Out of Band (OOB) interface

Out of band (OOB) management interface to access the device. Management VLAN is bypassed, and data traffic will not be routed or bridged on this interface. The OOB management interface is supported at PoP. A separate IPv4 address should be configured by bypassing the Management VLAN. Navigate to **Configuration** > **Nodes** > **Networking** > **OOB** and select the required option. Enter the IPv4 address and Subnet Mask to access the device.

Figure 176:	The OCB	section in	the	Networking	page
-------------	---------	------------	-----	------------	------

1	Configuration Network Nodes	
6	Q, Search	Radio Networking VLAN Security Advanced
	Por VSK 884555	Hulti-PoP / Relay Port
۵ ۲	OH-V5K-3M8	Multi-Fod / Relay Part Interface ○ Aux ○ Munit ○ Four ○ FOP Weed interfaces on which Equivity is unit. Should lise cond when DNs are connected leark to leak and on FoPs in a multi AP released.
) 11 6		COB CCOB COB COB
•		Pro4.Address 10.110.106.179 Subret Mask
		235.255.255.0

Enabling the DHCP Option 82 feature

When the **DHCP Option 82** feature is enabled, 60 GHz cnWave intercepts DHCPv4 REQUEST and DISCOVER packets and inserts option 82 fields.



Note

This feature is supported in the L2 bridge mode.

In addition, you can also configure **Circuit ID** and **Remote ID** fields. Use the following wildcards to configure **Circuit ID** and **Remote ID** fields:

- \$nodeMac\$ MAC address of the node in ASCII format without colons. This is a default option.
- \$nodeName\$ Topology name of the node.
- \$siteName\$ Name of the site.
- \$networkName\$ Network name as shown in cnMaestro.

Multiple wildcards can be combined with a : delimiter. Total length of the option (after replacing wildcards with corresponding values) is truncated to 120 characters. You can also configure a custom string, which must not start with a \$ character. For example, a customer's phone number.



Note

You cannot use the customized string and predefined wildcards together as a single sub option (Circuit ID / Remote ID).

To enable the DHCP Option 82 feature, perform the following steps:

1. Navigate to Nodes > Networking from the home page.

The **Networking** page appears. The **DHCP Option 82** feature is available in the Layer 2 Bridge section, as shown in Figure 177.

Configuration		
N	Refer services VLAN Develop Advected	
ති වසාසුකා ති වසාසුකා ති වසාසුකා	Elimente Paris Dinato Inac Similario (An Similario (An Similario (An Dinato) Dinato Dina	0
	Support allows as inserting investment interest in some factors of pharmonic for Support allows as inserting insertion in interest interesting and	•

Figure 177: The DHCP Option 82 feature

The enabled status of DHCP Option 82 implies that the feature is activated.

- 2. Type appropriate values in Circuit ID and Remote ID text boxes.
- 3. To save the configuration, click **Submit**.

Configuring Monitor PoP Interface

The Monitor PoP Interface feature is applicable to static routing and Layer 2 bridge.

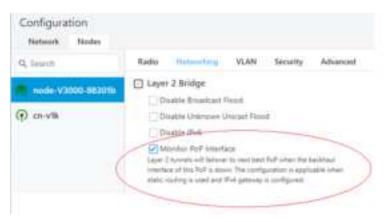
When the feature is enabled, the PoP interface is monitored. If the PoP interface is down, tunnels move to the next best PoP (which is best available). When there is no activity on the PoP interface, an attempt to reach the IPv4 gateway is made. Therefore, the IPv4 gateway configuration is necessary to activate this feature.

To configure the Monitor PoP Interface feature, perform the following steps:

1. Select Nodes> Networking in the home page.

The **Networking** page appears. The **Monitor PoP Interface** check box is available in the Layer 2 Bridge section, as shown in Figure 178.

Figure 178: The Monitor PoP Interface field



2. Select the Monitor PoP Interface check box to enable the feature.

VLAN tab

Data VLAN

The following 802.1Q features are supported per port:

- Adding single VLAN tag to untagged packets
- Adding QinQ/double-tag to untagged packets
- Adding QinQ outer tag to single tagged packets
- Transparently bridge single/double-tagged packets (default behavior)
- Remarking VLAN ID
- Remarking 802.1p priority
- Option to allow only the selected range of VLAN IDs
- Option to drop untagged packets
- Option to drop single tagged packets
- Option to select the ethertype of the outer tag

These options are per Ethernet port.

Note



VLAN configuration is applicable only when Layer2 bridge is enabled.

Port Type

Figure 179: The port types



Transparent

By default, the Ethernet port is in transparent mode. Packets will be transparently bridged without any 802.1Q processing.

Q

Q mode allows adding a single C-VLAN tag to untagged packets.

Figure 180: Native VLAN ID and priority

23	
Allowed range is 1 - 4094	
Native VLAN Priority	
2	

Native VLAN ID and priority fields define the C-VLAN tag properties.

Figure 181: Allowed VLANs



Allow only the listed range of VLAN IDs.

Figure 182: Untagged types



This option allows dropping untagged packets. Native VLAN properties are not necessary to fill when untagged packets are dropped.

QinQ

QinQ mode allows adding a double tag to untagged packets and outer S-VLAN to single-tagged packets. Figure 183: Native C-VLAN ID and priority

Native C-VLAN ID	
23	
Allowed range is 1 - 4094	
Native C-VLAN Priority	
Allowed range is 0 - 7	

These are the C-VLAN tag properties of added tag.

Figure 1	184:	Native	S-VL	AN ID	and	priority
----------	------	--------	------	-------	-----	----------

Native S-VLAN ID	
34	
Allowed range is 1 - 4094	
Native S-VLAN Priority	
Allowed range is 0 - 7	

These are the S-VLAN tag properties of the added outer tag.

