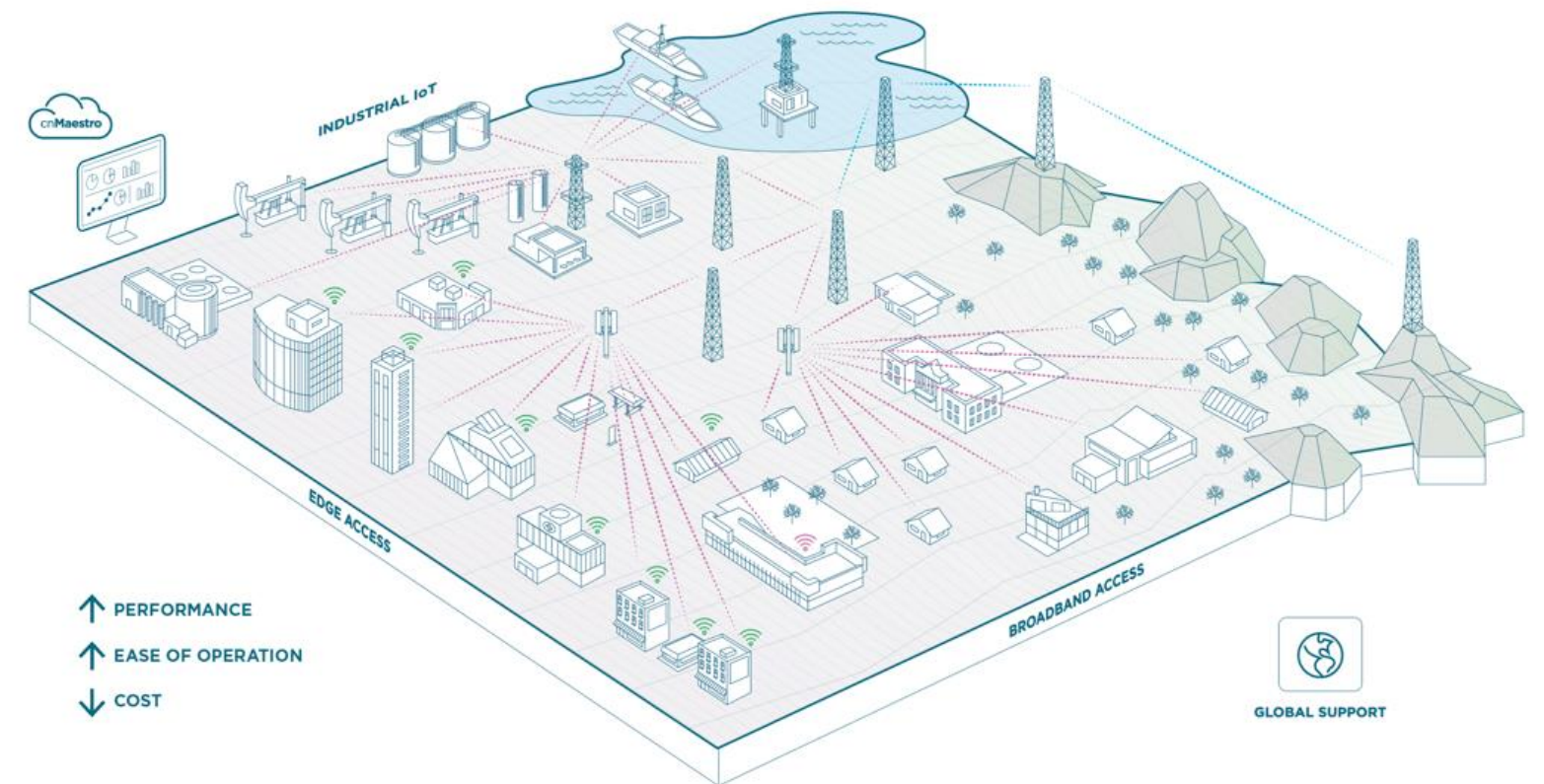
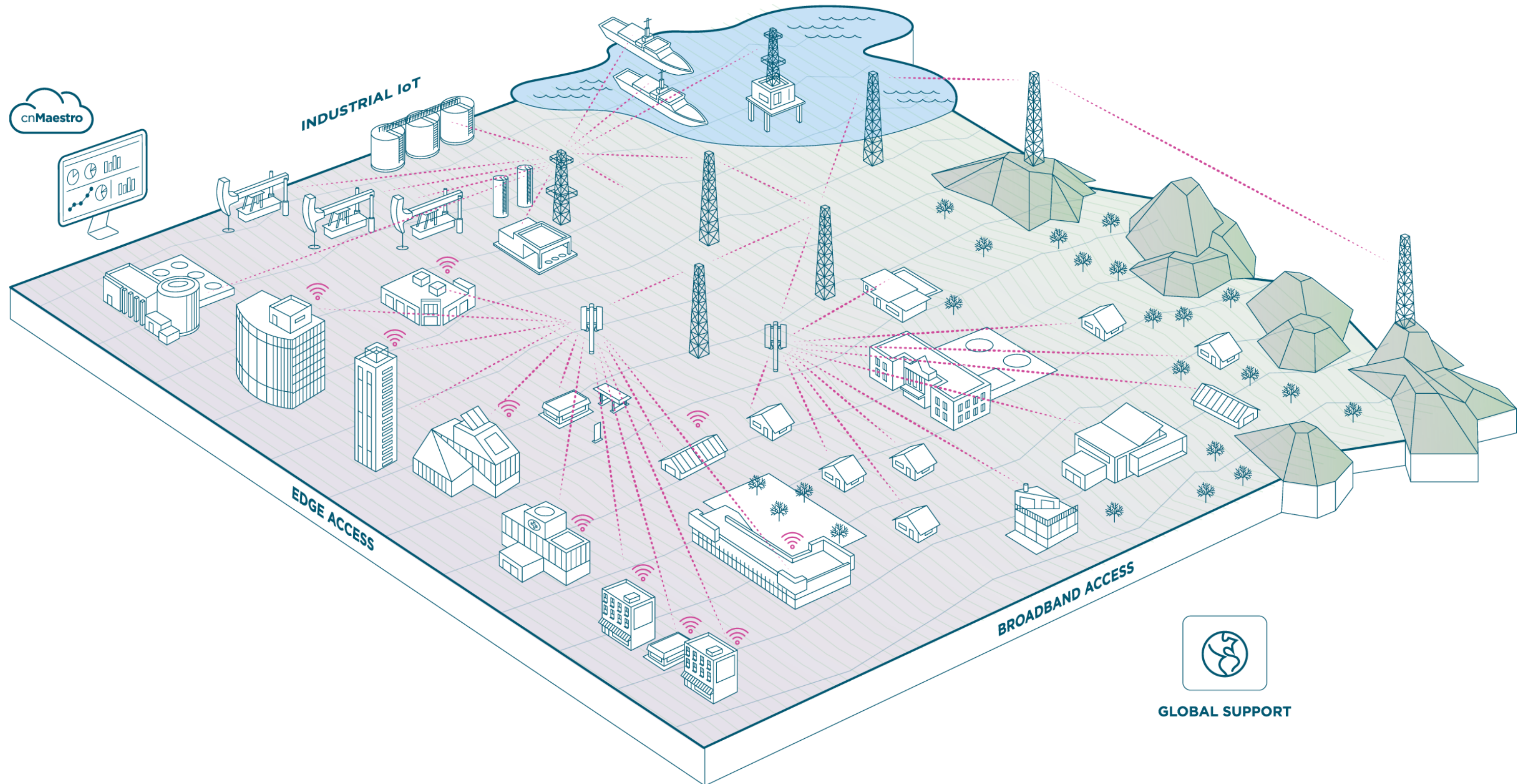


