Industrial Wireless for Manufacturing

New Solution for Mobile, Fixed and Backhaul in Factories

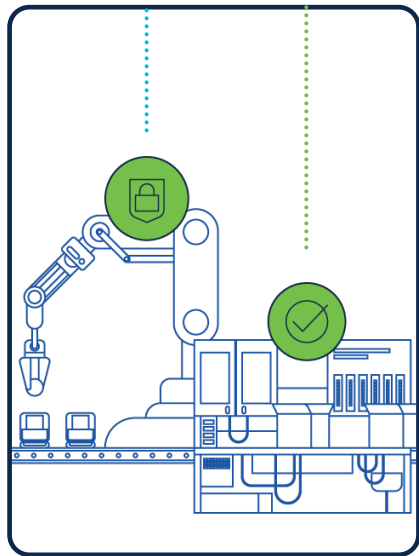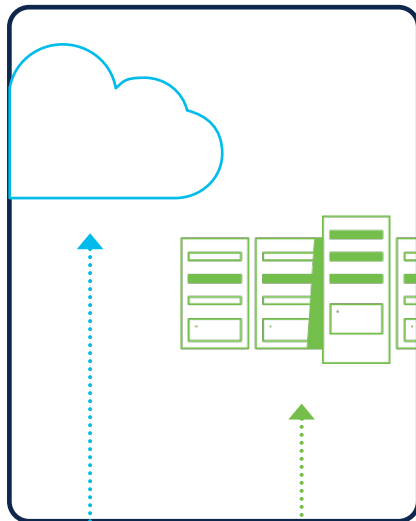Paul Didier – IIoT Manufacturing Solution Architect
BRKIOT-2555

Agenda

- Manufacturing trends & Wireless Use Cases

- Multi-access Wireless

- Wireless for Manufacturing Cisco Validated Design

- Resilient Wireless with Cisco URWB

- WiFi – adding the Work-group Bridge (WGB)

- Conclusion

The path to factory digitization

Networking and securing plant floor

Connecting the plant floor to the datacenter and cloud

Extracting data from machines to the datacenter for analytics

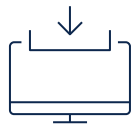Running efficient workloads with compute and hyperconverged solutions

Wireless is a key enabler for digitizing operations

Applications have unique wireless requirements

High bandwidth

HD video, AGVs, 3D sensors

Low latency

Teleremote, AGVs, AMRs

High availability

Loss of connectivity causes safety issues or loss of money

Zero-loss handoffs

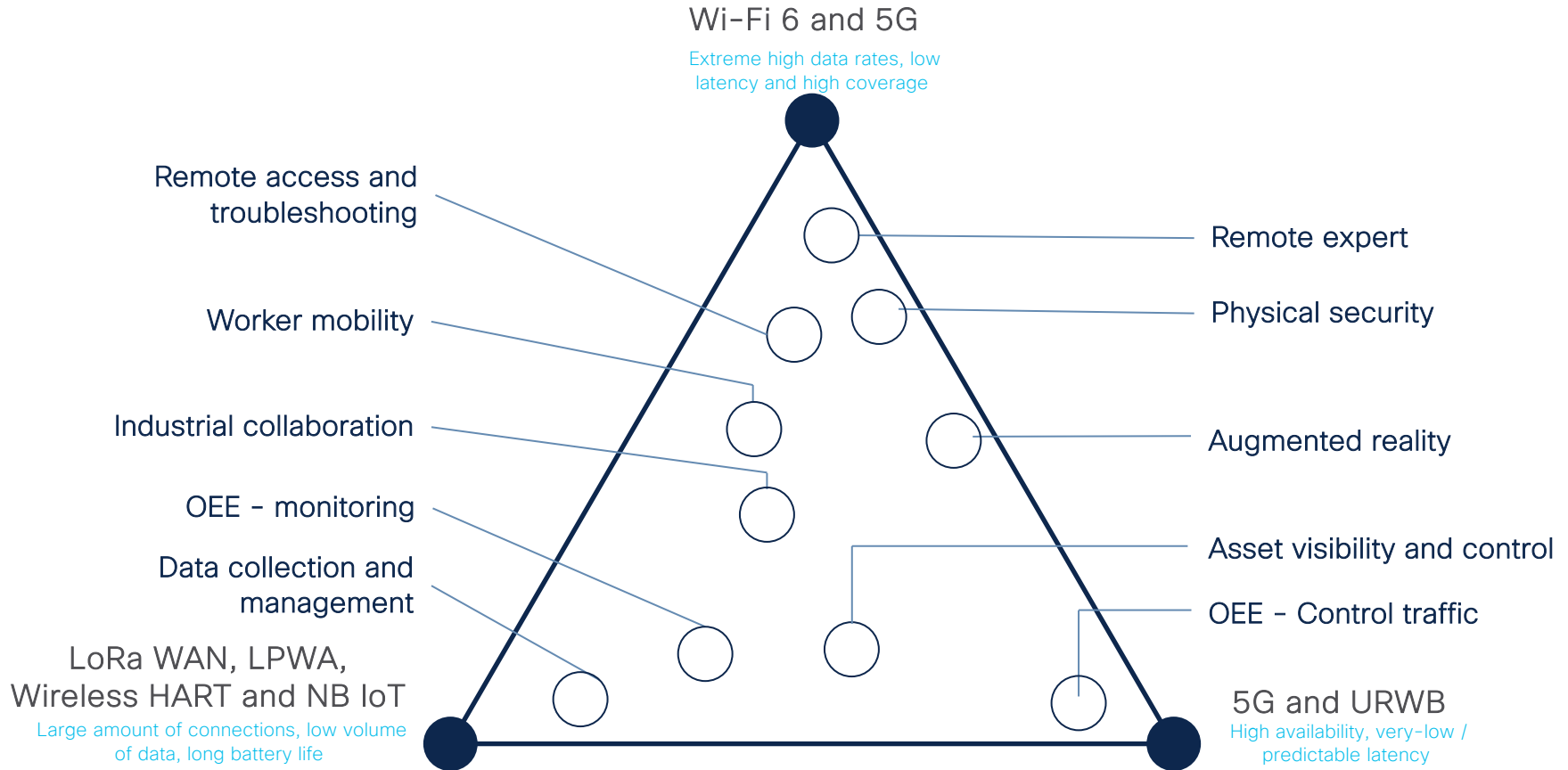Real-time control of unmanned vehicles, support for applications at high speed
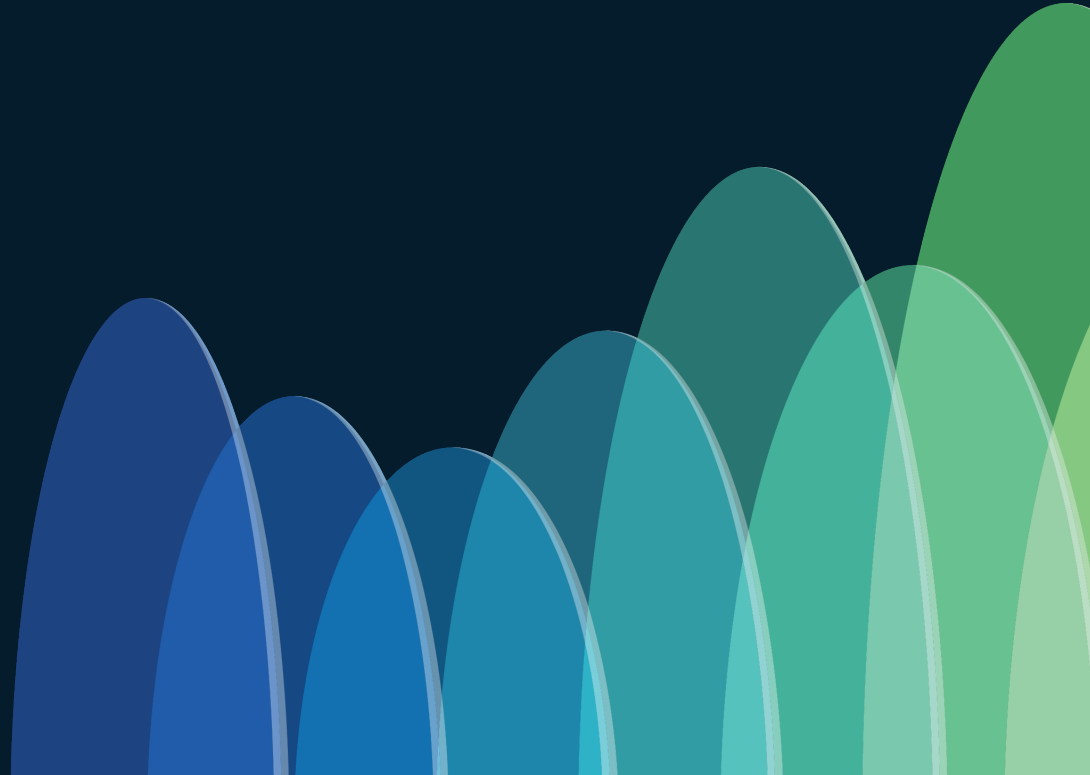
Ruggedization

IP67 protection (water and dust), hardened for shock, vibration, extreme temperatures

Use case mapping to ITU triangle

Wi-Fi 6 and 5G
Extreme high data rates, low latency and high coverage

Remote access and troubleshooting

Remote expert

Worker mobility

Physical security

Industrial collaboration

Augmented reality

OEE – monitoring

Asset visibility and control

Data collection and management

OEE – Control traffic

LoRa WAN, LPWA, Wireless HART and NB IoT
Large amount of connections, low volume of data, long battery life

5G and URWB
High availability, very-low / predictable latency

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Multi-Access Wireless

Considerations for wireless technology decision

| Manufacturing | Transportation | Mining | Utilities | Roadways | **Consider use cases**
AGV/AMR, train to trackside, autonomous mining, remote crane operations, entertainment, logistics, etc. |

Devices

Local and global Eco-system Handhelds, AGV/AMR, Dozer, Cranes, Rail

Application requirements

Latency, Reliability, Scalability, Ease of operations, device and system throughput...

Deployment

Regional regulations: spectrum?
Specify Environment: Indoor / Outdoor
Access / backhaul
Cyber-security

Technology

Wired: Ethernet, serial, DSL
Wireless: Wi-Fi and Ultra-Reliable Wireless Backhaul, 5G Cellular, Wi-SUN, LoRaWAN,...
Spectrum: Unlicensed, Licensed: Private, Public, Shared

TCO

Product costs?
Operational costs?
Complexity?
Training?
Backward compatibility?

