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The bridge to possible

Connecting moving assets with Cisco IoT Solutions

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@ManuNetworking

BRKIOT-1126

Cisco Webex App

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with the speaker after the session

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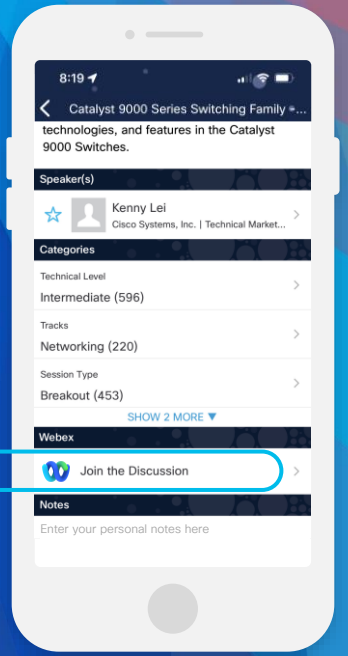
2. Click “Join the Discussion”
3. Install the Webex App or go directly to the Webex space
4. Enter messages/questions in the Webex space

Webex spaces will be moderated by the speaker until June 9, 2023.

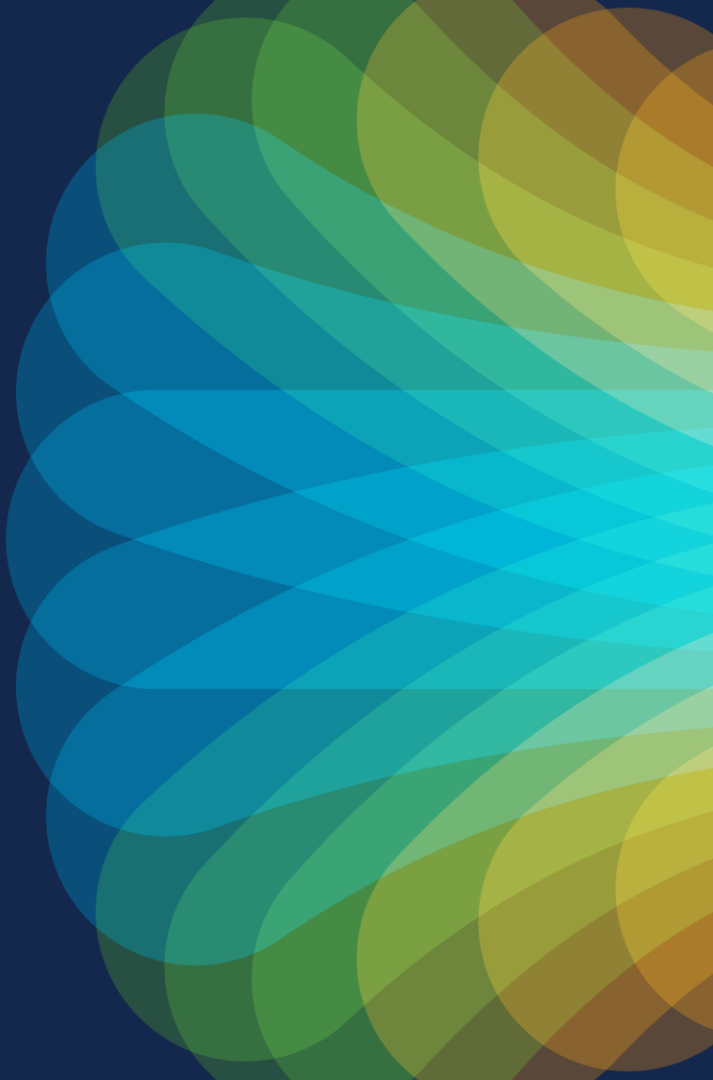


https://ciscolive.ciscoevents.com/ciscolivebot/#BRKIOT-1126

Agenda

- Problem Definition
- Mobile Router IR1800
  - WiFi
  - Cellular options
  - CANBUS
  - GPS
  - Ignition Management
- Cisco Ultra-Reliable Wireless
- Private 5G
- Network Management

Problem Definition



Multidimensional Problem

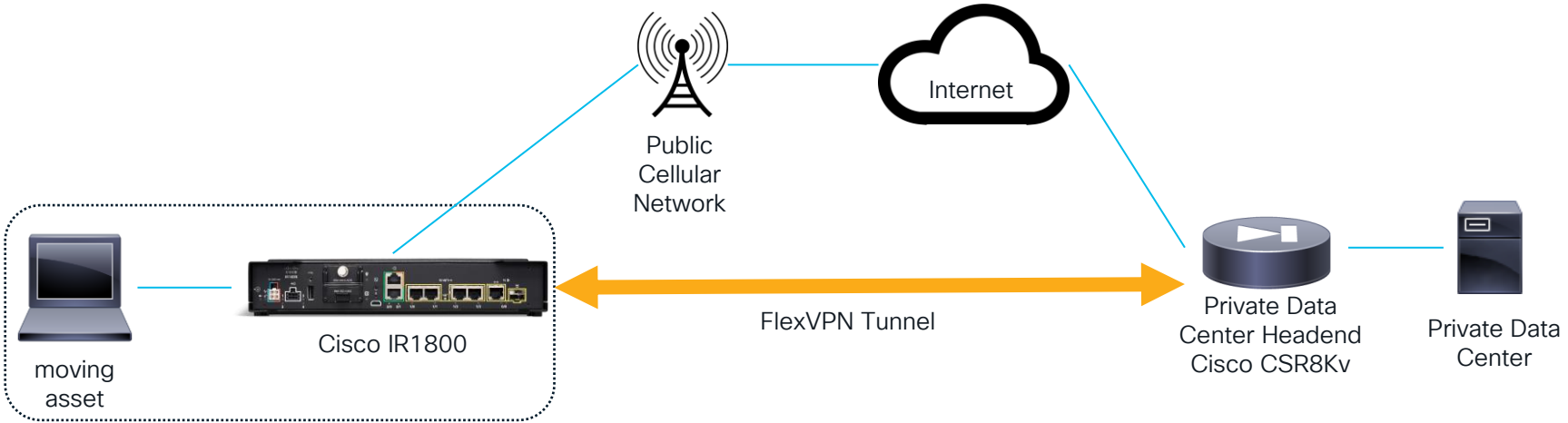
- Many factors to be taken in consideration

What are the communication needs?
Public Internet Only

- Use of traditional cellular network (if available)
- WiFi (if space with WiFi coverage)

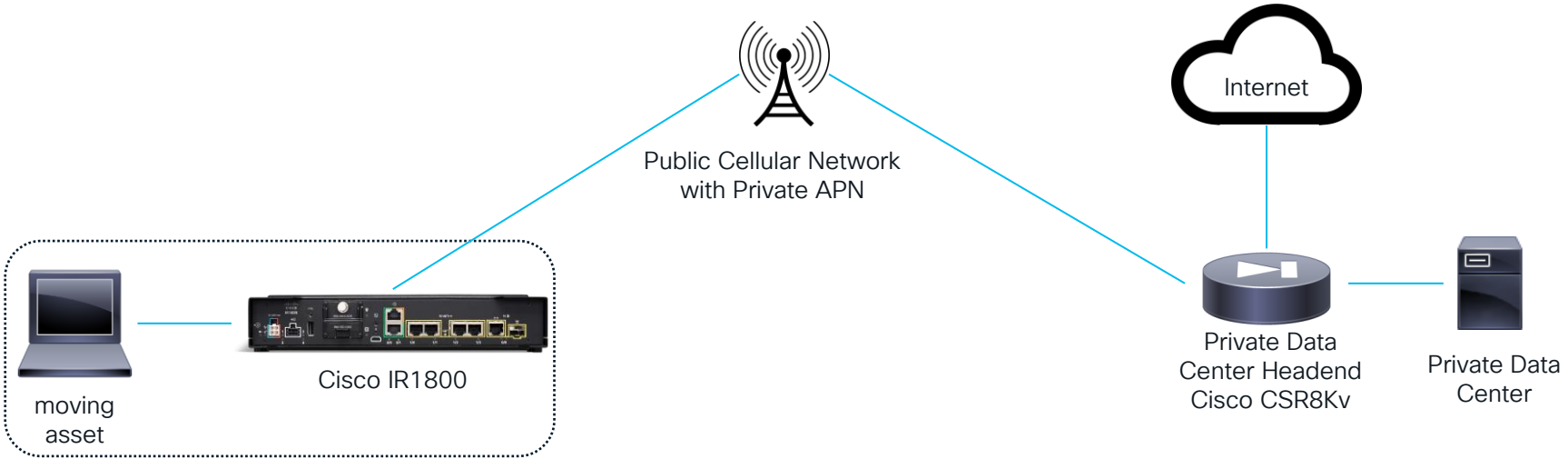
What are the communication needs?
Private Network or Data Center

Option #1 – Public cellular network with VPN overlay



What are the communication needs?
Private Network or Data Center

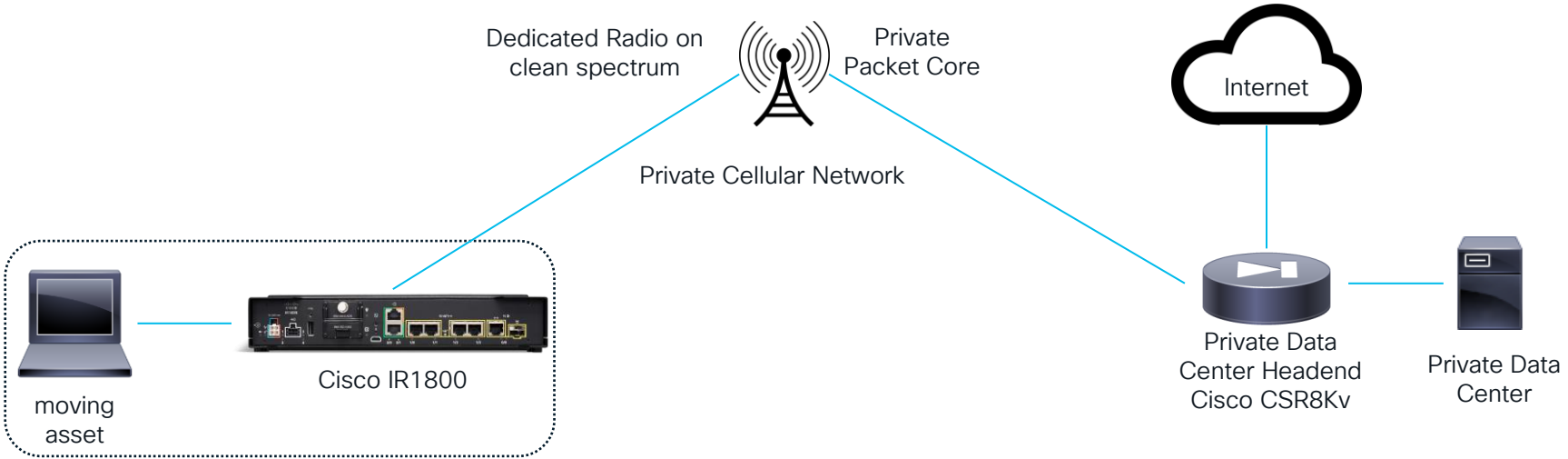
Option #2 - Public cellular network with private APN



The traffic flows directly from the IR1800, via the mobile network, to the private network where it terminates. This traffic does not travel across the Internet. Internet access is provided and controlled from the private network.

What are the communication needs?
Private Network or Data Center

Option #3 - Private cellular network (Private LTE, Private 5G)



Where do they move? **How far** they move?

