



## QUICK START GUIDE

60 GHz cnWave™

System Release 1.1



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# Introduction

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Thank you for purchasing Cambium Networks 60 GHz cnWave™ platform equipment. This Quick Start Guide assists operators in acquiring a high-level understanding of the 60 GHz cnWave™ platform hardware, installation methods, initial login procedures, and safety/warranty information.



## Product Description

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Cambium Networks' 60 GHz cnWave™ solution provides easy, fast, and cost-effective wireless Gigabit connectivity for edge access and/or high-capacity backhaul for edge access solutions at a significantly lower TCO than fiber infrastructure. Service providers and enterprises now have access to Gigabit for business and residential connectivity, backhaul for Wi-Fi access. Certified for Facebook Terragraph, 60 GHz cnWave™ mesh solutions are highly efficient at handling high-density deployments in cities and suburban areas.



V1000



V3000 (Choice of two antenna sizes  
40.5 dBi or 44.5 dBi)



V5000

# Installation and Operation

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Installation and operation of this product are complex, and Cambium therefore, recommends professional installation and management of the system to ensure that operation complies with the regulations of the region where the product is installed. Follow the instructions in this *Quick Start Guide*. For more details on the installation and operation of 60 GHz cnWave devices, refer *60 GHz cnWave™ User Guide*.

The installer must have sufficient skills, knowledge and experience to perform the installation task and is responsible for:

- Familiarity with current applicable national regulations including radio regulations, electrical installation regulations, surge protection regulations and 'working at heights' regulations
- Installation following Cambium Networks instructions
- Confirming that the equipment settings are compliant with national or regional regulations
- Familiarity with training material available on the Cambium Networks website.

Observe the important instructions below during installation. This sets the equipment in compliance with national regulatory regulations and ensure legal operation.

- Ensure the 60 GHz cnWave™ equipment is fitted with the latest application code. The software is available from the Cambium Support site, see links at the end of this document.

# Product Safety Information

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## Warning

To prevent loss of life or physical injury, observe the following safety guidelines. In no event shall Cambium Networks be liable for any injury or damage caused during the installation of the Cambium 60 GHz cnWave™ radio nodes. Ensure that only qualified personnel install 60 GHz cnWave™ radios.



## Attention

Pour éviter toute perte de vie ou blessure physique, respectez les consignes de sécurité suivantes. En aucun cas Cambium Networks ne pourra être tenu responsable des blessures ou dommages causés lors de l'installation des nœuds radio Cambium 60 GHz cnWave™. Assurez-vous que seul du personnel qualifié installe les radios cnWave™ 60 GHz.

1. Exercise extreme care when working near power lines.
2. Exercise extreme care when working at heights.
3. Always use one of the approved power supply options. Failure to use the Cambium-supplied PSUs could result in equipment damage and will invalidate the safety certification and may cause a safety hazard.
4. The cnWave™ radios must be properly grounded to protect against lightning. It is the user's responsibility to install the equipment in accordance with national regulations. In the USA, follow the requirements of the National Electrical Code NFPA 70-2005 and 780-2004 Installation of Lightning Protection Systems. In Canada, follow Section 54 of the Canadian Electrical Code. These codes describe correct installation procedures for grounding the outdoor unit, mast, lead-in wire and discharge unit, size of grounding conductors and connection requirements for grounding electrodes. Other regulations may apply in different countries and therefore it is recommended that installation of the outdoor unit be contracted to a professional installer.
5. Always use an appropriately rated and approved AC supply cord-set in accordance with the regulations of the country of use.
6. Before servicing 60 GHz cnWave™ equipment, always switch off the power supply and unplug it from the PSU. Do not disconnect the RJ45 drop cable connectors from the radio while the PSU is connected to the power supply. Always remove the AC or DC input power from the PSU.
7. The main power supply is the primary disconnect device.
8. Safety may be compromised if outdoor-rated cables are not used for connections that will be exposed to the outdoor environment.
9. The PSU output voltage may be hazardous in some conditions, for example in wet weather. Do not connect a drop cable tester to the PSU, either directly or via LPUs.
10. Strong radio frequency (RF) fields will be present close to the antenna when the transmitter is on. Always turn off the power to the radio before undertaking maintenance activities in front of the

antenna.

11. Ensure that personnel is not exposed to unsafe levels of RF energy. The units start to radiate RF energy as soon as they are powered up. Never work in front of the antenna when the radio is powered. Install the radios to provide and maintain the minimum separation distances from all persons. For minimum separation distances, refer *60 GHz cnWave™ User Guide*.
12. Ensure that the installation meets the requirements defined in the [Installation](#) section.
13. To provide effective protection against lightning-induced surges, observe these requirements:
  - Grounding conductor runs are as short, straight and smooth as possible, with bends and curves kept to a minimum..
  - Grounding cables must not be installed with drip loops.
  - All bends must have a minimum radius of 200 mm (8 in) and a minimum angle of 90°. A diagonal run is preferable to a bend, even though it does not follow the contour or run parallel to the supporting structure.
  - All bends, curves, and connections must be routed towards the grounding electrode system, ground rod, or ground bar.
  - Grounding conductors must be securely fastened.
  - Braided grounding conductors must not be used.
  - Approved bonding techniques must be used for the connection of dissimilar metals.
14. Radios are not designed to survive direct lightning strikes. For this reason they must be installed in Zone B as defined in the **Lightning protection zones** section in the *60 GHz cnWave™ User Guide*. Mounting in Zone A may put equipment, structures, and life at risk.

# Hardware Overview

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The 60 GHz cnWave™ solution includes three types of wireless nodes:

- V1000 Client Node
- V3000 Client Node (Choice of two antenna sizes 40.5 dBi or 44.5 dBi)
- V5000 Distribution Node

## V1000 Client Node



Figure 1: V1000 Client Node

### V1000 wall and pole mount (C000000L136A and C000000L137A)

The V1000 CN is supplied with a mounting plate and band clamp. The mounting plate can be used for mounting the V1000 on a wall, or it can be used with the band clamp to mount the V1000 on a pole with diameter in the range 40 mm to 77 mm (1.6 inches to 3.03 inches).



Figure 2: V1000 mounting plate and band clamp

### V1000 adjustable pole mount (N000900L022A)

The adjustable pole mount is used to provide elevation adjustment when a V1000 CN is mounted on a pole. The adjustable pole mount works with poles with diameter in the range 40 mm to 77 mm (1.6 inches to 3.03 inches).

