



Pathway to 5G

Cradlepoint Connect 2020

24 June

Cradlepoint Solutions are All Around You



Secure Access



Anywhere WiFi



Nonstop Networks



Smart Cities



Digital Signage



Mobile Networks



SD-WAN Branch Routing



Internet of Things



Machine-to-Machine

Leader in Enterprise Wireless WAN



Commitment to Enterprise Cellular Leadership

Next Up: First In 5G

First to deliver LTE Advanced Pro & Gigabit Class

First and only mobile router with SD-WAN

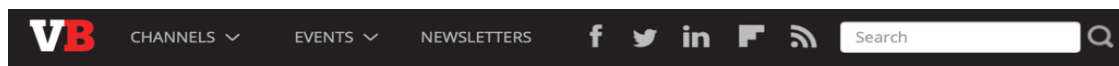
First to deliver 100M and 300M speeds

First to offer LTE as an Enterprise WAN link

Cradlepoint 5G Experience

- Gigabit Class LTE development
 - Cat 18 1.2 Gbps solutions
 - LAA, CBRS development
 - High performance platform design
- 5G Ecosystem Engagement
 - Module manufacturers
 - Infrastructure providers
 - Chipset manufacturers
 - Network operators

Cradlepoint Leadership on the Pathway to 5G



BUSINESS

Verizon and Cradlepoint announce enterprise 5G broadband service

JEREMY HORWITZ @HORWITZ SEPTEMBER 14, 2018 4:00 AM

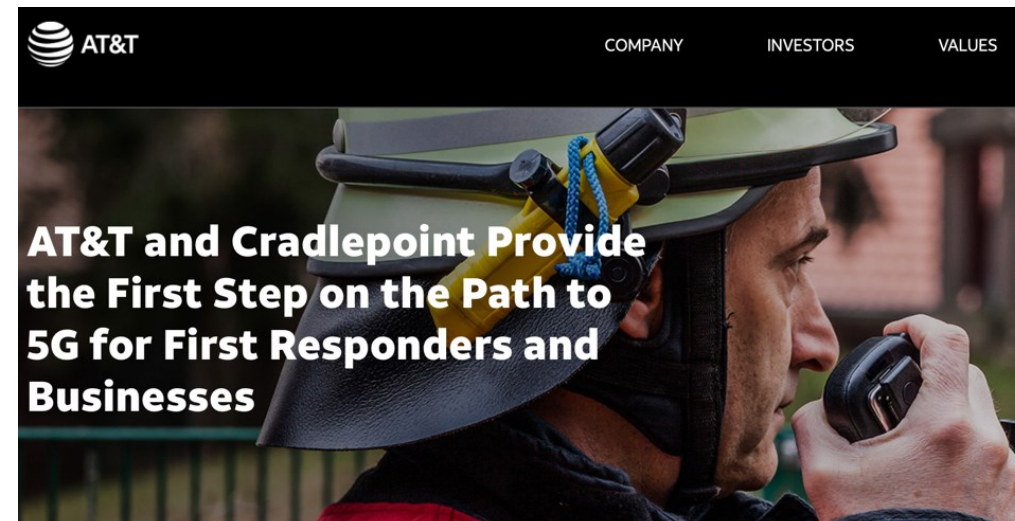
5G[✓]

Image Credit: Verizon

As of October 1, Verizon expects to be the first and only U.S. provider of next-generation 5G wireless services, but until now, its offerings were targeted solely at homes. Today, Verizon and Cradlepoint announced a partnership to offer a “Pathway to 5G for Business” that will combine Cradlepoint hardware and services with Verizon’s 5G and LTE Advanced networks.



More To Come



DALLAS, December 13, 2018

Access to New Cradlepoint Routers Gives FirstNet and AT&T Users the Fastest Speeds Possible Today with an Upgradable Path to 5G in the Future

As **AT&T*** drives the future of 5G closer, we’re working with Cradlepoint to help first responders and businesses prepare for this coming shift. Starting today, Cradlepoint’s latest in-office and rugged in-vehicle 5G Evolution routers are available only on the FirstNet communications platform and AT&T network.¹ The devices provide first responders and businesses with the fastest speeds possible today² while also giving them a path to easily upgrade to 5G in the future.



Telstra first to deploy Cradlepoint 5G edge computing technology

MELBOURNE: Telstra will be the first mobile operator to deploy edge computing technology for 5G networks from US based **Cradlepoint**, in its **Enterprise Wireless** service. Customer trials of Cradlepoint's W2000 Series 5G wireless adapters are scheduled to begin in April.



The product has been co-developed with Telstra, which last October announced a partnership

with Cradlepoint to develop an integrated 5G modem and edge router that would work seamlessly with Telstra's 5G mobile technology (*CDN, Oct. 25, 2019*).

Telstra's mobility executive **Andrew Stormont** yesterday said the wireless adapters would "make it easy for Telstra's business customers to get up and running on 5G, while providing full powerful management tools."