Wireless Fabric Intelligent Edge Connectivity Solutions



Cambium Networks' Wireless Fabric



Breakthrough Technologies

Cloud and Network Management

LINKPlanner

- Free, network design tool for RF environments
- Tens of thousands of links deployed



cnMaestro™

- Cloud management
- Secure, end-to-end network control



cnArcher™

- Free android app
- Allows field techs to configure PMP networks



Point-to-Point



PTP 650/670

- Replacement for legacy PTP 600 which was the "gold standard" for almost a decade



PTP 550

- Exceptional headline data rate (1.4 Gbps)

Point-to-Multipoint

cnMedusa™ (PMP 450m)



- Breakthrough 14x14 Massive MU-MIMO
- 3 and 5 GHz
- Will drive continued PMP growth for next several years



PMP 450i

- Long awaited replacement to flagship PMP product line
- Top performing Cambium product

ePMP™



ePMP 1000/2000

- High quality, affordable platform



ePMP 3000

- 4x4 MU-MIMO & 80 MHz Channel Support
- Higher Capacity and Spectral Efficiency

Wi-Fi



cnPilot™ e4/5/6xx/e700

- cloud-savvy
- 802.11ac Wave2
- Affordable yet uncompromising quality



cnPilot e430W

- Wall Plate AP for Hospitality
- Managed Service Provider enabler

cnReach™



cnReach N500

- IIoT narrowband connectivity
- Licensed and unlicensed spectrum



cnReach IO Expander

- 2 serial ports
- 2 Ethernet ports
- 8 Digital/Analog I/O ports

cnMatrix™ switches



cnMatrix EX2010

- 20 Gbps
- 8 ports
- 2 SFP uplink ports
- PoE ports option



cnMatrix EX2028

- 128 Gbps
- 24 ports
- 4 SFP+ uplink ports
- PoE ports option

cnPilot Wi-Fi Portfolio Overview

Provide seamless indoor and outdoor Wi-Fi with field proven solutions that meet capacity needs.



