



Quint@sQuinze

Fluidmesh é agora:

Cisco Ultra-Reliable Wireless

Backhaul

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July 2021



# Why the name change?

Fluidmesh  Cisco Ultra-Reliable  
Wireless Backhaul

**Descriptive:** This is specifically a backhaul technology.

**Recognizable:** Instantly identifiable as an alternative to 5G URLLC (ultra-reliable low-latency communication).

**Branded:** This is part of the Cisco Family of wireless technologies, and you'll be seeing more technical integrations in the future.



# Cisco Ultra-Reliable Wireless Backhaul

## Your industrial devices



## Your network

### Cisco Ultra-Reliable Wireless Backhaul

Your own fixed and mobile wireless backhaul.

#### Everything you need

- Ultra-low latency
- Ultra reliable
- High bandwidth
- Fast mobility
- Easy to deploy
- Custom to your needs

## Your critical applications



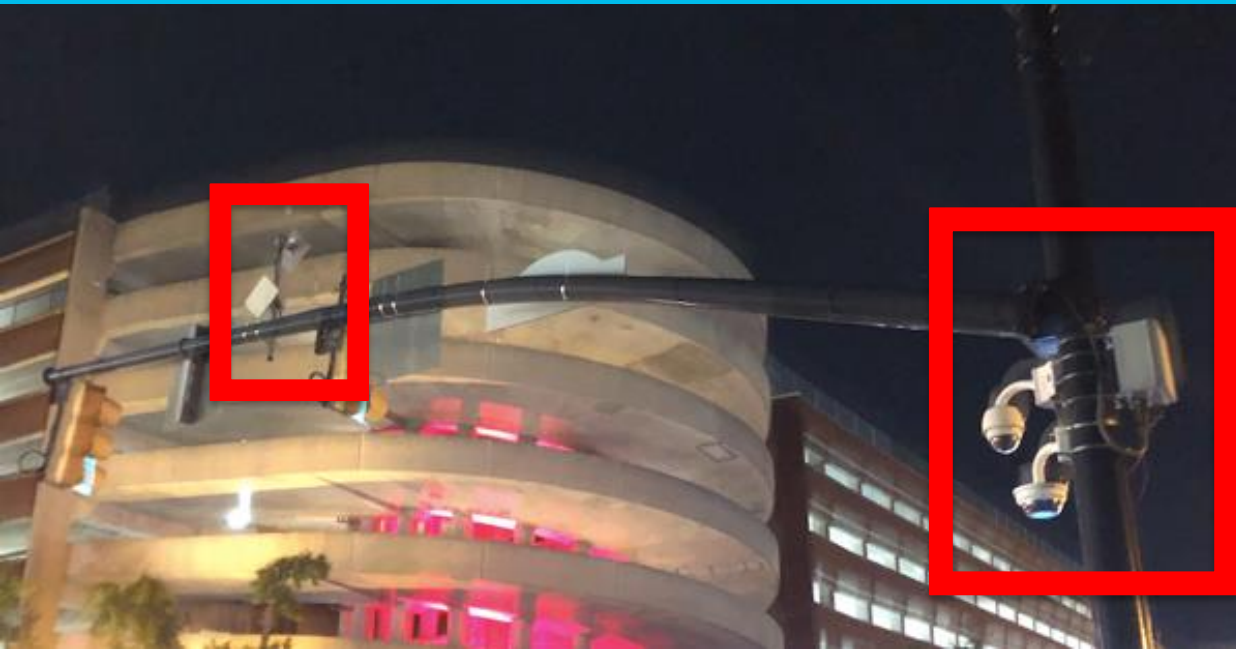
- Autonomous vehicles control
- Live HD video-surveillance
- Tele-remote machine operations
- Communications-based train control (CBTC)
- Train-to-ground communications
- Maintenance telemetry
- Terminal operations systems (TOS)
- SCADA backhaul
- Emergency response systems



The bridge between moving devices and business-critical applications



ENTERPRISE INDUSTRIES ARE ASKING FOR NETWORK CONNECTIVITY OUTDOORS





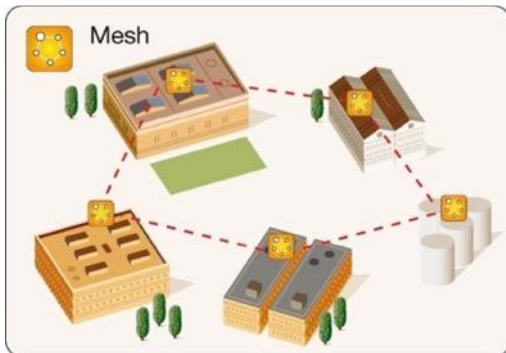
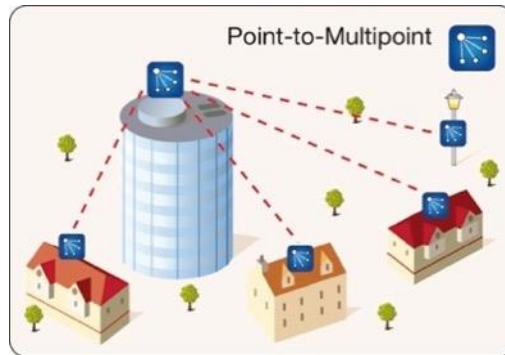
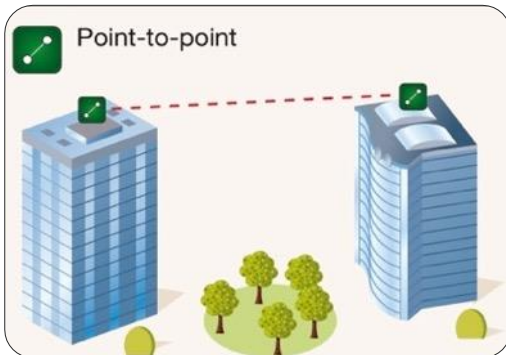
VEHICLES ARE GETTING AUTONOMOUS AND CONNECTED MORE THAN EVER



# Ultra-Reliable Wireless Backhaul Defined

## Wireless Fiber-Like Connectivity

Extending highly reliable network connections where wired Layer 1 can't go.



**Long Range and High Bandwidth Connectivity**

(up to 15 miles @ 500 MB)



**Fast and Accurate Roaming**

(0ms handoff, up to 225 Mph)