Figure 185: Untagged and Single tagged packets



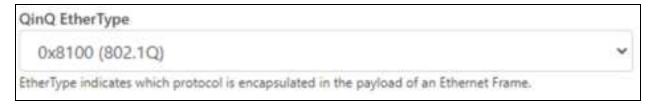
In QinQ mode, the above options allow dropping untagged/single-tagged ingress packets. Native C-VLAN fields are not necessary only when dropping single-tagged packets. Native S-VLAN fields are not necessary when dropping untagged and single tagged packets.

Figure 186: Allowed VLANs

Allowed VLANs	
2	
List of allowed VLANs. Comma separated, and/or range. e.g 100, 210-220. Filter based on outer tag.	

Allow only the listed range of VLAN IDs. VLAN ID of the outer tag is used for this check.

Figure 187: QinQ EtherType



QinQ EtherType is used while adding an outer tag. There are no other checks for EtherType.

Figure 188: VLAN ID Remarking

VLAN Remarking		
Ingress VLAN	Remark VLAN	
10	100	1 0
Add New		

VLAN ID of the ingress packet is remarked. In the above example, if a packet with VLAN ID 10 enters an Ethernet port, it is remarked to 100. In the egress path, the reverse remarking occurs. VLAN ID 100 is remarked to 10 and egresses the ethernet port.

The VLAN ID of the outer tag is used for remaking. For a double-tagged packet, S-VLAN ID gets remarked and for a single-tagged packet, C-VLAN 1D.

802.1p overriding

Priority field in the (outer) VLAN tag of ingress packet can be overwritten using this option.

Figure 189: VLAN Priority Override

VLAN Priority Override		
Ingress VLAN	Override Priority	
20	7	1 🗵
Add New		

Priority field in the (outer) VLAN tag of ingress packet can be overwritten using this option.

Management VLAN

A Single tag or double tag can be added to Management traffic.

Figure 190: The Management section

] Man	agement
🖲 Er	nabled 🔘 Disabled
VLAN	ID
2	
Allowe	ed range is 1 - 4094
VLAN	I Priority
1	
Allowe	ed range is 0 - 7
A	dd Outer Tag
S-VL	AN ID
3	
Allows	ed range is 1 - 4094
S-VL	AN Priority
2	
Allowe	ed range is 0 - 7

Security tab

In the Security tab, enter Private key password and Radius user password.

- Private key password
- Radius user password

Figure 191: The Security tab

	Configuration Solution Audio		
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		Radial and pressent	
-		And an advantage	
*			
-			

Controller GUI configuration

This Controller GUI configuration to be made on each DN.

Figure 192: Elements specific to Controller configuration

Configuration				
Network Noder				
Q, Search	Radio	Networking	Security	Advanced
POP		ser identity		
OP ON	test Private ke	ry password		
	Radius Priv	rate key password		
	Radius us	ser password		
	*******	**		
	Radius use	a buseword		

Node GUI configuration

Figure 193: Elements specific to node configuration

Private key paratent d	

Radius Prosts way parameter	
Radius perver shared secret	

Autice cost passions	
Radia are present	
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Note

Both the configurations are important for a successful authentication.

RADIUS Server configuration

Any RADIUS server can be used for authentication. Perform the following steps to configure the RADIUS Server:

- 1. Ensure RADIUS packets from IPv6 subnet (i.e., lo IP subnet is accepted in RADIUS configuration).
- 2. Configure EAP-TLS for RADIUS Server and setup server certificate, key.



Server certificate is signed by CA uploaded in node configuration.

3. Set the CA certificate which signed the client certificate installed on each node.

Advanced tab

These settings are for advanced users only.

Note



Caution

Users are not recommended to do these settings.

Figure 194: Advanced tab

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Configuration				
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	ana/house Mc144, 0199, 20000	ariana		3-1
	10/mm/6/.405	and a later of a	AD A COUNTRY OF THE PARTY	0.01
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	sigher-life (mt.)	- 244		0.01

Configuration options under **Network > Advanced** and **Node > Advanced** are for advanced users who understand the cnWave configuration model well. It is not recommended to use these options. Shows the merged configuration from the Base layer to the Network override layer.

cnWave is based on Facebook's Terragraph architecture. It follows a layered configuration model, with a node's "full" configuration computed as the union of all layers in the following order:

- Base configuration The default configuration, which is tied to a specific software version and is included as part of the image. The controller finds the closest match for a node's software version string and falls back to the latest if no match was found.
- Firmware-specific base configuration The default configuration is tied to a specific firmware version, which is also included as part of the image. Values are applied on top of the initial base configuration layer.
- Hardware-specific base configuration The default configuration is tied to a specific hardware type, which is also included as part of the image. Each hardware type supplies configuration that changes with software versions. Values are applied on top of the firmware-based configuration layer.
- Automated node overrides Contains any configuration parameters for specific nodes that were automatically set by the E2E controller.
- Network overrides Contains any configuration parameters that should be uniformly overridden across the entire network. This takes precedence over the base configuration and automatic overrides.
- Node overrides Contains any configuration parameters that should be overridden only on specific nodes (e.g. PoP nodes). This takes precedence over the network overrides.

The E2E controller manages and stores the separate configuration layers. The cnWave nodes have no knowledge of these layers, except the base configuration on the image. The nodes copy the latest base version (via natural sort order) if the configuration file on disk is missing or corrupt.

Click **Submit** to apply the changes.

Operation

Software upgrade

The **Software Upgrade** page is used to upgrade the installed software. This page contains the following three tabs:

- Node Upgrade to upgrade the node
- Images to upgrade the software images
- Node Upgrade Status displays the upgrade status

To upgrade a node, perform the following steps:

1. From the main dashboard page, click **Software upgrade** on the left navigation pane.

The **Software Upgrade** page appears, as shown below:

Red	iare Upgrade									e \varTheta admine
0	r üpgesde image	Node Upgrade								
R	arth		0							
	Hame	Model	Type	Alive?	Site	PuP Node	Upgrade Status	Reason	Image Version	Next Vession
s 🗆	PoP-VSR-804838	V5000	DN	Tes	Pair-site V58-8848	'West	NONE		1.2	
	DN-V5K-SRIP	V5000	DN	Tes	Dis Shell 3989	780	NONE		1.2	
•					- 6 K 5 X	a 10 x				
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<u>^</u>										
6										

By default, the Node Upgrade tab is selected.

