

Wireless Network Solutions for Ports, Distribution, and Logistics Facilities

Cambium Networks has extensive experience in delivering high-performance wireless networks for industrial ports, warehouses, distribution centers, and transportation hubs for some of the largest customers in this space around the world. From providing warehouse-wide coverage Wi-Fi networks to cellular Wi-Fi offload solutions (more often in commercial cruise line ports) to wide-area and distributed network deployments covering expansive logistic yards and large ports, Cambium delivers secure, low-latency connectivity that keeps inventory systems, administrative functions, IoT devices, and operational systems moving without interruption.



Within these environments, the need for connectivity is immense and seemingly constantly evolving. Although not intended to be an exhaustive list, these are some of the more common wireless connectivity needs seen in and around ports:

WORK MACHINERY

- Reach stackers
- Gantry cranes
- Empty container handlers
- Forklifts
- Terminal tractors
- Bilge/water removal pumps



SMART SAFETY TECHNOLOGIES

- Surveillance cameras
- Proximity detection and collision avoidance sensors
- Thermal cameras/sensors
- X-ray container scanners
- LiDAR imaging sensors



STAFF & HANDHELD DEVICE COMMUNICATIONS

- Laptops
- Tablets
- Smartphones
- Handheld scanners



This document provides a walkthrough of wireless network architectures commonly deployed by some of the largest global distribution operators in this space using Cambium solutions for their challenging and operationally critical network needs.

One of the key advantages of using Cambium solutions for any planned wireless deployment is the ease in designing these networks for customers' specific coverage areas and data requirements. Cambium's cloud-based LINKPlanner and Wi-Fi Designer provide operators with a suite of tools to collaboratively design and build their own customized networks (including automatically generating a supporting bills of material [BOM]) that are easy to use and offer proven accurate modeling.

Large distribution centers often exceed 500,000 square feet and contain dense metal racking that significantly impacts wireless signal propagation, requiring engineered network design rather than standard enterprise deployments. Below are two working example outputs from Cambium's network design tools.

Wireless network designs are commonly separated into two fundamental architectural parts:

1. **Backhaul Network Layer**
2. **Access Network Layer**

Once all of the port areas requiring coverage/connectivity have been identified, it's best to define the necessary backhaul network solution first. Fiber, when available, is a great option, but more often than not, it doesn't exist everywhere that it's needed and is extremely expensive to install and operationally disruptive to deploy in busy ports and/or large distribution and logistics yards.

KEY BENEFITS OF WIRELESS VS FIBER



**Faster
install
time**



**Less
disruption to
operations
during
installation**



**Significantly
lower cost of
installation
and
hardscape
repair**



**Flexibility
to place
connectivity
where you
need it**

Option 1: Backhaul Network Using cnWave 60 GHz Solution

Cambium's cnWave™ 60 GHz solution, providing high-capacity and gigabit speeds, low latency, milli-second self-healing network resiliency, fast deployment, and easy expandability, is often the go-to solution used to quickly create a backhaul network. Its license-free operation and typically clear spectrum availability makes it the ideal tool for many backhaul networks in this space. When special environmental considerations are required, Cambium offers an industrialized version (ATEX/HAZLOC-certified) of these cnWave devices.



