

The Cisco Live! logo, featuring the word "CISCO" in a dark blue, sans-serif font, followed by "Live!" in a dark blue, cursive script font.

CISCO *Live!*

The text "Let's go" in a large, dark blue, sans-serif font, positioned to the left of a bright white sunburst graphic that radiates across the right side of the image.

Let's go

#CiscoLiveAPJC



The bridge to possible

Using autonomous mining to improve safety and reduce carbon footprint

Bruce Frederick Solutions manager
BRKIOT-1328

CISCO *Live!*

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Cisco Webex App

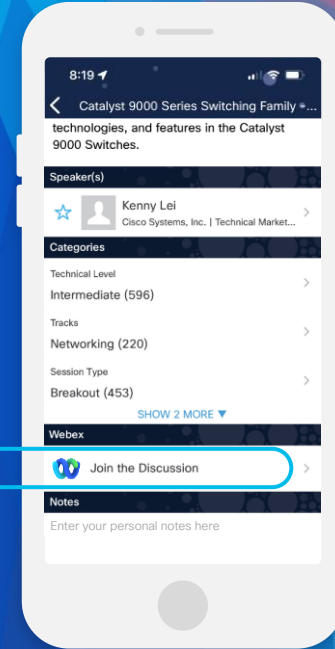
Questions?

Use Cisco Webex App to chat with the speaker after the session

How

- 1 Find this session in the Cisco Live 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

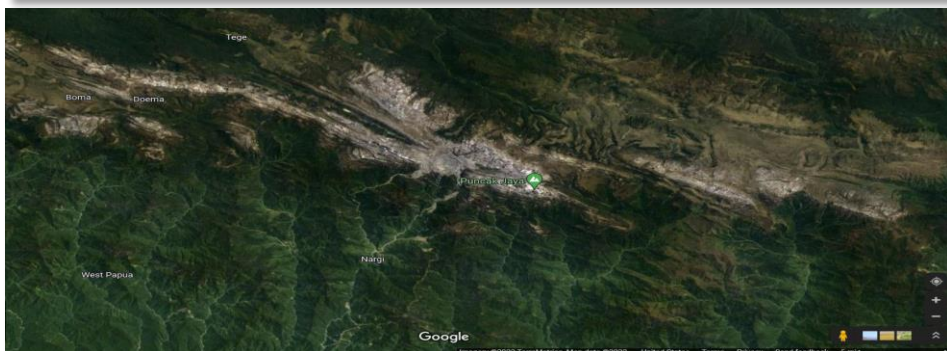
Webex spaces will be moderated by the speaker until December 22, 2023.



<https://ciscolive.ciscoevents.com/ciscolivebot/#BRKIOT-1328>

Agenda

- Introduction
- Factors autonomous operations
- Reducing the carbon footprint
- Multi wireless use cases
- Cisco's seamless transition to the next generation wireless
- Conclusion



Location and Environment



The old way of mining



The old way of mining



The IEA (International Energy Agency) in 2014, stated mining companies, should reduce their emissions by 58% by 2050.

Meeting this absolute emissions reduction target is made more difficult by the fact that demand for minerals is expected to increase.

Globally, there are approximately 28,000 large mine hauling trucks in service today.



- Each of these trucks will consume roughly **900,000 liters of diesel** per year and make up 30% - 50% of their mine's total energy use. That's 25.2 Billion Liters each year.
- Together these mining trucks emit **68 million tons of CO₂** per year, equivalent to the total greenhouse gas footprint of Finland or New Zealand

* Source: Rocky Mountain Institute, Pulling the weight of Heavy Truck Decarbonization

Caterpillar 793 Haul Truck

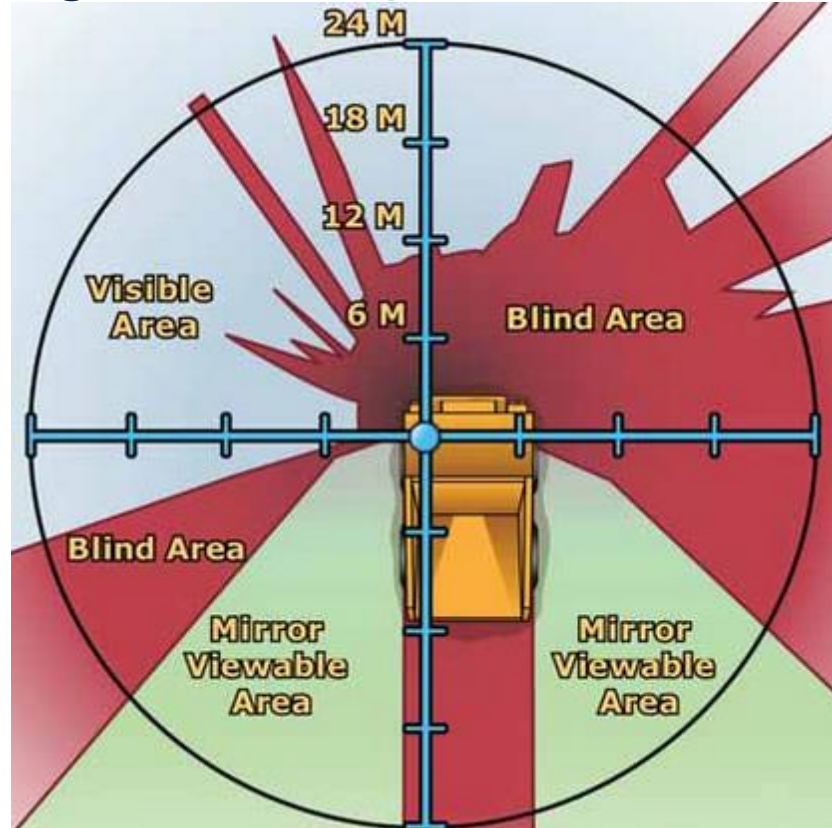
- 22 feet (~6,7m) tall
- 42 feet (~13m) long
- 25 feet (~8m) wide
- Chassis Weight 257,294 lbs. (117t)
- Body weight 120,000 lbs. (55t)
- Payload capacity 260 tons
- Gross Machine operating weight 846,000 lbs. (384t)
- Top speed loaded 34 mph (55kmh)
- Fuel tank capacity 1,300 gallons (~5000lt)



When you take large trucks....