**Support for real-time sensitive traffic.  
Zero Loss-Low Latency.**



**Pay as you go bandwidth consumption model.**

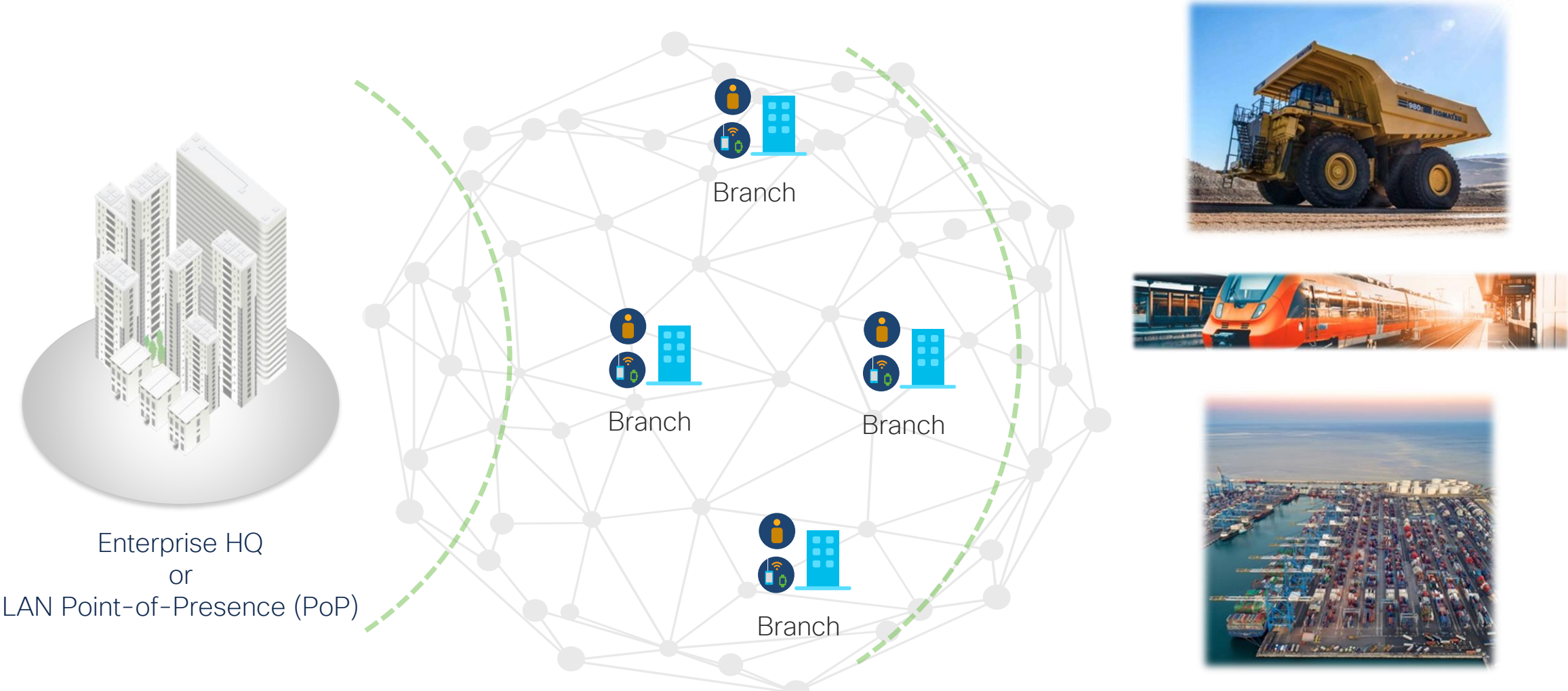


**Support multiple backhaul topologies – PtP, PtMP, Mesh, and Mobility**



**Secure MPLS based proprietary protocol with QoS support**

# Connecting Assets Between and Beyond Carpeted Spaces



Enterprise (IT)

Industrial (OT)

Ultra-Reliable Wireless Backhaul

# Cisco's Evolving Wireless Portfolio

There are many types of wireless technologies applicable to IoT

LTE and 5G

Unlicensed  
5GHz and 6GHz

900MHz ISM  
(i.e. sub-GHz)

Wide Coverage  
Medium Throughput

Local Coverage  
High Throughput

Broad Local Coverage  
Low Throughput

IoT Gateways



819-MNA, IR807, IR809,  
IR829, IR1101

Industrial Routing



CGR 1000, CGR 2000

Industrial Wi-Fi



IW3702  
IW6300, ESW6300

Ultra-Reliable  
Wireless  
Backhaul



FM ENDO, FM MOBI

Reliable and  
Proprietary  
Wireless Backhaul

Resilient Mesh



IR500

LoRaWAN



Gateway and Partner's NS



# No single connectivity option can meet all needs

## Cellular 3G, 4G, 5G

- Medium-to-high bandwidth, easy to deploy, long range
- High OpEX, monthly cost (\$40-100/SIM/Month)
- Dependent on mobile SP coverage in the area

## LoRaWAN / WiSUN

- Long range, great for sensors with small data payloads (<1 Mbps)
- Low power, low bandwidth

## 802.11 Wi-Fi

- High bandwidth, Unlicensed spectrum, broadly supported CPEs
- Delays with roaming handoff, prone to WiFi interference (dominant)

## Fiber or wired Ethernet

- Very high bandwidth, low latency
- Costly to deploy and construct, inflexible with design

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## Cisco Ultra-Reliable Wireless Backhaul Solution

- Proprietary Air-Interface, medium-long range
- High bandwidth (< 500 Mbps), unlicensed spectrum (no licensed OpEx)
- Low OpEX, flexible deployment, re-deployable worldwide (unlicensed)
- 0ms roaming (Fluidity), wireless High-Availability (<500ms failover via TITAN)
- Low latency (compared to other wireless architectures)
- TDMA or CSMA based radio access mechanism for max configurability

# Wi-Fi or Ultra-Reliable Wireless Backhaul?

It's not one or the other.



## Wi-Fi End Device Access



Contention-based user access



Standards-based optional security



IP management by centralized controller



Standard Rate Adaptation



Lengthy Handoff when Roaming



## Ultra-Reliable Wireless Backhaul



Scheduled Network Access for backhaul



Encrypted proprietary signaling



MPLS-based network reconfiguration



Predictive Rate selection



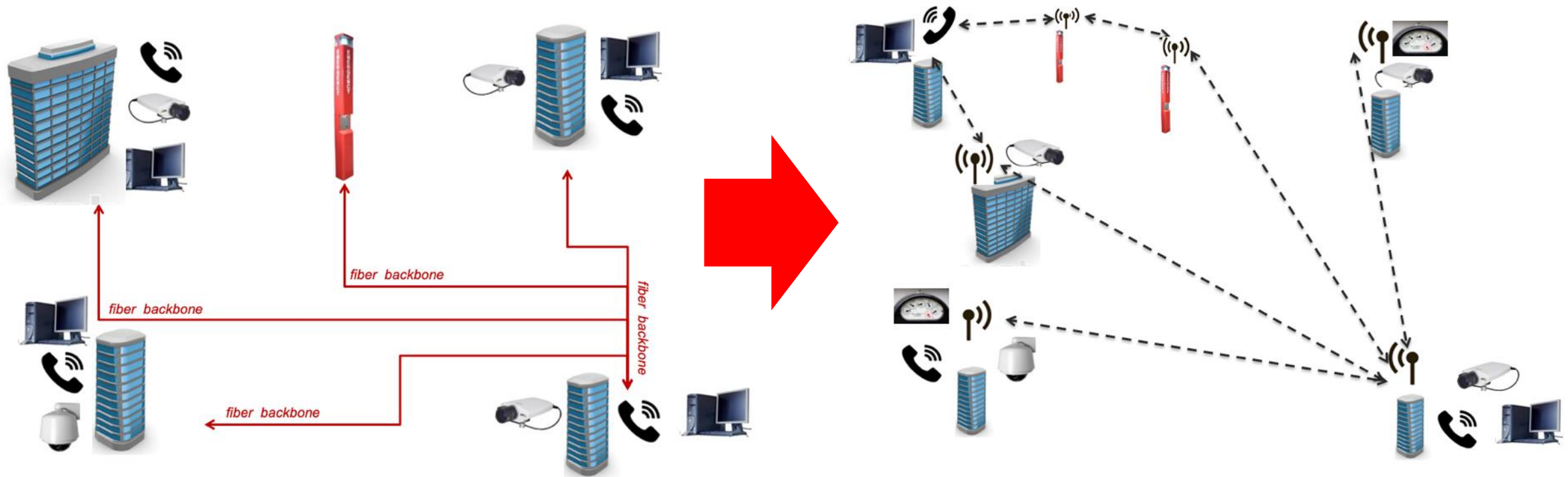
0 ms mobile initiated handoff



A person with short grey hair, wearing a blue uniform with a reflective stripe, is seen from behind, sitting at a workstation in a control room. The workstation features several computer monitors displaying various data and graphs. In the background, a large window provides a view of a factory interior with industrial machinery and bright lights. The overall scene is dimly lit, with the primary light sources being the monitors and the factory lights outside.

