Private 5G Solutions for Deployed Operations

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Defense & National Security
Expeditionary 5G Solutions for Deployed Operations
Private 5G Solutions for Deployed Operations – 3 buckets

Domestic Response Operations

Natural Disaster Response
• Anticipated – hurricanes, winter storms
• Unanticipated – tornados, wildfires

• Man-made Incident Response
  • Accidents – transit, industrial
  • Domestic terrorism

• Homeland Defense
  • Preparations / Response Actions

OCONUS Response Operations

• Nation State Response Actions
  • Invited, Humanitarian –
    - Humanitarian Response Ops (HUMRO)

  • Invited, Contingency - Coalition / Allied Partner
    - Staging locations, forward operating bases

  • Uninvited – Occupying force

Other (CONOPS/ TTP development)

• Joint Training Exercises
• National/DoD T&E efforts / “Rapid” Range Testing
• Fed/State/Local/Tribal Requirements
Objective -
Develop a mobile, tactical 5G core solution to support domestic response operations and overseas contingency deployments.

Goal -
Develop and produce a US providers go-to-market expeditionary 5G core product in the next 9-12 months with flexible, scalable configurations to meet a variety of operational mission needs.
JADC2 is DOD's effort to integrate sensors with shooters across all domains, commands and services.

"This is warfighting business. It belongs with the warfighter."
"This is about fires, and speedy engagement"
- Lt Gen Crall, USMC, J6
Defining the Tactical Edge

Drone with RF Analyzer

5G Service in Ops Center

Gateway selects optimum backhaul from up to six simultaneous options

3D Common Operational Picture

Agile Backhaul

LEO Satcom

GEO Satcom

Fiber

Flying COW® with EO/IR Camera

Robot Dogs with EO/IR Cameras

Mission Caster

Local Applications Services (CIVTAK, ATAK, Matrix)
Expeditionary 5G Baseline Kit Specifications & Capabilities

- Dual-mode, NSA/SA Core
- Reduced SWAP
- Transit case portable <200lbs / case; 3-4 cases max
- AC/DC powerable based on configuration
- Ruggedized, compliant –
  - Mil-STD 901D (mechanical shock)
  - Mil-STD 810 (shock, thermal, humidity, altitude)
  - Mil-STD 461 (EMI)
  - Mil-STD 167 (vibration)
  - DoD - Technology Readiness Level (TRL) 8
- Multi-spectrum/multi-band capable
  - Low Band: Bands 2, 4, 5, 12 and 14
  - Mid Band: Bands 2 and 66
  - High Band: Band n260
  - C-band (Int’l): N77/78 (DoD)
- Network Security – CORE to RAN
- Data & voice capability (IMS/VoLTE)
- Auto-switching, multi-backhaul capability (Auto-PACE)
  - Capacity/Throughput ~ 1 GB
- 10-100 Users – Tactical Ops Center (TOC)
- 100-1000 Users – Forward Op Base
- Up to 10K users

Why AT&T?
✓ Spectrum
✓ Int’l Roaming Agreements
✓ Custom solutions
Expeditionary 5G Baseline Kit Enhancements & Services

Scalable Enhancements
- **Network Slicing** (Msn Crit vs Admin)
- Dynamic Spectrum Sharing (DSS)
- IAB – Integrated Access Backhaul (mmW coverage extender)
- Security – ZTA, MDM (Mobile Device Mgt), LPI/LPD/LPG (low probability of geolocation) (non-mil sig)
- **Tactical Edge: CSfC**, Mobile Ad-hoc Networking (MANET), IoBT
- Networks – SDN, NFV (Ntwk Function Virtualization)

AT&T Products/Services/Capabilities
- Leveraging Existing/Ongoing Commercial Investments
  - **Global comm wireline/wireless enterprise**
  - EITaaS – agnostic cloud connectivity
  - Custom RAN / UE solns
    - ORAN and custom implementations – DoD spectrum bands
    - Custom UE chipsets, software, firmware - DoD spectrum bands
    - UE provisioning for private 5G solutions
    - CRU/IRU & BYOD implementation
  - FirstNet
  - NOC/SOC
  - AT&T VPN
  - EDGE/FOG computing capability (MEC)
  - Services – Tier 1-3 support – remote and on-site
  - AT&T DoD 5G Testbed

