslog: 1 last mes: syslog: 1 syslog: 1 syslog: 1 syslog: 1	713]: sys The radio The radio The radio sage buff The radio The radio The radio	slogd v2 o transmi o receive o receive fered 1 o is tran o receive o transmi o is tran o is tran	.5.2: re iitter ha er is sc er is sc times nsmittin er is tr iitter ha nsmittin	start. s been di anning on anning on g with an acking a s been en g with an	sabled (frequer frequer EIRP of BTS sign abled (p EIRP of	powered hcy 26000 hcy 26000 = -1.0 dB hal on fr powered o = 21.7 dB	off) beca .000 MHz .000 MHz m equency 2 n) m	use: Fr and Hor and Ver	requency No rizontal po rtical pola 30 MHz and 1	t Track larisat /ertica

2. Set the value of each parameter, as described in the table below.

Parameter	Description					
Configuration						
	Allows you to configure the lowest syslog severity that is logged locally on the CPE device.					
	The following syslog severity levels are supported:					
	 Emergency - means system is unusable. 					
	 Alert - means action must be taken immediately. 					
	Critical - means critical conditions.					
Lowest Severity	Error - means error conditions.					
	Warning - means warning conditions.					
	 Notice - means normal but significant conditions. 					
	 Information - means informative messages. 					
	 Debug - means debug-level messages. 					
	Select the required severity from the drop-down list.					
Remote Enabled	When you enable this remote syslog parameter, important system events are sent to the configured remote syslog receivers.					
	Syslog facilities include syslog, auth, and local0 thro local7.					

Table 44: List of parameters in the Syslog page - C100 UI

Parameter	Description				
	When you select the Remote Enabled checkbox, the Remote Receivers section appears with the following parameters:				
	Inet Address				
	• Port				
	• Standard				
	Lowest Severity				
Remote Receivers					
	IP address that is assigned to the remote syslog receiver.				
Inet Address	All enabled severity levels of syslog messages are sent to this address.				
	Type an appropriate value in the text box.				
	The network port that is assigned to the remote syslog receiver.				
Port	Type a valid value in the text box.				
	Note : The zero (0) value is not valid.				
	Indicates the syslog message format, which is determined by RFC 3164 and RFC 5424 standards.				
	The following options are supported:				
Standard	• RFC 3164				
	• RFC 5424				
	Select the required option from the drop-down list.				
	Allows you to configure the lowest syslog severity message that is sent to the remote syslog receiver.				
	The following syslog severity levels are supported:				
	 Emergency - means system is unusable. 				
	• Alert - means action must be taken immediately.				
Lowest Severity	Critical - means critical conditions.				
	Error - means error conditions.				
	Warning - means warning conditions.				
	 Notice - means normal but significant conditions. 				
	 Information - means informative messages. 				

Parameter	Description
	 Debug - means debug-level messages.
	Select the required severity from the drop-down list.

3. Click **Save** to apply the changes.

The **Device Logs** section displays the events of the CPE device for the selected severity level. You can view and download the logs (if required) using the $\frac{1}{2}$ icon.

Configuring tools

The **Tools** page in the C100 UI allows you to upload new firmware and reboot the unit. The **Tools** page helps to troubleshoot the radio links.

You must use the **Tools** icon (X) to configure, view, and manage the device for CPEs.

The **Tools** page contains the following tabs:

- Firmware
- Configuration
- Network Test
- MAC Learning Tables
- Engineering
- Logs

Firmware

The **Firmware** page allows you to upgrade or downgrade software firmware. This page also provides device summary, upload details, and upgrade status of a firmware image.



Note

Before upgrading or downgrading firmware, consider the requirements and compatibility matrix specific to cnWave[™] 5G Fixed products (BTS or CPE), as described in:

- Requirements for firmware version upgrade or downgrade
- Compatibility matrix

Upgrade or downgrade firmware

You can upgrade or downgrade firmware (CPE) using the Tools page of C100 UI.



Note

Before upgrading or downgrading firmware, consider the following key points:

- To **upgrade** a sector with the BTS and all CPEs running with an official software release X, perform the following steps using the **Tools** page:
 - a. Upgrade the BTS first to the next official software release version Y.

- b. Upgrade all CPEs to the next official software release version Y.
- To **downgrade** a sector with the BTS and all CPEs running with an official software release X, perform the following steps using the **Tools** page:
 - a. Downgrade all CPEs first to the previous BTS software version W.
 - b. Upgrade the BTS to the previous official software release version W.

Using the **Tools** page, perform the following steps to upgrade or downgrade a firmware:

1. From the main C100 dashboard page, navigate to **Tools** > **Firmware**.

The **Tools** page appears with multiple tabs, as shown in Figure 70. By default, the **Firmware** tab is selected.

Figure	70.	The	Tools	nade	_	C100	L.
Igure	70.	IIIC	10015	page	-	0100	

() ()	Cambium Networks ∣cnWave [™] 5G Fixed C100		Undo 🖰	Save 🖬 😃	Administrator 🛛 🚨 admin 🝷
-	Firmware Configuration Network Test MAC Lear	ning Tables Engineering Logs			
:	Device Information				~ ⊞
-	Product Name	cnWave 5G Fixed Consumer Premises Equipment (CPE)			
\$	Release Name	4.1b2			
×	Image Upload				~ 🖪
٩	 Source 	Local File			
A	Local File	Choose File No file chosen			
	1 Destination	O Image 1 O Image 2			
		Start Upload			
	Upgrade Status				✓ ⊞
	Upload Progress				
	Install Progress				
	Reboot				✓ ■
	Inable Reboot	A reboot will be required to install a firmware image			
	Installable Images				~ ⊞
	3 Status	Description			
	Image 1 Valid Image	cnWave 5G Fixed (CPE) 4.1b1	Erase	Install	
	Image 2 Valid Image	cnWave 5G Fixed (CPE) 4.1b2	Erase	Install	

2. Set the required parameters, as described in Table 45.

Table 45: List of parameters in the Firmware page

Parameter	Description			
Device Information				
Product Namo	Name of the device that you have deployed.			
	Example: cnWave 5G Fixed Customer Premise Equipment (CPE)			
Release Name	Release number of the operational software.			
Image Upload				

Parameter	Description				
	An option to select the firmware image file from a location (stored).				
	This parameter supports the following options:				
Source	 Local File: Indicates the image file that you have stored locally on your machine. 				
	 Remote Server: Indicates the image file that you have stored on a remote server (for example, SharePoint). 				
	Select the required option.				
	This parameter is applicable only if you have selected Local File as the upload source.				
Local File	This parameter supports options to upload or upgrade the required firmware image file. For more details on how to upload the image file, refer to the <u>Uploading or upgrading a firmware</u> <u>image file</u> section.				
	This parameter is applicable only if you have selected Remote Server as the upload source.				
Server URL	To upload the image file from a remote server, provide the server URL in the text box. Then, click Start Upload on the Firmware page.				
Destination	An option to select the destination image in the firmware images table.				
	Select the required option.				
	An option to upload the firmware image file.				
Start Upload	On selecting the required image file (from a local file folder or a remote server), click Start Upload to begin the uploading process.				
Upgrade Status					
Upload Progress	Indicates the upgrade status of the firmware.				
Install Progress	Indicates the installation status of the firmware, if any.				
Reboot					
	Determines whether to reboot the device on upgrading or installing the firmware.				
Enable Reboot	Select the checkbox to enable the device to reboot.				
	When you select the checkbox, a message appears indicating that the device will reboot to install a firmware image.				
Installable Images	List of images that are recently uploaded, with details of the latest uploaded image at the top row.				

Parameter	Description
	You can upload multiple image files and manage them in this section.
	This parameter displays the following details for the uploaded images:
	 Status: Displays one of the following supported statuses of the image:
	 Empty: Indicates that the firmware image file is not present.
	 Invalid Image: Indicates that the firmware image file is not valid. The file might be truncated, damaged, or not an appropriate image of the device (wrong product or old).
	 Valid Image: Indicates that the firmware image file is valid and may be installed.
	 Description: A brief description of the firmware image file such as device name, version, build number, and time of uploading.
	To install an image file that you uploaded, click Install in the corresponding row of the required image file.
	To delete an image file that you uploaded, click Erase in the corresponding row of the required image file.

3. Click **Save** to apply the changes.

Configuration

The **Configuration** page allows you to set the CPE to factory defaults. This page also allows you to import a saved configuration or export a CPE configuration for backup (restore). This Import feature exports or imports the date model configuration (and/or status) as a JSON file.

To view and manage the configuration tool-specific settings, perform the following steps:

1. From the main C100 dashboard page, navigate to **Tools > Configuration**.

The **Configuration** page appears, as shown in Figure 71.

Figure 71: The Configuration page - C100 UI

Firmware Configurat	ion Network Test MAC Learning Tables Engineering Lo	gs			
Factory Defaults		~ ⊞	Import		
	 Local Management Access 		Import From	● Local File ─ Remote Server	
Do Not Reset	Radio Configuration		1 Local File	Choose File No file chosen	
			In Enable Reboot		
 Enable Reboot 	• A reboot is required to complete a reset to factory defaults		0	Data Import	
	Reset Configuration			Import Log	
Export		~ E			
0	Data Export		Import Log 🛓		

2. Set the values for parameters, as described in Table 46.

Parameter	Description
Factory Defaults	
	Determines whether you want to reset the CPE to factory defaults.
	The following options are supported:
	Local Management Access
	Radio Configuration
	By default, the Local Management Access checkbox is selected.
Do not reset	If you do not select the Local Management Access checkbox, then all the configuration data, including IP address, is wiped out and reset to 169.254.1.1.
	You have a choice of keeping at least local access IP address and wiping out all other data. This means that you can access the CPE on your local network.
	If you select Radio Configuration , then all the configuration data is wiped out, except for the frequency data and local IP address.
Enable Reboot	Determines whether the device is enabled to reboot to complete the process of reset to factory defaults.
	Select the checkbox to enable the reboot for the device.
Reset Configuration	An option to reset the system to factory defaults.

Table 46: List of parameters in the Configuration page

Parameter	Description									
	Click Reset Configuration if you want to reset the CPE to factory defaults.									
Export										
Data Export	An option to export the data model configuration (and/or status) as a JSON file for backup (restore).									
	When you click the Data Export button, the data model configuration is downloaded by the device.									
Import										
	An option to select a location (stored) from where you want to import the required data configuration.									
	This parameter supports the following options:									
	 Local File: A local import file (which is saved locally on your system) is uploaded by the browser. 									
Import From	• Remote Server : An import file that is saved on a remote server is downloaded by the device.									
	Select the required option.									
	Note : When you select Remote Server , the ⁵ icon appears indicating to select the Local File option (if required).									
	To upload a local import file (internally), perform the following steps:									
	a. Click Choose File in the Local File field.									
	A file browser window appears.									
Local File	b. Browse the location where you have saved the import file (for example, a JSON file) on your machine locally.									
	c. Select the file and click Open .									
	The local import file is selected.									
	d. To upload the import file, click Data Import in the Configuration page.									
Server LIPI	This parameter is applicable only if you have selected Remote Server in the Import From field.									
	To select the import file from a remote server, provide the server URL in the text box. Then, click the Data import button.									
Enable Reboot	Determines whether the device is enabled to reboot to complete the import configuration process.									
	Select the checkbox to enable the reboot for the device.									

