Multigig 60GHz networks and PMP (Point-to-multipoint) connections in practice

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Sylwester Chojnacki
Regional Sales Director – CEE Region

Wireless Fabric Agility – 100mb to 1Gb to the Edge

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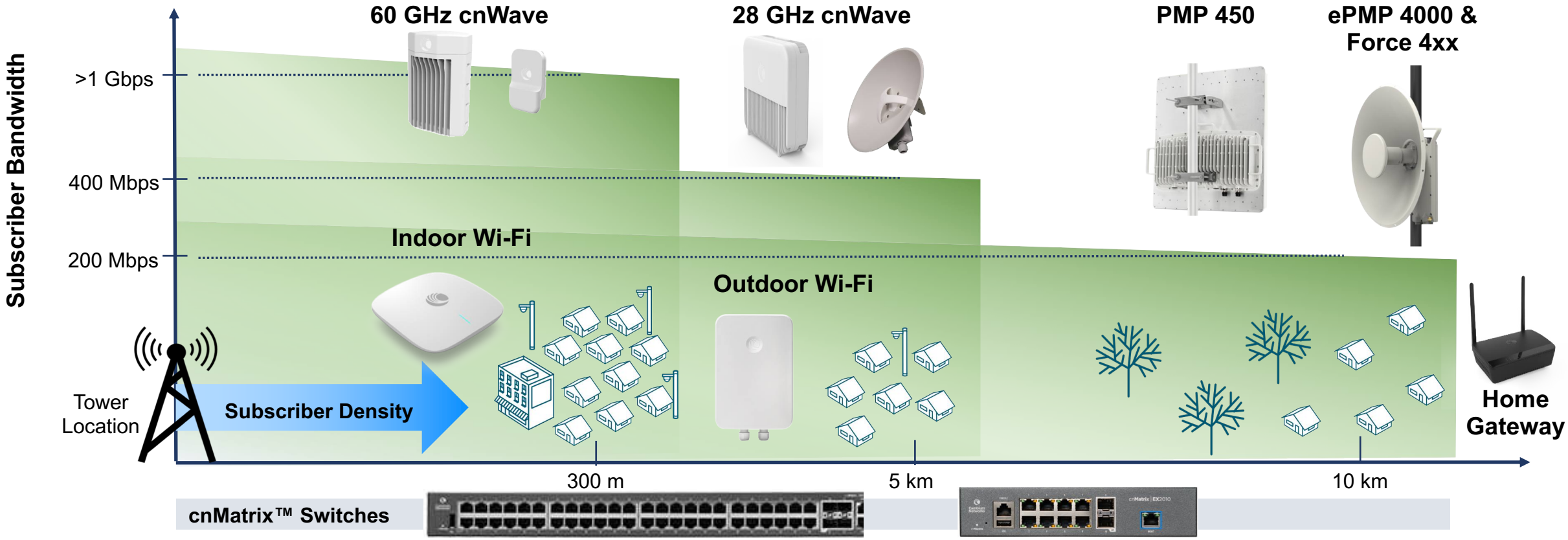

KPI			
Technology	**802.11ay Terragraph**	5G	cnMedusa MU-MIMO → 5G NR
Sector Capacity	**> 15 Gbps**	> 3 Gbps	> 1 Gbps
Subscribers per Sector	**30**	240	238
Management	cnMaestro READY		

Cambium 60 GHz cnWave

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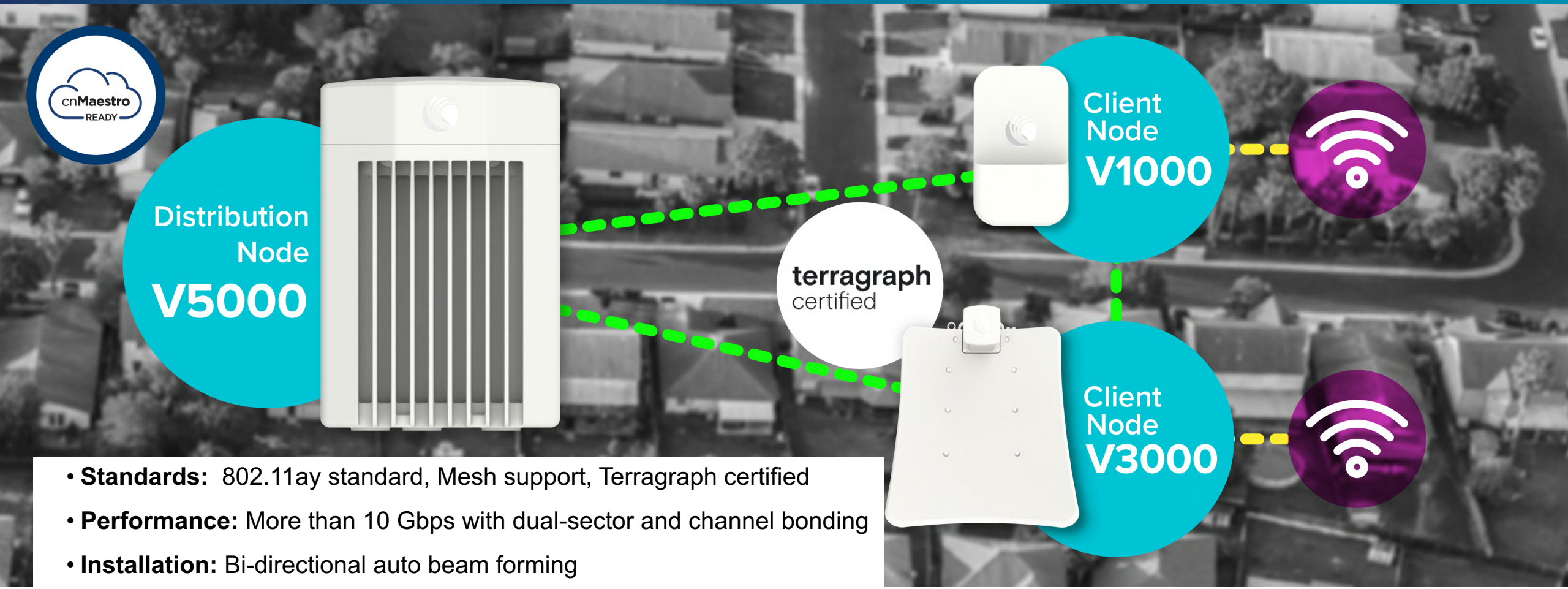

- **Standards:** 802.11ay standard, Mesh support, Terragraph certified
- **Performance:** More than 10 Gbps with dual-sector and channel bonding
- **Installation:** Bi-directional auto beam forming
- **Operation:** Auto expansion, auto healing with Mesh support
- **Configuration:** Point-to-Point, Point-to-MultiPoint, Mesh
- **Management:** cnMaestro™

