



# Building the Business Case for Wireless Backhaul for Public Wi-Fi



**Cambium Networks™**

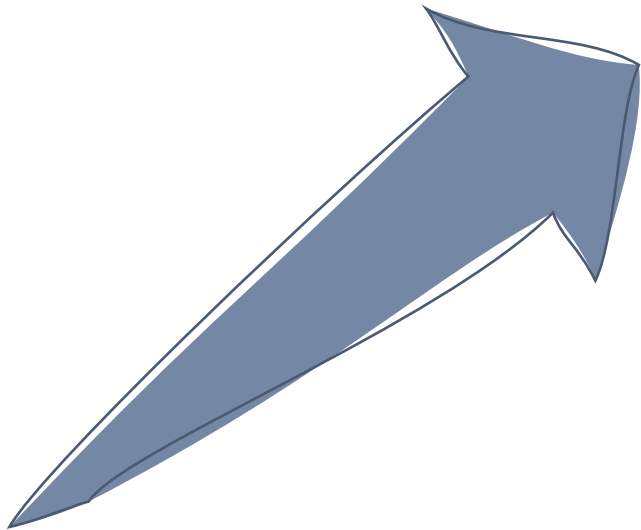
**Sagar Deshpande, Cambium Networks**

**Daran Hermans, Cambium Networks**

**Praveen Sampath, Facebook Connectivity**

**Ray Savich, Cambium Networks**

**How do I rapidly deliver the necessary broadband and deploy the infrastructure to minimize costs and maximize value?**



**\$645 million invested in Outdoor Wi-Fi in 2024**

*Matthew Ball, Canalys Research*



**Fiber average cost  
\$19,000 per mile (\$12k per km)**

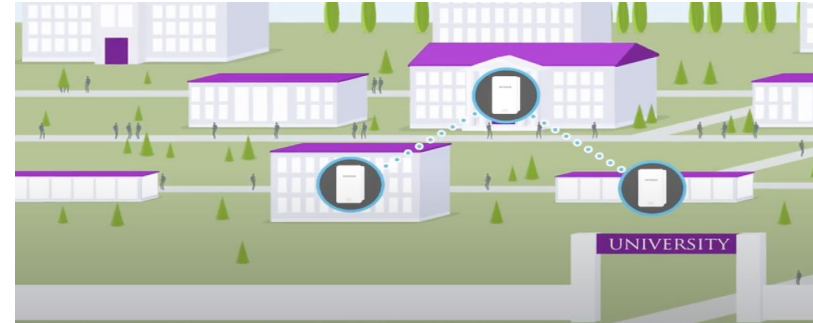
*US DOT*

<https://www.itscosts.its.dot.gov/its/benecost.nsf/DisplayRUCByUnitCostElementUnadjusted?ReadForm&UnitCostElement=Fiber+Optic+Cable+Installation+&Subsystem=Roadside+Telecommunications>

