Our pathway to 5G SDWAN

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4G versus 5G
What's all the fuss about?

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

- 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 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 – 5GNR

Sub-6 GHz PIM module
P-5GS6-GL

5G Sub-6 GHz module

Sub 6GHz 5G CAT 20 LTE

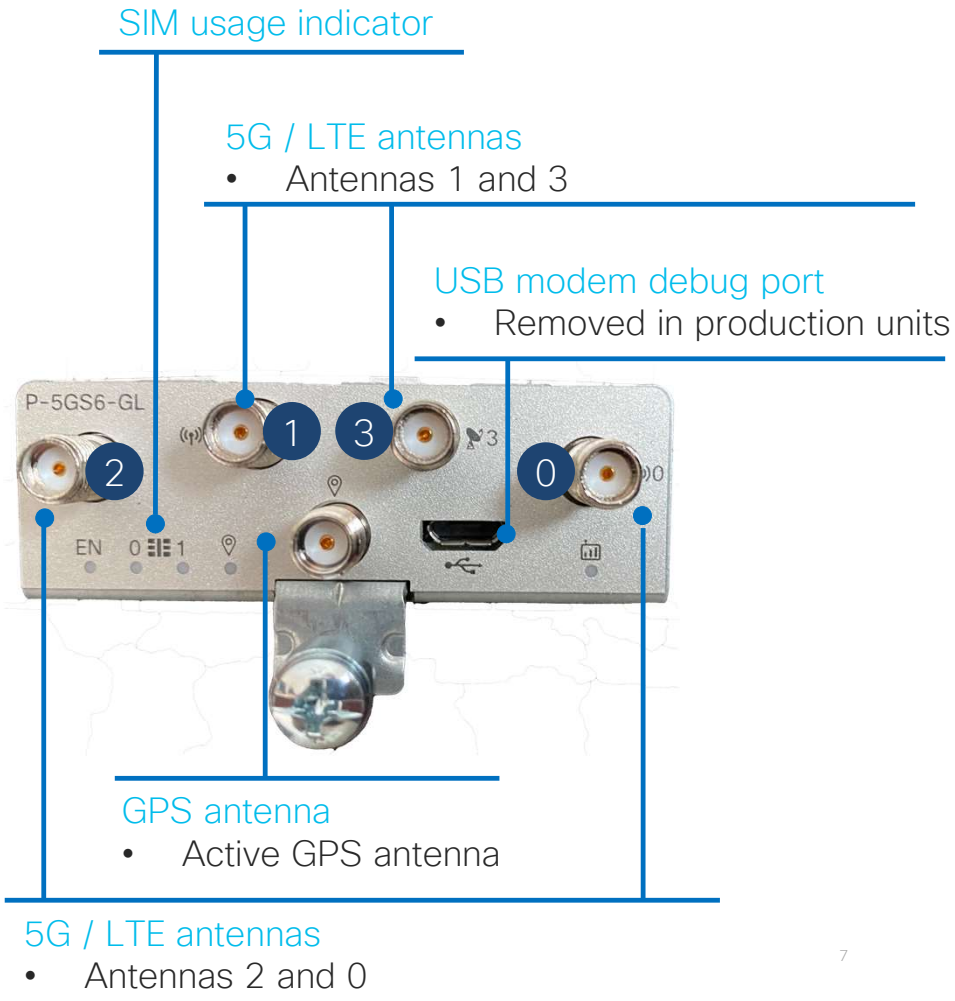
Dual Micro SIM

3.3 ↓ Gbps
400 ↑ Mbps

Supported for 8200 & 8300 platforms

SD-WAN support

PID	Modem	Region
P-5GS6-GL	Telit FN980	Global Single PID



P-5GS6-GL Introduction

- Pluggable PIM module for PIM enabled routers
- 5G Sub 6 GHz, 4G LTE Category 20, with fallback to 3G
- 3.3 Gbps / 420 Mb/sec downstream↓ / upstream↑ maximum throughput
- Dual micro SIM , single radio
- Telit FN980 modem, specific firmware varies depending on geography
- SMA connectors for antenna and GPS

Available firmware and bands

PID	Modem	Region
P-5GS6-GL	Telit FN980	Global

Carrier	Firmware
Generic / Global	FW-FN980-LTE-GN

Technology	Supported bands
5G	n1, n2, n3, n5, n7, n8, n12, n20, n25, n28, n38, n40, n41, n48, n66, n71, n77, n78, n79
4G	1, 2, 3, 4, 5, 7, 8, 12, 13, 14, 17, 18, 19, 20, 25, 26, 28, 29, 30, 32, 34, 38, 39, 40, 41, 42, 43, 46, 48, 66, 71
3G	1, 2, 3, 4, 5, 6, 8, 9, 19

Antenna Configuration

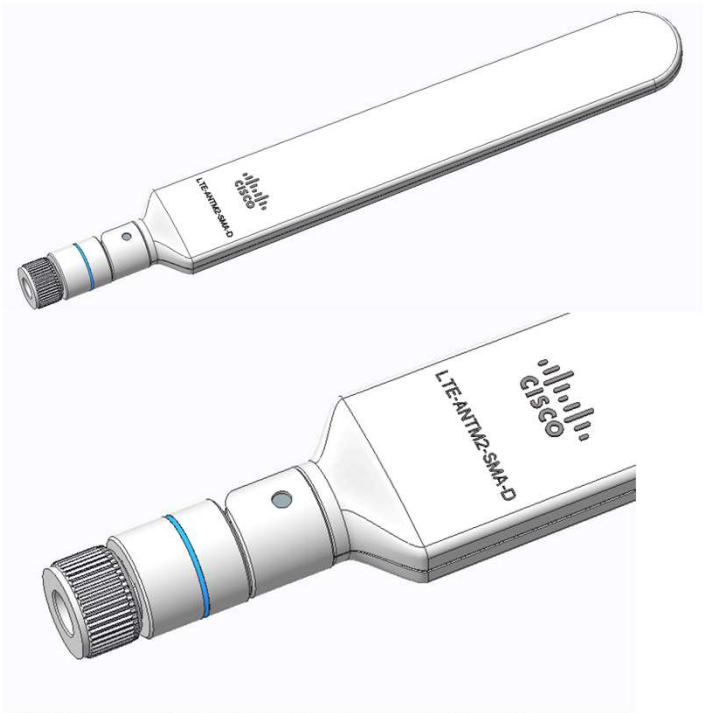
LTE / 5G Antenna number 1
- 3G: Rx only
- 4G: Tx and Rx
- 5G: Tx and Rx

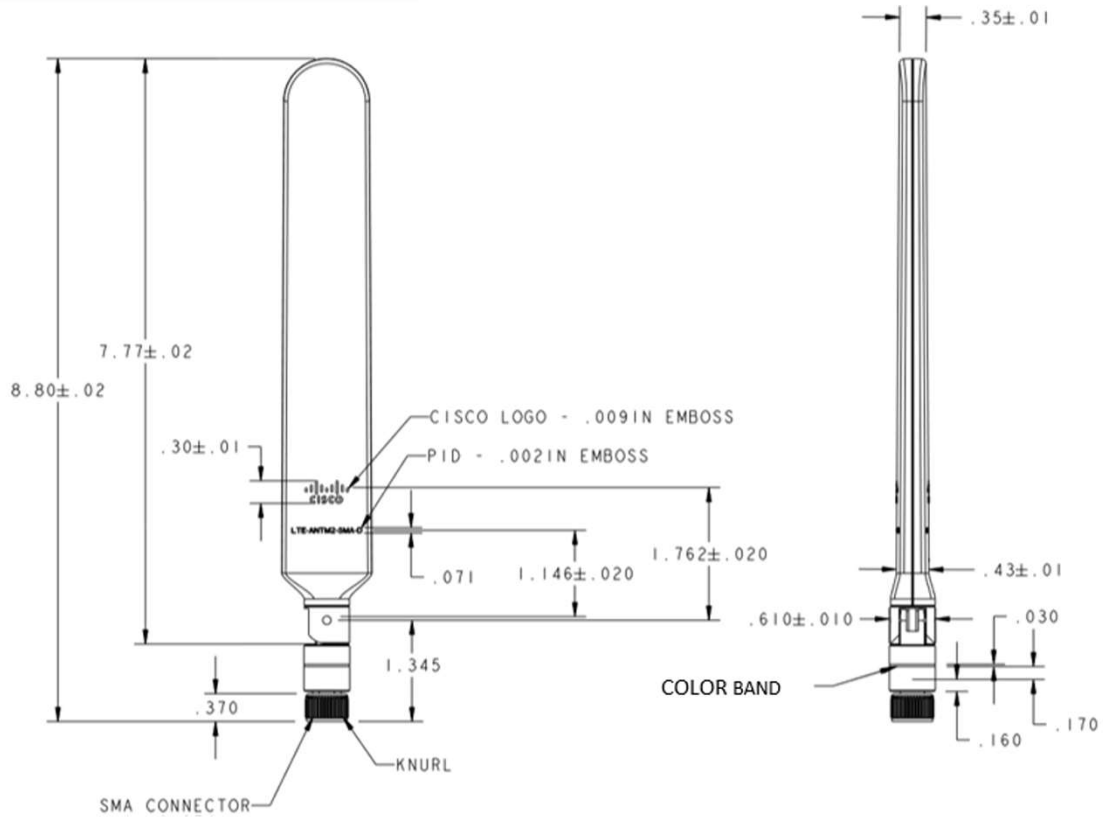
LTE / 5G Antenna number 3
- 3G: Not used
- 4G: Rx only
- 5G: Rx only