Outdoors Public Places

- Rely on public technologies such as Cellular
- Mix providers to improve coverage

International Public Places

- Public Cellular Networks
- Multi eUICC SIM card (ie: Webbing)

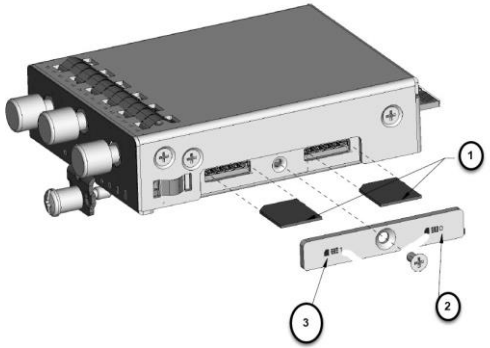
Private Places

- Public Cellular – if coverage
- Private Cellular Network
  - design your own coverage
  - great for very large spaces
  - expensive
- WiFi / CURWB
  - design your own coverage
  - great for smaller area (ie: warehouse)
  - great for well defined path (rails)

High Availability or Not ?

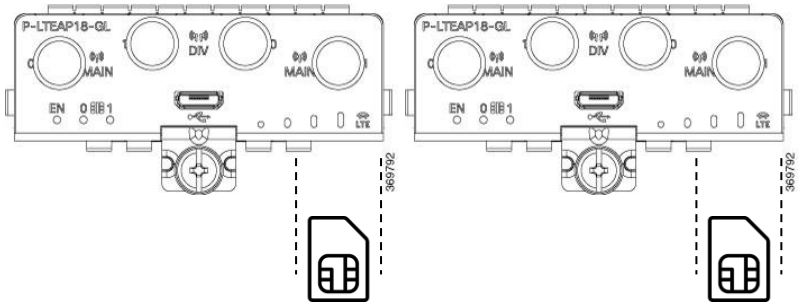
Low Availability Requirement

- Network can be lost for a few minutes
- Single SIM on public cellular network
- Better: Dual SIM on different providers
- Requires single LTE modem



High Availability Requirement

- Very difficult to guarantee
- Balance two **active** Cellular providers
- Requires dual LTE modem



High, Medium or Low Bandwidth ?

Low Bandwidth

- LTE Cat 4

↓ 150 Mbps
↑ 50 Mbps

Medium Bandwidth

- LTE Cat 18

↓ up to 1 Gbps
↑ 150 Mbps

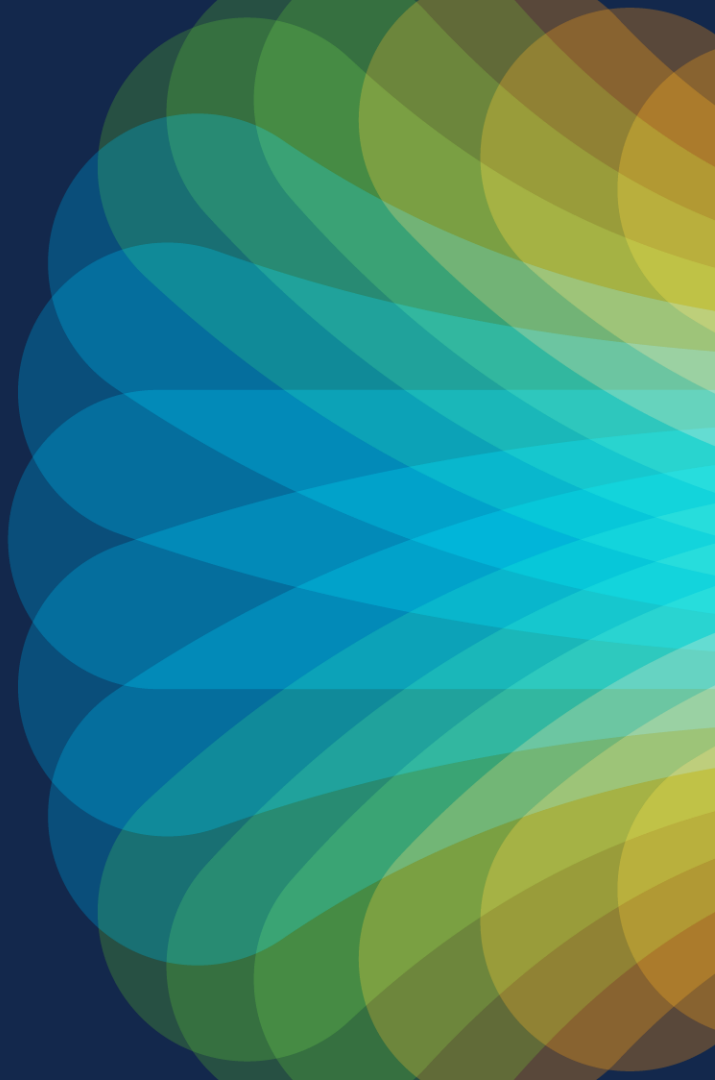
High Bandwidth

- 5G
- WiFi / CURWB

↓ 1+ Gbps
↑ 400+ Mbps

Filling the Needs

Cisco Mobile Router IR1800



Catalyst IR1800 Rugged Series Routers

High performance modular router for mission-critical mobile and remote assets

Flexible

Modular design – modules for storage, Wi-Fi, GPS, LTE, private LTE, 5G,FirstNet*

SD-WAN enabled

Choice of management for IT and Operations

Purpose-built for mobile

Transportation certifications, Shock and vibration resistant

Dead reckoning GNSS

Ignition Power Management

CAN bus support for vehicle diagnostics

Secure

Built-in Cisco multi-layer security

Visibility into OT assets with Cisco CyberVision

Edge Computing

Built-in edge compute resources

IOx support for your own applications

Cisco Edge Intelligence

*FirstNet certification pending

Take action at the edge with meaningful insights

Cisco Edge Intelligence
Simplifying the edge to multi-cloud data flow

Cisco Cyber Vision*
Deploy OT security

Customer and 3rd party developed apps

Powerful platform with built-in Edge Compute and expandable storage

Leverage Cisco IOx framework to develop and run IoT business apps

Use Cisco developed IOx apps or build your own

Reduce bandwidth costs and footprint , improve security , and scale operations

Broad portfolio to meet your needs

Cisco Catalyst IR1800 Series SKU's

IR1821

1 LTE slot
1 Wi-Fi slot

IR1831

2 LTE slots
1 Wi-Fi slot

IR1833

2 LTE slots
1 Wi-Fi slot
PoE, FRU GPS

IR1835

2 LTE Slots,
1 Wi-Fi slot,
PoE, FRU GPS,
Digital IO
More RAM memory

Bring the speed, security, and bandwidth
of Wi-Fi 6 to your mobile network

Compact pluggable module
- 2x2: 2SS
- Data rates up to 1.1 Gbps

Enterprise access point capabilities in compact ruggedized design
- Deploy Wi-Fi in harsh environments
- Extended temperature range

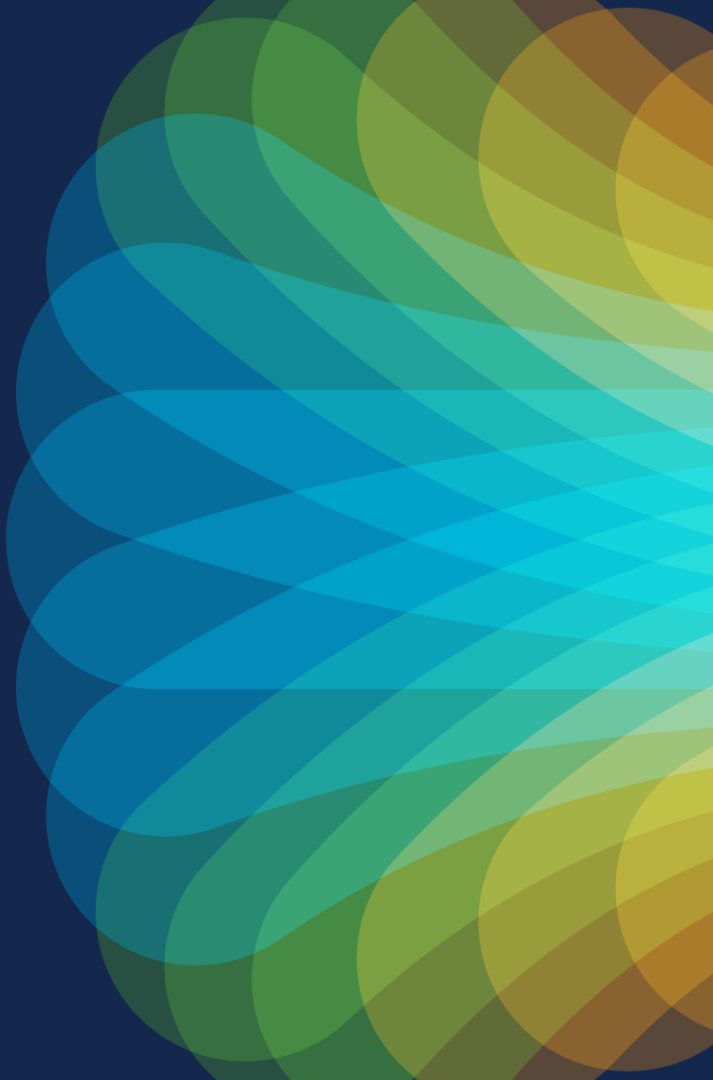
High performance, reliable and secure
- Deploy same policies as branch Wi-Fi for in-vehicle
- Faster video offload by seamlessly connecting to enterprise network.

Wi-Fi 6 for IR1800
Feature parity with Catalyst 9105AX Series

Extending Cisco's intent-based network to the edge

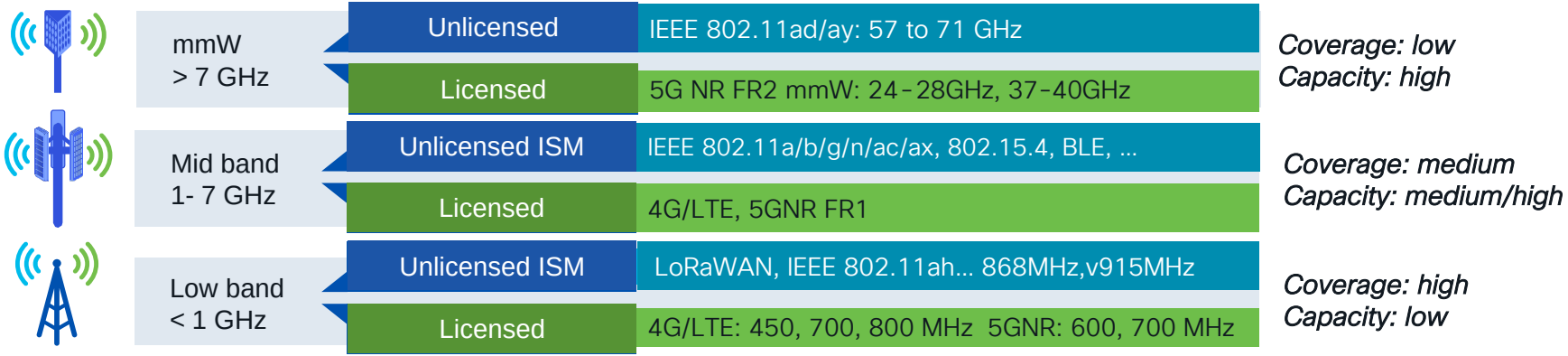
*Available in 2HCY21

IR1800
Cellular Options



Wireless Technologies – Spectrum

- Unlicensed: also known as ISM bands, generally free of charge, public, and private infrastructures, but regulated.
  - Different technologies may share the same frequency; co-existence definition in specifications
- Licensed: dedicated to SP (public services) or industries (private, critical infrastructures, i.e. U.S. Firstnet, Anterix, EU 450MHz…), paid license, allocated for several years.
  - Including “Locally Shared License” and “License-exempt Access” models.