Cradlepoint says the product is based on its software-defined modem technology, has been designed to support the wide range of 5G deployments by wireless operators, and is controlled and managed by the Cradlepoint Net-Cloud Service. – **Stuart Corner**

5G Trial Learnings

Radio

Massive MIMO

256 QAM, 5CA

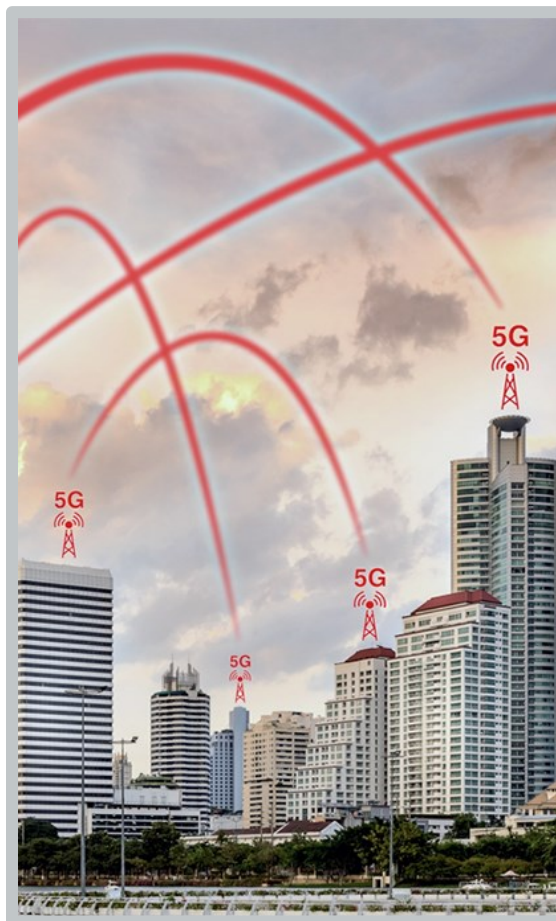
Support for key 4G Bands
(LAA, C-Band, Public Safety)

Breaking the Gigabit Barrier

Weak links

Ports, processor, memory, etc.