LTE / 5G Antenna number 2
- 3G: Not used
- 4G: Tx and Rx
- 5G: Tx and Rx

LTE / 5G Antenna number 0
- 3G: Tx and Rx
- 4G: Tx and Rx
- 5G: Tx and Rx

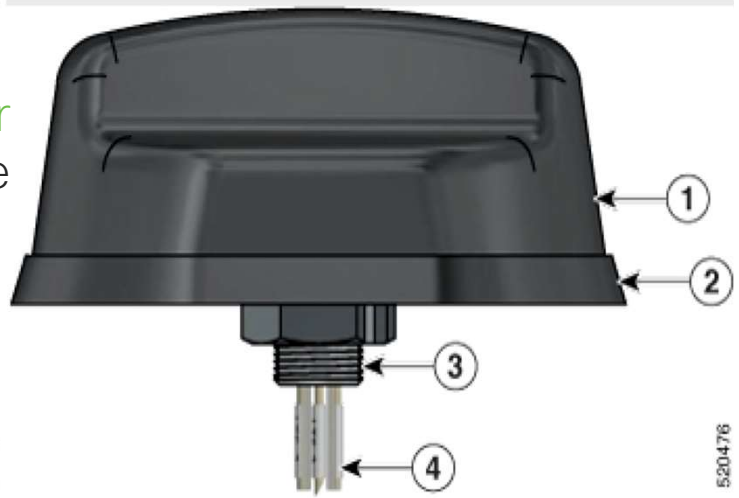
5G-ANTM-SMA-D

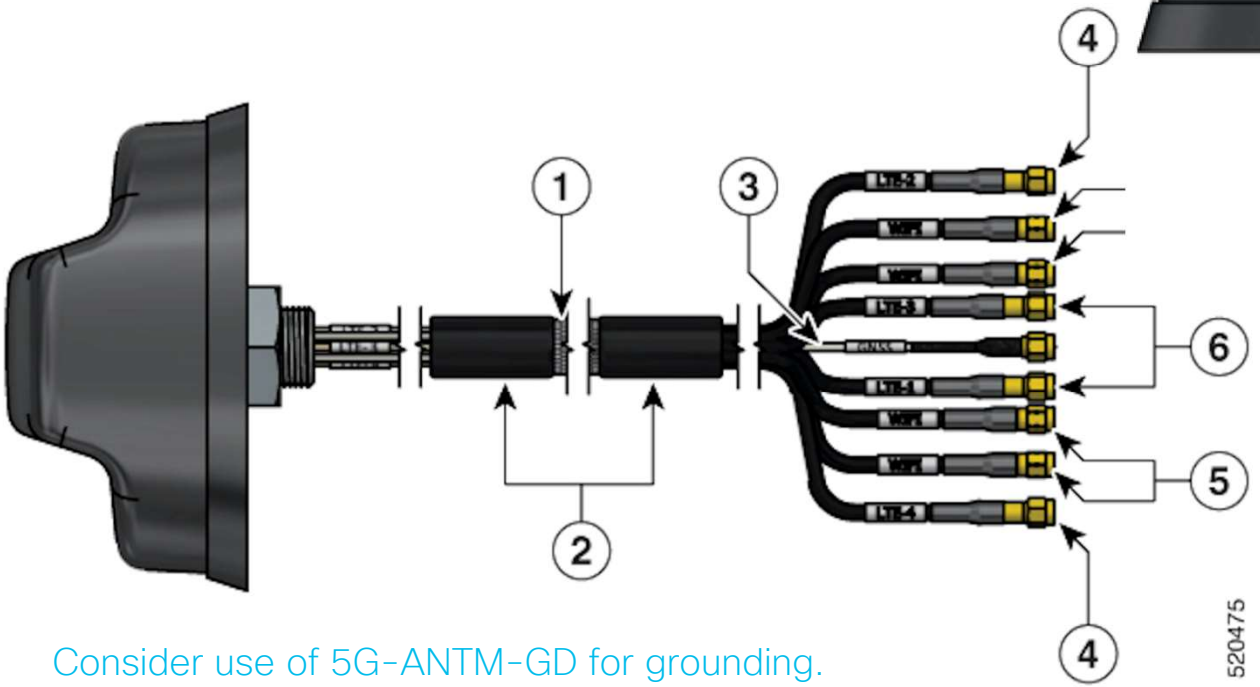




5G-ANTM-O-4-B

Indoor & Outdoor usage





Consider use of 5G-ANTM-GD for grounding.

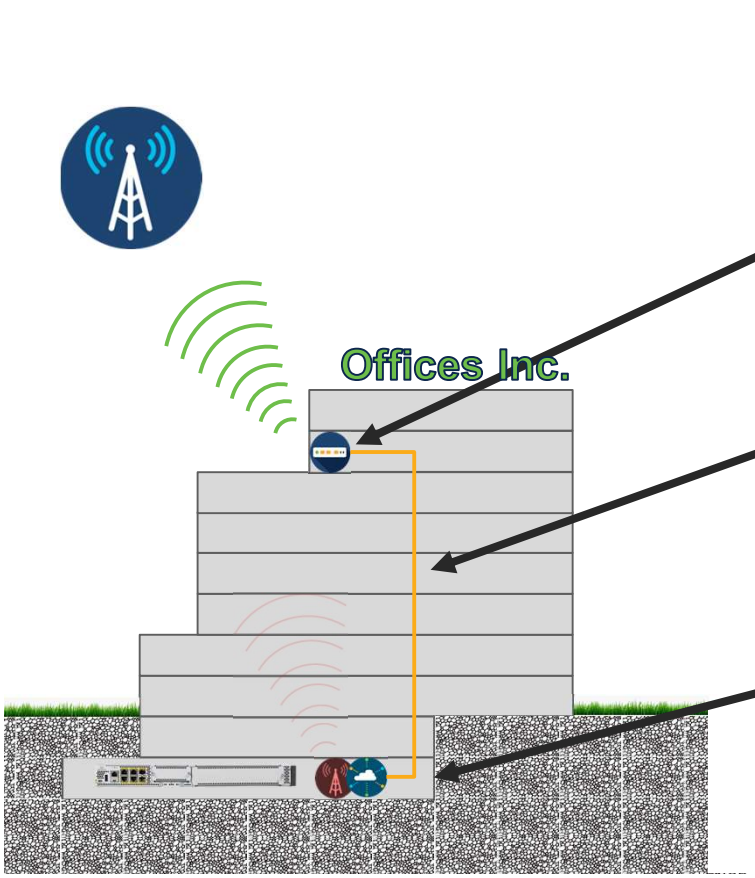
Datasheet TBD

Cellular Gateway Platform Details

Cellular Gateway platforms

- IP Passthrough device
  - LTE to Ethernet IPv4/IPv6 connectivity
  - No NAT
  - No Firewall
  - No L3 / L4 features
- Extending LTE radio to favorable location
- Use exiting facility ethernet infrastructure to connect Cellular Gateway to network stack
- Generic requirement for DHCP server / client operation

