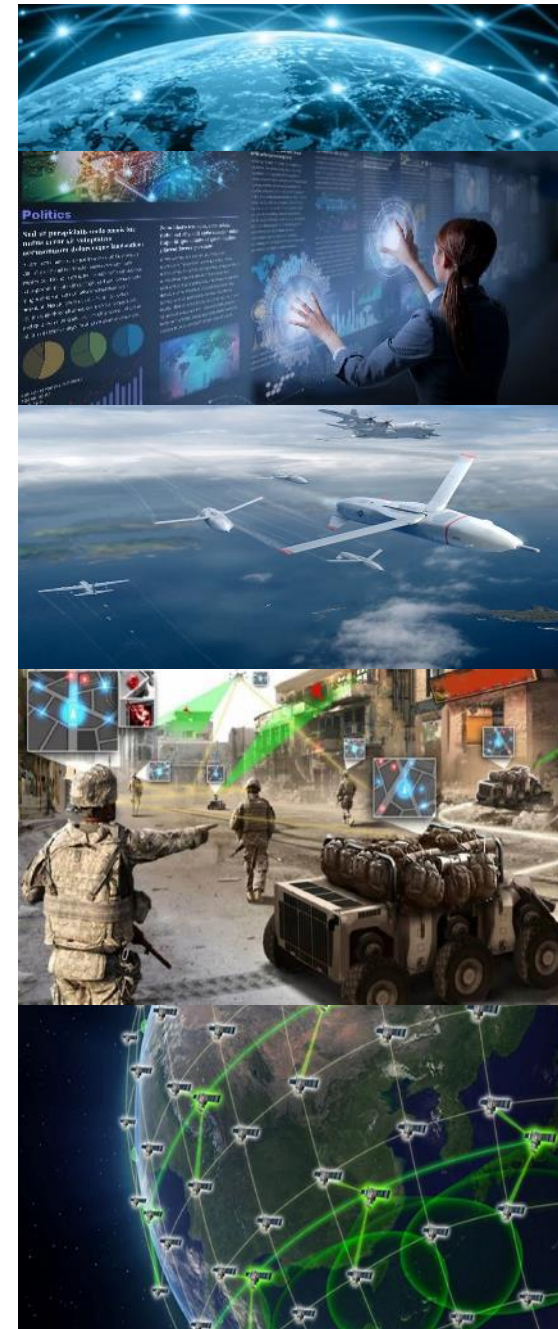# DoD and 5G

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2nd IEEE APL Workshop on 5G Technologies for 1st Responders & Tactical Networks
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5G – Key Themes for DoD

- **5G is transformational…it is "ubiquitous connectivity":** human-to-human, machine-to-machine, human-to-machine connectivity

  - Moving from discrete to continuous communications, computation, data curation & management
  - 5G is not just about the Radio Access Network (RAN), and not just cell phones

- There is no such thing as a secure system - we can work to make things more secure, be more mindful of vulnerabilities, but ultimately, we must effectively use networks in which we have **"zero trust"**.