V5000 Distribution Node



V3000 High Gain Client Node



V2000 Distribution Node

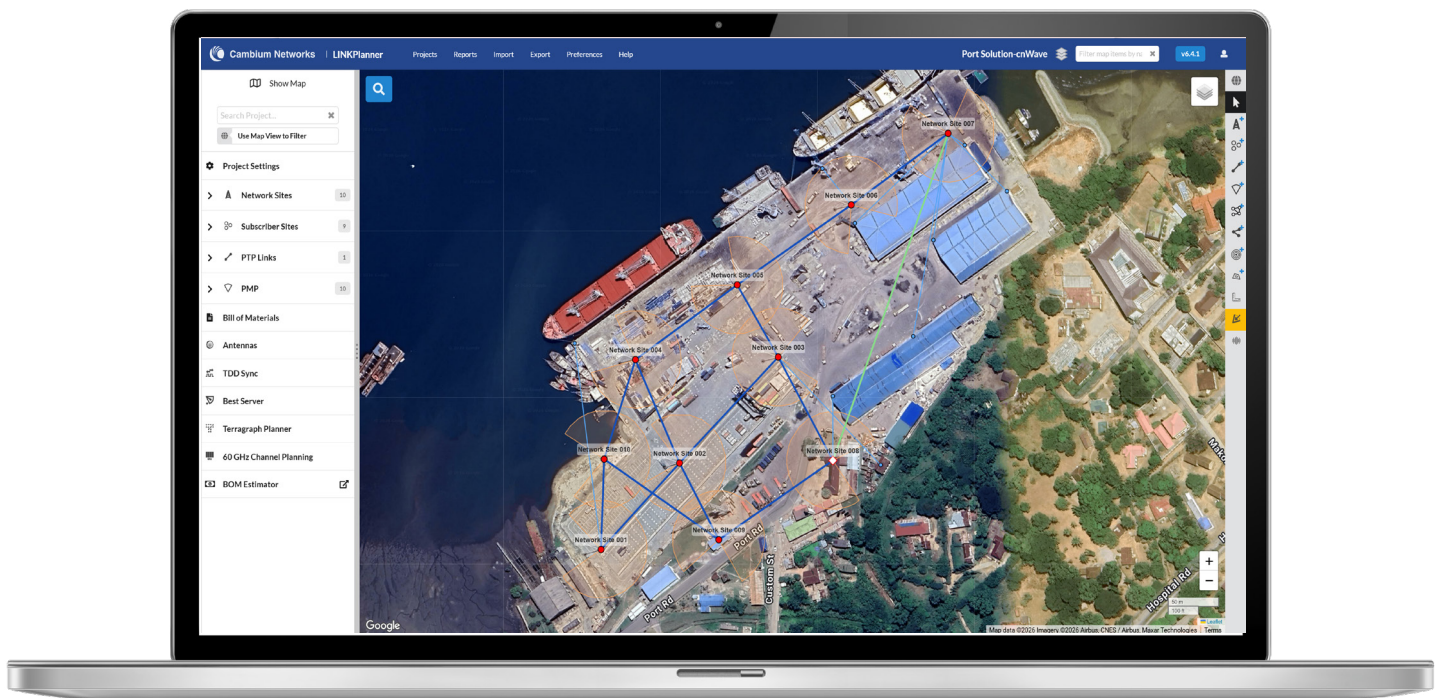


V1000 Distribution Node

cnWave 60 GHz

A representative example of such a backhaul network at a cargo port location is shown in the LINKPlanner image below, initially consisting of several interconnected V5000 Distribution Nodes and V2000 Client Nodes mounted to high sights around the port (e.g., tall light poles). The network's ability to easily create and manage multiple routes across the network in a changing environment is key to establishing the backhaul network's required high availability.

As earlier stated, Cambium's powerful LINKPlanner design tool allows quick and easy modeling of your wireless network design choices, from equipment selections and mounting location placement to link availability and installation/performance reports. A bill of materials (BOM) is also automatically generated by the tool based on the entered design. A comprehensive BOM for the example network design shown below is included in [Appendix 1](#).



Option 2 Backhaul Network Using PMP/ePMP Solution

When needed as an alternative (or complimentary overlay) solution to cnWave 60 GHz, Cambium's private point-to-multipoint (PMP/ePMP™) solutions also provide secure, resilient, wide-area wireless coverage across large logistics facilities. Unlike traditional Wi-Fi based PMP solutions, these private wide-area networks deliver predictable performance, extended range, and controlled device access. For distribution centers that require reliable connectivity beyond structured indoor spaces, private PMP networks support moderate mobility, segmented device management, and consistent coverage across expansive floor plans and adjacent logistics zones.