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802.11ad vs. 802.11ay

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	Product 802.11ad based	Product 802.11ay based
Protocol	802.11ad (Ratified in 2016)	802.11ay (Expect 2020)
Maximum PHY Throughput	4620 Mbps	9240 Mbps
Channel Width	2160 MHz	2160 MHz or 4320 MHz (Channel bonding)
Channel Access	CSMA/CA	TDMA/TDD
Network Synchronization	No	Yes (via GPS)
Mesh Support	No	Yes
CPE per Sector	8	15

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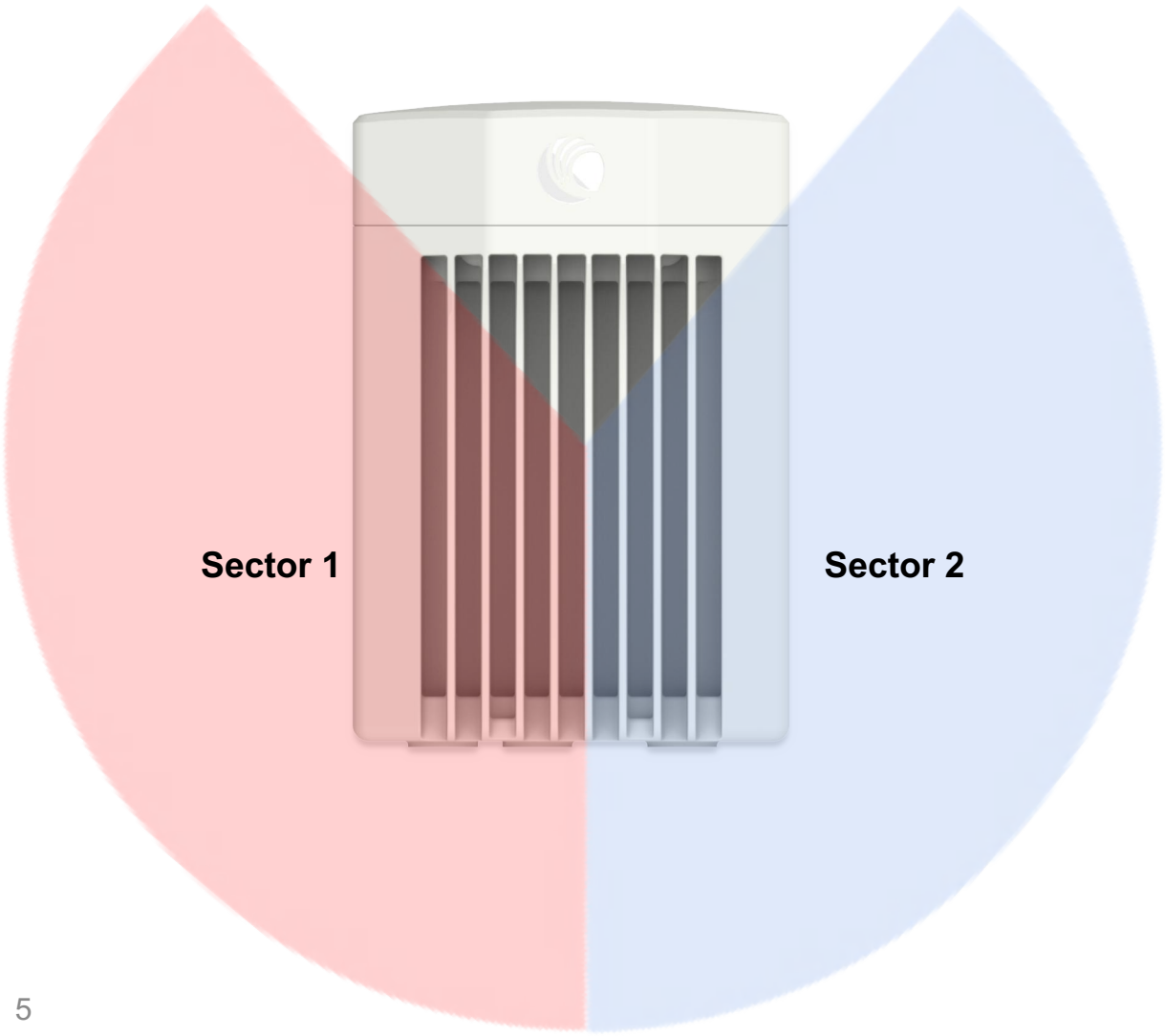
cnWave V5000 – 280º Coverage with a Single Node



Frequency: 57 to 66 GHz

Modulation: BPSK to 16 QAM (MCS 0 to MCS 12) with ACM

Throughput:

- 1.9 Gbps Uplink + 1.9 Gbps Downlink per sector
- Channel bonding* typically doubles capacity up to a maximum of 2.7 Gbps Uplink + 2.7 Gbps Downlink per sector

Coverage: Dual Sector 280 Degree Coverage with Beam Forming

Configurations: Up to 30 CNs or 4 DNs + 26 CNs

Latency: < 1 ms

Interfaces: 1 x 10GbE PoE Input
1 x 1 GbE PoE Output (802.3at)
1 x SFP+

* Roadmap feature

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Client Nodes Comparison

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	V1000	V2000	V3000 with 40.5 dBi Antenna	V3000 with 44.5 dBi Antenna
Status	Released	In Development	Released	Released
Key Benefit to End User	- Up to 1 Gbps one direction - Up to 200m for PMP - 120 K PPS	- Up to 1.9 Gbps one direction - Up to 320m for PMP - Higher PPS	- Up to 1.9 Gbps one direction - Up to 460m for PMP - 700K PPS	- Up to 1.9 Gbps one direction - Up to 490m for PMP - 700K PPS
Azimuth	+/- 40 degree	+/- 15 degree	+/- 2 degree	+/- 2 degree
Antenna Gain	22.5 dBi	34 dBi	40.5 dBi	44.6 dBi
Platform EIRP Maximum	38 dBm	48 dBm	54.5 dBm	60 dBm
User Interface	1 GE with PoE in	1 GE with PoE in 1 GE with PoE out (802.3at)	1/2.5/5/10 GE with PoE in 1 GE with PoE out (802.3at) SFP+ Cage	1/2.5/5/10 GE with PoE in 1 GE with PoE out (802.3at) SFP+ Cage
Size	140 x 85 x 40 mm	165 x 130 x 125 mm	414 x 250 x 250 mm	414 x 346 x 344 mm
Power Consumption	10W	25W 60W with PoE output	30W 60W with PoE output	30W 60W with PoE output

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Throughput Test Results, 2160MHz, TDD 50:50 split

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V5000 to V5000, V5000 to V3000, V3000 to V3000			
		TCP (Gbps)	UDP(Gbps)
Uplink		1.75	1.86
Downlink		1.75	1.82
Bidirectional	Uplink	1.47	1.76
	Downlink	1.65	1.74

V5000 to V1000			
		TCP (Mbps)	UDP(Mbps)
Uplink		932	947
Downlink		939	955
Bidirectional	Uplink	889	945
	Downlink	569	558