- The DoD will always assume that **we must operate through**, anywhere and anytime, regardless of the environment.
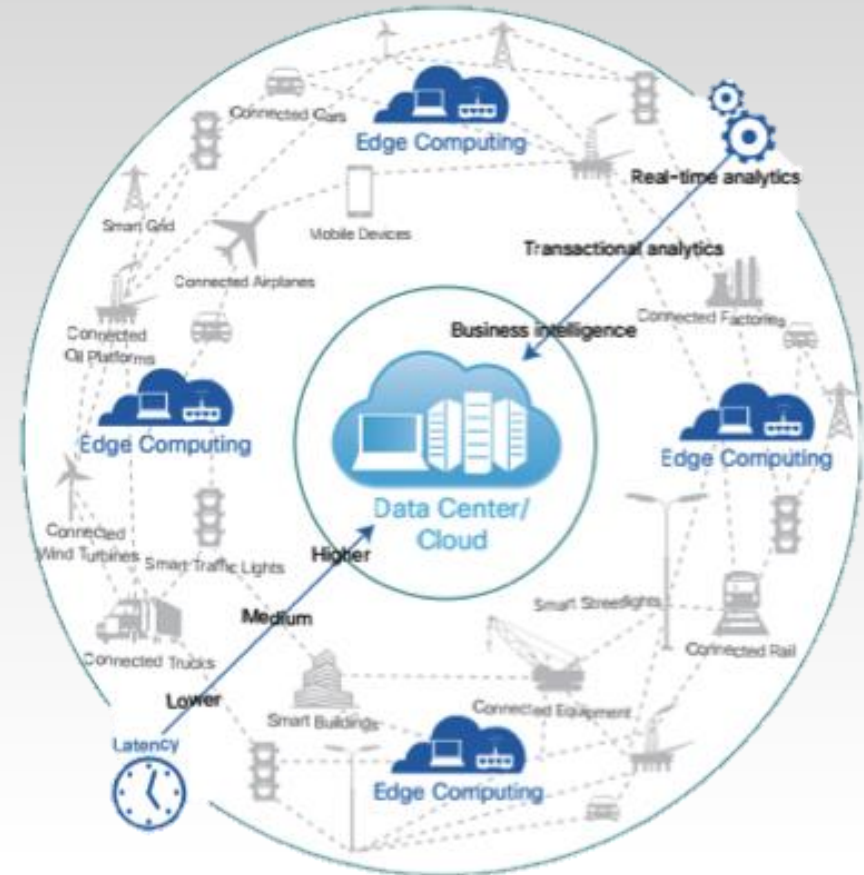
Source: https://www.cisco.com/c/dam/en_us/solutions/trends/iot/docs/iot-data-analytics-white-paper.PDF

> **The military that masters "ubiquitous connectivity" will maintain overmatch**

Operate Through

- DoD tactical needs share common traits with first responder communications needs.
  - Ability to operate in congested and degraded spectrum
  - Ability to operate over networks that may be compromised

- DoD 5G initiative will emphasize ways to operate through using:
  - Dynamic spectrum utilization based on sensing, collaboration, and frequency agile radios
  - Robust network overlays and "zero-trust" architectures

From static and manual
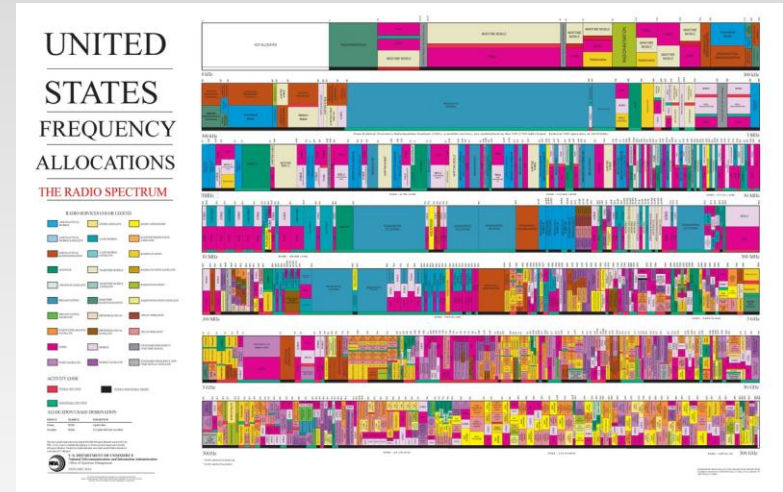
To dynamic and adaptive
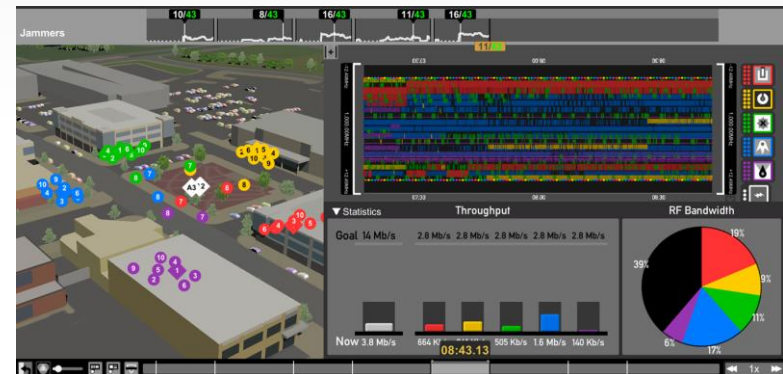
Overview of the DoD Plan