2. In the **Node Upgrade** page, select the required device for which you want to upgrade the node and click **Prepare** (as shown below).

Soft	tware Upgrade							Ø Dudo	etit Cardoller 🕚 Mala	est 🔒 admin
9.1	de Lipgrade Imag	en Node Lipp	e e						Property	e Cannit Re
	Name	Model	Type	Allow?	Site	Per Node	Upgrade Status	Reason	Image Version	Next Version
0	PoP-V58-804538	V5800	DN	-	PoP-site-158-8848	101	NONE		14	
	ON-VOLUME	V5000	DN	-	DN:57x-03589	760	NONE		1.2	
					AL 4 1	a 10 v				

The **Prepare Nodes** dialog box appears.

3. In the Prepare Nodes dialog box, select the required image file for the node and click Save.

You can also set additional options, if required, such as Upgrade Timeout, Download options, and Download Timeout.

- 4. Click **Commit** to upgrade the node.
- 5. To upgrade the software image, click on the **Images** tab in the **Software Upgrade** page.

The Images page appears, as shown below:

Figure 195: The Images page

٥	SECPE ONRATE 1500		O Dada CH Controller	🗇 helsool 🛛 🤁 admin +
	Software Upgrade			
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æ	v8000-v8000-upge0-1.2.188.img	V5000,V1000		8
٠	v1000-apgrd-1.2.100 ing			
٠				
•				
×				

6. In the Images page, click Upload Image.

You must browse and select the required image file from your machine. Example: Software image or package (cnWave60-<release>.tar.gz). The selected image file gets uploaded.

You can also delete an existing image file in the **Images** page.

7. To view the node upgrade status, click on the **Node Upgrade Status** tab in the **Software Upgrade** page.

The Node Upgrade Status page appears, as shown below:

Figure 196: The Node Upgrade Status page

۲	62 GF3 - 21Mare** 12220			ø	Diable C.H. Cantraller 🛛 Reboot	e strin-
	Software Upgrade					
0	Node Lipgrade Images	Node Upgrade Status				
R	Nodes in Current Batch					Root (pgrade
-	Name	Ripprode Station	Upgrade Request 10	Carrent image Version	Next image Newlon	
•••	No Data					
۰						
٠	Nudes in Pending Balch					
83	Name No Data	Upgrade Status	Upgrade Request 10	Carrent image Version	Next Image Tersion	
×			a a <mark>1</mark> a a 24			

You can view the upgrade status for the required device nodes.

Events

The **Events** page displays the running and competed tasks list and these events can be exported. To export the event list click **Export**.

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Statistics

The **Statistics** menu contains the following options:

- <u>Links</u>
- Ethernet
- <u>GPS</u>
- Radio
- Performance
- Prefix Zone Statistics
- Engineering
- Border Gateway Protocol (BGP)

Links

The **Links** page has Uplink and Downlink statistical data. It displays TX and RX data of the nodes from A to Z and Z to A.

Figure 197: The Links page

0	10 10 10 contract ** cont														1.0	to make a	e	all ill +
=	Statistics															-		
8	Units Ether	nt 521 8	ada Perbana	1 1/5	862												erden fi	white:
13 48	Link Name	A-Node	Z. Rende	8551	Link Fade Margin	Ra SPAR	Ra MCI	NX P88	RX Door Beams	73 Passar Index		TH MICS	TX PER	TX Soar Baarna	RJ Srran	RX Framm		TX Promos
٠	344-maile-1/92-	1204 Million	220476 and the	-14	148	18			100	31	25			12	10	1122		this
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*							1	10	- 10 -									
*																		

The Links page displays the following elements:

Elements	Description
Link Name	Link name
A-Node	Initiator Node
Z-Node	Responder Node
RSSI	Receiver Signal Strength Indicator
Link Fade	The statistic value (in dB) available for each RF link
Margin	The Link Fade Margin statistic values help operators to quickly assess any additional system gain or low marginal RF links (if any), which must be addressed.

Elements	Description
	The Link Fade Margin statistic value calculation is based on:
	Checking the RSSI received from a remote transmitter,
	 Assessing the availability of TX power (from the remote transmitter), and
	 Considering the RSSI value that is calculated based on how far away it is from an established receiver sensitively floor of -72 dBm.
Rx SNR	Signal to Noise Ratio
Rx MCS	Modulation Code Scheme of Receiver
RX PER	Receiver packer error rate
RX Scan Beams	Receiver scan beam index
TX Power Index	Transmitter power index
EIRP	The Effective Isotropic Radiated Power (EIRP) value.
TX MCS	Modulation Code Scheme of Transmitter
TX PER	Transmitter packer error rate
TX Scan Beams	Transmitter scan beam index
RX Errors	Receiver errors
RX Frames	Receiver frames
TX Errors	Transmitter errors
TX Frames	Transmitter frames

Ethernet

The **Ethernet** page displays Transmitting and receiving data of the nodes.