...with very large blind spots...



...and add light vehicles...



...big problems arise!



Challenges & opportunities

Of Sustainable mining

The mining sector, responsible for 4 to 7 percent of greenhouse gas emissions globally, will face pressure from governments, investors, and society to reduce emissions.

McKinsey

The Society for Mining, Metallurgy and Exploration forecasts that the US would need 359 new mines to meet its demand for metals crucial to the energy transition, such as nickel, cobalt and lithium.

S&P Global

Miners are operating at higher-than-expected productivity rates using remote operating centers (ROC). These and other digital innovations, such as supply chain optimization and automation have allowed mines to reduce their carbon footprints.

EY

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Current limiting factors for electrification of haulage

1. Because you need an operator for every haul truck, you are limited to the size of your haulage fleet.
2. Because your fleet size is limited, and operators are costly. Haul truck are very large to get the most ore movement at a time.
3. Companies are feeling an extreme pressure to reduce their carbon footprint and looking at going electric.
4. Electrification of these extremely large trucks is very difficult and inefficient.

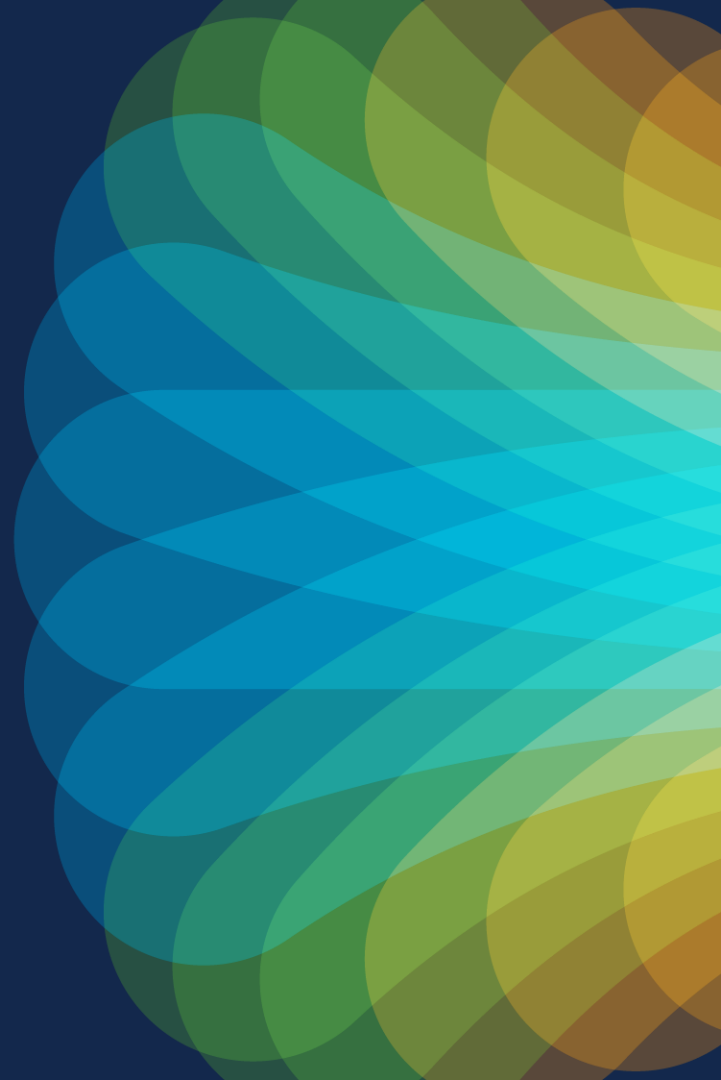
Where mining is going and how Cisco can help bridge the gap between today and the future

1. Autonomous and tele remote operations. Reducing the requirement for operators
2. Without the need of an operator per truck, the fleet is increased and reduced in physical size
3. The smaller truck are easier to electrify
4. With the larger number of trucks charging them is less of an issue
5. The network allows all the connections and monitoring needed for operations

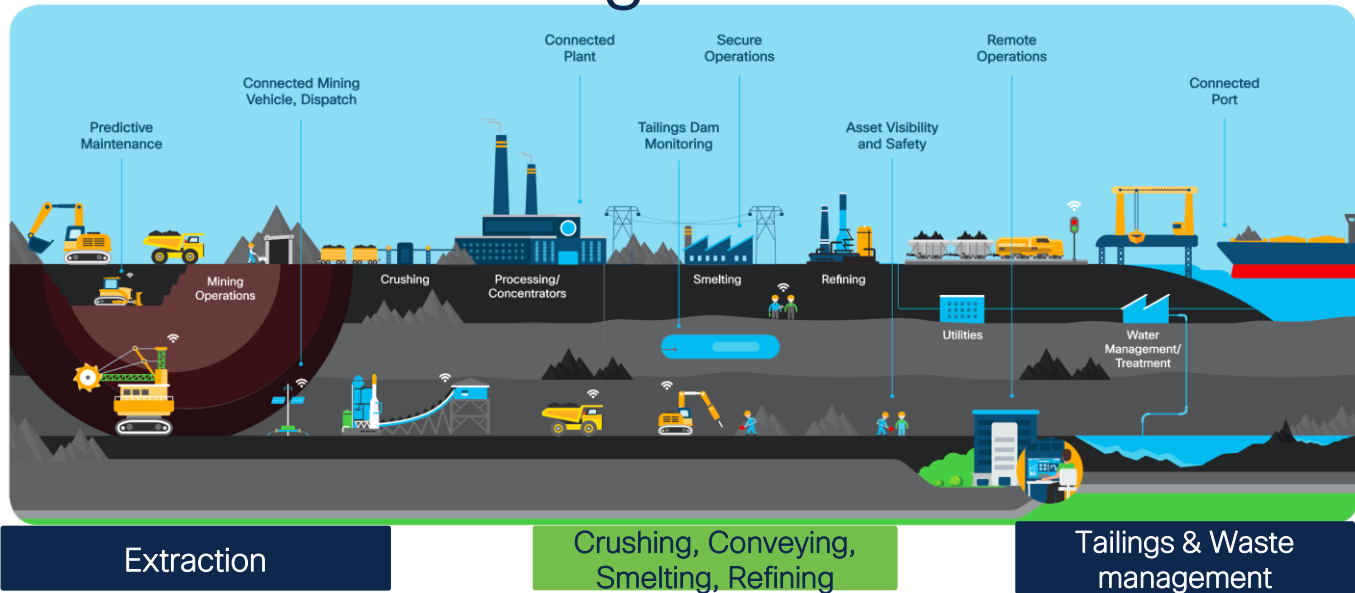
What mining could look like in the future