V1000 to V1000			
		TCP (Mbps)	UDP(Mbps)
Uplink		929	947
Downlink		887	931
Bidirectional	Uplink	703	668
	Downlink	569	672

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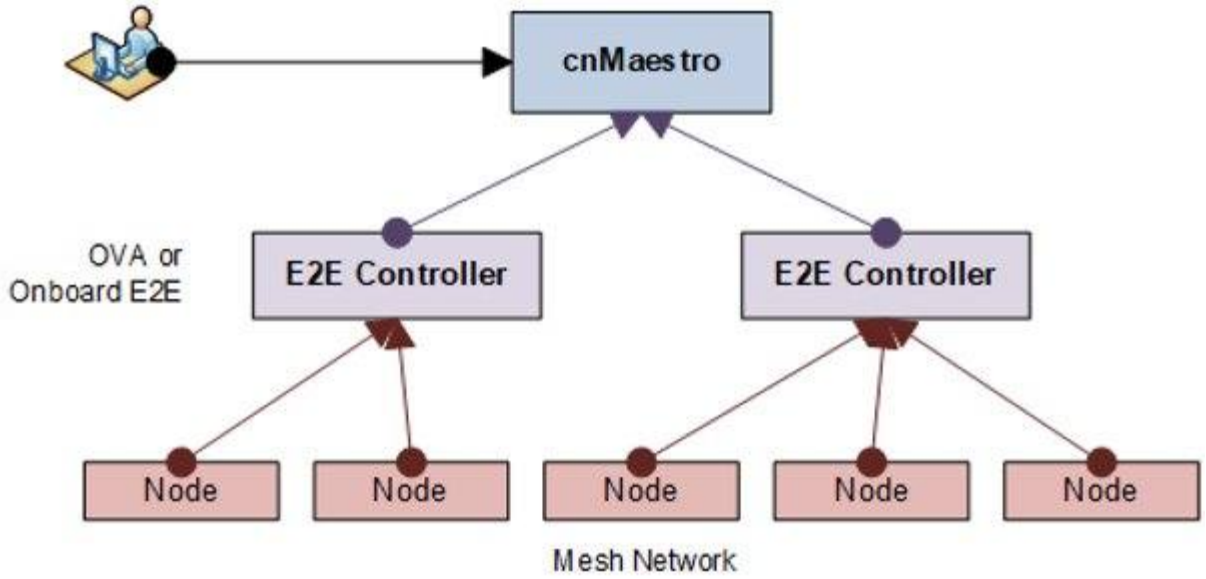
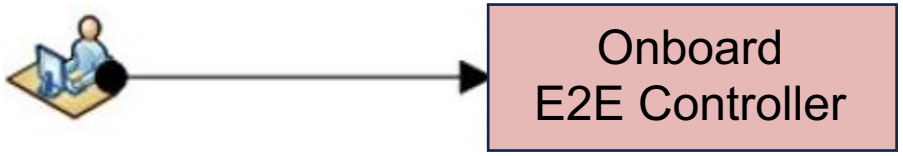
Configuration has to be done through E2E controller!

•cnMaestro Integration (Network, Site, Node)



•Standalone PoP



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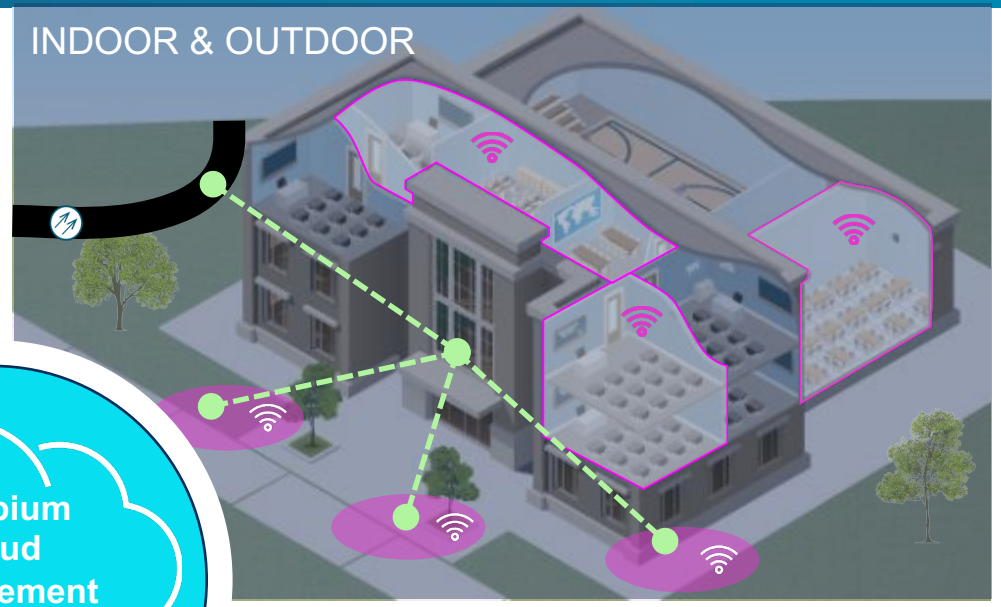
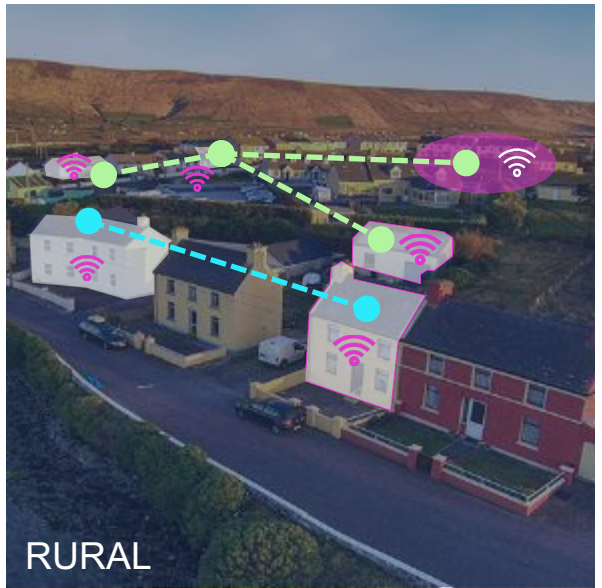
Cambium Networks Multi-Gigabit Wireless Fabric



Cambium Cloud Management



- Multi-Gig Wireless from Broadband to the Edge
- Proven Lowest Cost per Mbps
- One Dashboard for Wi-Fi, Switching and Broadband

- Fixed Wireless 60 GHz Distribution
- Fixed Wireless 60 GHz PTP
- Wi-Fi
- Fiber Ring