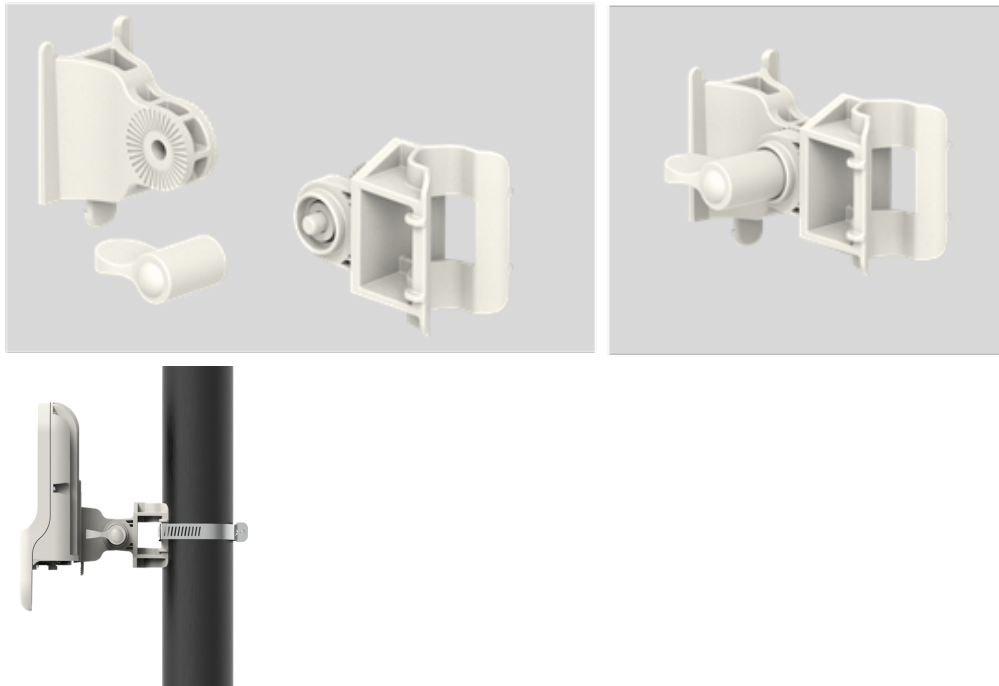


Figure 3: V1000 adjustable pole mount

## V3000 Client Node



Figure 4: V3000 Client Node with CN antenna (Choice of two antenna sizes 40.5 dBi or 44.5 dBi)

### V3000 precision bracket (C000000L125A)

The precision bracket ([Precision bracket](#) figure below) is used to mount the V3000 CN on a vertical pole with diameter in the range 25 mm to 80 mm (0.98 inches to 3.14 inches). The precision bracket provides fine adjustment of up to 18° in azimuth and +/-30° in elevation for accurate alignment of the V3000.

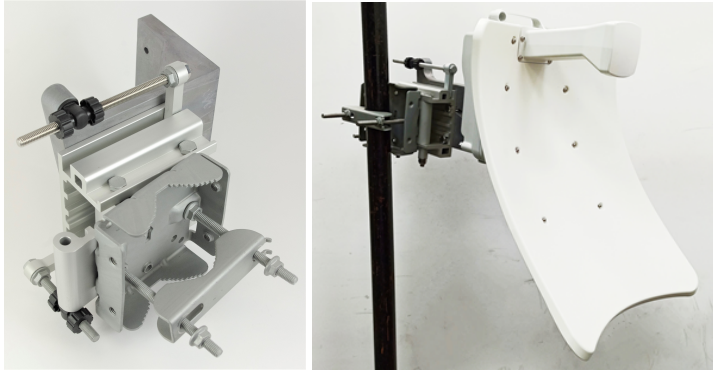
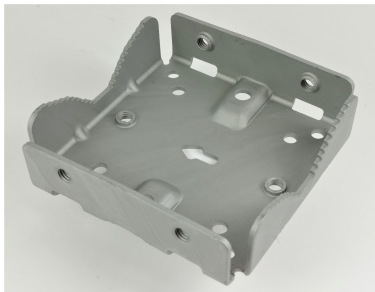


Figure 5: V3000 precision bracket (C000000L125A)

### V3000 precision bracket components



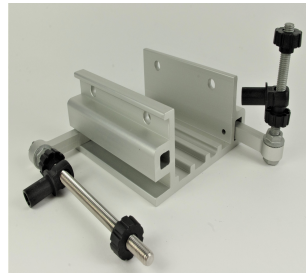
Bracket body



Azimuth arm



Long (120 mm) M8 screws and flange nuts



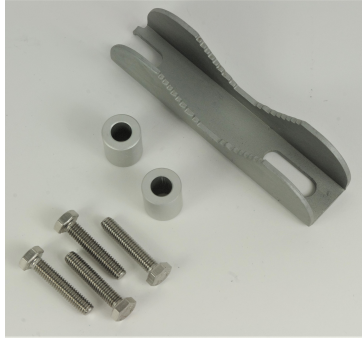
Bracket base



40 mm M8 screws, plain washers and Nyloc nuts



V3000 mount



28 mm M6 screws, M8 spacers and pole mount clamp

### V3000 tilt bracket (N000045L002A)

The tilt bracket ([Tilt bracket assembly](#) figure below) is used to provide elevation adjustment when a V3000 CN or V5000 DN is mounted on a pole. The tilt bracket works with poles with diameter in the range 25 mm to 80 mm (0.98 inches to 3.14 inches). The tilt bracket Assembly may be used with third-party band clamps to mount the ODU on larger pole with diameter in the range 90 mm to 230 mm (3.54 inches to 9.05 inches).



Figure 6: Tilt bracket assembly

## V5000 Distribution Node

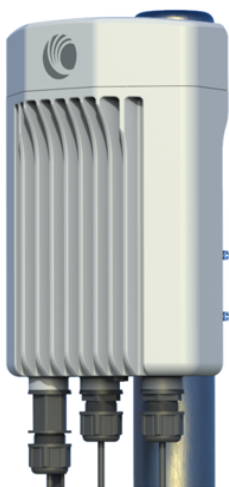


Figure 7: V5000 Distribution Node



## V5000 pole mount (C000000L137A)

The Pole Mount ([Pole mount](#) figure below) is used to mount a V5000 DN on a vertical pole with diameter in the range 25 mm to 80 mm (0.98 inches to 3.14 inches). It provides coarse azimuth (but not elevation) adjustment.