Cisco Validated Designs



Cisco for Mining



Extraction

Crushing, Conveying,
Smelting, Refining

Tailings & Waste
management

Industrial Safety & Security

Mine and Plant Operations

Mobile Fleet Operations

Workforce Enablement

Cybersecurity
Health, Safety and
Environmental

Digital Process & Production
Equipment monitoring
Asset Visibility

Digital Dispatch
Autonomous and
Remote Control

Workforce
Productivity
Workforce Continuity

Outcomes

- Uptime and Continuous Operations
- Safety & security
- Improved performance, Cost Reduction and operational efficiency
- Autonomous and Remote operations

How Enable

- **Best of Breed products:** Cisco industrial and enterprise products
- **Blueprints: CVD's**
 - Mining Process and production plant
 - Mining underground Autonomous Operations with Sandvik
 - Mining aboveground Autonomous Operations with CURWB
 - Industrial Automation

Solution Partners



Industrial Automation – Mining Process Control networks

Converged factory network for Industrial Automation

Combining industrial wired and wireless networks and security for operational excellence



Challenge

Complex network silos creating downtime, data isolation, and vulnerabilities. Inflexible and high TCO



Critical needs

- Scalable, converged network
- Security built in
- Simple to deploy
- Rapid fault isolation
- Highly available
- Prioritize IACS
- Enable edge applications
- Ruggedized infrastructure



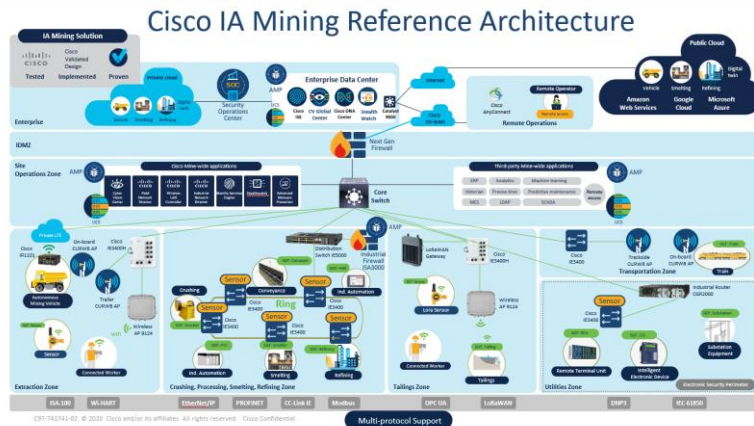
What's new

- aboveground remote control and autonomous fleet with Cisco Ultra Reliable Wireless Backhaul (CURWB)

“Nowadays a miner’s most important tool is a joystick or tablet”

– Boliden mining

Architecture



Process control networks

- IE1000, IE2000, IE3200, IE3300, IE3400, IE3400H, IE4000, IE5000
- IC3000
- Industrial Network Director
- Cisco® Catalyst® 9000 family

Connected wireless

- IW9167 Series
- Wireless LAN controller
- IoT-OD
- FM Monitor

Security

- IDMZ based on Cisco Secure Firewall
- Industrial firewall ISA 3000
- Policy management with Identity Services Engine ISE
- IT security with Cisco Secure Network Analytics
- Industrial Security visibility and analysis Cyber Vision

Business outcomes

Secure mine operations:

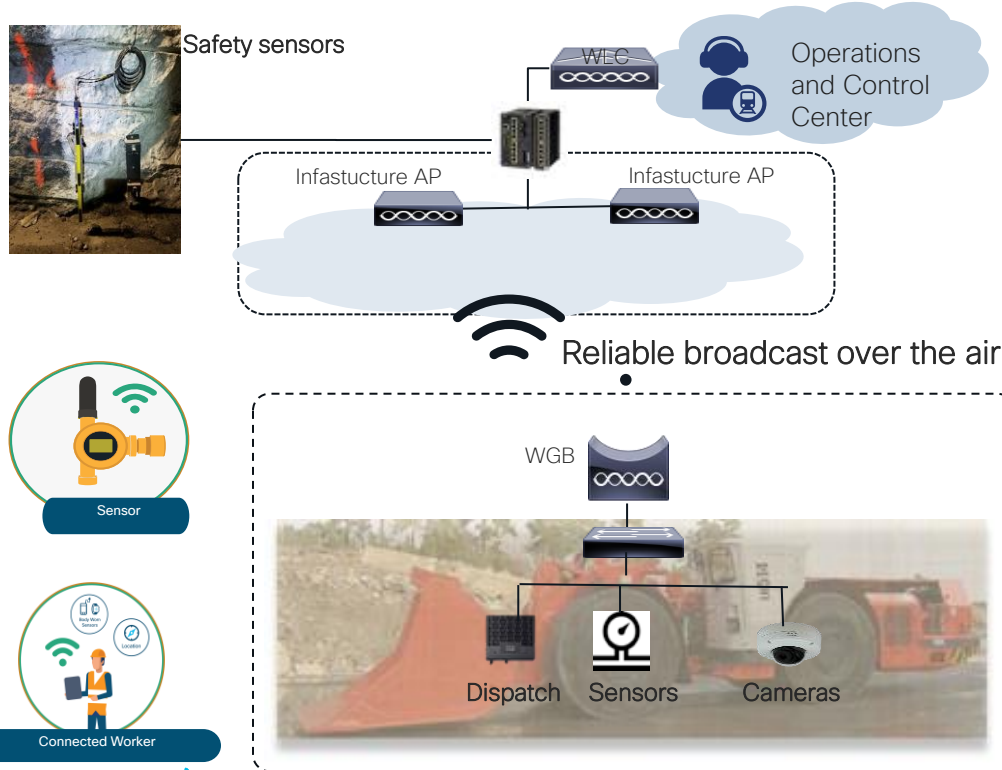


Reduced downtime



Improved OEE

Underground Mine Network – Connecting Sandvik Autonomous Vehicles Mining 1.5



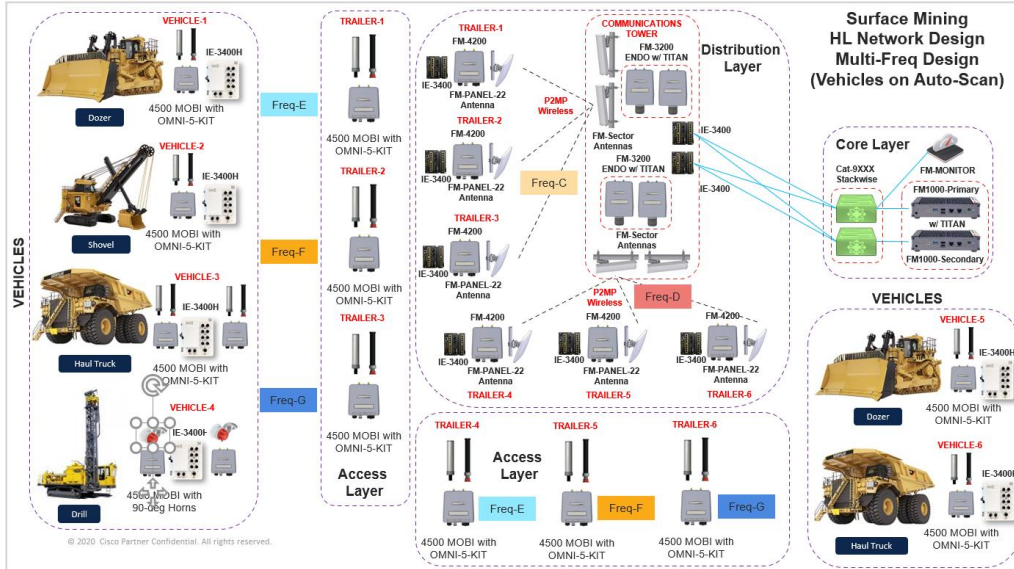
What problem does it solve

- Connecting multiple applications from mobile vehicle over the Wi-Fi network to Operations Center and Remote Operator
- Connecting personnel via Wi-Fi network
- Connecting plant control applications via wired network infrastructure

Solution

- On-board IW3702 Work-Group Bridge
- UG-Mine Wi-Fi deployment tuned for roaming vehicles and personnel
- UG-Mine wired network connected control equipment
- Site survey essential with proven partners and CX services oversight for successful deployment

Open pit Mine Network – Autonomous and tele remote Vehicles Mining 2.0



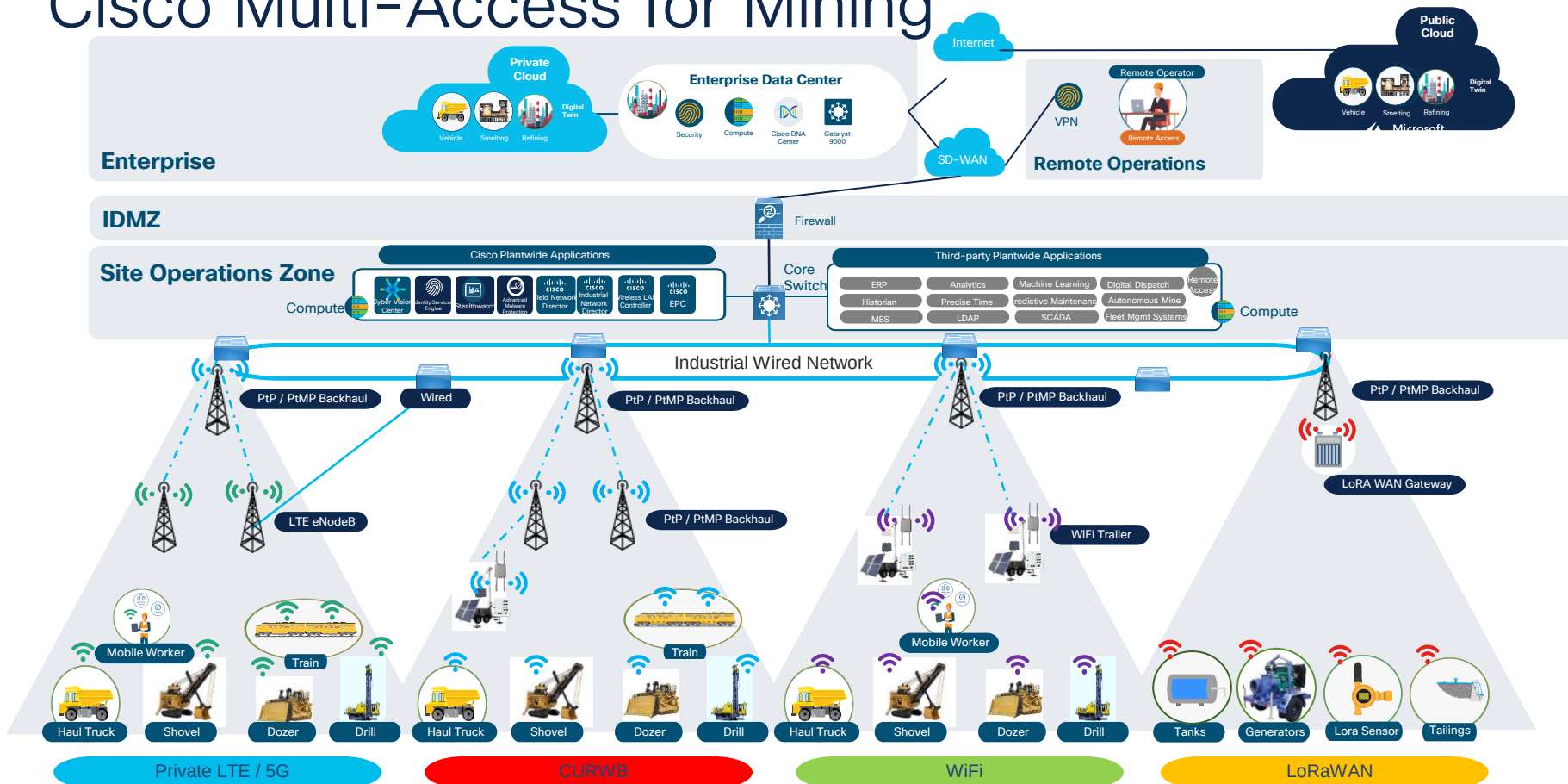
What problem does it solve

- Connecting multiple applications from mobile vehicle over the CURWB to Operations Center and Remote Operator