## Municipal and City Wi-Fi



## Inter Campus Connectivity



## Campgrounds, Parks and Playgrounds

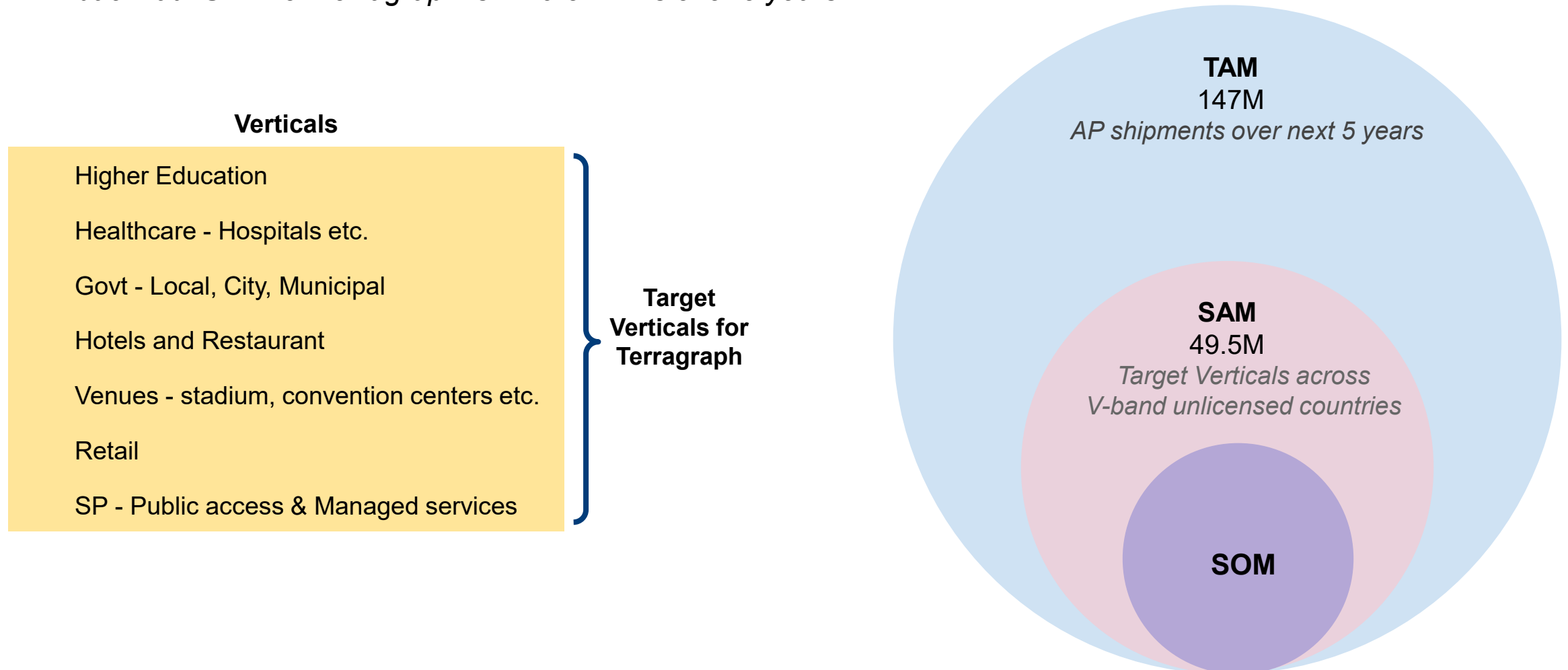


## Venues - Conventions centers, Stadiums



# Wi-Fi Backhaul Markets and SAM

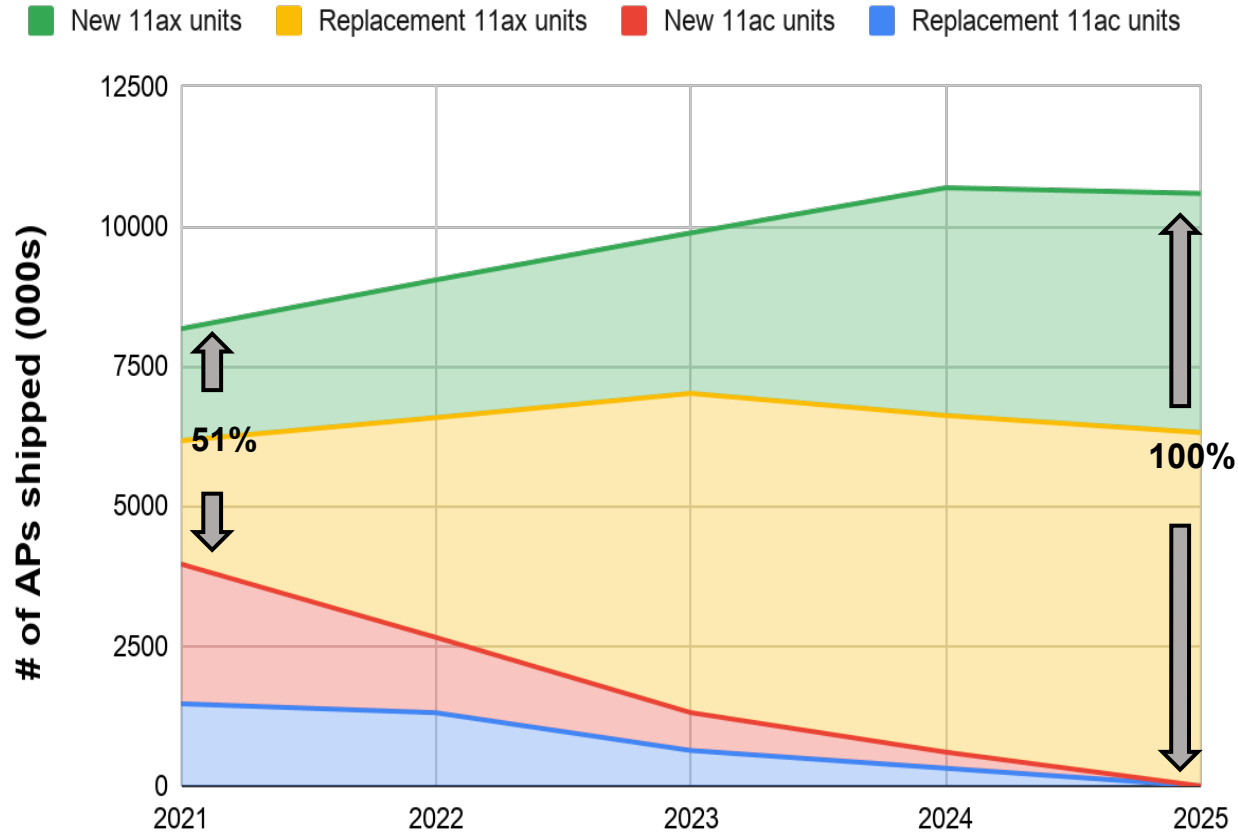
Wi-Fi backhaul SAM for Terragraph is ~ 49.5M APs over 5 years