r190W



r190V



e410



e600



e500



e700



e430H

Key Statement	Indoor residential and small to medium business Wi-Fi access		Enterprise indoor access points		Enterprise outdoor access point with options for antenna coverage: - E500 - omnidirectional - e501S - 90° - 120° - e502S - 30°	Enterprise 802.11ac Wave2 omnidirectional	Enterprise wall plate
Typical Application	Indoor Wi-Fi coverage - Residential - Small and medium business		Enterprise Wi-Fi coverage for indoor locations: - Enterprise - Hospitality - Industry - Public Wi-Fi - Retail		Wi-Fi coverage for outdoor areas - Enterprise - Hospitality - Industry - Public Wi-Fi	Fi coverage for outdoor areas - Enterprise - Hospitality - Industry - Public Wi-Fi	Hospitality
Wi-Fi Standard	802.11n	802.11n	802.11ac Wave 2	802.11ac Wave 2	802.11ac	802.11ac Wave2	802.11ac Wave 2
Frequency	2.4 and 5 GHz		2.4 and 5 GHz	2.4 and 5 GHz	2.4 and 5 GHz	2.4 and 5 GHz	2.4 AND 5 GHz
Max Throughput	300 Mbps	300 Mbps	867 Mbps	1.3 Gbps	1.01 Gbps	1.01 Gbps	1.01 Gbps
Tx Power	24 dBm	24 dBm	24 dBm at 2.4 GHz 25 dBm at 5 GHz	24 dBm at 2.4 GHz 28 dBm at 5 GHz	29 dBm at 2.4 GHz 28 dBm at 5 GHz	33 dBm at 2.4 GHz 36 dBm at 5 GHz	22 dBm at 2.4 GHz 21 dBm at 5 GHz
Concurrent Users	64	64	256	512	256	512	256
SSID	4	4	16	16	16	16	16
Mesh Capability	No	No	Yes	Yes	Yes	Yes	Yes
Ethernet ports	4 LAN 1 WAN	4 LAN 1 WAN	1 LAN	2 LAN	2 LAN	2 LAN	3 LAN 1 LAN + PoE
Roaming	No	No	Yes	Yes	Yes	Yes	Yes

PMP 450 Platform Overview

Access Points

PMP 450i 900 MHz

Subscriber Modules



	Access Points			Subscriber Modules		
	450m cnMedusa	450i	450	450b	450i	450
Frequency Bands	3 GHz, 5 GHz	900 MHz, 3 GHz, 5 GHz	2.4 GHz	3 GHz, 5 GHz	3 GHz, 5 GHz	900 MHz, 2.4 GHz
Channel Size	5 7 10 15 20 30 40 MHz	5 7 10 15 20 30 40 MHz	5 10 15 20 30 40 MHz	5 7 10 15 20 30 40 MHz	5 7 10 15 20 30 40 MHz	5 7 10 15 20 30 40 MHz
Physical Layer	14 x 14 MU-MIMO / OFDM	2 x 2 MIMO / OFDM	2 x 2 MIMO / OFDM	2 x 2 MIMO / OFDM	2 x 2 MIMO / OFDM	2 x 2 MIMO / OFDM
Interface	Gigabit, SFP 2 nd Ethernet port PoE out	Gigabit 2 nd Ethernet port PoE out	100 Mbit	Gigabit	Gigabit 2 nd Ethernet port PoE out	100 Mbit
Environmental	IP 67, IP 66	IP 67, IP 66	IP 67, IP 66	IP 55 (Mid-gain), IP 67 (High Gain)	IP 67, IP 66	IP 55
Latency	7-10 ms	3-5 ms	3-5 ms	3-5 ms	3-5 ms	3-5 ms
Performance	1.2 Gbps+	300+ Mbps	200+ Mbps	300+ Mbps	300+ Mbps	100+ Mbps
Powering Methods	40 – 60 V PoE Cambium Proprietary PoE Pinout	48-59 V PoE 802.3at Compatible	30V PoE Cambium Proprietary PoE Pinout	30V PoE Cambium Proprietary PoE Pinout	48-59 V PoE 802.3at Compatible	30V PoE Cambium Proprietary PoE Pinout
Power Consumption	85 W Max, 70 W Typical	19 W Max, 16 W Typical	15 W max, 12 W typical	12 W max, 9 W typical	19 W max, 16 W typical	12 W max, 9 W typical
Max Power	+42 dBm EIRP	+44 dBm EIRP +27 dBm Tx Power	+22 dBm Tx Power	+44 dBm EIRP (mid-gain) +51 dBm EIRP (High gain)	+50 dBm EIRP +27 dBm Tx Power	+22 dBm Tx Power
Antenna	90°/120° Sector 14 x 14 MU-MIMO Downlink Beamforming Uplink Beamforming	90°/120° Sector: 17 dBi (3 and 5 GHz) Connectorized, external 60° Sector Antenna (900 MHz)	Connectorized, external 60° Sector Antenna available	17 dBi: Mid-Gain 24 dBi: High Gain (5 GHz) 19 dBi: High Gain (3 GHz)*	23 dBi (5 GHz) 19 dBi (3 GHz) Integrated Flat Panel	9 dBi: Integrated (2.4 GHz) Connectorized, external 12 dBi Yagi (900 MHz)
SMs Supported Per Sector	238	238	238			