The Ambitions of 5G

Diverse Scenarios

eMBB

Enhanced Mobile Broadband

Data rate
- +10Gbps peak
- +100Mpbs user experience

URLLC

Ultra Reliability Low Latency Connection

Performance
- 1ms
- 5-9's to 6-9's

mMTC

Massive Internet of Things

Scale
- 1M endpoints per 1km2

Wide Spectrums

High Band (mmWave)

24 to 100 GHz, 400MHz bandwidth
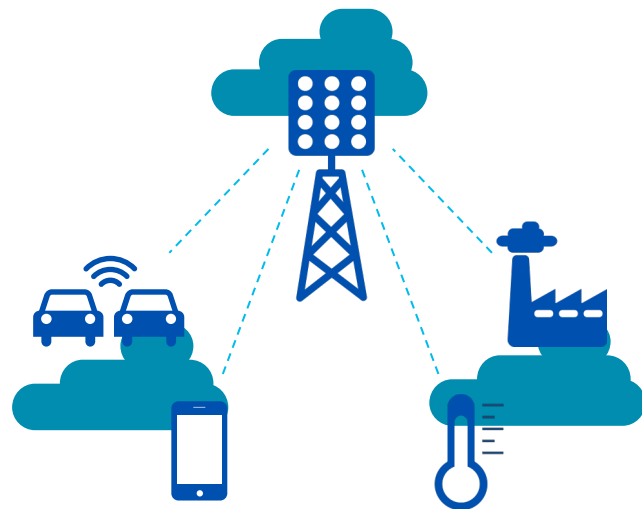
Mid Band (Sub-6)

1 to 6 GHz, 100MHz bandwidth

Low Band (Sub-G)
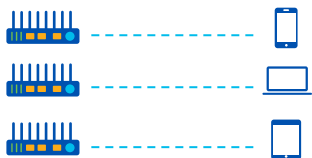
600 to 800 MHz, 30/35MHz bandwidth

Multiple Deployments

Public and Private Network

3GPP/GSMA's Vision to 5G - A Single Connectivity Fabric Crossing Consumers, Industries and Smart Cities
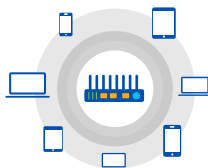
The Advantages of Wi-Fi 6/6E

Improved Capacity

MU-MIMO

- 8x8 MU MIMO for both downlink and uplink
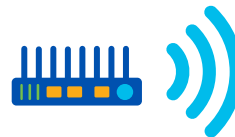- Allow multiple users packet in one frame – scale to 100s of IoT devices per AP

Greater Reliability

OFDMA

- Chunk 20MHz band to smaller sub-carriers – more granularity
- Dual sub-carrier modulation
- Improved latency

Extended Spectrum

Extended Range

- Up to 1.2GHz more spectrum (500MHz in EU) to support high throughput and high density, without compromises
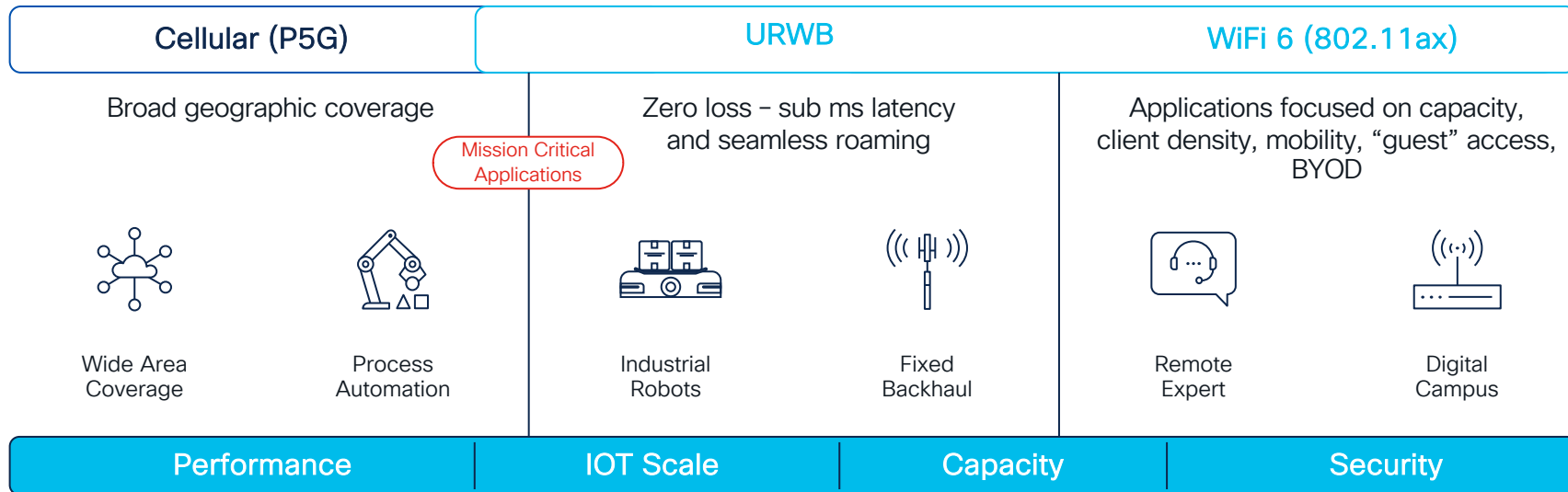
Reduced Power Consumption

- Up to 3x better battery life with Target Wake Time (TWT) by beacon from AP
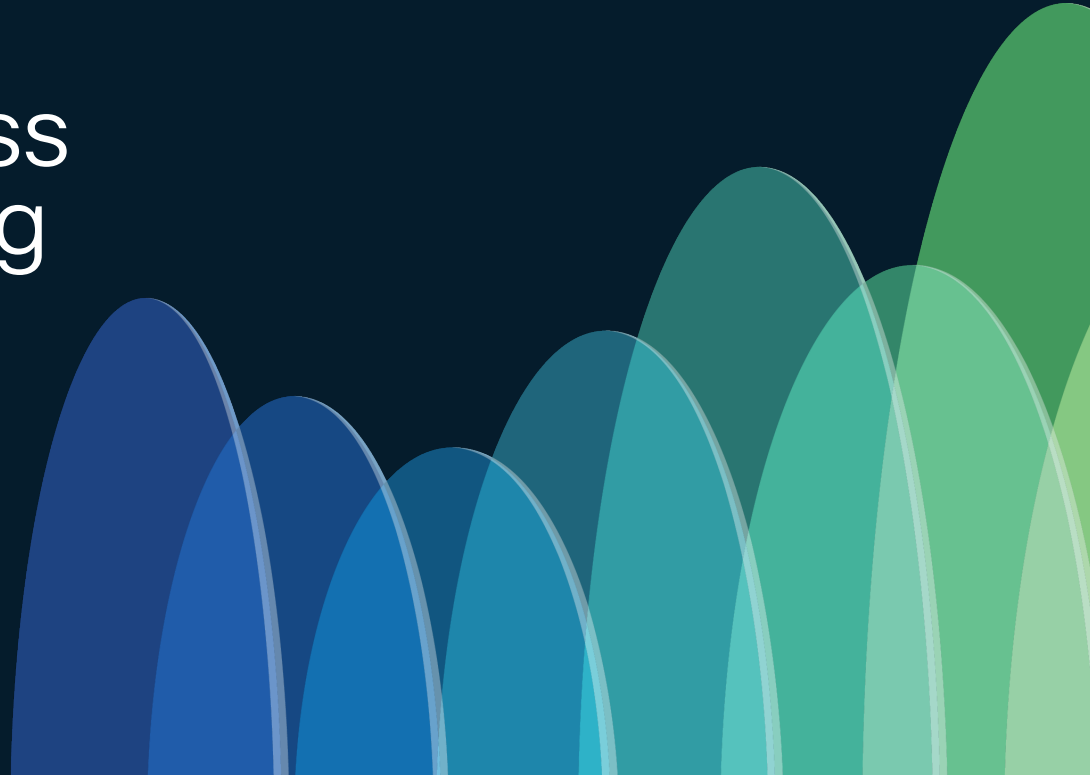
Multi wireless access – better together!

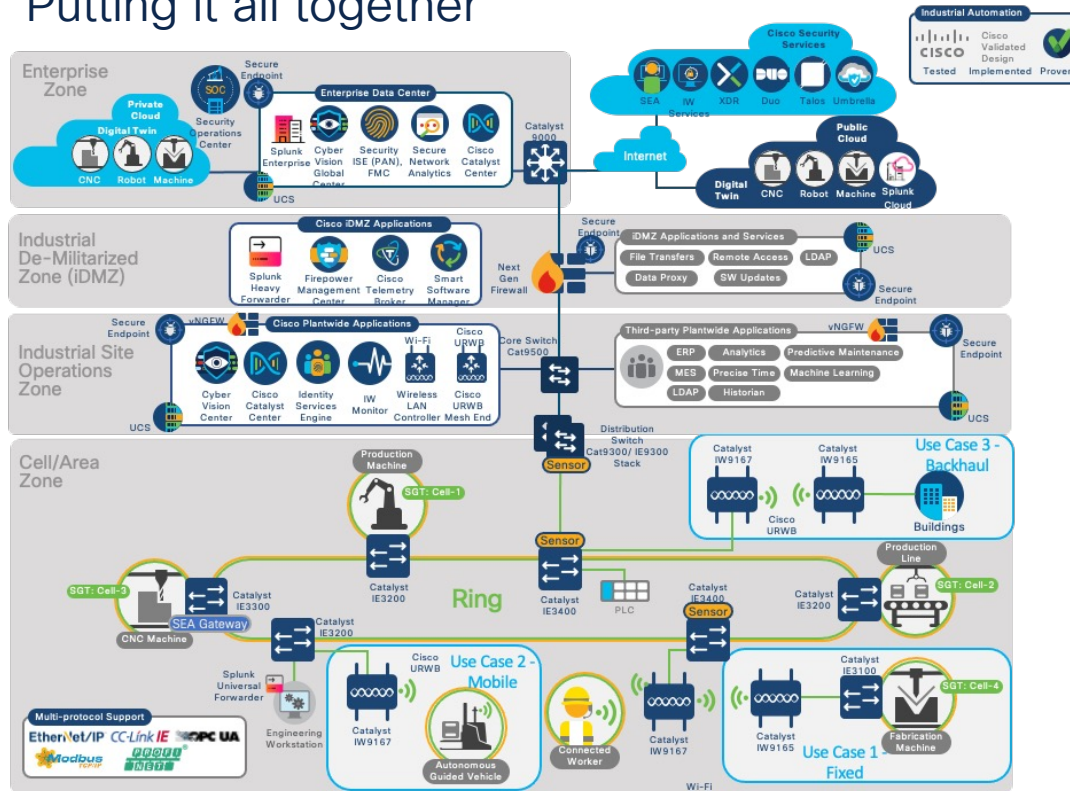## Cellular, Cisco URWB and Wi-Fi 6 are complementary technologies

Cellular (P5G)	URWB	WiFi 6 (802.11ax)
Broad geographic coverage	Zero loss – sub ms latency and seamless roaming	Applications focused on capacity, client density, mobility, "guest" access, BYOD

Mission Critical Applications

Wide Area Coverage	Process Automation	Industrial Robots	Fixed Backhaul	Remote Expert	Digital Campus

Performance	IOT Scale	Capacity	Security

Always be searching for better together

Industrial Wireless for Manufacturing CVD

CISCO Live!