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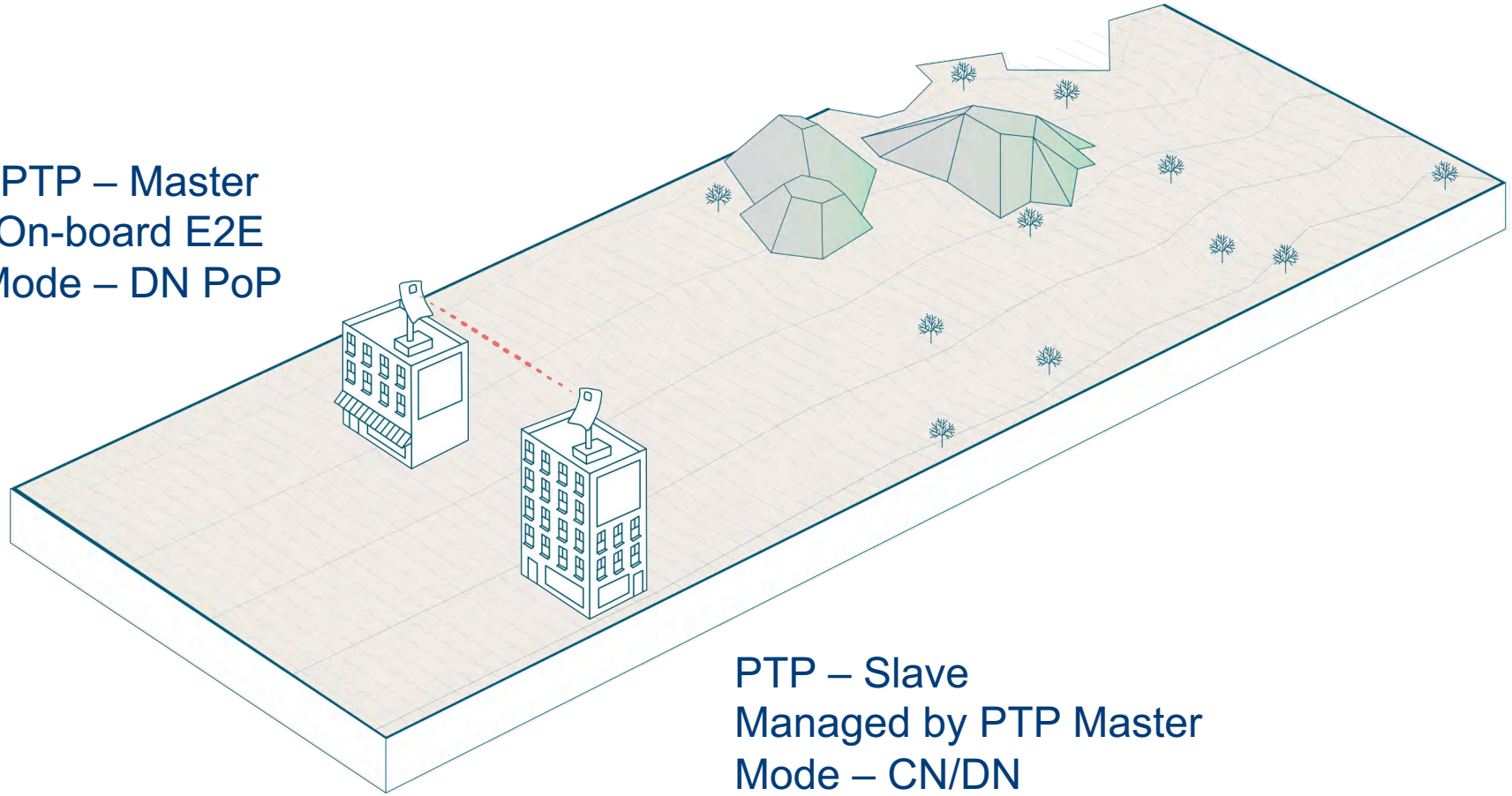
Point to Point (PTP)

PTP – Master
On-board E2E
Mode – DN PoP



PTP – Slave
Managed by PTP Master
Mode – CN/DN

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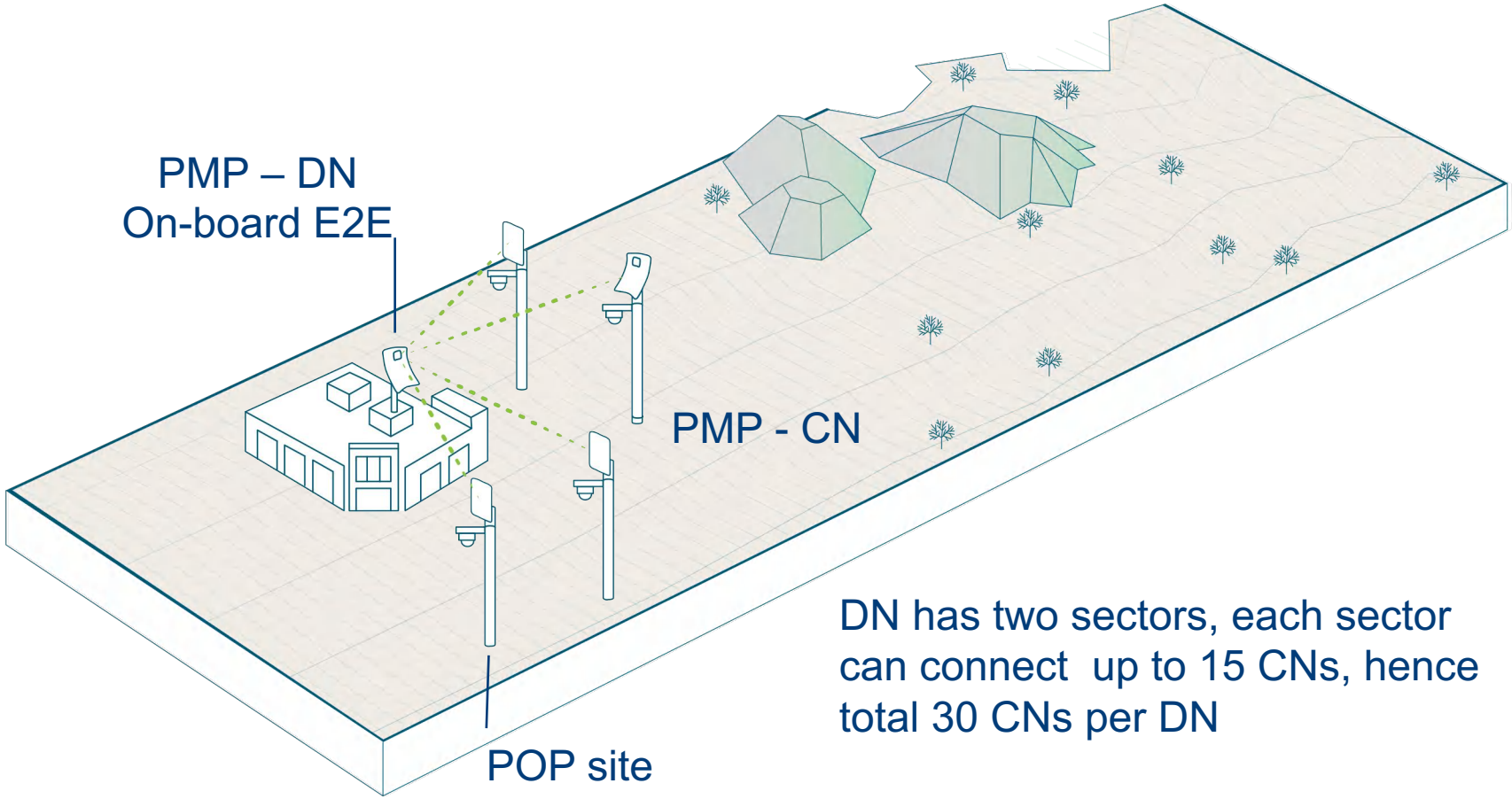
Point to MultiPoint (PMP)