Parameter	Description								
	Note : Reboot is applicable only to some configuration changes.								
Data Import	An option to import the required data model configuration from a JSON file.								
Import Log	An option to view and download the import logs from the C100 UI. Click the 🛓 icon to download the import logs.								

3. Click **Save** to apply the changes.

Network Test

The **Network Test** is a network tool that helps you to test connectivity and accessibility of CPE to a radio network. This page allows you to ensure whether the CPE is correctly connected to your network. Example: CPE's connectivity to BTS or RADIUS Server. This network test helps in troubleshooting network connection issues.

To test and view the network connectivity, perform the following steps:

1. From the main C100 dashboard page, navigate to **Tools > Network Test**.

The Network Test page appears, as shown in Figure 72.

	ambium Networks cn Wave	e™ 5G Fixed C100										ወ	Administrator	💄 admin 👻
÷H.	Firmware Configuration Ne	etwork Test MAC Learning Table	s Engineering	Logs										
;	Test Configuration													~ 🖽
	Туре	ping 🔿 traceroute												
.														
*	O Destination	Enter a valid	IPv4 address	s or DN	IS name									
A	O Packet Size	56												
	Count		3											
	Test Results													× 🖽
	networktests.log 🛓		networktests	log										

Figure 72: The Network Test page - C100 UI

2. View and set the values for parameters, as described in Table 47.

Parameter	Description
Test Configuration	
	Determines the method used for testing a network.
	Following options are supported:
	 ping: The CPE pings the required destination (for example, BTS, cnMaestro, RADIUS Server, DNS, or a radio network) to ensure its connectivity.
	If the ping is successful, this implies that the CPE can access the BTS or the required network.
Туре	• traceroute : CPE traces the source of the required destination (for example, if the BTS is connected to a switch, which is connected to another application such as a host Server) for identifying the number of hops connected to a radio network.
	If the trace is successful, CPE finds out the IP address of the BTS or the network in 30 hops. If the trace fails in 6 to 7 hops, this implies that the CPE cannot access the BTS or the network.
	Choose the required test type.
	Figure 73 and Figure 74 are examples of ping and traceroute types.
Destination	The valid IPv4 address or a DNS name of the required destination.
	Provide an appropriate value in the text box.
	Number of data bytes that has to be sent to the network.
Packet Size	Default value: 56 data bytes, which are translated into 64 ICMP data bytes when combined with the 8 bytes of ICMP header data.
	Provide the required value in the text box.
	Note : This parameter is not applicable if you select traceroute in the Type field.
	Number of ping packets that have to be sent to the network.
	Default value: 3
Count	Provide the required value in the text box.
	Note : This parameter is not applicable if you select Traceroute in the Type field.
Run Test	An option to run the test.

Table 47: Parameters in the Network Test page - C100 UI

Parameter	Description								
	This option appears only when you provide a value in the Destination text box.								
Stop Tost	An option to stop the test that has begun.								
Stop Test	This option appears only when you run the test.								
Test Results									
	Displays the test results for the required destination.								
networktests.log	By default, this field is disabled. When you run the test, this field displays the test results.								
	You can use the 📥 icon to download the log file.								

Figure 73 is an example of a test result for the **ping** type:

Figure 73: Test result - ping

	ambium Ne	tworks cn V	Vave ™ 5G Fixe	ed C100							Undo 🖒	Save 🖬	Φ	Administrator	💄 admin 👻
÷H.	Firmware	Configuration	Network Test	MAC Learning Tables	Engineering L	ogs									
;	Test Conf											~ ⊞			
	Туре			(🗿 ping 🔵 trac	eroute									
	Destination				169.254.3.99										
╳	Packet Size			56											
A	1 Count				3										
					Run Test										
	Test Resu	lts													~ 🖽
	networkte	sts.log 🛓			PING 169.254 64 bytes fro 64 bytes fro 64 bytes fro 64 bytes fro 169.254. 3 packets tr round-trip m	3.99 (169 m 169.254. m 169.254. m 169.254. 3.99 ping cansmitted, hin/avg/max	9.254.3. .3.99: s .3.99: s .3.99: s statist , 3 pack < = 9.90	.99): 56 dai seq=0 ttl=64 seq=1 ttl=64 seq=2 ttl=64 tics kets receive 09/10.656/12	ta bytes 4 time=9.90 4 time=10.4 4 time=11.5 ed, 0% pack 1.579 ms	09 ms 182 ms 579 ms cet loss					le

Figure 74 is an example of a test result for the **traceroute** type:

Figure 74: Test result - traceroute

	Cambium Networks I cnWave™ 5G Fixed	C100 Undo	9 Save 🖬	ወ	Administrator	💄 admin 👻
-H	Firmware Configuration Network Test M	AC Learning Tables Engineering Logs				
i	Test Configuration					~ ⊞
	Туре	O ping O traceroute				
4	1 Destination	160.254.3.253				්
×		Run Test				
A	Test Results					× A
		traceroute to 160.254.3.253 (160.254.3.253), 30 hops max, 38 byte packets 1 * * *				Î
		2 * * *				
		7 * * * 3 * * *				
	networktests.log 📩	5 * * *				
		6 * * *				
		7 * * *				
		9 * * *				- 10

MAC Learning Tables

The MAC Learning Tables page allows you to dump the MAC addresses of equipment (or other devices) connected to the CPE radio units. You can also download the dumped MAC addresses in .txt file format.

To dump the MAC learning tables for CPEs, perform the following steps:

1. From the main C100 dashboard page, navigate to Tools > MAC Learning Tables.

The MAC Learning Tables page appears, as shown in Figure 75.

Figure 75: The MAC Learning Tables page - C100 UI

	Car	nbium Net	bium Networks ∣ cnWave [™] 5G Fixed C100							Save 🖬	ወ	Administrator	💄 admin 👻
-14		Firmware	Configuration	Network Test	MAC Learning Tables	Engineering	Logs						
i		Configurat	ion										~ ⊞
						Dump MAC Learnii	ng Table						
**													
×													
A													

2. In the **Configuration** section, click on the **Dump MAC Learning Table** button.

The **MAC Learning Table Dump** parameter appears with the output in the **Results** section (as shown in Figure 76).

Figure 76: A sample MAC table dump for CPE

Firmulara	Configuration	Notwork Test	MAC Looming Tables	Engineering			
Firmware	Configuration	Network Test	MAC Learning Tables	Engineering Logs			
Configuratio	n						
				Dump MAC Learning Table			
Bassilta							
Results							
			==		-		
			Du	up of MAC Learning Table at 2024-05-30 09:58:45			
			==		-		
			IM	5I 18446744073709551615, IP 169.254.3.1, Sys Name CPE 1			
			Lo	al Ethernet port learning table			
			[1	<pre>Ix] MAC [Remaining life seconds]</pre>			
			[0	001] 58:c1:7a:9f:2b:d1 [295]			
			[0	002] 58:c1:7a:f7:ef:e2 [300]			
			Wi	eless port learning table			
MAC Learn	ing Table Dump		[i	X] MAC [Remaining life seconds]			
			[0]	00:1b:21:c0:19:5a [205]			
			10	1021 68:05:ca:2a:82:28 [295]			
			== En	of MAC Learning Table dump generated at 2024-05-30 09:58:45	=		
			==		-		
			_				_
				The full contents of this MAC Learning Table dump may be downloaded			

3. Download the mac_learning_table.txt file from the UI (if required).

Engineering

The **Engineering** page allows engineers (of Cambium Networks) to access the CPE radio remotely. Engineers can allow the users to access the radio using Telnet, SSH, and console secured cable (HTTP is not allowed).



Note

The **Engineering** page is configured and applicable only for troubleshooting and support purposes.

To view the **Engineering** page, perform the following steps:

1. From the main C100 dashboard page, navigate to **Tools > Engineering**.

The Engineering page appears, as shown in Figure 77..



Note

If the engineers (from Cambium Networks) have not removed any engineering keys from the UI, then the **Engineering Status** section in the **Engineering** page displays all the configured engineering keys as shown in Figure 77.

Figure 77: The Engineering page - C100 UI

C c	ambium Networks 🏾	cn Wave ™ 5G Fix	ed C100					Undo 🍤 Save 🖬 🛛	۵ Administrator	💄 admin 🝷
÷H-	Firmware Configura	tion Network Test	MAC Learning Tables	Engineering	Logs					
:	Device Identifier				~	B	Engineering Status			~ ⊞
•	() MSN	V5YA01XDV6	2D				Active Key	******		
•	ESN	0004567104F	9				Valid Key			
	SKU	C280500C00	IA				Serial Console Active			
×	1 MAC	00:04:56:71:0	4:f9				SSH Active			
1							Telnet Active			
	Engineering Key				~	B				
	1 PIN	615025								
	 New Key 	New Key								
		Remove								
	Access Permitted									

2. View and set the values for parameters, as described in Table 48.

Parameter	Description							
Device Identifier								
MSN	MSN of the device that is used for device identification.							
ESN	ESN of the device.							
SKU	SKU of the device.							
МАС	The MAC address that is assigned to the network interface and used for the device management.							
Engineering Key								
PIN	Unique six-digit number used by the Engineering team of Cambium Networks to generate an engineering key for the CPE device.							
	Note : This is a read-only field.							
	The new engineering key generated and provided by the Engineering team of Cambium Networks using PIN.							
New Key	This new engineering key allows privileged engineering access to the CPE device.							
	Enter the engineering key in the text box.							
Demove	An option to remove the installed key and access the CPE device.							
	If you click Remove , then the installed new key and access (using SSH, Serial Console, and Telnet) are removed.							
Access Permitted	Determines whether the new key enables engineering access to the CPE device.							

Table 48: List of parameters in the Engineering page

Parameter	Description					
	Select the checkbox to enable the engineering access for the new key.					
	Note : By default, the engineering access is enabled when a new key is installed.					
Engineering Status - Following are the read-only parameters:						
Active Key	Indicates whether the new generated key is accessible.					
Valid Key	Indicates whether the generated key is valid.					
Serial Console Active	Indicates whether the serial console is accessible for the users.					
SSH Active	Indicates whether SSH is accessible for the users.					
Telnet Active	Indicates whether the Telnet is accessible for the users.					

Logs

The Logs page allows you to view and download local.log and authentication.log files of CPEs. You can use these logs for troubleshooting.

To view and download the logs, complete the following steps:

1. From the main C100 dashboard page, navigate to **Tools** > **Logs**.

The Logs page appears, as shown in Figure 78. You can view the logs.