Cisco validated design for wireless architecture

Putting it all together

Use Cases
- Reliable wireless connectivity for mobile assets (e.g. AGVs, AMRs)
- Connected Worker
- Nomadic assets such as Process Skids, etc.
- Point-to-Point Communication between sites

Feature
- Resilient, reliable and secure wireless connectivity for IACS
- Visibility of IACS devices and communication
- Plant floor macro/micro-segmentation
- Network automation and assurance

Outcomes
- Improved uptime and OEE
- Reduced support effort & deployment errors
- Increased productivity
- Better IT/OT collaboration

Proven to work with: Rockwell Automation, SIEMENS, Schneider Electric, MITSUBISHI ELECTRIC

Summary of recommended Wireless technologies

Attribute	Wi-Fi	URWB
Type of Service	Network access via built-in radio on client devices	Network Access with separate attached URWB radio to wired client devices.
Operating characteristics	Short range, high bandwidth, high capacity, high throughput	Medium to long range, high bandwidth, low latency, seamless handoffs, high throughput.
Spectrum	Unlicensed 2.4, 5, or 6GHz	Unlicensed in 5GHz
Range	Indoor/Outdoor. Flexible antenna options	Indoor/outdoor. Flexible antenna options
Mobility	Practical for low speeds	Make before break radio link creation at high speed with minimal packet loss and optional Multipath Operations (MPO) for higher resiliency
Ease of Deployment	Easy to deploy. Can use existing infrastructure. WLC RRM channel planning.	Easy to deploy. Requires new installation and training. Requires static radio channel planning.
Provisioning, management	Enterprise. Fully automated, monitored, and assured with modern network management systems (Catalyst Center)	Management through IW Services. No automation currently.
Connecting Industrial devices	Any client with built-in Wi-Fi	Any device with Ethernet

Testing results from the Lab

Test results from lab-based, not necessarily reflective of a real production system

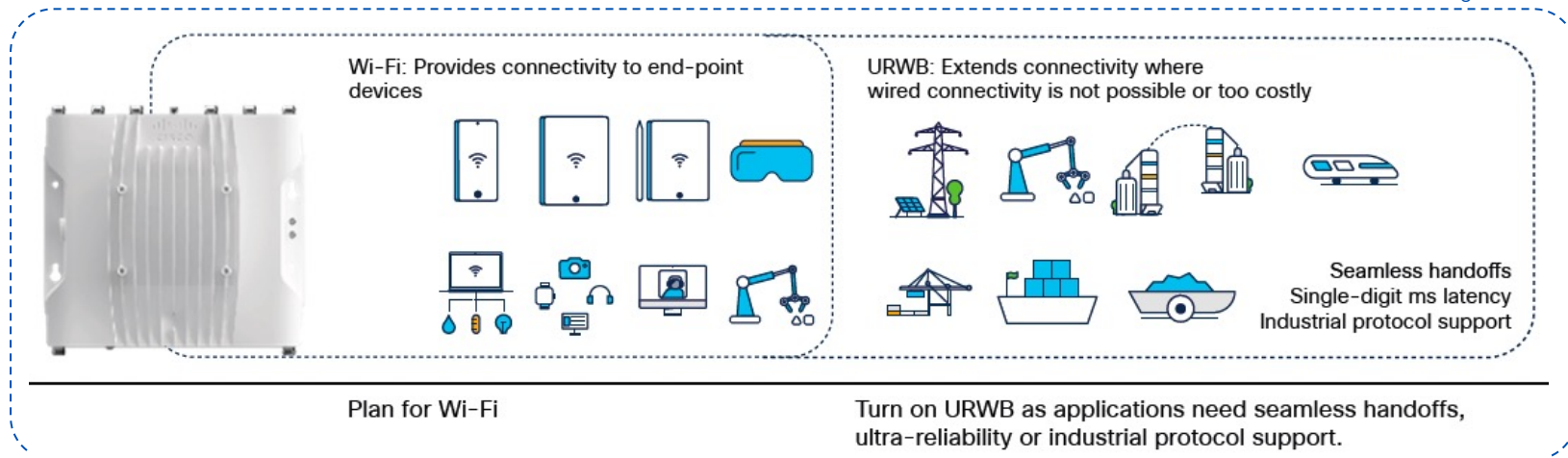|	WI-FI w/ Cisco WGB	URWB	URWB w/MPO	WI-FI w/ Cisco WGB	URWB	URWB w/MPO
	Stationary/Wandering			Roaming*		
Avg Latency	<10ms	<10ms	<10ms	<10ms	<10ms	<10ms
Max Latency	<60ms	<30ms	<30ms	<120ms	<30ms	<30ms
Packet Loss	<1%	<0.1%	<0.01%	<1%	<0.1%	<0.01%
Critical Traffic	No	Yes	Yes	No	Yes	Yes
Mobile Worker	Yes	No	No	Yes	No	No

*Roaming == Roaming between infrastructure access points

Application Recommendations W/ Cisco URWB

IACS Traffic Type	CIP Standard	Supported	Constraints
Supervisory information and diagnostics, peer-to-peer messaging	CIP Class 3 (HMI) CIP Class 3 (MSG)	Yes	Need to control bandwidth if combined with CIP Class 1 Standard and Safety traffic
Peer-to-peer Control I/O Control	CIP Class 1 Produced/Consumed Distributed I/O PROFINET RT	Yes	Application should tolerate occasional high latency, jitter and dropped packets; Packet rate restrictions
Safety Control	CIP safety PROFIsafe	Yes	Fast safety reaction times may not be supported
Time synchronization	CIP Sync	No	Accuracy and reliability can be optimized in specific configurations
Motion Control	Integrated Motion on the EtherNet/IP network (CIP Motion, CIP Sync)	No	Not feasible due to higher latency and jitter and poor CIP Sync accuracy

Customer needs Pervasive Mobility

Unified Management

Wi-Fi: Provides connectivity to end-point devices

URWB: Extends connectivity where wired connectivity is not possible or too costly

Seamless handoffs
Single-digit ms latency
Industrial protocol support

Plan for Wi-Fi

Turn on URWB as applications need seamless handoffs, ultra-reliability or industrial protocol support.

Connect everything
sensors, devices, robots, buildings, autonomous vehicles for AI models

Unify and Simplify
hardware, management and assurance

Connect everywhere
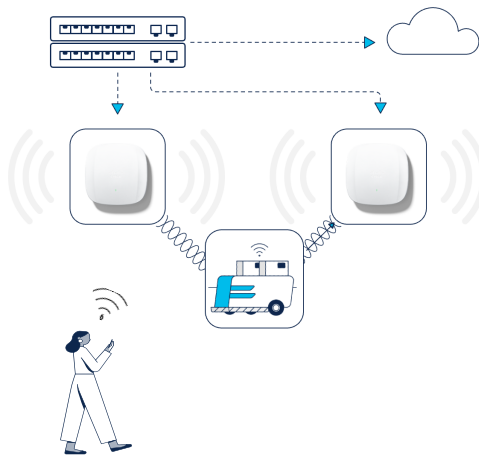campuses, branches, factories, roadways, railways, mines and beyond
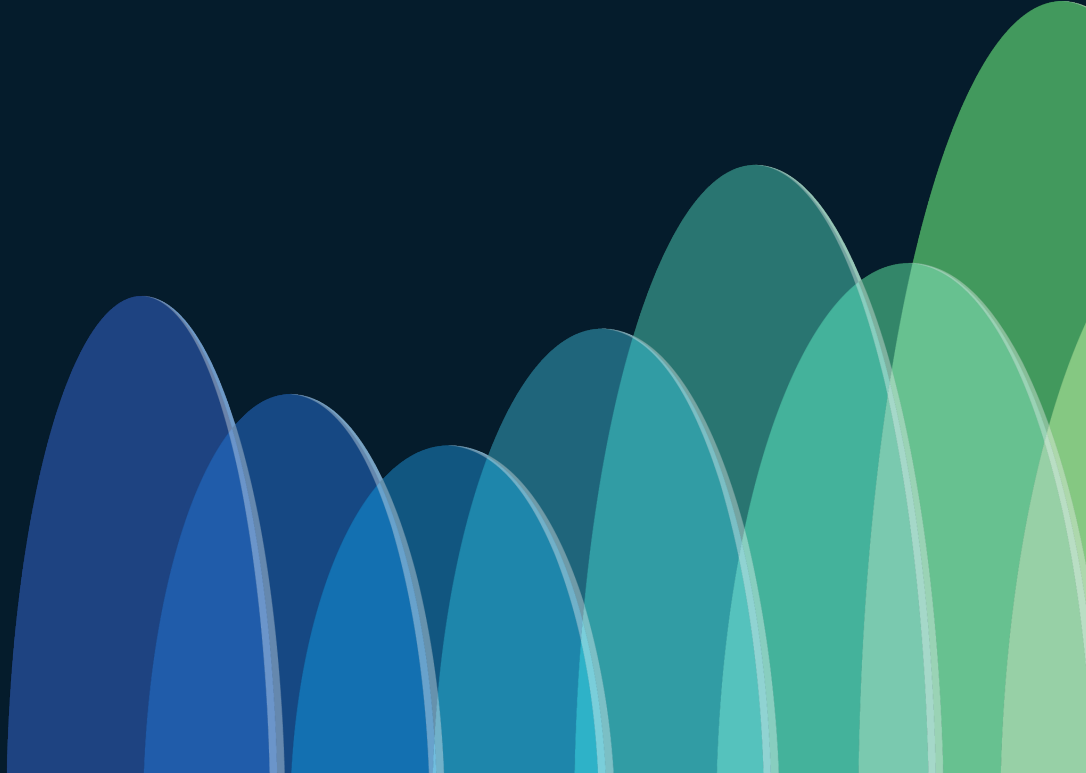
Cisco Ultra Reliable Wireless Backhaul

BACKHAUL CONNECTIVITY

SEAMLESS ROAMING

Low packet error rate

Low, deterministic latency

Fast roaming

Interference robustness

Ultra-Reliability
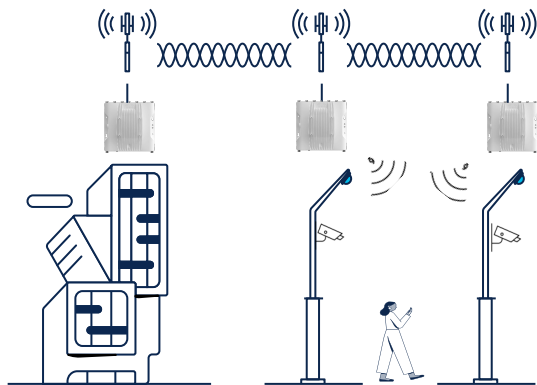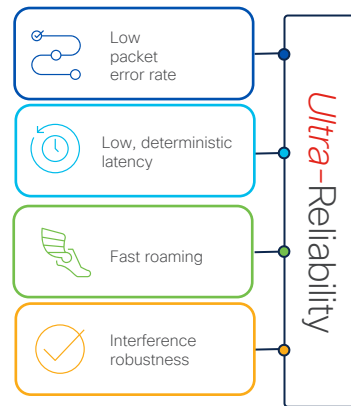
Up to 99.999999% availability

End-to-End Overlay

Ultra-fast failover Carrier-grade availability

Make-before-break handoff

Multipath operation
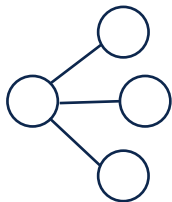
26 WORLDWIDE PATENTS

Supports highly flexible wireless architectures
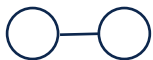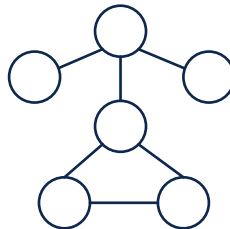

Point to Point   **Point to Multipoint**   **Mesh**   **Mixed**   **Mobility**
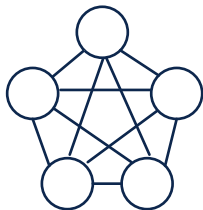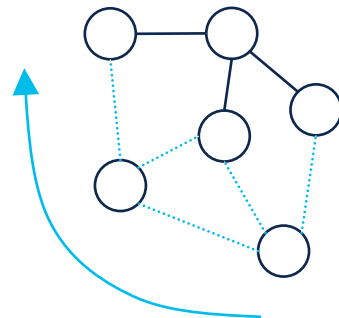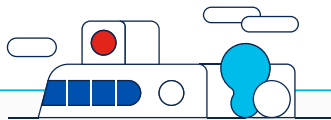
Ultra-Reliable Wireless Backhaul to connect fixed and mobile assets for Ports OTS, T2G, Entertainment, Mining, Smart Cities
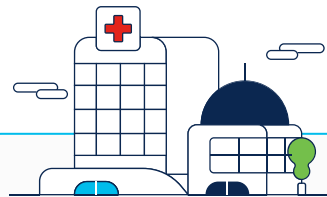
What makes URWB Ultra-Reliable?

