Hewlett Packard
Enterprise

PRIVATE 5G IN THE TACTICAL SPACE

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Air Force/Space Force/Army/COCOMs

AGENDA

What is Private 5G?
P5G vs Wi-Fi
Emergence of P5G
HPE P5G offering

WHAT IS PRIVATE 5G?

WHAT IS PRIVATE 5G?

Same technology as Public 5G networks offered by Telcos

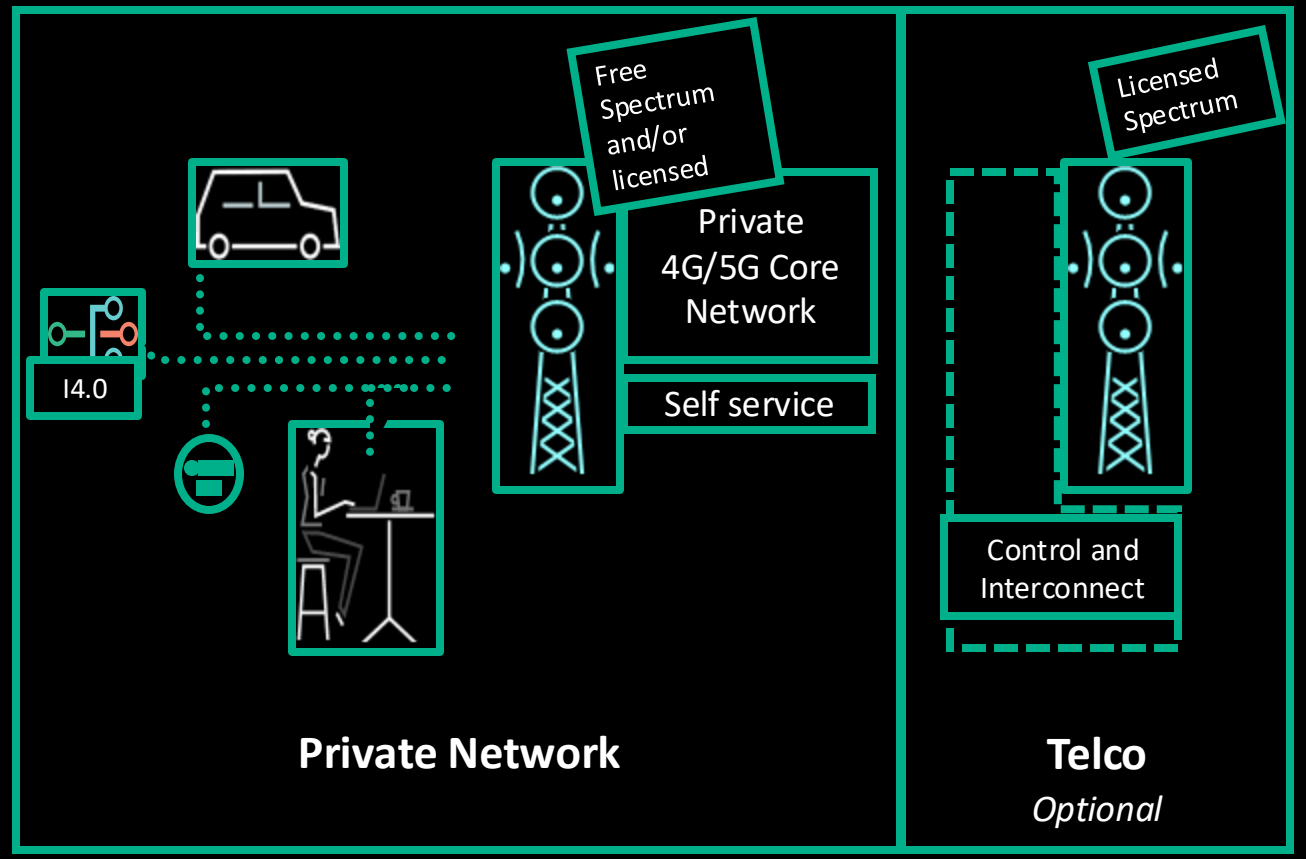
Wide area coverage
Nomadic connectivity
End-point security

Controlled by Enterprises, Businesses, Gov Agencies

Serving dedicated network services to Users, Staff, Systems or Applications

Radio in use:

Licensed spectrum - often leased from CSPs
Free spectrum (CBRS) – with verifying performance and device availability