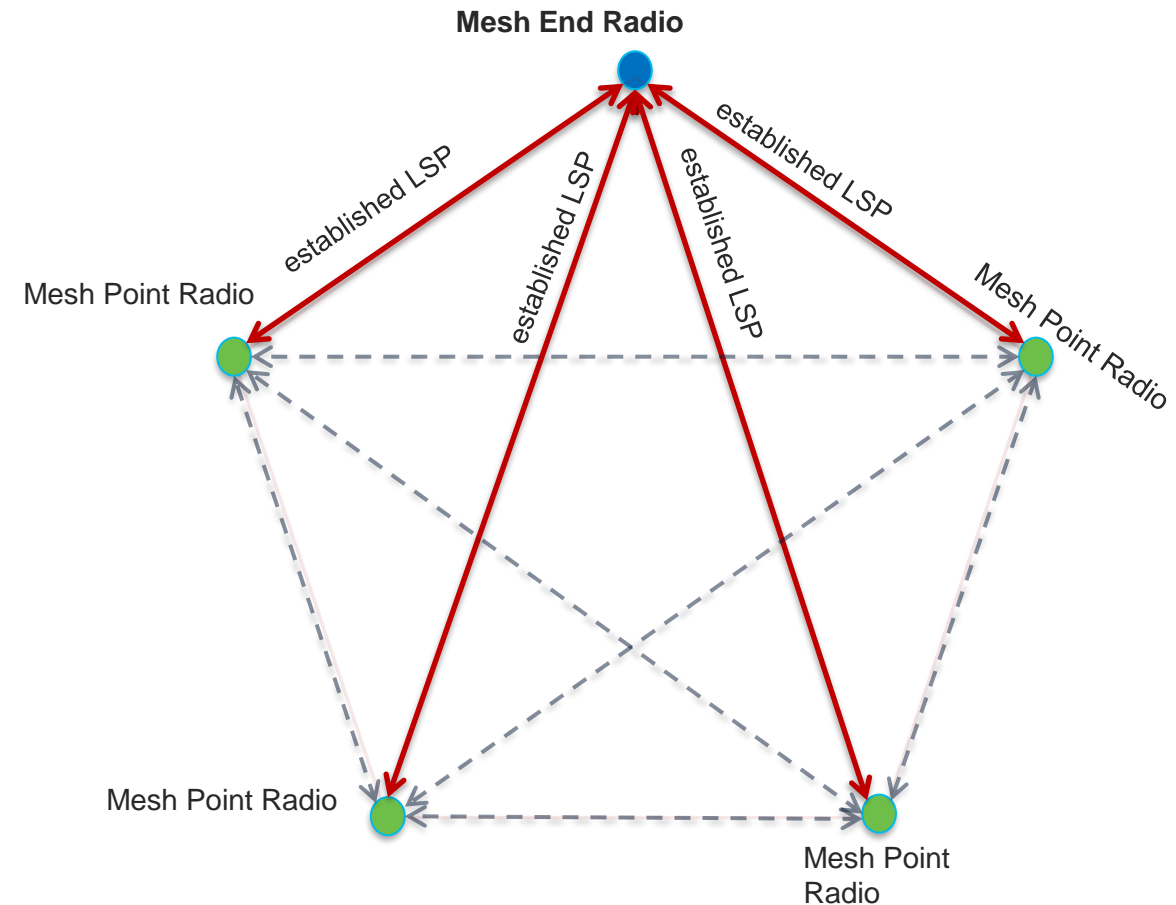
# Technology, Topology, and Product Overview

# Why Ultra-Reliable Wireless Backhaul? Alternative or Replacement for Layer 1



Cisco Ultra-Reliable Wireless Backhaul uses a customized wireless-based MPLS transmission protocol PRODIGY™, to discover and create LSPs between radio Mesh-Ends and Mesh-Points.

Label-Switched Path  
(LSP, i.e. MPLS dataflow route)



# PRODIGY™ 2.0

## Reliable wireless transmission for mission-critical applications

- **MPLS**-based transmission **protocol** built to overcome the limits of standard wireless protocols
- Optimization algorithm that allows every radio to assign a specific level of **priority and reliability to every packet** transmitted
- Delivers an infrastructure with a higher level of **reliability**
- **Extremely robust** in high interference areas
- **Low latency & jitter**





# Common Use Cases



# Verticais de Mercado



Segurança e Cidades Inteligentes



Transporte de Massa e Ferroviário



Portos e Marítimo



Mineração Óleo e Gas



Entretenimento



Setor Público e Militar



Robótica e Chão de Fábrica



Aeroportos



Transmissão de Eventos ao Vivo



Agricultura

Habilitando a Segurança por vídeo

Habilitando o Controle Autônomo e Automatizado de Veículos

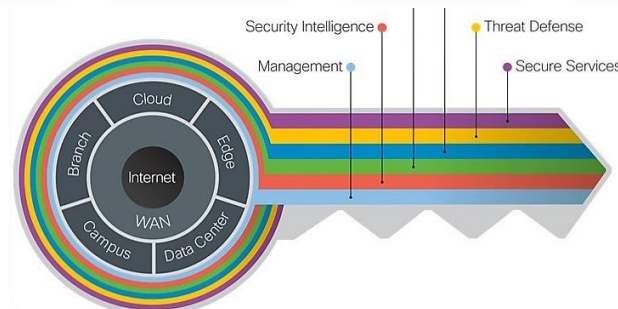
Habilitando Dados e Streaming de Áudio e Vídeo

Habilitando a Conectividade Wi-Fi e Celular

Bateria



Bateria



# Application Support

Extending reliable Ethernet connectivity where wired Layer 1 can't go.



IP & Megapixel  
Cameras



Thermal  
Cameras



Audio & Voice  
over IP (VoIP)



Enterprise  
Backhaul



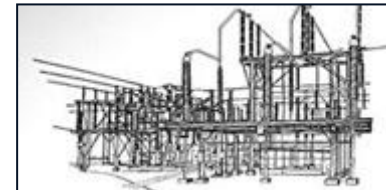
Emergency  
phones



Access Control  
over IP



Access point  
Wi-Fi



Substation  
Automation /  
SCADA

# Secure and Smart Cities Market – Why We Fit



ENVIRONMENT	CHARACTERISTICS	SERVICES		
OUTDOOR	<ul style="list-style-type: none"> <li>City wide networks</li> <li>VOIP and access control</li> <li>Backhaul for Temporary Data APs</li> <li>CCTV</li> </ul>	MANAGEMENT PLATFORM	DELIVERY SERVICES	FLUIDCARE & CUSTOMER SUCCESS

DESCRIPTION	NETWORK REQUIREMENTS
<u>Utilities and Smart Grids</u> <ul style="list-style-type: none"> <li>AMI/AMR collectors</li> <li>Distribution and Substation Automation</li> <li>Water Treatment and distribution</li> </ul>	<ul style="list-style-type: none"> <li>Backhauling for 900 MHz mesh LoRaWAN and WiSUN.</li> <li>Reliable alternative to cellular backhauling.</li> <li>High-bandwidth backhaul for capacitors banks, switches, transformers, distributed generators</li> </ul>
<u>Public Safety</u> <ul style="list-style-type: none"> <li>Municipalities</li> <li>Law Enforcement</li> <li>Military</li> </ul>	<ul style="list-style-type: none"> <li>Video-Surveillance</li> <li>Streaming from moving vehicles</li> <li>VoIP connections</li> <li>Tactical Communication</li> <li>Drone/UAV Remote Control</li> </ul>
<u>Education</u> <ul style="list-style-type: none"> <li>Digital Divide</li> <li>Campuses and dorms</li> <li>University</li> <li>K12</li> </ul>	<ul style="list-style-type: none"> <li>Remote building connectivity</li> <li>Wi-Fi backhaul</li> <li>Parking lot security</li> <li>Network extension</li> <li>Video security</li> <li>Emergency Phones</li> <li>Public Addressing (PA)</li> </ul>
<u>Residential and Healthcare</u> <ul style="list-style-type: none"> <li>Residential</li> <li>Healthcare</li> <li>Enterprise</li> </ul>	<ul style="list-style-type: none"> <li>Old building retrofit</li> <li>Covert surveillance</li> <li>Mass notification</li> <li>Gate and perimeter controls</li> <li>Wi-Fi infrastructure</li> <li>Remote Patient Monitoring</li> </ul>
<u>Connected Roadways - DOTs</u> <ul style="list-style-type: none"> <li>Traffic Lights Monitoring</li> <li>Situational Awareness</li> <li>Travel time/issues optimization</li> <li>Digital Signage</li> </ul>	<ul style="list-style-type: none"> <li>Facilitate safety, mobility and efficiency on roadways.</li> <li>Smoother flow of traffic, reducing congestion and collisions</li> <li>Better fuel/energy consumption</li> </ul>

# Rail Market – Why We Fit



ENVIRONMENT	CHARACTERISTICS	SERVICES		
MAIN TRACK	<ul style="list-style-type: none"> <li>Fast Roaming</li> <li>High Throughput</li> <li>Make before Break handoff</li> <li>Ultra High-Availability</li> </ul>	MANAGEMENT PLATFORM	DELIVERY SERVICES	CUSTOMER SUCCESS & FLUIDCARE
DEPOT	<ul style="list-style-type: none"> <li>Load Balancing</li> <li>Prioritization</li> <li>Multi Frequency</li> <li>Auto-sensing</li> </ul>			
INTER-CAR	<ul style="list-style-type: none"> <li>Intercar ad-hoc bridging</li> <li>Loopback protection</li> <li>Association threshold</li> <li>Shuffling Algorithm</li> </ul>			