MPLS over the wireless

Low latency (<10 ms)
Single digit ms

High-speed mobility 0ms hand-off

Seamless roaming

Ultra-fast failover

Carrier-grade availability

Self-healing network for up to 99.999% reliability
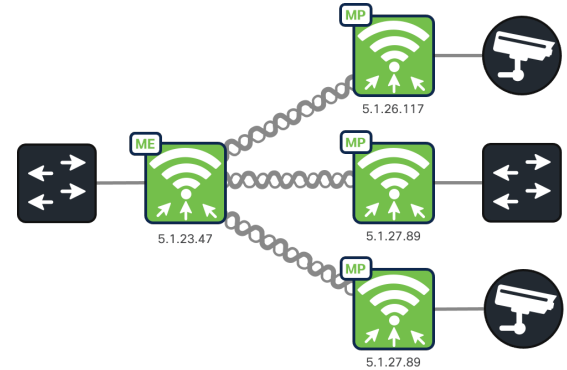The enabler for industrial wireless automation

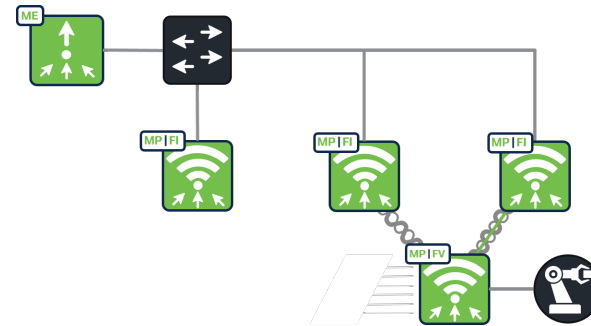# URWB Overview - topologies

Point-to-Point

Point-to-MultiPoint (FluidMax)

Mobility (Fluidity)

# URWB Overview - Roles

Mesh Ends (ME) and Mesh Points (MP) form an end-to-end overlay via an MPLS network. Mesh Ends are the gateway to the wired network. An ME can be an access point or a gateway device.

In mobile configurations (Fluidity), Mesh Points are either:
1. Fluidity Infrastructure (FI) when fixed with wired connectivity to ME
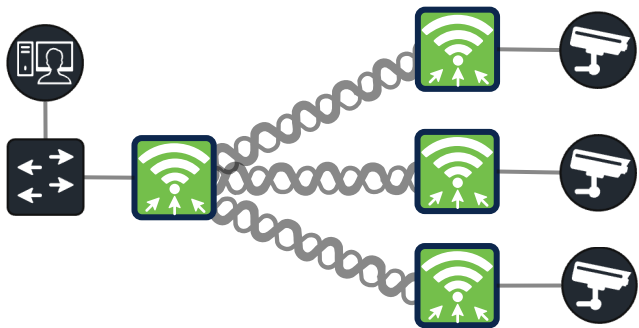2. Fluidity Vehicle (FV) with wireless connectivity to FI nodes
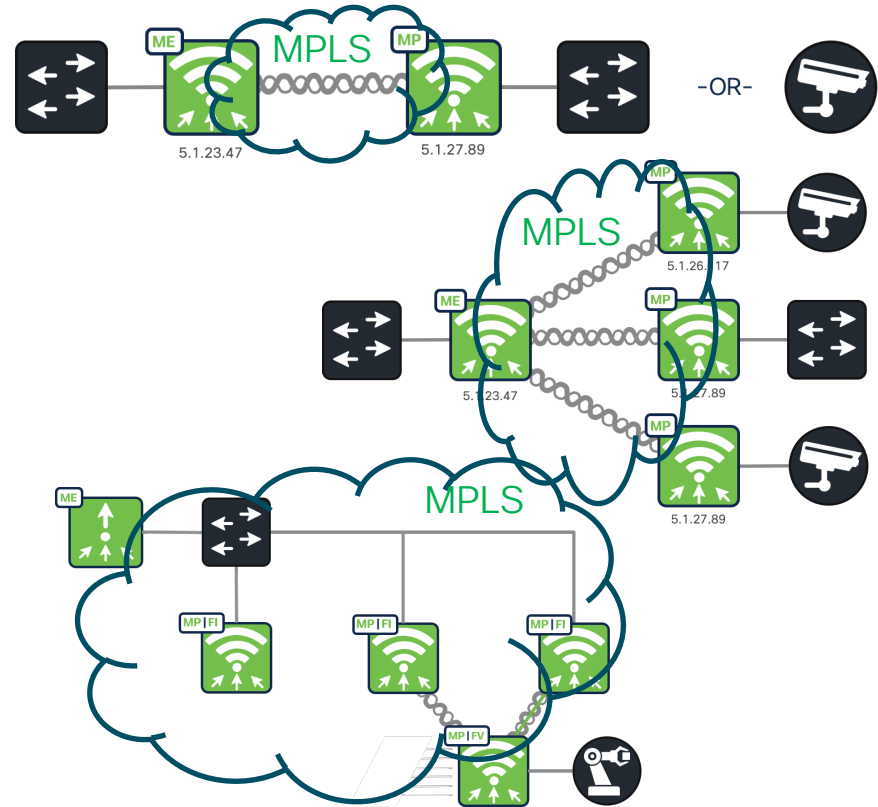
URWB Wireless Link Features

Fluidmax (Backhaul)

- Creates clusters of radios with primary/secondary relationships.

- Usually deployed to reflect physical network deployment.

Fluidity (Mobility)

- Defines infrastructure and vehicles roles for radios.

- Useful for mobility where vehicles are moving.
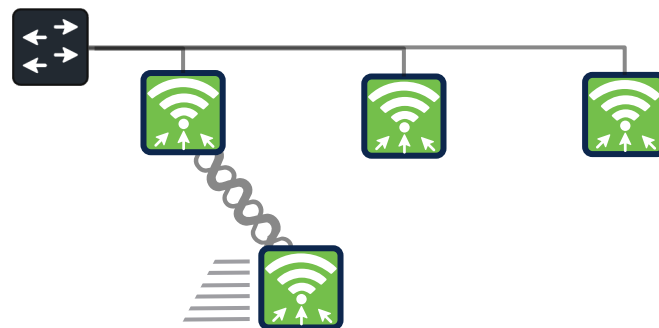
URWB Fluidity

- Fluidity enables special behaviors between radios optimized for mobility.

- When Fluidity is enabled on a radio, the access point must be configured as in Infrastructure mode or Vehicle mode.

- By default, Vehicle radios will only connect to Infrastructure Radios

- Fluidity is typically deployed with wired Infrastructure radios.
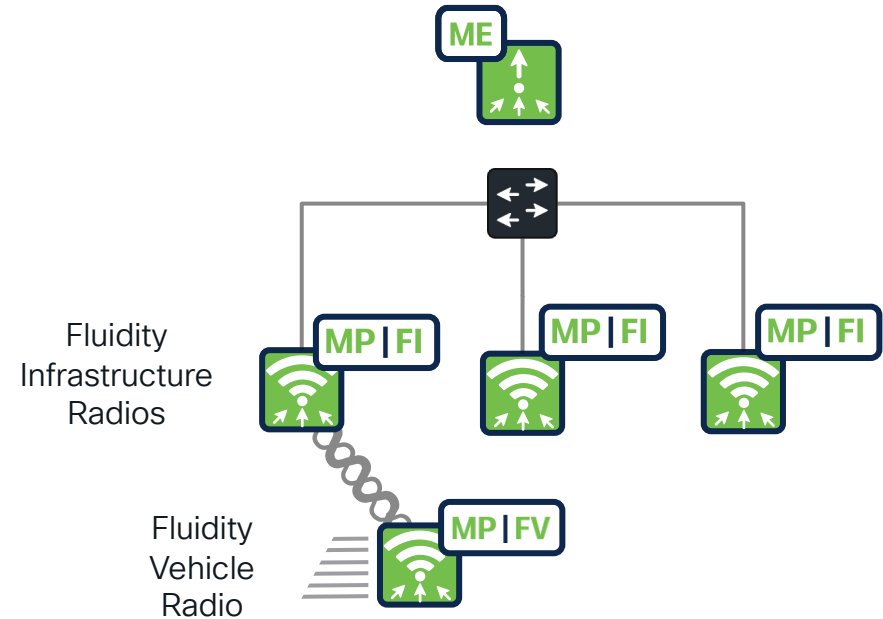
Use Case – Backhaul design considerations

- Fluidmax offers an independent set of interface parameters which allow greater flexibility in point to multipoint network topologies. With a Fluidmax primary mode to serve fluidmax secondary clients.
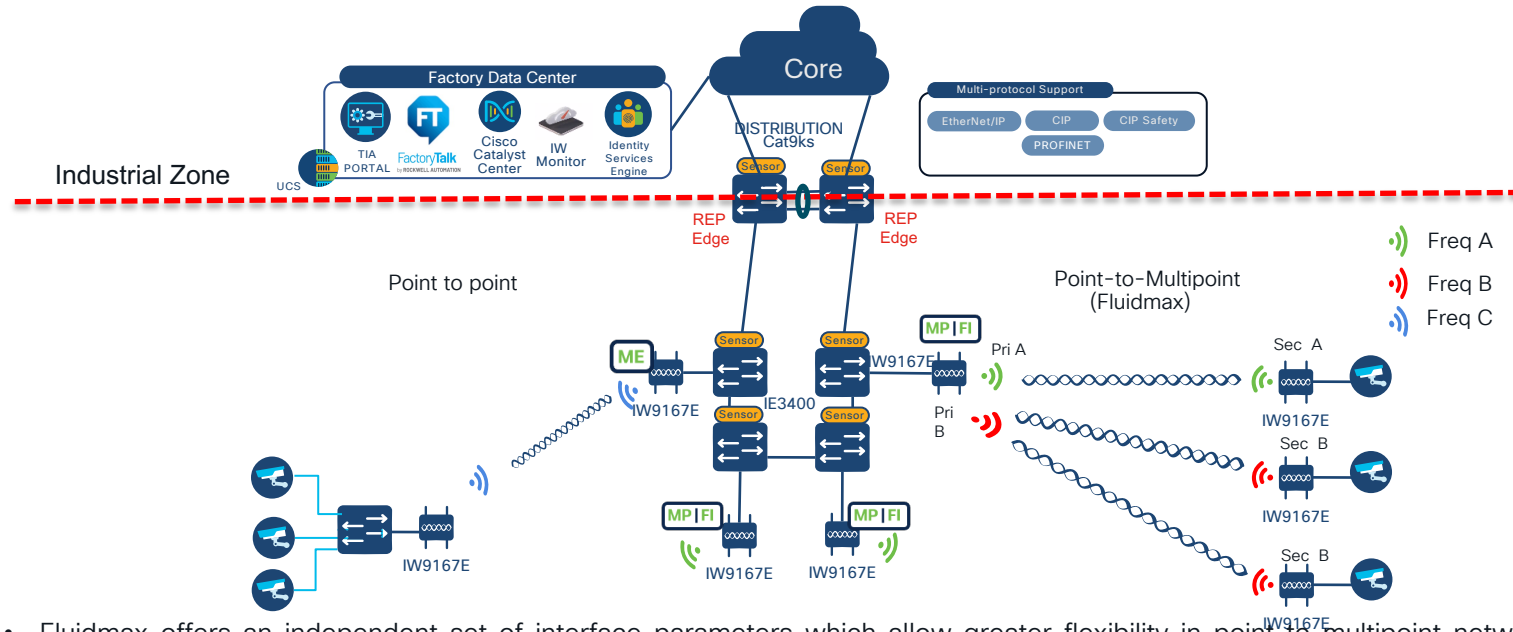- Cluster ID: This is an ID assigned to an interface in Fluidmax mode. It is used to group devices in the same cluster of radios and should be the same across primary and backup primary nodes. This is not the same as a passphrase.
- Fluidmax should only be used in PTMP Point to multipoint scenarios as RTS/CTS will be enabled
- Outdoor deployments can utilize longer guard intervals (1600ns, 3200ns) in High Efficiency

Use Case Mobile and Fixed assets – Small/De-Central Deployment

Industrial Zone

Cell/Area Zone

Factory Data Center

- TIA PORTAL
- FactoryTalk by ROCKWELL AUTOMATION
- Cisco Catalyst Center
- IW Monitor
- Identity Services Engine

