



Cisco Community Community Live event

All Things LTE...4G, 5G and Whatever's Next

David Roten

Technical Marketing Engineer

November 10th, 2020

News & Upcoming events



Ask Me Anything following the event

Now through Friday November 20th, 2020

With
David Roten

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David Roten
Technical Consulting Engineer

Upcoming Community Live Event

CATALYST 8500 SERIES – DEEP DIVE

November 17th, 2020

With Sumant Mali

Participate: <http://bit.ly/CLdeepdiveNov>



Cisco Community | Routing

 **NOVEMBER 17th**
Sumant Mali
Public event



 **Community Live**
Catalyst 8500 Series
Deep Dive

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The banner features a background image of two women in an office setting, one standing and one sitting at a computer. The design includes a dark blue header with the event title, a circular profile picture of Sumant Mali, and a green footer with the event name and a call-to-action button.

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A screenshot of the Cisco Community website showing the "Events Top Contributors" page. The page features a search bar, navigation tabs for "Technology & Support", "For Partners", "Customer Connection", "Events", and "Members & Recognition". Below the navigation, there is a section for "Events Top Contributors" with a description of the program and a list of contributors for the years 2014 and 2013. Contributors listed include Julio Carvajal and Ryota Takao. A small video thumbnail is also visible on the right side of the contributor list.

Cisco Designated VIPs

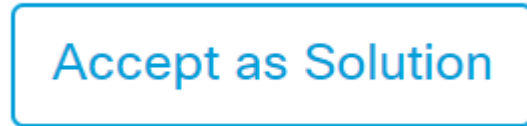
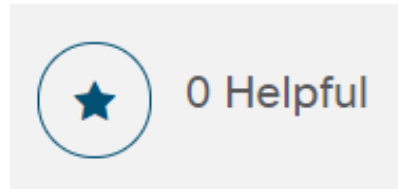


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Cisco Community Experts



David Roten
Technical Marketing Engineer

Question Manager



Kevin Gomes
Specialist Product Management

Thank You For
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Submit Your Questions Now!

Use the **Q&A** panel to submit your questions and the panel of experts will respond.

They will be answered eventually



Please take a moment to complete the survey at the end of the event



LTE, 4G, 5G and Whatever is next

David Roten
Technical Marketing Engineer
November 2020

Enterprise Routing role in LTE networking

- Enterprise routing is focused on building devices which act as clients for wireless WAN networks
- ISR 4000, ISR 1000, Catalyst 8300 and ISR 900 routers can today attach to wireless WAN networks as clients. They can also provide WiFi AP services to wireless LAN networks.
- This presentation will focus on those client technologies and use cases.
- Other Cisco business units focus on building the infrastructure to enable the wireless WAN core networks.

Agenda

- 4G and 5G cellular technology basics
- How does 5G cellular integrate with WiFi-6
- 4G and 5G use cases
- Current enterprise hardware offerings
- Antennas for LTE hardware

Polling Question 1

What is your experience with 5G networks so far?

- A. None - I'm here to learn
- B. I have 5G on my mobile phone and eager for more!
- C. I've started to explore deploying 5G for our enterprise.
- D. I've actually had my hands on 5G equipment for our enterprise.

What are these different cellular technologies?

What is the vocabulary?

- 2G
- 2.5G
- 3G
- 3.5G
- 4G LTE
- WiMax
- 5GE
- 5G
- Wifi6

- 2G
 - GSM - Global System for Mobiles
 - GPRS - General Packet Radio Service
 - EDGE - Enhanced Data for GSM Evolution

- 3G
 - UMTS - Universal Mobile Telecommunications System
 - TD-CDMA - Time Division Code Division Multiple Access
 - TD-WCDMA - Time Division Wideband Code Division Multiple Access
 - HSDPA, HSUPA, HSPA, HSPA+ - High Speed Packet Access variations
 - CDMA2000
 - OFDMA - Orthogonal frequency-division multiple access
 - EVDO rev 0, A, B and C

- 4G
 - LTE
 - 4G LTE Advanced
 - 4G LTE Advanced Pro
 - WiMax

- 5G
 - 5G Sub-6 GHz
 - 5G mm wave

- WiFi-6

WAN technology

WAN + LAN technology

LAN technology

4G Client / Consumer Vocabulary

3GPP Releases 15 and 16

3GPP Release 13
Categories **18**, 19, and 20

3GPP Releases 10, 11, 12
Categories **6**, 11, and 12



3GPP Release 8
Categories 3 and **4**

2011

↓150 Mbps
↑50 Mbps

2015

↓300 Mbps
↑51 Mbps

2018

↓1.2 Gbps
↑200 Mbps

Now

↓6.5+ Gbps

Wait, *G is supposed to be WAN tech, right?

- WiFi-6 is a wireless LAN technology
- Up to this point...
 - 4G has been a wireless WAN technology implemented by service providers using licensed frequency space
- Moving forward...
 - **5G** will be a wireless WAN technology implemented by service providers using **licensed and unlicensed (CBRS) (mm and sub-6GHz)** frequency space
 - **5G** will be a wireless LAN technology implemented by enterprises using **unlicensed frequency space (CBRS) in millimeter wavelengths**

How does 5G improve on 4G?



- Lower latency
 - An order of magnitude reduction
 - 4G – 30 to 50 milliseconds
 - 5G – less than 10 milliseconds



- Higher speeds
 - 4G – Near 1 Gbps theoretically
 - 5G – 5+ Gbps theoretically



- Higher density
 - More subscribers supported per cell
 - Less degradation of performance with higher user density

How does 5G improve on 4G? More!