5G Use Cases for DoD

Warfighter to Warfighter | **Warfighter to Machine** | **Machine to Machine**

- Virtual/Augmented Reality Military Planning/Training/Rehearsal
- Video Calling Virtual Meeting
- Fixed Wireless
- Ultra High Definition Video
- Unattended Sensing, Tipping & Cueing
- Mobile Cloud Computing
- Wearables
- Distributed Situational Awareness
- Smart DoD Posts, Camps, Bases, Stations
- Logistics Asset Management & Supply Chain
- Health Status Monitoring
- Vehicle to Infrastructure
- DoD Installation First Response
- Remote Surgery
- Vehicle to Warfighter
- Vehicle to Vehicle / Ship to Ship
- Depot Automation

- ***Accelerate* – Hasten DoD's adoption of 5G**
  - At-scale test facilities that enable rapid experimentation & dual-use application prototyping
- ***Operate Through* – Ensure that US forces can operate through wherever and whenever we deploy**
  - Dynamic spectrum utilization; "Zero Trust" architectures
- ***Innovate* – Enhance 5G technology and invest in future "Next G" technologies**
  - There is no finish line.

5G Engagement Opportunities

- The DoD 5G initiative will conduct multiple experiments at multiple DoD sites covering a variety of use cases including:

  - ❑ Mission planning/training
  - ❑ Depot operations
  - ❑ Global asset/supply chain management
  - ❑ Smart bases/ports

- Deployments at the DoD sites will also:
  - Advance dynamic spectrum utilization techniques for "Operating Through"
  - Employ Red Teaming to learn how to best defend 5G networks

- Engagement via the National Spectrum Consortium (NSC)
  - https://www.nationalspectrumconsortium.org/
  - Organizations can still join the NSC and participate in the upcoming RFP
  - Received ~ 260 technical concepts which were assessed in summer 2019
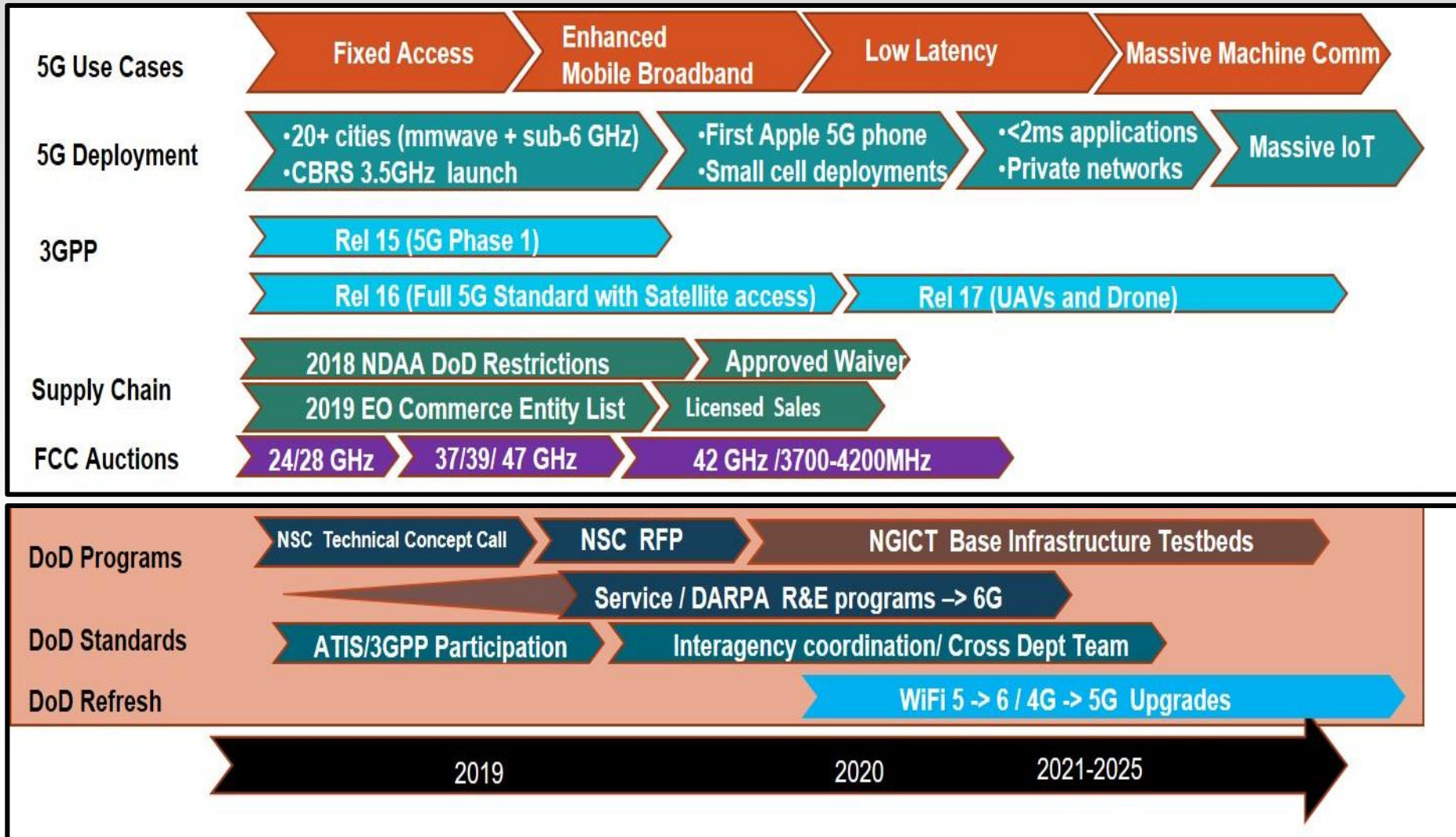 - **Initial RFP expected in November 2019**