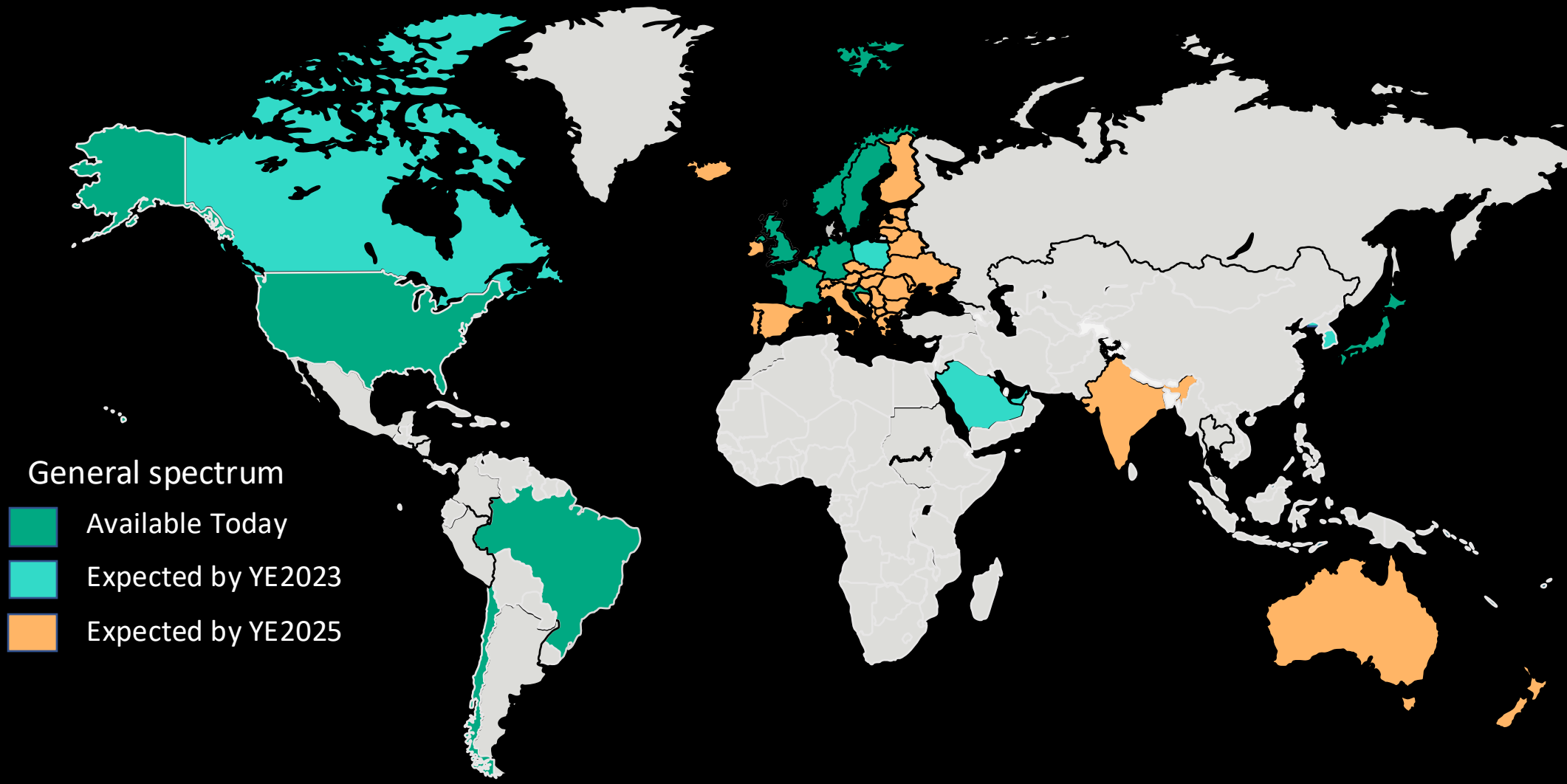


UNIQUE BENEFITS OF HPE PRIVATE 5G STAND ALONE NETWORK

True Private 5G Network designed and deployed to the specifications of the client's operational objectives:

- 5G stand alone network; most scalable private 5G network solution
- 3GPP Open Architecture
- Secured from Radio Access Network (RAN) through the 5G Core to Edge Compute environment; can offer WiFi6 to 5G interoperability
- Leverages private spectrum Citizen Broadband Radio Service (CBRS) and public (e.g. T-Mobile, AT&T, Verizon)
  - CBRS is a 150 MHz band of spectrum that operates in the 3.5GHz – 3.7GHz range
  - CBRS uses a three-tier priority systems
    - Incumbent Access – Grandfathered priority in the 150MHz spectrum
    - Priority Access – Purchased spectrum during CBRS auction
    - General Authorized Access – unlicensed/free to use
- Flexible deployment models…fixed or portable; 5G in-a-box or distributed architecture

GENERAL SPECTRUM AVAILABILITY IS A GAME CHANGER



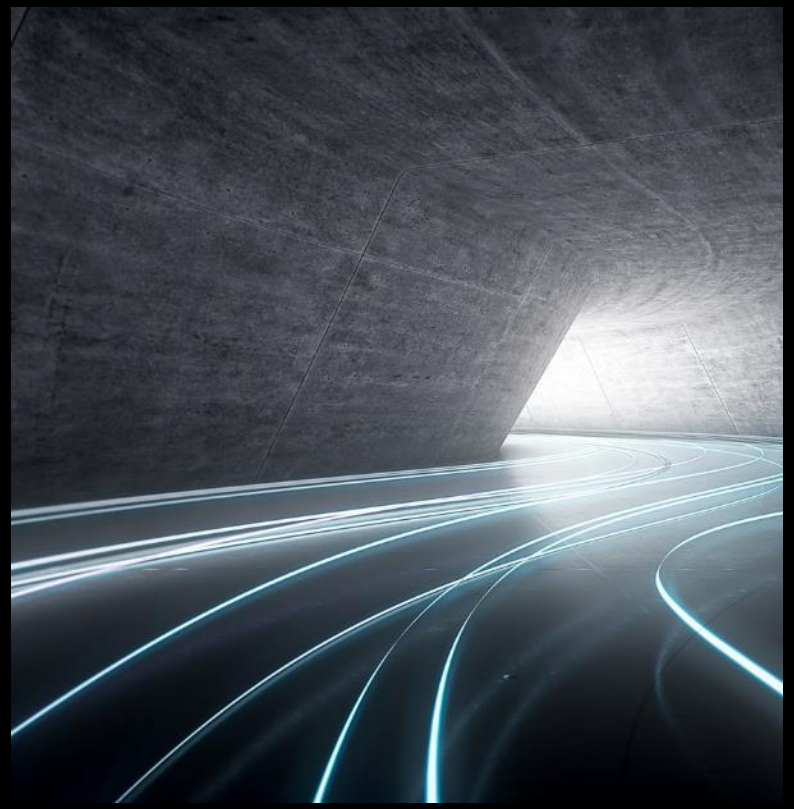
P5G availability by 2023:

- USA
- Canada
- Germany
- UK
- Poland
- Sweden
- Norway
- Brazil
- Japan
- South Korea
- Bahrain
- Saudi Arabia
- Korea

P5G availability by 2025:

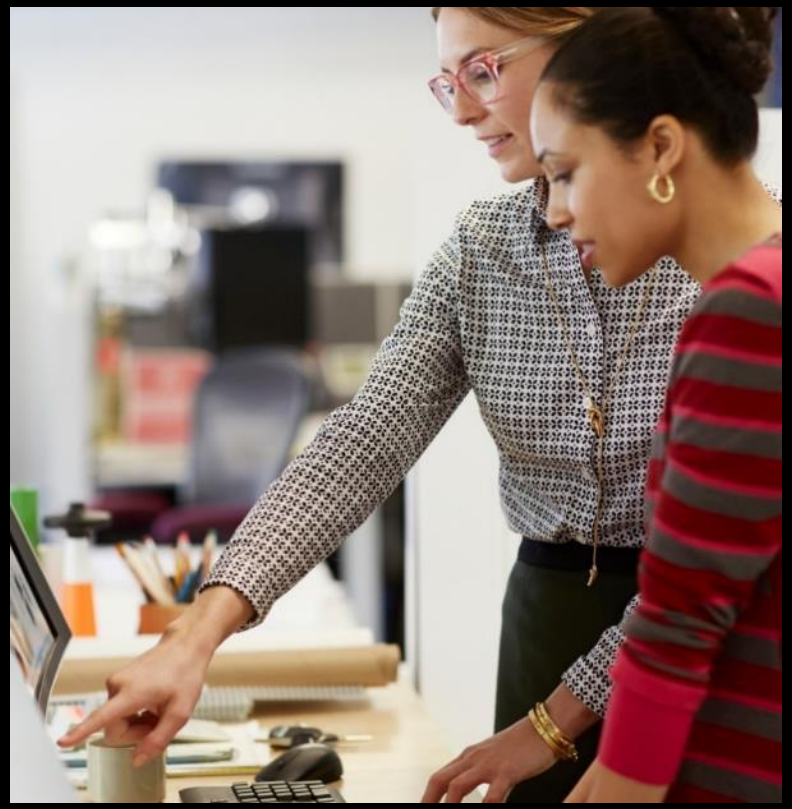
- Australia
- Mexico
- The Netherlands
- France
- Italy
- Luxembourg
- Spain
- Belgium
- Czech Republic
- Slovakia
- Turkey
- India
- United Arab Emirates
- South Africa

THE MUST HAVES OF PRIVATE 5G



Fast, flexible deployment

Under 1 hour



Easy to operate

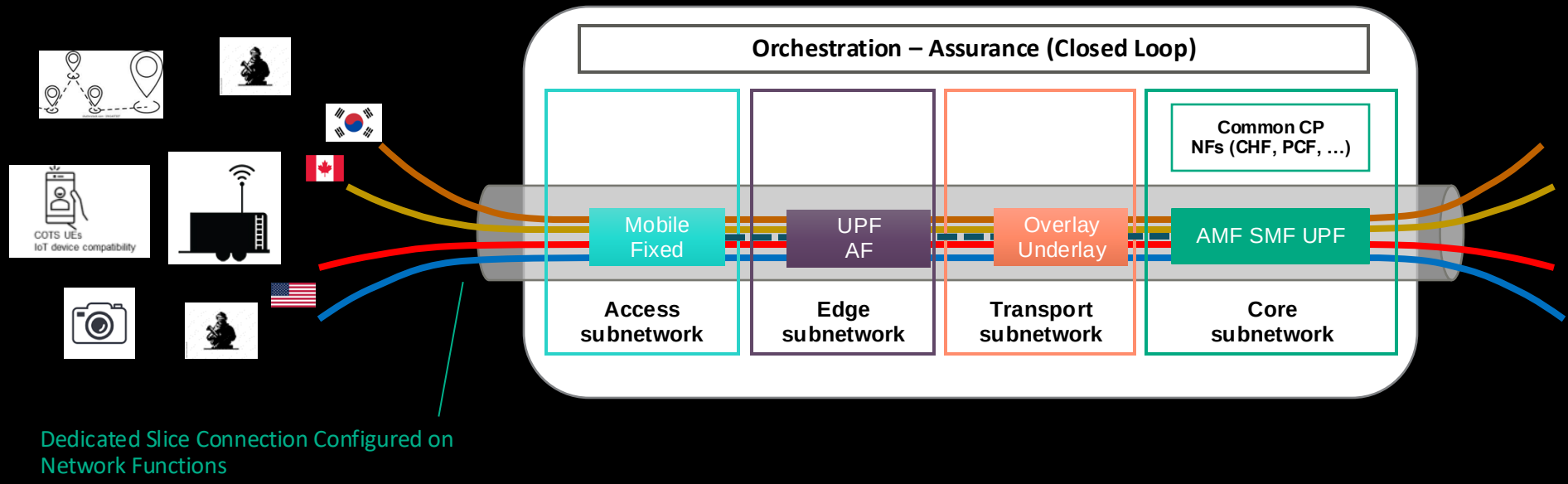
By Enterprise or Service Provider

Works well with Wi-Fi

Like a single network

5G SLICE MANAGEMENT – TACTICAL VALUE PROPOSITION

What is a slice and why is it needed?