Figure 78: The Logs page - C100 UI

	Cam	bium Net	works cnW	/ave ™ 5G Fixe	ed C100			Undo 🖒 Save 🖬 🌞 Administrator 💄 admi	n -		
÷H		Firmware	Configuration	Network Test	MAC Learning Tables	Engineering	Logs				
;		Device Logs						×	₿		
* * *		local.log 🕹			Jan 1 00:00:23 CPE-1-Rig-2-Release-3 syslogd[713]: syslogd v2.5.2: restart. Jan 1 00:00:23 CPE-1-Rig-2-Release-3 syslog: The radio transmitter has been disabled (powered off) because: Fn Jan 1 00:01:42 CPE-1-Rig-2-Release-3 syslog: The radio receiver is scanning on frequency 26000.000 MHz and Ven Jan 1 00:01:49 CPE-1-Rig-2-Release-3 syslog: The radio receiver is scanning on frequency 26000.000 MHz and Ven Jan 1 00:01:50 CPE-1-Rig-2-Release-3 syslog: The radio receiver is transmitting with an EIRP of -1.0 dBm Jan 1 00:02:00 CPE-1-Rig-2-Release-3 syslog: The radio receiver is tracking a BTS signal on frequency 26000.00 Jan 1 00:02:00 CPE-1-Rig-2-Release-3 syslog: The radio transmitter has been enabled (powered on) Jan 1 00:02:02 CPE-1-Rig-2-Release-3 syslog: The radio is transmitter has been enabled (powered on) Jan 1 00:02:02 CPE-1-Rig-2-Release-3 syslog: The radio is transmitter with an EIRP of 21.7 dBm						
		authenticatio	n.log 🕹			315535057 wpa 315535057 wpa 315535057 wpa 315535057 wpa 315535057 wpa 315535057 wpa 315535057 wpa 315535057 wpa	eventd eventd eventd eventd eventd eventd eventd eventd	(4374):1980-01-01_00:37:37 got attr sessions/CPECfg.10/dHCPOption82FullString.0 0, 0, 0, 0, (4374):1980-01-01_00:37:37 got attr sessions/CPECfg.10/dHCPOption82FullStringValid.0 False (4374):1980-01-01_00:37:37 got attr sessions/CPECfg.10/rADIUSConfigFileImportUP1.0 (4374):1980-01-01_00:37:37 got attr session/radius/auth/status/ADIUSConfigFileImportUP1.0 (4374):1980-01-01_00:37:37 got attr sessions/CPECfg.10/primaryDNSServer.0 0.0.0.0 (4374):1980-01-01_00:37:37 got attr sessions/CPECfg.10/status/ADIUSCNFigFileImportUP1.0 (0.0.0.0 (4374):1980-01-01_00:37:37 got attr sessions/CPECfg.10/status/ADIUSCNServer.0 0.0.0.0 (4374):1980-01-01_00:37:37 Set session/radius/auth/status/secondaryDNSServer.0 to '0.0.0.0' (4374):1980-01-01_00:37:37 got attr sessions/CPECfg.10/dHSDomainName.0	•		

2. Click the \leq icon to download the logs.

Setting up a wizard

The **Set-up Wizard** page allows you to set the antenna alignment mode and CPE configurations such as frequencies and power.

You can also use the **Set-up Wizard** icon (

To view and configure the **Set-up Wizard** page, perform the following steps:

1. From the left navigation column in the main C100 dashboard page, select the **Set-up Wizard** icon (

The Set-up Wizard page appears, as shown in Figure 79.

Figure 79: The Set-up Wizard page - C100 UI

🔘 c	ambium Networks 🕴 cn'	Wave™ 5G Fixed C100			Undo 🖒	Save 🖬	K Back	Next »	ወ	Administrator	💄 admin 👻
-H-	Antenna Align	ment									
i	Config			~ ⊞	Radio Resources Count	ers					~ ⊞
	Alignment Mode	0			1 Tx RACH Counts	2					
					Rx SRB Messages	5					
\	 Alignment Mode Timeout 	30	minutes		Tx SRB Messages	6					
<i>~</i>						Rese	t RACH Cour	nts			
A	Status			~ ⊞							
	 Active 										
	Tone	0.0									
	1 Level	0.0									
	Rx Power	-45 dBm									
	Rx Power PSS	-58 dBm									

2. Set and view the details of parameters, as described in Table 49.

Table 49: List of parameters on the Set-up Wizard page

Parameter	Description					
Config						
Alignment Mode	Determines whether the alignment mode is enabled to provide audio tones to assist with the CPE installation.					
Alghment Mode	After using this parameter in enabled mode, you must explicitly disable this parameter.					
	Disable the install tone (without the operator intervention) after the link has been up for more than the specified timeout period (in minutes).					
Alignment Mode Timeout	Type an appropriate value in the text box.					
	You can disable this timeout parameter by setting the timeout period to 0.					
Status						

Parameter	Description		
Active	Indicates whether the receive level audio tone indicator is enabled or activated for the antenna alignment.		
Tone	Frequency of the audio tone used for the antenna alignment.		
Level	Power of the received signal during antenna alignment.		
Rx Power	The Receive power (in dBm) of data symbols.		
Rx Power PSS	The Receive power (in dBm) of the PSS symbols.		
Radio Resource Counters			
	Number of registration requests sent by the device using the Random Access Channel (RACH).		
TX RACH Counts	A registration request is the first message that is transmitted when a suitable BTS signal is locked on.		
	Number of Signalling Radio Bearer (SRB) response messages that are received by the device.		
KX SKD Messages	An increase in the number of messages indicates that the device is receiving data bearer establishment messages from a BTS.		
	Number of SRB request messages that are transmitted by the device.		
Tx SRB Messages	An increase in the number of messages indicates that the device is transmitting data bearer establishment response messages to the BTS.		
Reset RACH Counts	An option to reset the Tx RACH count from the Antenna Alignment page of the C100 UI.		

3. Click **Save** to apply the changes.

Appendix 1: cnMaestro X Configuration

cnMaestro X is a network management platform available on cloud and on-premises deployments. If you have installed and configured cnMaestro X for the cnWave[™] 5G Fixed platform, you can use the cnMaestro X UI to monitor a cnWave 28 GHz network.



Note

You must use **cnMaestro™ 3.2.0 version or later versions**. Contact your Cambium Networks Sales representative for the details on how to join the cnMaestro™ program.

This topic covers the following sections:

- Prerequisite tasks
- Configuring cnMaestro X
- Managing BTS and CPEs
- Generating data reports

Prerequisite tasks

Before configuring cnMaestro X (after installation) for the cnWave[™] 5G Fixed platform, you must complete the following prerequisite tasks:

- 1. Create a **Cambium Support Center account**, which sets your username and password, required for accessing the cnMaestro X UI. This action also allows you to register on the Cambium Networks Support site.
- Use the Cambium Support Center account to log on to cnMaestro X and create a cnMaestro account. This action creates a cloud account required for managing devices using the cnMaestro X UI.

During this cnMaestro-specific account creation process, you can set the **Cambium ID** that is required for onboarding the BTS device (using the cnMaestro UI).



Note

A Cambium ID is a string that uniquely identifies an account (which you create). It consists of letters, numbers, and underscores. Example: 28GHz_CNWAVE_ PLATFORM_SIT

It is used to onboard devices and is assigned to the devices managed by cnMaestro X. You can locate it on the home page of cnMaestro X UI (on right side of the title bar). When a Cambium ID is set, you cannot modify it. You must contact the Cambium Networks Support team for any changes.

For detailed information about creating the accounts-specific to cnMaestro and logging in to the UI, refer to the latest *cnMaestro User Guide*.

On completing the prerequisite tasks, you must configure cnMaestro and the BTS device using their respective UIs.

Configuring cnMaestro X

You must configure the cnMaestro X UI to use Cambium ID and onboarding key on the BTS device. To configure cnMaestro X for the BTS device, perform the following steps:

1. Log on to the cnMaestro X UI (cloud or on-premises) using appropriate username and password.

The **cnMaestro X** home page appears.

2. From the home page, navigate to **Onboard > Settings**.

The **Onboard > Settings** page appears, as shown in Figure 80.

Figure 80: The **Settings** page

🜔 Ca	mbium Networks	cnMaestro [™] X						∳ ∳		
\rightarrow	Onboard									
	Devices 60	GHz cnWave Network	Edge Controller	Settings						
Б.	You can add devices to your account by logging into the Device UI directly and entering the Cambium ID and Onboarding Key (these were set when you created your Company Act 430/450 and ePMP 1000 Hotspot must be claimed using this method. 0									
	Cambium I	Cambium ID: 28GHZ_CNWAVE_PLATFORM_SIT								
	Allow devic	e to be claimed using	Cambium ID							
<u>•</u>	Enabling this fe its user interfac	eature allows a device t ce (or SNMP or CLI on s	to be claimed by en some devices). Eacl	ntering the Cambium ID and Onboardir h user can have their own Onboarding	ig Key on the device. This information o Key. <u>Learn more</u>	an be set on	the device via			
0	The following u	users can claim devices	s using the cnMaest	tro Cambium ID and the user's Onboar	ding Key.					
	User:	Chris Hartt		Onboarding Key:		1	Delete			
\$ ⇒	User:	Mitchell W Parsons		Onboarding Key:		/	Delete			
∎¥ >	User:	Ram Nayak		Onboarding Key:		1	Delete			
s	User:	Yassine Bouchlaghem		Onboarding Key:		1	Delete			
	Save	Cancel					Add New			

3. Select the Allow device to be claimed using Cambium ID checkbox.

The **Settings** page allows you to add new users and set onboarding keys (password). In addition, you can edit or delete the required usernames and onboarding keys from the **Settings** page.

To add a new user, perform the following steps:

a. Click Add New on the Settings page.

A new row appears with User and Onboarding Key text boxes.

- b. Enter the user's name in the **User** text box.
- c. Enter an appropriate value (password) in the Onboarding Key text box.
- d. Click Save.

The new user credentials are saved in cnMaestro.

4. Log on to the B1000 UI (as described in the <u>Accessing the B1000 UI</u> section) and perform the following steps:

a. From the main B1000 dashboard page, navigate to **System > General**.

The General page appears, as shown in Figure 10.

b. In the cnMaestro section, Select the Remote Management checkbox.

If everything works correctly at the background, the **cnMaestro** section displays the connection status (Connecting in 5 minutes) of the BTS system and cnMaestro-specific parameters (as shown in Figure 81).

Figure 81: The Connecting status of the BTS device

ambium Networks Ch Wave "	SG Fixed B1000			Undo Save 🖬 😃 Administrator 🛔	admin *
General Management Radio	Interfaces SFP Module CPE Provisioning Synchron	isation Syslog			
System		~ ⊞	VLAN Configuration		~ 🖽
3 System Name	POC-RIG_1 3.1 Software		0	Activate saved VLAN configuration	
System Location	D1 Lab		Management VID	1	
System Contact	yassine		Management VID Priority 0		
Timezone	GMT (+00:00) \$		VLAN Enabled	O Disabled O Enabled	
			Q-in-Q Ether Type Ox88a8 O 0x8100 O 0x9100 Ox9200 Ox9200		
Antenna Orientation		~ ⊞			
 Antenna Azimuth 	90.0 °		climaesu o		× 🖽
Antenna Tilt	-2.0 *		Remote Management	 Image: Second sec	
			Connection Status	Connecting in 5 minutes	
Network Configuration		~ ⊞	3 Address	qa.cloud.cambiumnetworks.com	
IP Address	169.254.3.99		Account ID	28GHZ_CNWAVE_PLATFORM_SIT	
Prefix	24		Cambium ID	Cambium ID	
3 Default Gateway	169 254 3 253		Onboarding Key	Onboarding Key	8
IPv6 Enabled			Validate Server Certificate		

You must wait for some time until the **Connection Status** parameter displays the **Device Approval Pending** status for the BTS device (as shown in Figure 82).