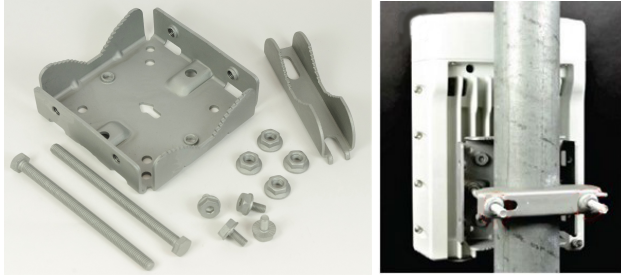


Figure 8: V5000 pole mount

## V5000 wall mount (C000000L136A)

The Wall Mount ([Wall mount](#) figure below) is used to mount a V5000 DN on a vertical wall. It does not provide azimuth or elevation adjustment. The wall mount requires additional fixing hardware suitable for the type of wall.

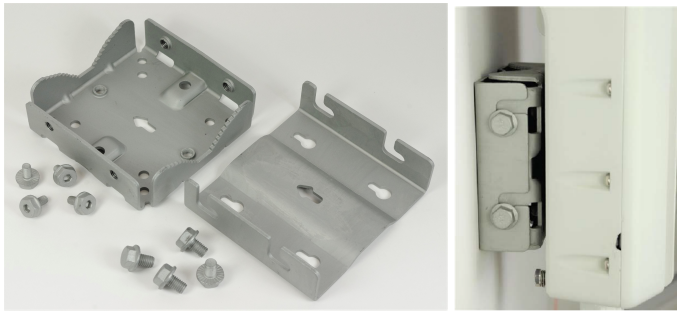


Figure 9: V5000 wall mount

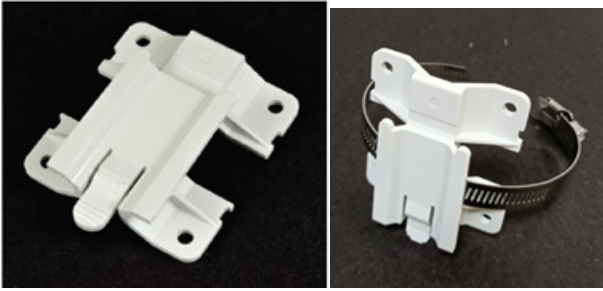
## Mounting of 60 GHz cnWave™ products

### 60 GHz cnWave™ V1000

#### V1000 pole mount

The V1000 CN can be installed to a pole using the supplied mounting plate and jubilee clip. Follow the below instructions to mount V1000 to the pole:

1. Insert the hose clamps through mounting plate and clamp to the pole by applying 3.0 Nm torque.



2. Insert the radio into the mounting plate on the pole.



## V1000 wall mount

Follow the below instructions to mount V1000 to the wall:

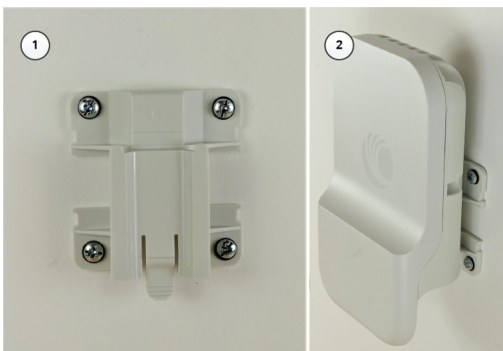
1. Fix the mounting plate (supplied with the V1000 ODU) securely to a vertical wall, using suitable fixings.



### Note

Fixing hardware is not supplied with the V1000.

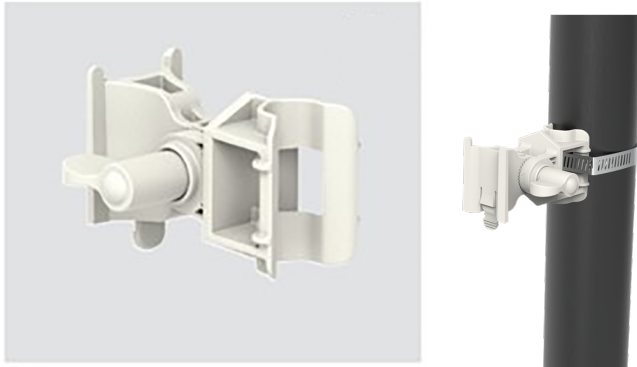
2. Slide the V1000 ODU onto the mounting plate from above, ensuring that the spring clip in the mounting plate clicks into place on the radio.



## Adjustable pole mount

Follow the below instructions to mount V1000 to the adjustable pole:

1. Insert the hose clamps through the adjustable pole mount bracket and clamp to the pole by applying 3.0 Nm torque.



2. Insert the radio into the adjustable pole mount bracket on the pole.



## V1000 alignment

The V1000 CN requires minimal effort to align as the internal antenna can beam steer  $\pm 45$  degrees in azimuth and  $\pm 20$  degrees in elevation from boresight. As long as the unit is installed with the remote node visible within this range, no further adjustment is required.

## 60 GHz cnWave™ V3000/V5000

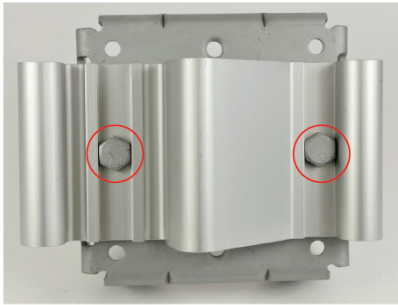
### V3000 precision bracket

The precision bracket is used to mount the cnWave V3000 CN on a vertical pole, providing fine adjustment up to  $18^\circ$  in azimuth and  $\pm 30^\circ$  in elevation for accurate alignment of the V3000. The precision bracket is compatible with pole diameters in the range of 25 mm to 80 mm (1.0 inches to 3.1 inches).

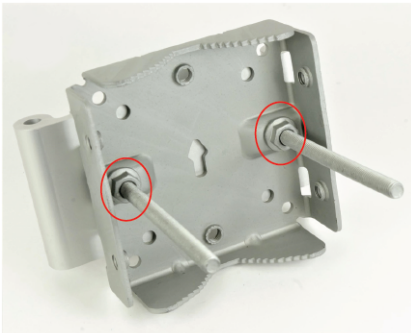
These instructions illustrate the procedure for assembling and using the precision bracket. We also illustrate the mounting of the optional alignment telescope.