Why Cellular Gateway is needed for high quality Wireless WAN

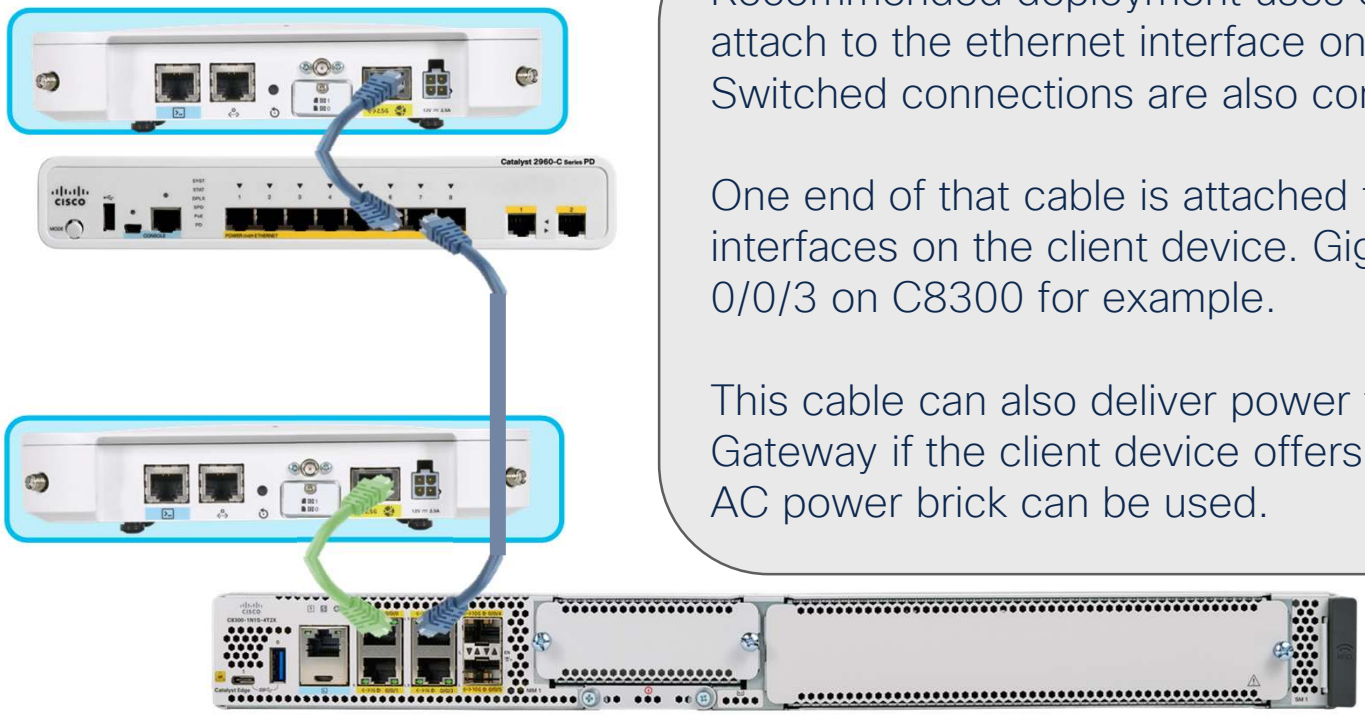


3 Cellular gateway is positioned to get a high quality LTE signal. Next to a window or mounted near the roof with external antennas with short coax runs.

2 Ethernet power and connectivity from the Cellular Gateway to the network stack.

1 Network stack is buried deep inside the building, maybe underground. Chance of a high-quality LTE or 5G signal is slim. Extending the antenna via coax might only get to ground level.

Deployment connectivity



Recommended deployment uses ethernet cable to attach to the ethernet interface on the Cellular Gateway. Switched connections are also compatible.

One end of that cable is attached to one of the WAN interfaces on the client device. GigabitEthernet 0/0/0 – 0/0/3 on C8300 for example.

This cable can also deliver power to the Cellular Gateway if the client device offers PoE. Otherwise, an AC power brick can be used.

Cellular Gateways

All gateways

- Dual Micro SIM Single Radio
- Supported with 3rd party devices
- Zero touch deployment
- 4x4 ↓ MIMO
- 2x2 ↑ MIMO
- Carrier Aggregation
- SD-WAN support
- Router GUI
- vManage support

CG522-E

- 5G Sub-6 GHz CAT 20 4G LTE
- ↓ 3.3 Gbps ↑ 400 Mbps
- 4G & 5G status LEDs

CG418-E

- CAT 18 4G LTE
- ↓ 1.2 Gbps ↑ 150 Mbps
- 4G status LED

- Same form factor
- Same security profile
- Same connectivity options

Cellular Gateway connections

GPS Antenna connector
- Future support for GPS antenna

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

SIMs
- 2 micro-SIM cards

AUX console
- Reverse console support in 17.6

Out of band power
- AC power brick connection

Ethernet
- CG418-E: mGig 2.5G ethernet link to the client device
- CG522-E: 10G Ethernet link to the client device
- optional PoE+ power

Antennas
- 4 SMA connectors
- Supports 4x4 MIMO

CG522-E vs CG418-E

	CG522-E	CG418-E
5G Sub-6 GHz support	Yes	No
4G LTE Advanced Pro	Yes, Category 22	Yes, Category 18
4G LTE Advanced (CAT 6)	Yes	
Maximum download	3.3 Gb/s	1.2 Gb/s
Maximum upload	400 Mb/s	150 Mb/s
Dual SIM, single radio	Yes	
LTE Radio	Sierra Wireless EM9190	Telit LM960A18

Available firmware and bands

PID	Modem	Region
CG-418E	Telit LM960A18	Global
CG-522E	SWI EM9190	Global

Technology		Supported bands
5G	CG522-E	n1, n2, n3, n5, n7, n8, n12, n20, n25, n28, n38, n40, n41, n48, n66, n71, n77, n78, n79
4G	CG418-E	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
	CG522-E	1, 2, 3, 4, 5, 7, 8, 12, 13, 14, 17, 18, 19, 20, 25, 26, 28, 29, 30, 32, 34, 38, 39, 40, 41, 42, 43, 46, 48, 66, 71
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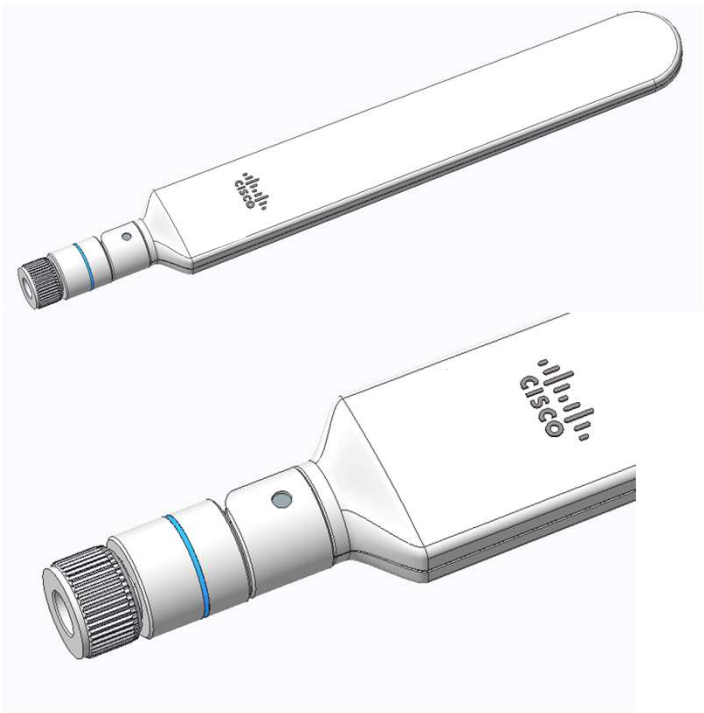
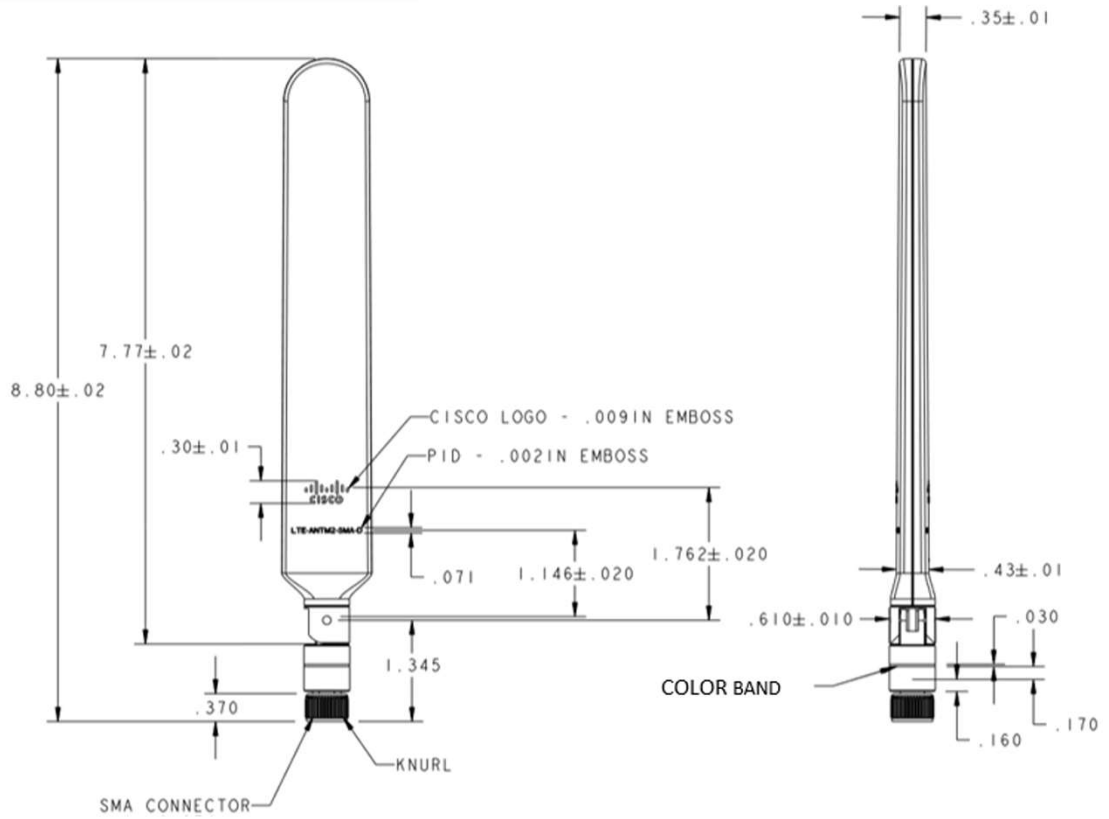
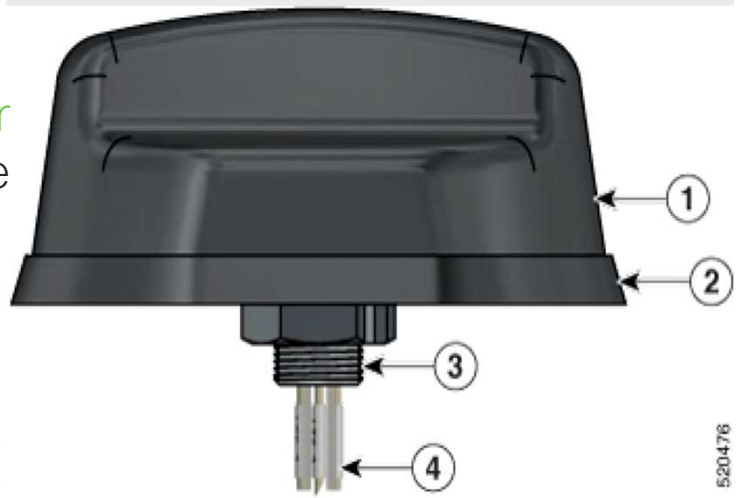
5G-ANTM-SMA-D