RF Noise



mmWave

Single mode

Radio remoting

POE, standards

Latency

Security model

SaaS architecture

IoT

New 5G Technologies Promise

For Network Operators

- More consistent user experience
- Better economics

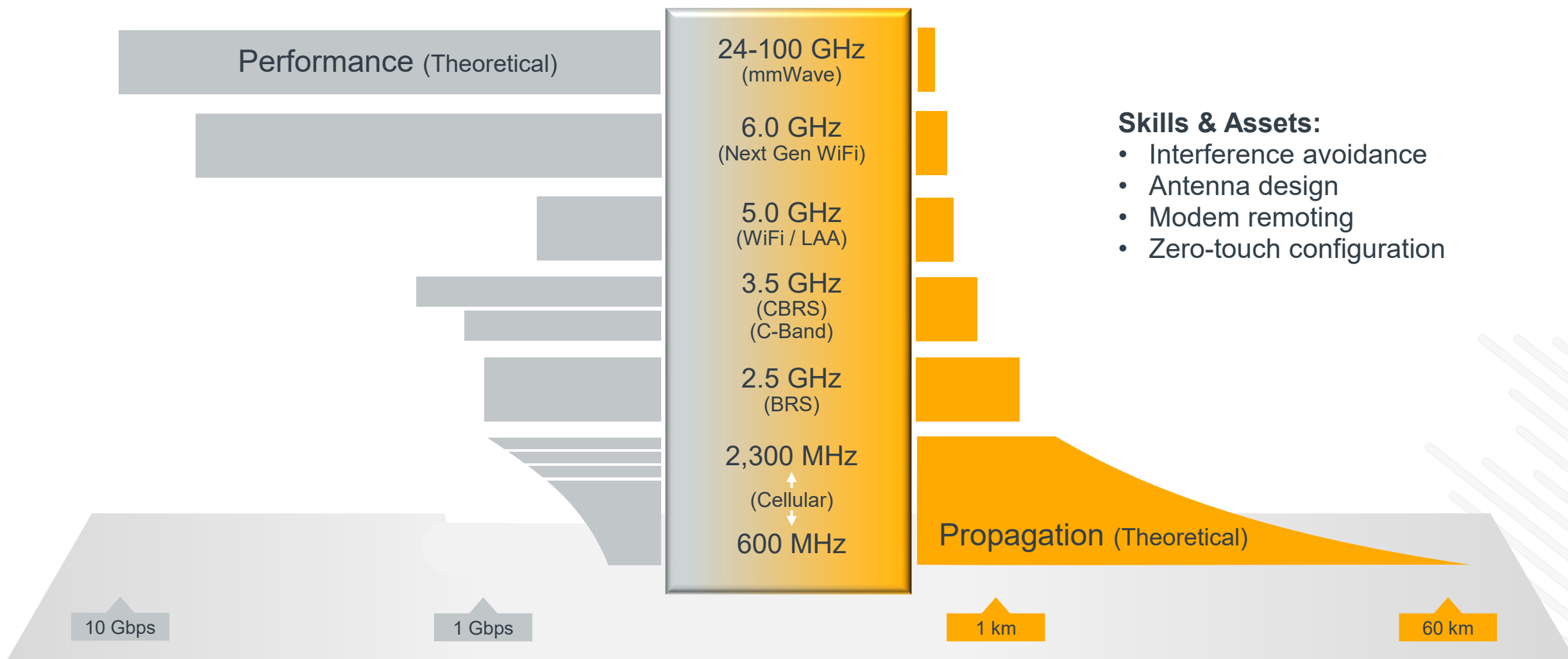
For Network Users

- Faster
- More Responsive
- New Applications
- Flat Rate Pricing
- New Paradigms

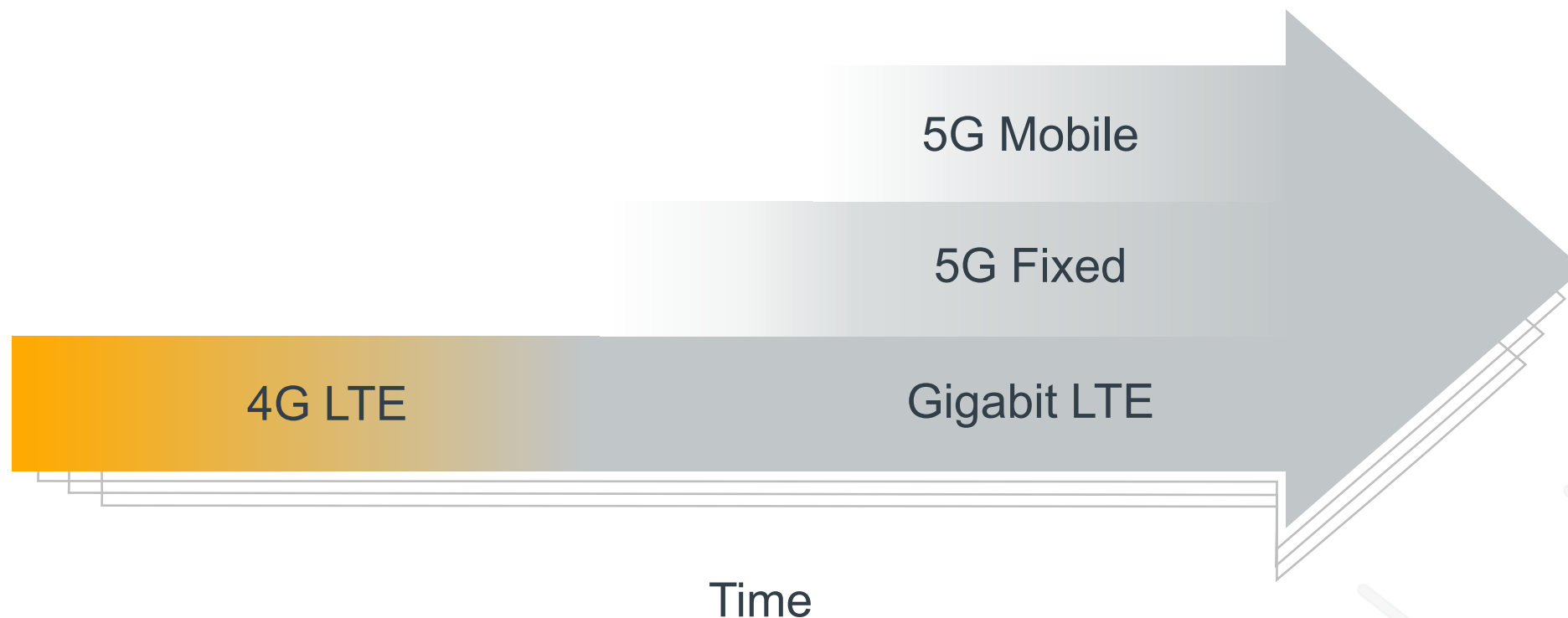
5G Will Bring Technological Advancements

- New spectrum
 - Re-farming of 2G and 3G spectrum
 - Use of unlicensed and lightly licensed spectrum (WiFi/LAA & CBRS)
 - High capacity-short distance-low penetration spectrum (mmWave 24-100Ghz)
- Innovative use of new technology
 - More streams per radio (Massive MIMO)
 - More information per frequency (256 QAM vs. 64 QAM)
 - Network slicing and Multi-Access Edge Computing
- Increased pockets of denser cells
- Seamless 4G integration with 5G
- Along the Pathway – Private LTE/5G