ePMP™ Portfolio Overview

ePMP 10002.4 GHz				ePMP 10005 GHz							ePMP 2000	ePMP 30005 GHz		
														
GPS Sync RadioConnectorizedIntegratedForce 200				GPS Sync RadioConnectorizedBridge-in-a-BoxForce 180Force 190Force 200Force 130							Access Point with Intelligent Filtering	Force 300-16CSM 300Force 300-25ePMP3000L		

	Connectorized Integrated	GPS Sync Radio	Bridge-in-a-Box	Force 180	Force 190	Force 200	Force 130	Access Point w/ Intelligent Filtering	Force 300-16 Force 300-25 CSM 300	4x4MUMIMO Access Point & 2X2 MIMO AC AP
Frequency Band(s)	2.4 GHz, 5 GHz 2.4/2.5 GHz (Brazil, NZ) 6.4 GHz (Russia)	2.4 GHz, 5 GHz	5 GHz	5 GHz	5 GHz	2.4 & 5 GHz	2.4 &, 5 GHz (not available in North Am)	5 GHz	5 GHz	5 GHz
Channel Size	5 10 20 40 MHz	5 10 20 40 MHz	5 10 20 40 MHz	5 10 20 40 MHz	5 10 20 40 MHz	5 10 20 40 MHz	20 40 MHz	5 10 20 40 MHz	20 40 80 MHz	20 40 80 MHz
Physical Layer	2 x 2 MIMO / OFDM 802.11n – 64QAM	2 x 2 MIMO / OFDM 802.11n – 64QAM	2 x 2 MIMO / OFDM 802.11n – 64QAM	2 x 2 MIMO / OFDM 802.11n – 64QAM	2 x 2 MIMO / OFDM 802.11n – 64QAM	2 x 2 MIMO / OFDM 802.11n – 64QAM	2 x 2 MIMO / OFDM 802.11n – 64QAM	2 x 2 MIMO / OFDM 802.11n – 64QAM	2 x 2 MIMO / OFDM 802.11ac Wave 2 256QAM	4 x 4 MIMO / OFDM 3000L is 2 x 2 MIMO 802.11ac Wave 2 256QAM
Interface	100 Mbit - 2 nd Ethernet port PoE out	Gigabit	Gigabit	Gigabit	100 Mbit	Gigabit	Gigabit	Gigabit	Gigabit	Gigabit/SFP
Environmental	IP55	IP55	IP55	IP55	IP55	IP55	IP55	IP55	IP55 CSM 300 is IP67	IP55 3000L is IP67
Latency	15~17ms	5~7ms	15~17ms	5~7ms	2~3ms	2~3ms	15-17 ms	5~7ms	5~7ms	5~7ms
Performance	200+ Mbps	200+ Mbps	200+ Mbps	200+ Mbps	200+ Mbps	200+ Mbps	200+ Mbps	200+ Mbps	600+ Mbps	1+ Gbps 3000L is 600 Mbps
Powering Methods	30V PoE Cambium Proprietary	30V PoE 802.3af	30V PoE Cambium Proprietary Standard PoE Pinouts	30V PoE Cambium Proprietary Standard PoE Pinouts	30V PoE Cambium Proprietary Standard PoE Pinouts	30V PoE Cambium Proprietary Standard PoE Pinouts	24V Passive PoE	56V PoE 802.3at	30V PoE	56V PoE, 802.3at 3000L is 30V POE
Power Consumption	7 W max, 5 W typical	10 W max, 7.5 W typical	10 W max, 5 W typical	10 W max, 5 W typical	8 W max, 5 W typical	10 W max, 5 W typical	5 W typical	20 W max	12 W	21 W max 3000L is 12W typical
Max Tx Power	+30 dBm	+30 dBm	+30 dBm	+30 dBm	+27 dBm	+30 dBm	+28dBm – 5 GHz +31 dBm – 2.4 GHz	+30 dBm	+27 dBm CSM 300 is+29 dBm	MCS0, VHT80: +25 dBm MCS9, VHT80: +21 dBm
Antenna	Integrated: 2.4 GHz – 11 dBi 5 GHz – 14 dBi Connectorized: 3 rd party	90°/120° Sector: 18 dBi or 3 rd party antenna	Integrated: 16 dBi	Integrated: 16 dBi	Dish: 22 dBi	Dish: 2.4 GHz - 17 dBi 5 GHz – 25 dBi	Integrated: 14 dBi @ 5 GHz,12 dBi @ 2.4 GHz	90/120° Sector: 17dBi Optional Beamforming	300-16: Integrated 16 dBi 300-25: Dish 25 dBi CSM 300: RP-SMA	90/120° Sector: 17 dBi 4 x 4 MU-MIMO Optional Beamforming 3000L is connectorized
Modes	AP: 120 Subscribers SM PTP	AP: 120 Subscribers PTP	Bridge-in-a-Box: PTP	SM PTP	SM PTP	SM PTP	SM PTP	AP: 120 Subscribers PTP	SM PTP	AP: 120 Subscribers 3000L AP: 64 Subscribers PTP