DESCRIPTION	NETWORK REQUIREMENTS
<u>Vital Communications:</u> Communications Based Train Control (CBTC) PLC and Safety Controls	450 Kbps to 5 Mbps Fast Failover < 500ms Fault tolerant (HA) and L3 support Mobility up to 225mph/360kmh 100% redundant RF coverage QoS ready, up to few ms of latency
<u>Non-Vital Communications:</u> CCTV, Wi-Fi backhaul, PA/PIS, VoIP, SCADA	5-500 Mbps Variable traffic Mobility up to 225mph/360kmh 100% RF coverage not guaranteed/needed QoS ready, up to few ms of latency
<u>Depot Offloading:</u> Onboard CCTV NVR offloads, PA/PIS content uploads, Advertising uploads, Onboard system upgrades	1 to 500 Mbps Variable traffic Mobility less than 20mph/40kmh 100% RF coverage not guaranteed/needed QoS ready, up to few ms of latency
<u>Inter-Car Connectivity:</u> CBTC car, Wi-Fi AP, CCTV camera, VoIP, femtocell connectivity and backhaul aggregation points for train-to-ground	150 Mbps to 500 Mbps Variable traffic Car shuffling algorithms Loopback prevention algorithms QoS ready, up to few ms of latency

# Ports & Terminal Market – Why We Fit



ENVIRONMENT	CHARACTERISTICS	SERVICES		
MAIN TRACK	<ul style="list-style-type: none"> <li>Compatible with, and <u>validated</u> by all main market vendors (Kalmar, Konecranes, ZPMC)</li> <li>Supports PROFINET and CIP safety</li> <li>Uptime 99.999%</li> <li>Low latency</li> <li>Seamless roaming (handoff)</li> <li>TITAN (fast failover)</li> <li>High bandwidth</li> <li>Load-balancing</li> <li>Easy installation</li> <li>Multi-frequency capability with 0 m/s handoff</li> </ul>	MANAGEMENT PLATFORM	DELIVERY SERVICES	FLUIDCARE & CUSTOMER SUCCESS

DESCRIPTION	NETWORK REQUIREMENTS
<u>Terminal Operating System (TOS):</u> terminal tractors, reach stackers, RTGs & similar applications + supporting systems	450 Kbps to 1 Mbps Variable traffic Good coverage Up to 1 second of latency
<u>Optical Charter Recognition (OCR)</u> TOS server integrated into OCR system	15 Mbps to 20 Mbps Constant traffic 100% coverage 50 ms latency
<u>Autonomous and tele-remote RTGs</u>	30 Mbps for AutoSC 60 Mbps for RTG Constant PLC traffic Constant Video traffic 0 ms handover Coverage across the working area 50 ms latency
<u>Autonomous Horizontal Transport</u> (Automation For PLC applications )	1 Mbps for AutoSC/AGV Constant PLC traffic 0 ms hand over Overlapping coverage at the working area 50 ms latency

# Mining Market – Why We Fit



ENVIRONMENT	CHARACTERISTICS	SERVICES		
OPEN PIT and UNDERGROUND	<ul style="list-style-type: none"> <li>Wide areas to be covered</li> <li>Elevation challenges</li> <li>Ultra High-Availability</li> <li>PROFINET</li> <li>FMS + ADS + AHS</li> </ul>	MANAGEMENT PLATFORM	DELIVERY SERVICES	CUSTOMER SUCCESS FLUIDCARE
RAIL/PORT PROCESSING OPERATIONS	<ul style="list-style-type: none"> <li>Stackers and Reclaimers Networks</li> <li>Ship loaders Backhaul Networks</li> <li>Train-to-Ground Trackside communication</li> <li>Remote Controlled Locomotive Communication</li> <li>PLC Backhaul for Belt Systems</li> <li>Remote Controlled Dozers for Bulk Cargo</li> </ul>			

DESCRIPTION	NETWORK REQUIREMENTS
<u>Fleet Management System (FMS)</u> (Modular, MineStar, Hexagon, Wenco) and supporting systems	450 Kbps to 1 Mbps Variable traffic 100% coverage not guaranteed Up to seconds of latency
<u>Autonomous Haulage System (AHS)</u> + FMS + supporting systems	5 Mbps to 10 Mbps Constant traffic 0 ms handover 100% coverage 50 ms latency
<u>Autonomous Drilling System</u> + Teleremote	10 Mbps to 20 Mbps Constant traffic 0 ms handover Full coverage on the mining pit 50 ms latency
<u>Tele-remote</u>	10 Mbps to 20 Mbps Constant traffic 0 ms handover Full coverage on the working area 50 ms latency
<u>Fix / Nomadic Wireless Backhaul</u>	1 Mbps to 100 Mbps Constant traffic

# Factory Automation – Why We Fit



ENVIRONMENT	CHARACTERISTICS	SERVICES		
INDOOR	<ul style="list-style-type: none"> <li>AGVs, Robotics</li> <li>Extreme Latency and Jitter Requirements</li> <li>Ultra High-Availability</li> <li>High Client Density</li> <li>PROFINET / Modbus TCP support</li> <li>RF Attenuators and Omni antennas</li> <li>Seamless roaming</li> <li>Lossless handoffs</li> </ul>	MANAGEMENT PLATFORM	DELIVERY SERVICES	FLUIDCARE & CUSTOMER SUCCESS
OUTDOOR	<ul style="list-style-type: none"> <li>Harsh environments</li> <li>Overhead Cranes</li> <li>AGVs</li> </ul>			

DESCRIPTION	NETWORK REQUIREMENTS
<u>AGVs</u>	On-board PLC for Vehicle Control (Safety Protocol) Navigation Info PLC control (control sync with vehicle movement) On-board Video Surveillance
<u>Robotics</u>	On-board PLC for Control (Safety Protocol) Cell connectivity (PLC or CNC) On-board Video Surveillance
<u>Overhead Cranes</u>	Motion control Collision avoidance communication Lighting Gantry / Trolley control Boom control
<u>Data Collection</u>	Sensor aggregation Vision systems Backhaul PLC-to-PLC communications Industrial protocol support (Profinet, Ethernet/IP, Modbus TCP)

INDY AUTONOMOUS CHALLENGE

# THE RACE IS ON



## Cisco Ultra Reliable Wireless Backhaul



[www.indyautonomuschallenge.com](http://www.indyautonomuschallenge.com)