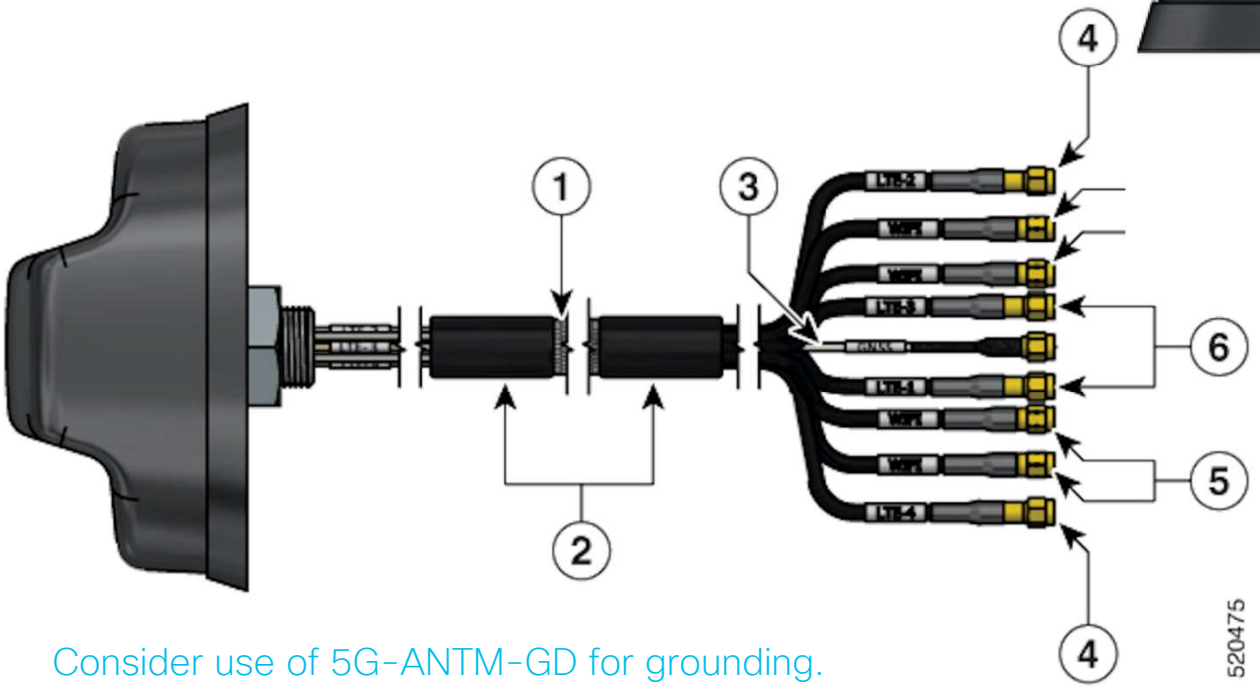




5G-ANTM-O-4-B

Indoor & Outdoor usage





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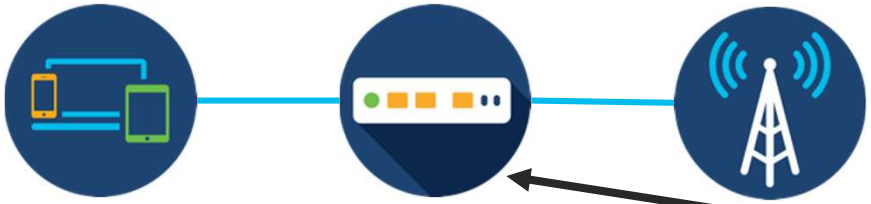
Use cases

Cellular Gateway use case topology

Users / Devices

Cellular Gateway

Cellular network

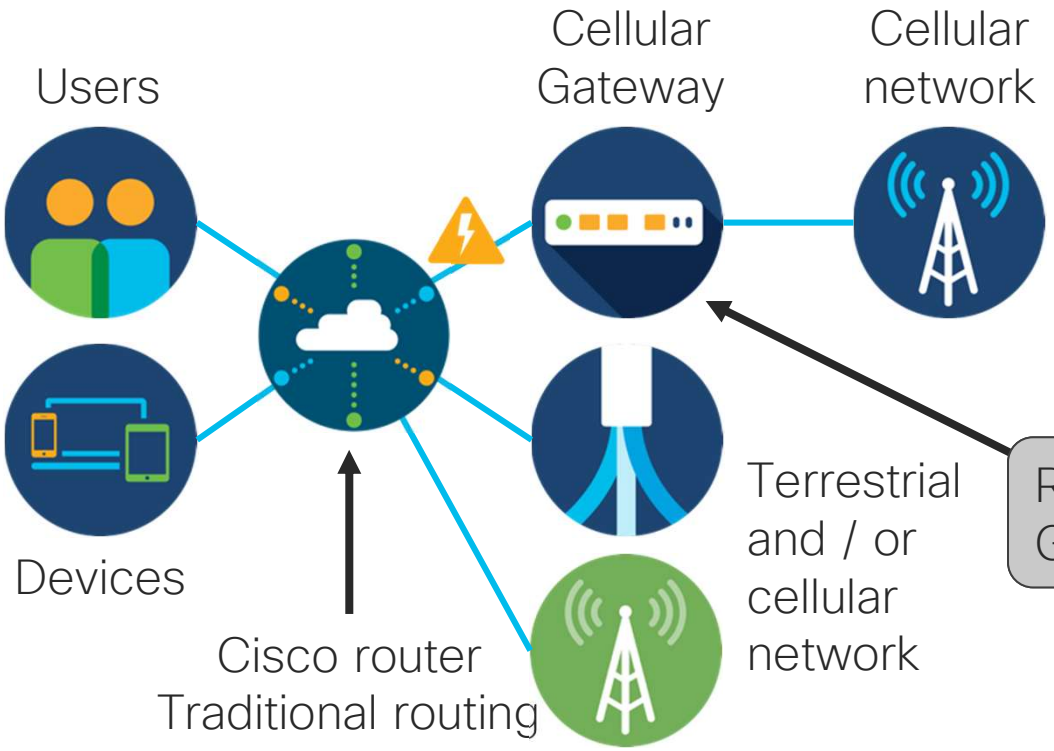


Quick rollout of pop-up services with traditional routing with LTE WAN only.

Direct attachment of PC or other device with DHCP client to Cellular Gateway for connectivity.

Remote placement of Cellular Gateway box for optimal signal.

Cellular Gateway use case topology

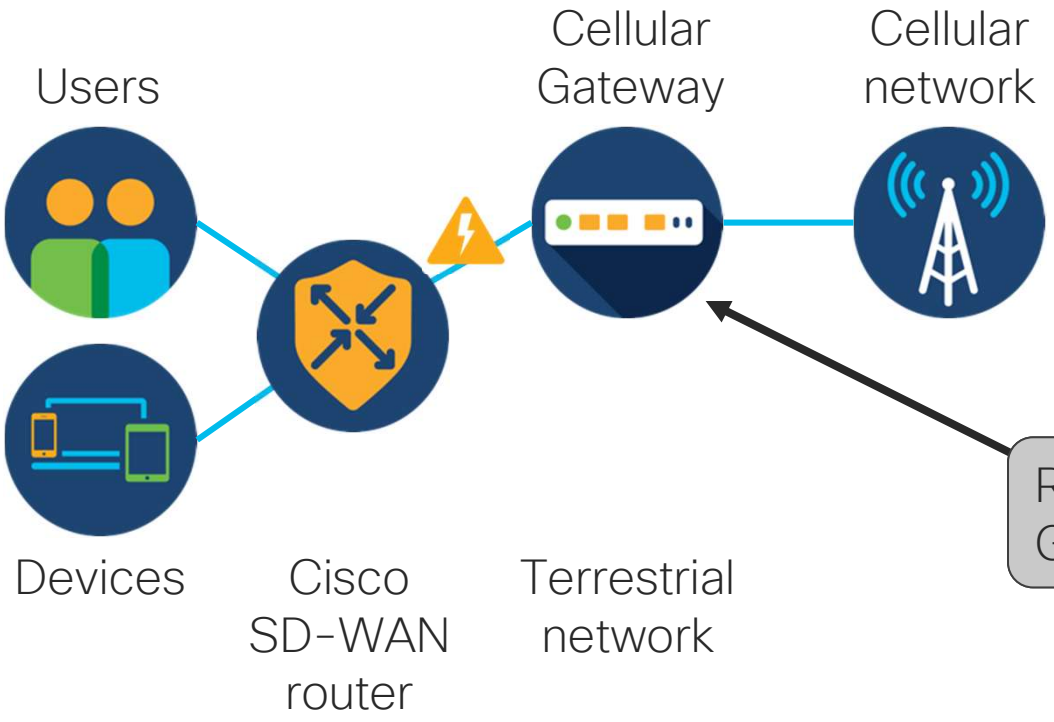


Secondary / Tertiary paths to WAN for traditional routing via LTE.