UCS

Core

DISTRIBUTION Cat9ks

Multi-protocol Support
- EtherNet/IP
- CIP
- CIP Safety
- PROFINET

Sensor   Sensor

REP Edge   REP Edge

AGV-1

Autonomous Guided Vehicle

IW9165
MP | FV

Wireless PAC

ME

Sensor   Sensor

IW9167E   IE3400   MP | FI   IW9167E

Sensor   Sensor

Fixed I/O

AGV Controller

MP | FI   MP | FI

IW9167E   IW9167E

REP Ring

IW9167/65 -
Mesh Point
(Vehicle Mode)

URWB MGMT VLAN X
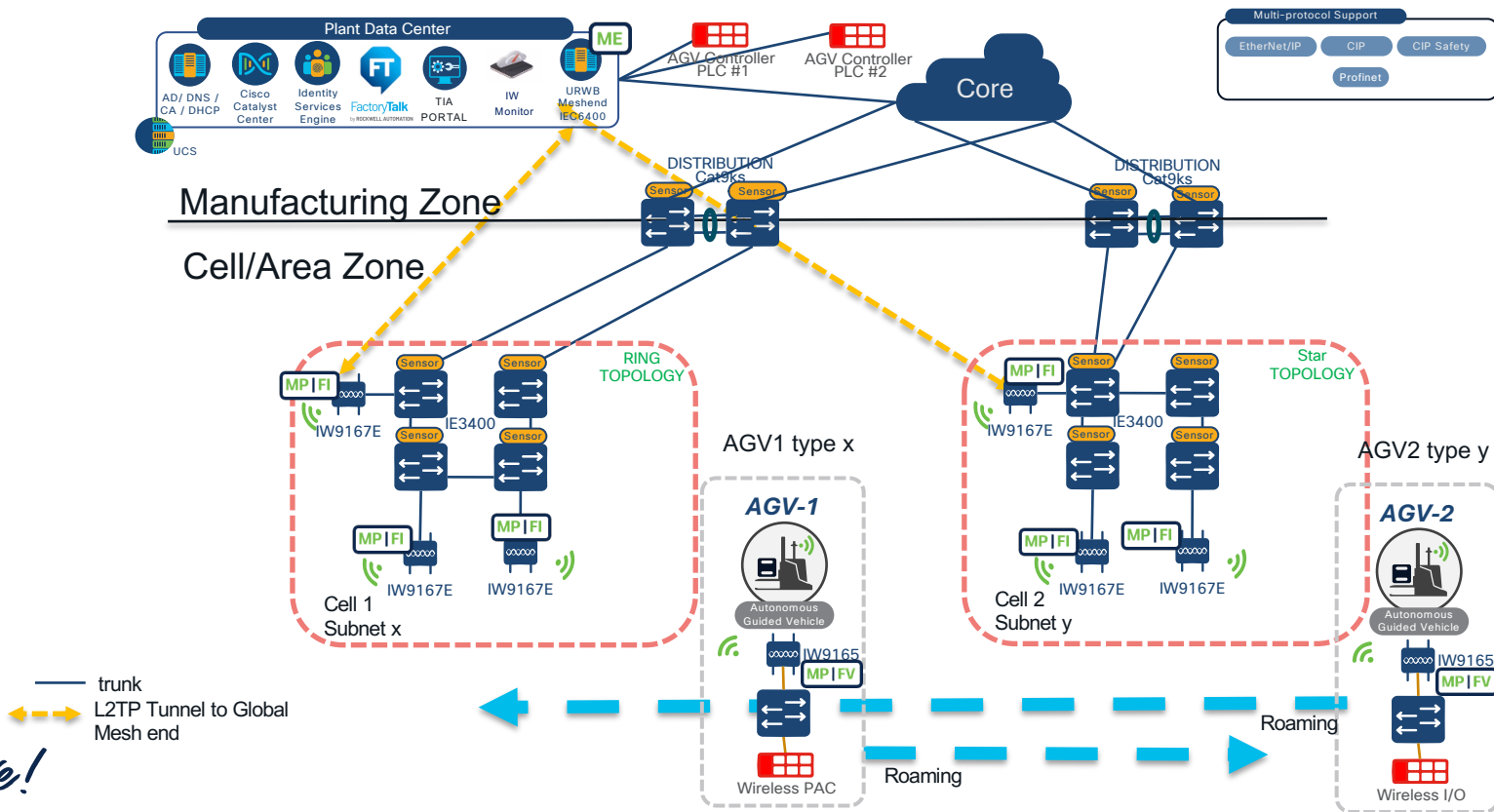Client device   Vlan X

AGV-2

Autonomous Guided Vehicle

IW9165
MP | FV

Wireless I/O

Industrial Wireless for IA Solution Test URWB L2 Fluidity
Option 3: Large deployment – L2 Extended

What makes URWB *Ultra*-Reliable?

Cisco URWB's new patented technology: Multipath Operations

Take advantage of the «Diversity»
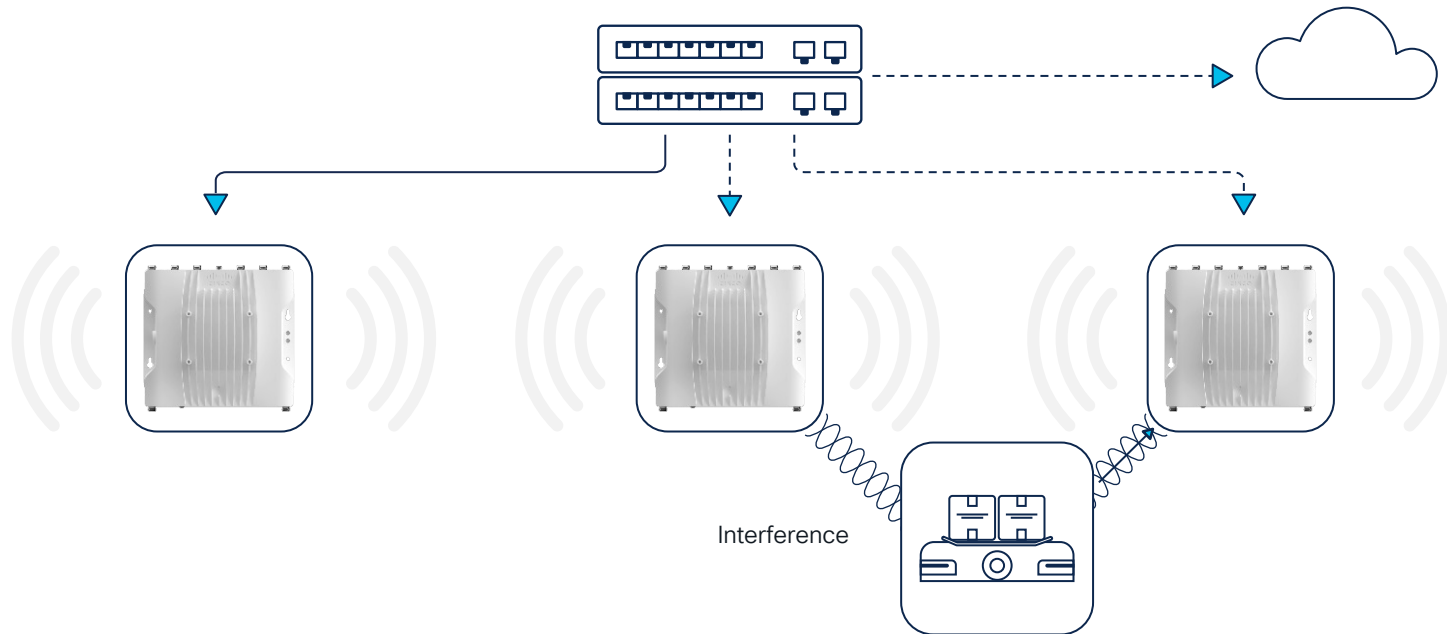
Time Diversity
Mitigates Fading and Medium Contention

Spatial Diversity
Mitigates blockages and obstacles

Frequency Diversity
Mitigates Interference

Interference

Duplicate high priority packets over up to 8 different paths

Cisco URWB reliability – Dynamic Multi-Frequency

While one of the unit's radio interfaces is in active/forwarding state, the other radio scans at the specified frequency scan periodic interval (this parameter is configurable).

Freq A — BS₁

Freq B — BS₂

Freq C — BS₃

Freq A — BS₄

A B C order

Active Mode

Autonomous Guided Vehicle

Scanning Mode

Scan list (scanning mode):
Freq A @ Channel width 20
Freq B @ Channel width 20
Freq C @ Channel width 20
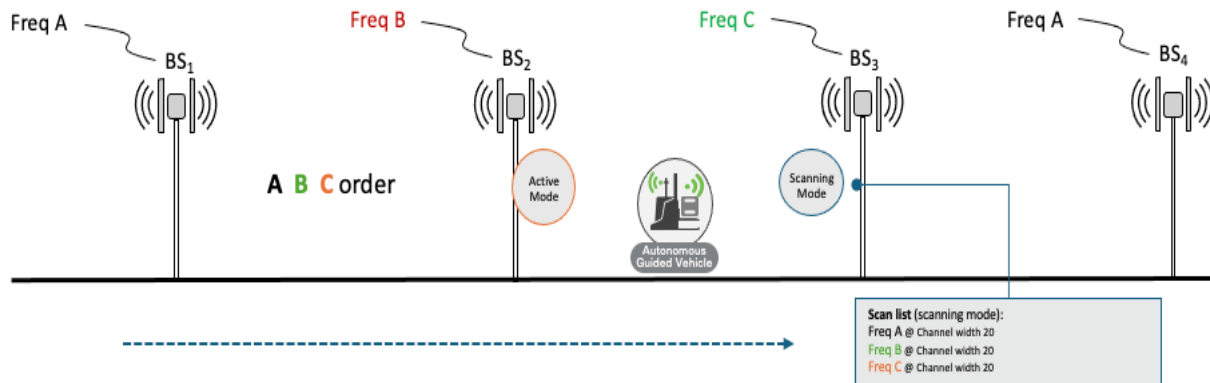
MPO Duplication and Deduplication
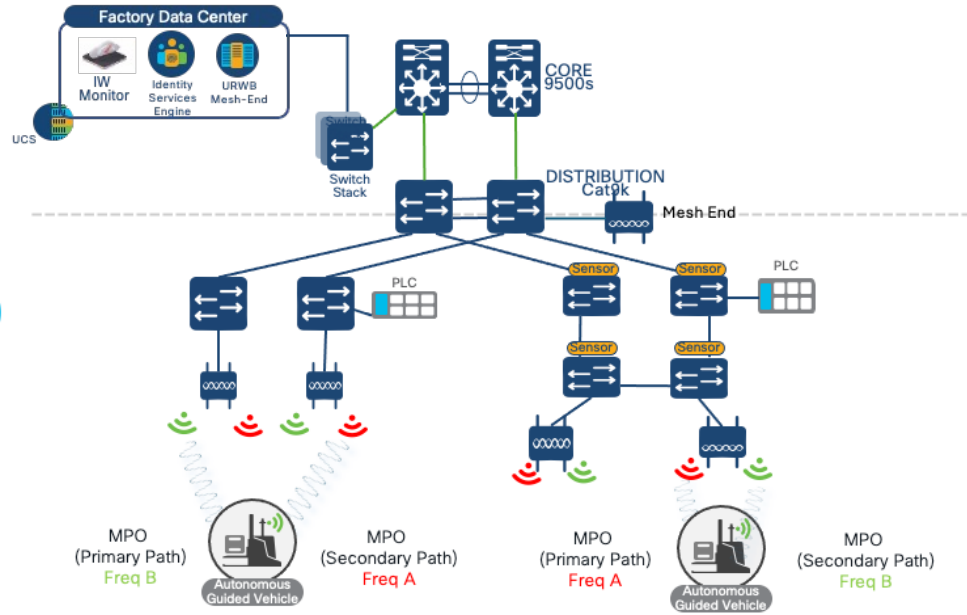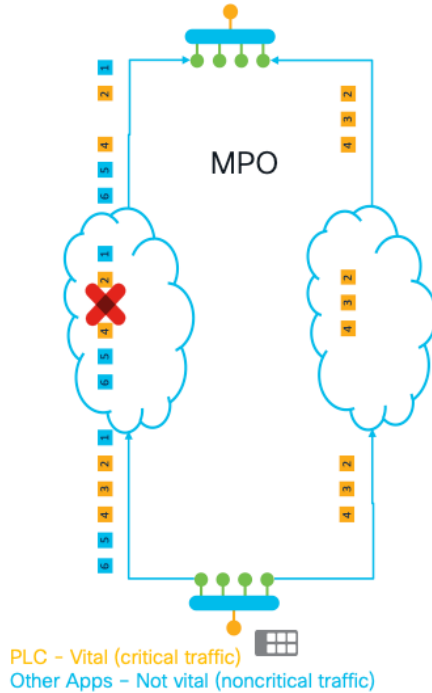
Advantages:
- ~0% Packet Error Rate
- Ultra Low Latency (<10ms)
- Low Jitter (<1ms)