# Products & Technology Overview



# IoT Networking + Security Portfolio



## Industrial Switching

1K, 2K, 3200, 3300, 3400, 3400H, 4K, 5K, CGS, ESS



## Industrial Routing

IR8XX, IR1101, CGR1120, CGR1240, CGR2010



## Embedded IoT

ESS, ESR, ESW, Resilient Mesh



## Industrial Wireless

Ultra-Reliable Wireless Backhaul, IW6300, IW3702, IR5XX, IXM Gateway



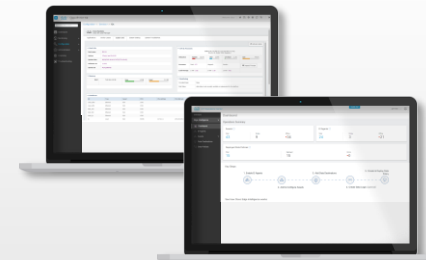
## Industrial Security

ISA 3000, Cyber Vision



## Edge Intelligence

IOx



## Full-stack as a Service

Industrial Asset Vision



## Management & Automation

Field Network Director, Industrial Network Director, IoT Operations Center



# Cisco Ultra-Reliable Wireless Backhaul Portfolio

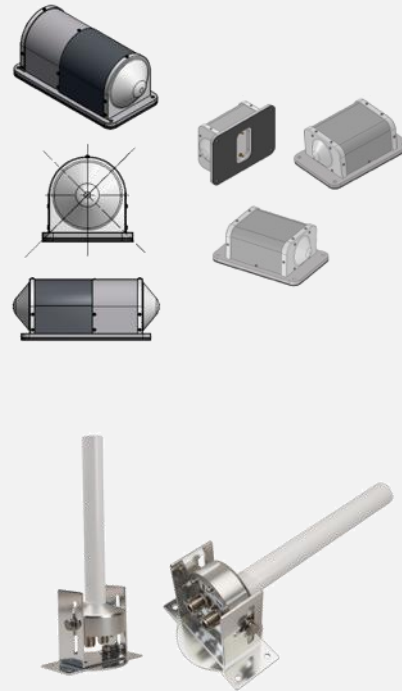
## Radios



## Gateways



## Antennas



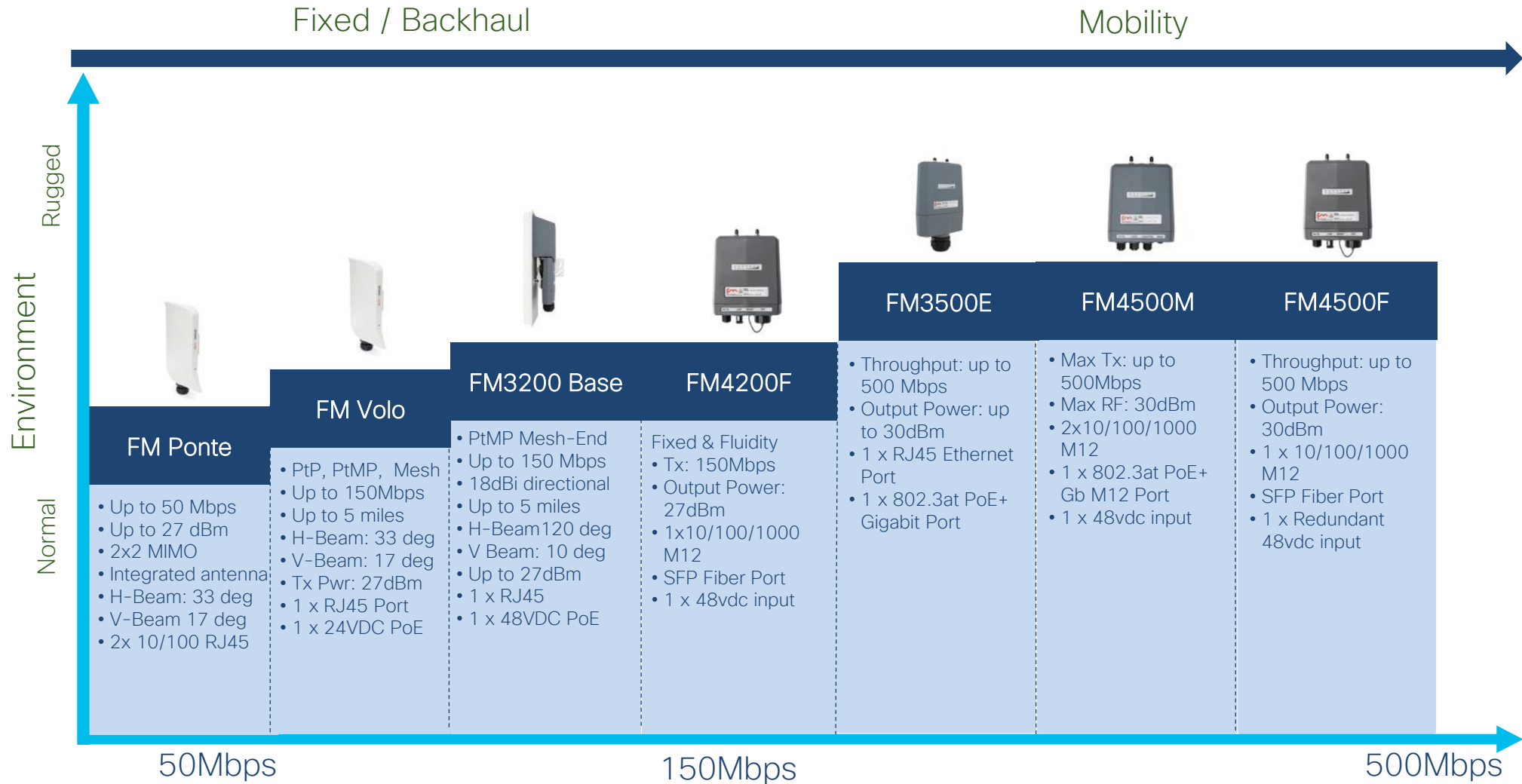
## Tools



## CX / Pro Services



# Cisco Ultra-Reliable Wireless Backhaul Radio Portfolio: 4.9-5.8GHz Solutions



# Antennas

## For ENDO, MOBI and FIBER Series

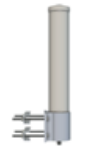
### OMNIDIRECTIONAL



FM-OMNI-3



FM-OMNI-5-KIT



FM-OMNI-10



FM-OMNI-12

### UNI-DIRECTIONAL



FM-TUBE-14



FM-PANEL-19 or 22



FM-PANEL-9



FM-DISH-29

### HORN / SECTOR



FM-HORN-90



FM-HORN-60



FM-HORN-30



FM-SECTOR90-16HV