Secondary or primary access for traditional routing.

Remote placement of Cellular Gateway box for optimal signal.

Cellular Gateway use case topology

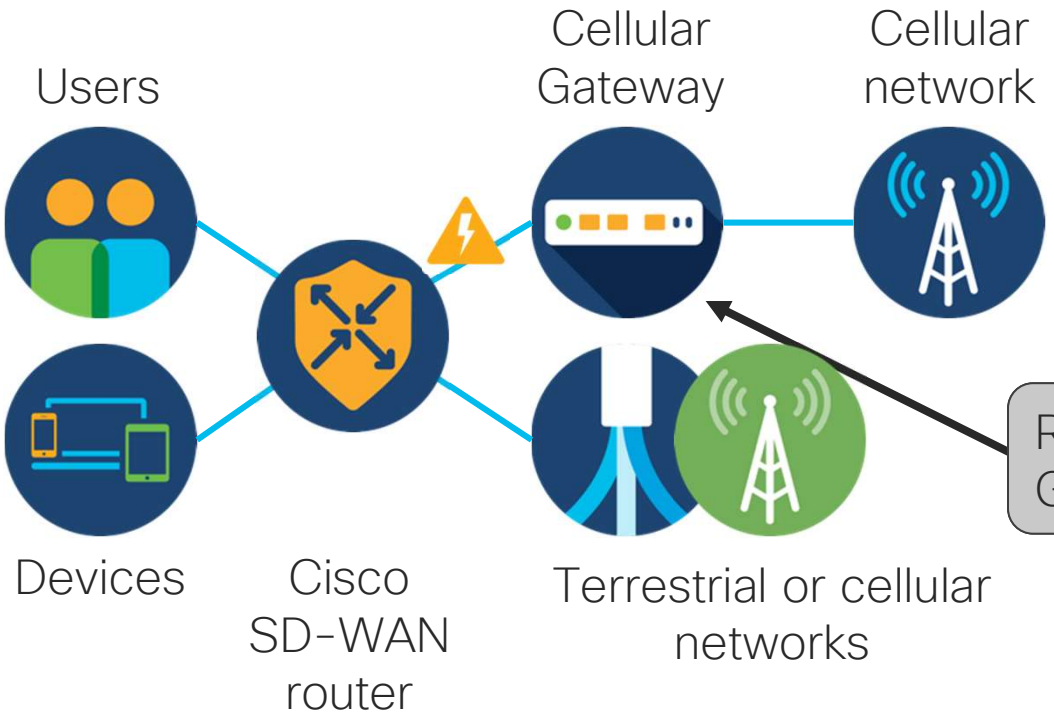


Quick rollout of pop-up services with SD-WAN with LTE WAN only.

Singular access for SD-WAN edge device to reach infrastructure as well as SD-WAN overlay. vManage management of device.

Remote placement of Cellular Gateway box for optimal signal.

Cellular Gateway use case topology

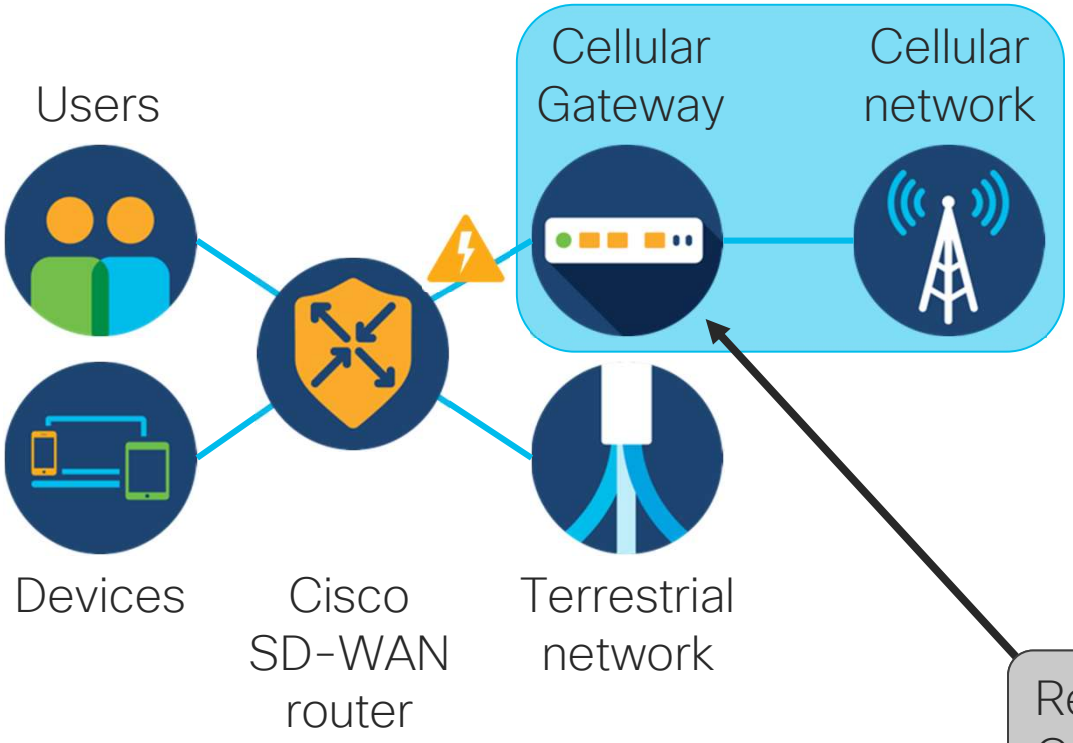


Secondary path to WAN for SD-WAN via LTE.

Secondary access for SD-WAN. Active / active WAN path routing. vManage management of device.

Remote placement of Cellular Gateway box for optimal signal.

Cellular Gateway use case topology



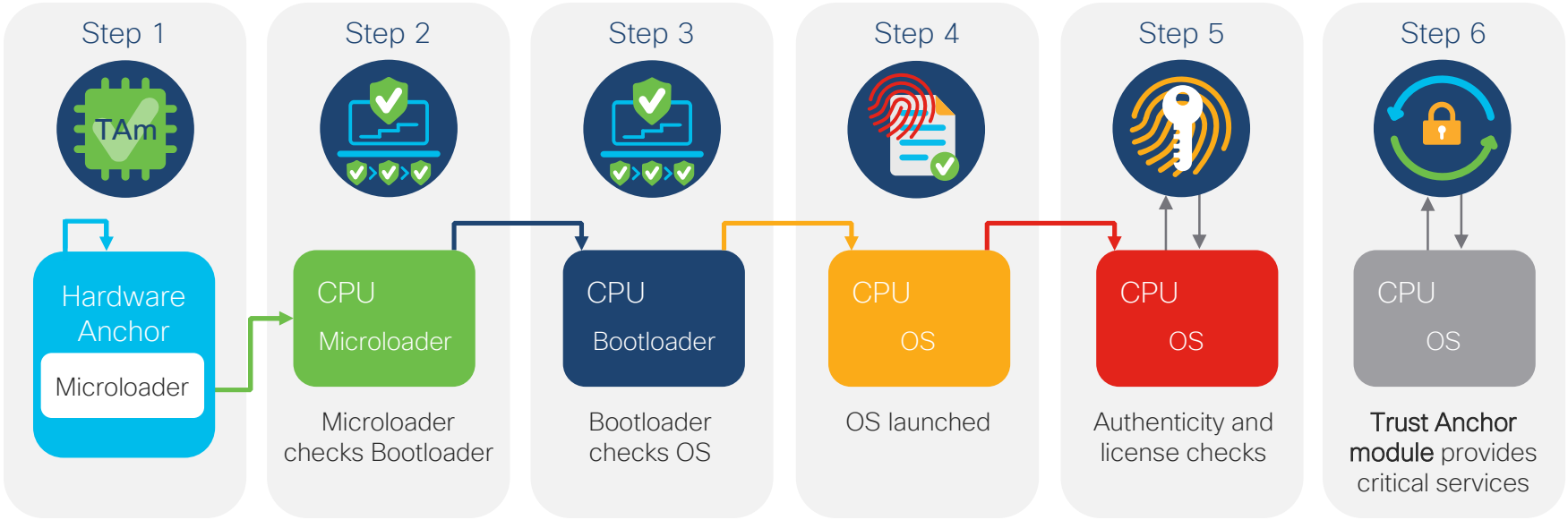
MSP with SDWAN managed access, ethernet handoff. Independent enterprise managed SDWAN.

Secondary access for SD-WAN. Active / active WAN path routing. SP managed access with vManage.

Remote placement of Cellular Gateway box for optimal signal.