Cisco URWB – Other Resiliency features

Mesh End failover and recovery

Gateway Failure

Backbone Network

PRIMARY → ME

Wireless links are already active on the same channel

With **Fast Failover:** Successful failover in less than 500ms

MP|FI   MP|FI   MP|FI   MP|FI

MP|FV

Autonomous Guided Vehicle

Mesh End
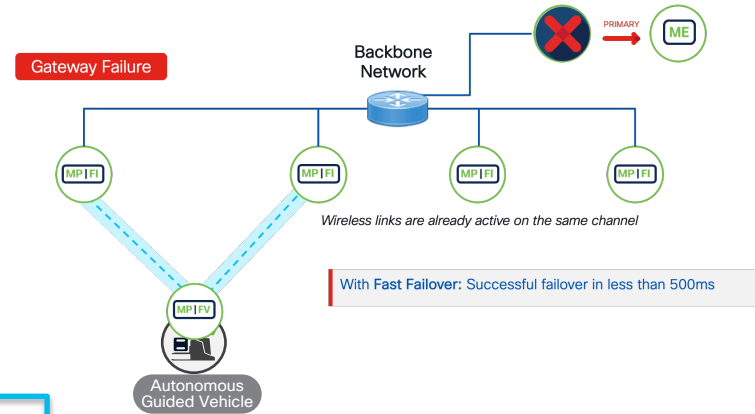
Hand-off Inhibition
- ME backhaul check
- Link backhaul check

Autonomous Guided Vehicle

Autonomous Guided Vehicle

Handoff inhibition
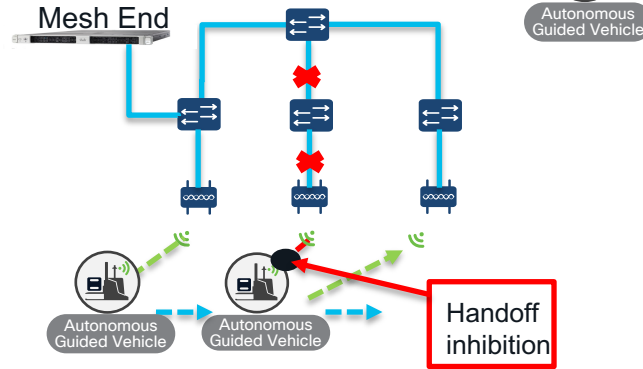
URWB QoS Support

- QoS Support is optional.

- When enabled, all nodes should have QoS enabled.

- QoS values are used for traffic prioritization on wireless interfaces, using the WMM standard

- URWB can read the QoS from:
    - COS (class of service) – VLAN header
    - TOS (type of service) – from the IPv4 header

- QoS re-mapping is possible. This does not re-write the values in the traffic.

- VLAN header / COS must be used to apply QoS to non-IP traffic.

- Queue 7 is used for intern control signaling and is use for data traffic is not recommended.

Incoming Packet without VLAN Header

Ethernet Header	IPv4 Header	Payload	Checksum

TOS **110** 000 = 6
First three bit of the DS field are used

Incoming Packet with VLAN Header

Ethernet Header	VLAN Header	IPv4 Header	Payload	Checksum

COS **110** = 6
The priority field is used
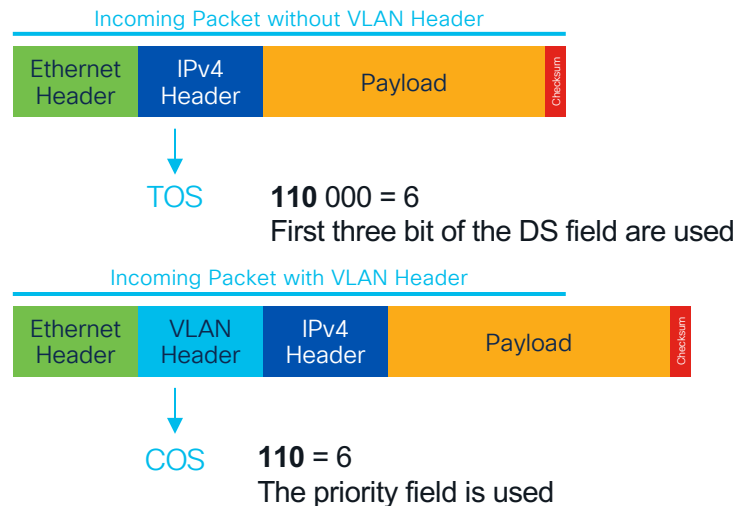
Binary	Decimal	WMM	Queue Name
000	0	BE	Best Effort
001	1	BK	Background
010	2		
011	3	BE	Best Effort
100	4	VI	
101	5		
110	6	VO	Voice
111	7		

cisco *Live!*

URWB Fundamentals v0.01

IW-Service Introduction

- Industrial Wireless (IW) Service is a secure, cloud-native, scalable service to provision and do firmware upgrades on IW devices remotely

- The IW Service also supports downloading configuration files which can be uploaded to IW devices if the devices are in the Offline Mode

- The IW Service is the replacement for RACER in the partner portal

Catalyst IW9167E, IW9165E, IW9165D access points and IEC-6400 gateway operating in Cisco Ultra-Reliable Wireless Backhaul (URWB) mode

IW Service Key Functions

- Inventory of devices, add devices from .CSV
  - Device details (IP address, last contact, license, etc)
- Shows device compliance with firmware and configuration
- Upgrade Firmware and configuration
- Create/maintain Groups to share configuration between similar devices
- Create/maintain Templates of configuration that can be used in Groups. IW Service has pre-defined and custom templates
- Allows downloading and exporting configurations to configure off-line devices

IW – Monitor

- IW-Monitor is an on-prem system that provides the following capabilities:

  - Dashboard for monitoring the status of the network and devices

  - Topology view of the network

  - Real time and historical view of wireless KPIs

  - Historical reports of events in the network

  - It supports the IW devices as well as the legacy URWB radios

  - APIs are available for advanced customization

- Export events/data for

- Interfaces with Quadro and Primstats tools

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35
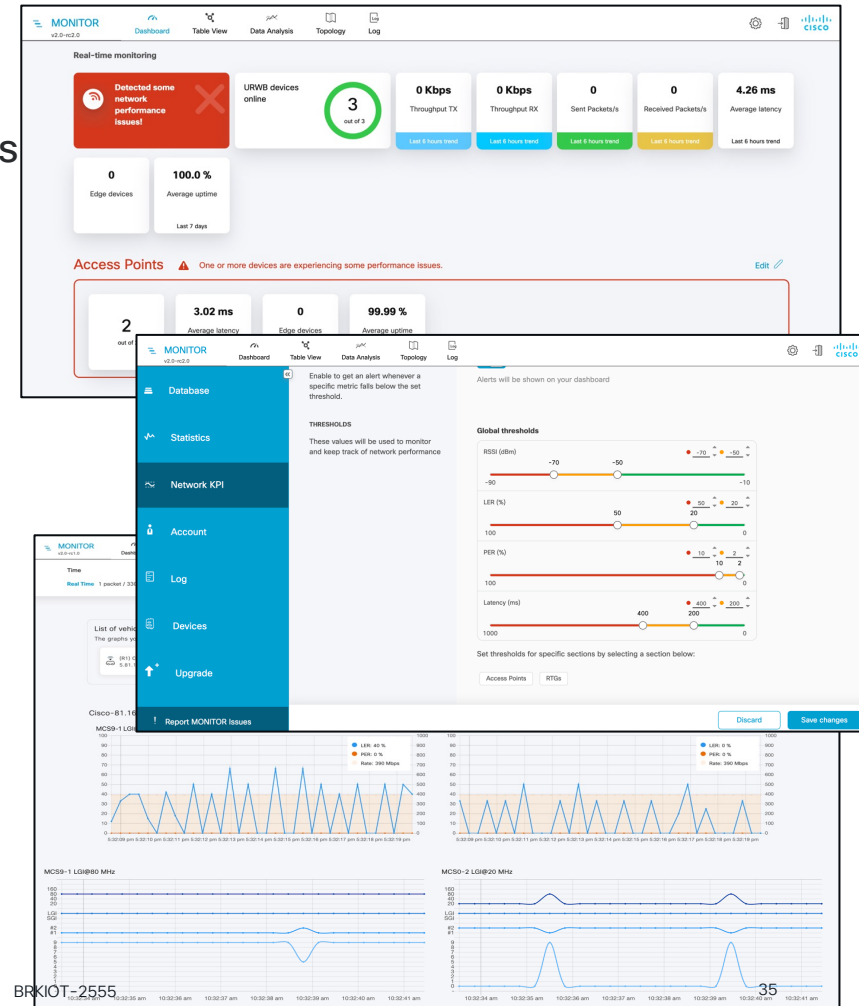
Catalyst IW9167E Heavy Duty Access Point

One hardware, two wireless technologies

Catalyst IW9167E Heavy Duty Access Point

Cisco URWB

Wi-Fi 6/6E-ready*

WGB

Chose your wireless technology

Chose Wi-Fi 6 or Cisco® Ultra-Reliable Wireless Backhaul (Cisco URWB). Evolve as your needs change

High-performance wireless

Tri-radio (2.4 GHz, 5 GHz, 5/6 GHz), 6 GHz hardware ready, high data rates

Get more from your industrial assets

Bluetooth Low Energy (BLE), GNSS, GPIO capabilities for advanced use cases

Build for harsh outdoor environments

IP67 rated enclosure, -50°C to +75°C, optional M12 adapters

*Wi-Fi 6E subject to regulatory agencies' regulations and approvals.

Cisco's first dedicated wireless client

Ultra-reliable broadband wireless connectivity for moving machines and vehicles

Catalyst® IW9165E Rugged Wireless Client

Cisco URWB

Wi-Fi 6/6E*

WGB

Autonomous robots and vehicles for manufacturing, ports, logistics

Rail and light-rail rolling stock

Roadways and intersections

Connect more machines to your network.

Compact form factor for integration into existing assets or deployment inside cabinets.

Get more from your industrial assets.

Bluetooth Low Energy (BLE), GNSS, GPIO capabilities for advanced use cases.

Connect moving vehicles to your systems.

Ultra-low latency and zero packet loss during handoff.

High-performance and modular wireless.

Dual 802.11ax radios with wide choice of antennas.

Works with your Wi-Fi infrastructure.

Supports Wi-Fi 6/6E* Workgroup Bridges (WGB)/universal WGB (uWGB) or Cisco® Ultra-Reliable Wireless Backhaul (Cisco URWB). Evolve as your needs change.

*Wi-Fi 6E subject to regulatory agencies' regulations and approvals

CISCO Live!