ePMP elevate

Leverage an existing 802.11-based installed network and add synchronization without the cost of replacing the entire network

ePMP elevate

Typical Application	Saving the cost and time of a total network replacement, an operator simply installs an ePMP Access Point and loads ePMP Elevate software onto their deployed subscriber modules.
Products Supported	• For Ubiquiti® XW/XM and Mikrotik SXT5-Lite Devices
Devices Supported	• Loco M5 WX • Loco M5 XM • NanoStation M5 XW • NanoStation M5 XM • NanoBridge M5 XM • Rocket M5 XM • Rocket M5 XW • PowerBeam M5 XW • airGrid M5HP XW • airGrid M5 XM • NanoBeam M5 XW

cnReach / IIoT Overview

Simplify the migration to an all-IP network and maximize the use of spectrum while reducing operating costs



N500 900 MHz



N500 700 MHz



N500 450 MHz



N500 220 MHz



N500 I/O Expander

Key Statement	For outdoor critical infrastructure operations, cnReach transports process monitoring and control data from the remote sensor or PLC/RTU back to the operations center supporting real-time automated decision making and on-going analytics. Covering large geographic areas, hard to reach terrain and challenging spectrum environments, cnReach delivers reliable, secure connectivity to the petrochemical, electric utility, water/wastewater/stormwater, rail and transportation industries. cnReach eases the migration to modern networks by combining legacy serial and analog/digital I/O with TCP/IP and Ethernet connectivity.				
Region	NA/CALA/Australia/NZ	US	Global	US	Global
Frequency Bands	ISM mode: 902 - 928 MHz; (915-928 MHz in Australia) MAS mode: 928 - 960 MHz	757-758 MHz and 787-788 MHz	406 – 430 MHz and 450 – 470 MHz ETSI RED 406-470 MHz	217 – 222 MHz	
Channel Size	ISM: 76 / 154 / 207 / 310 / 600 / 1200 kHz MAS: 12.5 / 25 / 50 kHz	12.5, 25, 50, 100, 200, 250 kHz	12.5 / 25 kHz (50 / 100 kHz available regulations permitting)	12.5 / 15 / 25 / 50 / 100 / 200 kHz	
Modulations	MSK / 2FSK / BPSK / QPSK / 8PSK / 16PSK / 16QAM / 32QAM	MSK / QPSK / 8PSK / 16QAM / 32QAM	MSK / QPSK / 8PSK / 16QAM / 32QAM	MSK / QPSK / 8PSK / 16QAM / 32QAM	
Max Tx Power	Up to 1 W (30 dBm) (ISM) Up to 4 W (36 dBm) (MAS)	Up to 10W (40 dBm)	FCC: 406.1 - 430 MHz (up to 2 W / 33 dBm); 450-470 MHz (up to 8 W / 39 dBm); ETSI RED: Up to 8W (39 dBm)	217-220: Up to 2W 220-222 Up to 5W	
Adaptive modulation	Yes	Yes	Yes	Yes	
Security	128/256-bit AES encryption and secure management interfaces (HTTPS, SNMPv3)				
Interfaces	Two Ethernet Two Serial (RS-232/422/485) Optional Analog/Digital GPIO	Two Ethernet Two Serial (RS-232/422/485) Optional Analog/Digital GPIO	Two Ethernet Two Serial (RS-232/422/485) Optional Analog/Digital GPIO	Two Ethernet Two Serial (RS-232/422/485) Optional Analog/Digital GPIO	Two Ethernet Two Serial (RS-232/422/485) Analog/Digital GPIO
LINKPlanner	Y	Y	Y	Y	
cnMaestro	Y	Y	Y	Y	

Cambium Networks offers a complete set of accessories for cnReach including power supplies, antennas and adaptors.