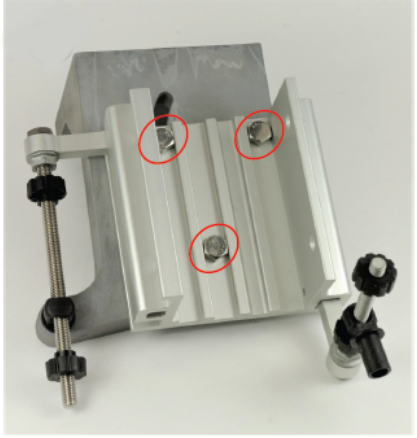
1. Insert two of the long (120 mm) screws through the azimuth arm and the bracket body. The screws locate in the slots in the azimuth arm.



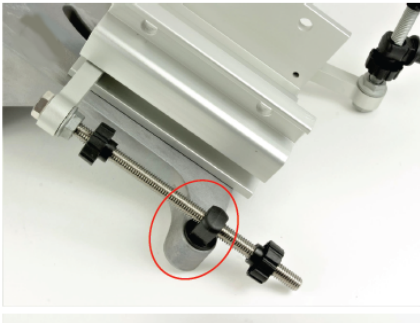
2. Fit two flanged M8 nuts to the long screws on the back of the bracket. Tighten using a 13 mm spanner.



3. Insert the three medium-length (40 mm) M8 screws through the bracket base and the V3000 mount. The screws locate in the slots in the bracket base.



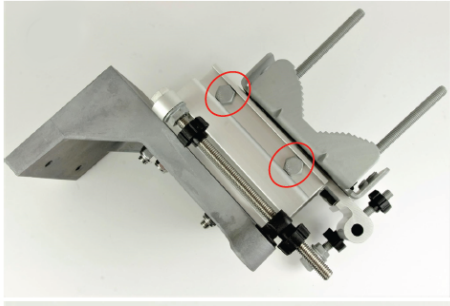
Ensure that the pivot pin in the elevation adjuster is located in the circular hole in the V3000 mount.



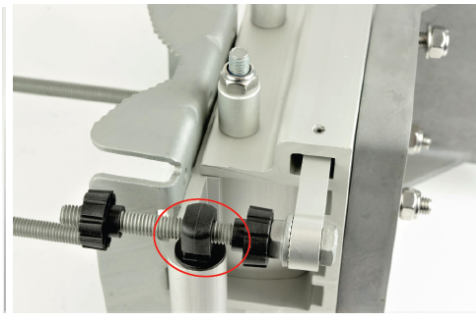
4. Fit plain washers and M8 Nyloc nuts to the screws on the back of the bracket base. Tighten using a 13 mm spanner.



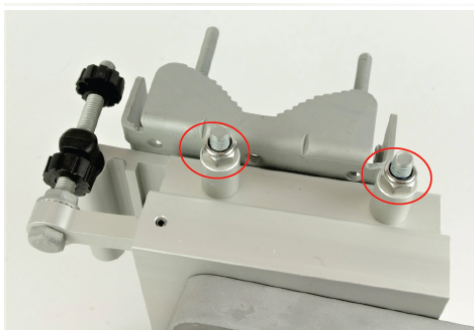
5. Insert the two remaining long (120 mm) M8 screws through the bracket body and the azimuth arm. The screws locate in the slots in the bracket body.



Ensure that the pivot pin in the azimuth adjuster is located in the circular hole in the bracket body.



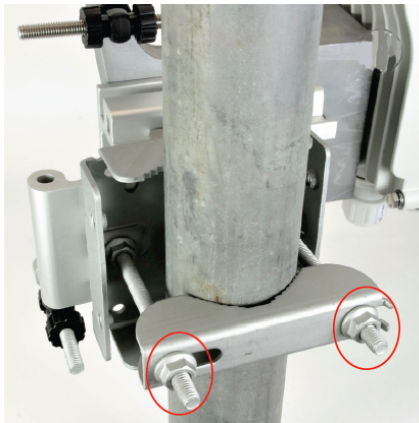
6. Fit three sets of spacers, plain washers and M8 Nyloc nuts to the screws on the underside of the bracket base. Tighten using a 13 mm spanner.



7. Attach the V3000 mount to the radio using the four short M6 bolts. Tighten the four bolts to a torque setting of 5.0 Nm (3.7 lb-ft) using a 13 mm spanner or socket.



8. Attach the precision bracket to the pole using the clamp and the remaining flanged nuts. Adjust azimuth approximately and tighten the nuts to 10 Nm (7.4 lbft) using a 13 mm spanner.



9. Lock the antenna alignment by tightening the five Nyloc nuts (see [step 5](#) and [step 8](#)) to 10 Nm (7.4 lbft) using a 13 mm spanner or socket.





### Precision bracket alignment telescope

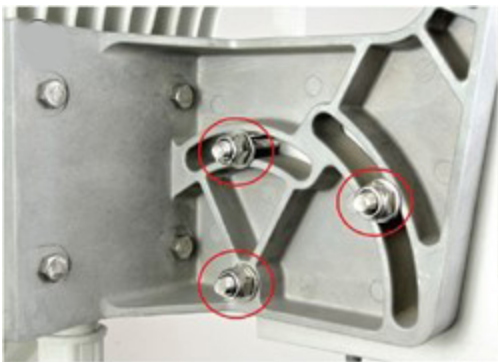
Follow the below instructions to align the telescope:

1. Attach the telescope mount to the V3000 radio using the knurled screw.
2. Attach the telescope by looping the two elastic O-rings over the ears of the mount, ensuring that the telescope is located securely in the mount.



### Precision bracket alignment

1. Ensure that the three Nyloc screws for securing the bracket in elevation are loose and the fine elevation adjuster is holding the weight of the unit.



2. Ensure the two Nyloc screws for securing the bracket in the azimuth are loose.





3. Before starting the mechanical alignment, move the fine elevation adjuster  $\frac{2}{3}$  of the way across the screw until the unit is sitting at approximately 0 degrees in elevation.



4. Move the fine azimuth adjuster to approximately the center of the available range and lock in position.



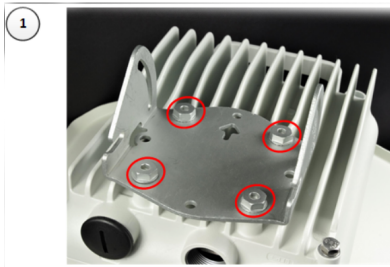
5. Loosen the clamp which attaches the bracket to the pole until there is enough freedom to rotate the unit in azimuth.
6. From behind the unit, using the sight to aim towards the remote node, rotate the unit until it is approximately aligned in azimuth. Tighten the clamp.
7. While looking for the far node through the sight, rotate the fine elevation adjuster until the alignment is complete in the elevation plane. One turn of the adjustment wheel is equivalent to approximately one degree of elevation. Lock the fine elevation adjuster screws in place.