Figure 198: The Ethernet page

Statistics	(Treesed)	015.1.948	0.000	ana inda	2000) (8	Network C	904					- Country	-
Q. Second				0								An	177
Doorse Name	Berts Robel	-Dates	RA Factorite	CC/admin	#11 Bytes	7779/10	Rit Green	Ti linee	ni Oroppeli	TR Dropped	 11,000	AX Trengt god	13 Teneptpe
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Personal South	98000°	(Deel)	1	8.1					0		 - 0	0.000	1.000
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0446Fh.	, 1200	(Date)			6		1.0		4			diam'	1104
						-	1						

The following elements are displayed in the **Ethernet** page:

Elements	Description
Device Name	Name of the device
Status	Ethernet link status
RX Packets	Receiver packets
TX Packets	Transmitter packets
RX Bytes	Receiver bytes
TX Bytes	Transmitter bytes
RX Errors	Receiver errors
TX Errors	Transmitter errors
RX Dropped	Receiver dropped
TX Dropped	Transmitter dropped
RX PPS	Receiver Packets Per Second
TX PPS	Transmitter Packets Per Second
RX Throughput	Receiver throughput
TX Throughput	Transmitter throughput

Table 46: Elements in the Ethernet page

GPS

The **GPS** page displays geographical data of the nodes.

Figure 199: The GPS page

Statistics						_	
Links Ether	net OP5 Radio Performa	nce Preta Zanes	Engineering BOP			Dos	reload Statisti
Device Name	MAC Address	Fix Type	Satellites tracked	Latitude	Longitude	Height	
D128PoP2830	20 00.04 56 88 30.00	30	17	12° 56' 2.139' N	77° 41' 39.996° E	931.m	
Pim-PoP@3000	1 00.0456.8030.0:	30	17	12° 56' 2.130' N	77° 41' 29.904' E	901 m	
DN1@PoP2@30	00.04.56.88.30.00	30	17	12° 90' 2.149" N	77° 42° 39.930° 8	531 m	
Disgronagoo	00.04 56 50 30.94	30	17	12° 96' 2.130' N	77° 41' 39.036' E	602 m	
DH4@PoP2@30	01:04:58:88:30:17	30	18	12* 56' 2.144" N	77° 41' 39.936' E	932 m	
			a a 1 > 20	90 -			

The following elements are displayed in the GPS page:

Table 47: Elements in the GPS page

Elements	Description
Device Name	Name of the device
MAC Address	MAC address of the device
Fix Type	GPS fix type. The fix status indicates the type of signal or technique being used by the GPS receiver to determine its location. The fix status is important for the GPS consumer, as it indicates the quality of the signal, or the accuracy and reliability of the location being reported.
Satellites tracked	The number of satellites tracked
Latitude	Latitude of the device
Longitude	Longitude of the device
Height	Height of the device

Radio

勳

The **Radio** page displays the radio data of the nodes.

Figure 200: The Radio page

Statistics								
cree - Ethereti	UTS Fails	Pederare 7	Pertu Datas - Prope	wing the				-
Sents have	MAL ARTIST	Spec Mode	Unarrial	Security	tive Association	Owner Law State	Alt Throughput.	TX THE APPLICA
794384-910/899	stricture and	876	18.000	796	.6		2 / Télen	Tafé Mapi
19/2819-010-0010	22.0434-0420-00	dares .	1.8	1104		1.0	138460	121.001 (100.00
Prim Fall(8100),1	120426-0626-0	395	10	904			12.43 Higs	12,74 Keys
Here Part (\$ \$600,)	121010-0620-01	12/16	1.8	1100	.0		38.00 mps	LL HI Mark
10120-01200	prochaminero.	10%	- 14	inter.			10101000	11A/mpt
Delignment and	222444666	Apres.	1.4	trpe	.0.	0.0	(0.47 Mpt	3,40 48pt
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(81427-814297)	1010410-0010011	1419	18	194			6.00 sheet	0.14 Marc
and the second second second					(a) 10 (c)			

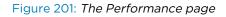
The **Radio** page has the following elements:

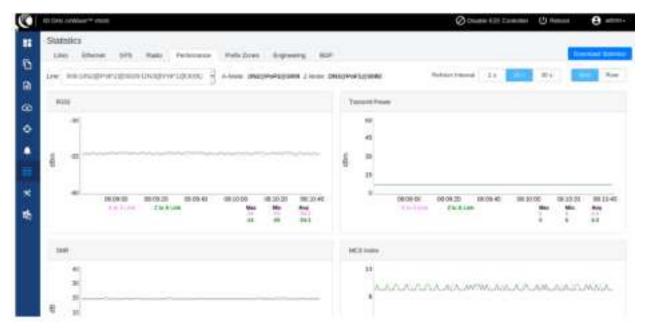
Table 48: Elements in the Radio page

Elements	Description
Device Name	Name of the device
MAC Address	MAC address of the device
Sync Mode	 GPS sync: Entry condition: Valid samples from GPS have been received for a few consecutive seconds (typically 2 seconds). Exit condition: Valid samples from GPS have not been received for a few consecutive seconds (typically 10 seconds).
	 RF sync: Not in "GPS sync", but is reachable to a DN with "GPS sync" over wireless links (1-2 hops away). Entry condition: Conditions for "GPS sync" have not been met, but a link exists to at least one other DN from which to derive timing. Exit condition: Conditions for "GPS sync" have not been met and no links to other DNs exist from which to derive timing. No sync: Neither in GPS sync nor RF sync. This is the default state. Entry condition: Conditions for "GPS sync" or "RF sync" are not met.
	• <i>Exit condition</i> : Condition for "GPS sync" or "RF sync" are met.
Channel	Operating channel
Security	Security type
Error Association	Error Association
Channel Last State	Channel Last State
RX Throughput	Receiver throughput
TX Throughput	Transmitter throughput

Performance

The **Performance** page displays the performance graph.