DN has two sectors, each sector can connect up to 15 CNs, hence total 30 CNs per DN

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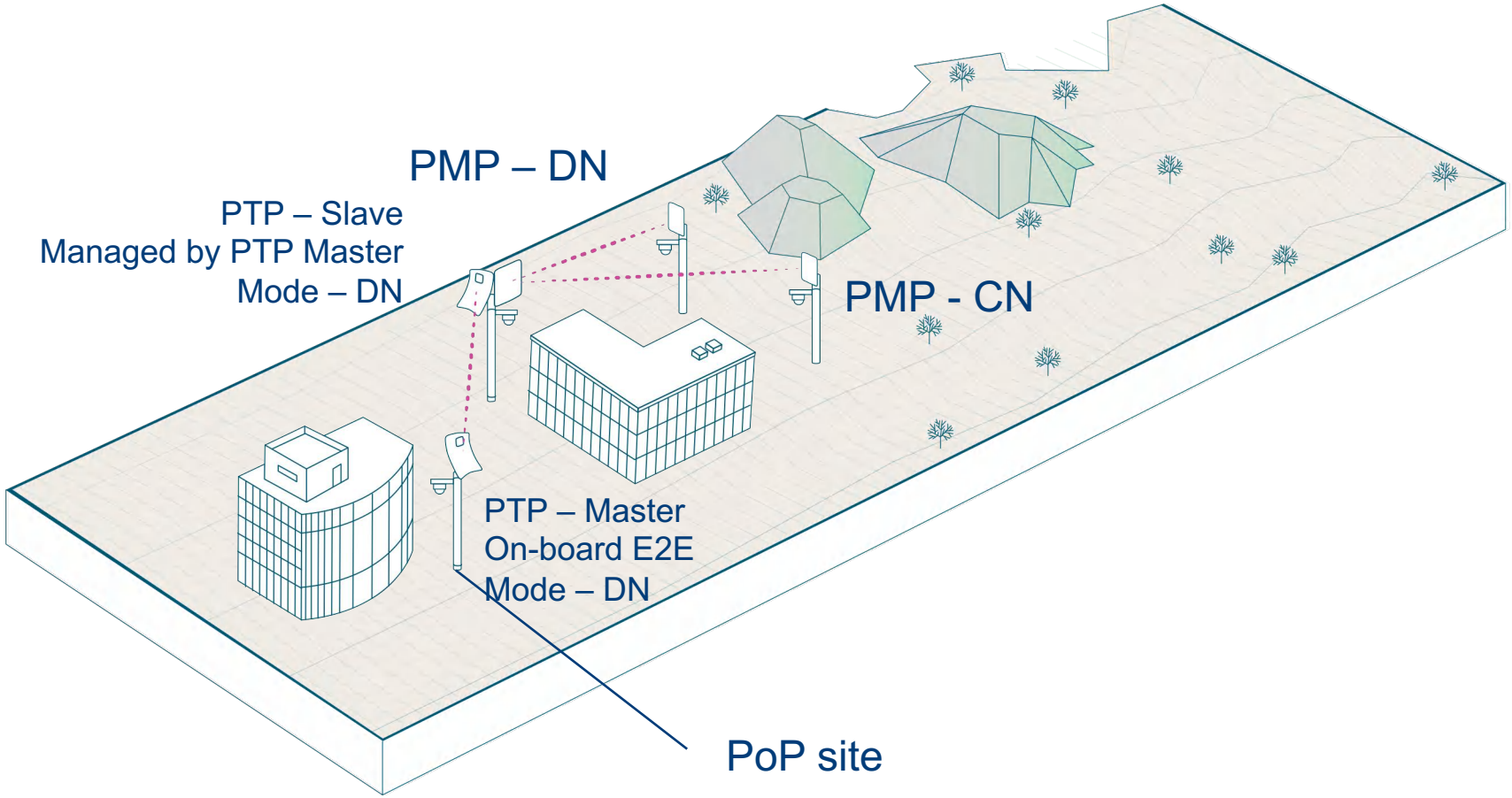
Extended PMP with PTP



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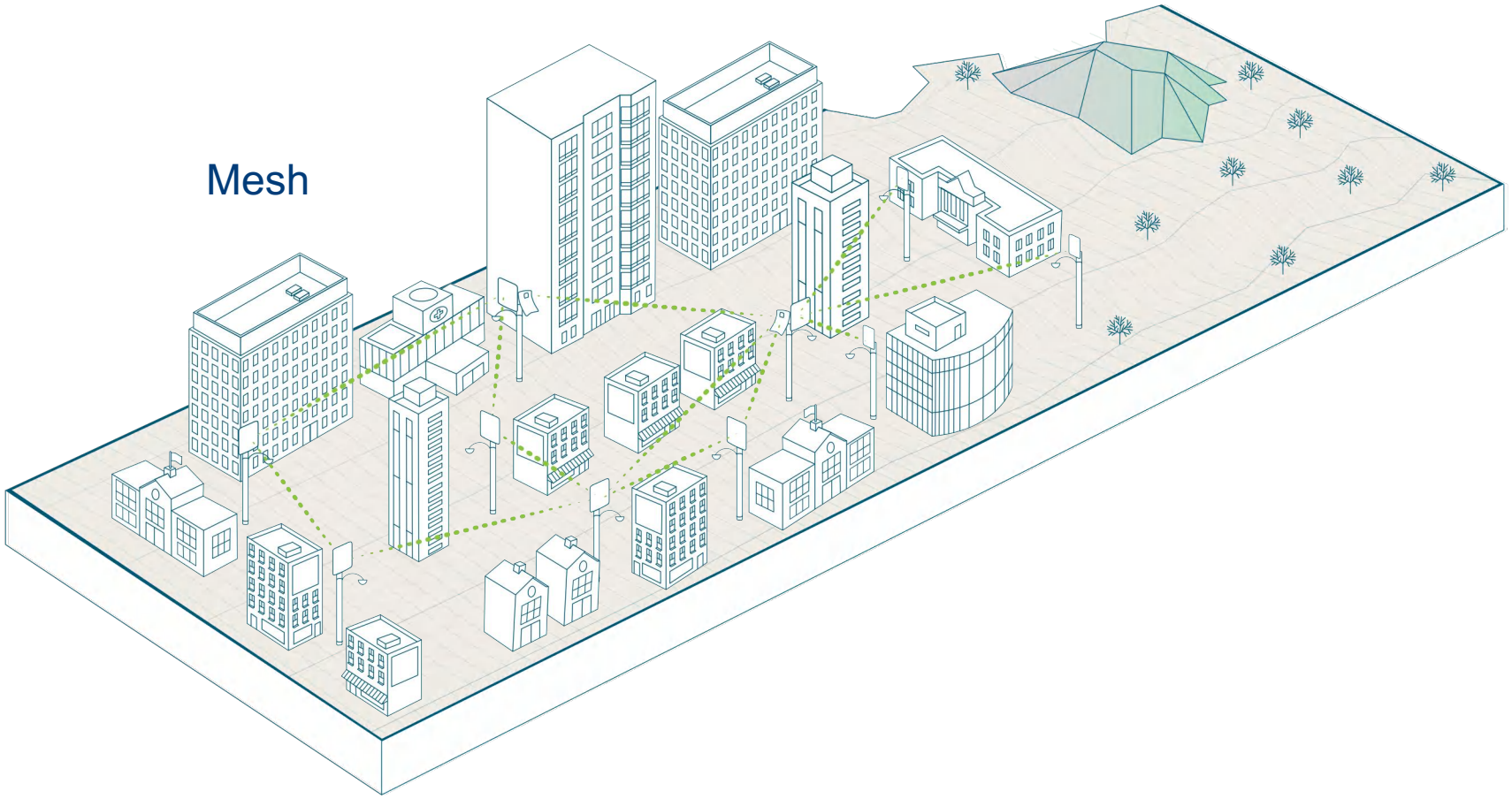
Mesh