Figure 82: The Device Approval Pending status

() c	ambium Networks cnWave* 5G Fixed B1000				Undo 🖱 Save 🖬 🕐 🗛	ministrator 📲 admin 👻
÷	General Management Radio Interfaces SFP Modu	CPE Provisioning Synchronisation System				
i	System		× 8	cnMaestro		✓ ■
•	System Name	MuMmo BTS Testing D1 Lab Yassine		Remote Management		
P	Protom Location			Connection Status	Device Approval Pending	
셤	aystem Location			Address	qa.cloud.cambiumnetworks.com	
NG	System Contact			Account ID		
~	Geographic Location		~ 8	Cambium ID	Cambium ID	
	0 Latitude	50.52305 DD -3.74029 DD 92.5 m		Onboarding Key	Onboarding Key	
	Longitude					
	0 Altitude			Validate Server Certificate		
	Network Configuration					
	IP Address	169.254.3.99				
	Prefix	24				
	Management VID	1				

The BTS device needs approval for onboarding.

5. Go to the cnMaestro X UI and navigate to **Onboard > Devices**.

The **Devices** page appears, indicating the waiting for approval status for the BTS device (for example, as shown in Figure 83).
Figure 83: The Waiting for approval status of the BTS device

🜔 Ca	mbium Networks cnMaestro	™ X								Þ	Å €1	e (🧐 🧐	e Yassine	Bouchlagh	em FOR
\rightarrow	Onboard															•
^	Devices 60 GHz cnWave Net	twork Edge Controller Se	ttings													
Ę	The Onboarding Queue holds d Learn more	evices before they are added	to your account. Devices mus	t be approved in order	to comp	plete the onboar	ding process and be n	anaged by cnMaestro. Y	ou can pre-provision devices	before they an	e approved	I by setting	location, confi	guration, or so	ftware versi	ion.
扁	Q. Search											Clai	n Device A	pprove All E	ixport 🕶	•
_	Type $=$	Serial Number	⊤ Name ⊤	MAC	- - 1	Tier	IP Address		∀ Added By	Status		$\overline{\tau}$	Duration			
<u> </u>	cnWave 5G Fixed 28GHZCPE	V5YA01N96HSZ	28 GHz cnWave-700186	00:04:56:70:01:86	1	Tier 6	N/A	N/A	Ram Nayak	 Waiting for 	Device		33d 21h 3m		/ 🛛 🗵	ē
۲	cnWave 5G Fixed B1000 BTS	V5YA02QBG1CJ	MuMimo-BTS-Testing	00:04:56:70:01:88	1	Tier 6	169.254.3.99	87.82.216.58	Yassine Bouchlaghem	 Waiting for 	Approval		0d Oh 7m		/02	ō
۶											Showi	ing 1 - 2 Total	2 10 ~	< Previous	1 Next	
۰.	Note: Devices will remain in th	e queue for 1 week after onbo	arding successfully.													

6. Select the tick box (2) on the required corresponding row, as shown in Figure 83.

When you select this corresponding tick box to approve, the BTS device is onboarded. The **Devices** page indicates the **Onboarded** status, as shown in Figure 84.

Figure 84: The Onboarded status of the BTS device

🕚 Car	mbium Networks cnM	aestro™ X											₽₽	₽ ®	P	e 🕄	: <mark>)9</mark> 🛛 🛛	Yassine Bou 28GHZ_CNWW	chlaghem /E_PLATFOR
÷	Onboard																		0
	Devices 60 GHz cnW	we Network Edg	e Controller Setti	ngs															
ш.	The Onboarding Queue I Learn more	olds devices befo	e they are added to	your account. Devices	must be approved in or	der to con	nplete the (onboarding process and	l be mar	aged by cnMaest	ro. You ci	In pre-provision devices	before they a	re approve	ed by settir	ng location,	configuratio	on, or softwa	re version.
	Q Search														C	laim Device	Approve	All Expor	
•	Туре	\Xi Serial Nu	mber 🤤	Name		$\overline{\tau}$	Tier	IP Address	-	Source IP	$\overline{\tau}$	Added By	Status			Duration	n		
<u>×</u>	cnWave 5G Fixed 28GH	CPE V5YA01N	96HSZ	28 GHz cnWave-700	186 00:04:56:70:01:86	i i	Tier 6	N/A		N/A		Ram Nayak	 Waiting fr 	or Device		33d 21h	5m	1	۵ 🗵
0	cnWave 5G Fixed B1000	BTS V5YA020	BG1CJ	MuMimo-BTS-Testing	00:04:56:70:01:88	3	Tier 6	169.254.3.99		87.82.216.58		Yassine Bouchlaghem	 Onboard 	ed		< 1m			1
۶														Show	wing 1 - 2 To	tal: 2 10	¥ (Previous 🚺	Next >
¢ ،	'Note: Devices will rema	in in the queue for	1 week after onboar	ding successfully.															

- 7. Go back to the System > General page of the B1000 UI and perform the following steps:
 - a. In the **cnMaestro** section, enter the Cambium ID and the onboarding key that you set on the **Settings** page of cnMaestro UI.

For more information about cnMaestro-specific parameters in the B1000 UI, refer to Table 8.

b. Click Save.

The **Connection Status** parameter in the **cnMaestro** section displays Connected, as shown in Figure 85.

mbium Ne	tworks Ch	vave o	G Fixed I t	31000					Undo S Save 🖬 🗿 Administrator	2
General	Management	Radio	Interfaces	SFP Module	CPE Provisioning	Synchronisation	Syslog			
System							~ ⊞	VLAN Configuration		
O System	Name		POC-RIG_	1 3.1 Software				θ	Activate saved VLAN configuration	
System	Location		D1 Lab					Management VID	1	
B System	Contact		yassine					Management VID Priority	0	
Timezon	e		GMT (+00:00))	٠			VLAN Enabled	O Disabled O Enabled	
								3 Q-in-Q Ether Type	○ 0x88a8 ○ 0x8100 ○ 0x9100 ○ 0x9200 ○ 0x9300	
Antenna	Drientation						~ ⊞			
O Antenna	Azimuth		90.0		0			cnMaestro		
Antenna	a Tilt		-2.0		۰			Remote Management	✓	
								Connection Status	Connected	
Network (Configuration						~ ⊞	Address	qa.cloud.cambiumnetworks.com	
0 IP Addr	255		169.254.3	99				Account ID	28GHZ_CNWAVE_PLATFORM_SIT	
Prefix			24					Cambium ID	Cambium ID	
0 Default	Gateway		109.254.3	253				Onboarding Key	Onboarding Key	

Figure 85: The connected status of the BTS device

The BTS device has connected to cnMaestro, successfully.

8. On the left navigation pane of cnMaestro home page, select the **Monitor and Manage** () icon and expand the options under the **Networks** section.

The BTS dashboard appears on the cnMaestro X UI (as shown in Figure 86), which you can use to monitor the performance of the BTS and the required CPEs. In addition, you can view information about each CPE on this dashboard.

Q. Search		I BTS > E	STS LAB v2							
Networks	Wi-Fi AP Groups	Dashboard	Notifications	Configuration	Details CPEs	Performance Software	Update Tools As	isists X		
V 🔇 System			Status		CPEs		Throughput			
✓ ♣• default		Online		Ad 10b A4m	•	0	12 49	E 09		
V 💝 BTS LA	B v2	1d 23h 27m	Offling Last W	Hotime	Depirtored CREe	Offling	IJ.40 Kbps	5.06 Kbps		
G. CPE	1 - 3.0 Release		Online Last W.	, opune	Registered CFEs	Online		14		
CPE	1 - 3.0 Release	Alarms			Device Health			Details		
CPE	1 - 3.0 Release	0	0	0				Product Name	cnWave 5G Fixed B10	DOO BTS
(CPE	2 Release 3.1.b5	CRITICAL	MAJOR	MINOR	ڪر BTS	B1000		MAC Address	00:04:56:70:01:93	
(CPE	4 - 3.0 Release							IPv4 Address	169.254.2.88	
CPE	4 Release 3.0	. 0				CPE Status		Seftuere Version	2165	
CDE	8 Release 2.1.1		Last 24 Hours		\checkmark	All 8 CPEs Up		Connected CPEr	3.105	
								Connected CPEs	0	
		Assists X						Site Location	0	
								Site Contact		
								Description	Cambium Networks	mWaye 5G Eiv
			71%					Description	Cambian Networks	citivave 50 Tix
		Good			Radio Details			Throughput		Resolutio
			Last 24 Hours		Frequency	25000.000 MHz				τ
		3		6	Max EIRP	20.0 dBm		_		
		Failu	e	Passed	Polarisation	Horizontal		S 500		
					Link Symmetry	5:2		Kbr		
		Top Active A	larms		Bandwidth	112 MHz				
					Target Rx Power	-60 dBm				
					UL Tx Pwr Ctrl	Enabled		26.	Jul 28 Jul	30 Jul
					Initial Adjust			• RX • IX		
					UL Tx Pwr Ctrl Cont Adjust	Enabled				
		+ -								

Figure 86: The BTS monitoring dashboard on the cnMaestro X UI

For detailed information about UI controls in the cnMaestro X UI, refer to the latest cnMaestro User Guide.

Managing BTS and CPEs

When you select the required network for BTS using the **Monitor and Manage** () icon on the cnMaestro X UI, the following UI modules are available:

- Dashboard
- Notifications
- <u>Configuration</u>
- Details
- <u>CPEs</u>
- Performance
- Software Upgrade

- Tools
- Assists X

Using these UI modules, you can monitor and manage BTS and CPE devices.

Dashboard

The **Dashboard** page displays summary of the BTS or CPE status (online or offline, uptime), count of registered CPEs and their status, throughput, and the radio details. The **Dashboard** page contains multiple widgets, as shown in Figure 86.

Table 50 lists and describes the widgets available on the **Dashboard** page for the BTS and a CPE.

Widget	Description
Alarms	Indicates the count of critical, major, and minor alarms observed in the last 24 hours for the BTS or a CPE.
Device Health	Specifies the status of BTS and connected CPEs.
Details	Displays the device details such as product name, MAC and IPv4 address, software version, count of connected and registered CPEs, site location and contact, and a brief description of the device.
Assists X	Indicates the percentage of excellent, good, and poor CPE connections observed in the last 24 hours. This widget also provides the count of failed and passed CPE connections with the BTS.
Padio Dotaile	Provides details of the BTS such as frequency, Max EIRP, polarisation, link symmetry, bandwidth, Target Rx Power, UL Tx Pwr Ctrl Initial Adjust, and UL Tx Pwr Ctrl Cont Adjust.
	For a CPE, this widget displays radio details such as DL and UL EVM, current EIRP, range, DL Rx power, DL an UL MCS, and alignment active status.
Throughput	Indicates the Rx and Tx throughput of the BTS or a CPE for a period in a graph format.
Top Active Alarms	Displays name of the device (BTS or CPE), device status, and the last up time.
Мар	Displays the location of the BTS or a CPE device. Use the zoom in and zoom out options to view the heatmap.
Session	Applicable only to the CPE dashboard. Indicates the registration state, registration time, and link uptime for a CPE.