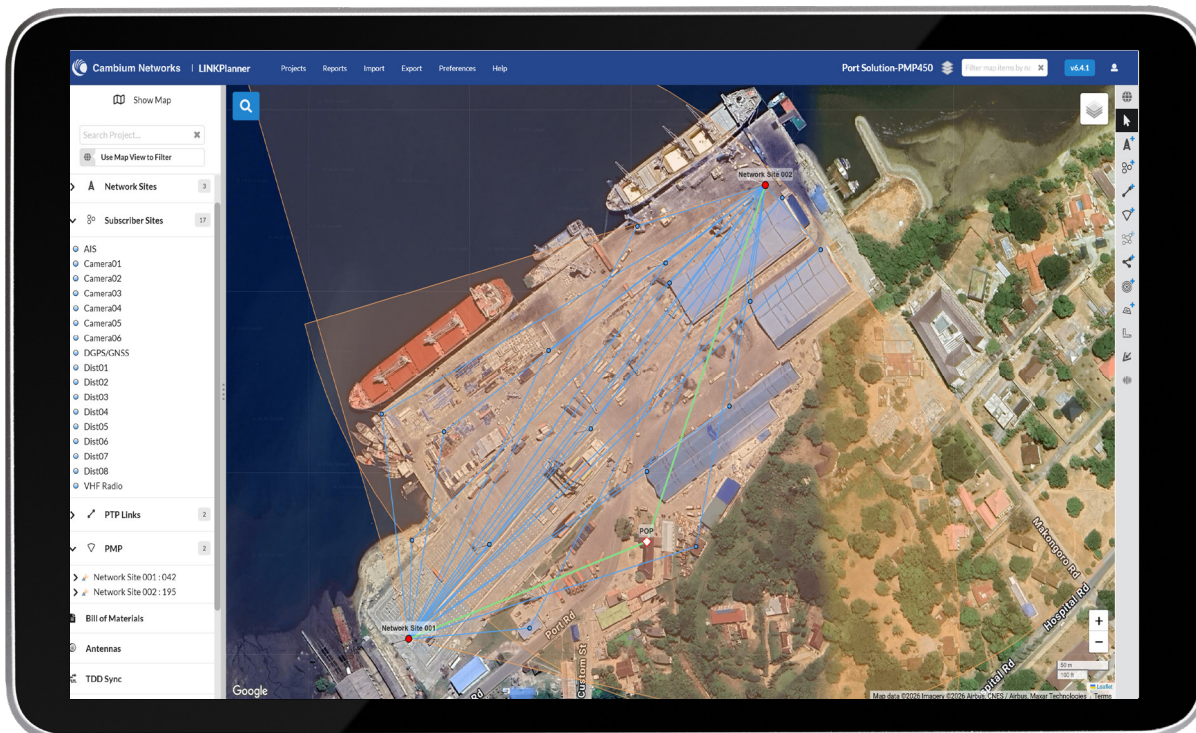
PMP/ePMP Access Points (AP) and Subscriber Modules (SM)



Cambium’s private PMP solutions provide stable, secure wireless coverage across large warehouse and distribution environments. It’s well suited for logistics facilities that require mobility, extended indoor and outdoor range, and reliable performance for handheld devices, vehicle-mounted systems, and core operational applications. As a mature and widely deployed solution, private PMP delivers predictable connectivity for mission-critical logistics workflows while maintaining strong device segmentation and network control.

A representative example of such a backhaul network at a cargo port location is shown in the LINKPlanner image below, initially consisting of two APs (providing redundant coverage) and several SMs mounted to targeted sites needing connectivity around the port. Each SM’s ability to easily create and manage multiple primary/secondary AP associations across the network in a changing environment is key to establishing the backhaul network’s required high availability.

As earlier stated, Cambium’s powerful LINKPlanner design tool allows quick and easy modeling of your wireless network design choices, from equipment selections and mounting location placement, to link availability and installation/performance reports. A BOM is also automatically generated by the tool based on the entered design. A comprehensive BOM for the example network design shown below is included in **Appendix 2** at the end of this document.