Future Enhancements
- Open Architectures, Open API
- Mosaic technologies for multi-domain ops
Expeditionary 5G Baseline Kit Enhancements & Services

5G for DoD
Foundation of the Future; AT&T 5G

Use Cases
- Enhanced Security, Resiliency and Diversity
- Non-Permissive Expeditionary Networks
- Non-terrestrial Networks / Satellite Backhaul
- Intermittent & Disconnected Operations
- RF Dense & Harsh Operational Environments
- Flight Line of the Future, IoT, Mission Apps

AT&T Trifecta – Wireline, Wireless and FirstNet
Hybrid Private Cellular Networks

- Dedicated Private RAN / Core
- Shared RAN* MOCN
- AT&T RAN / Core

ON PREMISE

MACRO

AT&T Proprietary Spectrum

Private SIM
DoD specific “purple” SIM?

CBRS Roaming – CONUS Only

Private SIMs
Comm’l Network

CBRS Requirements –
* CBRS requires a Spectrum Access System (SAS) connected FCC databases and incumbent reporting systems and PAL license for a specific area.
* The SAS also must interface with Environmental Sensing Capability (ESC) systems to detect radar use in the area.

* Enabled by MOCN (Multi-Operator Core Network)
Expeditionary 5G Considerations

Domestic Options
- Hybrid 1 (CBRS + DoD Proprietary Spectrum n77/n78 bands)
- Hybrid 2 (CBRS + Commercial Proprietary Spectrum)
- Hybrid 3 (DoD + Commercial Proprietary Spectrum)
- Hybrid 4 (DoD + CBRS + Commercial Proprietary Spectrum)
- FirstNet

General Considerations / Issues
- DoD C-Band Availability
  - Frequency / Bandwidth
  - Procurement lead times for int’l n77/78 RAN
  - UE software / firmware updates for n77/78 operation
- OA&M support & sustainment (CONUS/OCONUS/Deployed)
- NOC / SOC support
- Supply chain integrity
- US provider

Overseas Considerations / Issues
- Spectrum Availability
- Roaming Partnerships
- QoS

Tactical solution customizable for all services and COCOMs – domestic & All of World
Expeditionary 5G Near-Term Milestones

4Q21
Complete testing/demonstration on small form factor 5G tactical Core

1Q22
Small form factor 5G Core ready for production

3Q22
AT&T participates with 5G tactical kit at DoD/DHS exercises

Tomorrow's expeditionary 5G solution, today.
Questions/Discussion

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### Private 5G for Deployed Ops – Spectrum Considerations

<table>
<thead>
<tr>
<th>Spectrum</th>
<th>Low – Mid Band (4G LTE/FDD)</th>
<th>C Band (n77, n78)</th>
<th>CBRS* (CONUS only) (4G LTE/FDD)</th>
<th>High Band (mmW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>MHz – 700, 850,1900 GHz – 2.1, 2.3</td>
<td>3.3-4.2 GHz 3.3-3.8 GHz</td>
<td>3.5 - 3.77 GHz</td>
<td>24, 39 GHz</td>
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<tr>
<td>Coverage Range</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
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<tr>
<td>Propagation</td>
<td>•</td>
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<tr>
<td>Bandwidth</td>
<td>•</td>
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<td>Latency</td>
<td>Latency determined by deployed characteristics of the system. The closer we move the core or MEC to the customer, the lower the latency.</td>
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</tbody>
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*Exclusion zones apply

*AT&T does not possess any PAL licenses. Can only utilize if receiving a carrier grant from SAS.

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**DoD Spectrum Interest –**

- **3.3 - 3.45 GHz (DSS prototype)**
- **3.8 - 4.4 GHz (Radar Altimeter Study)**

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**DoD MoW Interest**
- EUCOM
- INDOPACOM

**5 EYES Partners**
- UK
- AUS
- CAN
- NZ

**KEY**
- Good
- Better
- Best