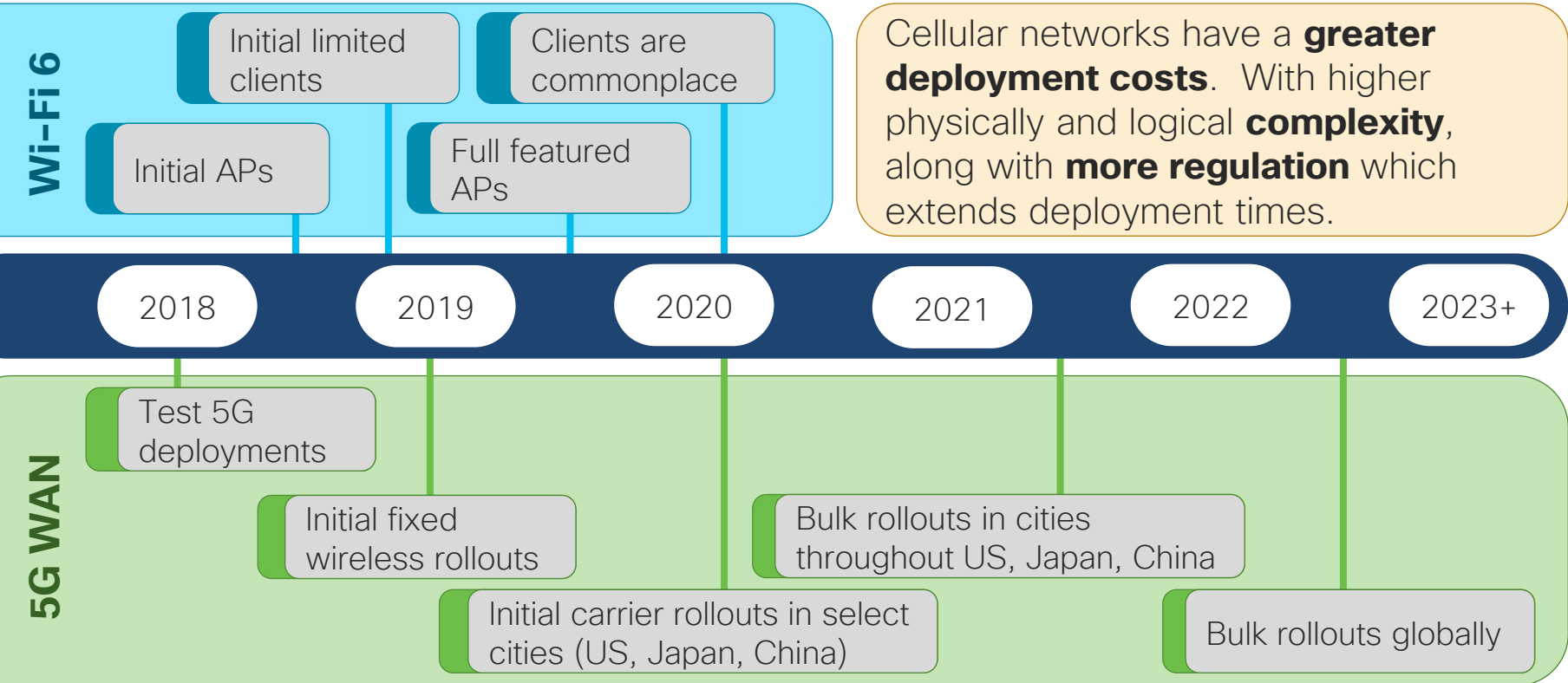


- Expansion of supported radio frequencies
 - Traditional frequency space
 - Sub 6 GHz overlaps with traditionally used by 4G LTE network frequencies
 - CBRS - Citizens Broadband Radio Service (aka band n48, 3.55 to 3.7 GHz range, unregulated) **+ LAN opportunities**
 - mmWave - 24 GHz to 28 GHz
 - upward expansion past 100 GHz
 - Includes regulated and unregulated bands **+ LAN opportunities**
- New generation of radio - 5G NR

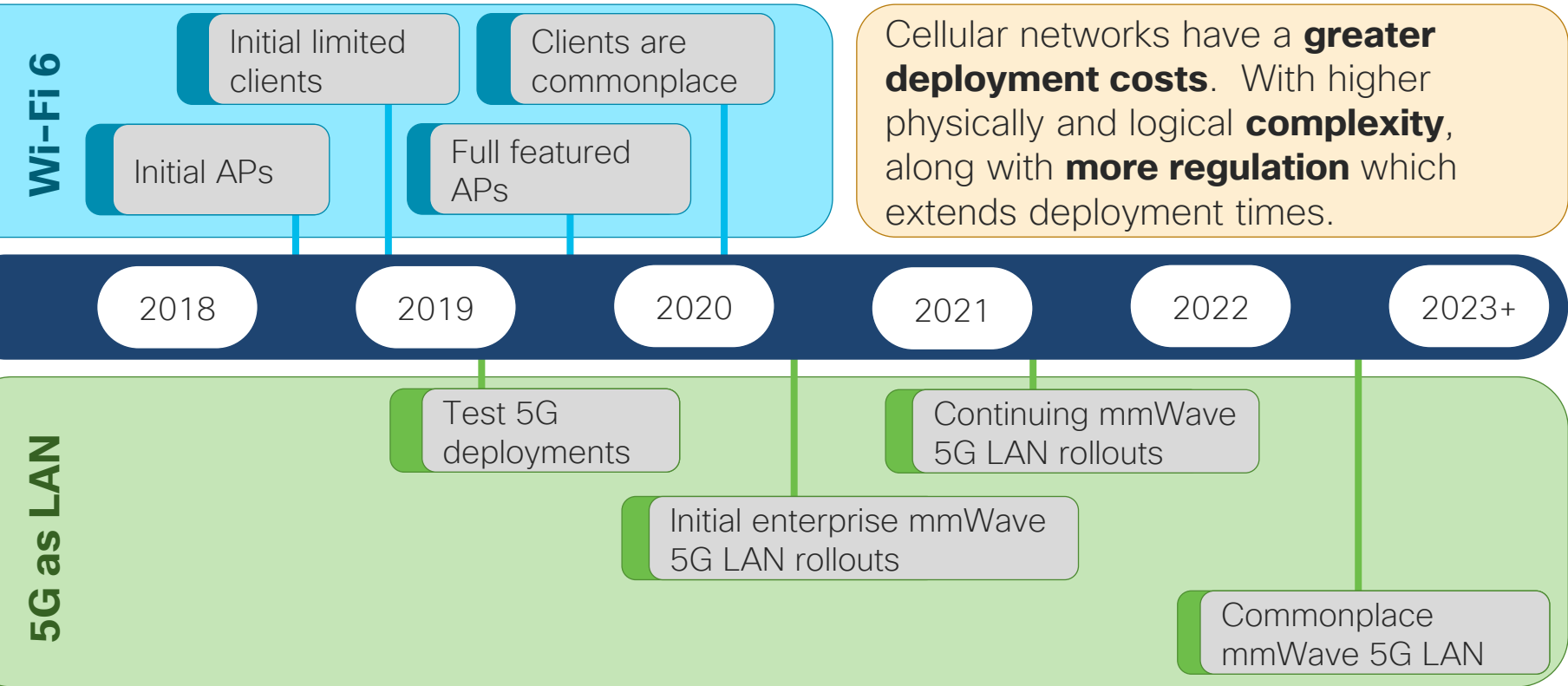
So what can each of these frequencies accomplish?

Radio Access Technology	Frequency range	Antenna Max Length	Building Penetration	Channel Bandwidth	Download Upload *
Sub 3 GHz	700 MHz – 2.6 GHz	125 ft at < 2GHz	Good while under 2 GHz	5 – 20 MHz	100 – 500 Mbps 10 – 100 Mbps
ISM 2.4GHz	2.4 GHz	75 ft	Fair	10 - 40 MHz Shared	50 – 1000 Mbps 10 – 200 Mbps
CBRS	3.5 GHz – 3.7 GHz	50 ft	Limited	5 – 20 MHz Shared	10 – 300 Mbps 5 – 50 Mbps
ISM 5GHz	5.2 GHz – 5.8 GHz	25 ft	Poor	20 – 100 MHz Shared	50 – 1000 Mbps 10 – 200 Mbps
Mm Wave (5G Only)	24 GHz – 28 GHz	< 2 ft	Very Poor	400 MHz	0.5 – 10 Gbps 0.1 – 5 Gbps

Mainstreaming of each technology



Mainstreaming of each technology



How does 5G cellular fit in
with WiFi-6?

Wi-Fi 6 or 5G...or both?

- Wi-Fi 6 and 5 G are complementary technologies that will extend the reach and use of wireless technology. **Cisco is invested in both of these technologies.**
- Cisco has you covered. We partner with the leading device and service providers for both technologies to **offer unrivaled value and integration into a single solution stack: Cisco DNA**
- For the interior portions of enterprise campus and branch deployments, **Wi-Fi 6 will remain the favored technology**. It provides the essential security and control necessary to support mission critical connectivity. Initially, **5G will be the focus for wireless WAN connectivity** and then infiltrate interior spaces over time.