Wi-Fi Access Network (Outdoor)

Warehouse and logistics operations need to provide a safe working environment. They also need to provide security to minimize theft and shrinkage. Cambium's indoor and outdoor Wi-Fi connectivity solutions provide reliable and efficient communications infrastructure for video surveillance, IoT sensors and controls, and automated vehicles. Additionally, Cambium's cnMatrix switching technology with centralized cloud management makes it easy to deploy connectivity without disrupting operations.

As a mature and widely deployed cellular standard, private LTE delivers predictable connectivity for mission-critical logistics workflows while maintaining strong device segmentation and network control.

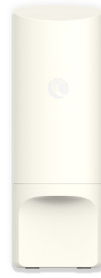
Wi-Fi 6/Wi-Fi 6E Outdoor Wireless Access Points



XV2-23T Wi-Fi 6 AP



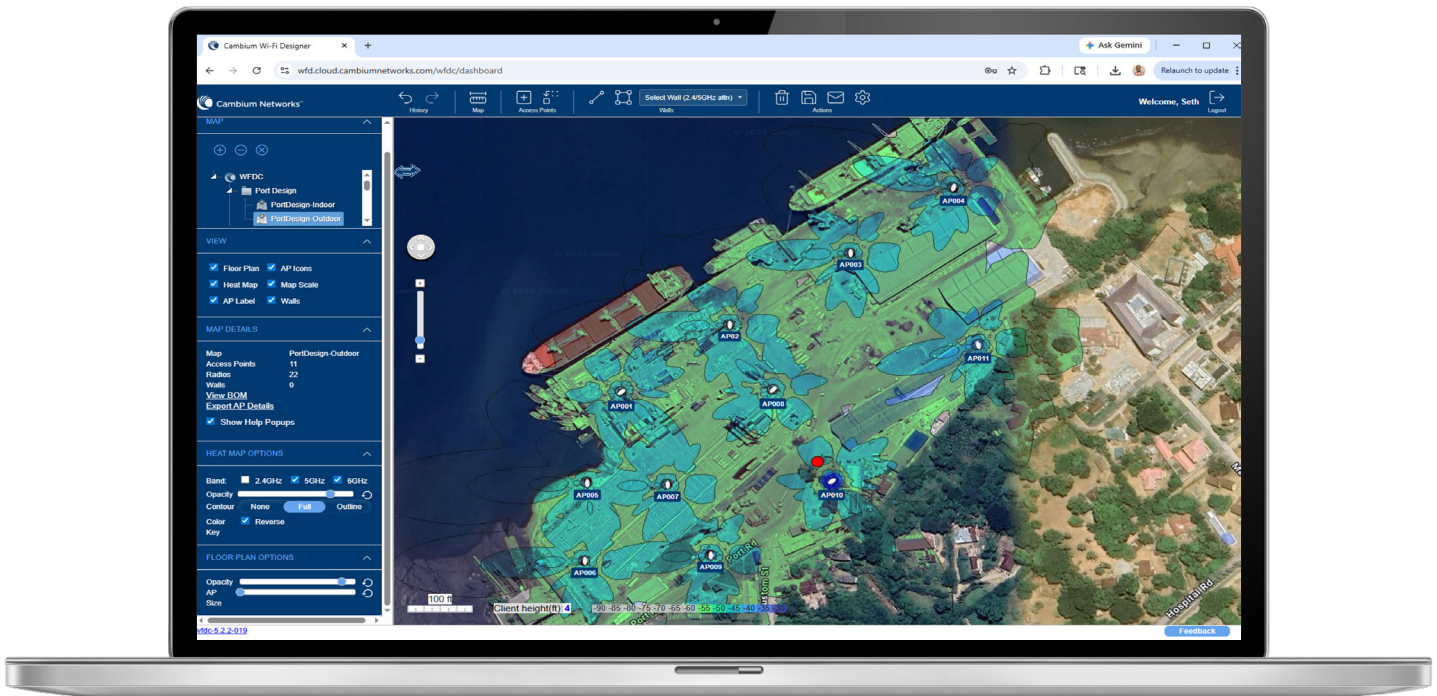
XV2-2T0 Wi-Fi 6 AP



XV2-2T1 Wi-Fi 6 AP



XE3-4TN Wi-Fi 6/6E AP



Wi-Fi Access Network (Indoor)