Cellular Gateway hardware information

Secure Platform with Trustworthy Solutions



First instructions run on CPU stored in tamper-resistant hardware

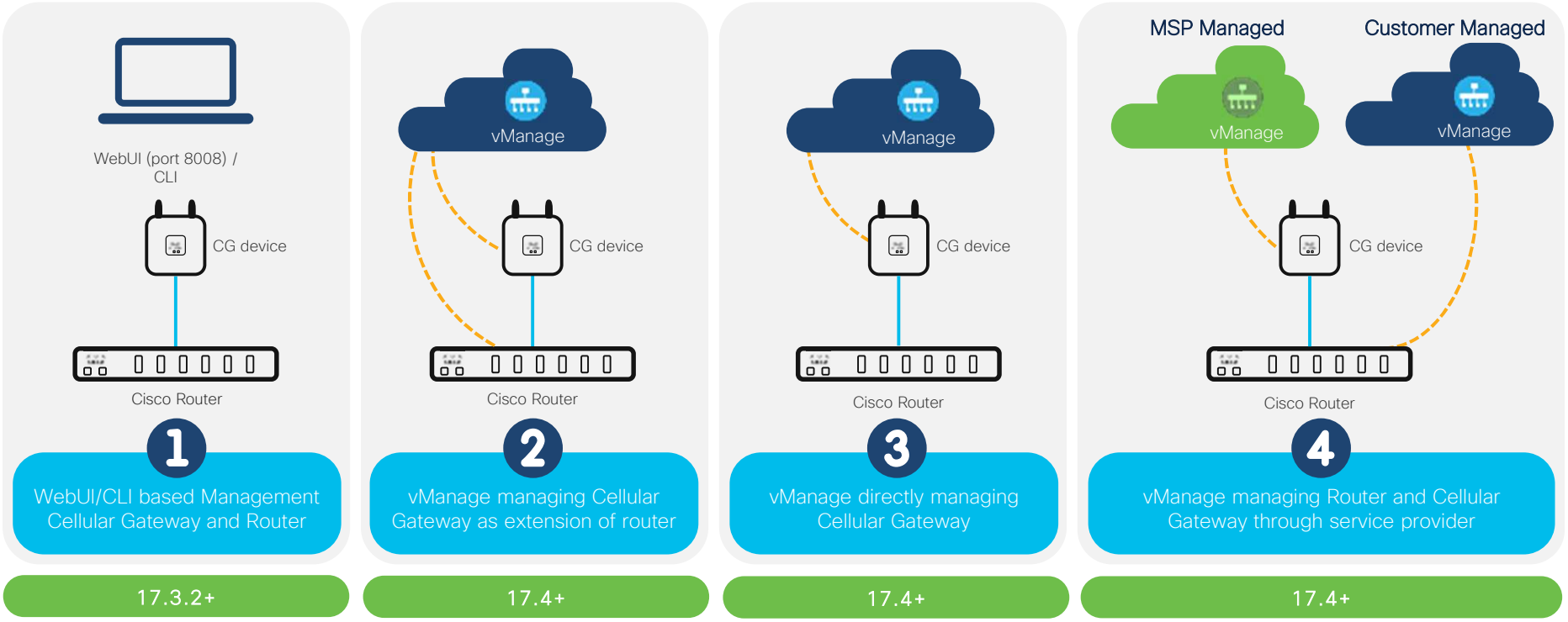
Confidentiality | Integrity | Authenticity

Cabling

- Maximum distance between Cellular Gateway and host:
  - CAT6e: 100 m
  - CAT6: 100 m
  - Cat5e: 100 m
  - Cat5: 100 m
- These cable lengths will support data transmission and PoE power required for the unit.
- Power can be provided by power brick, power injector, switch PoE, or client device provided PoE.

Management

Management Use Cases with Flexibility



Simplified management and cellular deployment while offering a bridge into 5G wireless WAN

vManage

vManage simplifies deployment and management workflow

Submit your order.
Serial number is put in Smart Account.

Map serial number to SD-WAN instance. Import into vManage. Apply templates.

Install SIM card. Connect Ethernet and power cables.

Cellular gateway comes up on public APN.

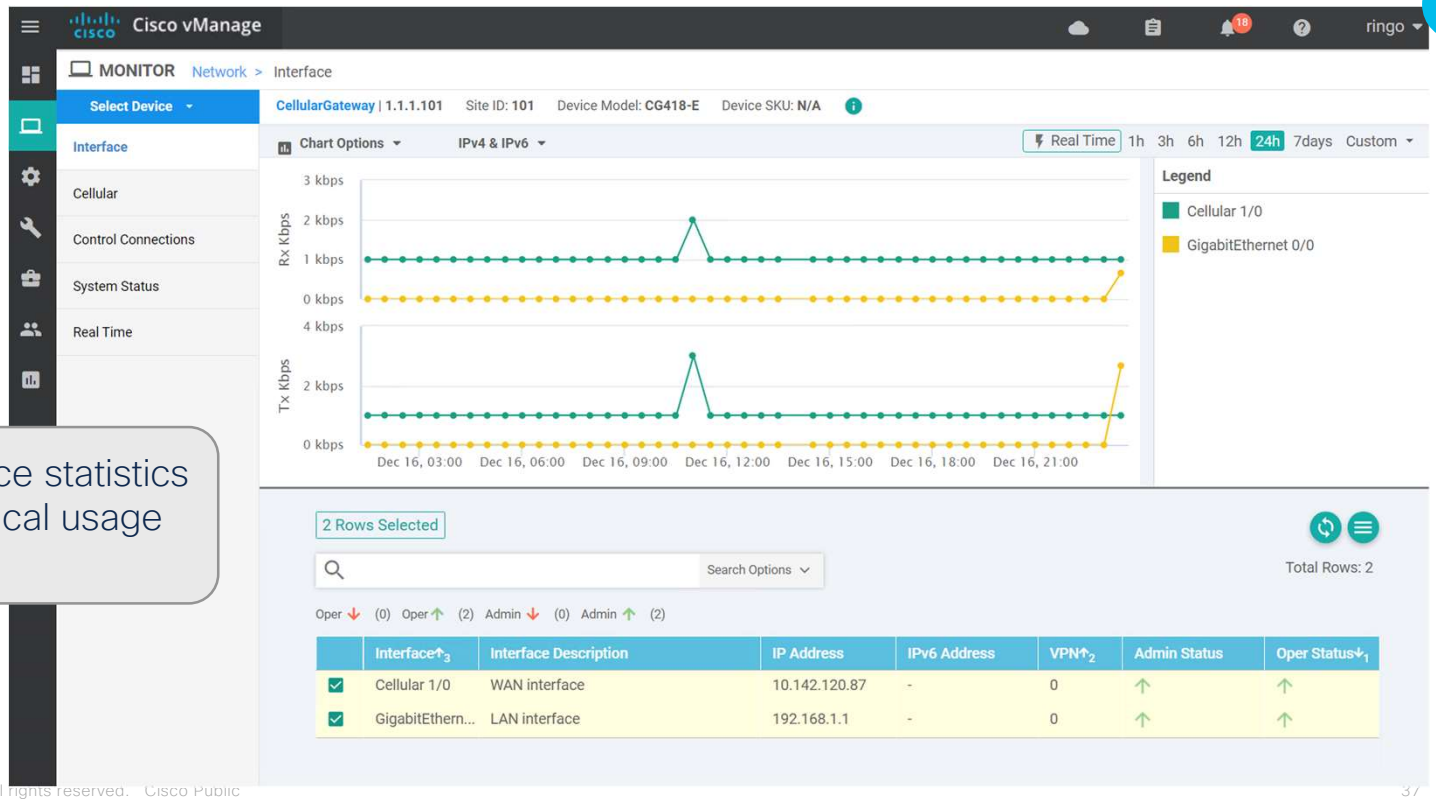
Connects to vBond and then to vManage. vManage then configures, applying the templated configuration. Custom APNs applied at this time.

Deployment complete with just one touch!
One button factory reset to redeploy.