Table 50: List of widgets on the Dashboard page

Notifications

The **Notifications** page provides detailed information of alarms raised for the BTS or the CPE device. This page contains the following tabs:

- <u>Alarms</u>
- Alarm History
- Events

Alarms

The **Alarms** page displays the count of critical, major, and minor alarms in different colors (as shown in Figure 87). This page also provides information of alarms in a table format, indicating severity level, alarm name, message (a brief description), duration, alarm status, raised time, and the acknowledged status of alarm.



🜔 Ca	mbium Networks │ cnMaestro [™] X								₽ 📫	e ?	^ر بې 🚰	Administrator POC_MAESTRO_ID	•
≡	Q Search	I BTS > BTS LAB	Rig 2									4	5
	Networks Wi-Fi AP Groups	Dashboard Notificat	ions Configuration	Details CPEs	Performance	Software Update	Tools Ass	sists X					
	🗸 🚯 System	Alarms Alarms His	ory Events										
<u>ы</u> х	✓ 🎶 default							_	_				
	🗸 🔆 BTS LAB Rig 2	0			1				0				
	🗞 CPE 1 Release 3.1.b5	Critical	Last 24 Hours		Major -	Last 24	Hours		Minor		Last 24	Hours	·
<u>•</u>	😿 CPE 2 Release 3.1.b6 - test	Apply Filter(s)	lear								Bulk Ackn	wledge Export -	1
	🗞 CPE 3 Release 3.1.b5	Soverity	Namo	Mossago		Duration	Statue	_ P	aisod Timo		Acknowledg		4
	CPE 4 Release 3.1.b5			message		Durudon	Status	- 1			Acknowledg		1
۵	CPE 5 Release 3.1.b5	🔲 🖶 Major	STATUS	Device is offin	ne.	0d 0n 15m	 Active 	. 0	8 Aug 2023, 1	J4:58 PM	Acknowledg	e (E	ン
\$ >	🗞 CPE 6 Release 3.1.b5								Showing 1	- 1 Total: 1	10 🗸 <	Previous 1 Next >	

Using the **Apply Filter(s)** button, you can set and apply the following filters for viewing the alarm data in a table:

- Severity (Minor, Major, Critical)
- Status (Active, Inactive)
- Raised Time (Between, Before, After)
- Acknowledge (Acknowledged, Unacknowledged)

Use the **Bulk Acknowledge** button only when you want to acknowledge the alarms in bulk. To export the alarm data (in CSV or PDF format), use the **Export** button (as shown in Figure 87).

When you click on the **View Details** icon (E), the **Alarm Details** page appears (as shown in Figure 88). You can use this page to view the detailed information of an alarm.

Figure 88: The Alarm Details page

🌘 Ca	mbium Networks cnMaestro [™] X					0	P	Å ⁹			(יַן	B Adm	ministrator - MAESTRO_ID
≡	Q Search	I BTS > BTS LAB	Alarm Details		×								¢
	Networks Wi-Fi AP Groups	Dashboard Notifica	Device Name	BTS LAB Rig 2	s	Assists)	ĸ						
m	✓ 🚱 System	Alarms Alarms His	Device Type	cnWave 5G Fixed B1000 BTS									
	✓ ↓ default		Mode	BTS									
₽	> 🔆 BTS LAB Rig 2	0	Device (MAC)	00:04:56:70:01:93				0					
₩		Critical	Source Device (MAC)	-			•	Minor			Last 24 Hou	rs	
<u>•</u>		Change Filter(s) ③	Parent Device (MAC)	•						Bul	k Acknowle	dge	Export 👻
0		Severity =	Network	default	t	atus 👳	Raise	d Time		- Ackno	wledge	÷	
~		🗌 🖲 Major	Tower	-		Active	08 Au	g 2023, C	4:58 PM	Ackno	wledge		Ē
-			Severity	Major									
\$\$			Name	STATUS				Showing 1	- 1 Total: 1	10 🗸		ious 1	
.			Status	Active									
•• 1			Raised	08 Aug 2023, 04:58 PM									
🔁 >			Message	Device is offline.									
			Offline Reason	-									
			Resolution	-									
			Duration	0d 0h 23m									
			K		>								

Alarm History

The Alarm History page displays the alarm data for the previous week in graph and table format (as shown in Figure 89).

Figure 89: The Notifications > Alarms History page

🜔 Ca	mbium Networks	cn Maestro ™ X							•	© 🖻	• 📫 🗗		Ç! <mark>9</mark>	B Admin	istrator - AESTRO_ID
≡	Q Search		I BTS >	BTS LAB Rig	2										0
	Networks	Wi-Fi AP Groups	Dashboard	Notifications	Configuration	Details CP	s Performance	Software Update	Tools As	sists X					
	🗸 🚱 System		Alarms	Alarms History	Events										
<u>ы</u>	🗸 🍫 default		- Alarm H	listory (Last W	leek)										
	🗸 🔆 BTS LAB	Rig 2		istory (East W	ccky										
	🗞 CPE 11	Release 3.1.b5													
<u>•</u>	🔏 CPE 2	Release 3.1.b6 - test													
ា	🗞 CPE 3	Release 3.1.b5	0 -												
	🗞 CPE 4	Release 3.1.b5													
٩	🗞 CPE 5	Release 3.1.b5													
± tt⇒	🗞 CPE 6	Release 3.1.b5	:	02 Aug	03 Au	9	04 Aug	05 Aug		06 Aug	07.	Aug	08	Aug	
	🗞 CPE 7	Release 3.1.b5						 Critical Major 	 Minor 						
** >	🔏 CPE 8	Release 3.1.b5	Apply Filter	(5)										E	xport -
😨 >			Fourity	- Nom	•	Massa	10	Cleare	d Du	ration	Paicod Timo	_	Status	_	
			Seventy	÷ Nain	e	Messa	Je	Cleare	a Du	auon	Raised Tille	-	Status	-	~
ş			 Major 	STAT	US	Device	is offline.	N/A	Od	0h 17m	08 Aug 2023, 0	4:58 PM	 Active 		Ē
											Showing 1 - 1 Tota	il: 1 10 🔨	Prev	ious 1	Next >

When you select a CPE , the Alarms History page displays data as shown in Figure 90.

Figure 90: The alarm history for a CPE (offline)

🜔 Ca	mbium Networks │ cnMaestro [™] X							۰ 🖗	¢9	e ,	<u>(י</u>	e Admin POC_M	nistrator - IAESTRO_ID
≡	Q Search	CPE > CPE	E 1 Release 3.1	.b5									6
	Networks Wi-Fi AP Groups	Dashboard No	otifications Con	figuration De	etails Performance	Software Upd	late Tools Assists)						
•••	✓ 🚱 System	Alarms Alarr	ms History Eve	ents									
Щ <u>х</u>	✓ 🎝• default		ory (Last Week)										
	V 🔆 BTS LAB Rig 2		, (Lu ot 1100111										
	CPE 1 Release 3.1.b5	1											
<u>•</u>	🕅 CPE 2 Release 3.1.b6 - test	1-											
6	🔗 CPE 3 Release 3.1.b5	1-											
	🗞 CPE 4 Release 3.1.b5												
۵	🗞 CPE 5 Release 3.1.b5	0 -											
1	🔗 CPE 6 Release 3.1.b5	: 0	02 Aug	03 Aug	04 Aug		05 Aug	06 Aug		07 Aug		08 Aug	
	😿 CPE 7 Release 3.1.b5					 Criti 	cal 🗕 Major 😐 Minor						
** >	🔗 CPE 8 Release 3.1.b5	Apply Filter(s)											Export -
😇 >		Soverity	- Namo		Mossago		Cleared	Duration	Pairod	Timo	- Sta	tue –	
		Sevency			Device in a filling		Cleared	Duration	Kaiseu	e	- Sta		nên.
\$		 Major 	STATUS		Device is offline.		N/A	0d 0h 16	m 08 Aug	3 2023, 04:58 P	M • A	Active	E
		Major	STATUS		Device is offline.		04 Aug 2023, 06:04 P	M 0d 0h 5r	n 04 Aug	2023, 05:58 P	M • I	nactive	Ē
									Showing 1 - 2	Total: 2 10 🔨	 < Pi 	revious 1	Next >

Use the Apply Filter(s) button to set and apply filters for viewing alarm data in the table.

Events

The Events page displays detailed information of alarms in a table format, as shown in Figure 91.

Figure 91: The Notifications > Events page

🐌 Ca	mbium Networks cnMaestro TM X						y 🌮	P	^ر بې 🔁	B Administ POC_MAES	trator -
≡	Q, Search	I BTS >	BTS LAB Rig 2								¢
	Networks Wi-Fi AP Groups	Dashboard	Notifications Configur	ation Details	CPEs Performance	Software Up	odate Tools	Assists X			
	🗸 🕄 System	Alarms	Alarms History Events								
<u>hi</u> t	✓ 🎶 default										
	🗸 🤹 BTS LAB Rig 2	Apply Filter	r(s)							Export 👻	iii •
••••	🖉 CPE 1 - 3.0 Release	Severity	= Category =	Event Type	Name	= Messag	ge		Raised Time	-	
<u>•</u>	🖒 CPE 1 - 3.0 Release	 Notify 	REGISTRATION	Status	ONBOARDING	Onboar	ded.		29 Jul 2023,	02:58 PM	Ê
0	CPE 2 Release 3.1.b5	 Notify 	NETWORK	Status	STATUS_UP	Device	is online.		29 Jul 2023,	02:58 PM	Ê
	🔗 CPE 2 Rig 2 Release 3.1.b5						Showing (L 2 Total: 2	10 24 4 5		out a
2	CPE 4 - 3.0 Release						Showing	1-2 10(8), 2	10 * 1		ext /
1	🖒 CPE 4 Release 3.0										
	CPE 8 Release 2.1.1										
- ₽ >	🖉 CPE Release										

Using the **Apply Filter(s)** button, you can set and apply the following filters for viewing the event data in a table:

- Severity (Notify, Minor, Major, Critical)
- Category (Infrastructure, Network, Operations, Others)
- Name (for example, Onboarding, Status_Up)
- Raised Time (Between, Before, After)

When you click on the **View Details** icon (E), the **Event Details** page appears. You can use this page to view detailed information about an event.

Configuration

The **Configuration** page allows you to configure the device settings, as shown in Figure 92.