8. While looking for the far node through the site, rotate the fine azimuth adjuster until the alignment is complete in the azimuth plane. One turn of the adjustment wheel is equivalent to approximately one degree of azimuth. Lock the fine azimuth adjuster screws in place.
9. Make any remaining adjustments to the elevation and azimuth as required. Once complete, tighten the three Nyloc screws in place to fix the elevation alignment and do the same for the two Nyloc screws for azimuth alignment to 10 Nm (7.4 lbft) using a 13 mm spanner or socket.

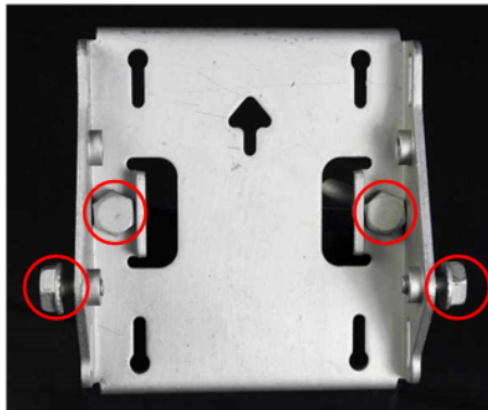
### **V3000 tilt bracket assembly**

1. Fix the mounting plate of the tilt bracket to the back of the radio using four of the short bolts, ensuring that the arrow in the plate points towards the top of the radio. Tighten the four bolts to a torque setting of 5.0 Nm (3.7 lb-ft) using a 13 mm spanner or socket.



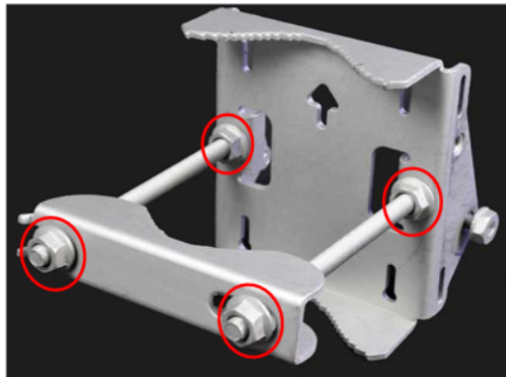
2. Fit the two long bolts through the bracket body so that the bolt heads engage in the slots as shown. Fit two of the short bolts into the side of the bracket body but do not tighten.

2



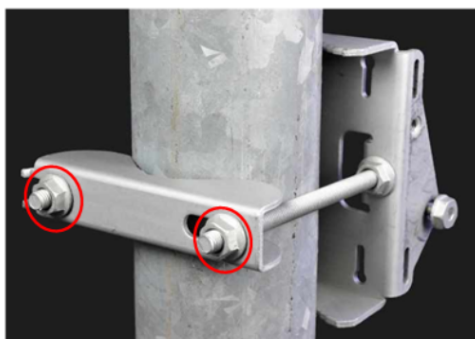
3. Thread two of the nuts to the long bolts and tighten against the bracket body using a 13 mm spanner. Fit the bracket strap and thread the remaining nuts onto the long bolts.

3



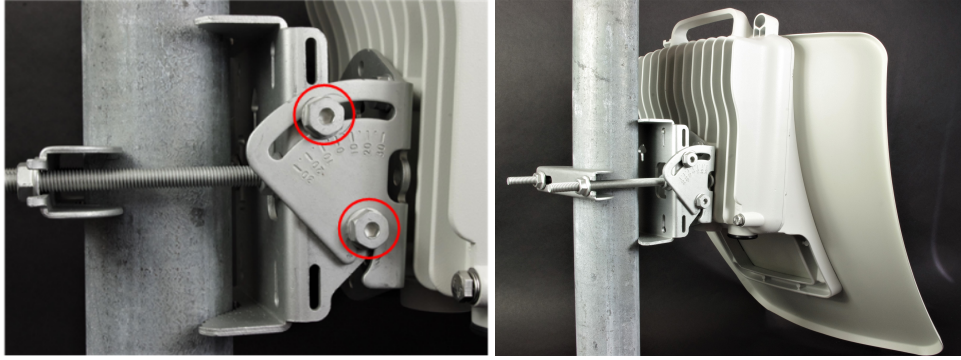
4. Fix the assembled bracket body to the pole, adjust the azimuth angle, and tighten the nuts to a torque setting of 10.0 Nm (7.4 lb-ft) using a 13 mm spanner, ensuring that the arrow in the body is pointing upwards.

4



5. Fit the mounting plate to the bracket body by positioning the open- ended slots over the short bolts. Insert the remaining short bolts through the longer curved slots into the threaded holes in the bracket body. Adjust the elevation angle and tighten the bolts to a torque setting of 5.0 Nm (3.7 lb-ft) using a 13 mm spanner or socket.