Dedicated Slice Connection Configured on Network Functions

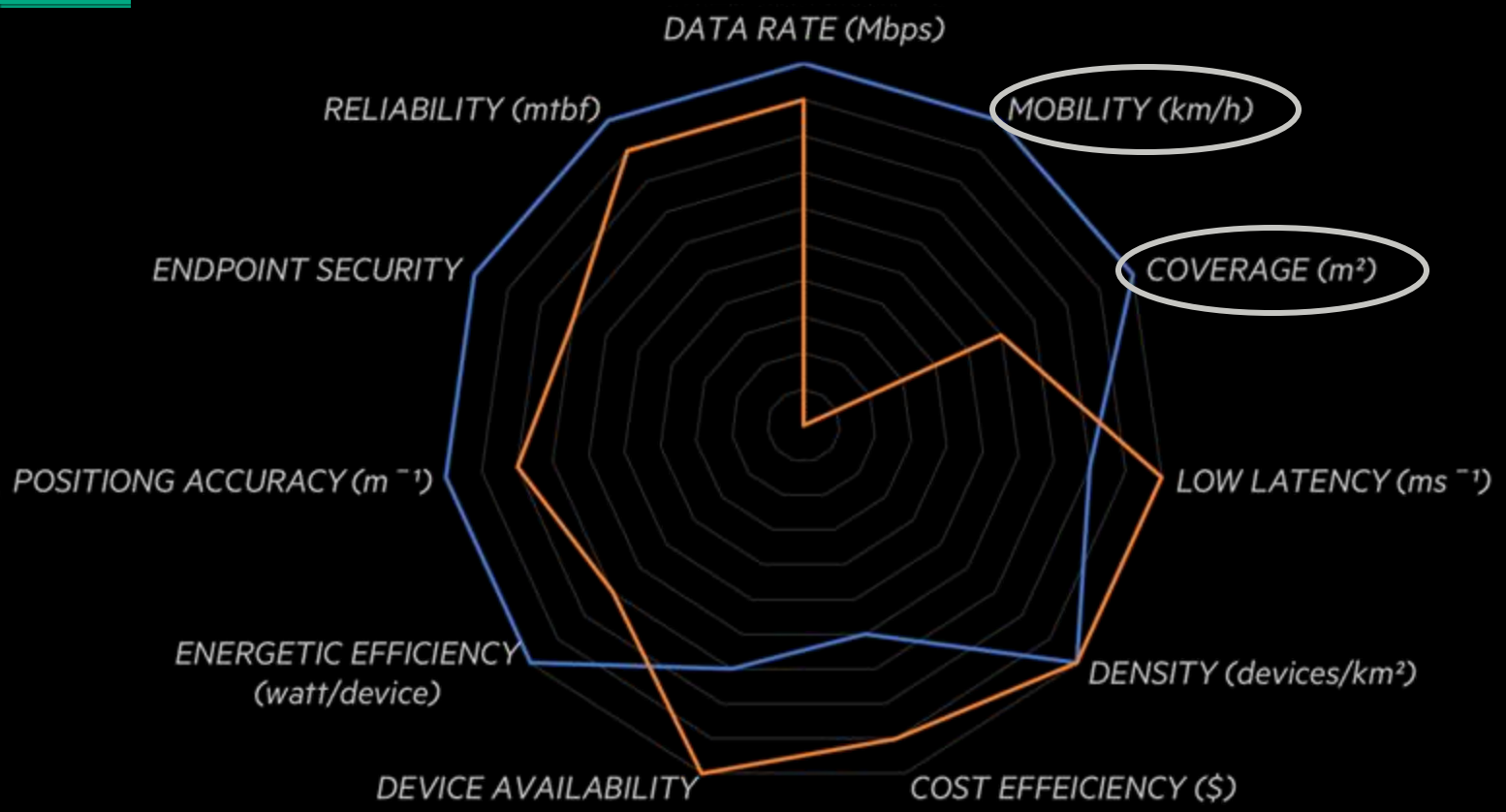
Command & Control (C2)

A network slice can be seen as a private network, providing a defined service quality for end user applications.

It is configured on top of dedicated or shared virtual network functions, running on shared physical infrastructure.

PRIVATE 5G VS WI-FI

PRIVATE-5G + WI-FI 6



Wi-Fi 6
for cost-effective Indoors connectivity

Private 5G
for wide-coverage, high-mobility

Sources:
- WBA, "5G and Wi-Fi RAN Convergence Aligning the Industry on Opportunities and Challenges", Dec 2020
- WBA, "5G Networks: The Role of Wi-Fi and Unlicensed Technologies", Sept 2017
- 5G PPP, "5G Empowering vertical Industries", Feb, 2016
- HPE internal studies