The **Performance** page contains the following graphs:

Table 49:	Elements	in the	Performance	page
-----------	----------	--------	-------------	------

Elements	Description
RSSI	Receiver Signal Strength Indicator. It is a measurement of the power present in a received radio signal
Transmit Power	Transmitting power
SNR	Signal to Noise Ratio
MCS Index	Modulation and Coding Scheme (MCS) Index Values can be used to determine the likely data rate of your wireless connection. The MCS value essentially summarizes the number of spatial streams, the modulation type and the coding rate that is possible when connecting your wireless access point.
Packet Error Ratio	Packet error ratio. It is the ratio, in percent, of the number of Test Packets not successfully received by the node to the number of Test Packets sent to the node by the test set.
Received Frames	The number of frames received at the node.
Transferred Frames	The number of frames transferred from the node.

RSSI graph

Figure 202: RSSI graph



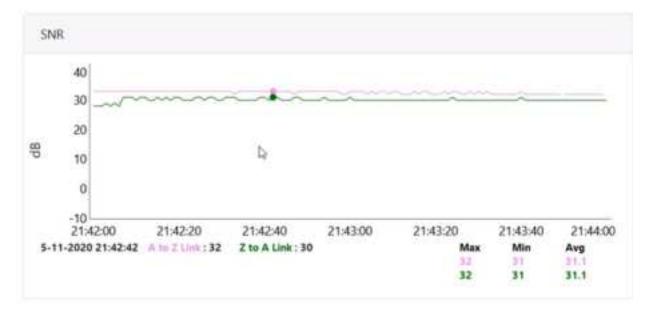
Transmit Power graph

Figure 203: Transmit Power graph



SNR graph

Figure 204: SNR graph



MCS Index graph





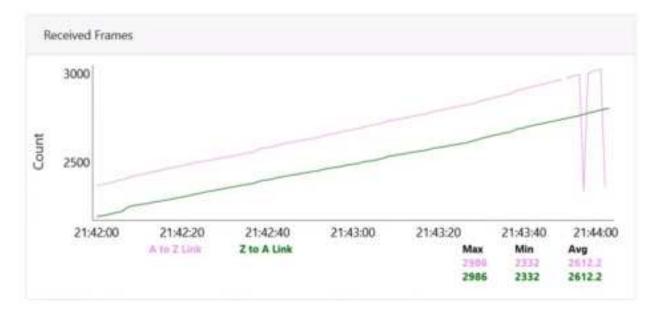
Packet Error Ratio graph





Received Frames graph

Figure 207: Received Frames graph



Transferred Frames graph

Figure 208: Transferred Frames graph



Prefix Zone Statistics

When a **Deterministic prefix** is enabled and in the multi-PoP deployments, the mesh is divided into prefix zones. Prefix Zone statistics are available on the **Statistics > Prefix Zone** page.

Figure 209: The Prefix Zones page

Engineering

The **Engineering** page displays the engineering information of the system and sector.

Figure 210: The Engineering page

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Border Gateway Protocol (BGP)

The BGP is the protocol used throughout the Internet to exchange routing information between networks. It is the language spoken by routers on the Internet to determine how packets can be sent from one router to another to reach their final destination. BGP has worked extremely well and continues to the be protocol that makes the Internet work.

The **BGP** page displays the routing information. This page also contains the details of routes advertised by PoPs to their peers and the routes received by the peers.

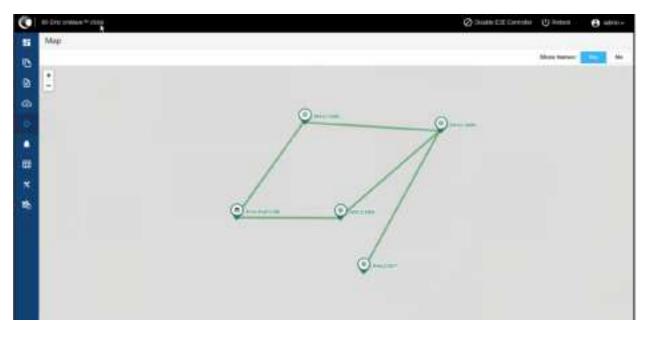
Figure 211: The BGP page

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Maps

The **Maps** page displays the topology and location/sites of the deployed nodes in the cnWave network. Click the **Maps** icon on the left panel to display the nodes.

Figure 212: The Map page



Tools

The **Tools** menu contains **Factory Reset** and **Logs** options. Factory Reset is used to set the default settings.

Figure 213: The Factory Reset page

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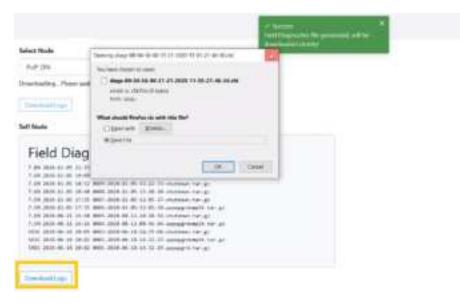
The **Field Diags** tab is used to view and download the error logs. To download the DN logs, select the DN node from the **Select Node** drop-down and click **Download Logs** (as shown below).

Figure 214: The Field Diags page



To download the logs for self node, click **Download Logs** at the bottom and save the log file.

Figure 215: Saving log files



Antenna Alignment

The Antenna Alignment tool assists in optimizing the alignment of V3000 to V3000, V5000, or V1000. This feature helps you to install and align the devices to achieve optimal performances.



Warning

The antenna alignment tool is not a substitute for optical alignment. The optical alignment is the key to get the signal within the +/-2 degree azimuth and +/1 degree Elevation window. At this window level, the tool can be used to get away from the edge, corner or spurious beams to ensure optimal alignment.

Prerequisite tasks:

- Complete a Link Plan with the help of a Link Planner from Cambium Networks. This prerequisite task provides the information on the RSSI expected for the PTP link. This must be used as target while using the antenna alignment tool.
- Enter the PTP topology in cnMaestro or in the UI of a device (with the Onboard Controller on it). Then, ensure that the following tasks are performed:
 - Creating two Sites and nodes.
 - Setting up the wireless link between the two nodes.
- Ensure that the nodes are already mounted at the sites.
- An installer must have access to the UI of the device.