Detailed deployment guide

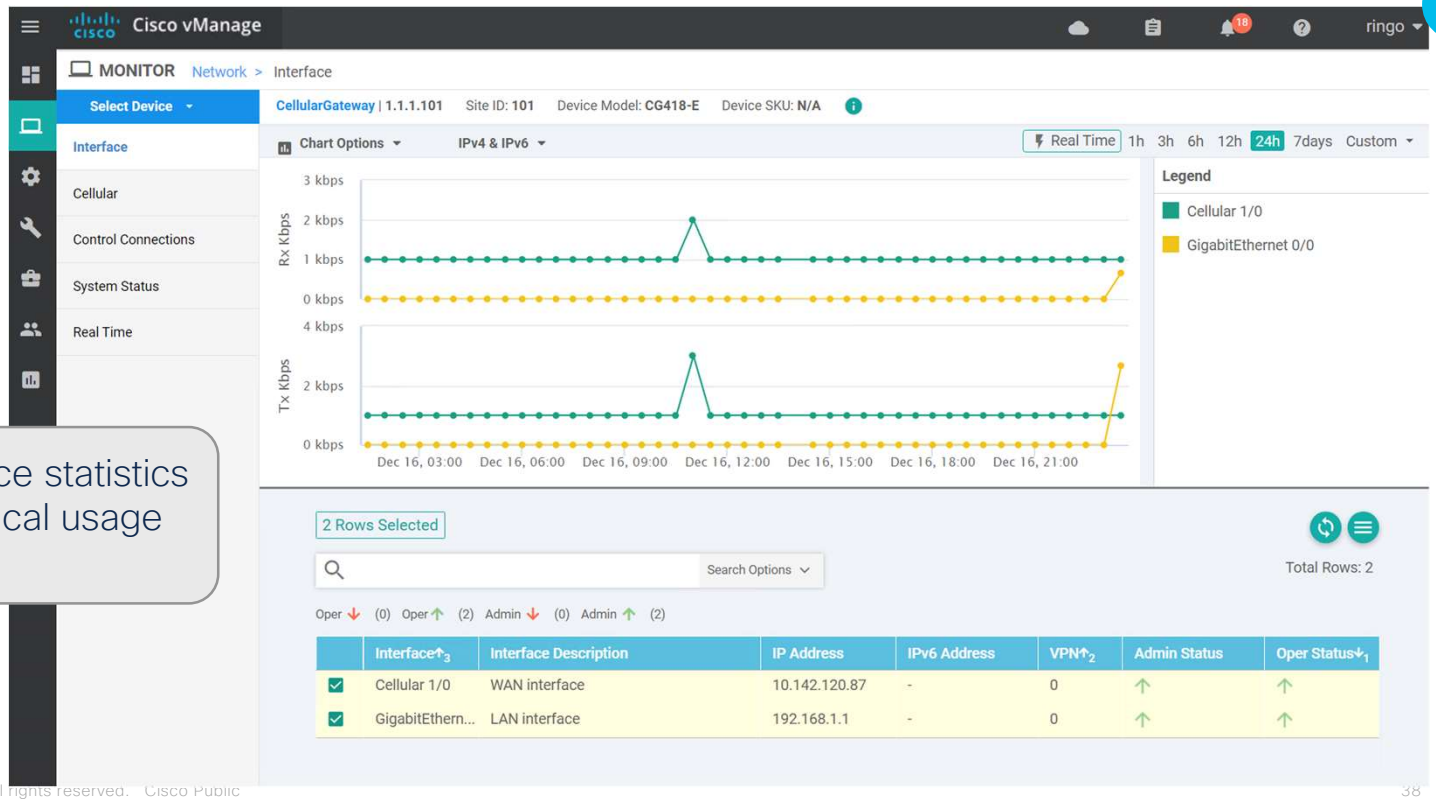
https://community.cisco.com/t5/networking-documents/step-by-step-cellular-gateway-onboarding-on-vmanage-using-pnp/ta-p/4454345

vManage offers deployment, monitoring and config



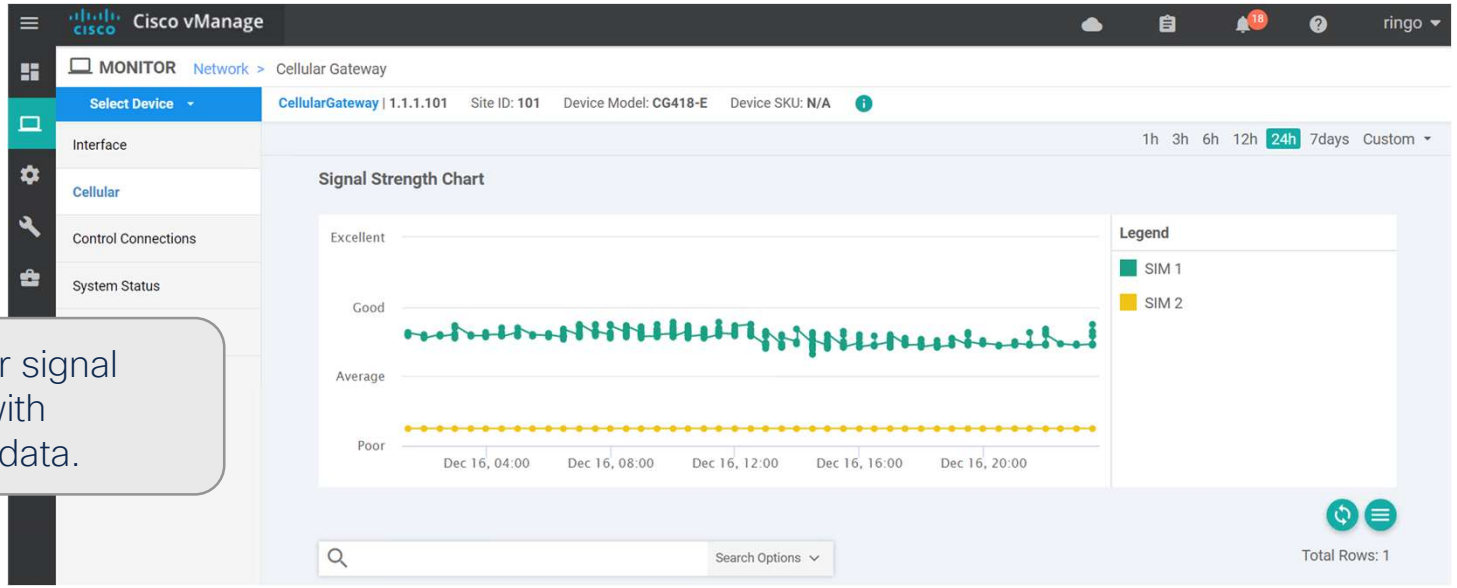
Real time interface statistics along with historical usage data.

vManage offers deployment, monitoring and config



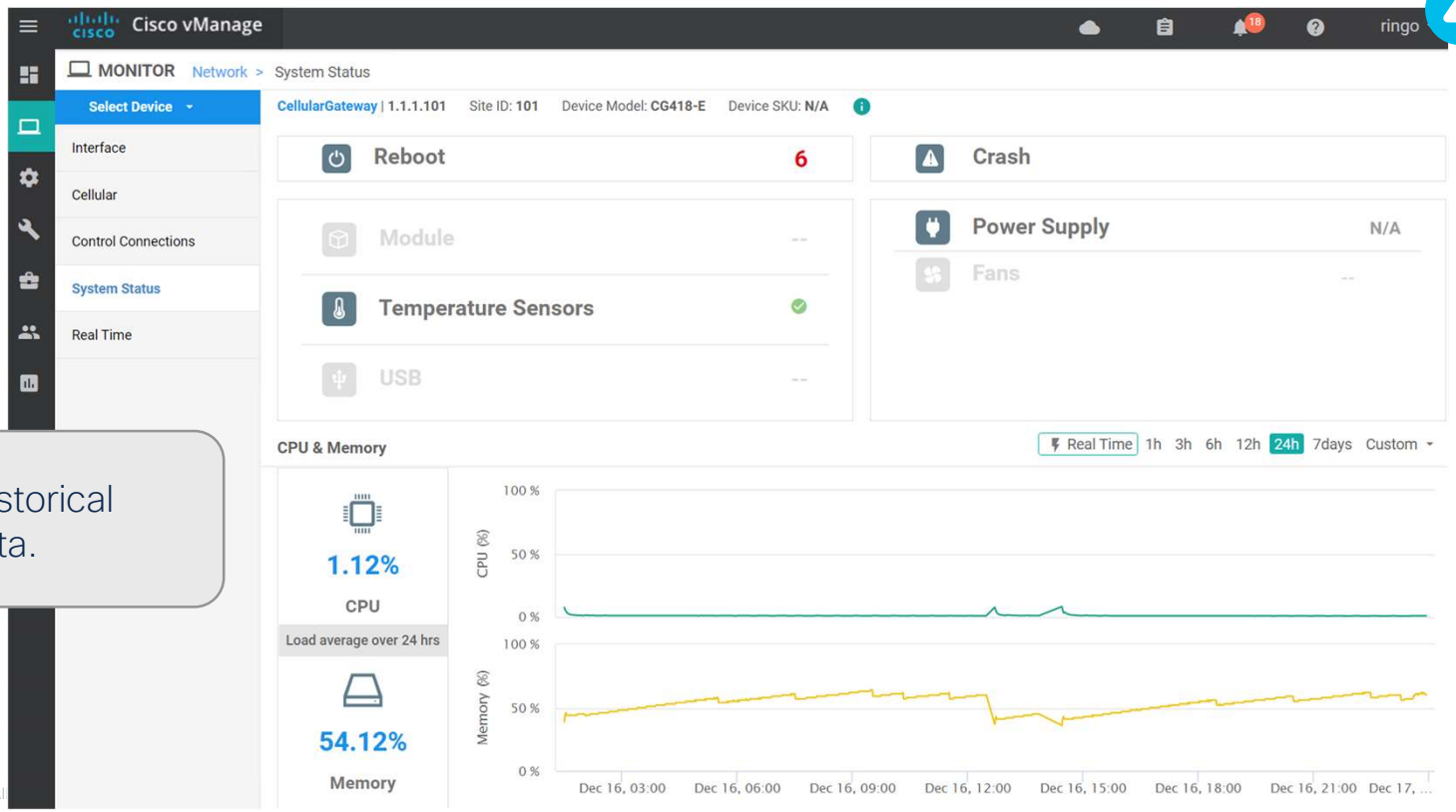
Real time interface statistics along with historical usage data.