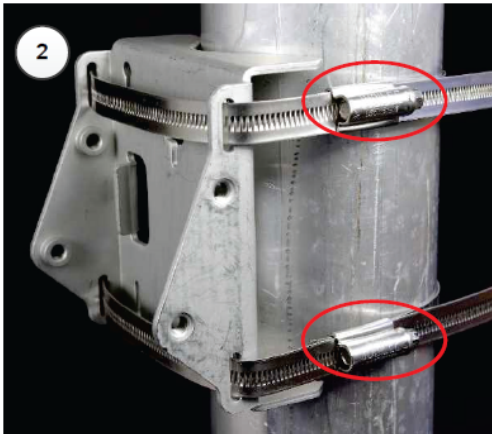
5



### V3000/V5000 tilt bracket assembly with band clamps

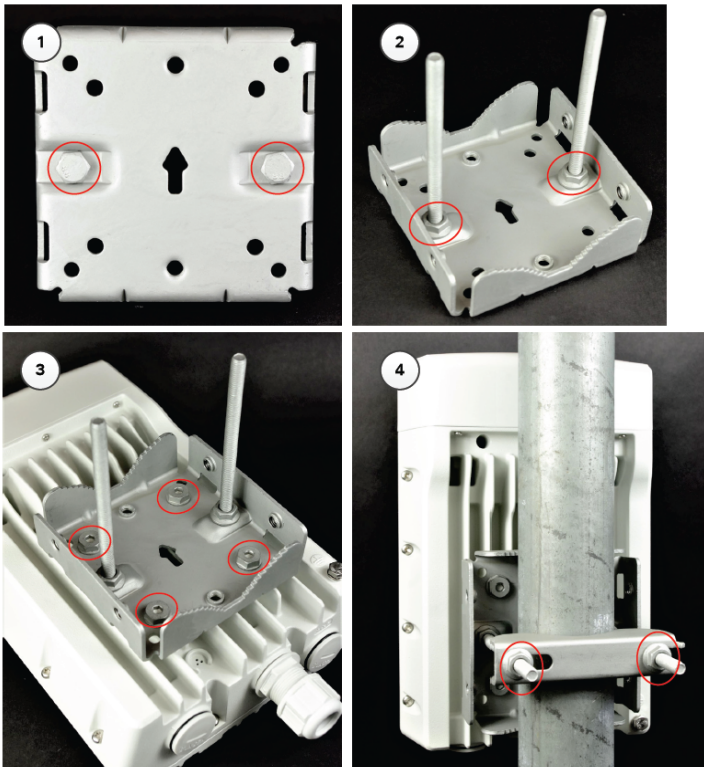
Follow the below instructions to assemble the tilt bracket with band clamps:

1. Follow Step 1 of the [V3000 tilt bracket assembly](#) procedure.
2. Feed the band clamps through the slots in the bracket body. Secure the bracket body to the pole using band clamps (not supplied by Cambium), ensuring that the arrow in the body is pointing upwards. Adjust the azimuth angle, and tighten the band clamps to a torque setting of 6.0 Nm (4.5 lb ft).
3. Fix the mounting plate to the bracket body with four of the short bolts, using a 13 mm spanner or socket. Adjust the elevation angle, and tighten the bolts to a torque setting of 5.0 Nm (3.7 lb-ft).



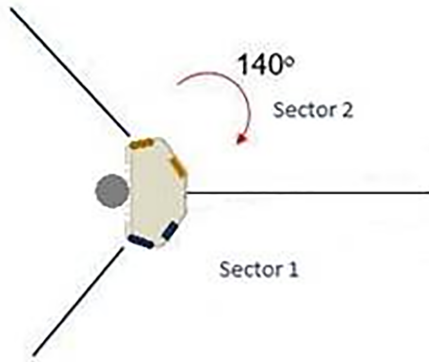
## V5000 pole mount bracket

1. Pass the long screws through the bracket body. The screws locate in the recess in the bracket.
2. Fit two flanged nuts to the long screws on the back of the bracket. Tighten using a 13 mm spanner.
3. Fix the bracket to the back of the radio using the four short M6 bolts, ensuring that the arrow in the plate points towards the top of the radio. Tighten the four bolts to a torque setting of 5.0 Nm (3.7 lb ft) using a 13 mm spanner or socket.
4. Attach the pole-mount bracket to the pole using the clamp and the remaining flanged nuts. Adjust azimuth and tighten the nuts to 10 Nm (7.4 lbft) using a 13 mm spanner.



## V5000 alignment

The V5000 distribution node has two sectors, situated side by side, each covering 140 degree range in azimuth, giving a combined coverage of 280 degrees. In elevation, the antenna can beam steer in a +/- 20 degree range. The boundary between where Sector 1 ends and Sector 2 begins is the centreline/boresight from the unit.



### V5000 wall mount bracket

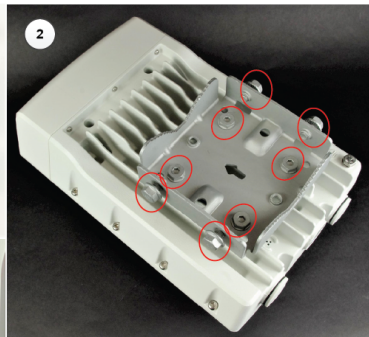
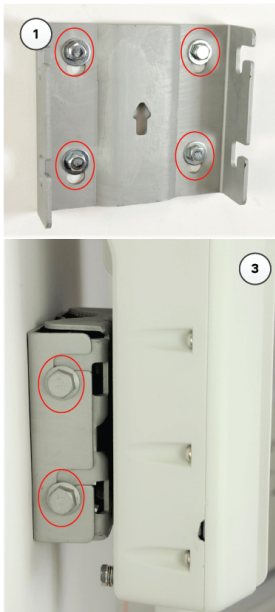
1. Install the mounting plate of the wall mount bracket securely on a vertical wall, using suitable fixings.



#### Note

Fixing hardware is not supplied with the wall mount bracket.

2. Fix the bracket body to the back of the radio using the four short M6 bolts, ensuring that the arrow in the plate points towards the top of the radio. Tighten the four bolts to a torque setting of 5.0 Nm (3.7 lb-ft) using a 13 mm spanner or socket.
3. Insert the four short M8 bolts into the sides of the bracket body.
4. Fit the bracket body to the mounting plate by positioning the short bolts into the open-ended slots. Tighten the bolts to a torque setting of 5.0 Nm (3.7 lb-ft) using a 13 mm spanner or socket.





# Connecting 60 GHz cnWave™ Products

## Installing PSU and powering the ODU

Install one of the following types of PSU:

- 60W DC power injector
- AC/DC power supply
- V1000 power injector



### Warning

Always use an appropriately rated and approved AC supply cord-set in accordance with the regulations of the country of use.



### Attention

Utilisez toujours un cordon d'alimentation secteur approprié et approuvé conformément aux réglementations du pays d'utilisation.



### Attention

As the PSU is not waterproof, locate it away from sources of moisture, either in the equipment building or in a ventilated moisture-proof enclosure. Do not locate the PSU in a position where it may exceed its temperature rating.



### Attention

Le bloc d'alimentation n'étant pas étanche, placez-le à l'écart des sources d'humidité, que ce soit dans le bâtiment de l'équipement ou dans une enceinte ventilée étanche à l'humidité. Ne placez pas le bloc d'alimentation dans une position où il pourrait dépasser sa température nominale.



### Attention

- Do not plug any device other than a 60 GHz cnWave™ ODU into the ODU port of the PSU. Other devices may get damage due to the non-standard techniques employed to inject DC power into the Ethernet connection between the PSU and the ODU.
- Do not plug any device other than a Cambium 60 GHz cnWave™ PSU into the PSU port of the ODU. Plugging any other device into the PSU port of the ODU may damage the ODU and device.



#### Attention

- Ne branchez aucun périphérique autre qu'une ODU cnWave™ 60 GHz dans le port ODU du bloc d'alimentation. D'autres appareils peuvent être endommagés en raison des techniques non standard utilisées pour injecter une alimentation CC dans la connexion Ethernet entre le bloc d'alimentation et l'ODU.
- Ne branchez aucun périphérique autre qu'un bloc d'alimentation cnWave™ Cambium 60 GHz dans le port PSU de l'ODU. Brancher tout autre périphérique sur le port PSU de l'ODU peut endommager l'ODU et le périphérique.