FM-SECTOR90-16DS

### SHARK



FM-SHARK-DUAL-13



FM-SHARK-14

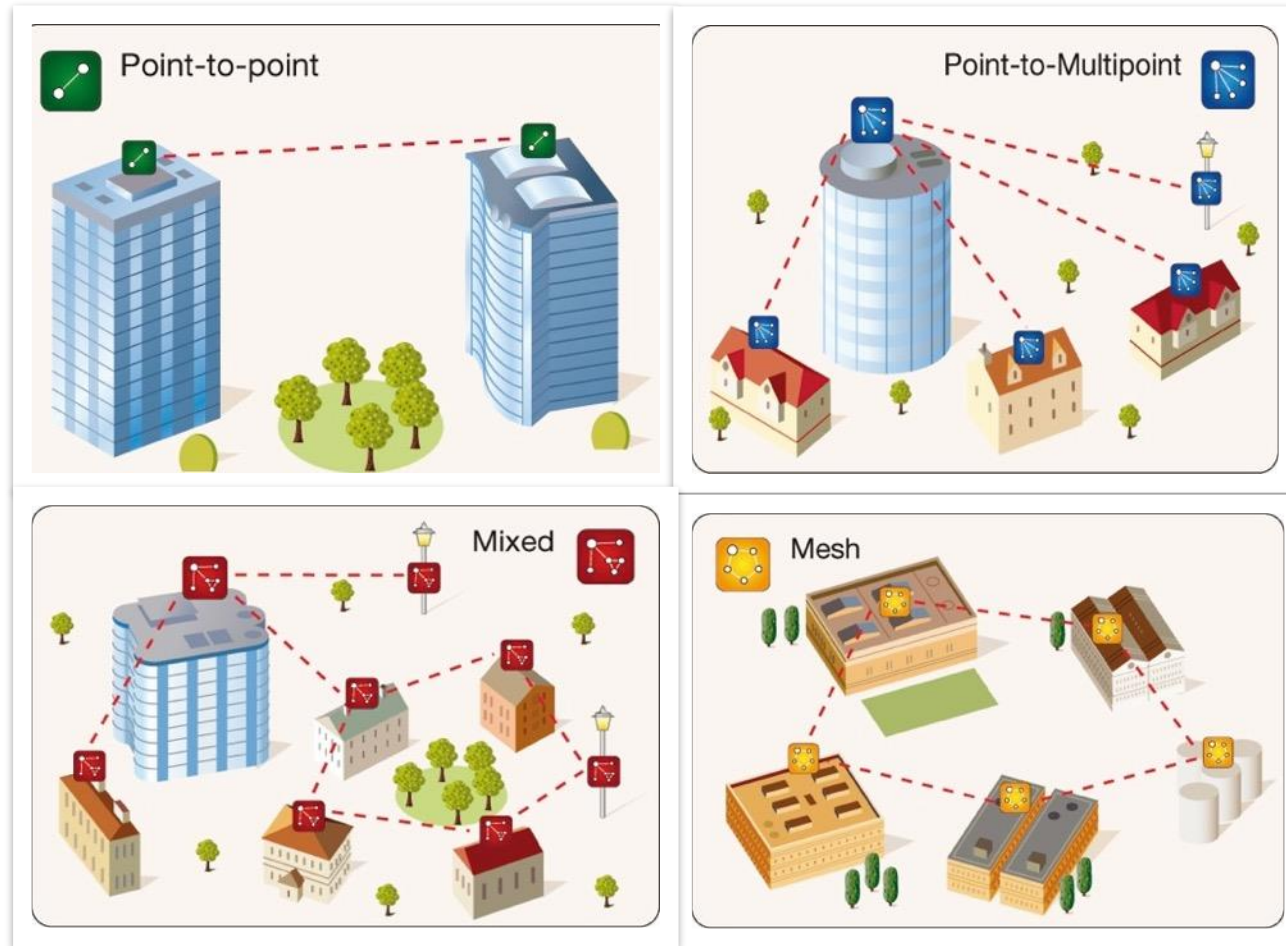


FM-SHARK-16



FM-ATT-06-N

# PTP/PTMP TOPOLOGY SUPPORT

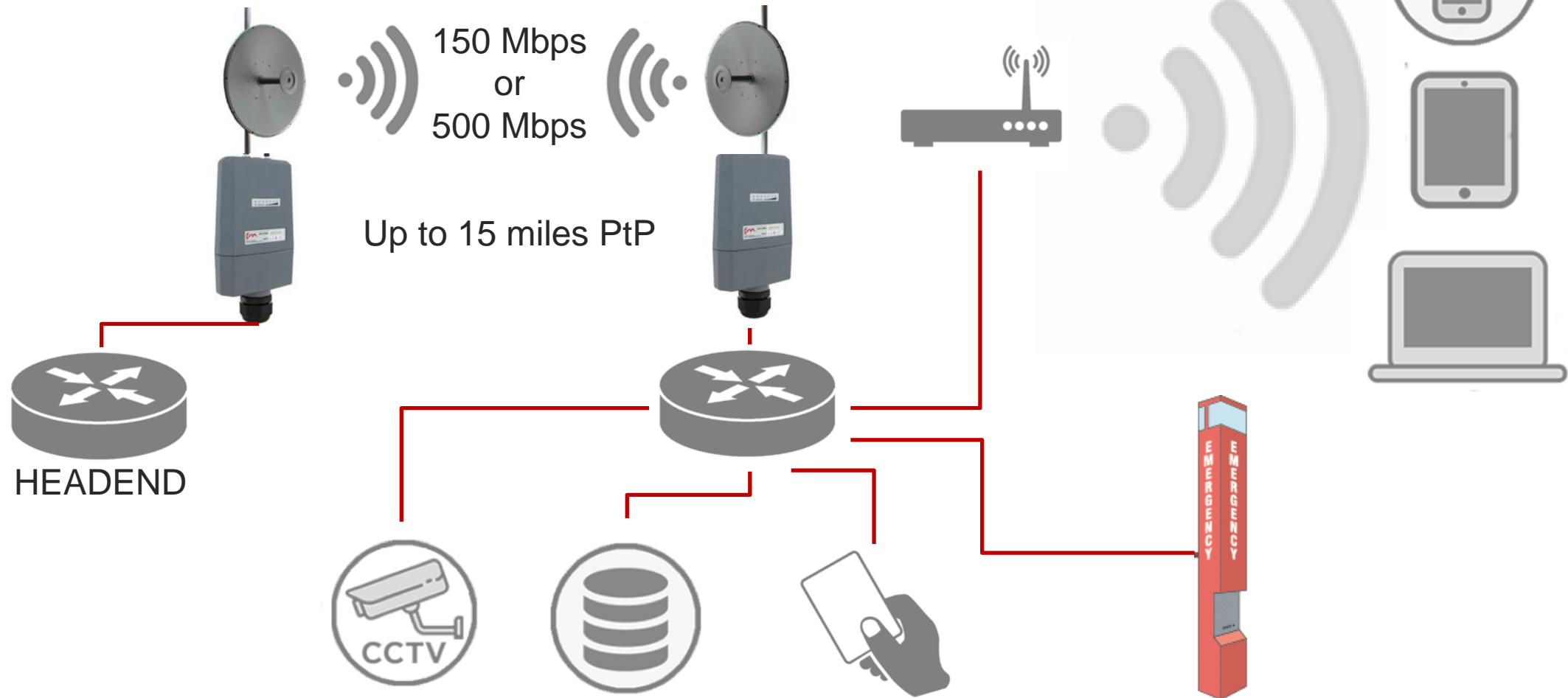


## SUPPORTED ARCHITECTURES



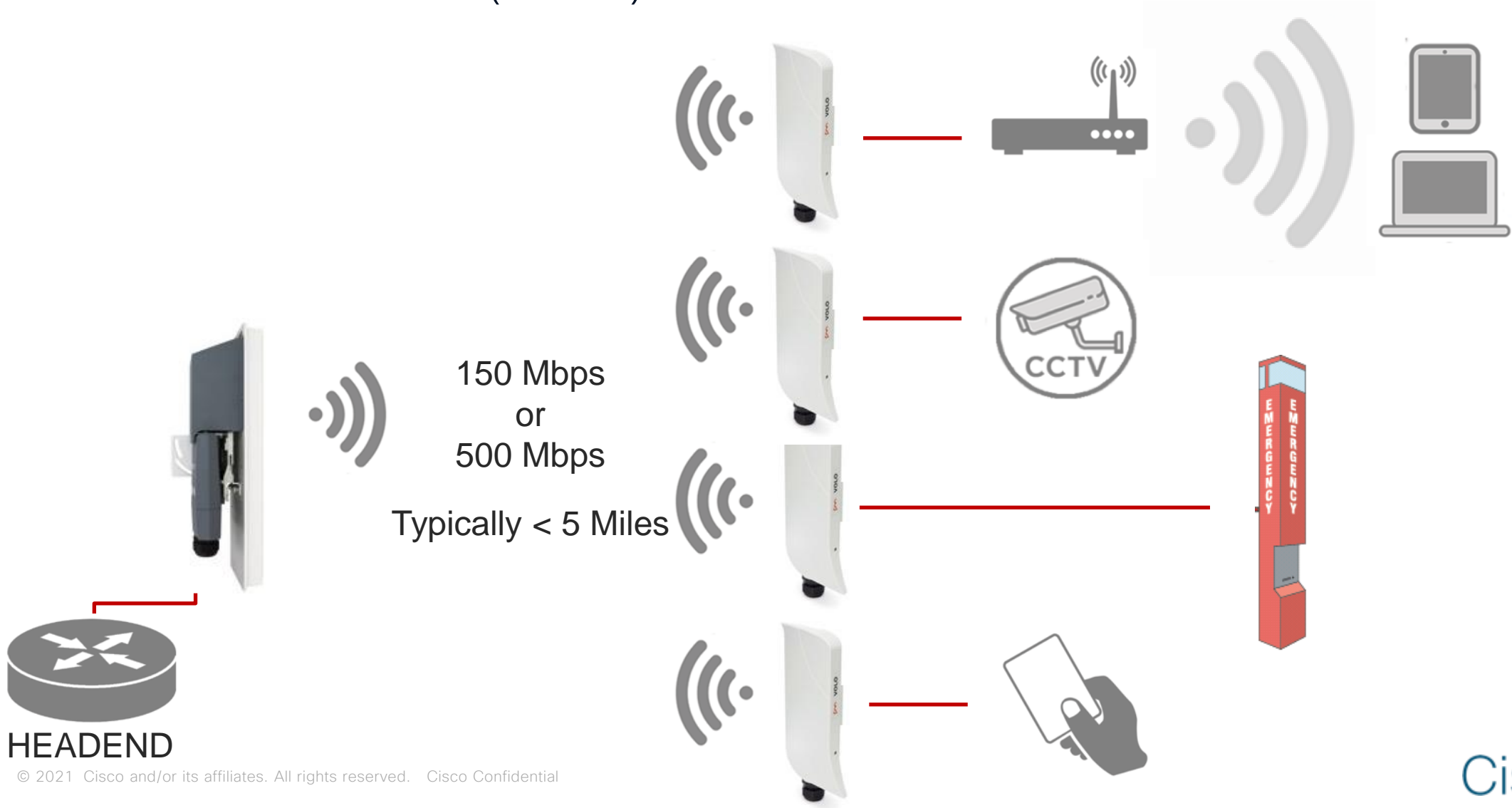
# TOPOLOGY SUPPORT

## Point-to-Point (PtP):



# TOPOLOGY SUPPORT

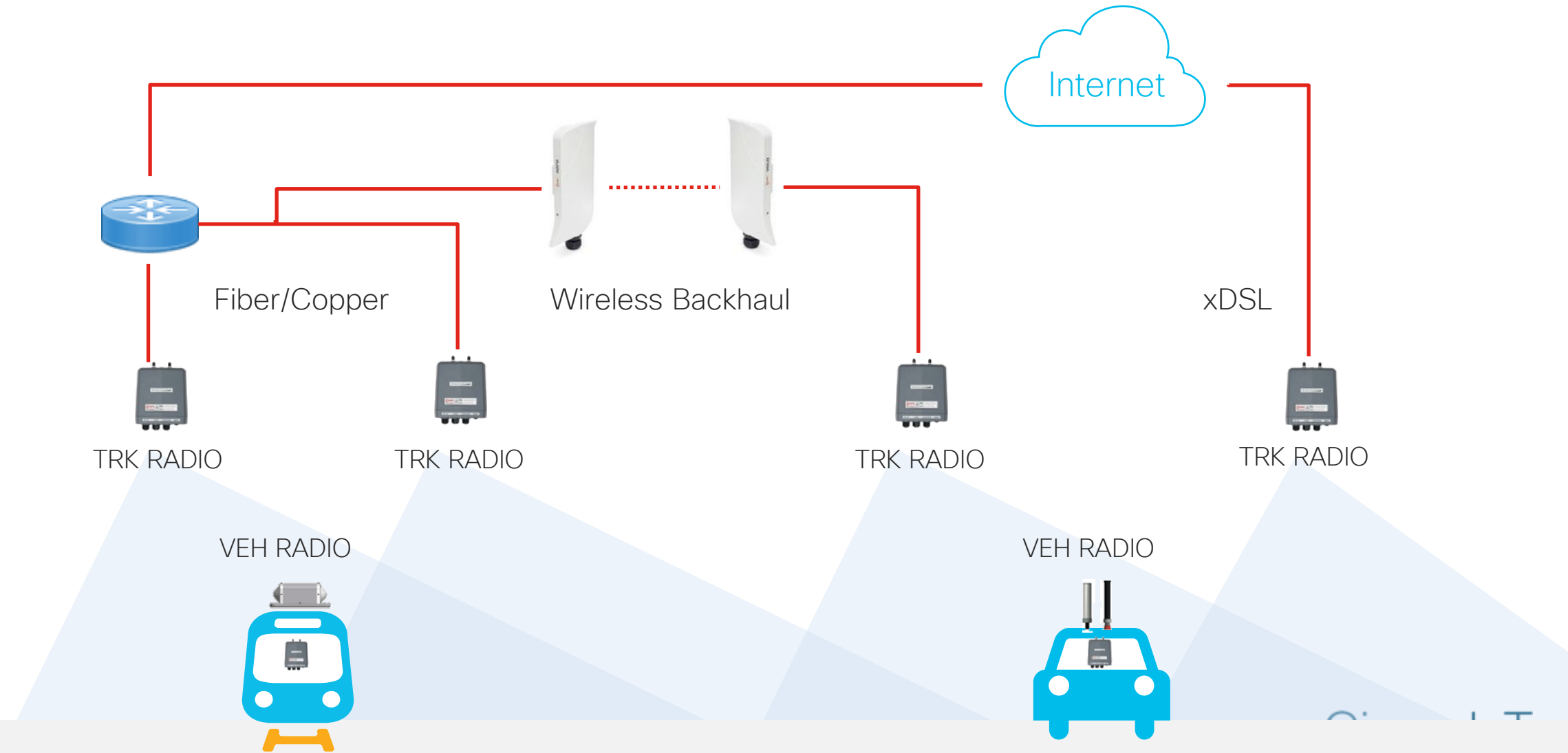
## Point-to-MultiPoint (PtMP):





# Fluidity: Typical Network Topology

Backbone  
Fixed Infrastructure  
Vehicle




A person with short grey hair, wearing a blue uniform with a white stripe on the shoulder, is seen from behind, sitting at a workstation. The workstation has several computer monitors displaying various data and charts. In the background, a large window looks out onto an industrial facility with many lights and structures. The overall scene is dimly lit, suggesting an indoor control room environment.

# Management and Monitoring

# Management/Monitoring: RACER, MONITOR, QUADRO


**RACER:** Provisioning/Configuration - Online Cloud-Managed Configuration Mode



Configure  
Devices

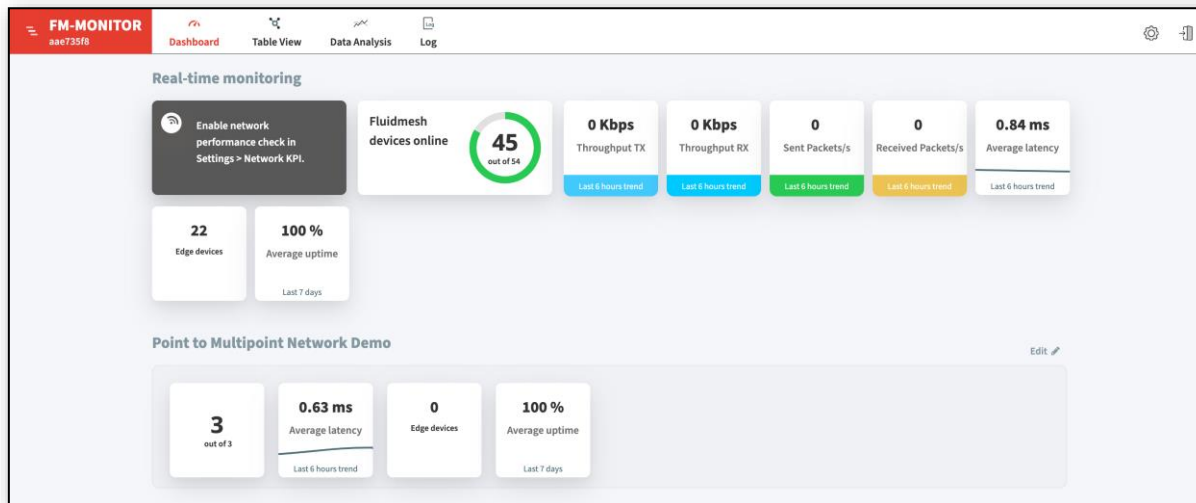
MANAGEMENT   **GENERAL**   WIRELESS RADIO   ADVANCED RADIO SETTINGS   ETHERNET SETTINGS   MULTICAST

<input type="checkbox"/>	Mesh ID - Serial Number	Mode	Local IP Address	Local Netmask	Default Gateway