Source: Dell'Oro Wifi Market Report (Dec 2019)

# Wi-Fi Backhaul Opportunity

Wi-Fi backhaul SAM for Terragraph is ~ 49.5M APs spread over 5 years



## 11ax APs projected to be 82% of SAM

- 52% in 2021 to 100% in 2025

## Gigabit capacity backhaul needed for 11ax deployments

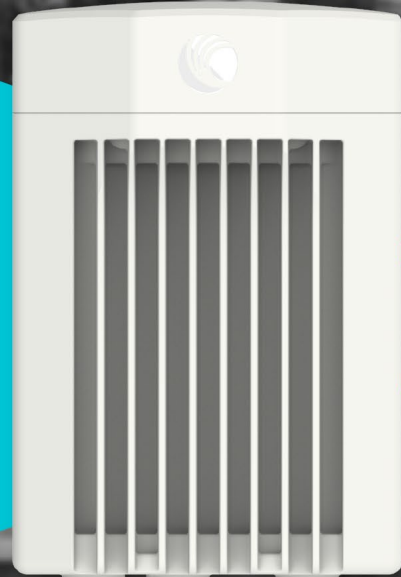
## Terragraph is a good fit for

- Replacing legacy backhaul 11ac → 11ax migration
- New 11ax deployments

# Cambium 60 GHz cnWave



Distribution  
Node  
**V5000**



**terragraph**  
certified



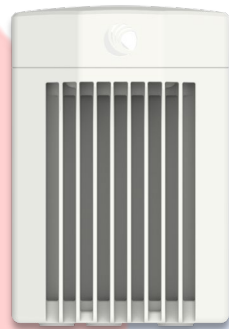
Client  
Node  
**V1000**



Client  
Node  
**V3000**



- Standards:** 802.11ay standard, Mesh support, Terragraph certified
- Performance:** Up to 15.0 Gbps with 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™



Sector 1

Sector 2

**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
- 3.8 Gbps Uplink + 3.8 Gbps Downlink with channel bonding\* per sector

**Coverage:** Dual Sector 280 Degree Coverage with Beam Forming

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

**Latency:** < 1 ms

# Outdoor Wi-Fi Hotspot

-  60 GHz Broadband link (3.8 Gbps, up to 7.2 Gbps future)
-  Ethernet with PoE interconnects between Wi-Fi AP and CN (client node)
-  48 VDC power (one cable serves both connected devices)
-  Fiber interconnect (GPON, active Ethernet over fiber)
-  Wi-Fi access network