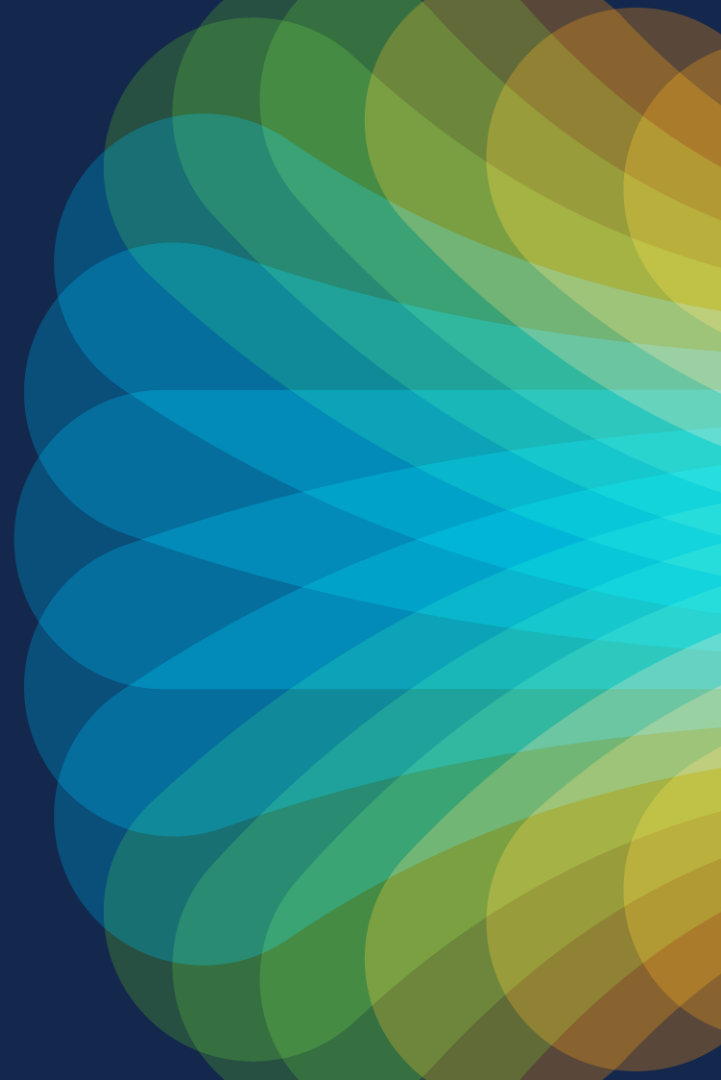
Solutions

- On-board FM4500 Mobile end point
- Mine CURWB deployment tuned for high-speed roaming vehicles.
- Mine wired network connected control equipment
- Site survey essential with proven partners and CX services oversight for successful deployment

Cisco Multi-Access for Mining



Cisco Product Portfolio



Cisco Industrial Portfolio

Industrial Switching

1K, 2K, 3100, 3200, 3300, 3400, 3400H, 4K, 5K, 9K



Industrial Routing

IR1101, IR1800, IR8100, IR8300, CGR1120, CGR1240, CGR2010



Industrial Sensor Solution

Industrial Asset Vision



Industrial Wireless

Cisco Ultra-Reliable Wireless Backhaul, IW9167E, IW6300, IW3702, IR5XX, IXM Gateway

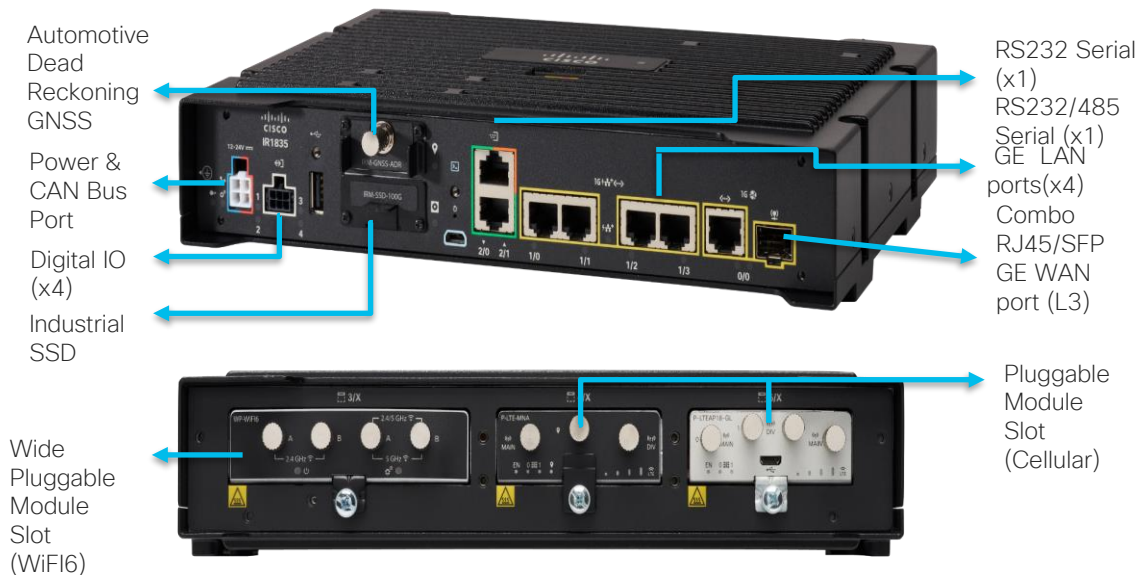


Industrial Cybersecurity

Cyber Vision, ISA3000 Firewall



Cisco IR1835



IoT Router with iOS XE



Modular WiFi, LTE & 5G, WiFi6 Ready



Cisco Enterprise Grade Security



Edge Intelligence Enabled



SD WAN Ready



Industrial, Automotive, Railway, Marine, and Military certification

IRM-1800-M12KIT

M12 Conversion Kit for IR1800 Series



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Designed for Railways, fleet and mobile use cases