Planned Outcomes

- We will drive toward fieldable prototype capability that will remain in place at designated DoD locations.

  - Prototypes delivered for final assessment approximately 36 months after awards

    - "Turnkey Solutions" that can be adapted for rapid deployment at additional sites without significant additional NRE

  - Not all activities are guaranteed to result in a fieldable prototype.

  - Efforts that do not perform sufficiently for leave behind capability will publish lessons learned to promulgate 5G knowledge and tradecraft.

- Deliverables will include…

  - 5G infrastructure sufficient to support prototype products and services

  - Software and firmware development kits that accelerate continued development and fielding at additional DoD locations

  - Upgraded test beds, facilities, and ranges that posture DoD to continue pursuit of emerging 5G and "Next 5G" technologies

5G Timelines

5G Use Cases	Fixed Access	Enhanced Mobile Broadband	Low Latency	Massive Machine Comm
5G Deployment	•20+ cities (mmwave + sub-6 GHz) •CBRS 3.5GHz launch	•First Apple 5G phone •Small cell deployments	•<2ms applications •Private networks	Massive IoT
3GPP	Rel 15 (5G Phase 1)			
	Rel 16 (Full 5G Standard with Satellite access)		Rel 17 (UAVs and Drone)	
Supply Chain	2018 NDAA DoD Restrictions	Approved Waiver		
	2019 EO Commerce Entity List	Licensed Sales		
FCC Auctions	24/28 GHz	37/39/ 47 GHz	42 GHz /3700-4200MHz	

DoD Programs	NSC Technical Concept Call	NSC RFP	NGICT Base Infrastructure Testbeds
		Service / DARPA R&E programs –> 6G	
DoD Standards	ATIS/3GPP Participation	Interagency coordination/ Cross Dept Team	
DoD Refresh		WiFi 5 -> 6 / 4G -> 5G Upgrades	
	2019	2020	2021-2025

Key Take-Aways

- The military that masters "ubiquitous connectivity" will maintain overmatch.

- 5G is not a race…there is no finish line. Hence our emphasis on 5G to Next G.

- 5G technologies are both enablers of and sources of vulnerability for:

  - o Economic security

  - o Homeland security

  - o National security

DoD strategy leverages the strength of U.S. innovation

Back-up Material

National Defense Strategy

Resumption of Great Power Competition, Modernization of Priorities

Lethality, Partnerships, Reform

USD(R&E) Mission

Military Technological Superiority, Modernization

Creating the Technologies of the Future Fight

Modernization Priorities

- *Hypersonics*

- *Fully Networked Command, Control & Communication (FNC3)*

- *Directed Energy*

- *Space*

- *Biotechnology*

- *Next Generation Mobile Communications (5G)*

- *Cyber*

- *Quantum Science*

- *Artificial Intelligence / Machine Learning (AI/ML)*

- *Microelectronics*

- *Autonomy*

There is a Portfolio Manager (Assistant Director) who is responsible for establishing the DoD-Wide, mission-focused strategy & execution plan for each modernization priority

DoD Research and Engineering Enterprise

Creating the Technologies of the Future Fight