5G versus Wi-Fi 6 as LAN



Today – complementary technologies
Service Provider – Enterprise

Future – Integrated with common
management and enhanced user
and device experience



5G NR
4G CBRS

Uncarpeted
spaces



Carpeted spaces

WiFi 6



Campus, stadium, auditorium,
outdoor industrial areas



4G to 5G Comparison

Technology /Feature	5G	4G	WiFi
Cost	Higher		Lower
Environment	Generally outdoors, can use indoors, supports mesh		Generally indoors, can use outdoors, supports mesh
Roaming/ Reach	Ubiquitous outdoors. May be limited indoors. Allows roaming.	Ubiquitous outdoors. Usually available indoors. Allows roaming .	Roaming will be spotty (hot spots only)
Complexity	Higher		Lower
Robustness	Excellent Slicing , DNNs, AAA, RF usage & control +++	Good APNs, AAA, RF usage & control +	Good (improved with WiFi6)
RF Licensing	Licensed and unlicensed	Licensed and unlicensed	Unlicensed

4G and 5G use cases

4G / 5G use cases for enterprise networking



5G Enhanced Mobile Broadband

Better connectivity and performance for mobile devices.

- Incredibly fast access even in high density environments
- 4K, virtual reality, 3D enhanced video



Fixed Wireless Access – today with 4G

5G Brings higher speeds and density

Low cost alternative to wireline broadband

- Quick to deploy even in challenging environments
- Speeds not possible with existing wired infrastructure



Critical Services



Smart Cities

5G

IOT deployments with high reliability, low latency, very high density

Wireless fixed access (SD-WAN)

Supplementary fixed wireless



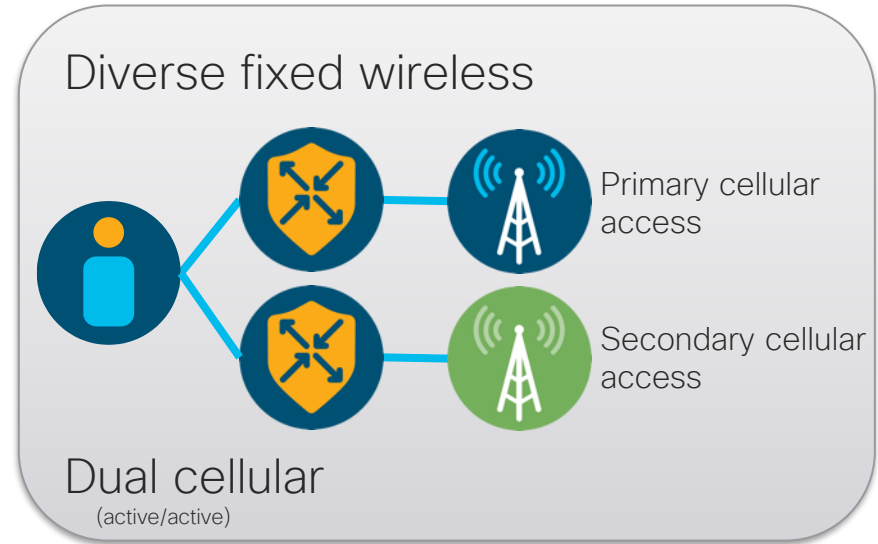
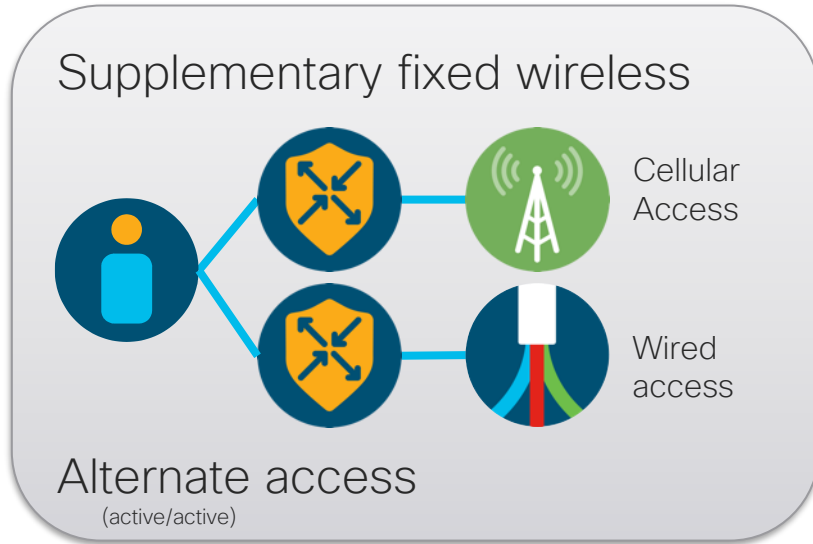
Alternate access
(active/active)

Diverse fixed wireless

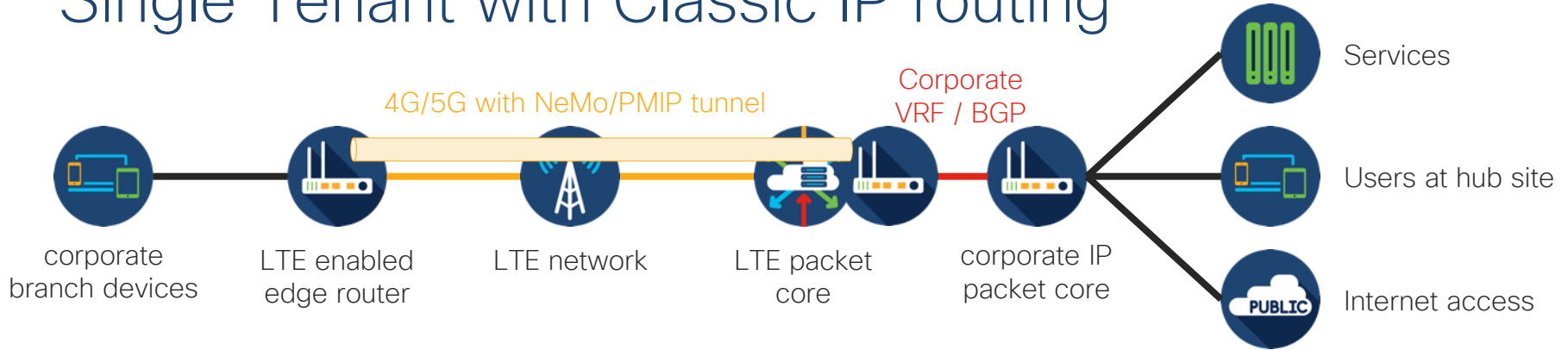


Dual cellular
(active/active)

Wireless fixed access (SD-WAN enhanced HA)