vManage offers deployment, monitoring and config



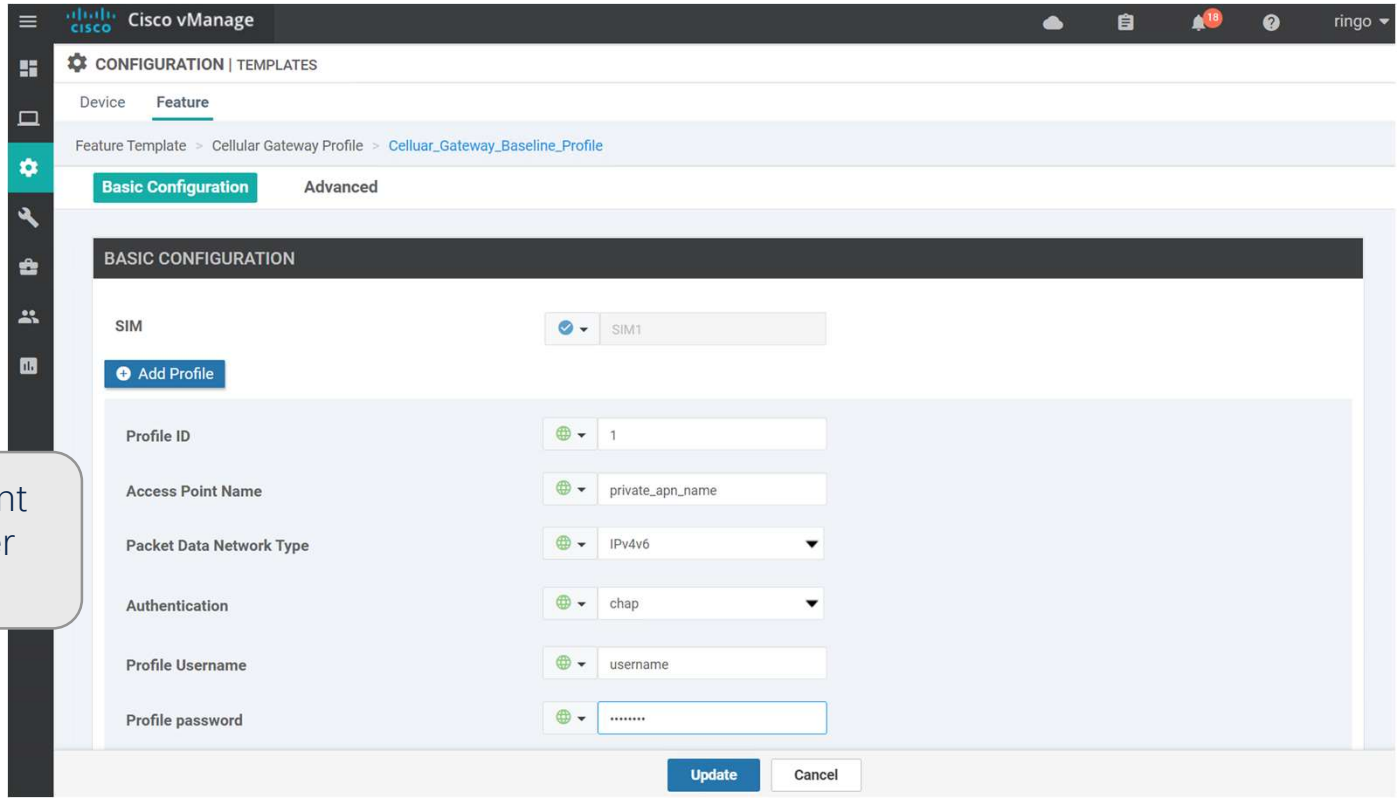
Real time cellular signal strength along with historical usage data.

vManage offers deployment, monitoring and config



Real time and historical control plane data.

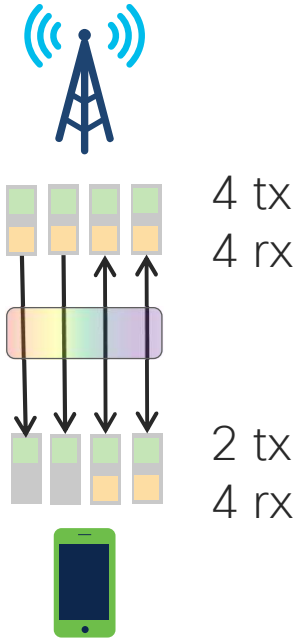
vManage offers deployment, monitoring and config



APN management via supported per SIM.

Cellular specifics

Upstream MIMO vs Downstream MIMO



- **2x2 MIMO upstream**
- **4x4 MIMO downstream**
  - Generally, user equipment supports only 2 tx streams, this is a 2x2 upstream system, even though SP side has more receivers. Directional system is always the lowest common denominator of the number tx and rx channels.
  - User equipment and cell tower supports 4 rx and tx streams each, this is a 4x4 downstream system.
  - User equipment has 2 tx and cell tower has 4 rx streams, this is a 2x2 upstream system.

Carrier Aggregation

LTE band x

LTE band y

LTE band z

Examples of possible combinations. Supported combinations are chipset dependent.

x

Contiguous in the same band

x

Non-contiguous in the same band

x y

CCs from two different bands
CC can be different widths

x y z

CCs from three different bands
CC can be different widths

MIMO and Carrier Aggregation

- MIMO 4x4 can be used in conjunction with Carrier Aggregation.
  - Multiple spatial streams using the same set aggregated frequency ranges on multiple antennas.
- Using both of these techniques together in areas with good signal can have a multiplicative effort for high bandwidth connections.

Conclusion

5G PIM and Catalyst Cellular Gateway

Cloud Management

- Intuitive, Simplified Cloud Management
- Zero-Touch Provisioning
- Remote Management

Secure and Trustworthy

- Secure Threat Management
- SIM security and re-use prevention
- Failure recovery

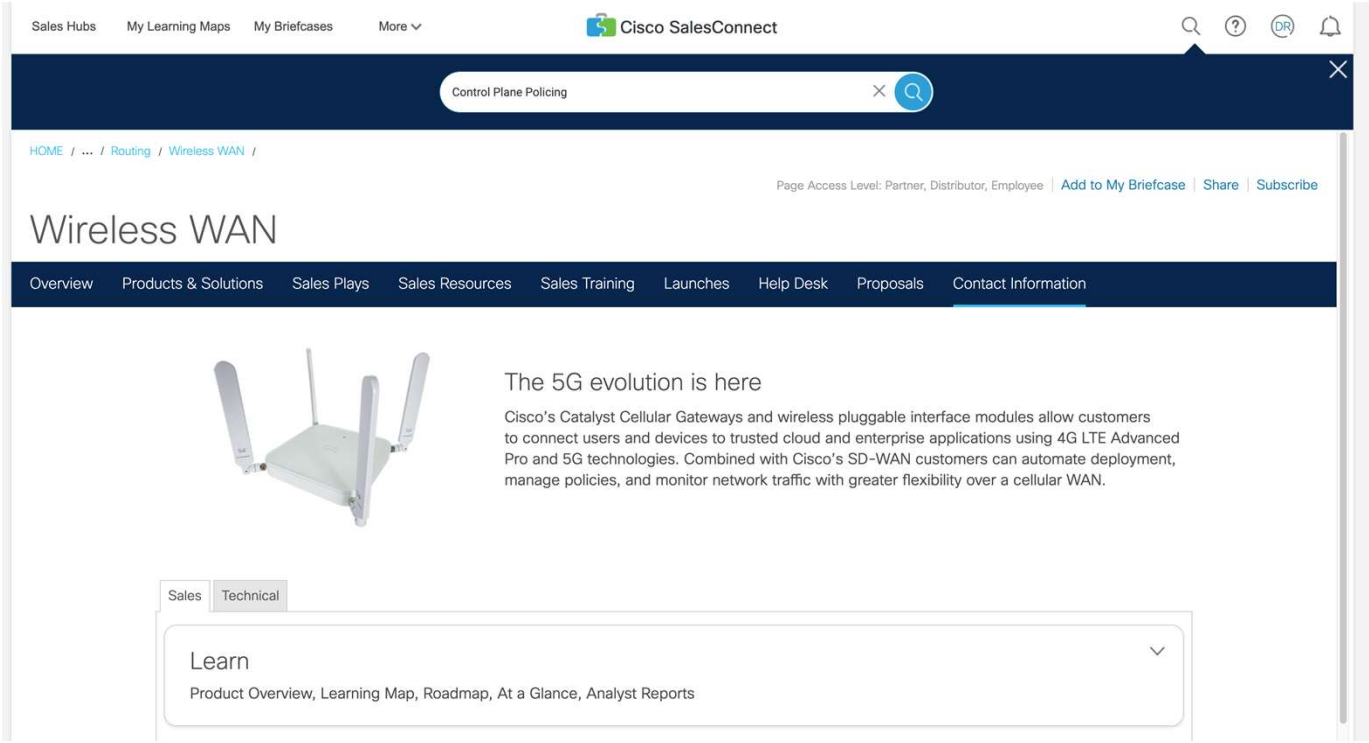
Analytics and Intelligence

- Enhanced Visibility
- Traffic Analytics
- SD-WAN

Higher Performance, Flexible and Secure Solution that Enables Better User Experience For All Deployment Types

More information…

https://salesconnect.cisco.com/#/program/PAGE-17393

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