

Frequently Asked Questions – cnWave 60GHz solution



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[Knowledge base articles](#)

[Link planner](#)

[Software download link](#)

[Video Training \(60GHz cnWave Starter Kit\)](#)

Q: What is E2E controller?

A cnWave network is managed by a central controller named ‘E2E Controller’. E2E Controller allows configuration, control and monitoring of all the managed nodes.

Cambium Networks supports two methods to utilize the E2E Controller:

- **On-Premises** installed as a VM and can be used for small or large deployment.
- **Onboard** the PoP, for PTP, PMP and small mesh networks the PoP can be configured to host the controller (limited to 31 nodes).

Please note E2E controller and cnMaestro are two separate entities, while E2E communicates with the cnMaestro using IPv4, the E2E communicates with the cnWave radios using IPv6. After successful onboarding of E2E onto cnMaestro, configurations can be pushed from cnMaestro through E2E to the end devices.

Q: How does cnWave node sync its config with E2E controller

To keep config in sync, nodes send a hash of their local config to the controller in their periodic status reports, and the controller will overwrite a node’s config upon receiving a mismatch

Q: Will cnWave network continue to work when the E2E controller is down?

True. Customer traffic continues to be bridged/routed. But network will be not manageable, that is configuration cannot be viewed/modified and statistics not available.

Q: How External E2E is at advantage compared to Onboard E2E

- Supports up to 500 nodes in a mesh. Onboard supports a maximum of 31* nodes including POP node.
- Upcoming Network Analyzer and Network Optimizer (NANO) features require external E2E.
- POP is an outdoor device. Docker hosting E2E can be at data center. Physical reliability is higher.
- In Multi POP deployments, network will remain manageable if any POP goes down. Whereas in the case of onboard controller, if the POP hosting E2E goes down, the network will no longer be manageable.

Q: How Onboard E2E is at advantage compared to External E2E

There is no need of another machine to host E2E. For a PTP network (say V3K to V3K) or a small network, this is a good choice.

No need to worry about IPv6 routing aspects between E2E and mesh nodes. With external E2E, its necessary to make sure IPv6 routes are properly set, so that E2E can communicate to all nodes.

Simplified upgrade is possible using Onboard E2E compared to external E2E controller

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Q: Briefly explain CPA and DPA

cnWave nodes communicate with IPv6 subnet prefixes which are allocated from the Seed prefix configured in the Controller.

Centralized prefix allocation (CPA) is a scheme where the controller allocates prefixes to all the nodes. This scheme linearly scans through the prefix range and assigns unallocated prefixes to nodes. CPA serves mostly as steppingstone for more advanced allocation schemes such as Deterministic prefix allocation (DPA).

CPA is recommended for Single POP deployment.

In DPA, controller assigns prefix zones to PoPs based on network topology. Nodes will be allocated prefixes from their zone's prefixes. PoP nodes take advantage of summarizing routes which helps in load balancing ingress/southbound traffic.

DPA is recommended for Multi POP deployment. Furthermore, configuring "Optimize DPA zone allocation" in "Controller >Advanced >Optimization" will restart e2e and would operate smooth after settling out the prefix zones

[Examples for prefix allocation](#) [IP Network Planning - 60 GHz cnWave](#)

Q: Why CPA is not recommended for Multipop deployment

There is no subnetting of seed prefix in CPA and all POP nodes will advertise the entire seed prefix to the upstream router. This makes the ingress/southbound traffic to choose the non-optimal POP nodes to reach the destination and **may stress only few POPs** in the network. Because of these limitations CPA is not recommended to be used for Multipop deployments.

Q: Briefly explain Tromboning

PoP nodes learn about other PoP nodes using IPv6 multicast packets, which do not cross broadcast domain.

This allows cnWave PoP nodes to forward traffic to other cnWave PoP nodes via a wired connection.

when the routing path of the other PoP node is closer to the traffic's destination. This concept is called Tromboning, as the traffic enters one PoP node and then leaves to another PoP node.

Q: Explain software upgrade in cnWave network

Upgrades consist of two phases: "prepare" and "commit". In "prepare" phase, the controller distributes the new software image to nodes; upon completion, the nodes will flash the new image onto a disk partition. The "commit" command simply instructs nodes to reboot to the newly written partition.