Figure 92: The Configuration page

🐌 Ca	mbium Networks │ cnMaestro [™] X				()	ţ°		<mark>ر</mark> بي <mark>ک</mark>	Administrator - POC_MAESTRO_ID
	Q. Search Networks Wi-Fi AP Groups	BTS > BTS LAB Rig 2 Dashboard Notifications Config	guration Details	CPEs Performance	Software Update	Tools	Assists X		¢
	 ✓ System ✓ Ar default 	Device Details			and a like surface of				
	🗸 🤹 BTS LAB Rig 2	Name		S	V5YA02QLDSVS				
	🖒 CPE 1 - 3.0 Release	BTS LAB Rig 2		Ν	AC Address				
<u> </u>	🖉 CPE 1 - 3.0 Release	Network	•		00:04:56:70:01:93				
۲	CPE 2 Release 3.1.b5	Tower		IF	Pv4 Address				
<u>@</u>	CPE 2 Rig 2 Release 3.1.b5	, None	•		169.254.2.88				
-	CPE 4 - 3.0 Release	Latitude							
 >	CPE 8 Release 2.1.1	50.52336	0						
** >	CPE Release	Longitude							
5 >	-	-3.74016	0						
		Device Configuration View D	ovice Configuration	1					
\$		Template	evice conliguration	1					
		None View Template							
		O Please note that modifying the	e polarization, bandv	width, or link symmetry	settings will trigger	an automa	tic reboot	of the device	
		Name		Value		D	Default		
				No variables o	configured				
		Apply Configuration							

Table 51 lists and describes the parameters available on the **Configuration** page.

Table 51:	Parameters	on the	Configuration	page
-----------	------------	--------	---------------	------

Parameter	Description
Device Details	
Namo	Name of the BTS device.
Name	This is a read-only parameter.
	Name of the network where the BTS device is available.
Network	Select the appropriate network name from the drop-down list.
	Note : This parameter is disabled for the CPE specific settings.
	Name of the antenna tower where the BTS device is located.
Tower	Select the appropriate tower name from the drop-down list.
	Note : This parameter is disabled for the CPE specific settings.
Latituda	The geographic latitude of the BTS device in decimal degrees (DD).
	This is a read-only parameter.

Parameter	Description					
Longitudo	The geographic longitude of the BTS device in DD.					
	This is a read-only parameter.					
Sorial Number	The serial number of the BTS device.					
Senai Number	This is a read-only parameter.					
MAC Address	The Ethernet Media Access Control (MAC) address that is assigned to the network interface and used for the device management.					
	This is a read-only parameter.					
IDv4 Addross	The IPv4 address that is set for the BTS or the CPE device.					
IP V4 Address	Enter an appropriate value in the text box.					
Device Configuration - Allows you to view the existing device configuration and the template. If you modify any parameters in the template (such as polarisation, bandwidth, or link symmetry), the deautomatically reboots.						

Apply Configuration	An option to submit or apply the new configuration changes.

Details

The **Details** page provides an overview, interface, and the radio details of the BTS or CPE device. This page contains the following tabs:

- Overview
- Interface
- Radio

Overview

The **Overview** page provides details of the device, boot loader, boot reason and count, and shutdown time (as shown in Figure 93).

🜔 Ca	mbium Networks │ c∩Maestro [™] X			🕸 📌 🙆		GP Administrator → POC_MAESTRO_ID
	Q Search	BTS > BTS LAB	/2			¢
♠	Networks Wi-Fi AP Groups	Dashboard Notificatio	ns Configuration Details CPEs Perform	mance Software Update Tools	Assists X	
lux.	V System	Overview Interfaces	Radios			
щ <u>э</u>	✓ ↓ default	Details		Boot		
	> C BISLABV2	Product Name	cnWave 5G Fixed B1000 BTS	Startup Reason	Non-Power Cycle	
•		MAC Address	00:04:56:70:01:93	Startup Count	261	
<u> </u>		IPv4 Address	169.254.2.88			
		Serial Number	V5YA02QLDSVS	Shutdown		
<u>_</u>		Software Version	3.1b5	Date & Time	Reason	Detail
· ·		Connected CPEs	8	2023-07-26 12:09:42.00	Firmware Upgrade	cnmaestro-bts-upgrade
₩ '		Registered CPEs	8	0000-00-00 00:00:00.00	Power Loss	Boot after long power cyc
*		Site Location		0000-00-00 00:00:00.00	Power Loss	Boot after long power cyc
E →		Site Contact		0000-00-00 00:00:00.00	Power Loss	Boot after long power cyc
		Description	Cambium Networks cnWave 5G Fixed Base	e 0000-00-00 00:00:00.00	Power Loss	Boot after long power cyc
\$		Boot Loader		0000-00-00 00:00:00.00	Power Loss	Boot after long power cy
		Cit Tag	develop/4/28	2023-07-12 08:31:50.00	Firmware Upgrade	cnmaestro-bts-upgrade
		Git lag		2023-07-03 15:07:19.00	Firmware Upgrade	3.0 to 3.1b4
		Bulla Name	DUTLUADER 36/2023-06-22 (W) 07:02:3	94		
		Hardware Version	Digits P9.0 RF 6.0			

Figure 93: The Details > Overview page for the BTS

For each CPE, the **Overview** page displays device, radio, and session details. For information on parameters available of the **Overview** page, refer to Table 5 in the <u>Device</u> section.

Interface

The Interface page displays the radio interface configuration details of the BTS or the CPE device (as shown in Figure 94).

Figure 94: The Details > Interface page for the BTS

🕚 Ca	mbium Networks │ cnMaestro [™] X							🛯 🌳	₽ ⁰	P		وبي 🥐	B Administrator - POC_MAESTRO_ID
	Q Search	€ BTS > E	BTS LAB Rig	J 2									Ø
f	Networks Wi-Fi AP Groups ✓ System Vi-Fi AP Groups	Dashboard Overview	Notifications	Configu Radios	ration De	tails CPEs	Performance	Software Update	Tools /	Assists X			
ц <u>х</u>	✓ 🎶 default	Interface Co	onfiguration					Tx/Rx Counters					
■	CPE 1 Release 3.1.b5	SFP1 Speed			Autoneg '	1000BASE-X			Wi	reless	Main	SFP 1	SFP 2
<u>•</u>	🖒 CPE 2 Release 3.1.b6 - test	SFP2 Speed	ł		Autoneg '	IOGBASE-R		In Octets	28	991	0	0	435227
6	CPE 3 Release 3.1.b5	GNSS						In Unicast Packets	178	3479	0	0	1260
	CPE 4 Release 3.1.b5	Tracking			GNSS fix	(1)		In Multicast Packe	ts 38	088	0	0	2486
-	CPE 5 Release 31.b5	: Altitude			94.8			In Broadcast Pack	ets 717	77	0	0	265
*	CPE 6 Release 3.1.05	Location			[-3 74010	50 523341		Out Octets	54	031	0	0	25458
	CPE 8 Release 31.b5	Satellites In	View		5	00102001)		Out Unicast Packe	ts 18 4	1442	0	0	2715
- ** >	3	Satenites III	VIEW		5			Out Multicast Pack	tets 153	356	0	0	596
R		Tx/Rx Errors	6					Out Broadcast	616	5981	0	0	55
			١	Vireless	Main	SFP 1	SFP 2	Packets					
5		In Discards	c)	0	0	28						
		In Errors	c)	0	0	0						
		Out Discard	ls C)	129456	0	126054						
		Out Errors	c)	0	0	0						

For each CPE, the **Interface** page displays Ethernet and wireless interface related details.

Radio

The **Radio** page displays the radio status of the BTS or the CPE device (as shown in Figure 95). Example: Frequency, Polarisation, link symmetry, and bandwidth details of the BTS.

Figure 95: The Details > Radio page for the BTS

	Cambium Networks │ cnMaestro [™] X							٩	P	¢	P	P	ζ! <mark>9</mark>	Administrator - POC_MAESTRO_ID
	Q Search	BTS > BTS LAB Rig	2											¢
	Networks Wi-Fi AP Groups	Dashboard Notifications	Configuration	Details CPE	B Performance	Software Upp	date Tools	Assists	x					
	✓ 🚱 System	Overview Interfaces	Radios											
Щ <u>х</u>	✓ ↓• default	Status												
	> 🐡 BTS LAB Rig 2	Status												
▦	CPE 1 Release 3.1.b5	Frequency	25000.000 N	1Hz										
•	CPE 2 Release 31 b6 - test	Max EIRP	25.0 dBm											
	CDE 3 Delease 31b5	Polarisation	Horizontal											
0		Link Symmetry	5:2											
0	CPE E Polosso 31 bE	Bandwidth	112 MHz											
-	CPE 5 Release 3.1.05	Target Rx Power	-60 dBm											
*	CPE 6 Release 3.1.05	UL Tx Pwr Ctrl Initial Adjust	Enabled											
	CPE / Release 3.1.b5	LIL Ty Pwr Ctrl Cont Adjust	Enabled											
Ĩ.	CPE 8 Release 3.1.b5	OL IX I WI CAI COIR Adjust	Linubled											

For each CPE, the **Radio** page displays radio interface related details such as alignment active, range, current EIRP, UL sounding state and DL sounding state.

CPEs

The **CPEs** page provides information on all the connected and registered CPEs with the BTS (as shown in Figure 96). The **CPEs** page is applicable only to the BTS.

Figure 96: The CPEs page

Car	mbium Networks │ cnMaestro [™] X					8	🦻 🕂 🗬	. ^و ي ¹ ي	9 Administrator - POC_MAESTRO_ID
=	Q. Search	I BTS > BTS LAB Rig	2						¢
♠	Networks Wi-Fi AP Groups	Dashboard Notifications	Configuration Deta	ails CPEs Performa	nce Software Update	Tools Assists X			
	🗸 😨 System	Q. Search							Export 🗸 🔟
ЦŚ	✓ 🎶 default	Davies Neme	MAG -	CONT	Shahua	INCL	Desistration State	Desistration Count	
扁	V 🤹 BTS LAB Rig 2	Device Name -	MAC	CRNII	Status -	INISI	Registration State	Registration Count	IPv4 Address
•	CPE 1 Release 3.1.b5	CPE 1 Release 3.1.b5	00:04:56:71:07:62	56	 Online (0d 0h 0m) 	888901007407458	Registered	1	169.254.2.11
<u>•</u>	🖉 CPE 2 Release 3.1.b6 - test	CPE 2 Release 3.1.b6 - test	00:04:56:71:07:A2	50	 Online (0d 0h 0m) 	888901007407522	Registered	1	169.254.2.12
	🖉 CPE 3 Release 3.1.b5	CPE 3 Release 3.1.b5	00:04:56:71:07:BA	20	 Online (0d 0h 0m) 	888901007407546	Registered	1	169.254.2.13
	CPE 4 Release 3.1.b5	CPE 4 Release 3.1.b5	00:04:56:71:07:60	76	 Online (0d 0h 0m) 	888901007407456	Registered	1	169.254.2.14
9	CPE 5 Release 3.1.b5	CPE 5 Release 3.1.b5	00:04:56:71:07:B7	40	 Online (0d 0h 0m) 	888901007407543	Registered	1	169.254.2.15
** >	CPE 6 Release 3.1.b5	CPE 6 Release 3.1.b5	00:04:56:71:07:A7	42	 Online (0d 0h 0m) 	888901007407527	Registered	1	169.254.2.16
	CPE 7 Release 3.1.b5	CPE 7 Release 3.1.b5	00:04:56:71:07:A9	21	 Online (0d 0h 0m) 	888901007407529	Registered	1	169.254.2.17
*	& CPE 8 Release 3.1.b5	CPE 8 Release 31.b5	00:04:56:71:07:5F	27	 Online (0d 0h 0m) 	888901007407455	Registered	1	169.254.2.18
< 🗊							Showing 1 - 8 Total:	8 10 🗸 < Previ	ious 1 Next >

Use the **column Selector** icon (iii-) to choose the required parameters and view the CPE data. For information on parameters available on the **CPEs** page, refer to the <u>Viewing Subscriber (CPE) Data</u> section.