Mitigating Spectrum Tradeoffs



High Performance Cellular is Progressive



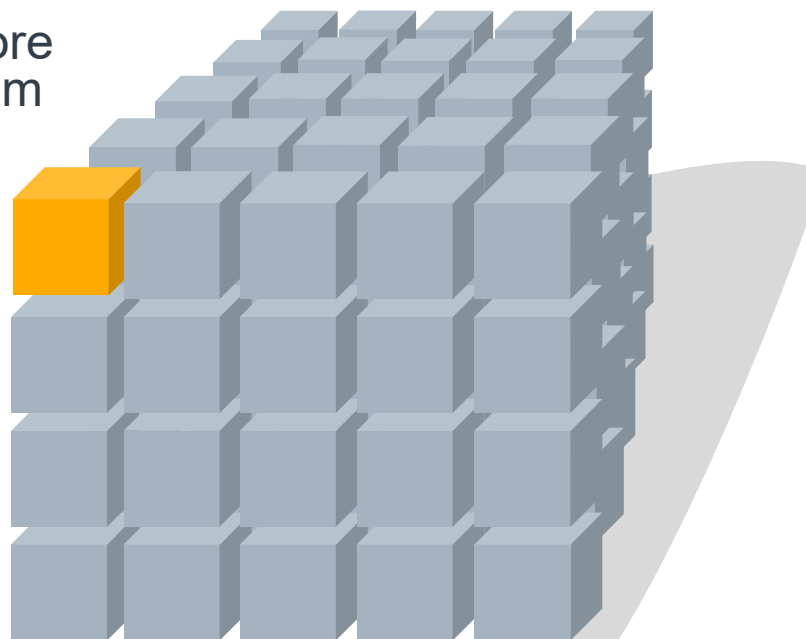
How are Operators Achieving Gigabit LTE?

Utilizing higher order modulation -- 256 QAM

Manipulates waveform for more bits per megahertz of spectrum

Adding up to 4 MIMO layers

Splits transmission across multiple antennas to increase capacity of an RF link

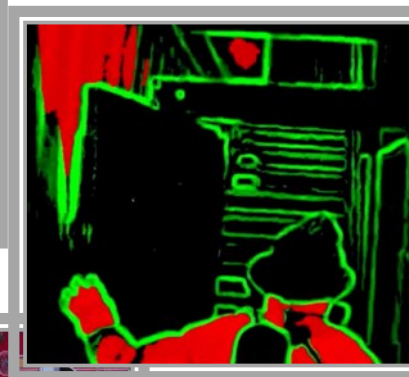


Aggregating more “carriers”

Joins together multiple channels of licensed and unlicensed spectrum into a wider channel

Why 5G Matters

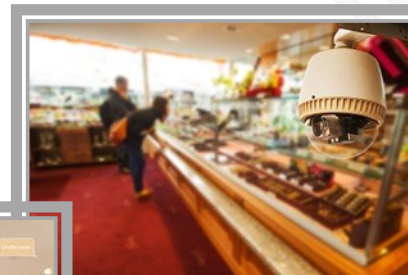
Low latency applications become practical



Wireless can be the sole WAN connection



Video surveillance, AI & augmented reality greatly improve



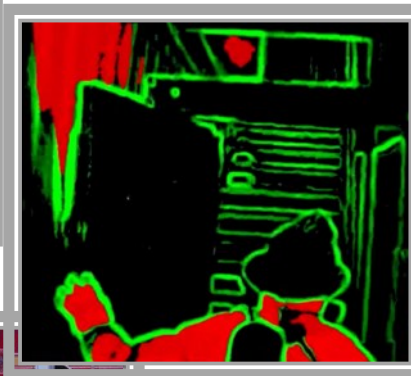
Remote SMEs and virtual workforce improve operational efficiencies



Horizontal Use Cases

Why 5G Matters

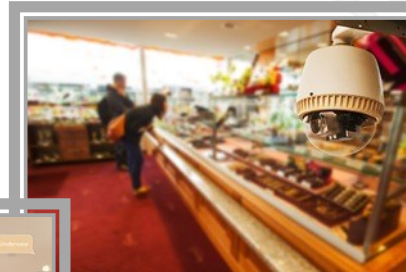
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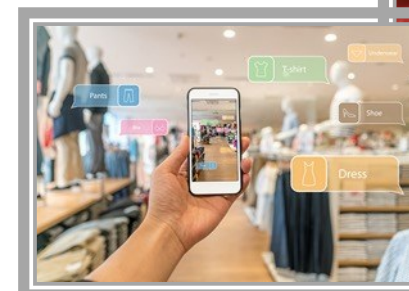
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Remote SMEs and virtual workforce improve operational efficiencies



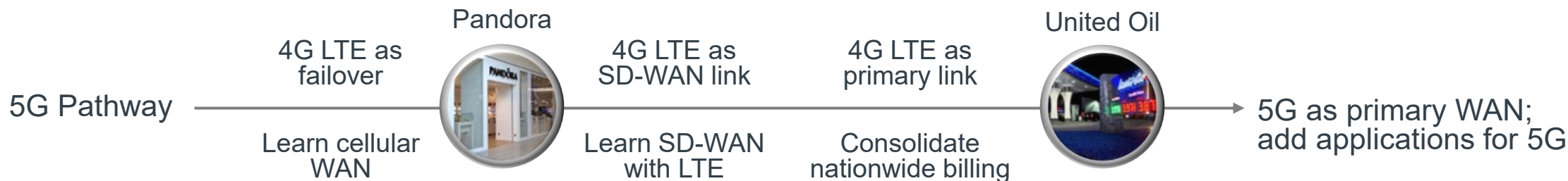
Fixed Sites Cutting the Wires

Today

- Retail stores & offices relying less on wired lines
- 4G LTE has enabled Day-1 connectivity

5G Tomorrow

- Viable replacement for fiber
- Pricing expected to become “all you can eat”
- 5G as primary WAN and 4G LTE for failover



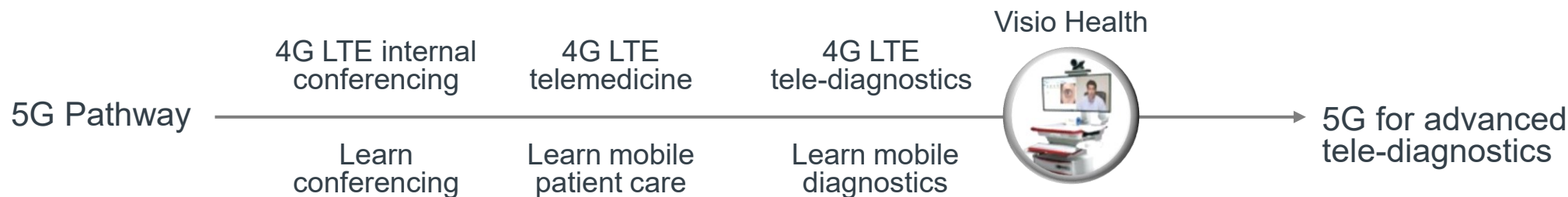
Remote SMEs

Today

- Kiosks have moved retailers beyond traditional stores
- New trend: Remote Subject Matter Experts (SMEs)

5G Tomorrow

- Will expand what can be done remotely
 - EXAMPLE: A patient donning a glove that lets a doctor feel what the patient feels — remotely
- Potential across virtually every industry



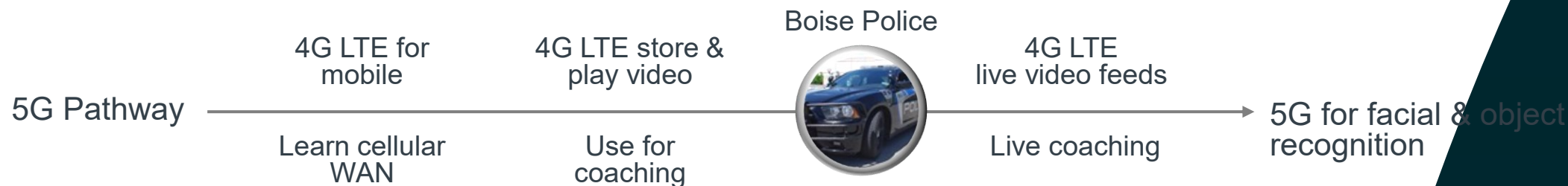
Video Surveillance & Augmented Reality

Today

- Important in virtually every industry
- In many locations, capabilities are limited

5G Tomorrow

- Real-time HD video analytics
 - Will help first responder organizations react more quickly
 - Footage presented in augmented reality



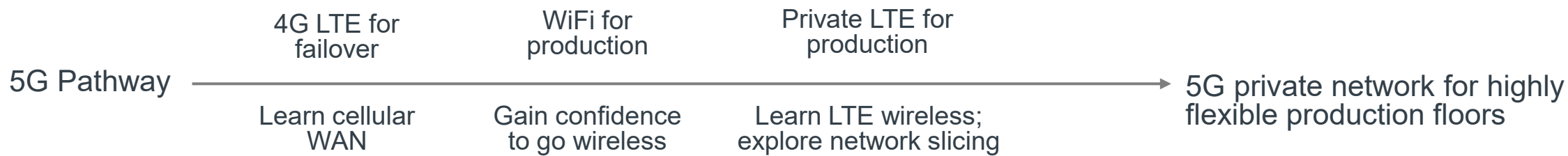
Manufacturing

Today

- Wired infrastructure is inflexible
- WiFi is congested
- Private LTE emerging

5G Tomorrow

- 5G latency and bandwidth advantages
- Performance, manageability, control and flexibility

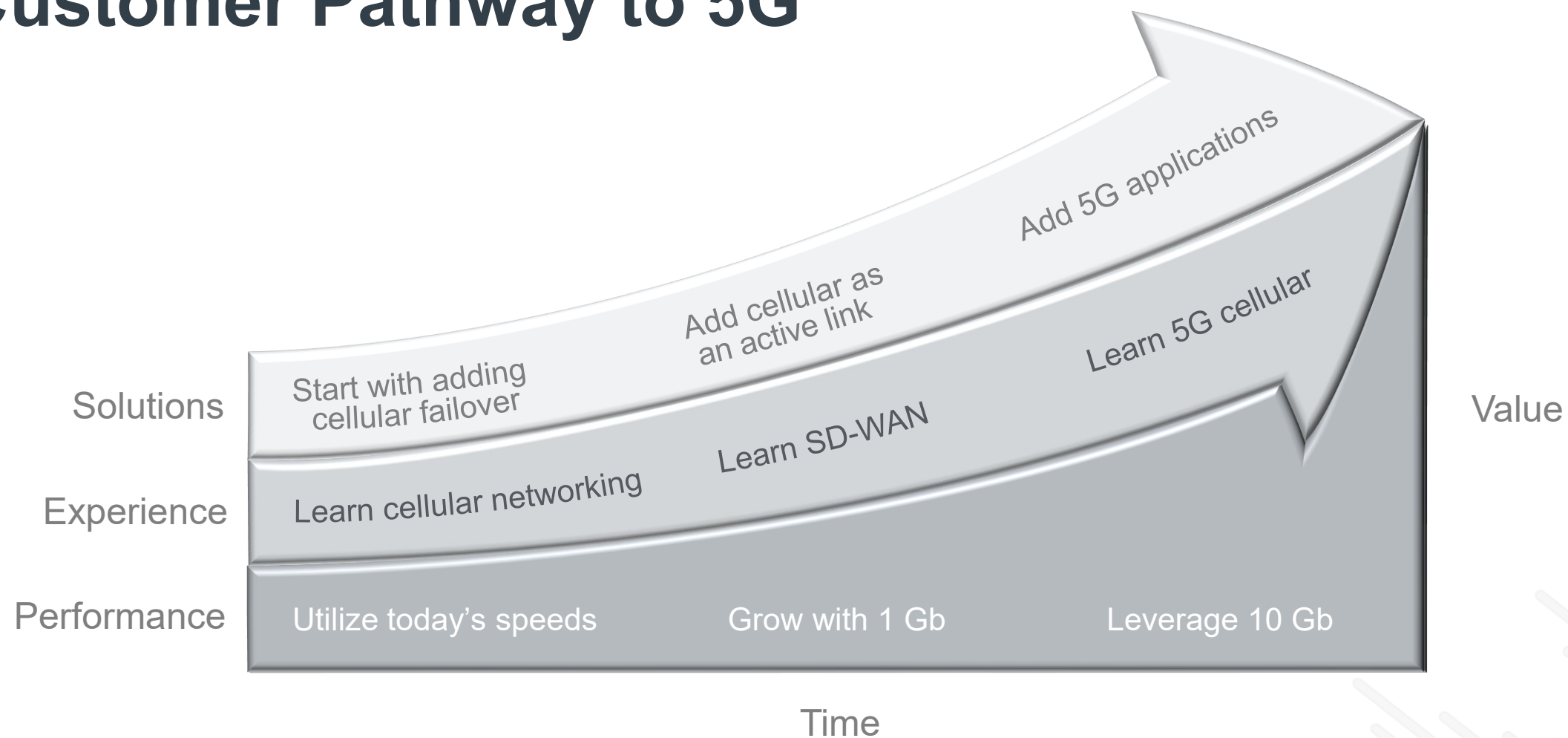


Implications of 5G in Enterprise

- Legacy network designs are too inefficient
 - VPN tunnel latency negates 5G latency benefits
 - Centralized data center firewalls increase latency
- You may need to:
 - Redesign corporate applications to take advantage of MEC
 - Deploy a distributed architecture to support lower latency
 - Firewall, router, IDS/IPS, compute, etc.
 - Implement higher throughput devices at the edge
 - Interface speed
 - CPU capabilities
 - Increase bandwidth at the core

5G will impact your technology roadmap

Customer Pathway to 5G



Suggestions To Our Customers

- Explore transformative use cases
 - Make money, save money, gain competitive advantage
 - Conduct planning meetings with department heads
 - Identify projects to “get on the pathway”
- Meet with your wireless carrier
 - Determine if participating in a 5G trial makes sense
- Incorporate 4G/5G in your technology roadmap
 - Ensure solutions that you implement today are 5G ready

www.cradlepoint.com/5G



Questions – Next Steps Pathway to 5G

Introducing the First 5G Wideband Adapter Series

- Stylized indoor or hardened outdoor models
- Multi-gigabit performance with software-defined modem to cover all Bands
- 5G+4G dual connectivity (ENDC)
- Support for SA (Standalone) 5G NR
- Mobile wizard-based installation application
- “Captive modem mode” with CP router
- 5G tools & value confirmation in NetCloud
- Adaptive to any SD-WAN environment
- Zero-touch deployment & Day-1 wireless
- Advanced remote management suite