Licensed Microwave Overview

	FULL OUTDOOR		SPLIT MOUNT	
				
	PTP820S	PTP820C	PTP820G + RFU-C	PTP820G + RFU-A
Frequency Band	6 – 38 GHz	6 – 38 GHz	6 – 38 GHz	6, 11 GHz
Channel Size	3.5 - 80 MHz	3.5 - 80 MHz	3.5 - 60 MHz	3.5 - 60 MHz
Number of Carriers	Single	Dual	Single and Dual	Single and Dual
XPIC	Not Supported	Supported	Supported	Supported
MIMO	Not Supported	2x2 / 4x4 MIMO	Not Supported	Not Supported
Traffic Interface	1 x 10/100/1000 Base T (RJ 45)	1 x 10/100/1000 Base T (RJ 45)	4 x 10/100/1000 Base T (RJ 45)	4 x 10/100/1000 Base T (RJ 45)
	2 x 1000 BaseX - SFP	1 x 1000 BaseX - SFP	2 x 1000 BaseX - SFP	2 x 1000 BaseX - SFP
MTU	9600 Bytes	9600 Bytes	9600 Bytes	9600 Bytes
QoS	VLAN ID, p-bits, IPv4, DSCP, IPv6 TC, MPLS EXP	VLAN ID, p-bits, IPv4, DSCP, IPv6 TC, MPLS EXP	VLAN ID, p-bits, IPv4, DSCP, IPv6 TC, MPLS EXP	VLAN ID, p-bits, IPv4, DSCP, IPv6 TC, MPLS EXP
	8 priority queues	8 priority queues	8 priority queues	8 priority queues
	configurable up to 64 Mbit per queue	configurable up to 64 Mbit per queue	configurable up to 64 Mbit per queue	configurable up to 64 Mbit per queue
Configuration	1+0	1+0 to 4+0	1+0 to 2+0	1+0 to 2+0
	1+1 HSB	1+1 / 2+2 HSB	1+1 / 2+2 HSB	1+1 / 2+2 HSB
	2+0, Non-XPIC	2+0 XPIC	2+0 XPIC	2+0 XPIC
		2+2 SD	1+1 HSB with SD	1+1 HSB with SD
Performance (Layer 2)	596 Mbps - No Compression	1.2 Gbps - No Compression	1 Gbps - No Compression	1 Gbps - No Compression
	833 - Multi-Layer Compression	2 Gbps - Multi-Layer Compression	2 Gbps - Multi-Layer Compression	2 Gbps - Multi-Layer Compression
Modulation	QPSK to 2048 OAM w/ACM	QPSK to 2048 OAM w/ACM	QPSK to 2048 OAM w/ACM	QPSK to 2048 OAM w/ACM
Multi Carrier Link Aggregation	N/A	MC-ABC	MC-ABC	MC-ABC
Power Consumption	6-11 GHz: 40W	6 & 11 GHz: 65W	IDU: 23.5W(single modem)	IDU: 23.5W(single modem)
		7 GHz: 75W	IDU: 26.4W(Dual modem)	IDU: 26.4W(Dual modem)
	13-38 GHz: 35W	13-15 GHz & 26-38 GHz: 55W	RFU-C 6-26 GHz: 22W (1+0), 39W (1+1)	RFU-Ae: 77W (1+0), 101W(1+1)
		18-24 GHz: 48W	RFU-C 28-38 GHz: 26W (1+0), 43W (1+1)	RFU-Aep: 90W (1+0), 114W(1+1)
Maximum Tx Power	29 dBm	28 dBm	26 dBm	35 dBm