When a node reboots, it will bring down links which can affect reachability to the rest of the network. The controller includes a scheduling algorithm that parallelizes commits (in "batches" of nodes) while minimizing network isolation, along with a retry mechanism to handle failures during any upgrade step.

- Upgrade the External E2E controller first and then the nodes (where External E2E is used)
- When using onboard controller, its recommended to upgrade the whole devices together.

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Q: What need to be ensured for successful migration of onboard E2E to external E2E

All IPv6 routers between External E2E to POP nodes must have routes to reach seed prefix IPv6 address of its cnWave nodes and vice versa. This allows external E2E to hear keep alive and other communication to each of its managed cnWave nodes.

Q: What is the azimuth and elevation coverage of V5000, V3000, V1000

V5000 has two sectors, situated side by side, each covering 140 degrees range in azimuth, giving a combined coverage of 240 degrees. In elevation, the antenna can beam steer in a +/- 20 degrees

V3000 has azimuth coverage of +/- 2 degrees and elevation coverage of +/-1 degree

V1000 has azimuth coverage of +/- 45 degrees and elevation coverage of +/- 20 degrees

Q: When should "short-range" option to be chosen

When V3000 deployment range is less than 150 meters

When V5000, V1000 deployments range is less than 25 meters

Q: What aspects should be given care in cnWave Multi PoP deployments

MTU of upstream switch ports should be at least 2000 bytes

Deterministic Prefix Allocation is recommended allocation for seed Prefix

[cnWave Multi POP aspects](#)

Q: How many channels does Cambium CnWave 60GHz support?

Cambium CnWave 60GHz supports the use of CH1 to CH4.

Q: Can all 4 channels be used in CnWave deployment?

Deployment in these channels depends on the allowed channels in respective region/country

Q: How much is the width of each channel in cnWave devices?

Each channel is 2.16GHz wide

Q: List the raster frequencies of cnWave devices

58.32, 60.48, 62.64, 64.8 GHz

Q: What is the suggested pole height for V5000

Anything greater than 5 meters is suggested to minimize ground bounce and avoid channel fluctuations, especially for links with long distances

Q: How many sectors are present in V5000, V3000, V1000

V5000 has two sectors each covering 140 degrees azimuth

V3000 and V1000 has single sector.

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Q: What concepts one need to be aware to avoid interference during cnWave deployment

- Minimum CN spacing at sector intersection
- Near-Far Ratio
- Early-Weak Interference
- Tight Angle deployment
- Straight line Interference
- Co-located V5Ks on a Site
- Polarity

For more references – explore [deployment guide](#)

Q: Enable_pop_prefix_broadcast, when is this flag useful?

When building cnWave network, PoPs might be isolated temporarily forming unconnected PoP zones. As a result, few nodes may not get IPv6 address leading to node onboarding issues.

When the value of this parameter is set to true, E2E Controller sends the prefix allocation message to all PoPs individually.

Q: In Multipop deployment, when and how will "Monitor PoP interface" option help

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, L2GRE 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.

IPv4 gateway configuration is necessary to activate this feature.

Q: When can "Automanage route" feature be handy?

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

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.

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.

Q: If a physical theft of DN/CN occurs, then what data of customer can be stolen [by attacker]?

CNs/DNs don't store the data frames during the transit or processing - so ideally no customer data is exposed to attacker

Furthermore, shell login access is controlled via u/p; even if attacker cracks u/p and get to CLI mode - he would not be able to get into root shell [which asks a response string]

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Q: Is VLAN configuration applicable when Layer2 bridge is disabled

No. VLAN configuration is applicable only when Layer2 bridge is enabled.

Q: Will DN [V5000] get defaulted to factory settings during reboot, power fluctuation?

The configuration should not get defaulted on the V5000 after power reboot.

Q: Config fallback feature [enabled by default] prevents situation wherein if a node goes from online to offline after a configuration change, then after a period of ___ minutes, node reboot and fallback to previous working configuration.

8 minutes

Note: This feature [config fallback feature] won't get activated under following condition

When configuration changes are done locally to the node, and it is not connected to controller.