<input checked="" type="checkbox"/>	5.0.145	Mesh Point	10.0.248.33	255.255.255.224	10.0.248.62
<input checked="" type="checkbox"/>	5.0.145	Mesh Point	10.0.248.242	255.255.255.224	10.0.248.254



Download  
selected

**Monitor:** Monitoring/Key Performance Indicators (Live and history)  
pro-actively maintain and monitor one or multiple CURWB OT networks



**FM-MONITOR** aae735f8

Dashboard   Table View   Data Analysis   Log

### Real-time monitoring

Enable network performance check in Settings > Network KPI.

Fluidmesh devices online: **45** out of 54

0 Kbps Throughput TX (Last 6 hours trend)

0 Kbps Throughput RX (Last 6 hours trend)

0 Sent Packets/s (Last 6 hours trend)

0 Received Packets/s (Last 6 hours trend)

0.84 ms Average latency (Last 6 hours trend)

22 Edge devices (Last 7 days)

100 % Average uptime (Last 7 days)

### Point to Multipoint Network Demo

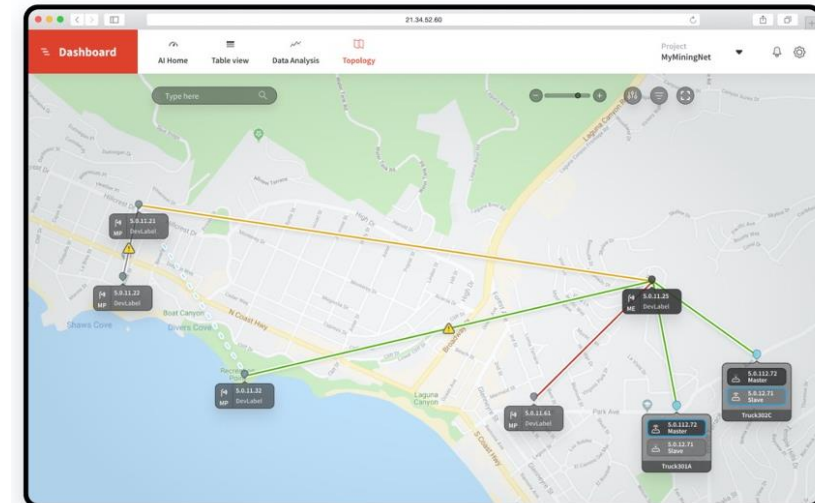
3 out of 3 (Last 6 hours trend)

0.63 ms Average latency (Last 6 hours trend)

0 Edge devices (Last 7 days)

100 % Average uptime (Last 7 days)

**QUADRO:** Visualization (Live)



Dashboard   AI Home   Table view   Data Analysis   Topology

Project: MyMiningNet

Map showing network topology with nodes and connections.