Performance

The **Performance** page displays the BTS throughput and count of CPEs for the selected time range and period in a g graph format (as shown in Figure 97). Use Time Range and Period filters to view the performance data for the required period (for example, last 7 days and 1 hour).

Figure 97: The Performance page statistics for the BTS

🜔 Ca	ambium Networks │ cnMaestro [™] X	o, 🏴 📽 🛒 📣	Administrator - POC_MAESTRO_ID
■	Q Search	I BTS > BTS LAB Rig 2	Ø
	Networks Wi-Fi AP Groups	Dashboard Notifications Configuration Details CPEs Performance Software Update Tools Assists X	
	🗸 🕲 System	Time Range: Last 7 Days + Period: 1 Hour + 0	III III III III ·
백숙	✓ 🎶 default		
Ħ	V 🐡 BTS LAB Rig 2	Throughput • X CPE Count	⊚ ×
	CPE 1 Release 3.1.b5	8	
<u>•</u>	🖉 CPE 2 Release 3.1.b6 - test		
គ្នា	CPE 3 Release 3.1.b5	g65.54	
	🖉 CPE 4 Release 3.1.b5	Σ 0 4	
۵	🖉 CPE 5 Release 3.1.b5		
ste >	CPE 6 Release 3.1.b5		
	CPE 7 Release 3.1.b5	01 Aug 02 Aug 03 Aug 04 Aug 05 Aug 06 Aug 01 Aug 02 Aug 03 Aug 04 Aug	05 Aug 06 Aug
•	🖉 CPE 8 Release 3.1.b5	Rx: 13.00 Kbps Tx: 6.00 Kbps 2023/08/02 15:30 Connected CPEs: 8 Registered CPEs: 8	2023/08/02 15:30

For each CPE, the **Performance** page displays throughput, EVM, MCS, and Rx Power for the selected time range and period (as shown in Figure 98).

Figure 98: The Performance page for each CPE



Software Upgrade

You can upgrade or downgrade BTS and CPE software using the **Software Upgrade** page.



Note

Software upgrade or downgrade using cnMaestro X is applicable only to cnWave[™] 5G Fixed release 2.1 version and later versions.

To upgrade or downgrade the BTS and CPE software using the **Software Upgrade** page, perform the following steps:

1. From the BTS **Dashboard** page, navigate to the **Software Update** tab.

The Software Update page appears, as shown in Figure 99.

Figure 99: The Software Update page

🜔 Ca	mbium Networks │ cnMaestro [™] X		🚳 🏴 🤷 📴 📴 🕬 Administrato	or -
≡	Q, Search	I BTS > BTS LAB Rig 2		Ø
♠	Networks Wi-Fi AP Groups	Dashboard Notifications Configuration Details CPEs Performance Software Update Tools A	Assists X	
	🗸 🚱 System	Device Type	Versions	_
ЩЧ	✓ ♣• default	cnWave 5G Fixed 👻		
Ħ	V 💝 BTS LAB Rig 2	Versions		
•	CPE 1 Release 3.1.b5	3.1b6 - Add New		
<u> </u>	CPE 2 Release 3.1.b6 - test			
0	"CPE 3 Release 3.1.b5	Q, Search	Multiple Selection -	41
6	CPE 4 Release 3.1.b5	Devices Selected CPEs	Status = Active =	Ŧ
-	"CPE 5 Release 3.1.b5	BTS LAB Rig 2 Select CPEs	Online 3.1b6	
\$	CPE 6 Release 3.1.b5	CPE 1 Release 31.b5	Online 3.1b6	
••• >	CPE 8 Pelease 31.65	CPE 2 Release 3.1.b6 - test	Online 3.1b6	
	C CIE O Release Shibs	CPE 3 Release 31.b5	Online 3.1b6	
		CPE 4 Release 31.b5	• Online 3.1b6	
\$		CPE 5 Release 3.1.b5	Online 3.1b6	
		CPE 6 Release 31.b5	Online 3.1b6	
		CPE 7 Release 31.b5	Online 3.1b6	
		CPE 8 Release 31.b5	Online 3.1b6	
			Showing 1 - 1 Total: 1 10 V < Previous 1 Next >	
		Jpdate		11
		Now Schedule		
		Job Options		
		Stop update on critical error		
		Notes		
_				
		Add Software Job to 0 device(s) View Update Jobs		



Note

When you select an individual CPE from the **Networks** group on the left column, the **Software Update** page allows to upgrade or downgrade only that specific CPE software.

- 2. Perform the following steps to upgrade or downgrade the software:
 - a. From the Device Type drop-down list, select cnWave 5G Fixed.
 - b. From the **Versions** drop-down list, select the required software version depending on the activity (upgrade or downgrade).
 - c. Select the checkbox against the required device names, for which you want to schedule this activity, in the **Devices** section (as shown in Figure 99).
 - d. In the Update section, select an option (Now or Schedule).

If you select **Schedule**, ensure to specify the start date and start time.

- e. In the Jobs Options section, select the Retry skipped/offline device (s) on reconnect checkbox.
- f. In the Notes text box, add a brief description about the activity (upgrade or downgrade).
- g. Click Add Software Jobs to <x> device (s).

The activity (upgrade or downgrade) is added to the job queue.

3. To run the scheduled job activity (upgrade or downgrade), perform the following steps:

- a. From the home page of cnMaestro UI, navigate to Administration > Jobs > Software Update page.
- b. On the Software Update page, select either Manual or Auto option.
- c. Select the checkbox against the required device name and details.
- d. Click Start.

The software upgrade or downgrade activity starts. You can view the activity status on the **Software Update** page. For more information about using the cnMaestro X UI and options available on the **Software Update** page, refer to the latest *cnMaestro User Guide*.

Tools

The **Tools** page contains the following tabs:

- Status
- Link Test (applicable only to BTS)

Status

The **Status** page displays device connection state (online or offline) for the BTS and a CPE. Figure 100 is an example of the CPE connection state

Figure 100: The Tools page for an individual CPE

🐌 Ca	mbium Networks │ cnMaestro [™] X		0	Þ	¢°	6		<u>ריי</u>	Administrator - POC_MAESTRO_ID
=	Q Search	CPE > CPE 1 Release 3.1.b5							¢
	Networks Wi-Fi AP Groups	Dashboard Notifications Configuration Details Performance Software Update Tools	Assists X						
1	✓ 🚱 System	Status							
<u>ы</u> х	✓ ♣• default	cnWave 56 Fixed							
扁	V 🗳 BTS LAB Rig 2	BTS LAB Rig 2 Downlink CPE 1 Release 31.b5							
•••	CPE 1 Release 3.1.b5	Online A Online							
<u>•</u>	CPE 2 Release 3.1.b6 - test	♦ 0 Uplink							
6	🔗 CPE 3 Release 3.1.b5	Inc. 23 (P00)							
	CPE 4 Release 3.1.b5	(manifalu)							
۵	𝒞 CPE 5 Release 3.1.b5	Throughput DL: 0.6 Kbps UL: 19 Kbps							
** >	𝒞 CPE 6 Release 3.1.b5								
	𝒞 CPE 7 Release 3.1.b5								
* >	🖉 CPE 8 Release 3.1.b5								

Use the \sim icon to download the Tech Support file, if required. To reboot the BTS or CPE device from the Tools page, use the 0 icon.

Link Test

The **Link Test** page allows you to test the links (uplink, downlink, or both), and analyze the link performance for a CPE. The test output helps in managing the traffic and troubleshooting the links for the selected CPE.

The **Link Test** page is available only when you select the BTS network on the left column, as highlighted in Figure 101.

To test the link performance of a CPE, perform the following steps:

- 1. On the Link Test page of cnMaestro UI, select the required CPE name from the CPE drop-down list.
- 2. In the **Duration** text box, provide an appropriate value (in seconds) to run the test.

The Duration parameter supports values from 0 to 60 (in seconds).

3. From the **Direction** parameter options, select the direction of transmission of the traffic that you want to test.

The Direction parameter supports the following options:

- Uplink
- Downlink
- Bidirectional

4. Click Start Test.

The Output section displays the test result, as shown in Figure 101.

Figure 101: The Links Test page - cnMaestro X UI

🜔 Ca	mbium Networks │ cnMaestro [™] X	💩 📌 🧬 🗐 😭 Administrator -
≡	Q. Search	BTS > BTS LAB Rig 2
♠	Networks Wi-Fi AP Groups	Dashboard Notifications Configuration Details CPEs Performance Software Update 10015 Assists X
_	V 🚯 System	Status Link Test
Щ <u>х</u>	✓ 🎶 default	"The Link Capacity Test measures the throughput of the RF link between the BTS and its CPE modules. The device's link test only utilizes the spare sector capacity for this test,
	🗸 🖕 BTS LAB Rig 2	therefore, sector traffic will not be disrupted. For the most accurate wireless link test results, it is best to run this test when there is no or very little customer data traffic being sent for
	CPE 1 Release 3.1.b5	the duration of the test." Learn more
<u>•</u>	🖉 CPE 2 Release 3.1.b6 - test	CPE*
	🖋 CPE 3 Release 3.1.b5	CPE 4 Release 3.1.05
	CPE 4 Release 3.1.b5	Duration*
	CPE 5 Release 3.1.b5	10
** >	🖉 CPE 6 Release 3.1.b5	¹ Direction
	CPE 7 Release 3.1.b5	Uplink Downlink Bidirectional
** >	🖒 CPE 8 Release 3.1.b5	Start Test
o >		Qutaut
5		Downlink Throughput: 315.858227 Uplink Throughput: 127.470019 Downlink Hilistion: 98
		Uplink Utilization: 99

You can also test the link capacity of a CPE using the B1000 UI (BTS). For more information, refer to the Link Capacity Test section.

Assists X

The Assists X page displays statistics of failed and passed events for the BTS and CPEs. Figure 102 is an example of failed and passed event statistics for BTS.

Figure 102: The Assists X page

🜔 Car	mbium Networks cnMaestro [™] X	@ 1 ⁹	📌 📽 🗗 🕫	Administrator - POC_MAESTRO_ID
	Q. Search Networks Wi-Fi AP Groups	IE BTS > BTS LAB Rig 2 Dashboard Notifications Configuration Details CPEs Performance Software Update Tools Assists X		Ø
•	 ♥ System ↓ default ↓ BTS LAB Rig 2 	Assists Score × Failed > Passed	⊕ Enabled	3/8
<u>♀</u> ⊚	び [™] CPE 1 Release 3.1.b5 び ^か CPE 2 Release 3.1.b6 - test び ^か CPE 3 Release 3.1.b5	Apply Filter(s) Status = Severity = Title	- Category	Export -
	CPE 4 Release 3.1.b5	Failed Major Ensure Privacy and Authentication Passphrases are not default O Failed Minor Ensure there is a certificate file installed O	Security	Wireless Management
\$ 	& CPE 6 Release 3.1.b5 & CPE 7 Release 3.1.b5 & CPE 8 Release 3.1.b5	Passed Major Ensure Privacy and Authentication types are selected 0 Passed Major Ensure RADIUS AAA is selected in CPE Provisioning 0	Security	Wireless
;	6	Passed Major Ensure at least one user account is configured for device administration O Passed Major Ensure read/write Passehrases are not default O	Security	Management Management
S		Passed ● Minor Ensure HTTP is disabled ○ Passed ● Minor Ensure SNMPy2c is disabled ○	Security	Management Management
			Showing 1 - 8 Total: 8 25 V	< Previous 1 Next >

Generating data reports

You can generate time-based data reports for cnWave 5G Fixed devices using the **Reports X** page in cnMaestro X UI. These reports help in administering and managing BTS and CPE devices.