Acts to make any IR1800 SKU IP54 rated along with the IP54 back plate



Made of die cast aluminum. Paint and texture matches IR1800 chassis

Includes:



- 1 M12 GE Copper Uplink
- 4 M12 GE LAN Ports
- 1 RS232/485* M12 port
- 1 GPS / GNSS SMA connector
- 1 M12 T-code power / CANBUS connector

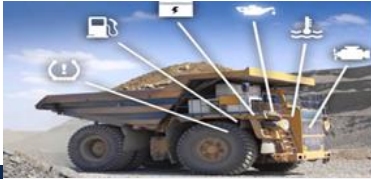


Form Factor is same as IR1800

- IR1800: 11.04 x 7.12 x 2.18 in
- With M12 Kit: 11.04 x 9.67 x 2.18 in

Cisco-Ultra Reliable Wireless backhaul in Mining field Cisco Ultra Reliable focus use cases

Fleet health big data (vehicle health)



- Higher fleet efficiency
- Preventative maintenance scheduling

Fleet

- Cisco/ Ultra Reliable Wireless Backhaul onboard switching, routing and wireless allowing real-time, secure transportation of vehicle information
- Using mining reference architecture data can be securely routed to the data lake to make real time decisions on vehicle maintenance before a costly incident occurs

Safety monitoring



- Highwall monitoring
- Slopes and overburden monitoring

Predictive Maintenance

- Real time monitoring of ground stable gives operators the information to stay out of dangerous areas.
- By connecting all the sensors though the infrastructure there is no longer a need for a slopes engineer to go to the site to take a manual reading

Secure Mine



- Secure Mine
- Pit Video
- Video for dust monitoring

Mine physical Security, Safety and compliance

- Video throughout the mine will allow the follow:
 - Security of the site from improper access to area.
 - Help ensure the area is clear for blasting
 - Monitor traffic flow
- Using video to ensure environmental compliance is a cost effect way to monitor

Connected Mine water management systems



- Connecting water management systems to data and control applications

Monitoring

- Monitor the following
 - Rainwater recovery reservoirs
 - Slurry pipe flow
 - Desalination systems and pipelines
 - Dewatering pumps

Business Outcome

Key Benefits

Next generation of outdoor and industrial wireless portfolio

Purpose-built dedicated wireless client



Catalyst® IW9165E Rugged Wireless Client

Cisco URWB

WGB

Wireless backhaul that's easy to deploy



Catalyst IW9165D Heavy Duty Access Point

Cisco URWB

Premier outdoor and industrial access point



Catalyst IW9167E Heavy Duty Access Point

Cisco URWB

Wi-Fi 6/6E*

WGB



Catalyst IW9167I Heavy Duty Access Point

Wi-Fi 6/6E*

Connect more devices. Wirelessly. Reliably. Even on the move.

Cisco Catalyst 6E* Industrial Wireless portfolio



	IW9165E	IW9165D	IW9167E	IW9167I
Application	Wireless client for mobile assets	Wireless backhaul for fixed and mobile assets	Wireless backhaul for fixed and mobile assets	Outdoor and industrial Wi-Fi access point
Radio	(2) 2x2 802.11ax radios 5GHz, 5/6GHz	(2) 2x2 802.11ax radios 5GHz, 5/6GHz	(3) 4x4 802.11ax radios 2.4GHz, 5GHz, 5/6GHz	(3) 4x4 802.11ax radios 2.4GHz, 5GHz, 6GHz
Antenna	(4) RP-SMA (f)	Internal 15dBi directional plus (2) N-Type (f)	(8) N-Type (f)	Internal Omnidirectional 5-6 dBi
Wireless mode	WGB or Cisco URWB	Cisco URWB	Wi-Fi AP, WGB, Cisco URWB	Wi-Fi AP
Ethernet	1 x 2.5Gbps + 1 x 1Gbps RJ45 Optional M12 adapter	1 x 2.5Gbps + 1 x 1Gbps RJ45 Optional M12 adapters	1 x 5Gbps RJ45 + 1 x SFP+ Optional M12 adapters	(1) 5Gbps RJ45 (1) SFP+ Optional M12 adapters
Expandability	BLE, GNSS, GPIO	BLE, GNSS	BLE, GNSS	
Certifications	IP30, EN50155 -40C to +70C	IP67 -50C to +75C	IP67, EN50155, -50C to +75C Class I, Division 2, Zone 2/22, ATEX, IECEx (coming soon)*	IP67 -40° C to +65° C
Dimensions	15.2 x 12.4 x 4.3 cm	18.3 x 18.0 x 9.1 cm	28.7 x 26.7 x 7.1 cm	28.7 x 26.7 x 7.1 cm