Cellular Pluggable Interface Modules for Industrial Routers

Cellular Interface Modules

P-LTE-GB Cat4	P-LTE-US Cat4	P-LTE-VZ Cat4	P-LTE-MNA Cat4	P-LTE-IN Cat4	P-LTE-JN Cat4	P-LTEA-EA Cat6	P-LTEA-LA Cat6	P-LTEAP18-GL Cat18	P-5GS6-GL 5G + 4G Cat 20	P-LTE-450 450 MHz band B31 & B72
↓ 150 Mbps ↑ 50 Mbps	↓ 150 Mbps ↑ 50 Mbps	↓ 150 Mbps ↑ 50 Mbps	↓ 150 Mbps ↑ 50 Mbps	↓ 150 Mbps ↑ 50 Mbps	↓ 150 Mbps ↑ 50 Mbps	↓ 300 Mbps ↑ 50 Mbps	↓ 300 Mbps ↑ 50 Mbps	↓ 1.2 Gbps ↑ 150 Mbps	↓ 3.2 Gbps ↑ 400 Mbps	↓ 37 Mbps ↑ 12 Mbps

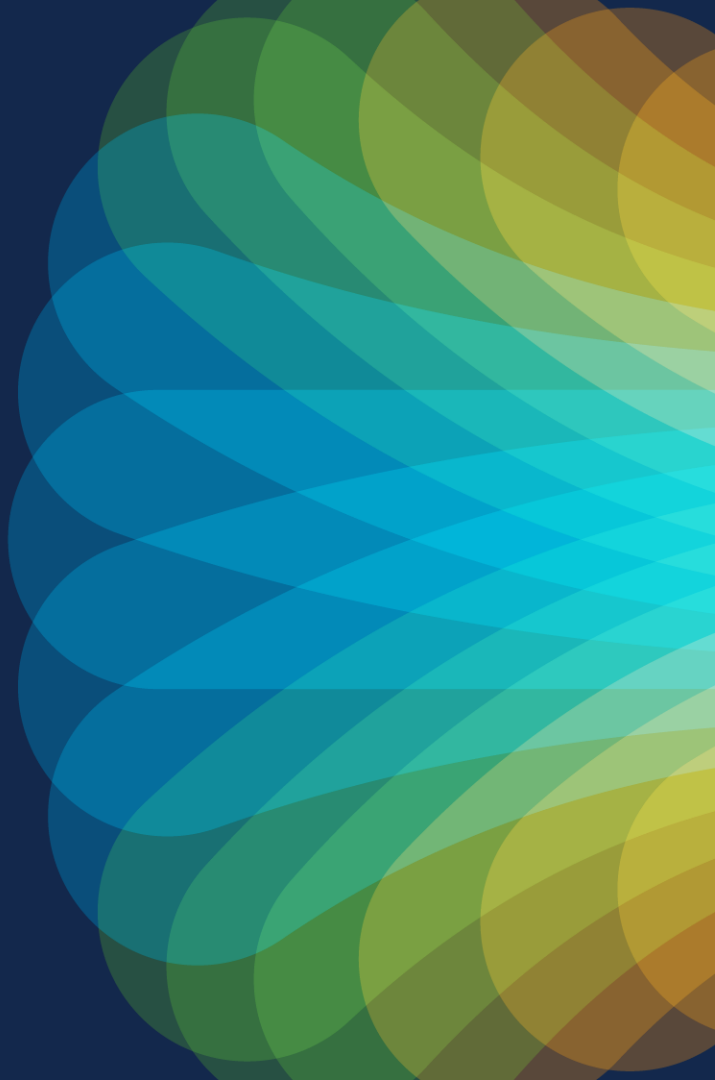
IR1101

IR1821, IR1831, IR1833, IR1835

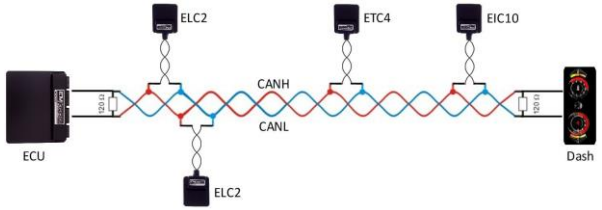
IR8100

IR8300

IR1800
CAN Bus



What is CAN Bus



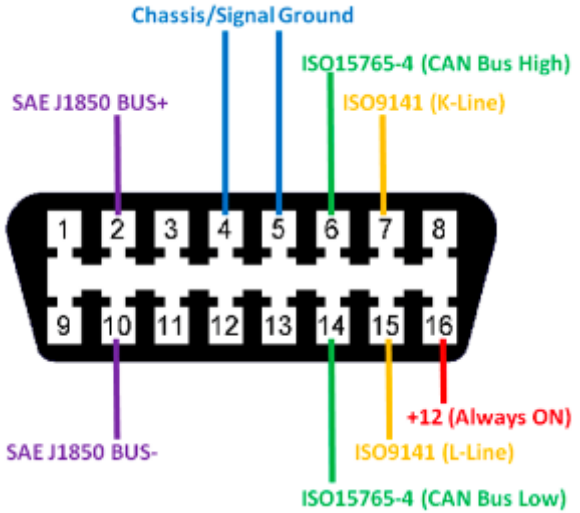
- CAN (Controller Area Network) bus enables ECU (electronic control unit) in a vehicle to communicate with all other ECUs
- ECU broadcast information (e.g. sensor data) over the CAN bus. Data data is accepted by all other ECUs that can then check the data and decide whether to receive or ignore it.
- CAN bus (High speed) is specified as data link layer (ISO 11898-1) and physical layer (ISO 11898-2).
- It consists of two wires, CAN bus High and Low supporting data rate up to 1 Mbps
- **High speed CAN bus**: (ISO 11898). It is the most popular CAN standard for the physical layer, supporting bit rates from 40 kbit/s to 1 Mbit/s (Classical CAN).
  - Maximum Cable length between 500m (125 kbit/s) and 40m (1 Mbit/s)
  - 120 ohms CAN bus termination

What is OBDII?

- OBDII standards or On-Board Diagnostic
  - OBD or OBDI standardizes the connector so that it is identical on all vehicles.
  - The communication protocol remains more or less specific depending on the make.
- Initially implemented by the CARB (Californian Air Resources Board) to control polluting emissions from vehicles.
  - OBDII arrived in the United States in 1996 to specify common protocols.
  - EOBD for European OBD based on OBDII is specific to European vehicles
- The OBDII **port** is **always powered** up, even when the car is off.

ODBII Connector - Female 16-pin (2x8) J1962

- J1962 Pin 16 is 12V+ from battery power.
- J1962 Pins 4 and 5 are both grounds. BUT,
  - Pin 4 is a chassis power ground
  - Pin 5 is a “signal ground.”



More Information https://pinoutguide.com/CarElectronics/car_obd2_pinout.shtml

CAN Bus Fleet Management Solution

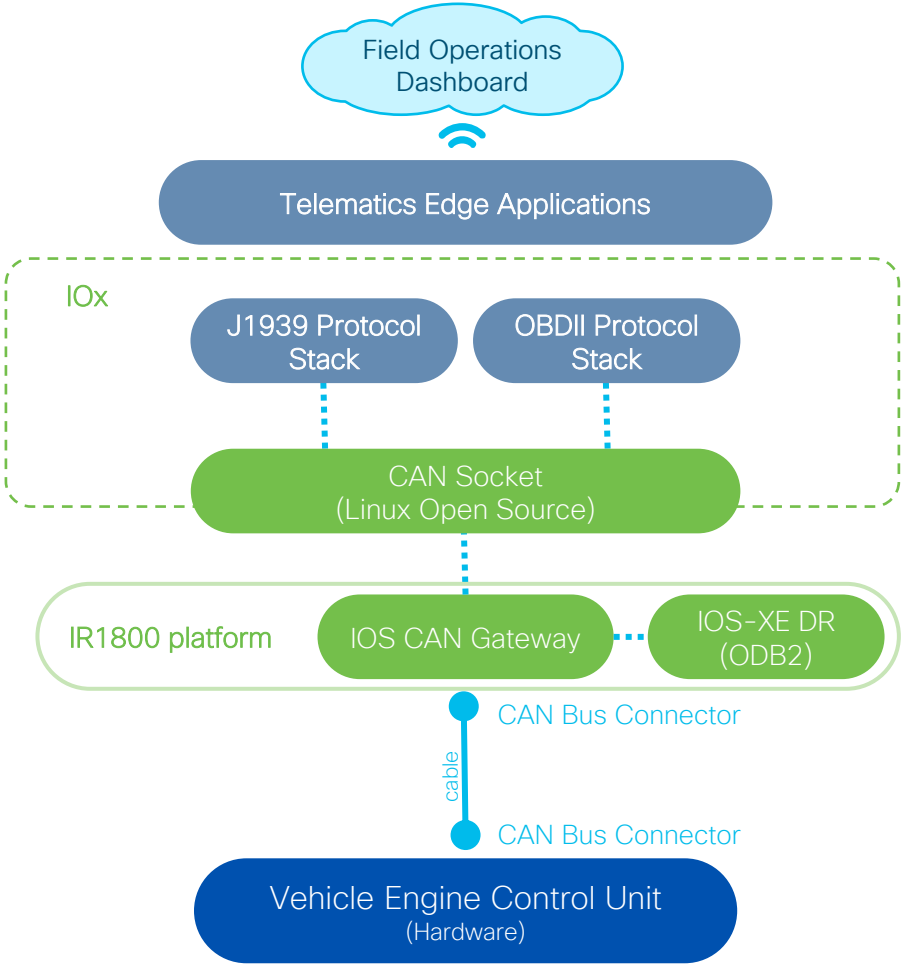
Vehicle Telematics Use Cases:

- Preventative Maintenance
- Driver behavior monitoring
- Fuel cost containment
- Accident detection

Third Party Elements Required:

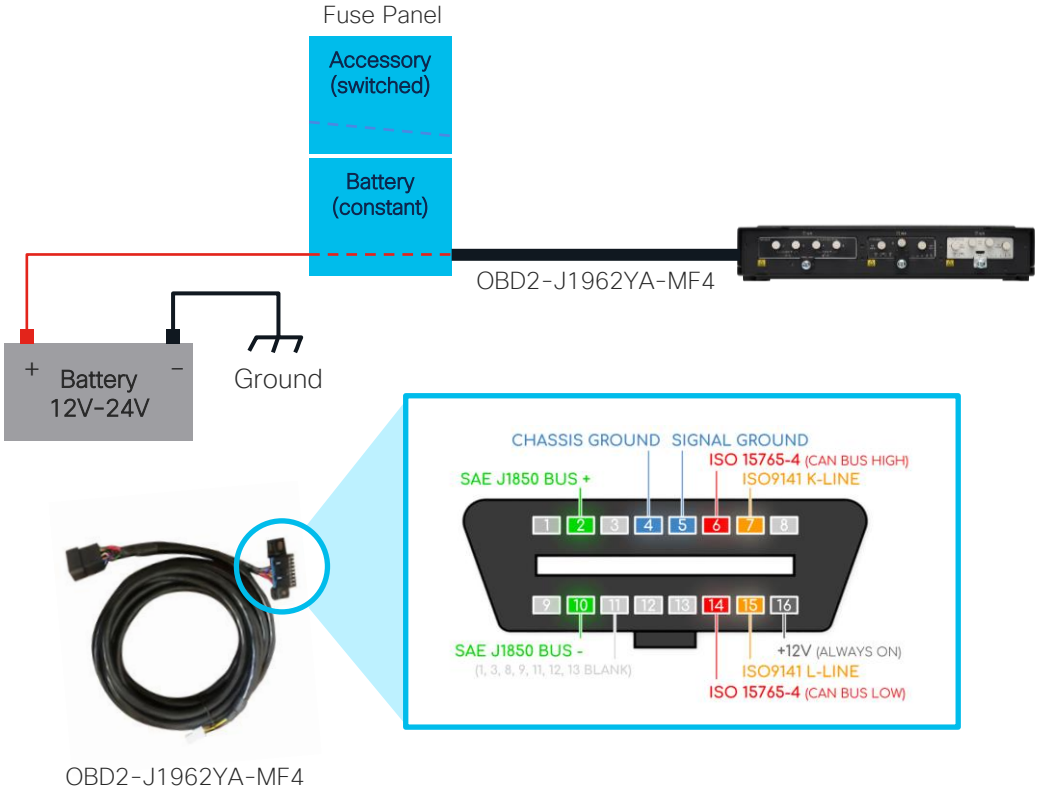
- J1939 protocol stack or OBDII protocol stack
- Thin or thick telematics edge applications