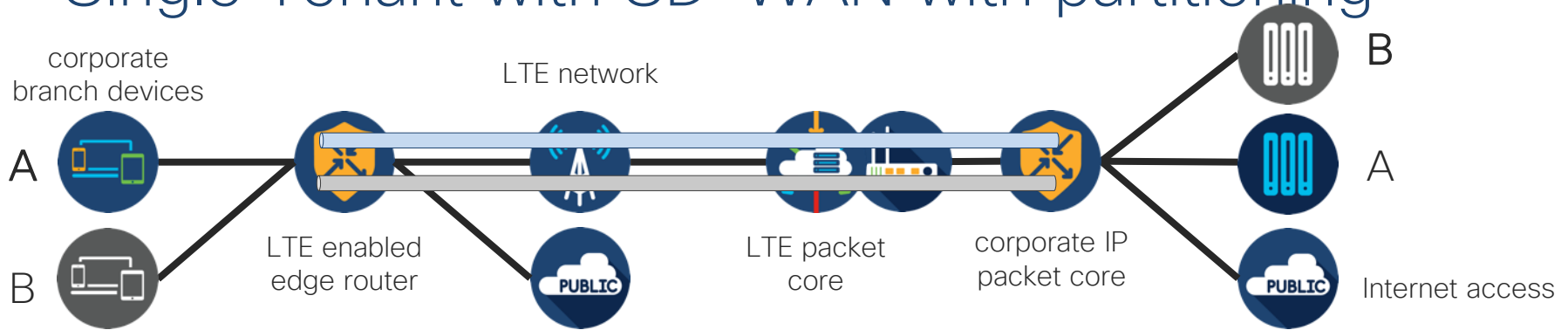


Single Tenant with Classic IP routing



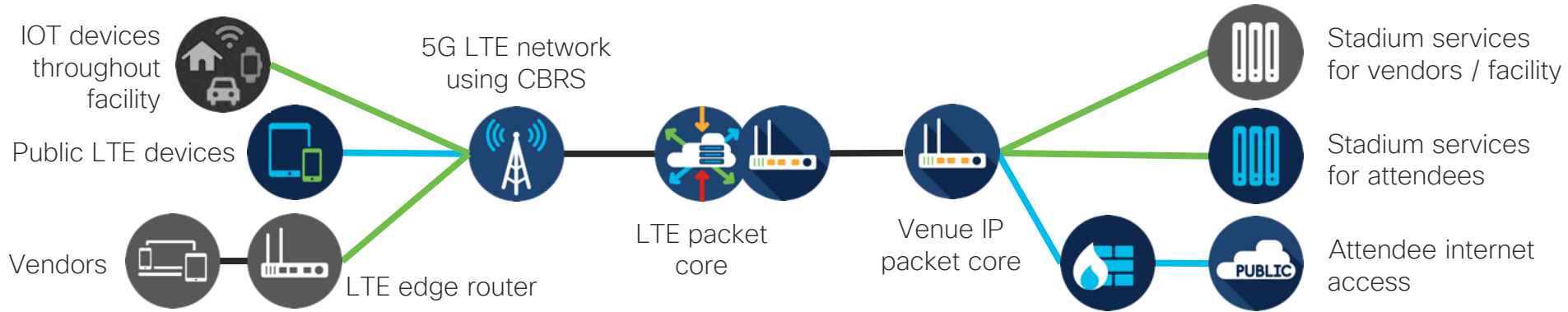
- Classic IP routing (non-SDWAN)
- Corporate has control of address space at branch
- All tunneling done by the service provider
- Encryption with GETVPN or targeted tunnels are possible

Single Tenant with SD-WAN with partitioning



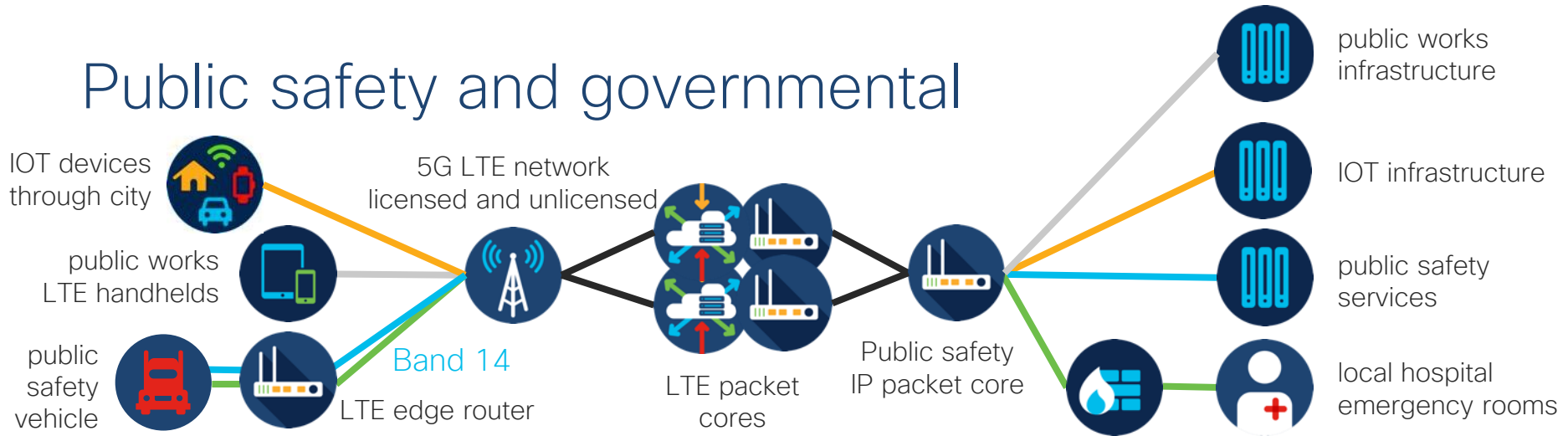
- SDWAN overlay over public or private APN/DDN slice from service provider underlay
- Customer can use VxLAN, SGT, VRFs, VPNs, etc. to partition traffic
- All expected SD-WAN feature functionality is available

Stadium venue



- High density of devices with full stadium with high bandwidth needs
- 5G network supports the necessary bandwidth and density using unlicensed spectrum
- Open space supports mmWave frequencies
- IOT devices and vendors supported on the same radio network, partitioned using 5G slices

Public safety and governmental



- High diversity of device types connecting to SP and public sector provided LTE networks
- Band 14 guarantees public safety access to wireless bandwidth during crisis situations
- Dual SIM devices could switch between enterprise and SP networks
- Multiple secure networks supported on the same radio network, partitioned using 5G slices

Polling Question 2

Which use case most speaks to what you are looking for?

- A. I want to take advantage of a service provider's 5G network.
- B. I want to deploy a 5G network for my enterprise for our internal use.
- C. I want to deploy a 5G network for use by others outside my company.

Current hardware offerings

LTE Categories

Category	Label	Max Downstream Mb/s	Max Upstream Mb/s	Max download MIMO layers	3GPP Release
CAT4	LTE	150	51	2	Release 8
CAT6	LTE Advanced	301	51	2 or 4	Release 10
CAT18	LTE Advanced Pro	1174	200	2, 4, or 8	Release 13
Future	5G				Release 15+

Cisco Wireless WAN Current Offerings

Embedded LTE Platforms

ISR 1000



- Up to 350 Mbps
- Cisco SD-WAN
- 802.11AC WiFi
- Embedded Cat 6 LTE options
- PIM module supports Cat 4, 6, and 18 LTE

ISR 900



- Up to 250 Mbps
- Embedded Cat 4 LTE options

vEdge 100



- Up to 100 Mbps
- Cisco SD-WAN
- Wireless LAN
- Embedded Cat 4 LTE options

Cisco Wireless WAN Current Offerings

Platforms Supporting LTE Modules

ISR 4000



- Up to 3 Gbps
- Cisco SD-WAN
- WAN and voice modules
- Compute with UCS-E modules
- NIM module supports Cat 4 and 6 LTE

ISR 1000



- Up to 350 Mbps
- Cisco SD-WAN
- 802.11AC WiFi
- Embedded Cat 6 LTE options
- PIM module supports Cat 4, 6, and 18 LTE

LTE Modules / Pluggables / Dongle

NIM-4G-LTE



- Category 4
- 100 Mbps down
- 50 Mbps up

NIM-LTEA



- Category 6
- 300 Mbps down
- 50 Mbps up

D-LTE



- Category 4
- 75 Mbps down
- 50 Mbps up

P-LTE



- Category 4
- 150 Mbps down
- 50 Mbps up

P-LTEA



- Category 6
- 300 Mbps down
- 50 Mbps up

P-LTEAP18



- Category 18
- 1.2 Gbps down
- 150 Mbps up

Cisco Wireless WAN Current Offerings

Cellular Gateway



- Remote radio placement
- Connection via Ethernet
- Flexibility for client devices