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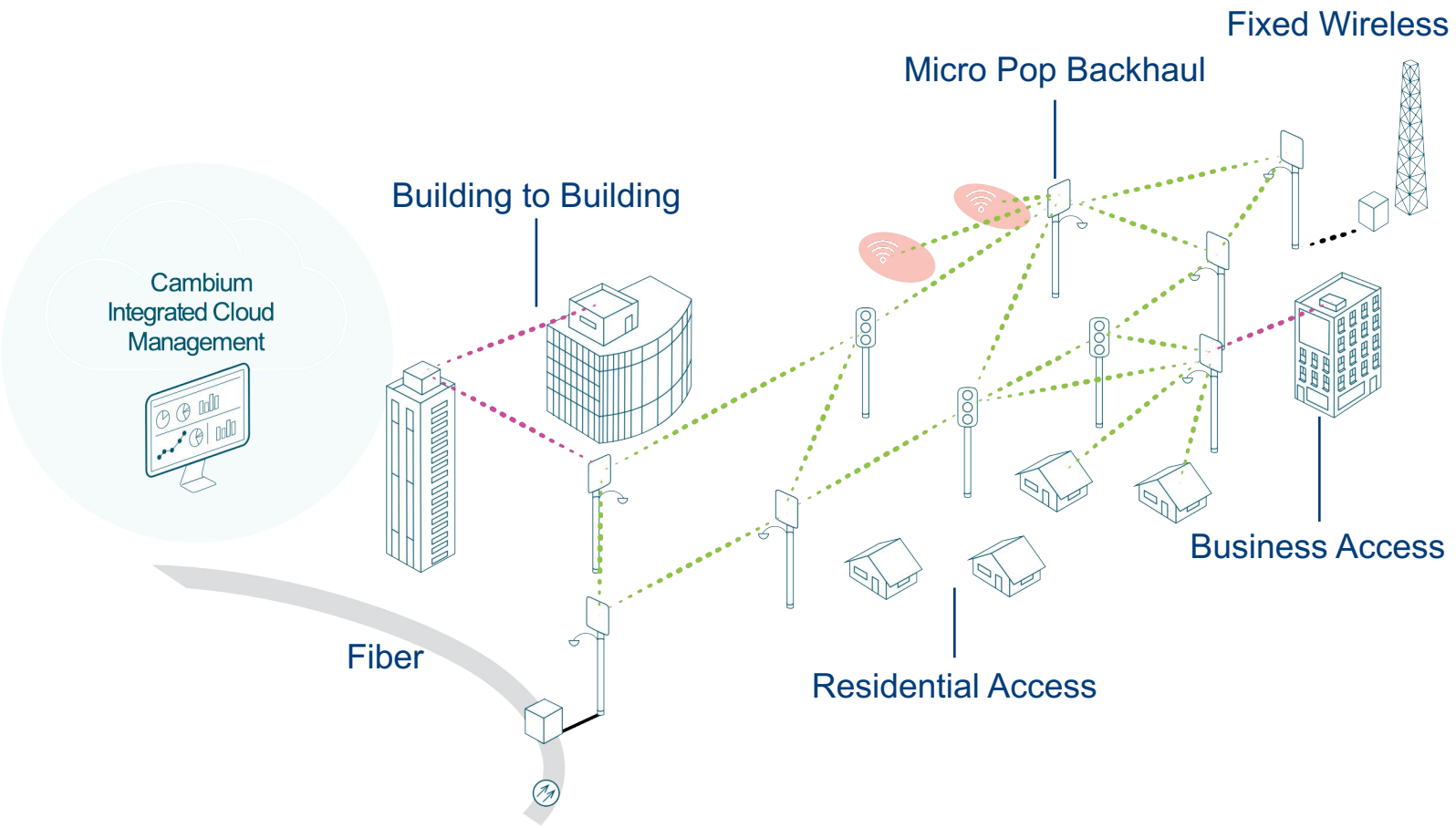
60 GHz Deployment Architecture



- **WTTH** – **W**ireless **T**o **T**he **H**ome
  - Providing Wireless Broadband access directly to the home. CPE placed indoors, in balcony or window-side.
- **WTTB** – **W**ireless **T**o **T**he **B**uilding
  - Wireless Broadband access provided to rooftops or side of buildings, which then get distributed to individual offices and homes via wire.
- **RTTRT** – **R**oof-**T**op **T**o **R**oof-**T**op
  - Point to Point, where high gain dish based, antenna could be utilized
  - Multi Dwelling Distribution
- AP/PMP Backhaul, Small Cell Backhaul and Connectivity for Smart City