PRIVATE 5G VS WI-FI

ATTRIBUTE	5G	WIFI 6
PERFORMANCE ENHANCEMENTS OVERPREDECESSOR	10x speed, 10x less latency, 1000x more capacity	4x faster, 75% lower latency, 4x more capacity than wifi 5
OPTIMAL SPEED (Typically, some overhead will prevent achieving maximum)	~ 10 gbps (Depends on spectrum, with mm Wave being fastest. Note that currentspeed achievements fall between 1gbps and 10 gbps)	600Mbps to a max 9.6gbps (Depends on # of devices and other neighbors sharing spectrum)
OPTIMAL LATENCY (Typically, some overhead will prevent achieving maximum)	~ 1 ms	~ 1 ms (Greatly impacted by # of devices and others sharing spectrum)
RANGE	Can provide service within building/space and across campus or larger field area	Optimal use within a building or space
TRAFFIC FLOW	Enables device-to-device communications which provides additional capabilities (vehicle collision avoidance, et.) as well as not requiring the backhaul /trunk to support 100% of traffic	Requires a Wi-Fi 6 AP to communicate with router
HANDOFFS BETWEEN PRIVATE/COMMERCIAL	Enabled through dual SIMs (including eSIMs)	N/A
DEDICATE PURPOSEFUL SLICE(S) FOR DIFFERENT TRAFFIC	Yes	Yes, but limited
SECURITY	Smaller attack surface/Leverages eSIM	Partially due to its intended purpose, Wi-Fi 6 leverages unprotected unlicensed spectrum which has a larger attack surface and a lesssecure WPA3
COST	Higher cost and complexity	Overall lower cost compared to 5G
SPECTRUM	Licensed and Unlicensed – licensed require subscription such as for 5G cell service. Unlicensed space aslo includes protections from being impacted by others	Unlicensed
APPLICATION	Mobile connections covering larger areas and cases with a large # ofsensors such as manufacturing. Potentially used as alternative to wire to provide connectivity to home and business. Typically used for mission critical applications and those requiring low latency.	Home and businesses within a single building Typically used for non-mission critical applicationsor general access within a home or building

EMERGENCE OF PRIVATE 5G

WHERE WE SEE PRIVATE 5G?

Tactical forces

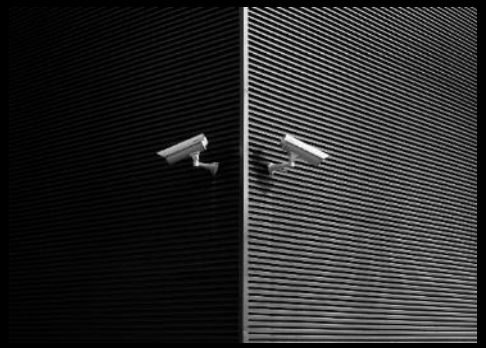
Healthcare

Manufacturing

Sea ports

Broadcasting

Oil Field



Security

AR/VR

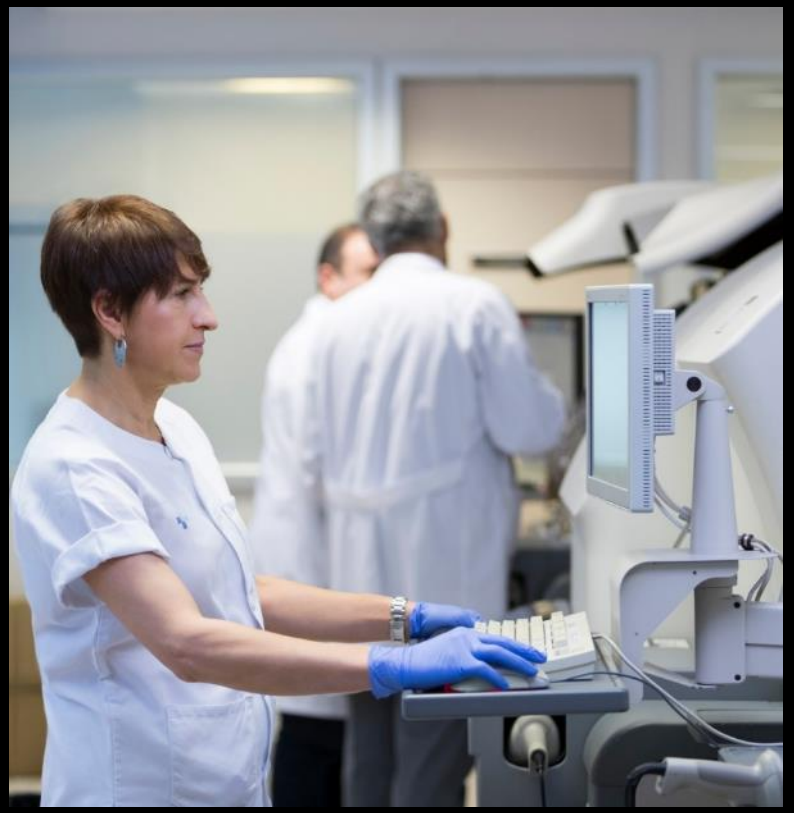
Farming

Sponsored services

PRIVATE 5G – 3 PRINCIPAL TYPES

Enable autonomous operations 1

“5G in-a-box”



Support critical 2

“Head in the cloud, feet at the Edge”

Dedicated 3

“Virtual Private 5G”

ENTERPRISE USE CASES

TELEMEDICINE PRIVATE 5G

The Government of India allows large enterprises to leverage non-radiating experimental indoor spectrum license, specially allocated for non-Mobile Operator.