MANAGED WAREHOUSE WI-FI FOR HIGH-DENSITY LOGISTICS OPERATIONS

Managed warehouse Wi-Fi supports high-density device environments inside distribution centers. Optimized AP placement, predictive RF modeling, and fast roaming protocols ensure reliable performance for handheld scanners, tablets, voice systems, and warehouse management applications.

Wi-Fi 6/6E/7 Indoor Wireless Access Points



XV2-21X Wi-Fi 6 Enterprise AP



XV2-2X Wi-Fi 6 AP



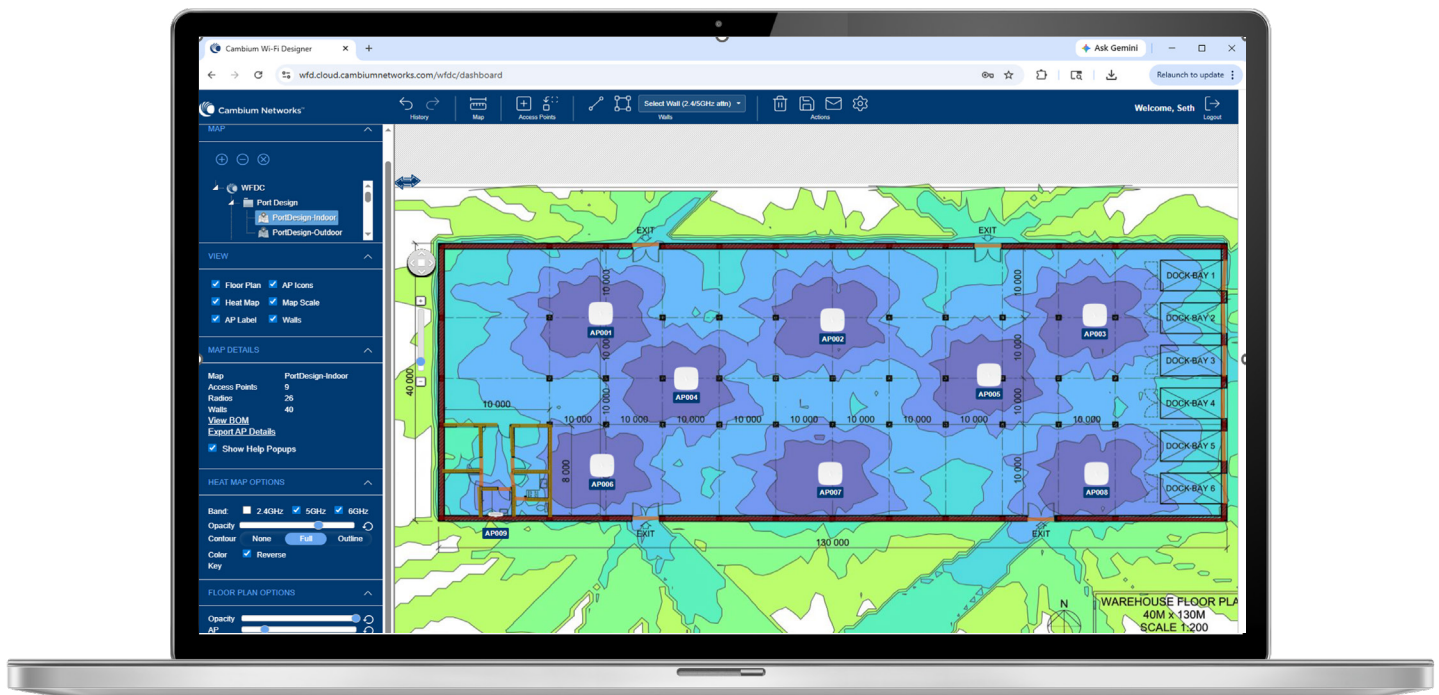
XE3-4 Wi-Fi 6E AP



X7-35X Wi-Fi 7 AP

While private cellular provides broad and secure coverage, warehouse Wi-Fi remains the most efficient solution for supporting large volumes of short-range client devices within structured indoor environments.