Point to Point Sub 6 GHz: Product at a Glance



	Bridge-in-a-Box	F300-25	PTP 450	PTP 450i	PTP 550 (Dual Carrier)	PTP 670
Frequency Range (GHz)	4.9 to 5.97	5.15 to 5.97	3.5 /3.65/ 5.4 to 5.8 GHz	3, 5, 4.90 to 5.925	5.15 – 5.97	4.9 to 6.05
Channel BW (MHz)	5/10/20/40	20/40/80	5/10/20/30	5/10/15/20/30/40	2x 20/40/80	5/10/15/20/30/40/45
Technology	802.11n	802.11ac Wave 2	Proprietary	Proprietary	802.11ac Wave 2	Proprietary
Line of Sight	LoS	LoS	LoS	LoS	LoS	LoS, nLoS, NLoS
Environmental	IP55	IP55	IP55	IP66/67	IP66/67	IP66/67
Latency	3-6 ms	3-6 ms	3-5 ms	3-5 ms	3-5 ms	1-3 ms
Performance	200 Mbps	600 Mbps	300 Mbps	300 Mbps	1.4 Gbps	450 Mbps
Top Modulation	64 QAM	256 QAM	256 QAM	256 QAM	256 QAM	256 QAM
Max Frame Size	1700 Bytes	1700 Bytes	1700 Bytes	1700 Bytes	1700 Bytes	9600 Bytes
Spectrum Management	Standby Spectrum Analyzer	Live Spectrum Analyzer	Standby Spectrum Analyzer	Standby Spectrum Analyzer	Dynamic Channel Selection	Dynamic Spectrum Optimization (DSO)
Dynamic Filter	No	No	No	Yes	No	No
IEEE 1588v2 & SyncE	No	No	No	No	No	Yes
TDD Sync	No	No	Yes	Yes	Yes	Yes
Encryption	AES 128	AES 128	AES 128	AES 128	AES 128	AES 128/AES 256
QOS	3 Level	3 Level	2 Level	4 Level	3 Level	8 Levels
Power Consumption	7W	12 W	12 W	< 25 W	< 25 W	<30 W
Max Tx Power	30 dBm	27 dBm	22 dBm	27 dBm	27 dBm	27 dBm
Integrated Antenna	16 dBi	25 dBi or 16 dBi	14 dBi	23 dBi	23 dBi	23 dBi

cnMatrix Switch Portfolio

Cambium Networks’ next generation switching platform offers a cloud managed, high performance, feature rich enterprise grade ethernet switching solution. The cnMatrix™ platform of switches provides:

- Easy and simple free cloud management with cnMaestro
- Zero touch deployment of switches makes deployment easy
- Zero touch policy based configuration enables automation, reduces errors and network downtime
- Device profiling, automatic port configuration and network segmentation improves security posture of the network
- Wireless Aware: Together with Cambium Networks cnPilot Wi-Fi solution, enables a simple, easy-to-use cloud managed Unified Wired-Wireless access solution

The cnMatrix series of fully managed switches delivers full Layer2 and Layer 3 capabilities with enhanced access security. cnMatrix switches deliver power savings with several models offering fanless operation. The cnMatrix switch series offers flexibility with 4 – 10 Gbps (SFP+) uplinks on the 28 port models while offering 2 - 1Gbps (SFP) uplink ports on the 10 port models.



ES2028P



EX2028



EX2010P



EX2010

Throughput	128 Gbps	128 Gbps	20 Gbps	20 Gbps
PoE enabled ports	24	24	8	8
10/100/1000 ports	24	24	8	8
Uplink ports	4 SFP+	4 SFP+	2 SFP	2 SFP
Rack Mount Kit	√	√	Optional	Optional
Internal Fans	2	Fanless	Fanless	Fanless

Planning and Management Overview



LINKPlanner

Quickly design networks for optimal deployment and cost effectiveness with ease.



cnHeat

Improve the precision of site surveys while saving time and money. Heat map displays provide the exact antenna location that provides the best connectivity.



cnArcher

Improve installation accuracy with cnArcher™, the free Android app that gives field techs the information they need to configure and properly align PMP subscriber modules.