LTE modules for the ISR4000 series



Cat4 – NIM-LTE

CAT 4 LTE

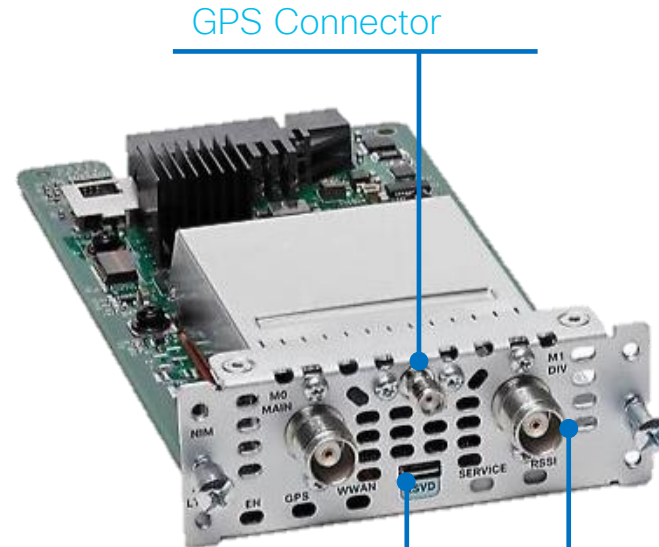
Mini SIM

100 / 50 Mbps

Supported on
ISR 4000
platforms with
NIM slot

SD-WAN support

Modem Types	Region	Bands
NIM-4G-LTE-GA	Europe Australia	1, 3, 7, 8, 20
NIM-4G-LTE-VZ	US - Verizon	4, 13
NIM-4G-LTE-ST	US - Sprint	25
NIM-4G-LTE-NA	US - ATT Canada	2, 5, 4, 17



GPS Connector

Micro USB Modem Debug

- Micro USB access for modem diagnostics

Main and diversity antennas

- RX / TX antennas with SMA connectors

Cat4 - NIM-LTE



- Pluggable NIM module for ISR 4000 series routers
- Single mini SIM , single radio
- Sierra Wireless MC73xx Wireless modem, specific firmware varies depending on geography
- TNC connectors for antennas
- GPS support

Cat6 – NIM-LTEA

CAT 6 LTE

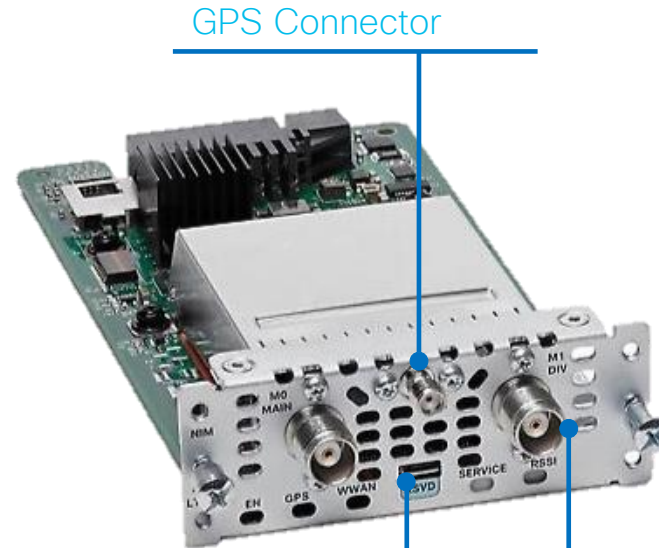
Dual Micro SIM

300 / 50 Mbps

Supported on
ISR 4000
platforms with
NIM slot

SD-WAN support

Modem Types	Region	Bands
NIM-LTEA-EA	Europe North America Middle East	1, 2, 3, 4, 5, 7, 8, 12, 13, 20, 25, 26, 29, 30, 41
NIM-LTEA-LA	Australia, China, Japan, India, South Korea, Southeast Asia, Latin America	1, 3, 5, 7, 8, 18, 19, 21, 28, 38, 39, 40, 41



Micro USB Modem Debug

- Micro USB access for modem diagnostics

Main and diversity antennas

- RX / TX antennas with SMA connectors

Cat6 - NIM-LTEA



- Pluggable NIM module for ISR 4000 series routers
- Single mini SIM , single radio
- Sierra Wireless MC74xx Wireless modem, specific firmware varies depending on geography
- TNC connectors for antennas

LTE for the ISR1100 and C8300 series



Cat4/6 - C1100 built in LTE

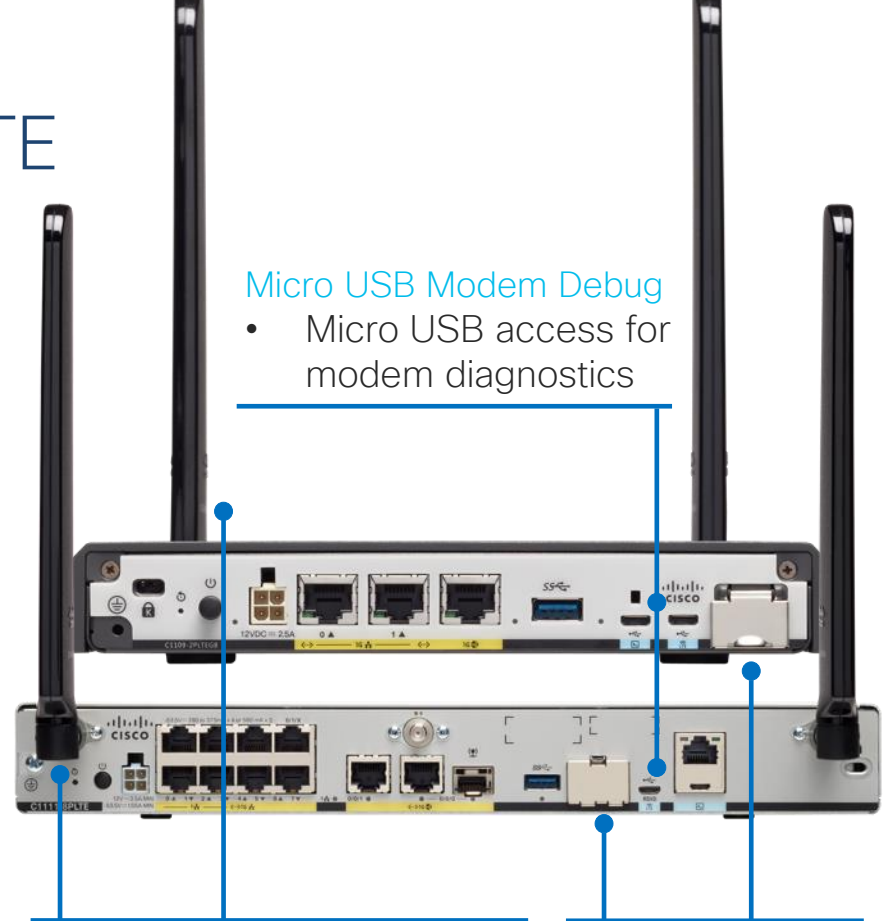
CAT 6 LTE
CAT 4 LTE

Dual Micro SIM

300 / 50 Mbps
150 / 50 Mbps

SD-WAN support

	Platform	Region	Bands
Cat 4	ISR1109 - VZ	Verizon	4, 13
	ISR1109 - US	AT&T, T-Mobile	2, 4, 5, 12, 17
	ISR1109 - GB	Europe	1, 3, 7, 8, 20, 28
Cat 6	ISR111x LTENA	Europe North America Middle East	1, 2, 3, 4, 5, 7, 12, 13, 20, 25, 26, 29, 30, 41
	ISR111x LTELA	Latin America Asia	1, 3, 5, 7, 8, 18, 19, 21, 28, 38, 39, 40, 41