Cambium designs and manages industrial-grade Wi-Fi networks built specifically for warehouses and logistics facilities. This approach focuses on predictive RF modeling, optimized access point placement, and seamless device roaming to ensure consistent performance across the entire facility.





Engineered for High-Bay and Multi-Dense Environments

Warehouse environments present unique wireless challenges. Tall ceilings, metal racking, palletized inventory, and moving equipment can cause signal reflection, absorption, and interference. Standard enterprise Wi-Fi deployments often fail to account for these variables.

Cambium Networks partners can conduct detailed site surveys and predictive wireless modeling to design coverage that penetrates high-bay racking and maintains signal strength across large distribution floors. This ensures stable connectivity for handheld scanners, mobile computers, and warehouse management systems.

Seamless Roaming for Mobile Workforce and Devices

Logistics operations depend on uninterrupted mobility. Workers using handheld scanners, tablets, VoIP devices, and vehicle-mounted systems must transition between access points without dropped sessions or latency spikes.

Cambium's warehouse Wi-Fi architecture supports fast roaming protocols, optimized channel planning, and proper access point density to maintain continuous connectivity. This reduces workflow disruption, improves inventory accuracy, and supports real time data exchange across the facility.

Optimized for WMS, IoT, and Industrial Applications

Modern logistics facilities rely on warehouse management systems, IoT sensors, automated conveyors, and smart inventory tracking. These systems require predictable bandwidth and low-latency performance.

Cambium designs managed Wi-Fi environments that prioritize mission-critical traffic, segment device types securely, and support high client density without congestion. The result is a wireless infrastructure capable of scaling with operational growth and automation initiatives.

Overcoming Signal Loss in Large Metal Structures

Steel framing, metal shelving, insulated walls, and concrete construction significantly degrade public carrier signal strength inside logistics facilities. These environments create dead zones that impact mobile phones, push-to-talk systems, and data-enabled devices.

Cambium's partners can conduct signal testing and RF analysis to identify coverage gaps and design solutions that restore consistent signal levels across loading docks, warehouse floors, mezzanines, and administrative spaces.



Summary of Benefits

SOLVING CRITICAL WIRELESS CHALLENGES IN LOGISTICS OPERATIONS

Modern logistics facilities rely on uninterrupted wireless connectivity to coordinate transportation, warehouse operations, automation systems, and real-time supply chain visibility. Fragmented networks, coverage gaps, and performance bottlenecks can delay shipments, disrupt workflows, and increase operational risk.

Cambium designs integrate wireless architectures that eliminate these gaps and enable logistics operators to maintain secure, reliable connectivity across distribution centers, ports, and transportation hubs.

ENABLING REAL-TIME VISIBILITY ACROSS COMPLEX SUPPLY CHAINS

Logistics operations depend on continuous data exchange between warehouse management systems, transportation platforms, handheld devices, and IoT sensors. Gaps between public networks, private wireless, and Wi-Fi environments can create blind spots that limit operational visibility.

Cambium integrates private PMP, managed Wi-Fi, and in-building coverage into a unified wireless architecture that ensures reliable data flow across indoor and outdoor logistics operations. The result is clearer visibility, faster response times, and improved coordination across the supply chain.

SUPPORTING AUTOMATION WITH LOW-LATENCY AND HIGH-THROUGHPUT CONNECTIVITY

Autonomous mobile robots, conveyor systems, and machine-vision platforms require predictable bandwidth and low-latency connectivity. Traditional wireless deployments often struggle in high-density warehouse environments.

Cambium designs wireless networks to support automation at scale, combining private cnWave 60 GHz, private PMP, and optimized warehouse Wi-Fi to maintain stable performance as device counts and data demands increase. This enables smarter and faster warehouse operations without network bottlenecks.