When on-board controller state is changed. i.e., E2E controller is Enabled / Disabled from GUI.

Q: Can cnWave nodes be used in an ipv4 network to replace an existing layer 2 wireless link (epmp)

Yes. For more references – [L2 Bridge using Onboard E2E](#)

Q: What's the purpose of precision mounting bracket?

The Precision Mounting Bracket is used to mount the cnWave V3000 Client Node on a vertical pole, providing fine adjustment up to 18° in azimuth and +/-30° in elevation for accurate alignment of the V3000. The Precision Bracket is compatible with pole diameters in the range 25 mm to 80 mm (1.0 inches to 3.1 inches).

Q: Want to know the distance that cnWave radios can support

In general, cnWave 60 GHz radios will operate at ranges from 15m to 1.5KM*.

*Please use [link planner](#) to set proper expectations.

Q: What's the last resort to bring back cnWave nodes setup

Factory default the radio and re-configure the sites, nodes and link. The link should form without any issue.

Q: Can I backup and restore the onboard E2E controller config?

Backup and restore is supported in the cnMaestro; however, it is not available on the device GUI.

Q: What is the maximum no. of CNs that can be installed on a single sector

Up to 15 CNs can be installed on a single sector.

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Q: What encryption algorithm is supported to secure wireless traffic between cnWave nodes

AES-GCMP-128 bit is supported

Q: When is POP IPv6 gateway necessary?

For static routing infrastructure, POP nodes **must be configured with IPv6 Gateway if E2E controller is in different subnet.**

IPv6 gateway is not necessary if both E2E and POP are in same subnet.

For BGP routing infrastructure, this is not required and option itself would be greyed out.

This address can be left blank when layer 2 bridging is enabled and node acts as Onboard E2E.

Q: Can V1000 act as POP?

V1000 can act as POP for a point-to-point link deployment.

Q: Can V1000 act as wired relay

V1000 will not work in the wired relay as it cannot act as a DN

Q: Who will initiate the ignition attempts, is it DN or CN?

The nodes which are configured as DN will be initiators who will be sending the ignition attempts to the clients. The DN nodes will show as online initiator and client node will show as online once it is connected.

Q: Is it possible to disable communication btw devices behind two client nodes.

Client Isolation is not supported. However, this can be done on the switch or uplink devices. Assigning different network address to devices behind the client nodes.

Q: When to enable option “Force GPS Disable”

Enable option “Force GPS Disable” to establish link between indoor nodes. In some scenarios like lab setups, it may be necessary to disable GPS. Here radio uses internal sync rather than the GPS sync.

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Q: What are the wireless events seen on e2e_minion logs due to unfavorable wireless conditions

- BF_TRAINING_FAILED
- HB_KA_LOSS

Note: these messages are consequence rather than the problem due to unfavorable wireless conditions (may be due to rain/snow, interference...)

Below are some scenarios where we can see BF_TRAINING_FAILED, HB_KA_LOSS

- Reboot of peer node forming the link
- Physically misalign the radios forming the link (due to heavy wind...)
- Heavy Rain/snow fall
- Interference
- If nodes are close to the edge on the system margin, i.e., not much distance left

Usecase:

If link has been UP and due to rain, now link is DOWN and doesn't reestablish then we may see HB_KA_LOSS message at the transition point.

If the link drop (due to rain) is severe enough and until the wireless conditions improve that link will not get reestablished and will end up in BF_TRAINING_FAILED messages.

Further when wireless conditions improve, we will again see HB_KA_LOSS because RSSI is right at the noise, just about to form link

Q: Explain concepts that help identify GPS related issues

All cnWave radios synchronizes its timers to an external, accurate time source, such as GPS.

Each sector of a node is assigned specific times during which it can transmit or receive. A timing pulse that resets the Timing Synchronization Function (TSF) on the DN is repeated once second (1PPS). This timing pulse occurs exactly at the turn of each second.

V3000 and V5000 have built-in GPS receivers. E2E Controller manages time synchronization

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

GPS sync: Valid samples from GPS have been received for a few consecutive seconds (typically 2 seconds).

RF sync: Valid samples from GPS have not been received for a few consecutive seconds (typically 10 seconds). But is reachable to a DN with "GPS sync" over wireless links (1-2 hops away).