Micro USB Modem Debug

- Micro USB access for modem diagnostics

Main antennas

- Primary RX / TX antennas with TNC connectors

Dual SIM cards

Cat4/6 – C1100 built in LTE



- Integrated LTE modem in router, not modular
- Dual micro SIM , single radio
- TNC connectors for antennas
- GPS support

Cat 4 - D-LTE

CAT 4 LTE

Single Micro SIM

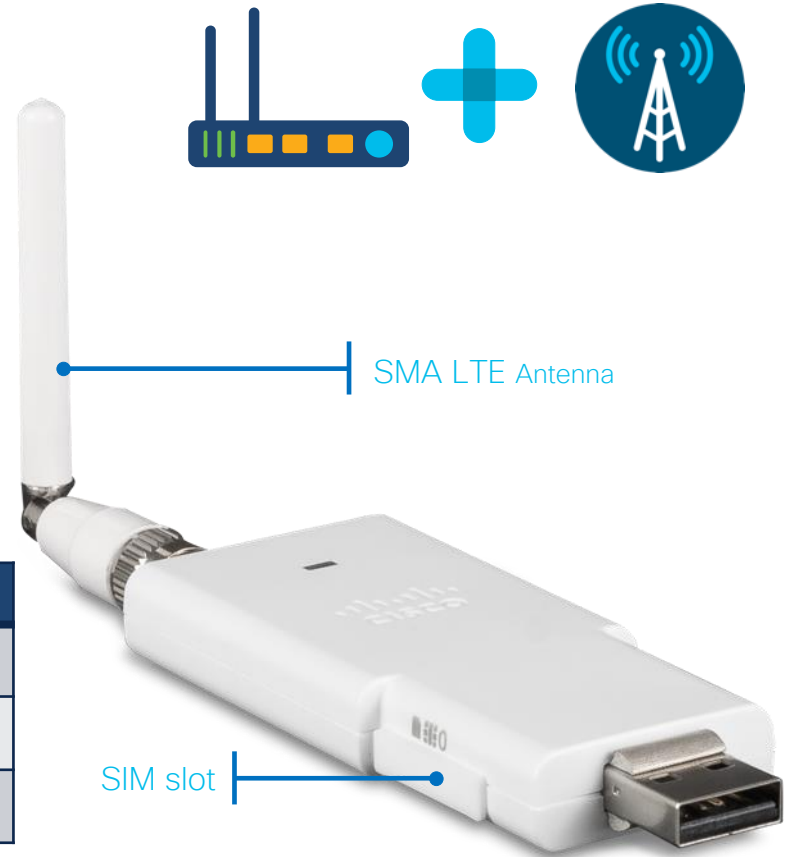
75 / 50 Mbps

Supported on
ISR1000 only *

SD-WAN support
on roadmap

*selected platforms only

Modem Types	Region	Bands
D-LTE-GB	Global	1, 3, 7, 8, 20, 28
D-LTE-AS	ASEAN	1, 3, 5, 8, 40, 41
D-LTE-NA	North America	2, 4, 5, 12, 13, 14, 17



Cat 4 - D-LTE



- **Budget LTE dongle** that can be used with certain platforms with external USB interface
- **Single micro SIM , single radio**
- Sierra Wireless WP76xx modem, firmware depends on geography
- Easy to install SMA connector for antenna, included with base unit
- Alternative SMA connected antennas also usable
- Only one D-LTE dongle per router is supported
- No GPS support

Cat4 - P-LTE

CAT 4 LTE

Dual Micro SIM

150 / 50 Mbps

Supported all
ISR1100 platforms
with PIM slot

SD-WAN support

Modem Types	Region	Bands
P-LTE-VZ	US Verizon	4, 13
P-LTE-US	US AT&T / T-Mobile	2, 4, 5, 12, 17
P-LTE-GB	Europe	1, 3, 7, 8, 20, 28



GPS connector

Micro USB Modem Debug

- Micro USB access for modem diagnostics

Main antennas

- Primary RX / TX antennas with SMA connectors

Cat4 - P-LTE



- Pluggable PIM module for ISR 1000 series routers
- Dual micro SIM , single radio
- Sierra Wireless WP76xx wireless modem, specific firmware varies depending on geography
- SMA connectors for antennas
- GPS support

Cat6 - P-LTEA

CAT 6 LTE

Dual Micro SIM

300 / 50 Mbps

Supported all
ISR1100 and
C8300 platforms
with PIM slot

SD-WAN support

Modem Types	Region	Bands
D-LTE-EA	Europe North America Middle East	1, 2, 3, 4, 5, 7, 12, 13, 20, 25, 26, 29, 30, 41
D-LTE-LA	Latin America Asia	1, 3, 5, 7, 8, 18, 19, 21, 28, 38, 39, 40, 41



GPS connector

Micro USB Modem Debug

- Micro USB access for modem diagnostics

Main antennas

- Primary RX / TX antennas with SMA connectors

Cat6 - P-LTEA



- Pluggable PIM module for ISR 1000 series routers
- Dual micro SIM , single radio
- Sierra Wireless MC74xx Wireless modem, specific firmware varies depending on geography
- SMA connectors for antennas
- GPS support

Cat18 - P-LTEAP18-GL

CAT 18 LTE

Dual Micro SIM

1200 / 150 Mbps

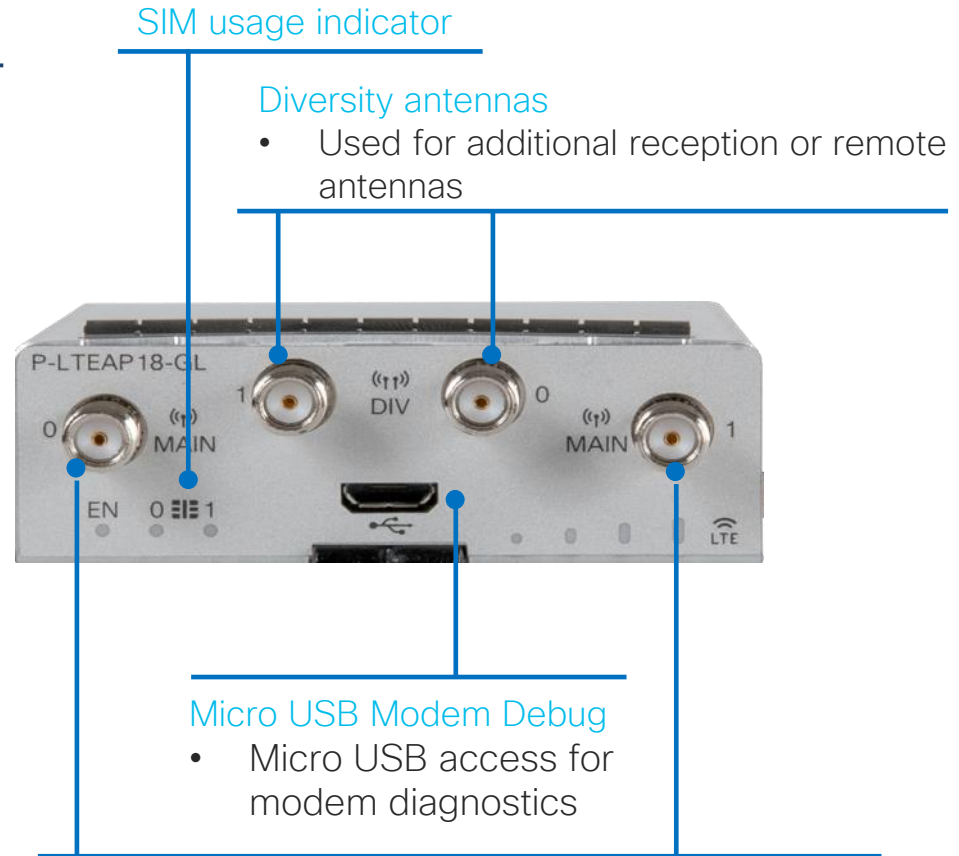
Supported on
ISR112x, ISR116x,
and C8300
platforms