## Benefits

Backhaul exceeds GPON fiber speed (3.8Gb vs 2.5Gb)

Low cost deployment – no fiber access rights cost

Repeatable, predictable installation

## Cambium Products in this Case

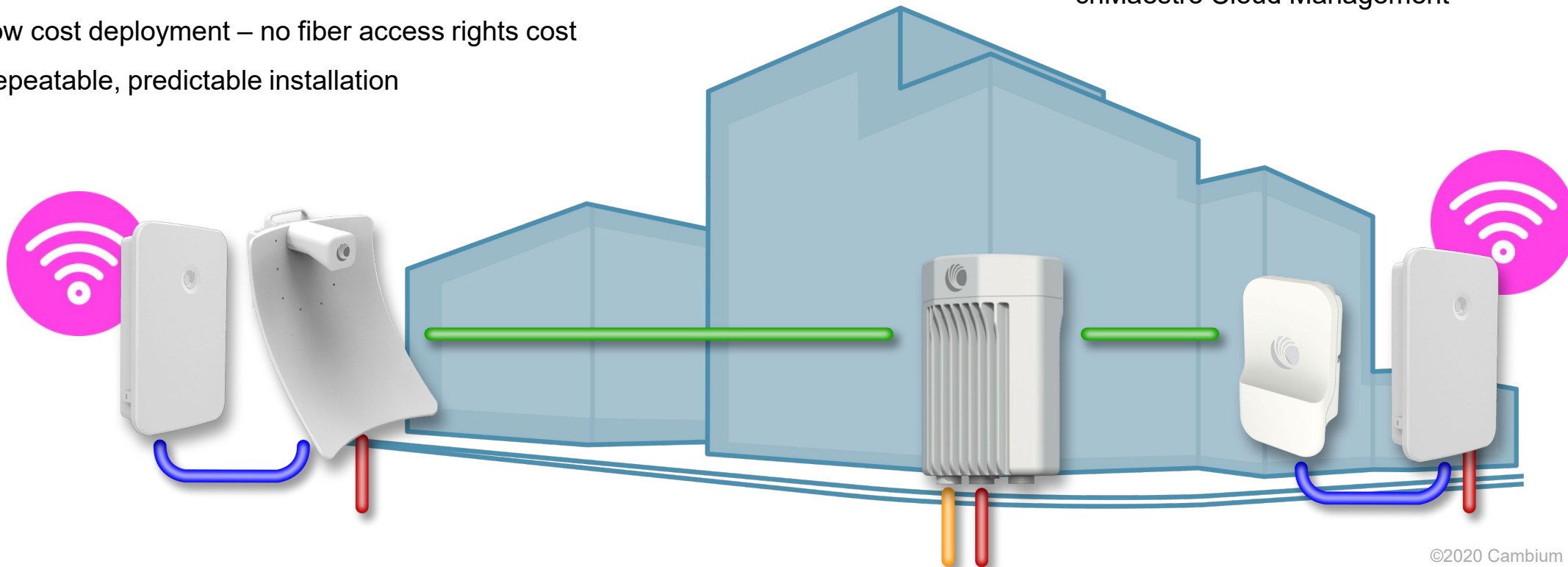
Outdoor 802.11ac wave 2, dual radio

60 GHz V1000 Client Node

60 GHz V3000 Client Node




60 GHz V5000 Distribution Node

cnMaestro Cloud Management





# Municipal Wi-Fi MESH

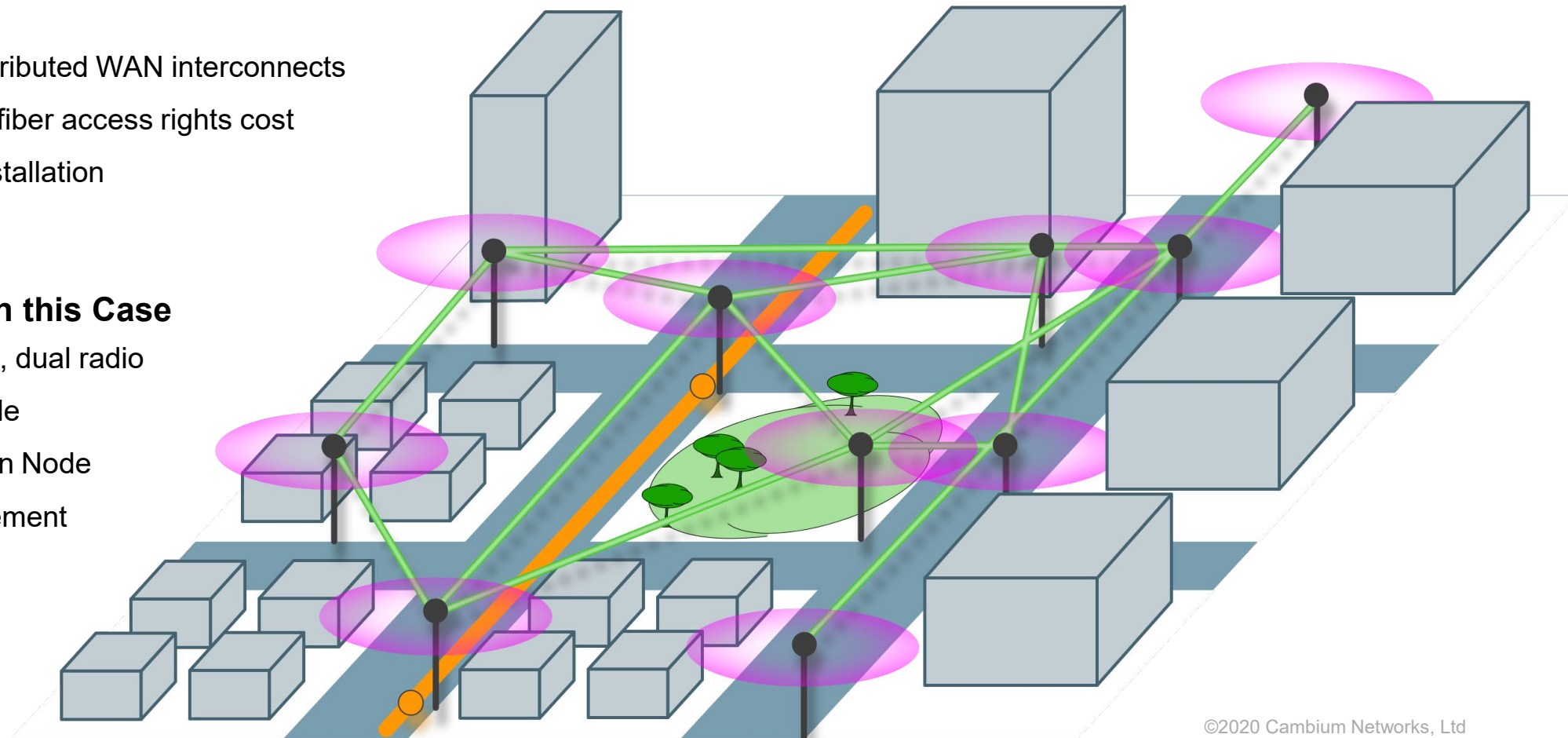
-  60 GHz Broadband link (3.8 Gbps, up to 7.2 Gbps future)
-  Fiber interconnect (GPON, active Ethernet over fiber)
-  Wi-Fi access network

## Benefits




- Redundant MESH with distributed WAN interconnects
- Low cost deployment – no fiber access rights cost
- Repeatable, predictable installation

## Cambium Products in this Case

- Outdoor 802.11ac wave 2, dual radio
- 60 GHz V3000 Client Node
- 60 GHz V5000 Distribution Node
- cnMaestro Cloud Management