## Installing the 60W DC power injector

Connect the 5 GbE port to ODU and 5GbE LAN port to the network equipment.



Figure 1: 60W DC power injector

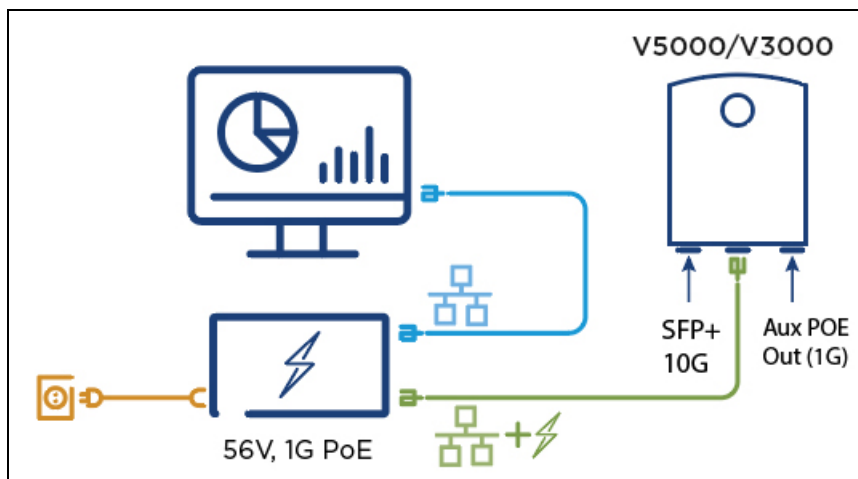


Figure 2: 60W DC powering diagram



## Installing the AC/DC PSU

- Connect the Input side of the AC/DC PSU to the AC power line.
- Connect the Output side of DC PSU to ODU through cable joiner and DC mini adapter.



Figure 3: AC/DC PSU (N000000L179B)

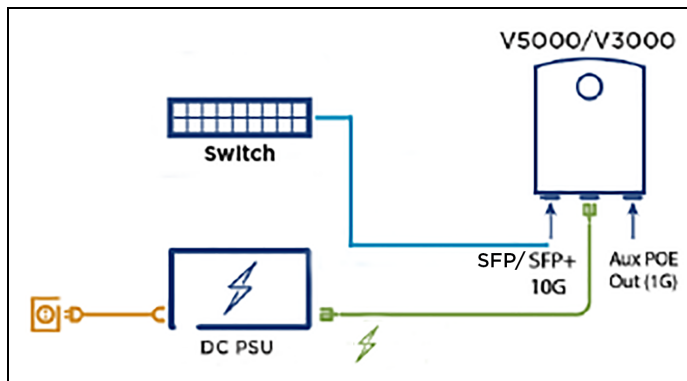


Figure 4: AC/DC powering diagram

## Installing the V1000 power injector

- Connect the 56V Gigabit Data + Power port to ODU and Gigabit Data port to the network equipment.



Figure 5: V1000 power injector

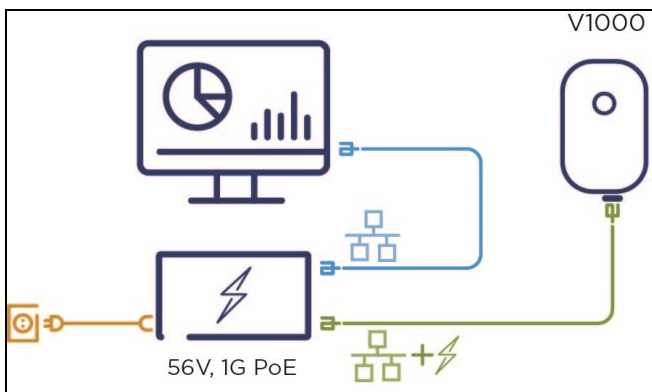


Figure 6: V1000 powering diagram

# Operation

## Theory of operation

60 GHz cnWave™ devices support Facebook connectivity Technology called Terragraph. cnWave™ devices implement IEEE 802.11ay WLAN standard and use 60GHz frequency band for wider spectrum and higher capacity. cnWave™ devices can provide multi-gigabit throughput from 100M to 1.5 KM.

Deployment of the devices use Open/R based layer3/IPv6 Mesh for efficient distribution of traffic between the nodes and higher availability of the traffic. This will also overcome non-Line of sight issues.

Devices use TDMA/TDD technology to achieve density deployment efficiency.

The Network and the nodes are configured, controlled and monitored by a cloud-based E2E controller.

Following terminology is used for the network deployment:

- **Distribution node (DN)** - DN connects with other DN for mesh network
- **Client node (CN)** - CN connects to DN to provide high-speed connectivity
- **PoP** - DN connected to the backhaul
- **CPE** - Customer premises devices like WiFi router.