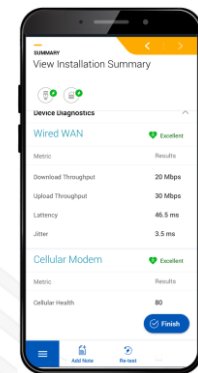
NetCloud Platform



W2000 Indoor



W2005 Outdoor

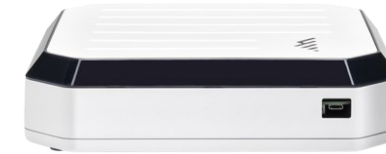


Cradlepoint Verify™

W-Series High Level Specifications

Feature	Specification
Wireless connectivity	5G/4G dual connectivity
Form factor	W2005 metal IP67 rated / W2000 plastic
Ethernet ports	2 LAN 10/100/1000/2500
USB ports	1 (W2000 only)
Console ports	RJ45 Console Port (W2000 only)
Wi-Fi	802.11ax Wi-Fi 6 (installation only)
Frequency bands (Telstra)	5G Sub-6 GHz: n5, n7, n78 LTE Bands: B1, B3, B7, B28
Power	802.3bt (90W) PoE compliant source
Operating temperature	W2000: 0 °C to 50 °C (32 °F to 122 °F) W2005: -30 °C to 70 °C (-22 °F to 158 °F)

W2000

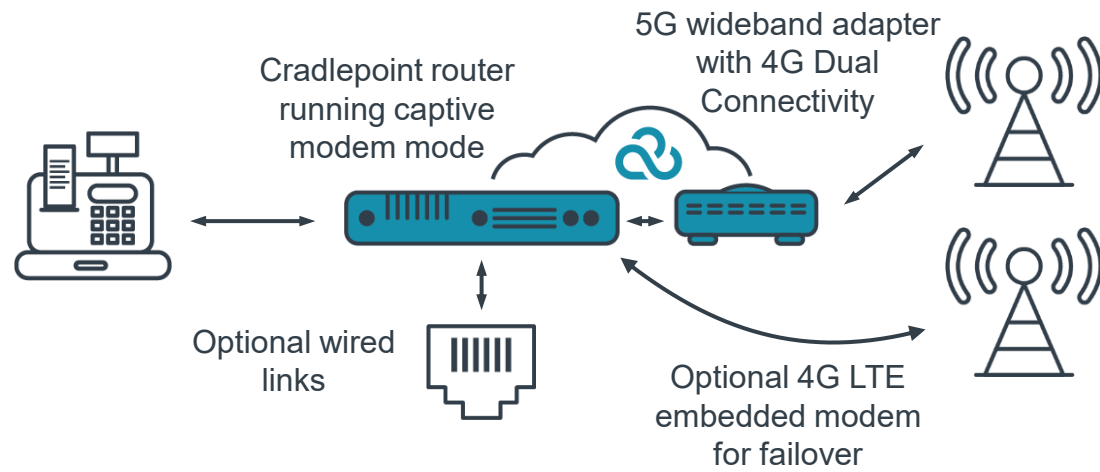


W2005

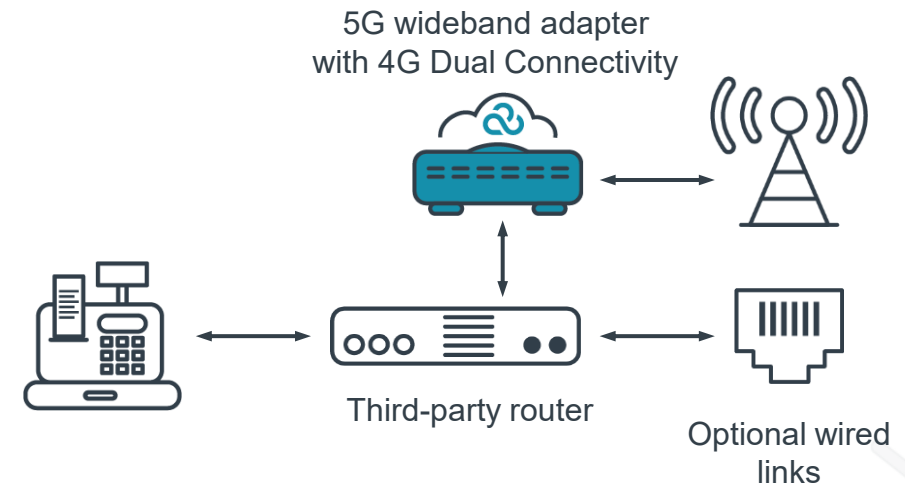


Flexible Deployment

Full Cradlepoint Deployment

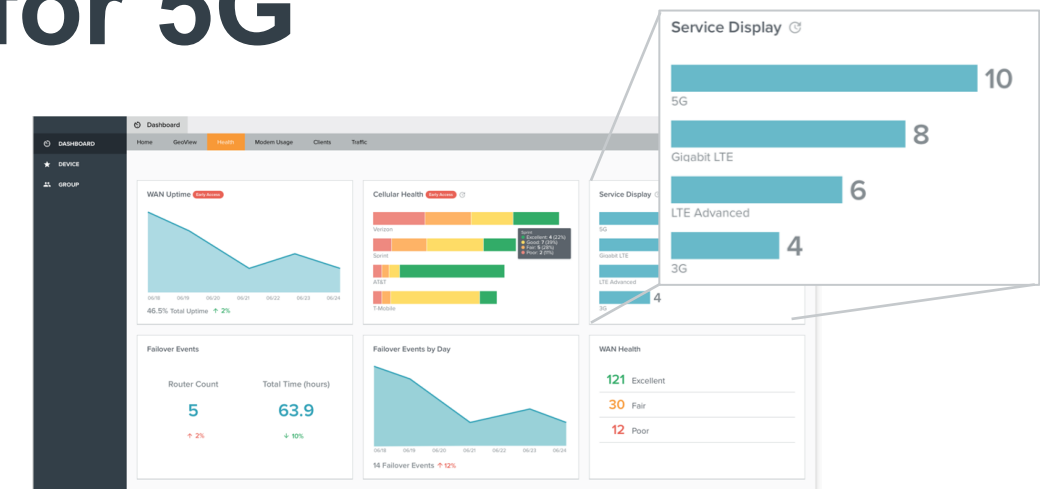


Third-Party Router Deployment

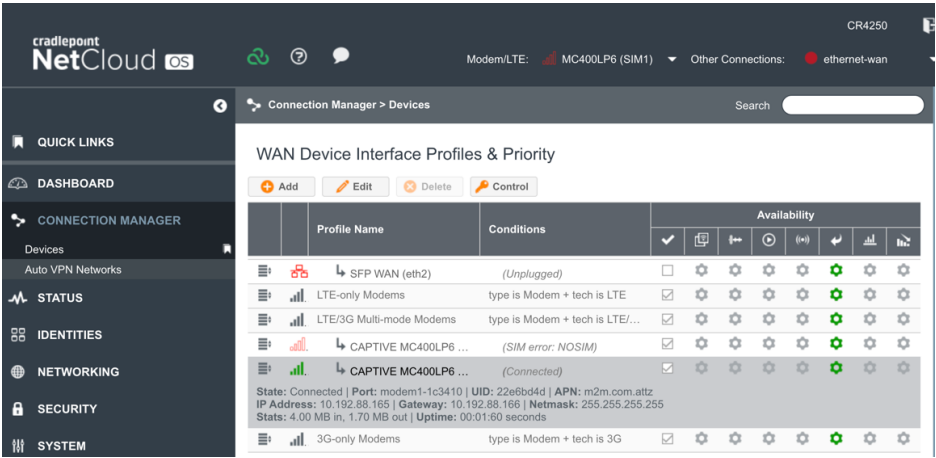


NetCloud Enhancements for 5G

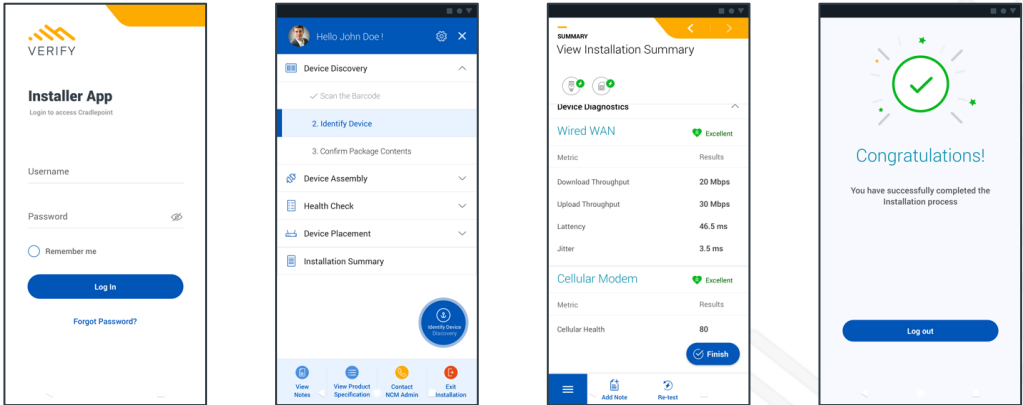
Site Survey/Installation
Connection Optimization
Value Confirmation
Monitoring & Troubleshooting
Captive Modem



5G Differentiation Throughout NetCloud



Captive Modem



Installer/Customer Apps