IR1800 collects raw CAN Bus data from connected vehicles and delivers to Linux Open Source CAN socket in IOx environment



IR1800 CAN Bus to Vehicle OBD2 Connectivity

- IR1800 Mini-Fit connector includes the DC power and CAN Bus wiring as documented in the IR1800 HW installation guide
- OBD2 is generally supporting and protected for ~60 Watts (12VDC/5Amps)
  - When connecting an IR1800 CAN Bus, vehicle's owner must review the characteristics of the OBD2 power and fuse protection.
- CAN Bus adaptive data rate supported post IOS-XE 17.5.1



IR 1800 CAN Bus on Cisco IOS-XE

- CAN Bus interface is seen under “show platform hardware canbus xxx”
- GNSS/CAN Bus ODBII Dead Reckoning on IR1835-K9 and IR1833-K9 is supported by IOS-XE 17.6.1 – see GNSS & Dead Reckoning section
  - Dead Reckoning with J1939 is available on IOS-XE 17.9.1
- CAN Bus traffic capture as .pcap file
  - Available on IOS-XE 17.9.1
- CAN Bus to IOx is on IOS-XE 17.6.1
  - Vxcan interface, no Edge Intelligence support
- *Disclaimer: Modifying any value over CAN Bus would be the customer/partner responsibility. Cisco can’t assume any responsibility for security/safety/compliancy issue if an application tampered the CAN Bus.*

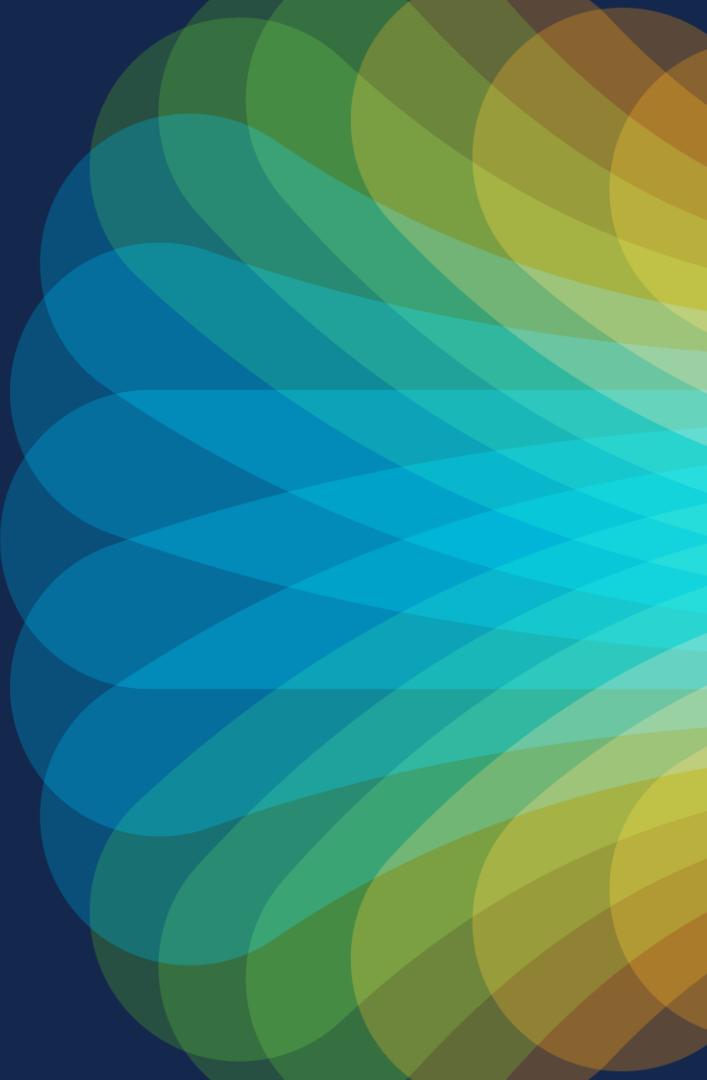
```
IR1800#conf term
Enter configuration commands, one per line.  End with
CNTL/Z.
IR1821(config)#canbus baudrate ?
  <125000-1000000>  enter baud rate ranging from 125000 to
1000000

IR1821#show platform hardware canbus ?
  interface  Display CAN Bus interface
  link       Display CAN Bus link


IR1821#show platform hardware canbus link
8: can0: <NOARP,UP,LOWER_UP,ECHO> mtu 16 qdisc pfifo_fast
state UP mode DEFAULT group default qlen 10
    link/can  promiscuity 0
    can state ERROR-ACTIVE restart-ms 100
          bitrate 125000 sample-point 0.875
          tq 500 prop-seg 6 phase-seg1 7 phase-seg2 2 sjw 1
          mcp251x: tseg1 3..16 tseg2 2..8 sjw 1..4 brp
1..64 brp-inc 1
          clock 10000000
          re-started bus-errors arbit-lost error-warn
error-pass bus-off
          0          0          0          0          0
      0         numtxqueues 1 numrxqueues 1 gso_max_size
65536 gso_max_segs 65535
    RX: bytes  packets  errors  dropped overrun mcast
    0          0        0       0       0       0
    TX: bytes  packets  errors  dropped carrier collsns
    0          0        0       0       0       0

IR1821#
```

Cisco OBDII Cables for IR1800

	Cable	Description (OBD-II cables are 4.35 m in length)
	OBD2-J1962YA-MF4	OBD-II (J1962) Type A to IR1800 cable with type 1 Y-splitting bypass harness
	OBD2-J1962YB-MF4	OBD-II (J1962) Type B to IR1800 cable with type 2 Y-splitting bypass harness
	OBD2-J1939Y2-MF4	OBD-II (J1939) Type 2 heavy duty diagnostic harness for Volvo/Mack
	OBD2-J1939Y1-MF4	OBD-II (J1939) Type 1 to IR1800 cable with type 1 y-splitting bypass harness and auxiliary (discrete voltage) inputs
	OBD2-J1708Y-MF4	OBD-II (J1708) to IR1800 cable with type 1 y-splitting bypass harness and auxiliary (discrete voltage) inputs
	OBD2-J1962VMB-MF4	J1962-VM-Type B Volvo & Mack

Note# OBDII location and connector type may vary based on vehicle.
Cisco have validated the above cables for IR18xx routers.

IR1800 GNSS/GPS and Dead Reckoning (DR) Feature



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GNSS/GPS on Cisco Industrial Routers

Antenna: must comply with the various frequencies for GNSS

Cellular modem-based GNSS/GPS

- PIM dependent, e.g., not available on P-LTEAP18-GL
- Can be configured as "*standalone*" or "*MS-based*" (Assisted GPS mode using secure Google SUPL service) under *Controller Cellular 0/x/0*

IR1800 GNSS/GPS interface

- GNSS module on the IR1835/1833 is a FRU in a dedicated slot with its own GNSS antenna
- Independent of cellular GPS with its own configuration, show commands and Yang model
- GNSS includes GPS (U.S.), Galileo (EU), Glonass (Russia) and Baidou (China) constellation.
- Based on Telit SL869-ADR chipset

Dead Reckoning

Dead Reckoning is a GNSS/GPS fallback feature that provides users with location information during satellite signal interruption.

Information can be displayed from IOS-XE CLI, or be sent through NMEA, or be accessed through an IOx app

Dead Reckoning features requires:

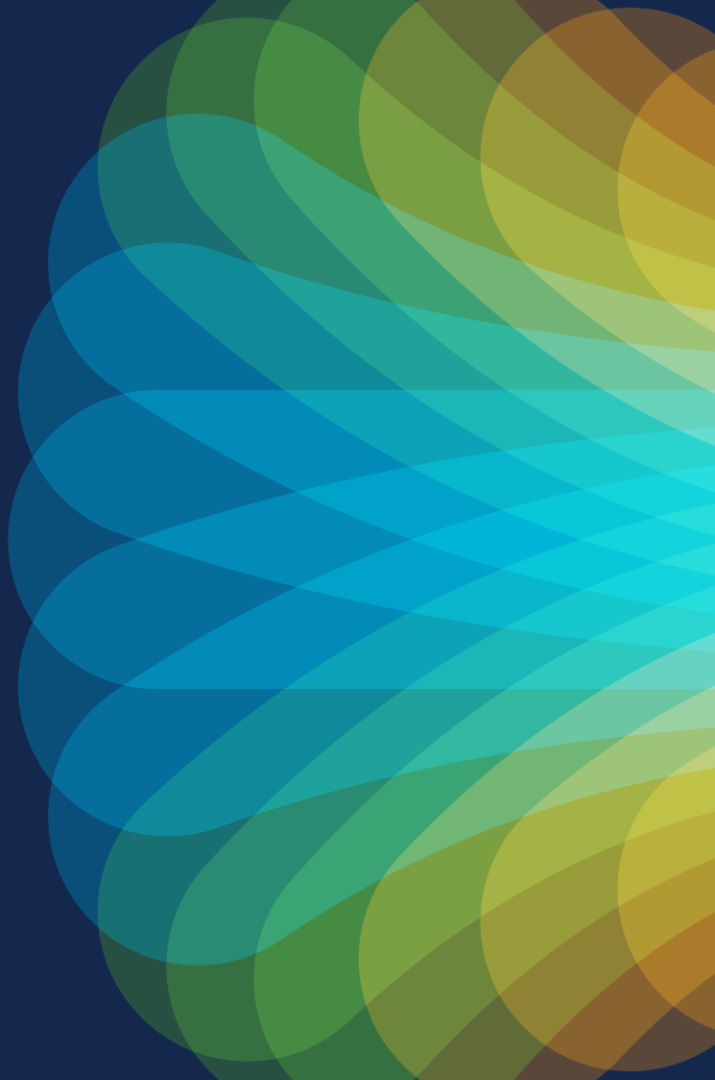
- CAN Bus connectivity – cable attached to vehicle's OBD2 connector
- IRM-GNSS-ADR module in IR1833/1835 and dedicated antenna installation
- Software configuration:

```
IR1835# conf term
Enter configuration commands, one per line.
End with CNTL/Z
IR1835#(config)#canbus baudrate 500000
IR1835(config)#controller gps-Dr
IR1835(config-controller)#dead-reckoning
enable
Info: []: DR process enabled successfully.
```