Telemedicine provider deploy a central 5G Core lab to do technical evaluations of Private 5G services with their healthcare devices, including: EMBB, URLLC and MEC (mm-wave) scenario, with Mobile X-ray units and scanners

HPE solution

- HPE 5G Core Stack centralized deployment
- Airspan 5G indoor RU: AV 2700 Sub 6GHz

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PETRO-CHEMICAL COMPANY, USA

CONNECTIVITY DURING MAINTENANCE

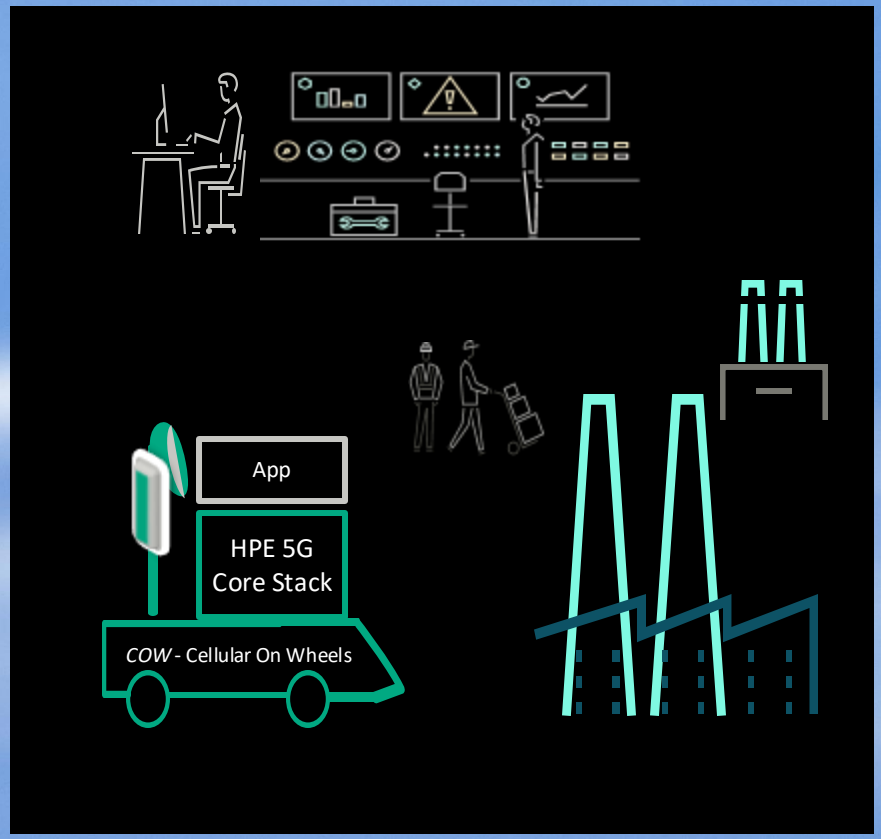
With large area remote facilities, and metallic interferences, Petrochemical companies turn to cellular coverage.

Autonomous connectivity is needed for site maintenance

Co-existence with in-building WiFi

HPE 5G Core Stack

- Cellular on wheels:
  - HPE 5G Core Stack
  - Radio units



AUTOMOTIVE MANUFACTURER

GERMANY

Networking machines and systems with a high-performance mobile network for a paperless ultra-dense Operational Technology (OT) environment.

Goals:

- Continuous bidirectional segregated data flows among OT and IT, with reliable, efficient and ultralow-latency connectivity.
- Designed to support “digital twin” solutions

HPE 5G Core Stack
HPE Service Director
HPE Dynamic SIM provisioning

HPE DOD PRIVATE 5G USE CASES

Mobile Connectivity

Tele Medicine

Aircraft

FWA for DoD Camps

IOT

Connectivity to Distributed Bases

Surveillance

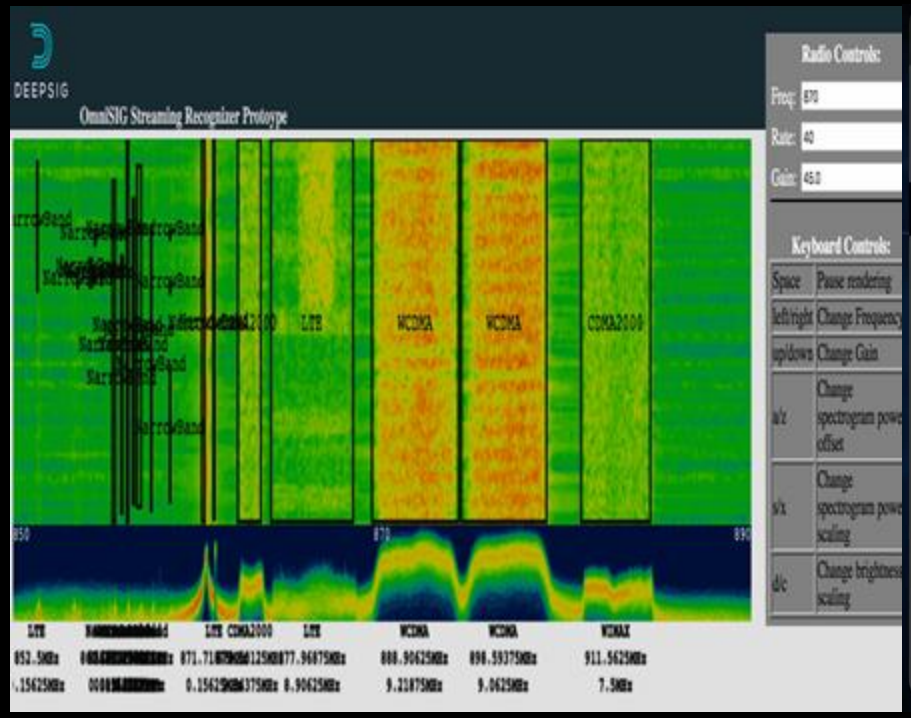
AR/VR

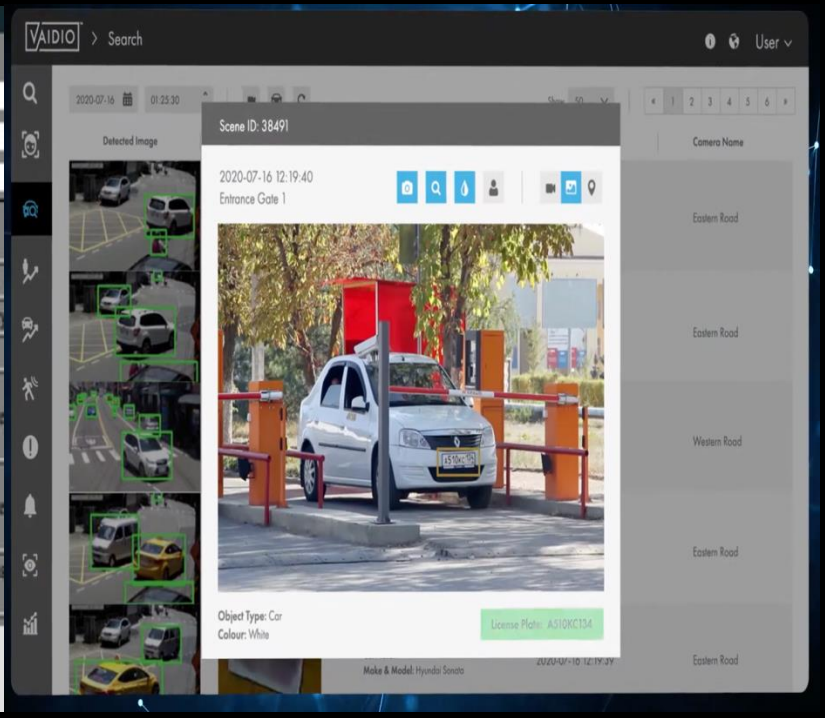
Coalition Forces

SWaP

IOT USE CASE WITH AI ML

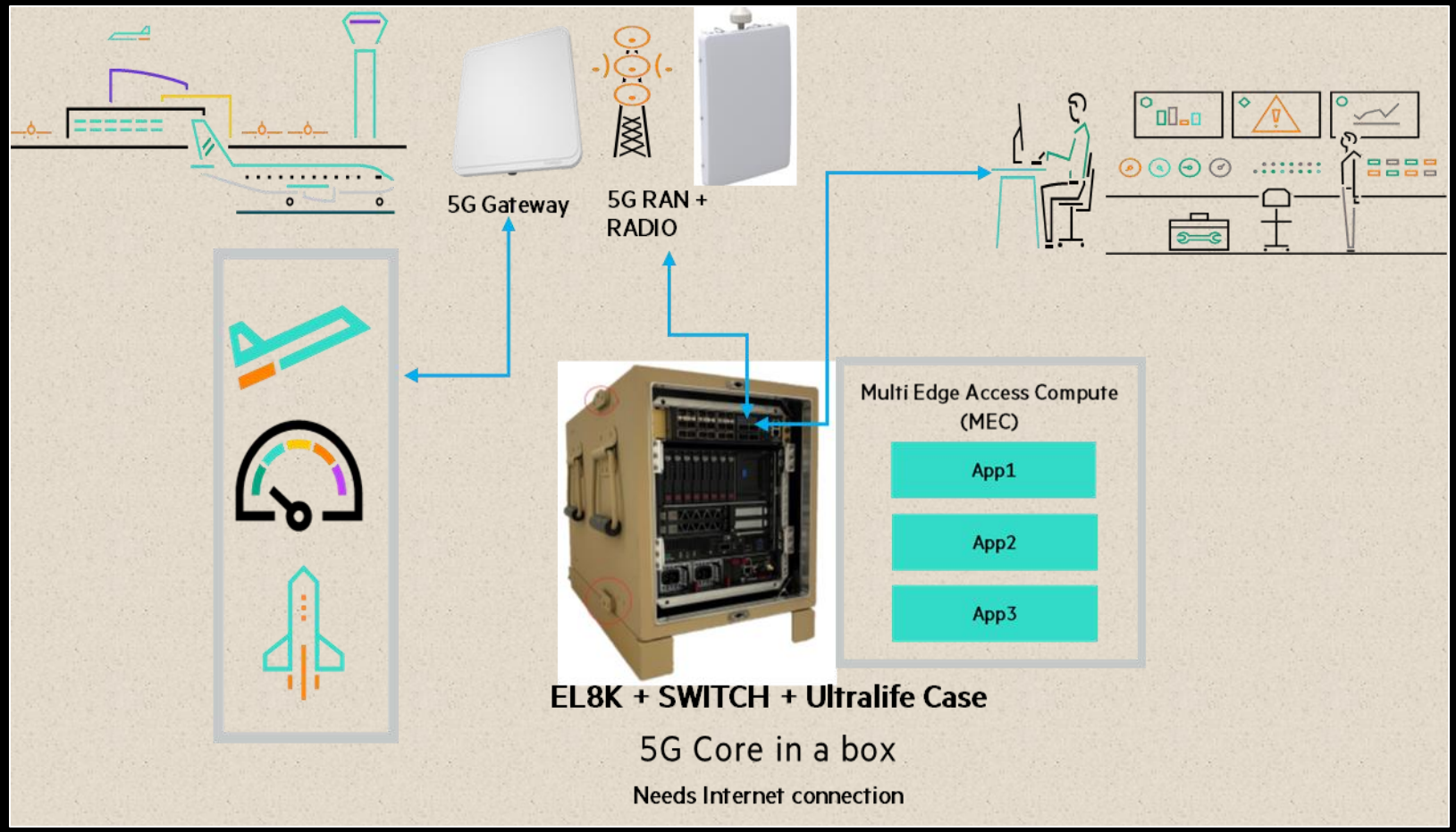
- Supports high-speed connectivity at the edge for real-time object detection
- Finetuned on custom datasets to detect vehicles and aircraft





AIRCRAFT MAINTENANCE

High speed connectivity at the edge to ingest the big amount of Engine data and transfer to AI/ML system for analytics and generate the insights into the Aircraft Engine and system health.



HPE PRIVATE 5G OFFERING

HPE TACTICAL 5G (IN-A-BOX) SOLUTION

- US DoD requested first 5G transportable production systems (HPE 5G Core Stack (CS) product in-a-box) for DoD base (USA) in Hawaii.
- The solution is integrated into Ultralife Rugged Cases to be mobile/deployable and air droppable, with a custom high-capacity UPS.
- Provides high speed connectivity at the edge to support AI/ML sensor ingestion and data operations with over the top (OTT) applications for Mission Command communications.

Inseego 5G GW

Motorola Edge+ 5G Handsets

5G system in a box

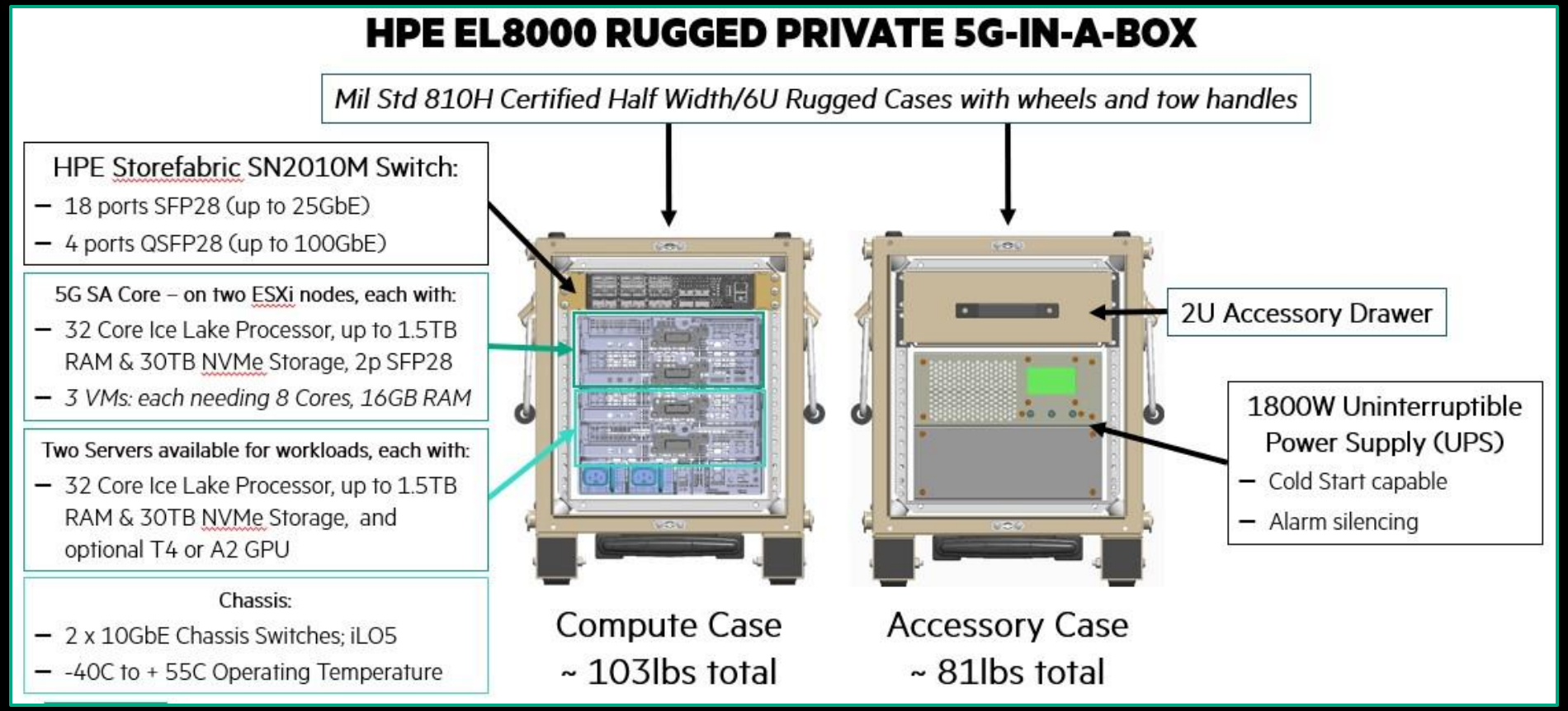
10/25 GB ethernet connection

Portable 5G RAN on a tripod

HPE Tactical 5G Demo

DEPLOYABLE PRIVATE 5G STAND ALONE SERVICE

- HPE's "5G-in-a-box" packaged in a Mil Spec 810H certified rugged case with a rugged Uninterruptible Power Supply can deploy into harsh environments to provide high speed communications at the tactical edge.



THANK YOU

Tactical EL8000 Private 5G Demo:
https://www.youtube.com/watch?v=wELaVS0X_8c