Connect your fixed and mobile assets easily

6 GHz-ready wireless backhaul and Wi-Fi 6/6E* access point

Catalyst IW9165D
Heavy Duty Access Point

Cisco URWB

Wi-Fi 6/6E*

Building-to-building, smart cities, intersections, roadways, railway, mining

Easily extend your network anywhere.
Built-in directional antenna for long-range connectivity.

Fixed and mobile use cases simultaneously.
External antennas enable future uses as needs evolve.

Connect moving vehicles to your systems.
Ultra-low latency and zero packet loss during handoff with URWB.

Build for harsh outdoor environments.
IP67 rated enclosure, -40° to +70° C, optional M12 adapters.

High-performance and modular wireless.
Dual 802.11ax radios for Point-to-Point (PtP), Point-to-Multipoint (PtMP), and mobile applications.

Flexibility
Supports Wi-Fi 6/6E* or Cisco® Ultra-Reliable Wireless Backhaul (Cisco URWB). Evolve as your needs change.

*Wi-Fi 6E subject to regulatory agencies' regulations and approvals

cisco Live!

Factory AGV Solution

Manufacturing

Challenge

- Reliably connect AGVs, AMRs, and other mobile assets on the factory floor
- On-board PLC for Vehicle Control (Industrial & Safety Protocols), Navigation Info, On-board video
- Motion control

Cisco Solution

- Catalyst IW9167E as infrastructure AP
- Catalyst IW9165E as a client: solution tailored for installation on AGVs/AMRs and mobile assets in the factory floor
- Dual mode operation (WiFI6/WGB or URWB) to easily adapt to the different use cases

Outcomes

- 0ms hand-off, MPO and low/determinist latency delivered by URWB to boost reliability and support Industrial protocols requirements
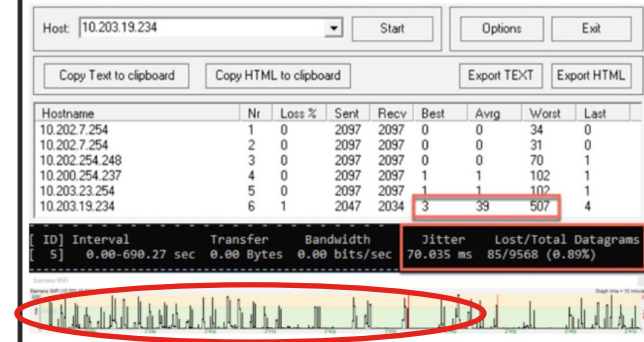- WiFi6/WGB support to connect to existing standard WiFi infrastructure
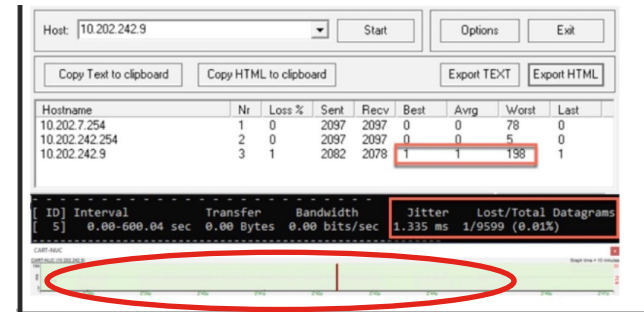
Factory AGV Solution

Manufacturing
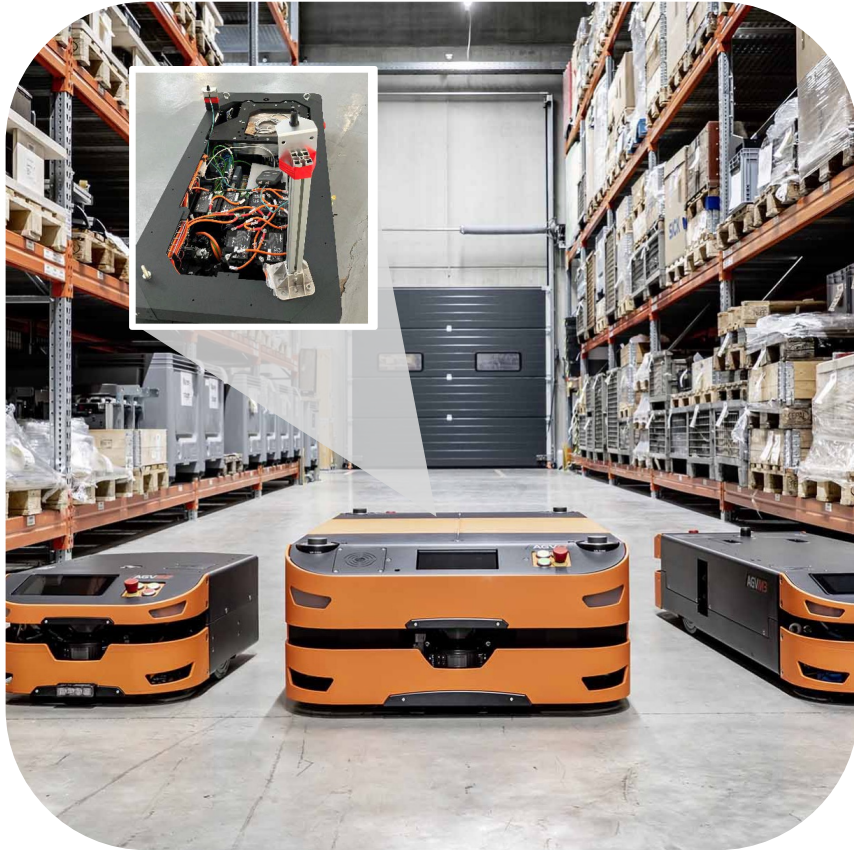
Measured latency over time
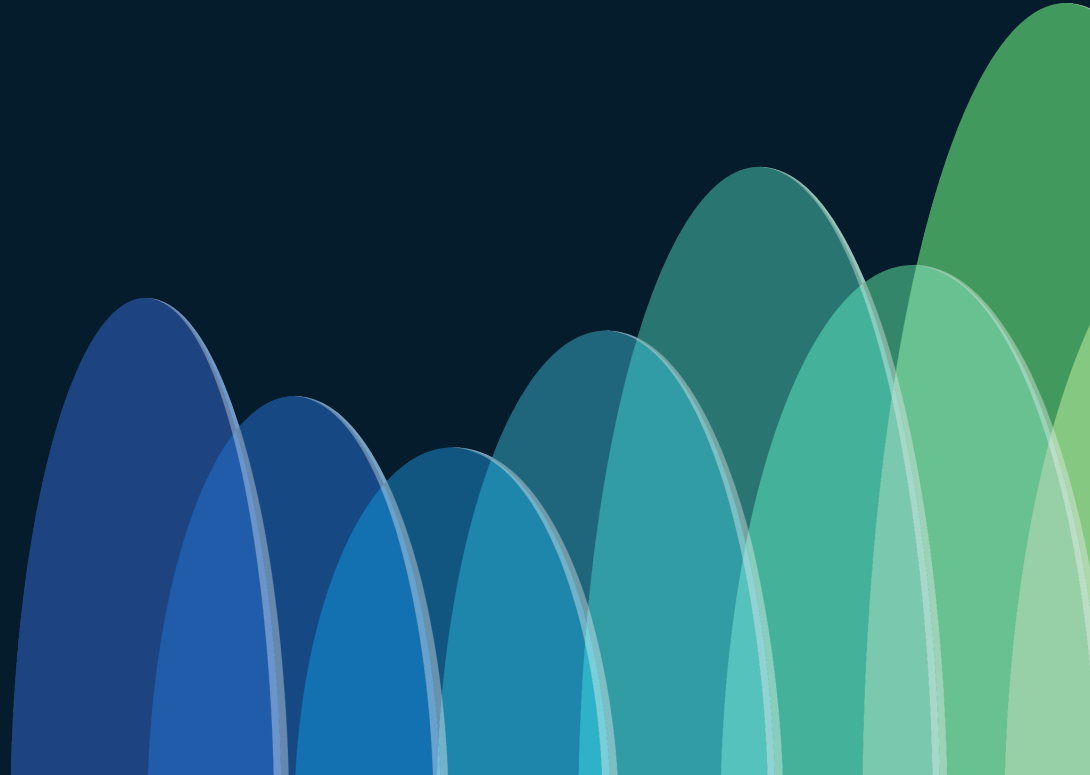
Standard WiFi6 solution
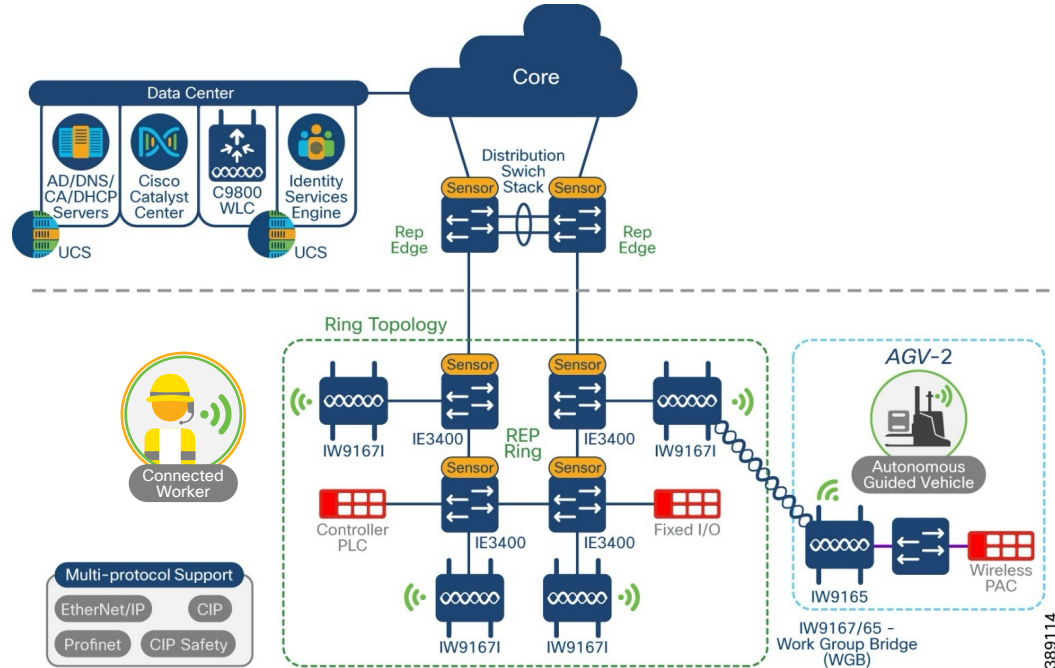