# Enterprise Wi-Fi (school, small business, branch office)

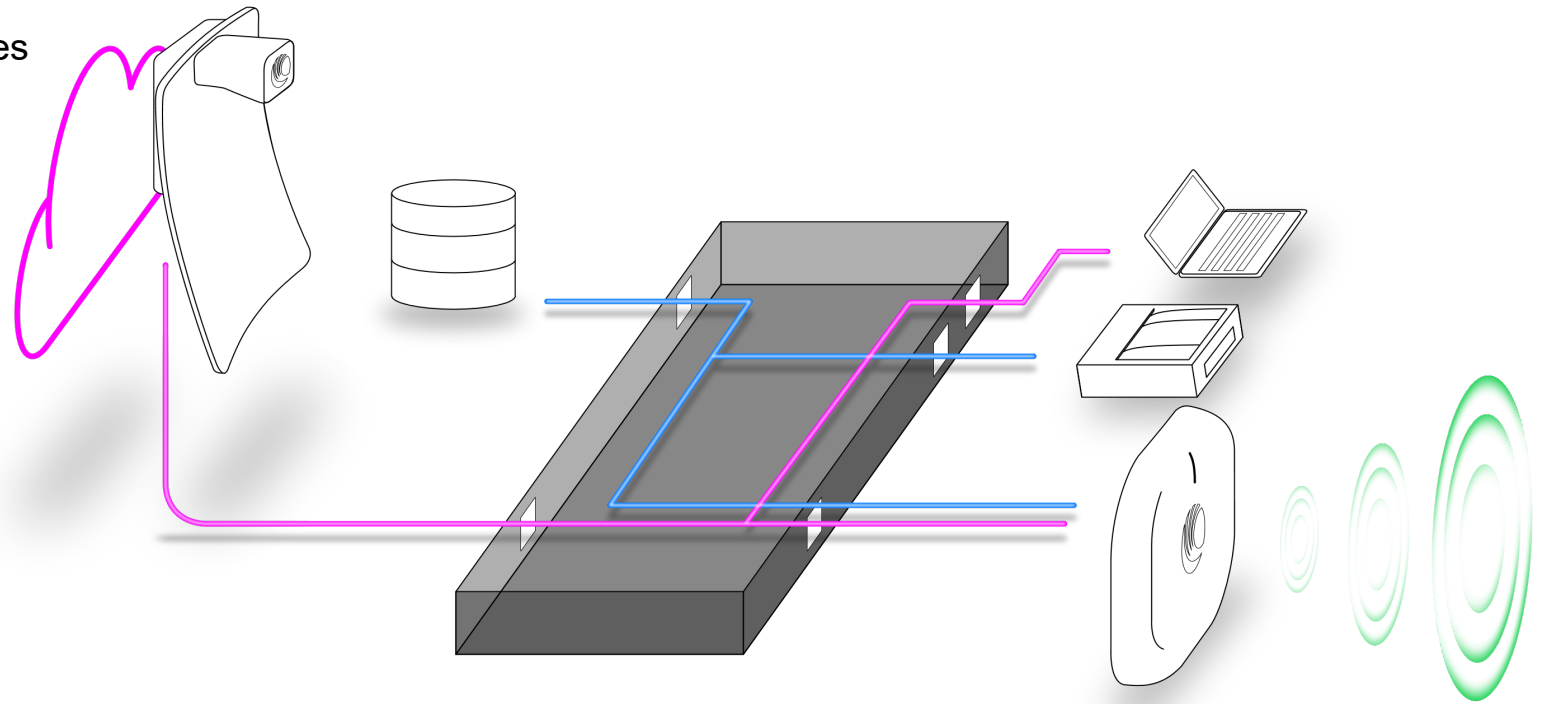
-  Indoor Enterprise Wi-Fi Network
-  Secure enterprise Network
-  Internet access network for staff, guests, contractors, with 60GHz WAN link

## Benefits

- Policy Based Network automation, Ethernet Switch
- Intelligent network adapts automatically to changes
- Multi-gigabit Wi-Fi, Ethernet, Broadband

## Cambium Products in this Case

- cnMatrix Ethernet Switching with PBA
- Wi-Fi 6 tri-radio with dedicated sensor and SDR
- 60 GHz V3000 Client Node
- 60 GHz V5000 Distribution Node
- cnMaestro Cloud Management



# Enterprise Wi-Fi (industrial park, transportation hub)

-  Broadband interconnects between buildings
-  Indoor / Outdoor Ethernet + Wi-Fi for warehouse and office devices (IP camera, scanner, printer, PC, voice call, voice pick, pick-to-cart, etc)

