Understanding FirstNet Capabilities

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Blue Book
Wireless Communications for Public Agencies

- Will be published by National Academy of Science soon
- Downloadable version from NAS will be free
- AASHTO intends to publish as well
- Plain, simple language centered around real-world experiences
- Diagrams to simplify the complex
- “Deeper Dive” links for more information
- Table of Contents acts as a reminder of key concepts

Blue Book Topics

- Who Are You?
- What's Next For My System?
- Radio Systems
  - Conventional/Trunking
  - Core Infrastructure
  - Supporting Networks
  - Site Design
- Radios
  - Portable and Mobile
  - Accessories
- Coverage
- Cellular (Including 5G)
- FirstNet
- Funding and Governance
  - Procurement
  - Soft Skills
- Cybersecurity
- FCC
- SatCom (Including Low Earth Orbit)

Radio and Smartphone Disinfection http://bit.ly/radiosmartphonedisinfection

- Spreadsheet for manufacturer-approved disinfection methods
  - Radios
  - Smartphones
  - FirstNet Devices
  - Dispatch Equipment and Computers
- Direct link here: https://docs.google.com/spreadsheets/d/1NxaDo5RxtQqwAVnSeLaCwPN4eQSmU2uRURQZdekR7Fs/edit#gid=1607865612
- Use File Menu for Excel version or contact rpoltermann@commdex.com if Excel file desired
- Hand Sanitizer Warning: Recall for Methanol, almost entirely made in Mexico

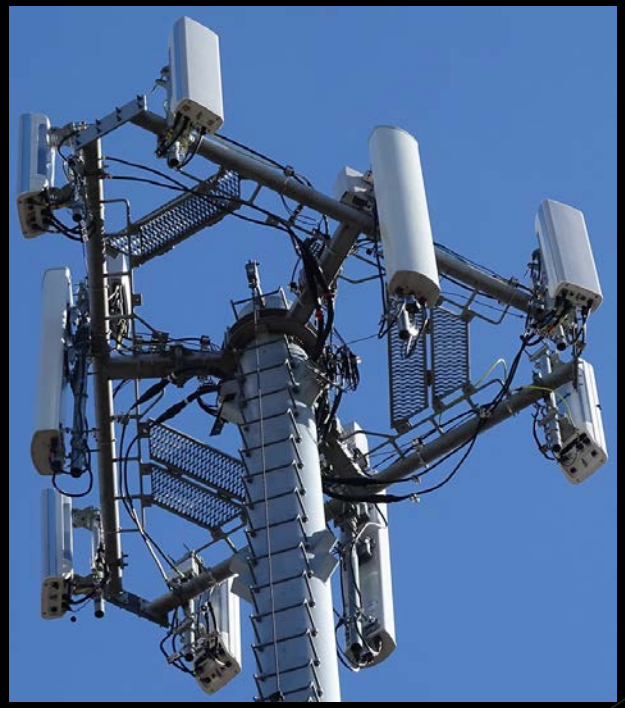
Cell Phone vs. LMR/PTT Radio

- Open mind, realistic expectations, and understanding of performance
- Shift from voice-only to voice+data+video
- Smartphones present cybersecurity risks
  - Represents a fundamental change
  - Devices need to be actively managed
- Radio power output is at the antenna connector
  - Portable radio antennas **lose** power
- Cell phone power output is actually from the antenna
  - Cell phones may reduce power for FCC limits (SAR)