DELIVERING SEAMLESS INDOOR AND OUTDOOR COVERAGE

Logistics operations extend beyond warehouse floors to loading docks, yard management areas, and transportation corridors. Disconnected indoor and outdoor networks create communication gaps that disrupt workflow continuity.

Cambium designs integrate wireless infrastructures that provide consistent connectivity across the full facility footprint. This ensures continuous communication as goods and personnel move between operational zones.

One Network. One Platform. Total Control.

Digital experiences are everywhere, but managing the network behind them has never been more complex.

- Budgets are tighter.
- Skilled staff is harder to find.
- Usage patterns keep changing.
- Networks keep getting more complex.

ONE Network brings it all together. A complete networking portfolio managed through cnMaestro™ X that gives you a single, secure, converged network from edge to cloud.

Simplify Operations Across the Entire Network. Manage the network fabric from a single pane of glass:

- Indoor, outdoor, and wall plate Wi-Fi (Wi-Fi 6/6E and Wi-Fi 7)
- Indoor and hardened switches
- Next-gen firewall
- Fixed wireless PTP and PMP (CBRS, 3 GHz, 5 GHz, 6 GHz, 28 GHz, and 60 GHz)

Ensuring 24x7 Operational Continuity

Supply chain operations run around the clock. Wireless disruptions can impact throughput, safety, and delivery performance, particularly in lean IT environments.

Cambium partners can provide proactive monitoring, performance optimization, and ongoing support to maintain stable wireless operations. This reduces downtime risk and supports uninterrupted logistics performance.

About Cambium Networks

Cambium Networks enables service providers, enterprises, industrial organizations, and governments to deliver exceptional digital experiences and device connectivity with compelling economics. Our ONE Network platform simplifies management of Cambium Networks' wired and wireless broadband and network edge technologies. Our customers can focus more resources on managing their business rather than the network. We make connectivity that just works.



Appendix A: Option 1 cnWave Sample Bill of Materials (BOM)

PART NUMBER	Description	Quantity	Notes
C000000L033	Gigabit Surge Suppressor (56V), 10/100/1000/2.5G BaseT	4	
C000000L138	Grounding Cable, 0.6m with M6 ring to M6 ring	2	
C600500C001	60GHz cnWave V1000 Client Node with US cord	1	Includes radio with antenna, power supply, line cord, and mounting bracket
C600500C020	60GHz cnWave V2000 Client Node 30W with US cord	1	Includes radio with antenna, power supply, line cord, and mounting bracket
EW-E2CNWV1000-WW	cnWave 60 GHz V1000 Extended Warranty, 2 Additional Years	1	
EW-E2CNWV2000-WW	cnWave 60 GHz V2000 Extended Warranty, 2 Additional Years	1	
N000082L173	Grounding Kit for CAT5E F/UTP 8mm and Cat6A Cable	4	Add 2 additional kits per PoE injector installed outdoors
N000082L174	RJ45 Connector for CAT6A Cable, Qty 10	2	Number of packs (12 units required)
N000000L155	CAT6A Outdoor Cable, 100m	1	
C000000L033	Gigabit Surge Suppressor (56V), 10/100/1000/2.5G BaseT	20	
C000000L124	Cable Gland, Long, for 6-10mm cable, M25, Qty 5	2	Number of packs (10 units required)
C000000L137	Universal Pole Mount Bracket for 1" - 3" diameter poles	10	
C000000L138	Grounding Cable, 0.6m with M6 ring to M6 ring	10	
C000000L141	PoE, 60W, 56V, 10GbE DC Injector, Indoor, Energy Level 6 Supply	10	Replaces N000065L001
C600500A004	60GHz cnWave V5000 Distribution Node	10	
EW-E2CNWV5000-WW	cnWave 60 GHz V5000 Extended Warranty, 2 Additional Years	10	