## Benefits

Policy Based Network automation, Ethernet Switch

Multi-gigabit Wi-Fi, Ethernet, Broadband

Automatic RF control, high gain directional antennas

## Cambium Products in this Case

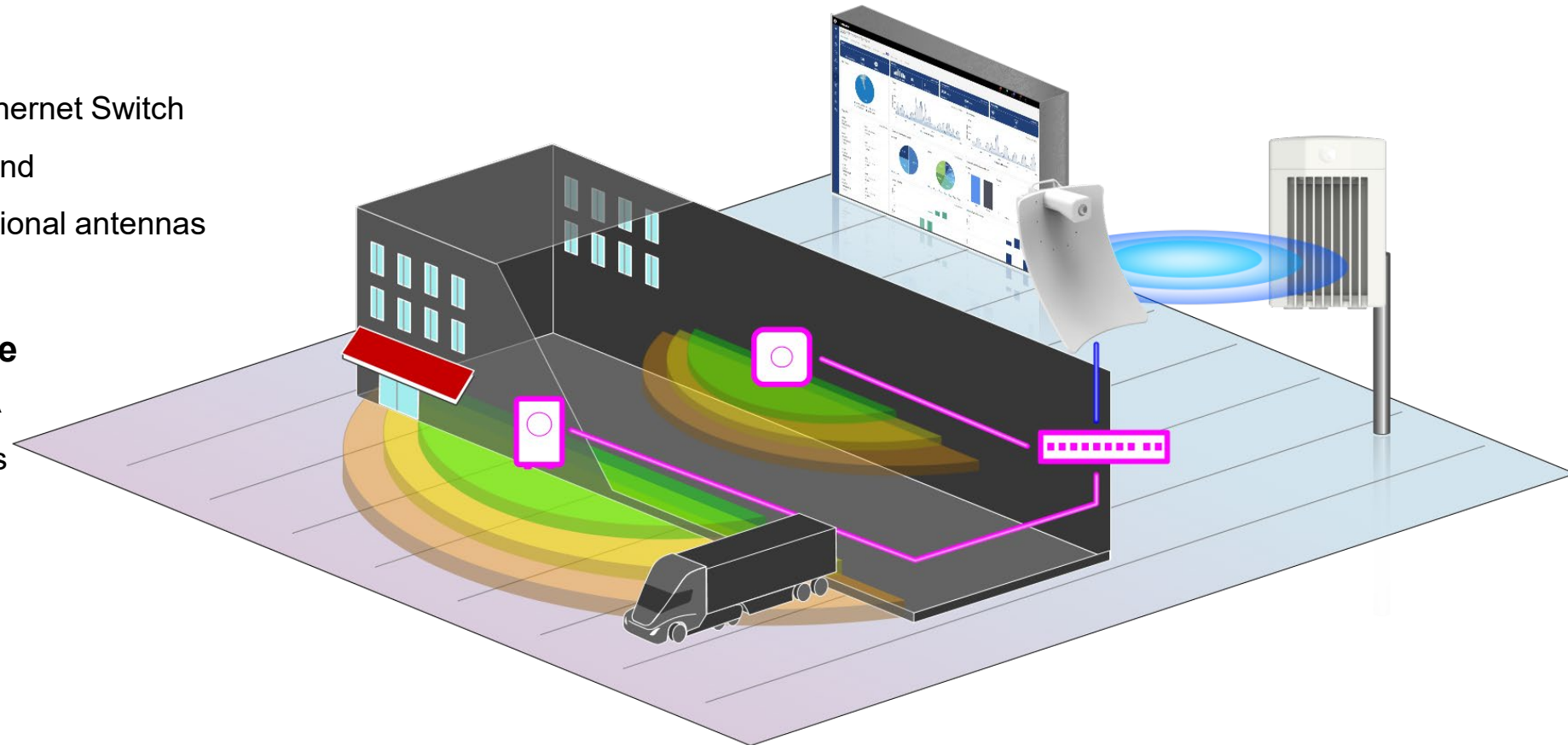
cnMatrix Ethernet Switching with PBA

802.11ac and/or Wi-Fi 6 access points

60 GHz V3000 Client Node

60 GHz V5000 Distribution Node

cnMaestro Cloud Management

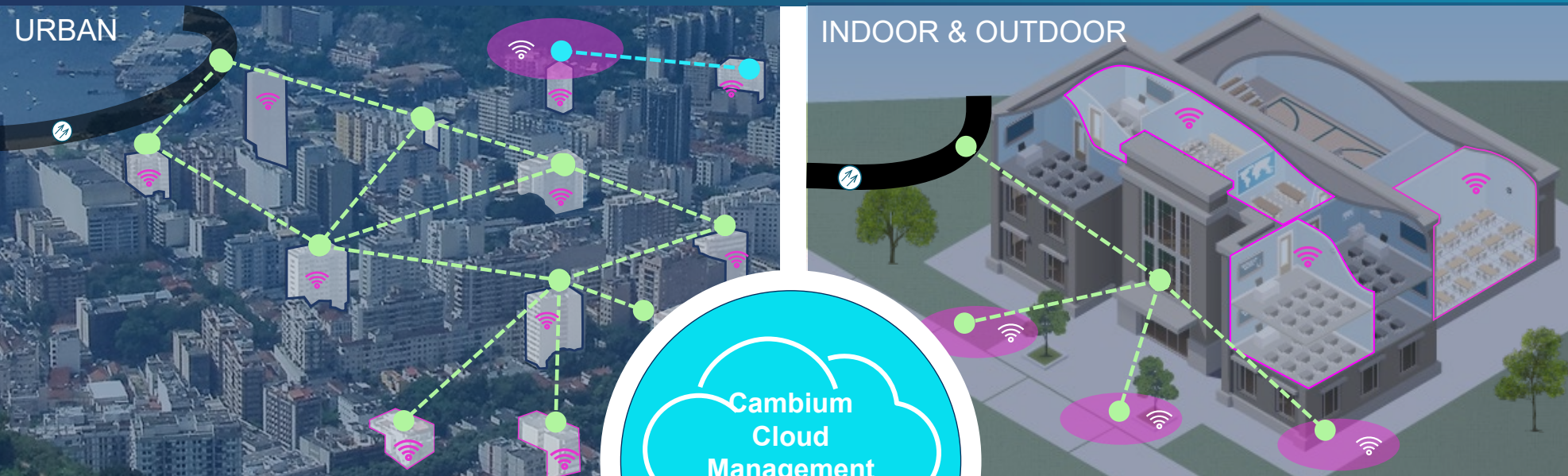