Our easy-to-use web based interface for an easy wireless configuration

A person with short grey hair, wearing a blue uniform with a white reflective stripe on the shoulder, is seen from behind, sitting at a workstation. The workstation features several computer monitors displaying various data visualizations, including charts and graphs. The person is looking out a large window that provides a view of an industrial facility, possibly a power plant or refinery, with complex structures and bright lights. The overall scene is dimly lit, with the primary light source being the monitors and the lights visible through the window.

Training

# Additional Information - SalesConnect Training Curriculum

- The same recorded training content within our Partner Portal, can also be found within SalesConnect
- Official Training and Enablement for Ultra-Reliable Wireless Backhaul product lines and configuration
  - Track for Sales and Technical personnel

Sales Hubs My Learning Maps My Briefcases More

Cisco SalesConnect

fluidmesh

Home > Search > IoT Fluidmesh - Training and Enablement

## IoT Fluidmesh - Training and Enablement

In this course, you'll be introduced to the Fluidmesh product and gain a brief overview of each device within the product portfolio. In addition, you'll identify the common design and implementation solutions for the product. Finally, you'll learn how to configure and deploy the product in many different vertical markets. July 2020

Access Level: Employee | Language: English | Rating: ★★★★★ (7) [Write a Review](#) | Author: [ncassone](#), [abyfield](#), [patnolan](#) | Published Date: Oct 2, 2020 | Expiration Date: Jul 15, 2021 | Assigned by: [Igormois](#) | Assigned on: 29 Jul 2020

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To achieve completion status and generate a certificate of completion for Learning Map please select only your appropriate closed path.

8% <a href="#">Sales Track</a> 1 of 14 Learning Items Completed	12% <a href="#">Technical Track</a> 4 of 36 Learning Items Completed
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<a href="#">Introduction and Portfolio</a> Please complete this module first.	Required to Complete: 14
<a href="#">Fluidmesh Network Configurations</a> Please complete this module second.	Required to Complete: 5
<a href="#">Implementing Fluidmesh</a> Please complete this module third.	Required to Complete: 10
<a href="#">Fluidmesh Vertical Positioning</a> Please complete this module fourth.	Required to Complete: 6

Quint@sQuinze

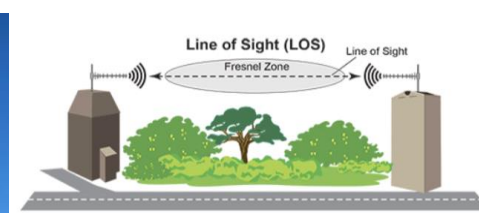
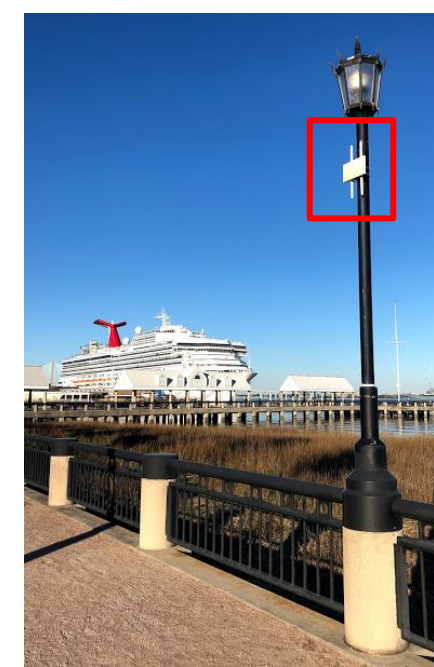


Muito Obrigado

# Vertical Assets Survey

## Needed at all wireless head-end, relay, and end-point locations

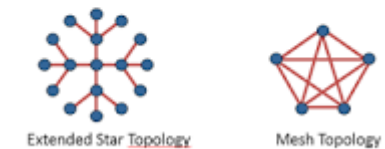
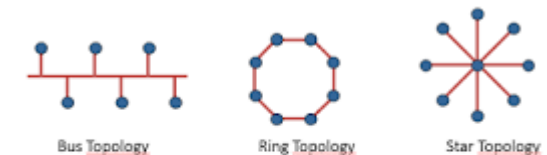
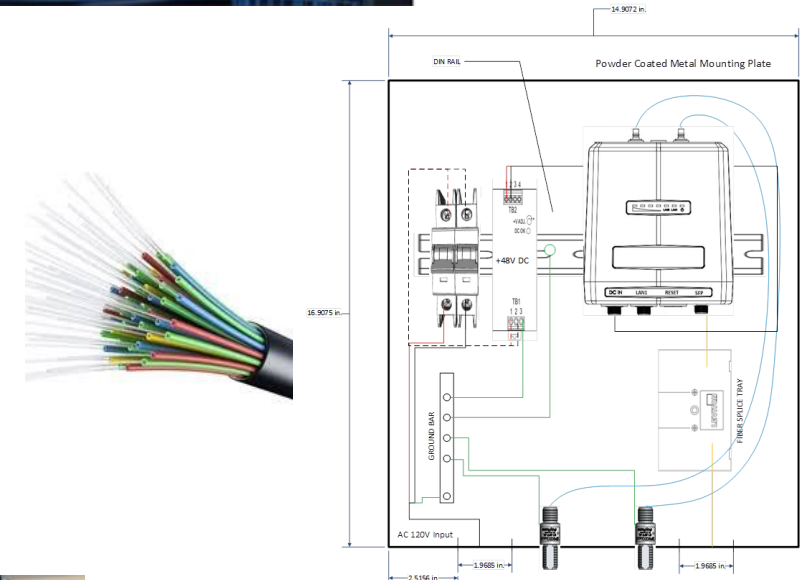
- ❑ Identify wireless head-end, relay, and end-point locations where radios will sit.
- ❑ Communication towers, water towers, tall buildings, street-lights, utility-poles, and traffic lights are all suitable assets.
- ❑ Who owns these assets? City, municipality, school, or public utility?
- ❑ What is the max Above Ground Level (AGL) height at each asset location? Any restrictions?
- ❑ What kind of AC/DC power, Copper/Fiber network requirements at each asset location, and any OpEx for power, leasing, and network connectivity?
- ❑ Collect information, and plot location on Google Earth (.kmz/.kml files preferred).



# Network Assets Survey

Extend Layer 1 wirelessly, but also offload data quickly and often to wired networks

- ❑ Understand the full wired framework that's in place.
- ❑ Is it customer owned, leased from a Service Provider, are there dark-fibers that can easily network to existing LANs?
- ❑ Where are the head-end location(s) connected to the ISP, as well as well-known network Point-of-Presence (PoPs) outside the carpeted spaces.
- ❑ Understand any network bottlenecks, that may throttle the overall network performance.
- ❑ How are we interfacing to the radios on the vertical assets? Direct fiber with DC input, PoE from an IE SW, combination of both?





# Key Design Elements

Pulling it all together for a constructible design

- ❑ Always look for Clear radio Line of Sight (LoS) for all wireless links. One poor link can compromise a large portion of the network.
- ❑ Combination of high installation points at the street poles, and very tall assets at fiber locations.
- ❑ Nothing beats a physical site-survey, with actual RF measurements at the AGL heights.
- ❑ Understand the local RF congestion in the 5GHz & 6GHz frequency spectrum.
- ❑ Design WiFi and CURWB networks on separate, non-overlapping frequencies.
- ❑ Are we using PoE Switches at each location, or networking via PoE Injectors, etc.?