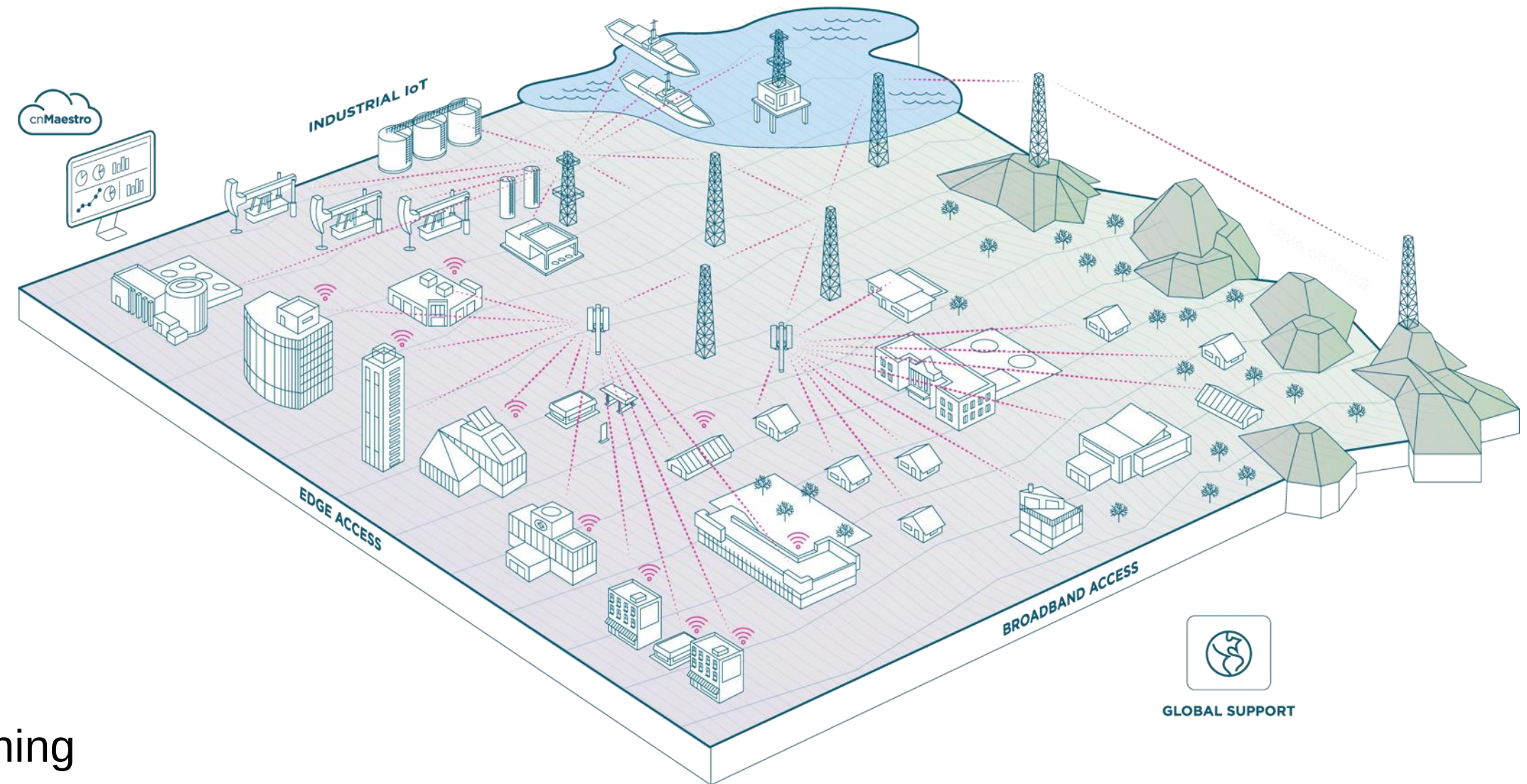
cnMaestro

cnMaestro™ is a cloud-based or on-premises software Platform for secure, end-to-end network control.

Typical Application	LINKPlanner allows you to model scenarios – based on geography, distance, antenna height, transmit power, and other factors – to optimize system performance before purchase. Quickly design networks for optimal deployment and cost effectiveness with ease. Available for Microsoft® Windows® and Mac® systems, LINKPlanner is a free, user-friendly link-design tool.	Built upon Cambium Networks’ expertise in RF planning, propagation, and modeling as seen in LINKPlanner and integrated with GIS data down to 1 meter precision, cnHeat generates highly accurate RF predictions and derivative services that accurately represent the reality of the RF world.	Designed with input from field technicians and years of experience on our millions of wireless broadband modules deployed, cnArcher validates configuration and alignment in seconds. Increase the number of installs done right the first time, and increase customer satisfaction. Eliminate problems, and focus your manpower on connecting new subscribers as your network grows.	cnMaestro wireless network manager simplifies device management by offering full network visibility. View and perform a full suite of wireless network management functions in real time. Optimize system availability, maximize throughput, and meet emerging needs of business and residential customers.
Products Supported	- cnPilot - ePMP - PMP - PTP - cnReach	- ePMP - PMP	- PMP 450 - ePMP* - PTP* - cnReach* *Upcoming updates to app	- cnPilot - PMP 450 - ePMP - cnReach

Cambium Networks Wireless Network Fabric

- People Places Things
- Purpose Built
- 2 m to 246 km
- Kb to Mb to Gb
- Indoor and Outdoor
- PTP PMP Wi-Fi LTE
- Licensed & Unlicensed
- Scalable
- Concept to Commissioning
- Single Pane of Glass



Resilient, Efficient, Affordable Wireless Connectivity Solutions