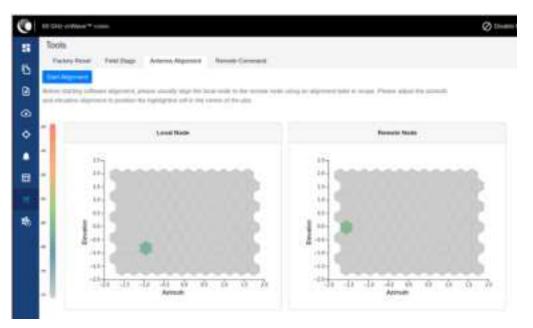
Using the Antenna Alignment tool

To use the Antenna Alignment tool, perform the following steps:

1. From the landing page of the device UI, navigate to Tools > Antenna Alignment.

The Antenna Alignment page appears, as shown in Figure 216.





9

Note

If the alignment is initiated from a CN, ensure that the operating channel is set on the radio (before alignment). If the channel is not set, you must set the required channel in the **Configuration** page of the V3000 single node UI.

2. Click the Start Alignment button located at the top left side of the Antenna Alignment page.

The **Confirm** message box appears (as shown in Figure 217), indicating that the link ignition will be disabled. For running the antenna alignment tool, the auto ignition needs to be disabled. If a link has been established already, it is disassociated at this level.

Figure 217: The Confirm message box in the Antenna Alignment page

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3. In the Confirm message box, click Continue to start the antenna alignment process.

The antenna alignment process begins.

Note

If the alignment is initiated from a device (which is not running with Onboard Controller), perform the following actions:

- a. Disable the ignition of the link at the Controller.
- b. Send Dis-assoc for the link from the Controller.
- c. When the alignment starts, select the required node from the **Remote Node Model** drop-down list.

The Time Frame section populates the RSSI time series as shown in Figure 218.

Figure 218: The RSSI time series



Following details explain about the RSSI time series that populates in the Antenna Alignment page:

- The Local Node section (located at the left side of the Antenna Alignment page) displays the direction of arrival angle with respect to the local (PoP) device.
- The **Remote Node** section (located at the right side of the Antenna Alignment page) displays the direction of arrival angle with respect to the remote device.
- In Local Node and Remote Node sections, a cell marks the direction of arrival. The color of the cell represents the RSSI based on the heatmap scale given on the left side.
- The **Time Frame** section (located at the bottom of the Antenna Alignment page) displays the RSSI time series, along with the peak RSSI time and the latest data point (on the right end of the plot).

The RSSI time series and the heatmap plots get updated in every six seconds. This is due to the processing time taken for a complete sweep of all the combinations of beams and channels.

During the alignment phase, the transmit power used is the maximum configured power and the transmit power control is disabled.



Note

If the installer has enabled the short-range installation in the radio configuration, the transmit power control is set to the minimum configured power.

4. Adjust the optimal RSSI that must be reached when the beams are close to the central region, as shown in Figure 219.



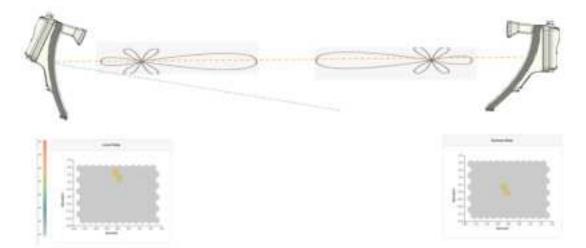
Figure 219: The optional RSSI alignment

The RSSI time series must be close to the Link planner's predicted RSSI, with an error of +/-5dB. Consider the following points when adjusting the optional RSSI:

- If the time series reporting RSSI is more than 10dB from that of the Link Planner's expected RSSI, then the device has been aligned incorrectly and is being picked up by the sidelobes or spurious beams.
- If a cell is highlighted and the time series reporting RSSI is more than 10dB off the expected RSSI, then it is necessary to sweep beyond the current position of both azimuth and elevation, in turn to ride past the sidelobes.
- 5. Make use of the direction of arrival information (if there is any elevation or azimuth mismatch) to physically align the radio antennas.

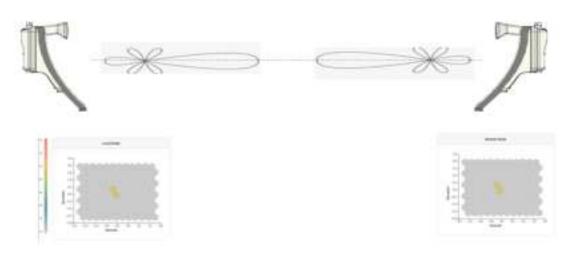
• When there is an elevation mismatch (as shown in Figure 220):

Figure 220: Example of the elevation mismatch



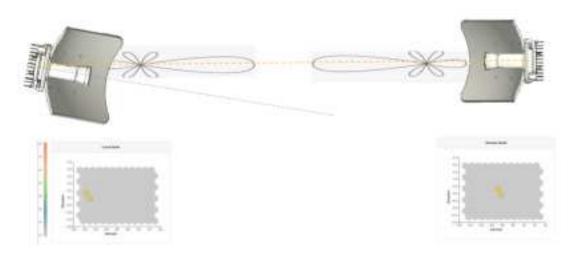
In Figure 220, the angles are exaggerated to show the point. In this example, consider that the radio has been misaligned by a down-tilt of 2 degrees behind the unit (from an installer's view side). This means that the angle of the beam selected might be in the +2 degrees direction in the elevation due to beamforming. The aim is to get the optimal boresight beam. Therefore, the radio must be up tilted in the elevation direction by 2 degrees. The selected beam is now closer to the boresight beam, as shown in Figure 221.

Figure 221: On correcting the elevation mismatch



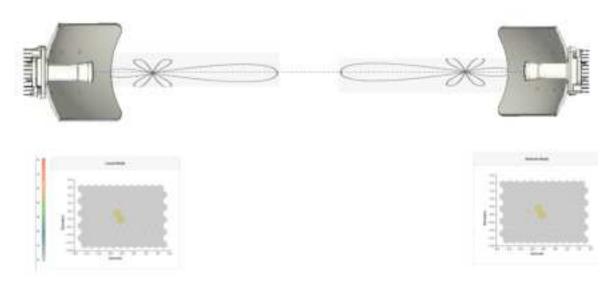
• When there is an azimuth mismatch (as shown in Figure 222):

Figure 222: Example of the azimuth mismatch



In Figure 222, the angles are exaggerated to show the point. In this example, consider that the radio has been misaligned in azimuth by 2 degrees to the right behind the unit (from an installer's view side). This means that the angle of the beam selected might be in the -2 degrees direction due to beamforming. The aim is to get the optimal boresight beam. Therefore, the radio must be tilted in the azimuthal direction to the left by 2 degrees. The selected beam is now closer to the boresight beam, as shown in Figure 223.





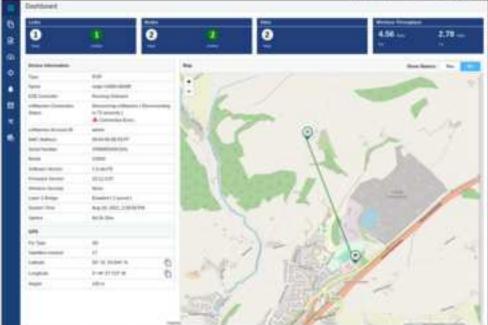
6. When you achieve the desired alignment and RSSI, click the **End Alignment** button located at the top left side of the Antenna Alignment page.

If you do not click the **End Alignment** button, the alignment cycle ends automatically after 15 minutes. When the alignment cycle ends, the ignition state (disabled earlier) is enabled to auto

ignition and the link is established. Figure 224 shows how the Antenna Alignment dashboard page looks on completing the antenna alignment task.

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Figure 224: The updated Antenna Alignment dashboard page



Ping tool

The Ping feature (a tool) provides information that is used to identify the reachability between the required node and another nodes or destination (for IPv4 and IPv6). The ping tool is useful in troubleshooting the radio links.

To use the ping tool, perform the following steps:

1. Navigate to Tools > Remote Command from the home page of Onboard Controller UI.

The **Ping** page appears.

2. Set the parameters with the required values, as described in Table 50.

Table 50. List of parameters in the Pilip page		
Parameter	Description	
Source Node	The source node for which you want to find the reachability with another node or destination.	
	Select the required source node from the drop-down list.	
Destination Type	The required node or destination address (IPv4 or IPv6) that for which the reachability has to be identified.	
	Following options are supported:	

Table 50: List of parameters in the Ping page

Parameter	Description
	• Node
	• IPv4
	• IPv6
	Select the required option (mandatory).
	Number of times that a packet is transmitted to find the reachability.
Number of Packets (-c)	Default value: 3
Number of Packets (-C)	This parameter supports values between 1 (minimum) and 10 (maximum).
	Type an appropriate value in the text box.
	Size (in bytes) of the packet.
	Default value: 56
Buffer Size (-s)	This parameter supports values between 1 (minimum) and 65507 (maximum).
	Type an appropriate value in the text box.

3. Click Start Ping.

The **Ping Result** section displays the information for the selected criteria, as shown in Figure 225.

Figure 225: The Ping page

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Show SFP Power details

Note

The **Show SFP Power Details** feature (a remote command) has been introduced in this release. When you execute this remote command from the Onboard Controller UI or the node CLI, the command provides the SFP power details (as an output) for the required SFP ports and interfaces.



Currently, the Show SFP Power Details remote command is not available in cnMaestro.

To execute the Show SFP Power Details remote command, perform the following steps:

1. Navigate to Tools > Remote Command from the home page of Onboard Controller UI.

The **Remote Command** page appears.

- 2. Select the required node from the **Select Node** drop-down list.
- 3. Select Show SFP Power Details from the Select Command drop-down list.
- 4. Click Execute.

The **Output** section displays the SFP power details for the selected node, as shown in Figure 226. Figure 226: *The UI supported output - SFP Power details*

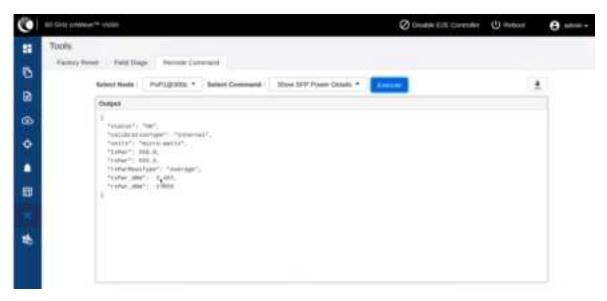


Table 51 lists and describes each parameter in the output.

Table 51: Output details

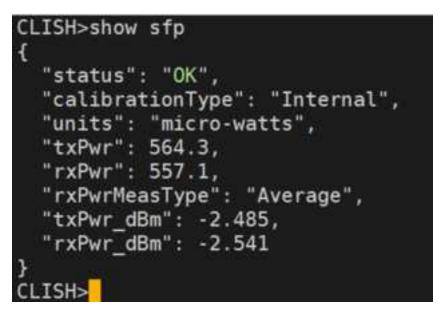
Output Parameter	Description
Status	Determines whether the output is valid.
	If the Status field contains OK, it implies that the rest of the output is valid.

Output Parameter	Description
	If the Status field does not contain OK, it implies that only the Status field is valid. In such cases, the Status field provides the reason for not being able to read the laser powers.
CalibrationType	Indicates the measurement type that is calibrated over the criteria, such as the following (for example):
	Specified transceiver temperature,
	Transceiver supply voltage,
	TX output power, and
	RX received optical power.
	The value of this parameter is Internal.
Units	Indicates the unit of measurement.
	The value of this parameter is micro-watts (mW).
txPwr	Indicates the TX output power in mW.
rxPwr	Indicates the RX received optical power in mW.
rxPwrMeasType	Indicates whether the received power measurement represents an average input optical power.
	The value of this parameter is Average.
txPwr_dBm	Indicates the TX output power in dBm.
rxPwr_dBm	Indicates the RX received optical power in dBm.

5. To download the output, click the download icon located at the top left side of the **Remote Command** page.

You can also execute the **Show SFP Power Details** command by using the device CLI. Log on to the device and open the CLI. At the command prompt, provide the Show SFP value and hit **Enter** on your keyboard. The command displays the output, as shown in Figure 227.

Figure 227: The CLI supported output - SFP Power details

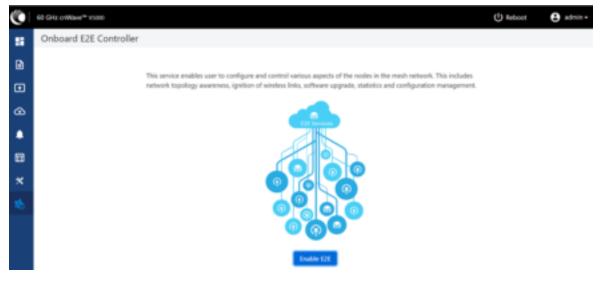


cnMaestro support for Onboard Controller

From System Release 1.0.1 onwards, The Onboard E2E controller can be managed by cnMaestro 2.5.0 (on-premises) for network management.

- After the Onboard E2E controller is enabled from UI, enter the cnMaestro URL. If Cambium ID based authentication option is enabled in cnMaestro, then enter the Cambium ID and onboarding key.
- 2. Click Enable E2E on Onboard E2E Controller in UI.

Figure 228: The Onboard E2E Controller page



3. Enter the cnMaestro management configuration information.

- Remote Management Select the required remote management option
- cnMaestro URL cnMaestro address
- Cambium ID Cambium ID of the device
- Onboarding key Password to onboard the device

Figure 229: The cnMaestro section

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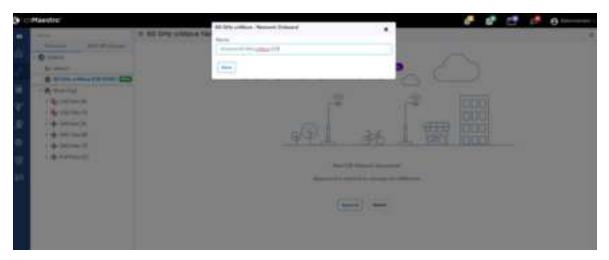
- 4. Click Enable.
- 5. A new E2E Network appears in cnMaestro. Click Approve to manage it.

Figure 230: Information on the new E2E network

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- 6. The Network Onboard window appears and provides an option to edit the network name.
- 7. Click Save.

Figure 231: The 60 GHZ cnWave - Network Onboard



After the successful onboarding of the E2E Network, it can be managed through cnMaestro.

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Figure 232: The Onboard 60 GHZ cnWave E2E dashboard page

Auto Manage IPv6 Routes (External E2E Controller)

E2E Controller communicates with all nodes over IPv6. PoP nodes use IPv6 address of the statically configured interface to communicate with E2E Controller. CNs and DNs use the IPv6 address derived from Seed Prefix.



Note

The Auto Manage Routes feature requires cnMaestro 3.0.4.

The **Auto Manage Routes** feature adds and manages the IPv6 routes at E2E Controller. These IPv6 routes are required for routing the IPv6 packets to CNs and DNs.

The feature is applicable only when PoP and E2E Controller are in the same subnet.

Single PoP network

When the feature is disabled, you must add the IPv6 route by performing the following steps:

 From the landing page of the device UI, navigate to Tools > Settings > IPv6 Routes > Add new. The Add Route page appears, as shown in the Figure 233.

Figure 233: The Add Route page in the cnMaestro UI

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:27ff:fe01:2121	
Cancel	
	0::/56 0:27ff:fe01:2121 Cancel

- 2. Type the seed prefix value in the **Destination** text box.
- 3. Type the required PoP's interface IP address in the **Gateway** text box.
- 4. Click Add.

The IPv6 route is added.

When the feature is enabled, all the above steps (described from step 1 to step 5 in this section) are not required and IPV6 routes are added automatically.

5. Select the Auto Manage Routes check box in the IPv6 Routes page.

Figure 234 shows the location of the Auto Manage Routes check box in the IPv6 Routes page.

Figure 234: The Auto Manage Routes check box

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E IPv6 Routes	
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Multi-PoP network

In a multi-PoP network, the **Auto Manage Routes** feature allows to avoid a BGP v6 router under the following conditions:

- When the Layer 2 bridge is enabled (which implies that the BGP v6 router is not required for managing data traffic).
- When PoPs and E2E Controller are in the same subnet or L2 broadcast domain.

In a multi-PoP network, Deterministic Prefix Allocation (DPA) is used. The mesh gets divided into zones. Each PoP is the best gateway to reach nodes in its zone. When a PoP is down, a different alive PoP must be used as a gateway to reach zones. When the **Auto Manage Routes** feature is enabled, it performs the following functions in a multi-PoP network:

- Understands the network topology of 60 GHz cnWave,
- Keeps a track of aliveness of PoPs, and
- Dynamically builds and manages the routing table.

Figure 235 is an example of an IPv6 route table that is built automatically by the feature for a four PoP network.

Figure 235: Example of IPv6 route entries in the IPv6 Routes page

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Figure 236 shows how the cnMaestro dashboard diagrammatically displays the routes taken by E2E Controller and the traffic controlled by cnWave nodes.