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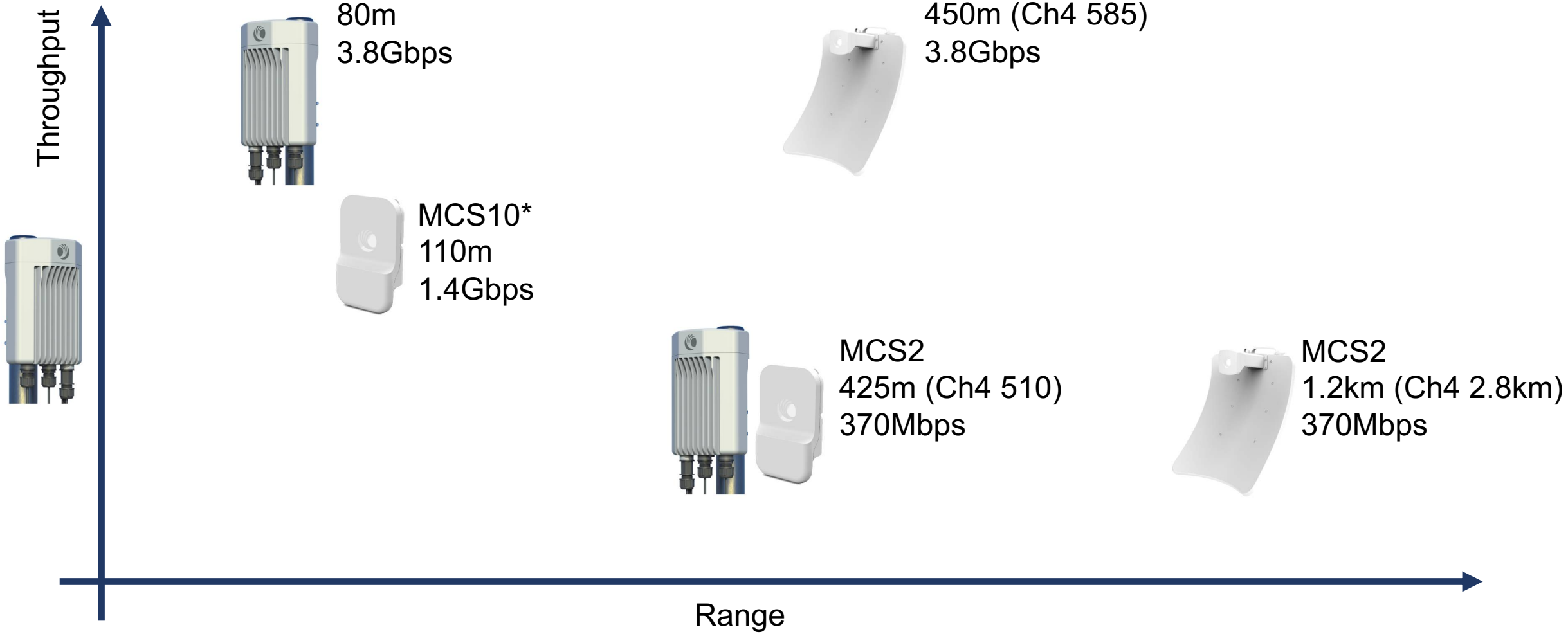
Range / Throughput (PMP)



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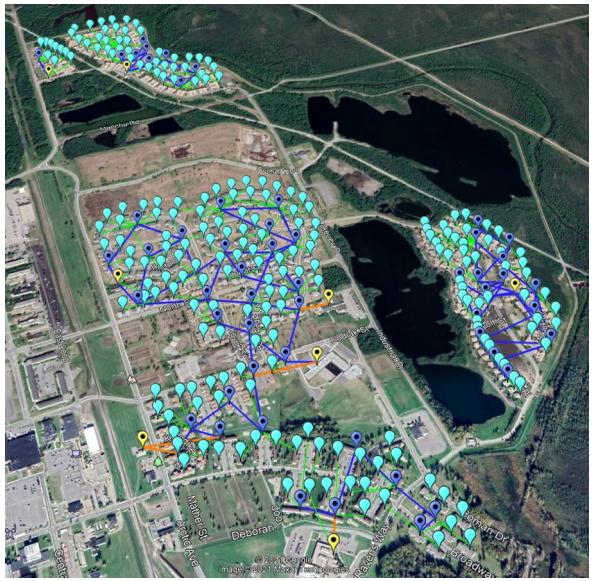
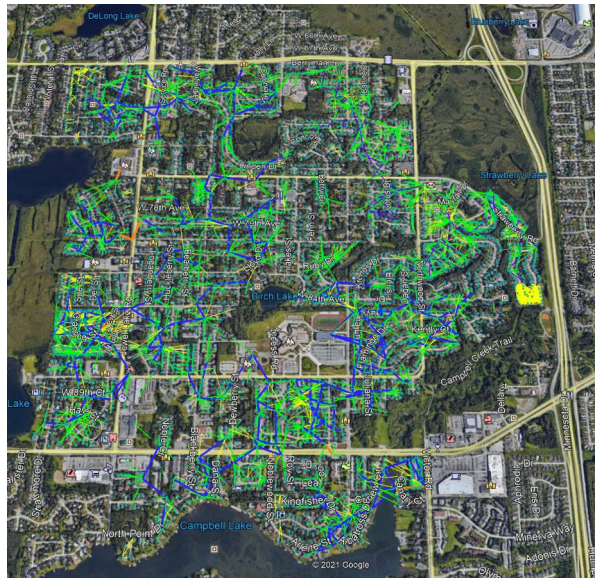
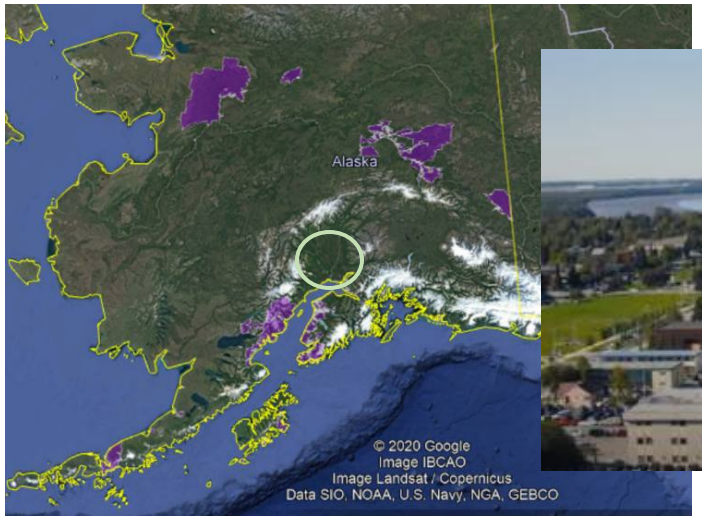
Hybrid Fiber Network
Delivering Gb to the Residential Address







Goals

- Deliver 50/100/250 Mbps and 1 Gbps residential services
- Upgrade existing DSL wireline network and leveraging fiber assets
- Competing with Cable (DOCSIS) Operator
- Three pilot areas ahead of network wide rollout
  (Eielson AFB housing, Fairbanks and Anchorage neighborhoods)

Solution

- Deploy 60 GHz cnWave V5000 and V3000 with Mesh configuration to handle the high-density area
- **Leverage existing fiber rings and PoPs**
- ACS also deploys CBRS, licensed microwave from Cambium

Status

- 340 DN's, 1,500 Client Nodes for initial deployment
- Deployment ramping in May target end of year completion