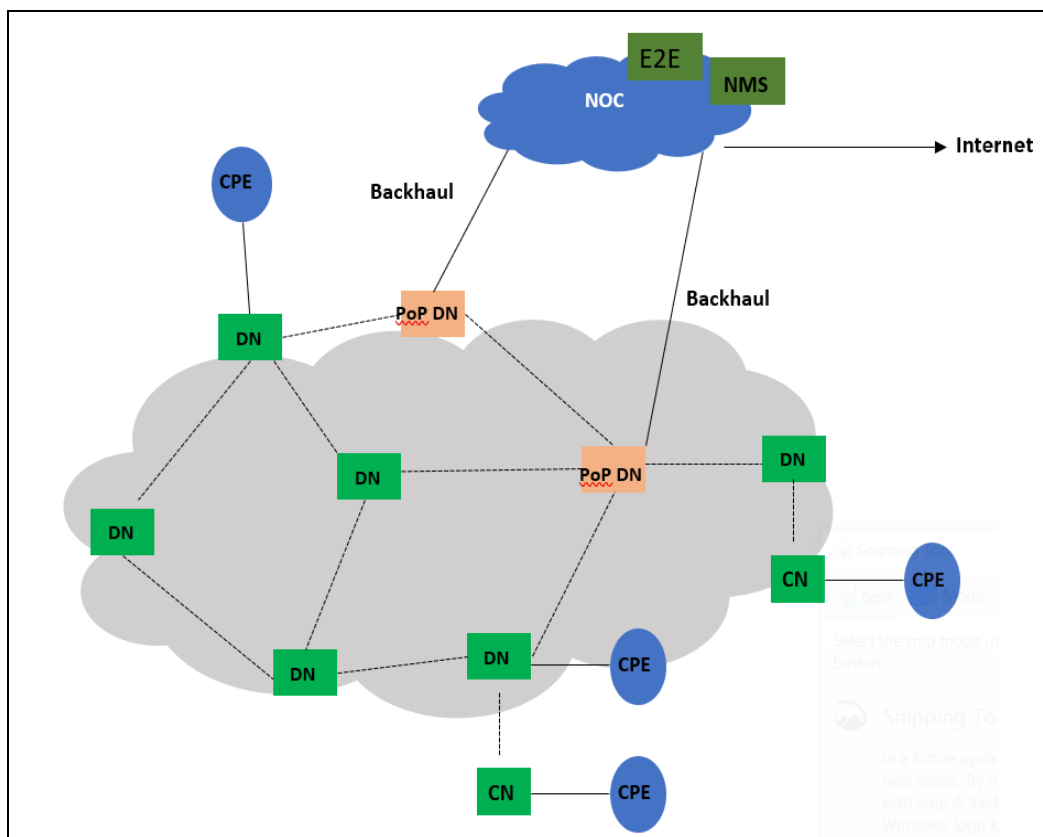


Figure 1: Theory of operation

# Configuration and Alignment

All configurations are done on the E2E except for the initial configuration to connect the PoP DN to the E2E. The configuration parameters are:

- PoP
- PoP/DN/CN

## Nodes deployment

The configuration of cnWave™ nodes is handled automatically by the E2E service. However, the first PoP node must be configured manually since connectivity to the E2E controller has not yet been established. After establishing communication with the E2E controller, the nodes report a hash of their local configuration file and the controller automatically pushes configuration changes to the nodes upon seeing any mismatches. Centralized configuration management architecture implemented in which the E2E controller, serves as the single point of truth for configurations in the network.

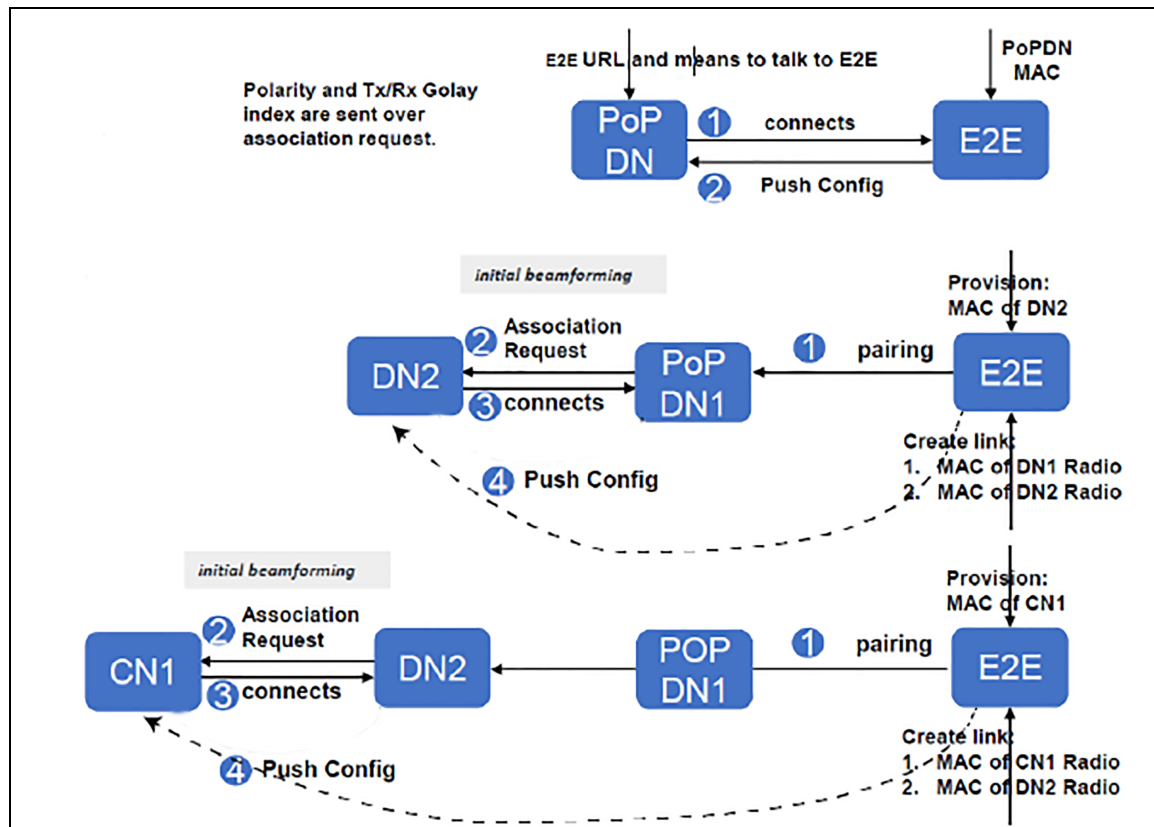


Figure 1: Nodes deployment

## Glossary

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Term	Definition
CN	Client Node
DN	Distribution Node
E2E Controller	End to End Controller

# Cambium Networks

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Cambium Networks provides professional-grade fixed wireless broadband and microwave solutions for customers around the world. Our solutions are deployed in thousands of networks in over 153 countries, with our innovative technologies providing reliable, secure, cost-effective connectivity that's easy to deploy and proven to deliver outstanding performance.

Our award-winning Point to Point (PTP) radio solutions operate in licensed, unlicensed, and defined use frequency bands including specific FIPS 140-2 solutions for the U.S. Federal market. Ruggedized for 99.999% availability, our PTP solutions have an impeccable track record for delivering reliable high-speed backhaul connectivity even in the most challenging non-line-of-sight RF environments.

Our flexible Point-to-Multipoint (PMP) solutions operate in the licensed, unlicensed, and federal frequency bands, providing reliable, secure, cost-effective access networks. With more than three million modules deployed in networks around the world, our PMP access network solutions prove themselves day-in and day-out in residential access, leased line replacement, video surveillance and smart grid infrastructure applications.

Cambium Networks solutions are proven, respected leaders in the wireless broadband industry. We design, deploy and deliver innovative data, voice, and video connectivity solutions that enable and ensure the communications of life, empowering personal, commercial and community growth virtually everywhere in the world.

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