No sync: Neither in GPS sync nor RF sync. This is the default state

To avoid GPS issues, ensure head of V3000, V5000 are not blocked by other devices especially If related pole has multiple devices mounted.

Checkpoints while Troubleshooting cnWave 60GHz issues

Issue	Checkpoints/Suggestion
Links not formed	<ul style="list-style-type: none">* Ensure correct sector is chosen while creating link* Ensure DN has GPS synced (3D mode)* Ensure same channel, Golay codes, if configured* Ensure different polarity, if configured* Ensure same wireless security in the nodes forming the link* Ensure ignition is not disabled on the node forming the link* Check other CN/DN to be switched on* Ensure correct MAC is configured for related link* Check minion logs for errors in GUI/maestro* Use linkplanner and Revisit link distance and predicted availability, MCS* look at string "FW assert" in the name of Diagnostic file
Unstable Links; Link between the radios break sporadically again and again	<ul style="list-style-type: none">* Ensure LOS is clear between the nodes* Check configs related to radio parameters* Check Radio parameters stats like RSSI (< -60), SNR (>12), MCS (> 8)* Ensure there is no other device/antenna above cnWave node (ask for a photograph of the node and confirm)* Check for interference and nearby nodes/reflectors* Rain/Snow could lead to unfavorable wireless conditions* Check Golay Allocation* Look at string "FW assert" in the name of Diagnostic file* Check minion logs for errors in GUI/maestro; Until wireless conditions improve you would see BF_TRAINING_FAILED, HB_KA_LOSS
Link is UP But related CN/DN still not onboarded	<ul style="list-style-type: none">*Ensure POP and DN/CN has ipv6 prefix allocated*Ensure controller has route to reach correct POP for seed prefix allocated to that DN/CN*Ensure POP and BGP has active sessions and routes*Ensure POPs are reachable with each other in multi-pop deployment* Configure correct IPv6 default gateway to allow a route between the E2E controller and node

Checkpoints while Troubleshooting cnWave 60GHz issues

Issue	Checkpoints/Suggestion
Device not powering up	<ul style="list-style-type: none">* Check for power rating of POE is as suggested in user guide* Check for LED status of the node* Ensure Power on Aux port is enabled on cnWave node which is used as power source
DNs are not getting IPv6 address	<ul style="list-style-type: none">* Ensure proper MTU size on devices forming network path between connected POP* Check for errors in Tech dump logs at E2E controllerworkaround: Enable "enable_pop_prefix_broadcast" parameter in E2E controller advanced tab
Unable to access cnWave node using its configured IPv4 address [via Main PSU interface], but able to access it only via ipv6 - what could be wrong ?	<ul style="list-style-type: none">* Access your cnWave using its IPV6 address. then navigate to configuration - Network page.* You may have selected 'Main' under "IPv6 layer 3 CPE". Please choose disableNote: When you enable the IPV6 layer 3 CPE on a port , it will not allow you Layer 2 bridge on that port
POP not onboarded	<ul style="list-style-type: none">* Check for BGP parameters (ASN,...)* Check for default route* Check controller routes for POP ADDR
POP node frequently rebooting/disconnecting after adding to external E2E	<ul style="list-style-type: none">* Check BGP configurations, ensure proper BGP peering with router* Ensure proper MTU size on devices forming network path between POP and E2E controller
In Multipop deployment, I notice only few POPs getting stressed	<ul style="list-style-type: none">* Ensure DPA is opted for prefix allocation* Check relay port configuration on each POP node
After modifying few parameters (like ipv6 address) in Maestro, node is not connecting back	<ul style="list-style-type: none">* Disable/enable E2E controller* Check config fallback feature - enable it if its disabled
Low throughput issues	<ul style="list-style-type: none">* Use link planner to get the predicted receive level and the MCS level.* Incompatible, Faulty SFP modules* Check links, ethernet, radio statistics on the data path (POP interface, l2gre, terra,...)
Can't reach IPv4 devices on subnet that are behind the V1000 and V3000 client nodes	<ul style="list-style-type: none">* Check L2 GRE tunnel* Check DN to PoP connectivity* Disable L2_DISABLE_BROADCAST