Appendix A: Option 1 cnWave Sample Bill of Materials (BOM) *continued*

PART NUMBER	Description	Quantity	Notes
MSX-SUB-T5-5	cnMaestro X for cnWave: Advanced management and includes CC Pro for Tier5; 5-year subscription / Tier5 device; Tier5 device include Distribution Node. Order CCADV-UPG-XXXX for NBD advanced replacement hardware support.	10	
N000000L155	CAT6A Outdoor Cable, 100m	2	
N000082L139	Optical CABLE,SM, 30m	10	
N000082L173	Grounding Kit for CAT5E F/UTP 8mm and Cat6A Cable	20	Add 2 additional kits per PoE injector installed outdoors
N000082L174	RJ45 Connector for CAT6A Cable, Qty 10	6	Number of packs (60 units required)
N000900L031	AC line cord, US Type B, 720mm, C5 connector	10	Replaces N000900L007
SFP-10G-LR	10G SFP+ SMF LR Transceiver, 1310nm. -40C to 85C	20	
C000000L033	Gigabit Surge Suppressor (56V), 10/100/1000/2.5G BaseT	18	
C000000L138	Grounding Cable, 0.6m with M6 ring to M6 ring	9	
C600500C001	60GHz cnWave V1000 Client Node with US cord	9	Includes radio with antenna, power supply, line cord, and mounting bracket
EW-E2CNWV1000-WW	cnWave 60 GHz V1000 Extended Warranty, 2 Additional Years	9	
N000000L155	CAT6A Outdoor Cable, 100m	1	Total cable requirements aggregated at parent level
N000082L173	Grounding Kit for CAT5E F/UTP 8mm and Cat6A Cable	18	Add 2 additional kits per PoE injector installed outdoors
N000082L174	RJ45 Connector for CAT6A Cable, Qty 10	6	Number of packs (54 units required)

Appendix B: Option 2 PMP/ePMP Sample Bill of Materials (BOM)

PART NUMBER	Description	Quantity	Notes
C000000L033	Gigabit Surge Suppressor (56V), 10/100/1000/2.5G BaseT	8	
C000000L138	Grounding Cable, 0.6m with M6 ring to M6 ring	4	
C600510C020	60GHz Bridge in a Box 2Gb with US cord	2	Includes 2 radios with antenna, 2 power supplies, 2 line cords, and 4 mounting brackets
EW-E2CNWV2000-WW	cnWave 60 GHz V2000 Extended Warranty, 2 Additional Years	4	
N000082L173	Grounding Kit for CAT5E F/UTP 8mm and Cat6A Cable	8	Add 2 additional kits per PoE injector installed outdoors
N000082L174	RJ45 Connector for CAT6A Cable, Qty 10	3	Number of packs (24 units required)
N000000L155	CAT6A Outdoor Cable, 100m	1	
01010419001	Coaxial Cable Grounding Kits for 1/4" and 3/8" Cable	4	
C000065L007	LPU and Grounding Kit (1 kit per ODU)	2	
C050045A005	5 GHz PMP 450i Integrated Access Point, 90 degree (ROW)	2	Requires suffix B or newer
EW-E2PM45AP-WW	PMP450/450i Access Point Extended Warranty, 2 Additional Years	2	
N000000L034	PoE, 30.5W, 56V, 5GbE DC Injector, Indoor, Energy Level 6 Supply, accepts C5 connector	2	
N000900L031	AC line cord, US Type B, 720mm, C5 connector	2	Replaces N000900L007
WB3176	328 ft (100 m) Reel Outdoor Copper Clad CAT5E (Recommended for PTP)	1	
C000000L065	Gigabit Surge Suppressor (30V)	32	
C050045B031	5 GHz 450b - Mid-Gain - ROW	32	
EW-E2PT450B-WW	PTP 450b Extended Warranty, 2 additional years (per END)	32	
N000900L001	PoE, 15W, 30V, 2.5GbE DC Injector, Indoor, 0C to 40C,C5 connector	32	
N000900L031	AC line cord, US Type B, 720mm, C5 connector	32	Replaces N000900L007