"**show platform hardware gps dead reckoning**" displays the following:

- Firmware running on the GPS module
- CAN transmit/receive count,
- Odometer reading
- Accelerometer
- Gyroscope readings
- DR is in use for location fix or not

IR1800 Ignition Management

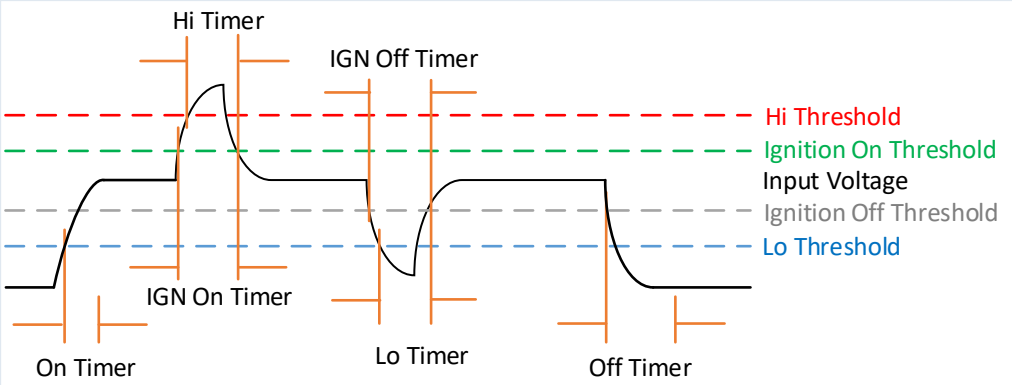


IR1800 Ignition Power Management

- On IR1800, Ignition Power Management adds ignition sense through software
- IR1800 Ignition Power Management benefits
  - After engine is turned off, IR1800 can remain operational for a pre-determined period of time.
  - Automatic power down of the router when vehicle battery drops below certain voltage threshold
  - Backup eMMC storage to prevent bootflash corruption in case of intermittent power restarts

IR1800 Ignition Sense Overview

Ignition based on voltage (Analog Input)




```
IR1800_FCW2445P8H8#show run | s ignition
ignition off-timer 300
ignition undervoltage threshold 9 000
ignition battery-type 12v
ignition sense-voltage threshold 13 000
ignition sense
no ignition enable

IR1800_FCW2445P8H8#show ignition status
Ignition management: Disabled
Input voltage: 13.3 V
Ignition status: Power on
Ignition Sense: Enabled
Shutdown timer: 0.0 s to off [will begin power
down at ~100 sec]
Thresholds:
Undervoltage: 13.000 V
Overvoltage: 37.0 V
Undervoltage timer: 20.0 s
Overvoltage timer: 1.0 s
Ignition-Off timer: 300.0 s
```

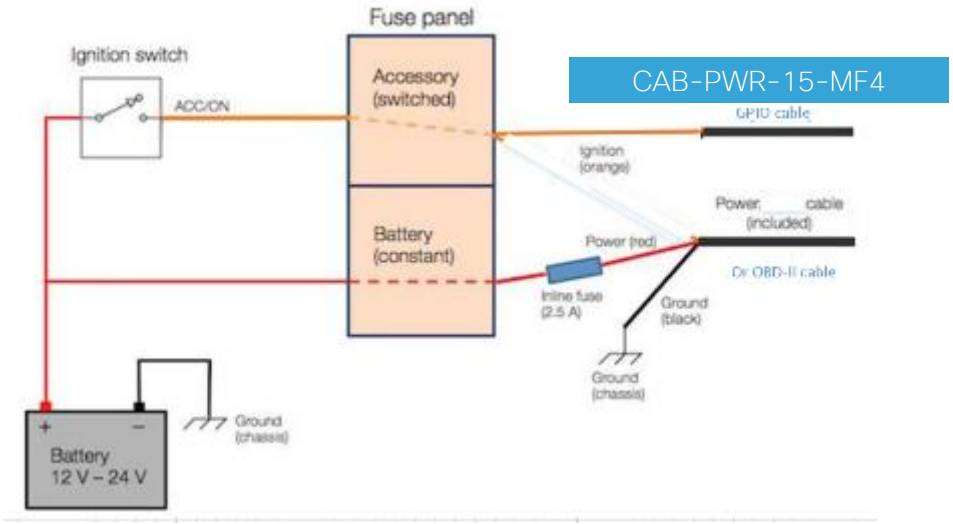
	Input Voltage (DC)
Min	9.6V
Max	36V
Nominal	12V or 24V

	Ignition Sense Voltage	
	12V Battery	24V Battery
On	13V + 2%	26V + 2%
Off	13V -2%	26V - 2%

	Battery Voltage	
	12V Battery	24V Battery
UnderVoltage	11.5V	23V
Overvoltage	36V	36V

IR1835 Ignition Signal/Ignition Switch

Ignition based on Signal/Ignition switch(Digital Input)

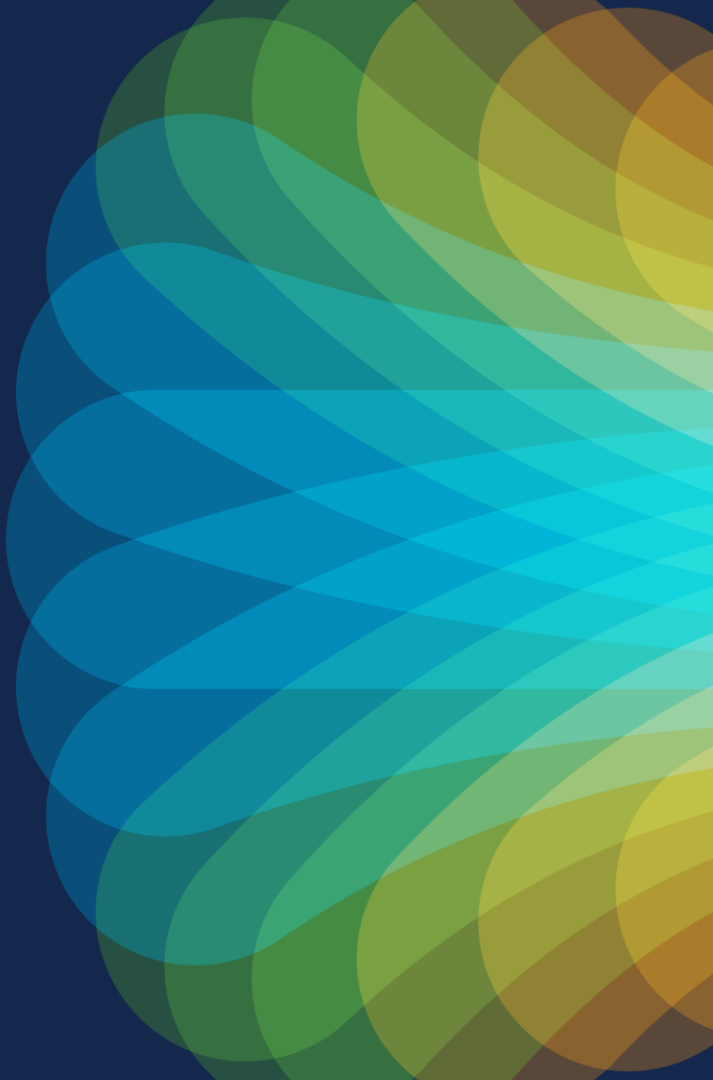



```
IR1835#show run | s ignit ! Configuring
ignition off-timer 120
ignition undervoltage threshold 9 600
ignition battery-type 12v
ignition sense-voltage threshold 13 000
no ignition sense
ignition enable

IR1835#show ignition Status ! Monitoring
 Ignition management: Enabled
Input voltage:        13.999 V
Ignition status:      Power on
Ignition Sense:       Disabled
 Shutdown timer:       0.0 s to off [will
begin power down at ~100 sec]
Config-ed battery:    12v
Thresholds:
Undervoltage:         9.600 V
Overvoltage:          37.000 V
Sense on:             13.200 V
Sense off:            12.800 V
Undervoltage timer:   20.0 s
Overvoltage timer:    1.0 s
Ignition-Off timer:   120.0 s
```

Upcoming Sessions on IR1800

- True Multi-access for the Industrial IoT edge : How to automate your access at the Industrial edge with IoT operations dashboard and the IR1800 - IBOIOT-2201
  (Tuesday, Jun 6 | 4:00 PM - 5:00 PM PDT)
- 3 Keys to Succeeding at IoT Scale with Cellular Connectivity Management - PSOSPG-1701
  (Thursday, Jun 811:00 AM - 11:30 AM PDT)

Cisco Ultra Reliable Wireless Backhaul (CURWB)



Wireless Backhaul Defined

- **Long range and high bandwidth connectivity**
  (up to 15 miles / 500 Mbps)
- **Fast and accurate handoff**
  (0ms handoff, up to 225 Mph)
- **Support for real-time sensitive traffic**
- **Support fixed and mobile architectures**

Fiber connectivity vs. Cisco Ultra-Reliable Wireless Backhaul

Analysis shows between 20% to 80% installation cost reduction by using Cisco Ultra-Reliable Wireless Backhaul instead of fiber

Deployment Work/Time/cost	Fiber	Cisco Ultra-Reliable Wireless Backhaul
Man hour to prepare get authorization	**HIGH**	**LOW**
specialist labor for fiber installation	**HIGH**	**LOW**
Full installation in one time	**NO**	**YES**
Capacity to use the solution for temporary use case	**NO**	**YES**

No single connectivity option can meet all needs

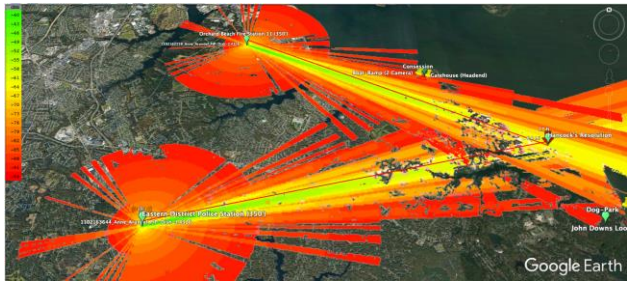
Cellular 3G, 4G, 5G	✔	• Medium-to high bandwidth, easy to deploy, long range
	⚠	• High OpEX, monthly cost ($40-100/SIM/Month) • Dependent on mobile SP coverage in the area
LoRaWAN / WiSUN	✔	• Long range, great for sensors with small data payloads (<1 Mbps) • Low Power
	⚠	• Low bandwidth
802.11 Wi-Fi	✔	• 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

Ultra-Reliable Wireless Backhaul

- ✔ Proprietary Air-Interface, medium-long range, flexible deployment, re-deployable worldwide (unlicensed), low OpEX
- ✔ High bandwidth (~500 Mbps), unlicensed spectrum (no licensed OpEx)
- ✔ 0ms roaming (Fluidity) Low latency (compared to other wireless architectures)