Cisco URWB Solution
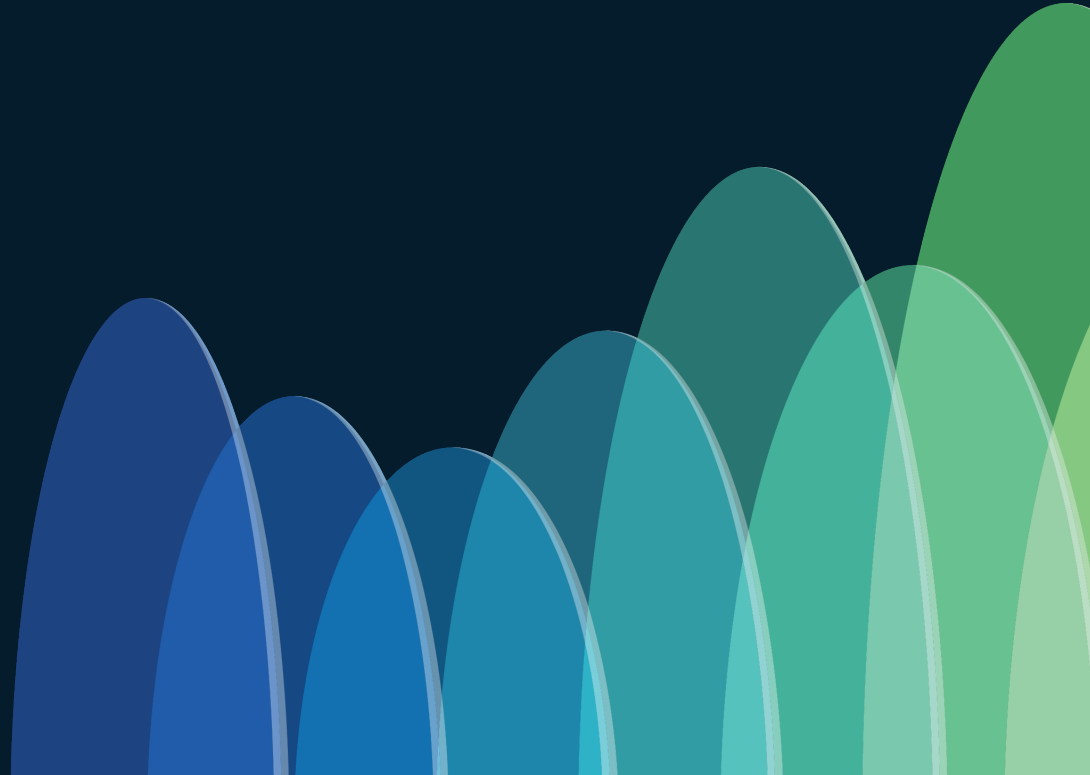
Cisco Industrial WiFi

Wi-Fi Updates – Work-Group Bridge

Key additions:

- IW9167i as Wi-Fi 6/6E Access Points
- IW9165 as Wi-Fi6 Work-Group Bridge (WGB)
- Support for roaming AGV/AMRs

Conclusion

Cisco industrial networking lays the foundation for future innovation

Connect and protect with secure networking

Accelerate IT and OT collaboration

Establish an AI-ready foundation

The future of manufacturing

Millions of AI powered mobile cobots revolutionizing manufacturing, logistics, retail

Cobots **+** Mobile platform **+** Vision **+** AI

Trust proven designs tested in industry

Cisco Validated Design

Standardization is seamless with **Cisco Validated Designs:**
Technical blueprints and architectures, tested and proven by industry

| Faster deployments | Less risk | Increased predictability | End-to-end designs |

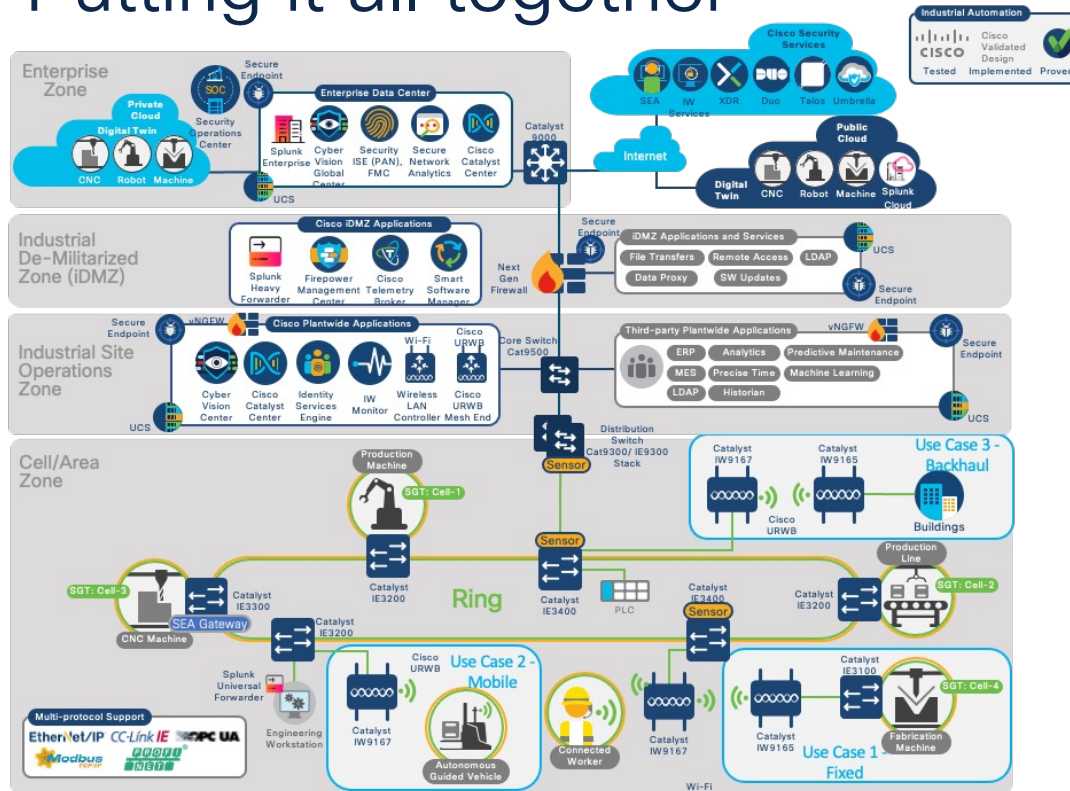**Design, deploy, and extend networking and cybersecurity technologies across your environment successfully**

80+ Different designs and architectures

20+ Interoperable partners and OT vendors

Cisco validated design for wireless architectur[e] Putting it all together

Use Cases
- Reliable wireless connectivity for mobile assets (e.g. AGVs, AMRs)
- Connected Worker
- Nomadic assets such as Process Skids, etc.
- Point-to-Point Communication between sites

Feature
- Resilient, reliable and secure wireless connectivity for IACS
- Visibility of IACS devices and communication
- Plant floor macro/micro-segmentation
- Network automation and assurance

Outcomes
- Improved uptime and OEE
- Reduced support effort & deployment errors
- Increased productivity
- Better IT/OT collaboration
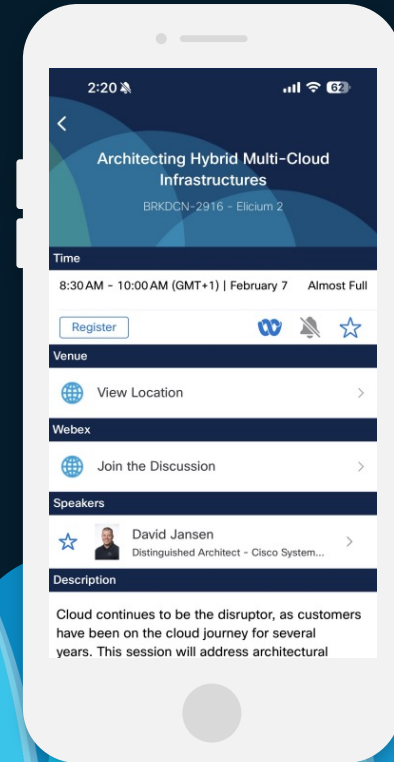
Proven to work with:

Webex App

Questions?

Use the Webex app to chat with the speaker after the session

How

1. Find this session in the Cisco Events mobile app

2. Click "Join the Discussion"

3. Install the Webex app or go directly to the Webex space

4. Enter messages/questions in the Webex space

Webex spaces will be moderated by the speaker until February 28, 2025.

Fill Out Your Session Surveys

Participants who fill out a minimum of 4 session surveys and the overall event survey will get a unique Cisco Live t-shirt.

(from 11:30 on Thursday, while supplies last)

All surveys can be taken in the Cisco Events mobile app or by logging in to the Session Catalog and clicking the 'Participant Dashboard'

Content Catalog

Continue your education

- Visit the Cisco Showcase for related demos

- Book your one-on-one Meet the Engineer meeting

- Attend the interactive education with DevNet, Capture the Flag, and Walk-in Labs

- Visit the On-Demand Library for more sessions at ciscolive.com/on-demand. Sessions from this event will be available from March 3.

Industrial IoT - Manufacturing Learning Track

Feb 9 **Sunday**	Feb 10 **Monday**	Feb 11 **Tuesday**	Feb 12 **Wednesday**	Feb 13 **Thursday**	Feb 14 **Friday**
TECIOT-2000 Wireless Evolution: 4-Hour Comprehensive Guide to URWB and Wi-Fi Technologies 13:30 - 18:00 | G102	TECIOT-1000 IoT Fundamentals Bootcamp 8:30-13:00 | G104	BRKIOT-1073 Fantastic APIs on your Factory Floor, and Where to Find Them 8:00 - 9:00 | A14	BRKIOT-1126 Connecting Remote and Critical Assets with Cisco IoT Solutions 8:00 - 9:00 | A5	IBOIOT-3485 Technical Deep Dive on Cyber Vision Installation, Configuration, and Troubleshooting 10:00 -11:00 | D508	BRKIOT-2299 The Software-defined Factory Enabled by SDA 9:00 -10:30 | D203
TECSEC2001 Industrial Security Journey: from Visibility to Enforcement and Protection 13:45 - 18:15 | D504	TECIOT-2201 Dive into the Depths of Industrial Resiliency Protocols 8:30-13:00 | G105	**Manufacturing Summit 11:30 - 17:00**	BRKIOT-2210 Unlock Value at the Edge: Unleash your networks hardware for AI/ML based analytics! 12:30 - 13:30 | G103	BRKIOT-2555 Industrial Wireless for Manufacturing – New Solution 10:30 - 11:30 | D203	
	PSOIOT-1015 **Get a Handle on Your OT Cyber Risks** **11:40 - 12:10**	BRKIOT-2365 Unified Wireless for Industries – from WIFI to Private 5G and Beyond 12:00 - 13:30 | G103	IBOIOT-2100 Cut Through the Complexity: Navigating LAN Redundancy Options with Ease 13:00 - 14:00 | D508	IBOIOT-2501 Cisco Catalyst WAN Manager for OT/Industrial Networks: Fabric or Non-fabric, Which is Right for Me? 11:30 - 12:30 | G111	
	BRKIOT-1005 Enable Zero Trust Network Access for Industrial Networks with Cisco Secure Equipment Access 16:15 - 17:45 | Elicium 1	**PSOIOT-1016** **Turn Your Assets into Superheroes at Scale with a Unified Management Experience** **12:50 - 13:20**	BRKIOT-2104 -40C Industrial Networking: Where Enterprise Products Fear to Go 15:00 - 16:30 | Elicium 1	BRKIOT-2808 Creative and Unusual Use Case Ideas for Industrial Networking Devices 12:00 - 13:00 | D203	
		BRKIOT-2990 5 Ways to Deploy Scalable, Secure AND Cost Sensitive Industrial IoT Solutions using Cisco Catalyst SDWAN 13:00 - 14:30 | A12	IBOIOT-2094 Build The Next Generation Industrial Firewall with a Single Industrial Router using SDWAN 16:00 - 17:00 | G110	BRKSEC-2821 Securing Industrial Networks: Strategies and Best Practices 13:00 - 14:30 | A6	
		IBOIOT-1141 Own the OT Network! Do I Really Know What's Happening Inside? 13:30 - 14:30 | G110	BRKIOT-2362 Converge IT and OT Networks with Cisco Catalyst Center: In-Depth look into Industrial Networks 17:00 - 18:30 | Elicium 1	BRKIOT-2720 Revolutionizing Manufacturing: The Dawn of Industry 4.0 and Smart Factory Integration 15:15 - 16:45 | A3	
		BRKIOT-2882 Implementing Segmentation in Industrial Networks 16:00 - 17:30 | A9		**PSOIOT-1017** **5 Game-Changing Use Cases to Unlock the Power of Industrial and Outdoor Wireless** **16:00-16:30**	
		BRKIOT-2910 Securing Industrial Networks: Where to start - using Cyber Vision for OT Asset Visibility 16:30 - 18:00 | D201			

Thank you