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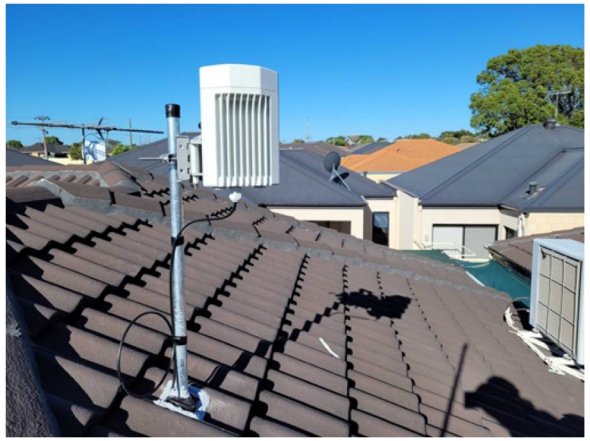
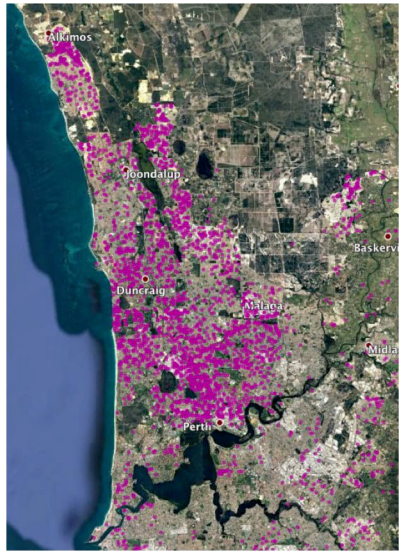
PENTANET
Perth Powered Internet

Competitive 5 GHz Churn to Gb to the Edge

Cambium Networks™





Goals

- Overlay existing UBNT 5 GHz network with Gigabit speeds
- Targeting Perth metropolitan area for coverage
- Leverage 300 km+ of **dark fiber** around Perth

Solution

- cnWave 60 GHz for residential access
- PTP 8x0 licensed for backhaul

Status

- Deploying one DN per business day and ≈ 130 CPE's per month

Impact

- Large urban deployment area
- Gb to the edge
- Technology leader; already looking at 28 GHz in addition

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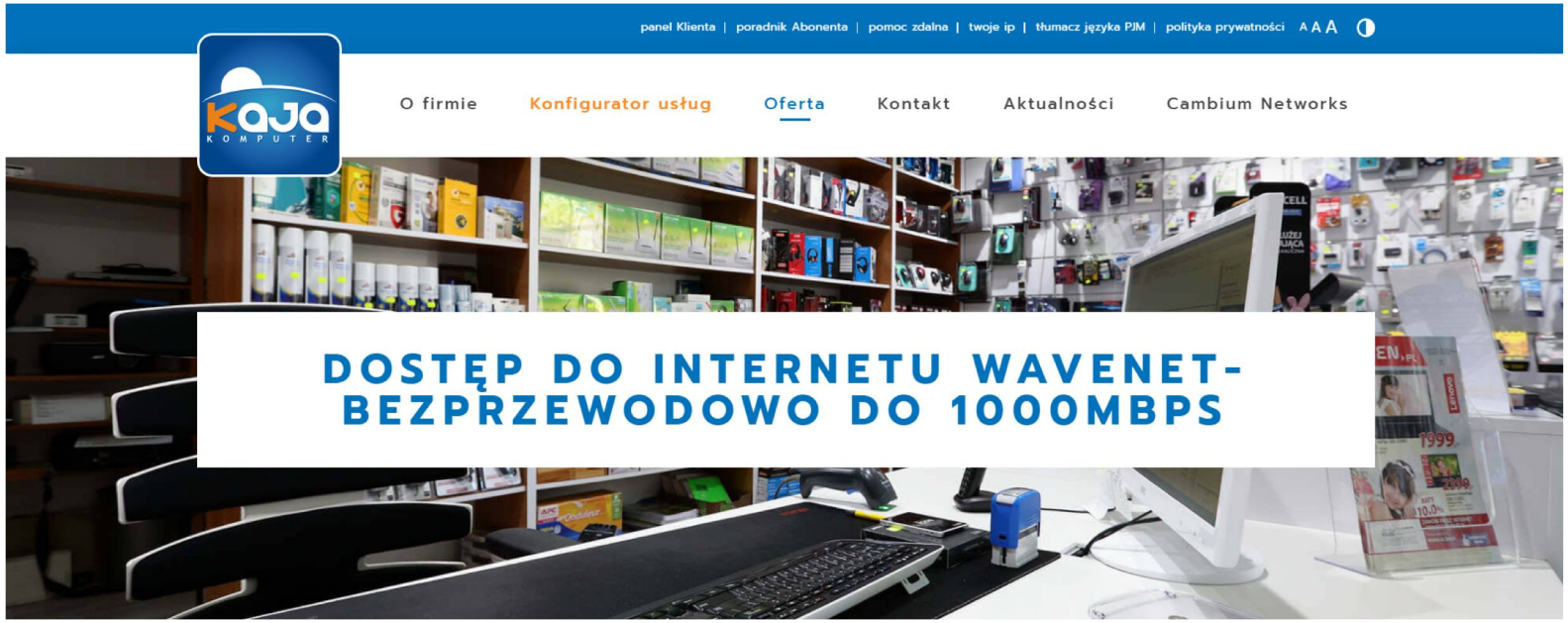
Commercial PMP implementations in KAJA network



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Commercial PMP implementations in KAJA network

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KAJA KOMPUTER

O firmie | Konfigurator usług | Oferta | Kontakt | Aktualności | Cambium Networks

WAVENET 300

79,00 zł/m-c

300 Mb/s
pobieranie
100 Mb/s
wysyłanie
opóźnienie pakietu > 2ms

bez limitu danych

WAVENET 500

89,00 zł/m-c

500 Mb/s
pobieranie
100 Mb/s
wysyłanie
opóźnienie pakietu > 2ms

bez limitu danych

WAVENET 1000

99,00 zł/m-c

1000 Mb/s
pobieranie
100 Mb/s
wysyłanie
opóźnienie pakietu > 2ms

bez limitu danych

Introducing the ePMP Force 425 and Force 400C

Cambium Networks™

Industry first proprietary point to point product based on 802.11ax

Gigabit Performance
Last-mile Fiber alternative

Target Markets / Applications

- High-capacity Enterprise point to point
- Low-cost WISP back-haul
- GPON last mile

Key Specifications

- Up to 1Gbps usable throughput
- Sub 5 ms latency
- 4.9 to 6.135 GHz – **an additional~230MHz for ROW!**
- 25 dBi integrated dish (**optional 28 dBi range extender - a first for Cambium**)
- IP67 Ruggedization
- GigE and SFP port (**optional GPON module – a first for Cambium**)

Force 425

Force 400C

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Wireless Fiber Extension Solution

Cambium Networks™

Force 425 GPON MAC enabled SFP module

Eliminate Media convertor

Aerial
or
In-ground Fiber

Fiber Data Connection

Optical Line Terminal (OLT)

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