CURWB – Best Practices

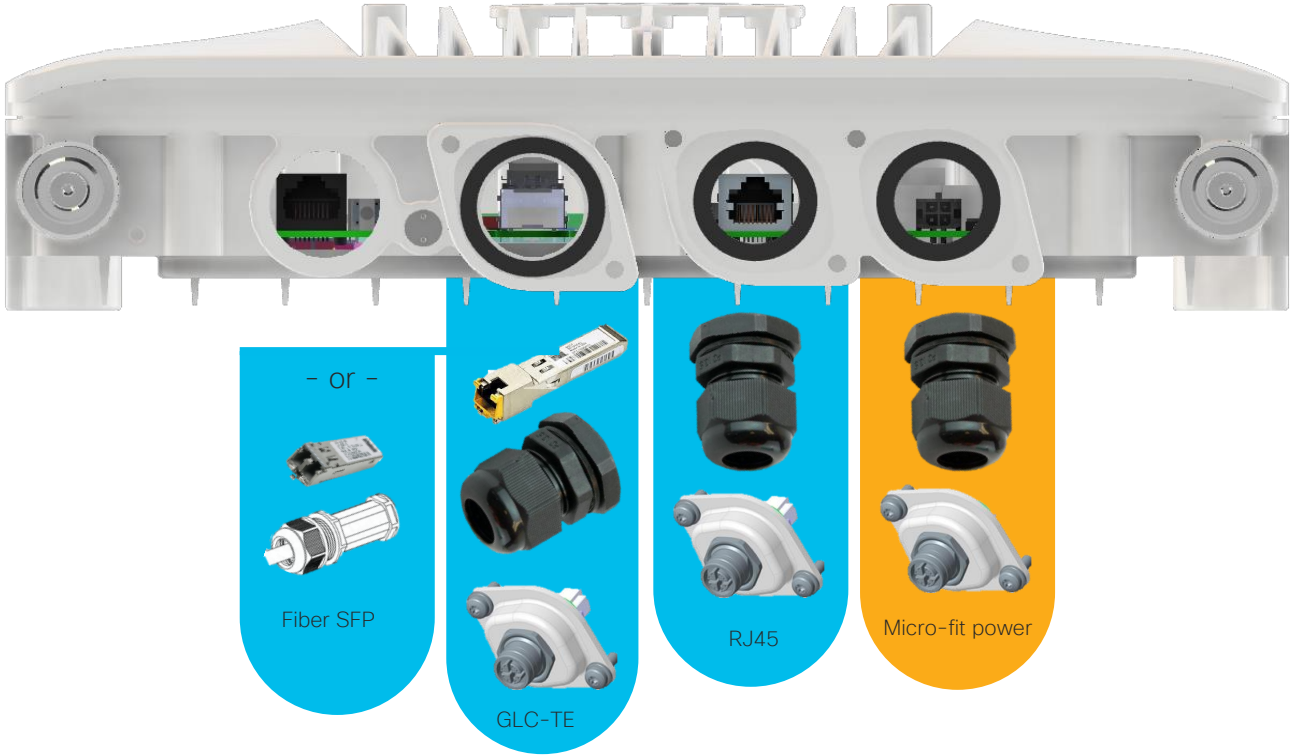
- Carefully plan the mobile client path for ideal radio placement
- Always use clear radio Line of Sight (LoS) for all wireless links
- Use separate, non-overlapping frequencies
- Anticipate signal propagation in advance with tools like CloudRF
- Do site survey to validate proper placement and design



Cisco Catalyst 6E Industrial Wireless Portfolio

	 IW9165E	 IW9165D	 IW9167
Application	Wireless client for mobile assets	Wireless backhaul for fixed and mobile assets	Wireless backhaul for fixed and mobile assets
Radio	2 x 802.11ax radios (5GHz, 5/6GHz)	2 x 802.11ax radios (5GHz, 5/6GHz)	3 x 802.11ax radios (2.4GHz, 5GHz, 5/6GHz)
Antenna	4 x RP-SMA	Built-in 15dBi directional plus 2 x N-Type (f)	8 x N-Type (f)
Modulation	2x2 MIMO	2x2 MIMO	4x4 MIMO
Wireless Mode	WGB or URWB	URWB	WiFi, WGB, URWB
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
Expendability	BLE, GNSS, GPIO	BLE, GNSS	BLE, GNSS
Certifications	IP30, EN50155 -20C to +50C	IP67 -50C to +75C	IP67, EN50155 -50C to +75C

One hardware, multiple weatherproofing options



Cable Glands
- Maintain IP67 rating
- Optional accessory

M12 Adapter
- Maintain IP67 rating
- Vibration rated for rail (EN50155)
- Optional accessory

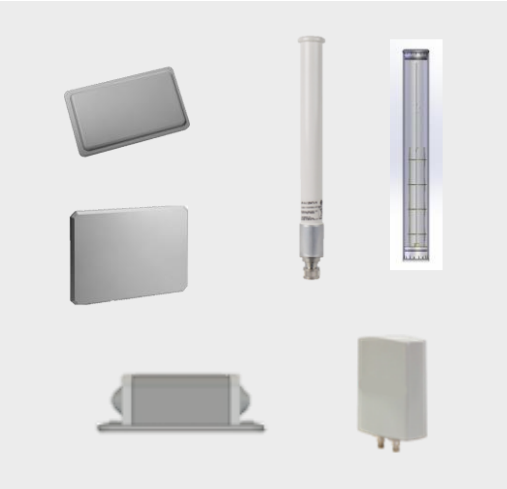
Accessories designed for easy deployment

Power Injectors and Adapters

Flexible power for any use case

Mounting Brackets

Reuse IW3702 brackets for easy drop-in field replacement



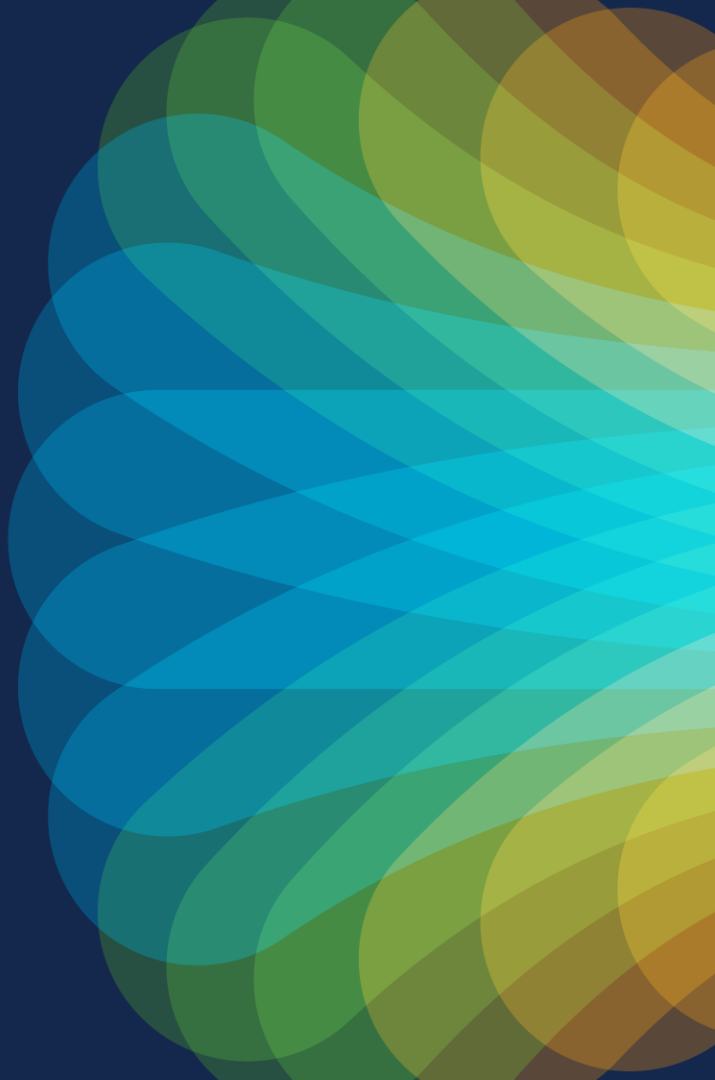
Antennas

Comprehensive antenna portfolio for maximum performance

Upcoming Sessions on CURWB & WiFi

- 8 Tips for Deploying Indoor Wireless Mobility with Cisco Industrial Wireless - BRKIOT-2601
  (Thursday, Jun 8 | 8:30 AM - 10:00 AM PDT)
- Catalyst IW9160 Family Architecture - BRKIOT-2106
  (Wednesday, Jun 7 | 10:30 AM - 11:30 AM PDT)
- Saving Energy and Money with Your Cisco Wireless Network - BRKEWN-2043
  (Tuesday, Jun 6 | 10:30 AM - 11:30 AM PDT)

Private 5G



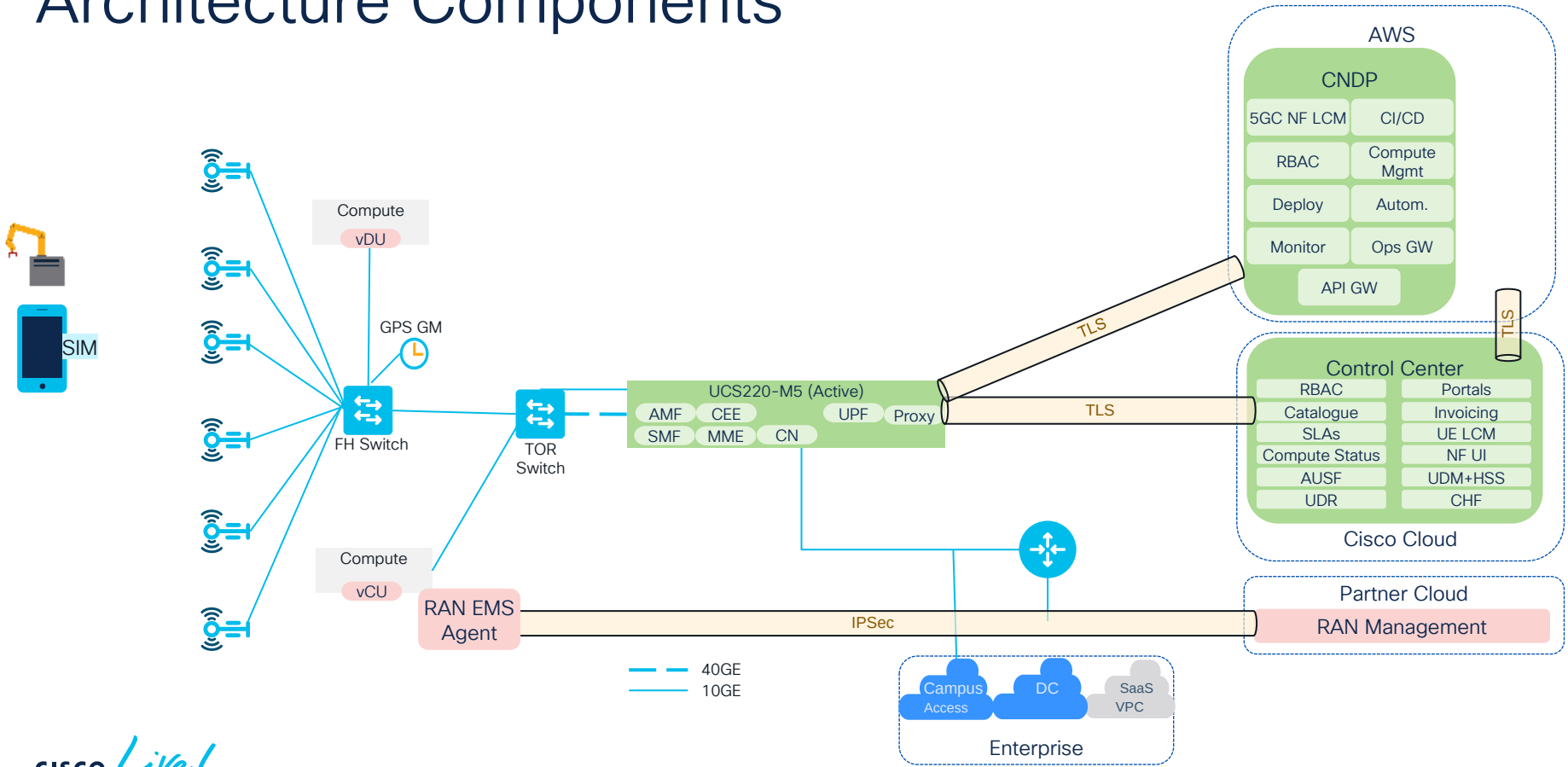
Cisco's Private5G

All the benefits of 5G without the hassle

- Easy to consume and outcome based
- Purchased as a subscription
- Open API for integration
- Leverage IOT expertise with Control Center
- Includes industry leading Network Core