Towers

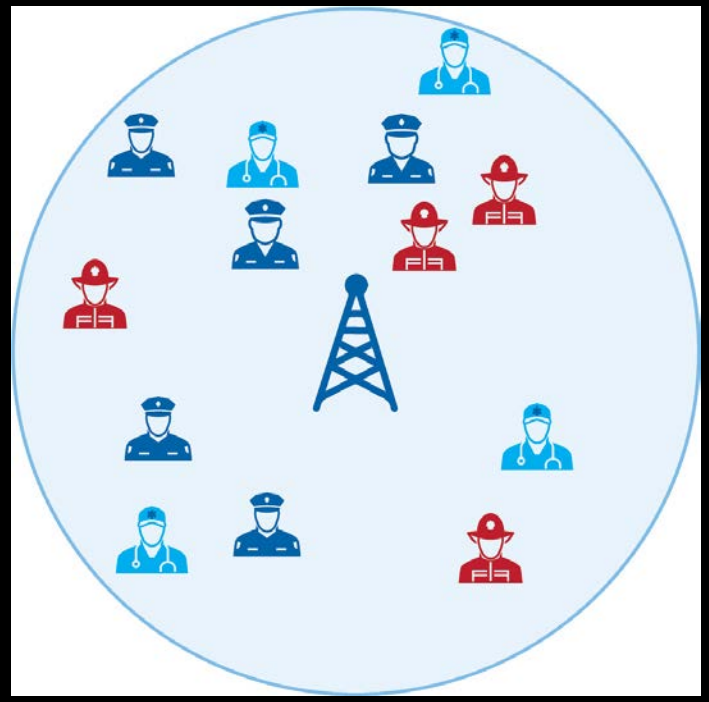
Radio Site

Cell Site

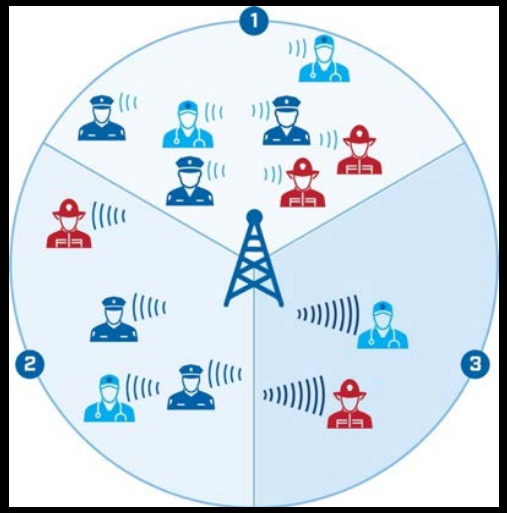


How Sites Work

Radio Site



Cell Site



Site Resiliency

LMR/Radio

- Fairly consistent design criteria
- Traditionally with UPS
- Traditionally with generator
- Minimum run-times for both mandated
- Site hardening requirements

Cellular

- Depends on carrier
- Typically has UPS (small cells an exception)
- May not have generator
- May not have minimum run-times
- Site may not be hardened

Key Differences in Coverage

LMR/Radio

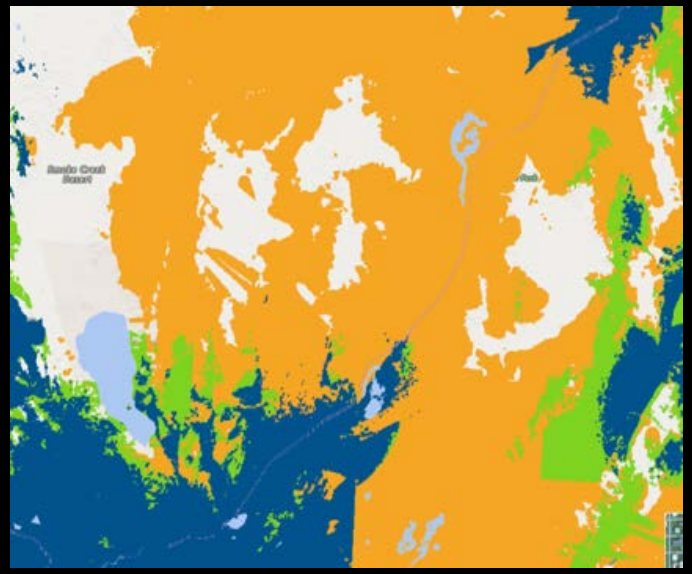
- Specific device
- Factors in user
- Single frequency band, typically single frequency shown
- Coverage map for each type of modulation
- Coverage is static
- Traditionally has coverage obligations