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

** Orderability Mar 2024; FCS July 2024 - subject to change w/o notice

6 GHz is the biggest Wi-Fi spectrum expansion ever!

Band Channels Bandwidth

2.4 GHz

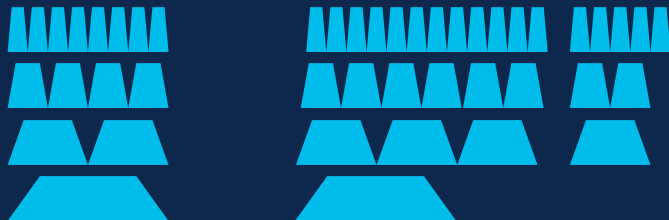
3	20 MHz
1	40 MHz



60 MHz of spectrum and
3x 20-MHz channels

5 GHz

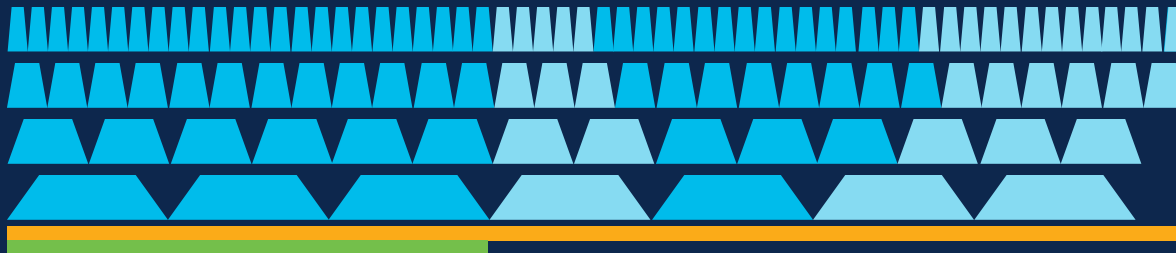
25	20 MHz
12	40 MHz
6	80 MHz
2	160 MHz



500 MHz of spectrum and
25x 20-MHz channels

6 GHz

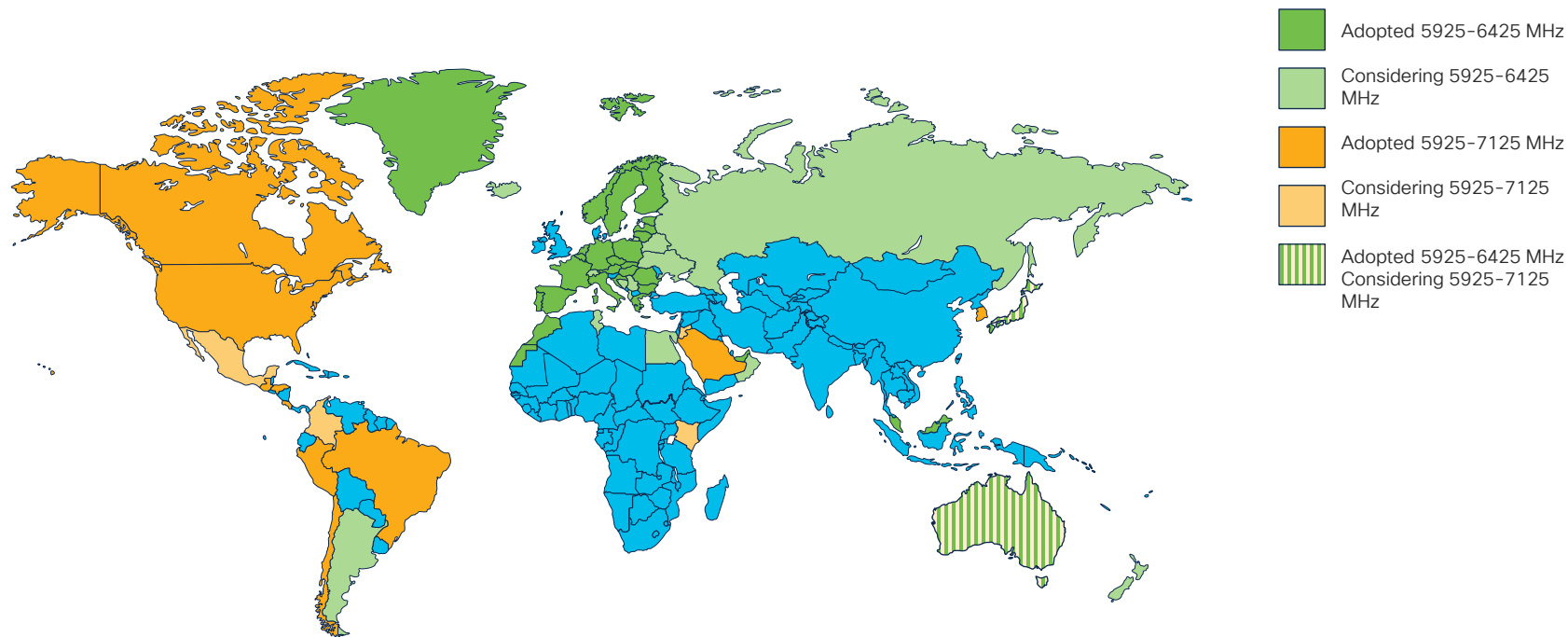
59	20 MHz
29	40 MHz
14	80 MHz
7	160 MHz



1200 MHz of
spectrum and
59x 20-MHz
channels in US

500 MHz of
spectrum in EU

Countries enabling Wi-Fi 6E



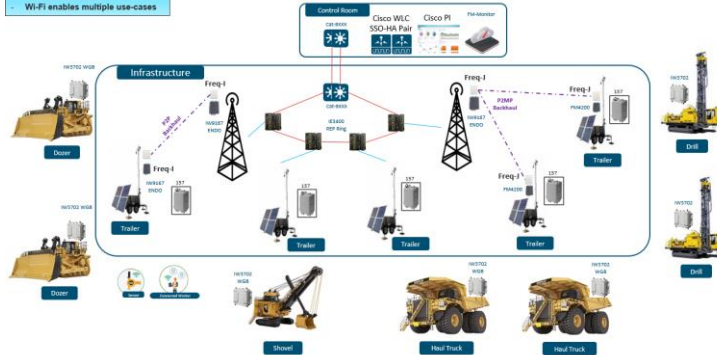
From 1572 to 9167

Cisco 1572 Infrastructure
Cisco IW3702 WGB on Vehicles
FM P2P and P2MP Backhaul

Attributes:
Scalable Solution
Wi-Fi enables multiple use-cases

3. Current brownfield deployment adding

P2P & P2MP

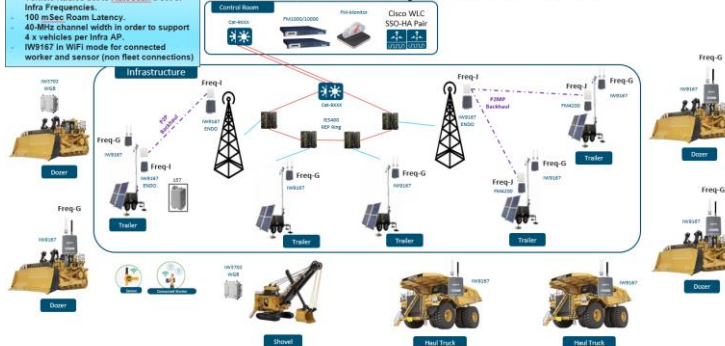


FM Infra + FM Mobility + FM Backhaul
Multi-Freq: Single-Radio Design except haul trucks with dual radio

Characteristics:

- Vehicle Radios set to AutoScan a set of Infra Frequencies.
- 100 mSec. Roam Latency.
- 40-MHz channel width in order to support 4 x vehicles per Infra AP.
- IW9167 in WFI mode for connected worker and sensor (non-Real connections)

2. Transition mode moving from current deployment to IW9167 mobility architecture - Brownfield



Current customer's needs:

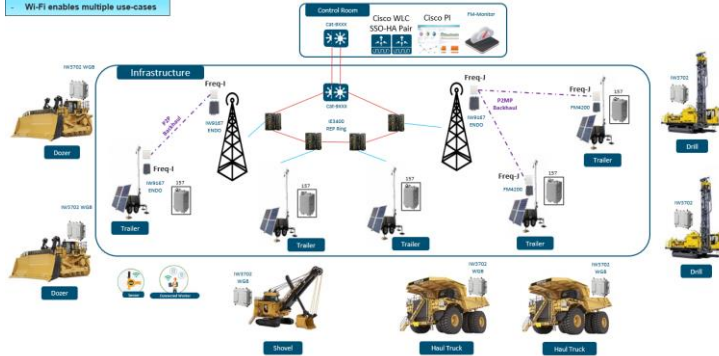
- Current state customers have a deployment of 1572, 1532, 1552H and IW3702 APs.
- There is a need to expand current footprint or add mobile equipment.
- Very difficult to rip and replace entire system at one time.
- By adding the IW9167 the customer can mix old APs and the new one in the same mesh deployment.
- This is a mix of AIROS and IOS-XE
- Customers can use any combination of 1572 RAP / MAP with IW9167 RAP /MAP

From 1572 to 9167

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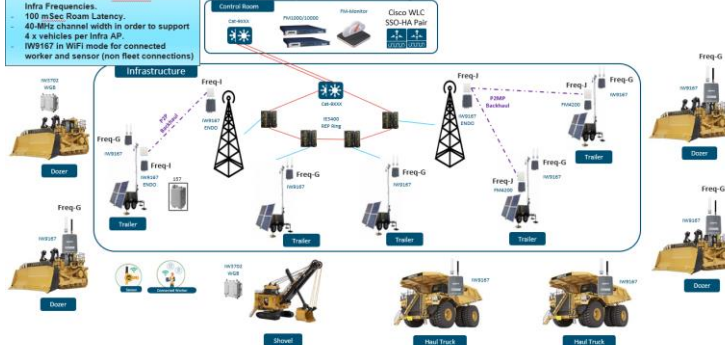


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2. Transition mode moving from current deployment to IW9167 mobility architecture - Brownfield



Additional advantages:

- With the updated IW9167 there are two 5 GHz radios this gives many options
 - 1) ability to use one radio where two were needed in the past
 - 2) can use both radios from a single wired location (RAP) to double the spectral bandwidth
 - 3) using the two radios on the MAP will allow one radio as an ingress radio and one as an egress radio eliminating the 1/n bandwidth lost per hop.

Get the reliable, secure connectivity you need with Cisco IoT



Cisco Ultra-Reliable Wireless Backhaul

Get ultra-reliable, low-latency wireless backhaul for mission-critical, and real-time applications anywhere you need them.



Cisco Catalyst Industrial Ethernet Switches

Connect your assets in any environment, with the cybersecurity, network automation, and agility you need.



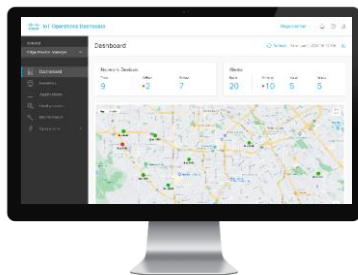
Cisco Cyber Vision

Gain visibility to drive cybersecurity through segmentation. Detect OT threats to protect endpoints and avoid downtime.

Cisco IoT Operations Dashboard

A cloud platform of OT services to connect, maintain and secure industrial assets and gain insights

IoT Operations Dashboard



NEW

IW service

Deploy and monitor IW devices in Cisco URWB mode

Enhanced

IR service (EDM)

Deploy and monitor industrial routers

NEW

Secure Equipment Access

Secure remote access to industrial assets

Cyber Vision

Visibility of asset inventory and security posture

Edge Intelligence

Collect, process and control transfer of data

Industrial Asset Vision

Industrial sensors

Application Management

Manage applications across the network

Industrial networks



Wireless backhaul



Industrial routing



LoRaWAN



Roadway intersections



Transportation



Solar panels



EV chargers



Connected signage



Wind farms



Connected machines

Customer Success depends on proper Planning and Execution

Cisco CX Service oversight and preferred partners recommended

Advisory services around key project validation gates

Design Consulting



Validate Design Assumptions

Testing & Validation



Validate the ability to meet the business requirements

Wireless Planning & Design



Site Survey
Deliver an accurate RF design

Wireless Tuning & Optimization



Optimal RF Tuning and standard methods of procedure

Enable Cisco Partners in Model of True Partnership

Numerous options available within each service

In Conclusion...

Autonomy and tele remote operations allow:

Improved efficiency

Reduced travel expenses

Remove of wasted time for travel

Easier to recruit and retain quality employees

Higher Overall Equipment Effectiveness for heavy equipment

The ability to increase fleet size with smaller haulage units

This allows easier electrification

The reduction in greenhouse gases

Increased production

IMPROVED SAFETY

Why we stay safe!!!!!!!!!!!!!!





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You can have a
one-on-one session with
a technical expert!

Visit Meet the Expert in The HUB
to meet, greet, whiteboard & gain
insights about your unique questions
with the best of the best.



Meet the Expert Opening Hours:

Tuesday	3:00pm – 7:00pm
Wednesday	11:15am – 7:00pm
Thursday	9:30am – 4:00pm
Friday	10:30am – 1:30pm

Session Surveys

We would love to know your feedback on this session!

- Complete a minimum of four session surveys and the overall event surveys to claim a Cisco Live T-Shirt



Continue your education



- Visit the Cisco Showcase for related demos
- Book your one-on-one Meet the Expert meeting
- Attend the interactive education with DevNet, Capture the Flag, and Walk-in Labs
- Visit the On-Demand Library for more sessions at www.CiscoLive.com/on-demand



The bridge to possible

Thank you

CISCO *Live!*

#CiscoLiveAPJC

The background features a vibrant, multi-colored abstract design. On the left, there are horizontal, wavy bands of color in shades of red, orange, yellow, and green. On the right, a bright white light source emits a series of colorful rays in shades of blue, green, and yellow, creating a sunburst effect.

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Let's go

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