SD-WAN support

PID	Modem	Region	LTE Bands
P-LTEAP 18-GL	Telit Wireless	Global	1, 2, 3, 4, 5, 7, 8, 12, 13, 14*, 17, 18, 19, 20, 25, 26, 28, 29, 30, 32, 38, 39, 40, 41, 42, 43, 46, 48**, 66, 71

* Support for LTE band dedicated for use by emergency services

** CBRS support



Cat18 - P-LTEAP18-GL



- Pluggable PIM module for selected ISR 1000 series routers
- LTE Category 18, with fallback to 4G / 3G
- Dual micro SIM , single radio
- Telit LM960A18 Wireless modem, specific firmware varies depending on geography
- SMA connectors for antennas
- No GPS support

P-LTEAP18-GL Supported ISR1000 platforms



- C1121
 - C1121-4PLTEP
 - C1121-4PLTEPW_y
 - C1121-8PLTEP
 - C1121-8PLTEPW_y
 - C1121X-8PLTEP
 - C1121X-8PLTEPW_y
- C1126
 - C1126-8PLTEP
 - C1126X-8PLTEP
- C1127
 - C1127-8PLTEP
 - C1127-8PMLTEP
 - C1127X-8PLTEP
 - C1127X-8PMLTEP
- C1128
 - C1128-8PLTEP
- C1160
 - C1161-8PLTEP
 - C1161X-8PLTEP

Where:

_y=B,E,Q,Z

Cisco Catalyst Cellular Gateway

Flexibility & Simplicity Redefined for Multigigabit Wireless WAN

Giga-Bit Class Cellular

LTE/CAT18 Speeds
Dual SIM

SD-WAN Ready

Automation, Assurance
API Support

Secure by Design

Trustworthy Solutions
Failure Recovery

Operational Resiliency

Out-of-band management
IP Passthrough using Single PDN



High-speed Failover or
Primary Cellular WAN

Precision Placement for
Better Coverage

PoE or External
Power Source

CG418-E hardware

Management

- Serial console
- optional micro-USB for debug
- Reset switch

SIMs

- 2 micro-SIM cards



Ethernet

- mGig 2.5G ethernet link to the host
- optional PoE+ power



Radios and GPS

- SMA connector for GPS
- 4 SMA's for 4x4 antennas

CG418-E Vitals

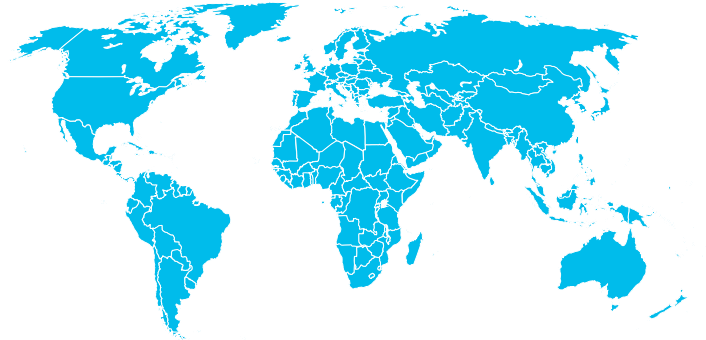


- Remotely deployed, ethernet attached CAT18 device that can be used to access quality LTE signal when router is deployed in RF impaired area
- LTE Category 18 , with fallback to Cat12 and Cat 6
- 4x4 MIMO antenna with SMA connectors and one GPS connection
- 1.2 Gb/sec ↓ / 150 Mb/sec ↑ maximum throughput
- Dual micro SIM , single radio
- Telit Wireless LM960A18 series modem

Available models

PID	Modem	Region	LTE Bands
CG418-E	Telit Wireless LM960A18	Global	FDD: 1, 2, 3, 4, 5, 7, 8, 9, 12, 13, 14, 17, 18, 19, 20, 28, 29, 30, 66, 71 TDD: 38, 39, 40, 41, 42, 46, 48 3G: 1, 2, 4, 5, 8, 19

PID	SD-WAN support Deploy and manage	Traditional routing GUI and CLI management
CG418-E	IOS XE 17.4.1	IOS XE 17.3.1



Only DHCP and SSH clients are required for standalone deployments.

Supported ISR platforms



- With **integrated** GUI management

Using IOS XE 17.3.1 or newer
Traditional and **SD-WAN** deployments

- All ISR 1000 models
- All ISR 4000 models
- All Catalyst 8300 models

Using IOS XE 17.4.1 (targeted) or newer
SD-WAN deployments

- All ISR 1000 models
- All ISR 4000 models
- All Catalyst 8300 models

- With **no** GUI management

No software version requirement for attached device.

- All ENCS models
- All ASR 1000 models
- All vEdge hardware
- Any Cisco router
- Any 3rd party router supporting DHCP client on ethernet
- Any 3rd party device with SSH client for management

Basic required configuration on client device

```
ipv6 unicast-routing
!  
interface GigabitEthernet0/0/1  
  ip mtu 1428  
  ip address dhcp  
  negotiation auto  
  ipv6 mtu 1428  
  ipv6 address autoconfig default  
  ipv6 enable  
  ipv6 dhcp client request vendor
```

Commands in **blue** are the minimum requirement for IPv4 DHCP client.

Commands in **green** are the minimum for IPv6 client.

MTU values may vary depending on service provider's network requirements.

Polling Question 3

What are the two primary requirements to deploy Cellular Gateway? (chose two)

- A. DHCP client
- B. NTP client
- C. PoE switching infrastructure
- D. SSH client
- E. Reverse Path Forwarding detection

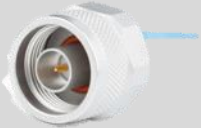
Antennas for LTE hardware



Connector type summary

	Connector Type
ISR4000 - NIM	TNC
ISR1000 - PIM Cellular Gateway	SMA
ISR1000 - Integrated	TNC
ISR 900 - Integrated	SMA

N






SMA



TNC






Antenna Portfolio

Description	Part Number	Connector type	Use Cases	Picture
Multi-Band Swivel Mount Dipole Antenna-Faceplate Mount	LTE-ANTM-D LTE-ANTM-D=	TNC	Default antennas, attached directly to router antenna ports when there is good LTE signal, or clear line of sight.	
Multi-Band Swivel Mount Dipole Antenna-Faceplate Mount SMA	LTE-ANTM2-SMA-D LTE-ANTM2-SMA-D=	SMA	Default antennas, attached directly to router antenna ports when there is good LTE signal, or clear line of sight.	
Multi-Band Omnidirectional Antenna-Ceiling Mount	4G-ANTM-OM-CM 4G-ANTM-OM-CM=	TNC	* Single Antenna * Indoor ceiling mount	



Antenna Portfolio

Lightning arrestors should be ordered separately.

Description	Part Number	Connector type	Use Cases	Picture
Multiband Omni-Directional Stick Outdoor 4G Antenna	ANT-4G-OMNI-OUT-N	N	Omni directional pole mounted antenna Mounted above roof line to maximize signal strength	
Multiband Low-Profile Saucer Outdoor 4G Antenna	ANT-4G-SR-OUT-TNC	TNC	Single Outdoor Antenna	
Multiband Panel Outdoor 4G Antenna	ANT-4G-PNL-OUT-N	N	Outdoor directional antenna with 110-degree beam For rural areas or locations where extended reach is required	

Antenna Portfolio

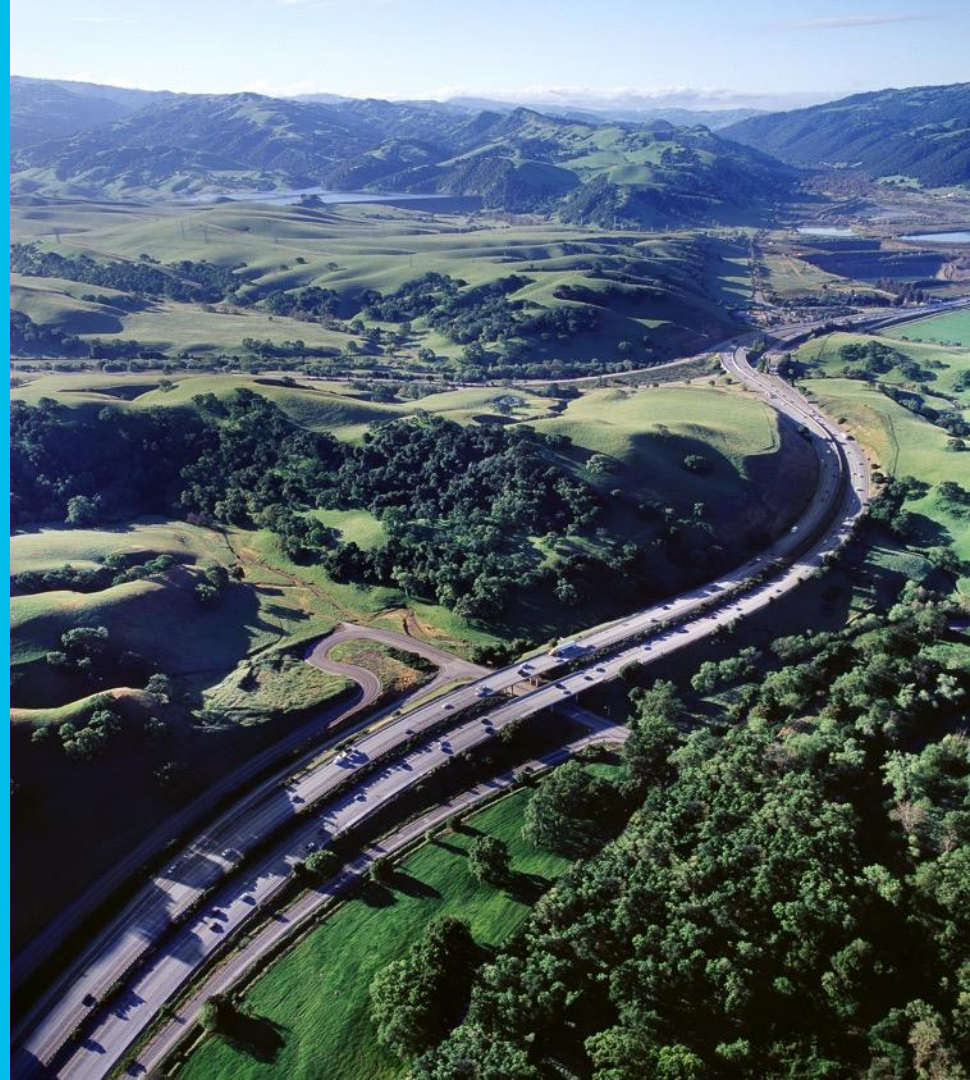
Lightning arrestors should be ordered separately.

Description	Part Number	Connector type	Use Cases	Picture
Indoor/outdoor low profile with 3-in-1 antenna harness	4G-LTE-ANTM-O-3-W= 4G-LTE-ANTM-O-3-B= 4G-LTE-ANTM-O-3-R= 4G-LTE-ANTM-O-3-C=	SMA	Mounted on vehicle, kiosk, ATM, etc. MIMO 3:1 (two LTE + GPS) Single water tight enclosure	
Dual LTE indoor Ceiling Mount antenna	LTE-ANTM-I-2-W	TNC	Indoor ceiling mount for retail, eased office space, etc. Optimized dual LTE Antenna	




Other antenna models available for specific use cases.

<https://www.cisco.com/c/en/us/td/docs/routers/connectedgrid/antennas/installing-combined/industrial-routers-and-industrial-wireless-antenna-guide/Antenna-Selection.html>

In conclusion



In conclusion

-  LTE connectivity is quickly evolving
-  LTE will bring a torrent of new possibilities
 - Hardware
 - Network design
 - Software requirements
- WiFi-6 will make room and be a good companion as mmWave 5G matures
- Cisco Enterprise networking is well positioned to allow current and future networking solutions to fully utilize what  LTE makes possible

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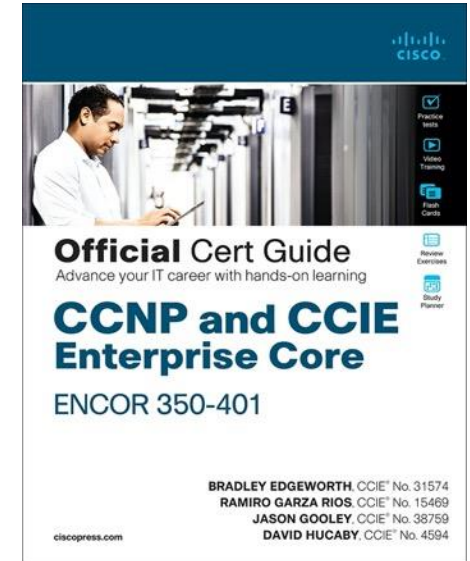
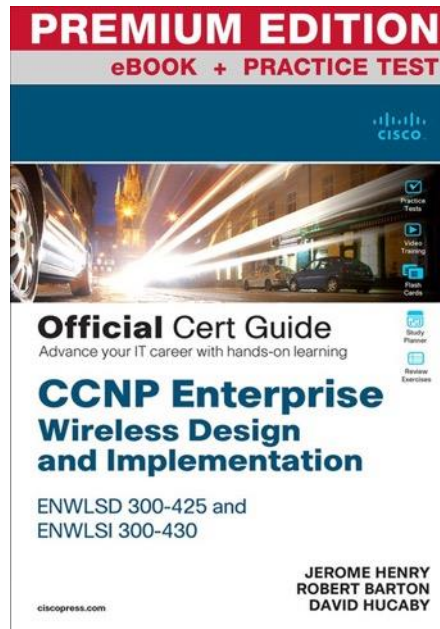
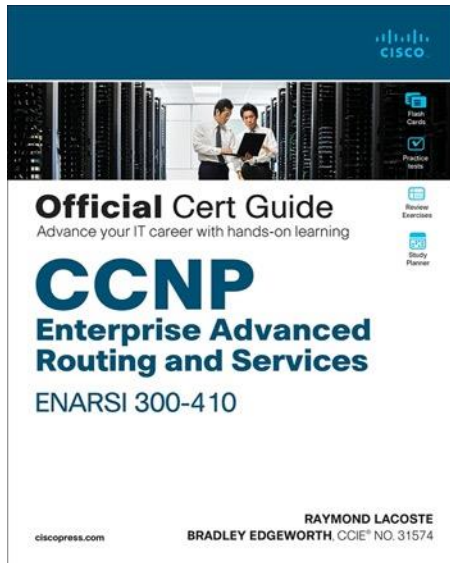
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