To generate a data report, perform the following steps:

 On the home page of cnMaestro X UI, Select Monitor and Manage > default (under the Networks group) > Reports X.

The **Reports X** page appears, as shown in Figure 103.

Figure 103: The Reports X page in the cnMaestro X UI

🜔 Ca	mbium Networks │ cnMaestro™	х		(a)	P 🏥 🔊 🚬 🖓 🖶 Administrator 🕶
=	Q, Search	Networks > defau	ilt 🔨		۵
	Networks Wi-Fi AP G	roups Dashboard Notification	s Configuration Statistics	Software Update Clients Mesh Peers Assis	sts X
	🗸 🕄 System	Scheduled Complete	d		
Les .	🗸 🎶 default				
	V 🔆 BTS LAB Rig 2	Apply Filter(s)			Add New Data Report Delete
■	CPE 1 Release 3.1.b5	D ID Nam	e = Report Type	Schedule 👳 Starts At	Status Next Scheduled Time
<u>•</u>	CPE 2 Release 3.1.b	- test			
គ្នោ	🔗 CPE 3 Release 3.1.b	i			
	🗞 CPE 4 Release 3.1.b	i		No Data Available	
۵	🗞 CPE 5 Release 3.1.b!	i			

2. On the **Reports X** page, click **Add New Data Report**.

The **Reports > Add Report** page appears. This page allows you to select device-specific parameters and period (for example, daily or weekly) for generating a report.

3. Set the values for parameters, for example, as shown in Figure 104.

Figure 104: Parameters on the Add Report page

🌔 Ca	mbium Networks cnMaestro [™] X			🚳 🏴 🧬 🔡 😭 eperatoria	trator - STRO_ID
≡	Reports > Add Report				¢.
♠	Generate report for the "device time-based performant Note: This feature may generate a large file if many dev	ce data" as a comma-separated value (CSV) file. A vices are selected.	Il devices of selected type under the tree node will be inclu	ded in the export. Select all parameters that should be included.	
L.	Name*				
_	Performance				
	Description				
•	Test				
	Type*				
0	Performance	~			
<u>a</u>	Device Type				
	cnWave 5G Fixed	-			
\$ >	Mode				
• ¥ >	Select data to include in report				
1	- 🖌 Basic				
-	Connected CPEs	Device Mode	Device Name	Device Type	
5	V EVM	MAC	MCS	V Network	
	Timestamp	Registered CPEs	Rx Power	Throughput	
	V Tower				
	Schedule Now Daily Weekly Monthly (30 days)				
	Time Range Last Day Last Week Last Month Custo	om Time Range			
	Period ⊙ ○ 5 Minutes ● 1 Hour ○ 1 Day				
	③ Report generation may take several minutes, dependence	iding upon quantity of data.			
	Add Cancel				

Table 52 lists and describes the parameters on the Add Report page.

Table 52:	Parameters	for	generating	а	report
				_	

Parameter	Description
	Name of the report that you want to generate.
Name	This is a mandatory field.
	Provide an appropriate name in the text box. Example: Performance
Description	A brief description of the report.
	The report type that you want to generate.
	The following options are supported:
	• Devices
	Performance
	Active Alarms
Туре	Alarm History
	• Events
	Clients
	Mesh Peers
	Select the required report type from the drop-down list. This is a mandatory field.

Parameter	Description
	The device for which you want to generate the report.
Device Type	The value of this parameter must always be cnWave 5G Fixed .
	Select the device name from the drop-down list.
Mode	The device mode for which you want to generate the report.
node	Select BTS, CPE or both (if required).
	Check the device-specific parameters that you want to include in the report.
Select data to include in report	Example: Connected CPEs, EVM.
	The report, when generated, displays these parameters in CSV format.
	Time at when you want to generate the report.
	The following options are supported:
	• Now
	• Daily
Schedule	• Weekly
	Monthly
	Choose the option.
	Note : When you select Daily, Weekly, or Monthly, ensure to specify the start date, start time, end, and number of occurrences (1-100). For more details on the schedule specific options, refer to the latest cnMaestro User Guide .
	The time range for which you want to generate the report.
	The following options are supported:
	• Last Day
Time Range	• Last Week
	Last Month
	Custom Time Range
	Choose the required time range.
	Duration for which you want to generate and view the report.
	The following options are support:
Period	• 5 Minutes
	• 1 Hour

Parameter	Description
	• 1Day
	Choose the required period.

4. Click Add.

The report is scheduled, processed, and generated. The **Reports X** page displays the status while generating the report, as shown in Figure 105.

Figure 105: The report scheduled status

() c	ambium Networks	cnMaestro [™] X										s 📌	ţ,	6	5	Ç! <mark>9</mark>	O Admin	nistrator - IAESTRO_ID
≡	Q, Search		Network	ks > default														¢
	Networks	Wi-Fi AP Groups	Dashboard	Notifications	Configuration	Statistics	Reports X	Software Update	Clients	Mesh Peers	Assists X							
	∽ 🚱 System		Scheduled	Completed														
<u>ы</u> с	> 🎶 default																	
_			Apply Filter(s	5)								-			A	d New Dat	a Report	Delete
▦			D	Name	-	Report	Туре	Schedule	⇒ Sta	arts At		Status		Ne	xt Schedu	uled Time		
<u>•</u>			07	Performan	ce O	Data	Performance	Now	11 /	Aug 2023, 12:36 F	м	Processin	g 🎇	11.4	Aug 2023,	12:36 PM		0
ត្រា													Showing	1 - 1 Total: 1	10 🗸	< Pre	vious 1	Next >

5. To download and view the report, select the **Completed** tab on the **Reports X** page.

The **Reports X** page displays all reports that are scheduled, as shown in Figure 106.

Figure 106: The Completed tab on the Reports X page

🜔 Ca	mbium Networks	cn Maestro ™ XI								P 🕂 🐨	௺ 🦨 😁 Adm	MAESTRO_ID
≡	Q. Search		Networks >	default								0
♠	Networks	Wi-Fi AP Groups	Dashboard Noti	ications Configura	tion Stati	stics Reports X Sc	ftware Update	Clients Mesh Peers	Assists X			
	🗸 🔞 System		Scheduled Co	mpleted								
Ш.	> 🎶 default		Analy Filter(a)									Delete
			Apply Pilter(s)									Delete
••••			D	Name	= Repo	rt Type	Schedule	= Created By		Status	Generated On	\sim
<u>•</u>			7	Performance	O Data	Performance	Now	Administrator		 Completed 	11 Aug 2023, 01:37 PM	(F) 🗵
۲			6	Performance	O Data	Performance	Now	Administrator		Completed	11 Aug 2023, 01:01 PM	± 🖻
0			5	Performance	O Data	Performance	Now	Administrator		Completed	11 Aug 2023, 12:58 PM	业 🖻
-			4	Performance	O Data	Performance	Now	Administrator		Completed	09 Aug 2023, 06:30 PM	N 🕁 🖻
÷.			: 🗆 3	Performance	O Data	Performance	Now	Administrator		 Completed 	09 Aug 2023, 05:44 PN	小山前
** >			2	Performance	Data	Performance	Now	Administrator		Completed	01 Aug 2023, 10:49 PM	± 🖻
< 🖬			0 1	Performance	Data	Performance	Now	Administrator		Completed	31 Jul 2023, 06:16 PM	1
5										Showing 1 - 7 Total:	7 10 🗸 < Previous 1	Next >

You can also view the same report using the **Administration > Jobs > Reports X** page.

6. Use the 🕁 icon to download the data report (in .xls format).

You can view and modify this report locally.

Appendix 2: Acronyms and Abbreviations

Table 53 lists acronyms and abbreviations used in this guide.

Table 53: List of acronyms and abbreviations

Term	Definition
5G NR	5G New Radio (From Release 15, the 3GPP consortium refers to the air interface as 5G New Radio)
BTS	Base Transceiver Station
CIR	Committed information rate
C-RNTI	Call-Radio Network Temporary Identifier
CIR	Committed information rate
CPE	Customer Premise Equipment
dBm	Decibel relative to a milliwatt
DNS	Domain Name System
DL	Downlink
EIRP	Effective Isotropic Radiated Power
ESN	Electronic Serial Number
EVM	Error Vector Magnitude
FQDN	Fully qualified domain name
GHz	Gigahertz
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
LoS	Line of Sight
LPU	Lightning Protection Unit
MAC	Media access control
MCS	Modulation and Coding Scheme
MHz	megahertz
MSN	Manufacturer Serial Number
MU-MIMO	Multi- user multi-input-multi-output (MU-MIMO)
ms	Millisecond
NTP	Network Time Protocol
OFDMA	Orthogonal Frequency Division Multiple Access
ODU	Outdoor Unit

Term	Definition
PC	Personal computer
PDSCH	Physical Downlink Shared Channel
PDCCH	Physical Downlink Control Channel
РМР	Point-to-MultiPoint
POC	Proof of Concept
PoE	Power over Ethernet
PPS	Pulse Per Second
PSS	Primary Synchronization Signal
PSU	Power Supply Unit
PUSCH	Physical Uplink Shared Channel
PUCCH	Physical Uplink Control Channel
QAM	Quadrature Amplitude Modulation
QoS	Quality of Service
QPSK	Quadrature Phase Shift Keying
RF	Radio Frequency
RACH	Random Access Channel
RADIUS	Remote Authentication Dial-In Service
RSSI	Receiver Signal Strength Indication
SFP	Small form-factor pluggable (transceiver)
SIM	Subscriber Identification Module
SI-RNTI	System Information-Radio Network Temporary Identifier
SNR	Signal-to-Noise Ratio
SKU	Stock Keeping Unit
SNMP	Simple Network Management Protocol
TDD	Time Division Duplexing
UI	User Interface
UL	Uplink
VLAN	Virtual Local Area Network

Cambium Networks

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Installation and Configuration Guides	http://www.cambiumnetworks.com/guides
Technical training	https://learning.cambiumnetworks.com/learn
Support website (enquiries)	https://support.cambiumnetworks.com
Main website	http://www.cambiumnetworks.com
Sales enquiries	solutions@cambiumnetworks.com
Warranty	https://www.cambiumnetworks.com/support/standard-warranty/
Telephone number list to contact	http://www.cambiumnetworks.com/contact-us/
Address	Cambium Networks Limited, Unit B2, Linhay Business Park, Eastern Road, Ashburton, Devon, TQ13 7UP United Kingdom

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