Full Stack | End-to-End | Cloud Managed

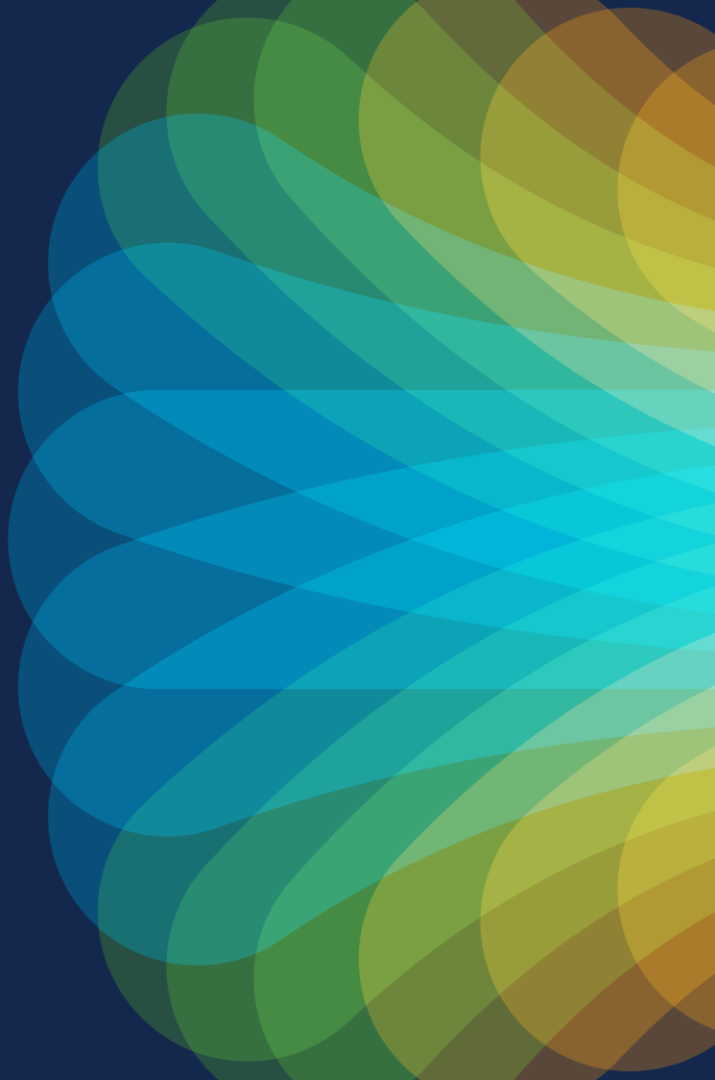
Architecture Components



Upcoming Sessions on Private 5G

- Getting Started with Private 5G – IBOSPG-2007
  (Thursday, Jun 8 1:00 PM – 2:00 PM PDT)
- WiFi6 and Private 5G for the Enterprise – a ‘Better Together’ Journey – BRKEWN-2030
  (Tuesday, Jun 6 3:00 PM – 4:30 PM PDT)

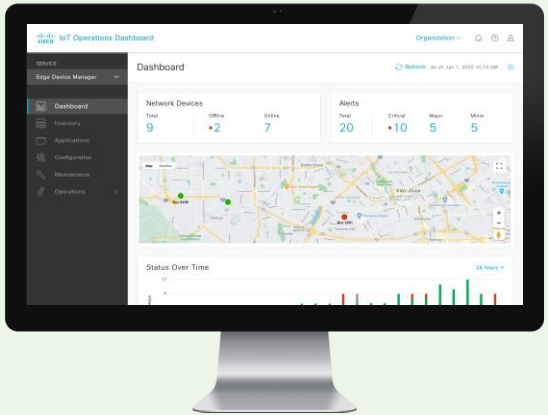
Network Management



Run connected operations at scale – your way

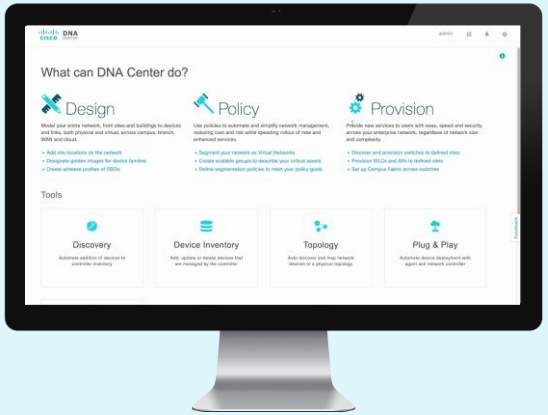
Choice of tools to meet IT and operations needs

Manage Mobile and Remote Assets



Cisco IoT Operations Dashboard

Enable IT to manage from campus the edge



Cisco DNA Center (now: Catalyst Center)
vManage for SD-WAN (now: Catalyst SD-WAN)

Best Option for Mobile Operations: Cisco IoT OD

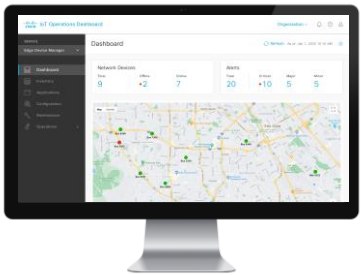
- Reverse secure connection from gateway to the Cloud
- No firewall rule required – all encrypted over FlexVPN

- Template Engine
  - Advanced: full support for all Cisco IOS-XE features
  - Quick Start: pre-made Templates, no IOS knowledge required

IoT Operations Dashboard

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

IoT Operations Dashboard



Deploy and monitor industrial networks

- Routers
- Wireless backhaul (URWB)
- LoRaWAN

Secure Equipment Access

Secure remote access to industrial assets

Cyber Vision

Visibility into asset inventories and security posture

Edge Intelligence

Collect and manage data

Industrial Asset Vision

Industrial sensors

Edge application management

Manage applications across the network

Industrial networks

Industrial routing

Wireless backhaul

LoRaWAN

Roadway intersections

Transportation

Solar panels

EV chargers

Connected signage

Wind farms

Connected machines

What is Edge Device Manager (EDM)?

Core service in Cisco IoT OD to manage industrial network configurations at scale:

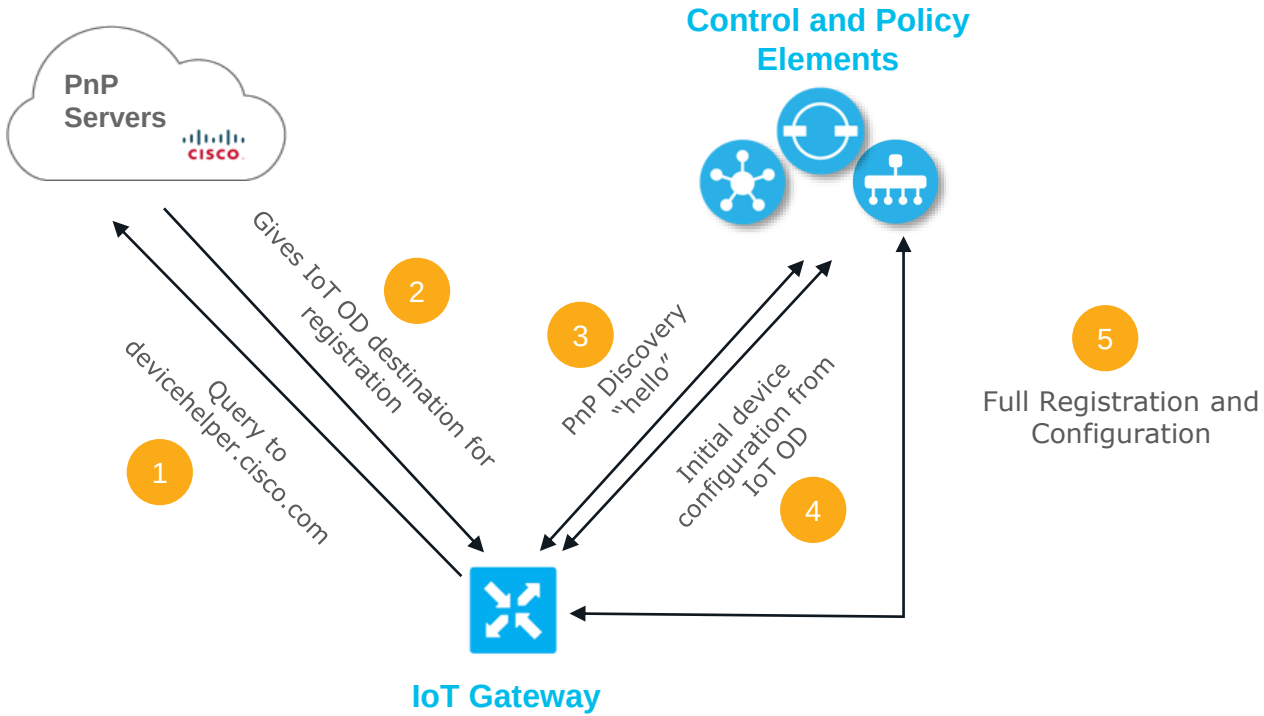
- Zero Touch Deployment (ZTD) using PnP Connect
- Configuration Management
- Visibility and Monitoring
- Troubleshooting Tools
- Software Upgrades (IOS, IOS-XE and embedded AP firmware)
- Cisco Validated Design Templates (eCVD)

Device Onboarding with PnP Connect

- Cisco cloud-based service to redirect devices to their management platform
- Leveraged by IoT OD, but also vManage and DNA-C
- Activates when the router boots without any configuration
- If pre-staging required, can be started by configuring:

```
pnp profile pnp_cco_profile
  transport https host devicehelper.cisco.com port 443
```

On Boarding Gateway with PnP



EDM Onboarding Process

Integrity of the connection is verified using Certificates.

Communication between the IoT-OD and Devices are encrypted across a VPN tunnel or secure websockets.

Cisco IoT Operations Dashboard [PnP Server + Device Manager (DM)]

Device uses CGNA to register to IoT-OD
Sends SUDI Cert

IoT-OD Authenticate Device's SUDI Cert

Device Authenticate Cloud against Cert provided by PnP

IoT-OD Sends Cloud Cert

Device request bootstrap configuration

IoT-OD PnP sends bootstrap configuration

Management VPN Tunnel established

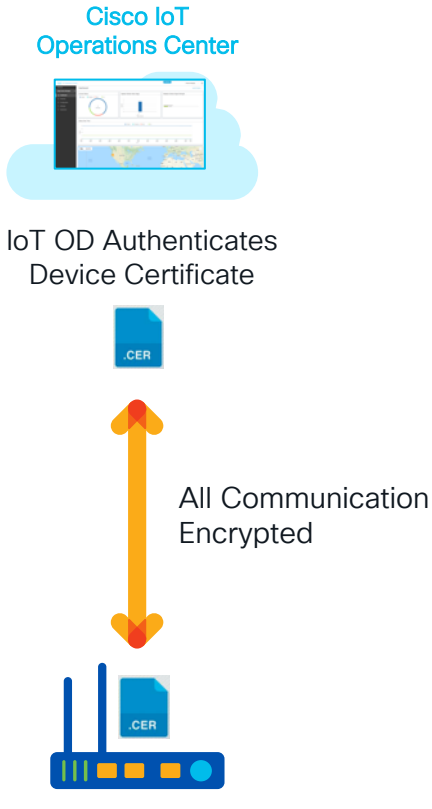
All Communication Encrypted in Management VPN Tunnel

IoT-OD DM Provides Configuration to Device

Power-On Device	PnP Discovery and Redirect	GW registers IoT-OD	Bootstrap Config pushed from IoT-OD to Device	Device Config pushed from IoT-OD	AP Config pushed from IoT-OD
~3-6 min	~2 min	~2 min	~3 min	~3 min AP Registers to IoT-OD ~3 min	~3 min

Onboarding Device Security

- Integrity of the connection is verified using Certificates.
- Gateway validates this is IoT OD by challenging a certificate received during PnP.
- IoT OD validates this is the right gateway by challenging the device SUDI crypto cert.
- Communication between IoT OD and Devices are encrypted across a VPN tunnel or secure WebSocket.