## **What Wi-Fi Backhaul applications will be in your early deployments of 60 GHz?**

*select all that apply*

- Enterprise Wi-Fi (*Industrial park, transportation hub*)
- Enterprise (*school, small business, branch office*)
- Muni Wi-Fi Mesh
- Outdoor Hotspot
- Other

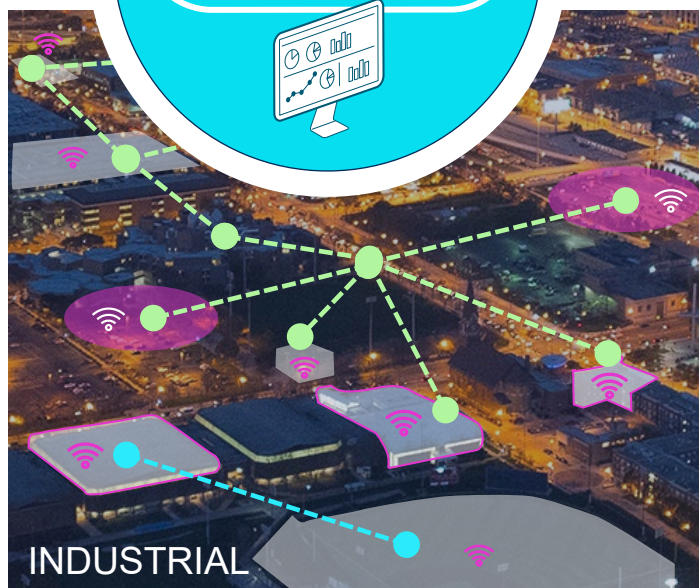
# Cambium Networks Multi-Gigabit Wireless Fabric



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



Cambium Networks™

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