Cellular

- Generic device
- Doesn't factor user in
- May combine frequency bands to show coverage
- Bandwidth may not match user requirements
- Coverage changes based on usage
- May not have contractual obligations
- May be optimistic (see FCC Coverage Maps Investigation Report 19-367)

AT&T Vs. FirstNet Coverage – Spot the Difference

AT&T

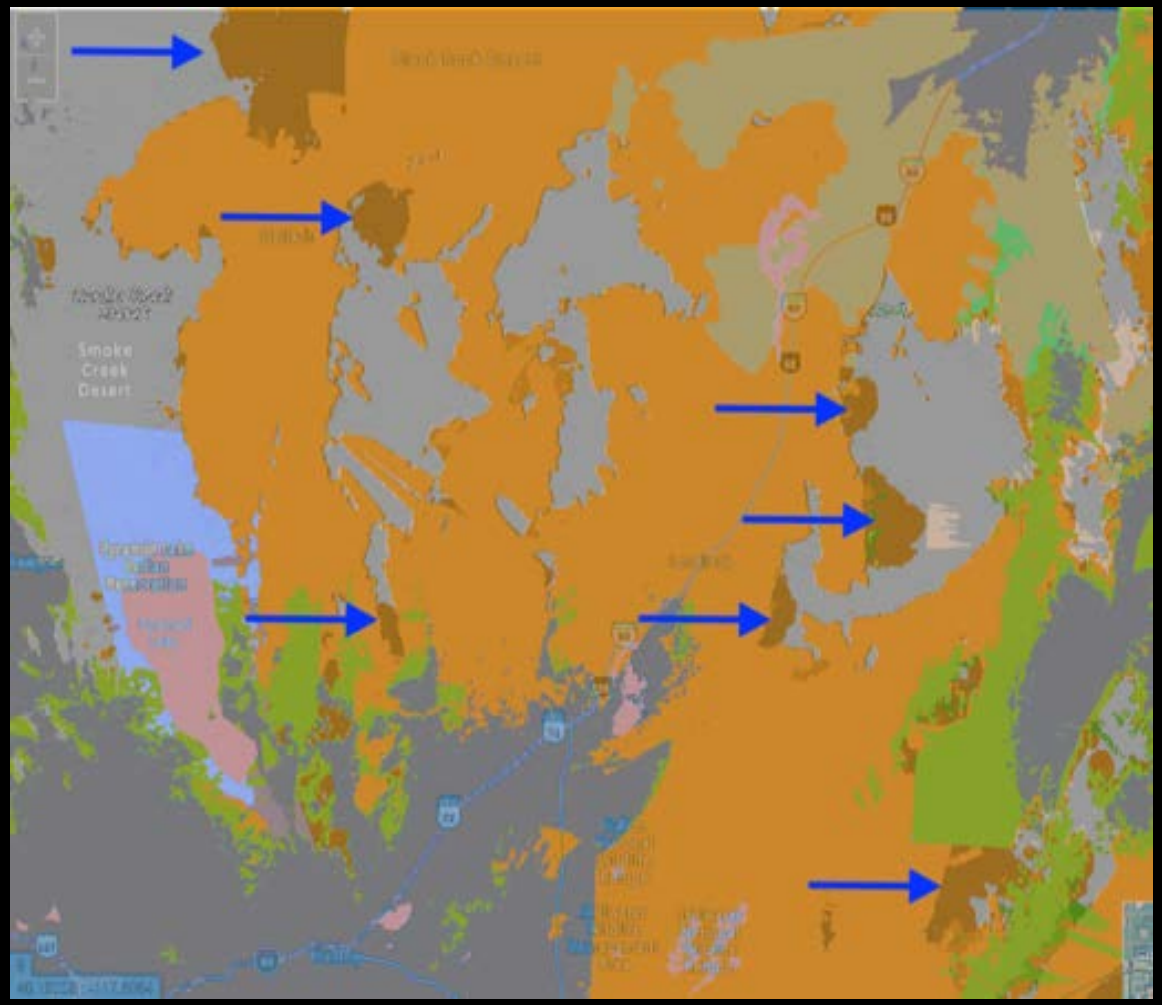


FirstNet

Reno, NV Area

Accessed December 6, 2019

AT&T Vs. FirstNet Coverage Differences



Band 14 vs. Non-Band 14

- 700 MHz spectrum, 20 MHz (10 MHz up, 10 MHz down)
- Public agencies don't have exclusive use of Band 14
  - Never have, even in initial RFP
- FirstNet uses **all** AT&T bands
- In-Building Coverage Surprises
  - Mandates appearing for just Band 14 coverage, but may be open to all AT&T users
  - May be different for cell sites installed within building

High Power User Equipment (HPUE)

- For Band 14, will not be seen in any smartphones
- HPUE first deployed in the US by Sprint (2.5 GHz) which supports smartphones
- Band 14 uses 1.25W maximum
  - 900 MHz recently approved for 3W
- Watch for GPS interference on vehicles

Mission Critical Push-To-Talk (MCPTT)

- Called FirstNet PTT on AT&T
- Two providers
  - Kodiak (Motorola Solutions)
  - Selected but not announced
- Already in active use in other countries
  - Will replace LMR for European public safety and LTE-R for railroads
- Direct Mode/ProSe limited availability
  - Industry Problem: Qualcomm hasn't provided it
  - Samsung has only device because they have their own modem

BRETSA Petition to FCC

- FCC Petition for MCPTT interoperability between carriers by State of Colorado
  - Initially denied, then revisited
  - No decision has been made as of August 26th, 2020
- FirstNet by AT&T policy prevents MCPTT interoperability in US
  - MCPTT standards allow for secure interoperability
    - Europe intends seamless integration between countries
    - Korea uses multiple carriers
    - Canada will use multiple carriers

MCPTT Consoles

- Not clear how consoles will connect
  - Number of interfaces available
  - Dependent on carrier policy
- Network requirements
- Authentication of computers
- NPSTC Console Report http://npstc.org/article.jsp?id=2385&cat=6307
- NPSTC assisting TCCA with Control Room (Dispatch) Implementation Guide

LMR-LTE Working Together

- Donor Radio
  - Cheapest, easiest, and most limited
- ISSI Connection
  - Expensive but flexible
- Interworking Function (IWF)
  - Not available yet

MCPTT vs. Over-The-Top (OTT)

MCPTT

- New
- Open Standard
- Highest Network Priority
- Carrier interoperable, but FirstNet by AT&T chooses not to
- Information/data contained within cellular carrier

Over-The-Top

- Around for years
- Proprietary
- May not have priority or lower priority
- Carrier agnostic, so can use on any
- Information/data may be sent to the cloud

5G

- Ignore the hype
- Two categories – Commonly called Sub 6 GHz and mmWave
  - Actually 410 MHz – 7.125 GHz (Frequency Range 1) and 24.25 GHz – 52.6 GHz (FR2)
  - AT&T calls it 5G and 5G+ respectively (5G+ is a marketing term)
- Sub 6
  - Performs slightly better than current LTE
  - Coverage is similar to LTE
- mmWave
  - Extremely fast
  - Extremely short range
  - Can be blocked by hands, walls, glass
- Major benefits won't be seen until carrier's core architecture replaced

Cellular Vs. LMR Coverage Summary

- HF
  - Probably Low Earth Orbit satellite long-term
- VHF
  - Staying using radios long-term
- UHF
  - Rural – Probably staying with radios long-term
  - Urban (T-Band) – Most likely cellular
- 7/800
  - Most likely cellular
- Data needs align with cellular, particularly transit
- Budgets may influence decision