Template-based Configuration

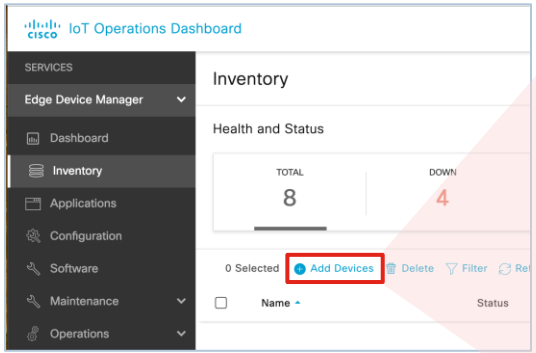
- Leveraging template language Apache FreeMarker
- Write your own configuration from scratch
- Or use Cisco-provided eCVD templates
- Examples: https://github.com/etychon/eCVD-Templates

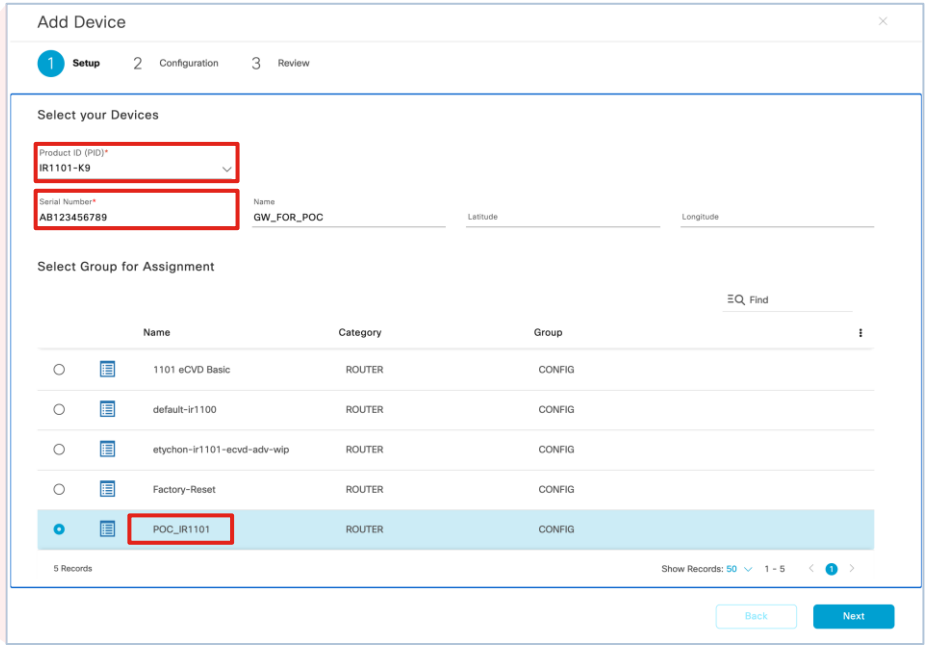
```
!
parameter-map type regex dns_bypass
pattern .*\.cisco\..*
<#if far.umbrellaDnsBypassList?has_content>
  <#list far.umbrellaDnsBypassList as patterns>
    pattern ${patterns['umbrellaDnsBypassDomain']}
  </#list>
</#if>
!
parameter-map type umbrella global
<#if UmbrellaToken?has_content>
  token ${UmbrellaToken}
</#if>

local-domain dns_bypass
dnscrypt
udp-timeout 5
!
no ip dns server
!
interface Vlan1
  ip nbar protocol-discovery
!
</#if>
```

Onboard and Power On Gateway

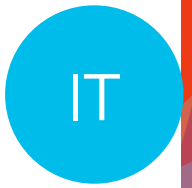
Onboard gateway to IoT OD

Add the gateway to the config group you've just made





Leverage Templates for IT/OT separation



- IT prepares a router configuration like usual
- Configuration contains all **invariable** parameters.

Base configuration:

```
interface Vlan1
  ip address 192.168.3.1 255.255.255.0
  ip nat inside
```

... but I also need to enable/disable FastEthernet1 on some gateways

Leverage Templates for IT/OT separation

IT

- **Variable** parameters are presented as options to the user
- IT uses Apache FreeMarker template language

Example:

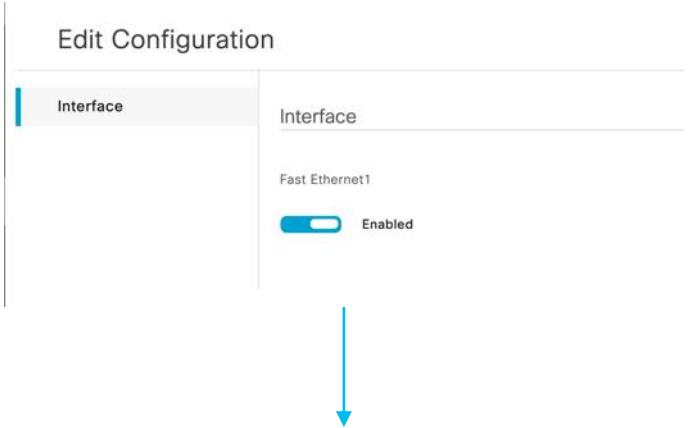
```
1  interface Vlan1
2    ip address 192.168.3.1 255.255.255.0
3    ip nat inside
4  !
5  <#assign FastEthernet1_enabled = far.fastEthernet1!"true">
6  interface FastEthernet0/0/1
7    description SUBTENDED NETWORK
8    <#if FastEthernet1_enabled != "true">
9      shutdown
10   <#else>
11     no shutdown
12   </#if>
```

Leverage Templates for IT/OT separation

OT

- OT users are only presented with parameters relevant to them
- In this case, there is only one parameter reducing the risk of error

Example:




```
interface Vlan1
  ip address 192.168.3.1 255.255.255.0
  ip nat inside

interface FastEthernet0/0/1
  description SUBTENDED NETWORK
  no shutdown
```

Fill out your session surveys!

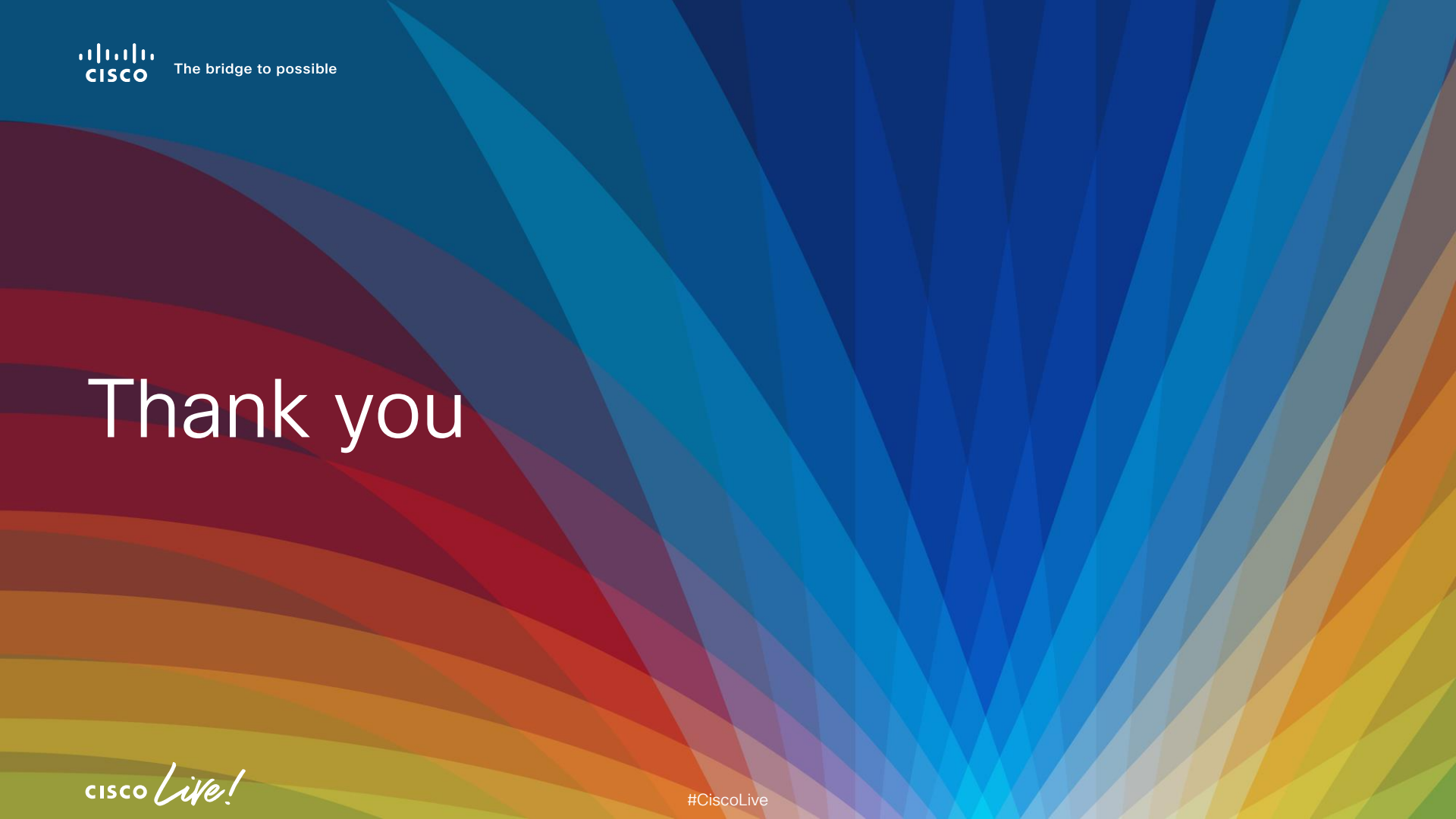
Attendees who fill out a minimum of four session surveys and the overall event survey will get **Cisco Live-branded socks** (while supplies last)!

Attendees will also earn 100 points in the **Cisco Live Challenge** for every survey completed.

These points help you get on the leaderboard and increase your chances of winning daily and grand prizes

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 www.CiscoLive.com/on-demand


cisco
The bridge to possible
Thank you
cisco Live!
#CiscoLive


cisco Live!
Let's go
#CiscoLive

Cisco Live
Challenge

Gamify your Cisco Live experience!

Get points for attending this session!

How:

1. Open the Cisco Events App.
2. Click on 'Cisco Live Challenge' in the side menu.
3. Click on View Your Badges at the top.
4. Click the + at the bottom of the screen and scan the QR code: