Broadband Consultation Prep Workshop
State of Nevada

DHS Office of Emergency
Communications

August 21, 2014

Homeland
Security

I. OEC Background and Public Safety Broadband Overview

I. OEC Technical Assistance

II. Nationwide Public Safety Broadband Network (NPSBN) & FirstNet

III. State and Local Implementation Grant Program (SLIGP)

II. Establishing Coverage Objectives

I. State Overview

II. Review OEC Baseline

III. Tailoring based on State's Needs

III. Identifying Users

I. Eligible Users

II. User Identification

III. Data Collection Tools

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Acronym List

OEC Background

Office of Emergency Communications

Mission: OEC leads the coordination of interoperable emergency communications at the Federal, State, local, and tribal levels and supports national security/emergency preparedness communications.

- **OEC expanded in Nov 2012 to include several National Communications System (NCS) functions.**

- **OEC now includes:**
  - **Architecture and Advanced Technology Branch**
  - **Communications Portfolio Management Branch**
  - **Policy and Planning Branch**
  - **Public Safety and National Security/Emergency Preparedness Partnerships Branch**
  - **Regional Coordination Branch**
  - **Technical Assistance Branch**

Title XVIII	Technical Assistance
	Policy and Planning
	Federal, State & Local Partnerships
	Regional Coordination

Office of Emergency Communications

E.O. 136.8	Communications Infrastructure
	Priority Services
	Advanced Technologies
	Modeling & Analysis

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Approaches to OEC TA

- **State-Requested TA**
  - **Supports State/local interoperable communication needs in multiple areas**
    - For example, operations, training, exercises, governance and SOPs; engineering; CASM
  - **Supports State/local emergency communications strategies: SOP ; guidelines; TICPs; SCIPs**
  - **Furthers goals and objectives of NECP**
  - **Submitted via SWICs**

- **National Priority TA Offerings**
  - **Vary year to year**
  - **Special TA focused on specific capability or stakeholder group, for example, NPSBN/FirstNet, Tribal Nation outreach**

- **Automated Tools (www.publicsafetytools.info)**
  - **Specially designed web-based tools assist stakeholder/agencies with ongoing emergency communications needs**
  - **Features OEC-developed tools and stakeholder inputs**

Technical Assistance Catalog
Department of Homeland Security
Office of Emergency Communications
Version 3.1

Public Safety Tools Website
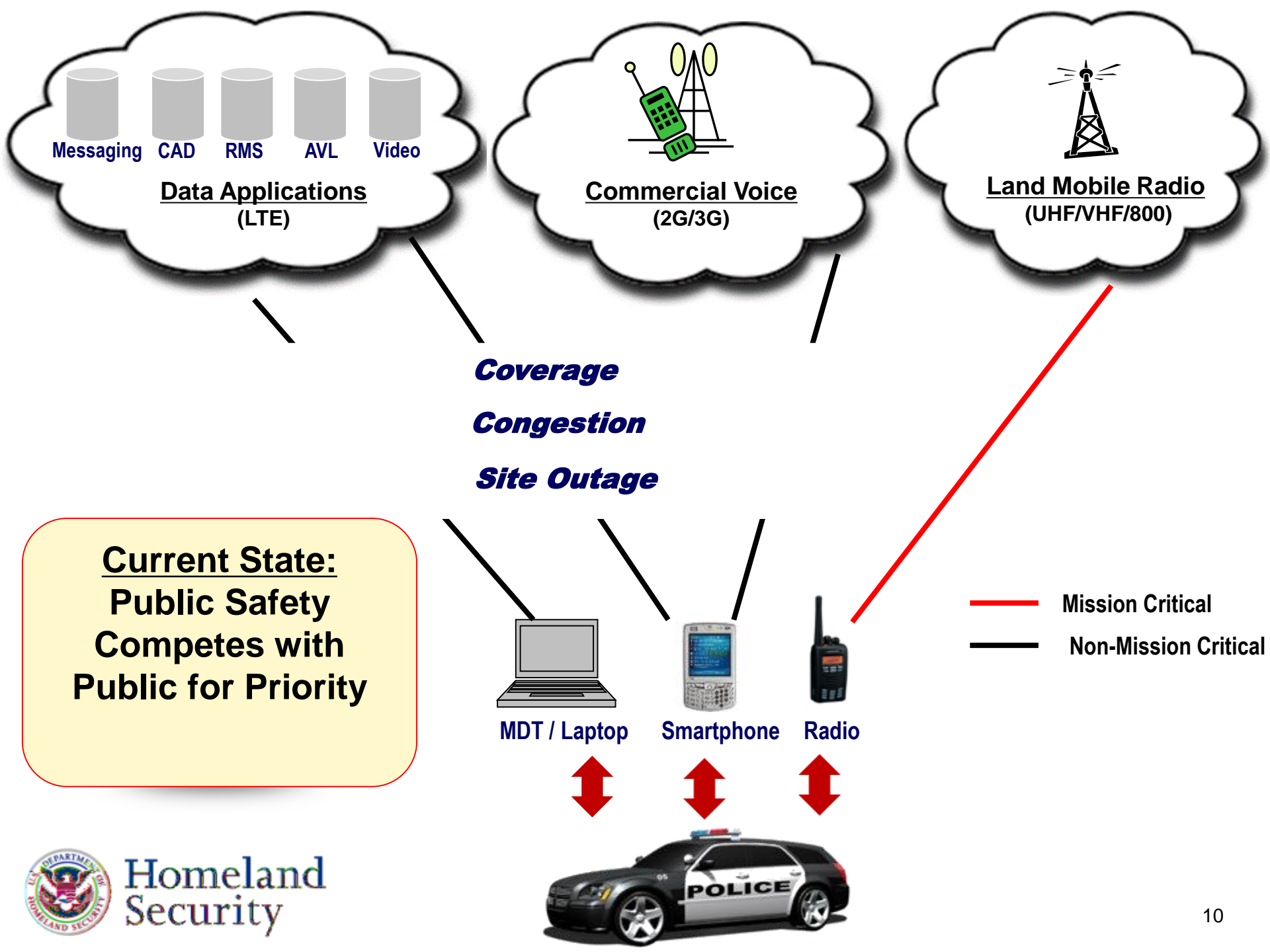

www.publicsafetytools.info
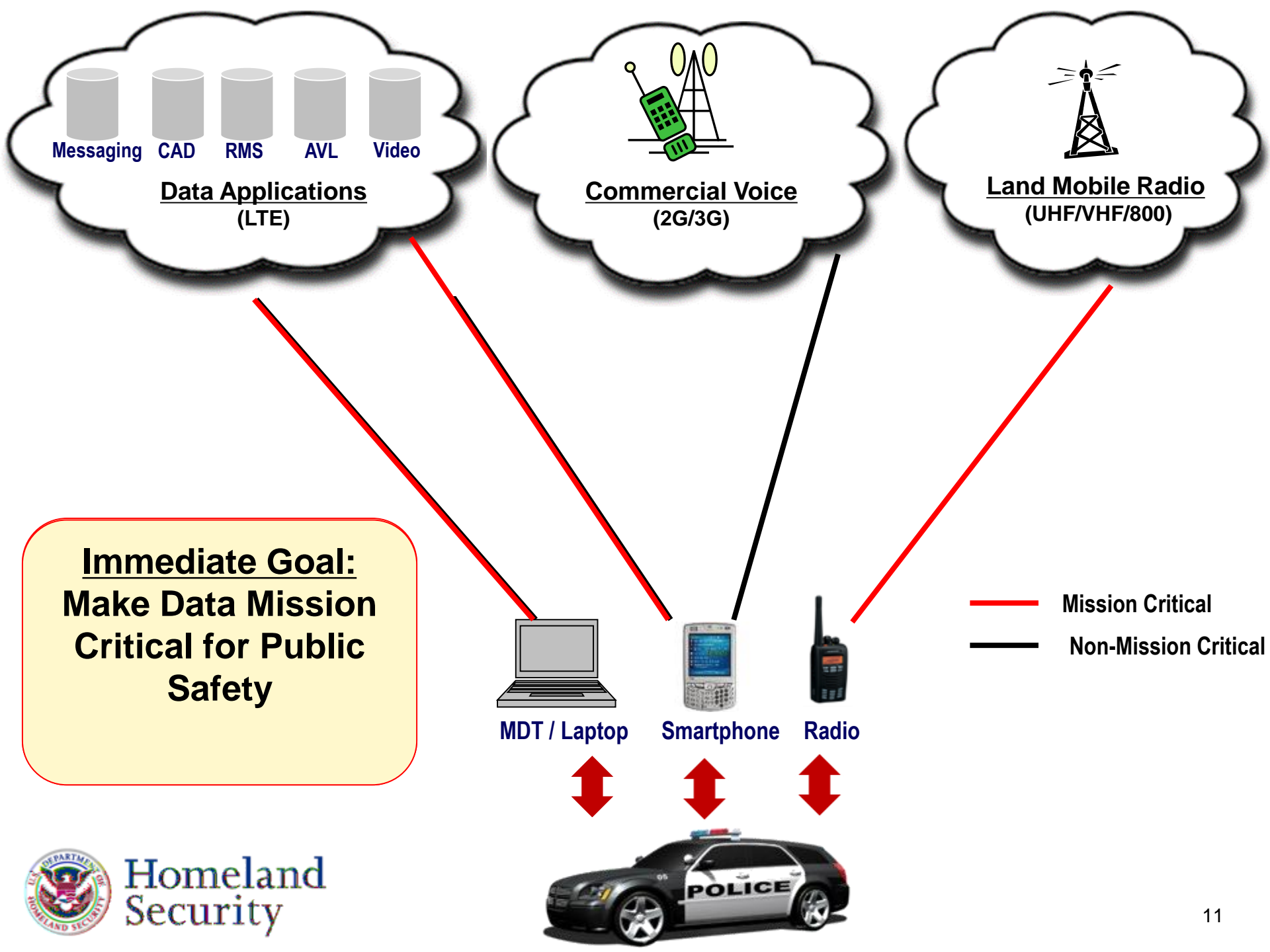
OEC Consultation Prep Workshop

- **On-Site workshop focuses on preparing States for the consultation process with FirstNet**

- **Half day meeting is divided into two components:**
  - **Broadband 101**
  - **Coverage / Users**

- **OEC provides various GIS datasets to assist discussion on public safety operational coverage needs**

- **User Information is compiled from FEMA, Department of Justice, CASM and commercial databases**
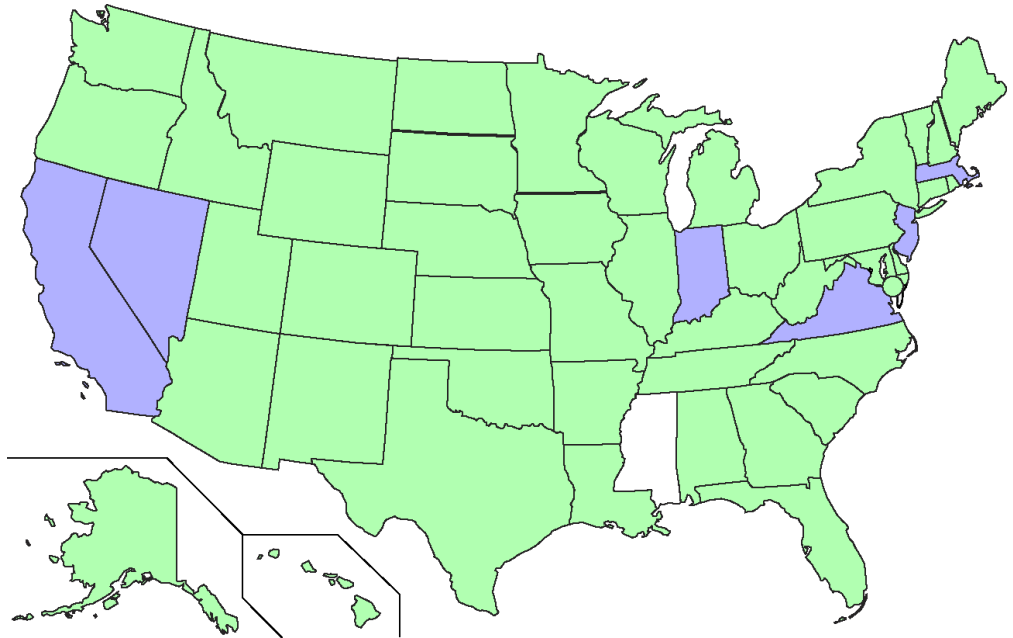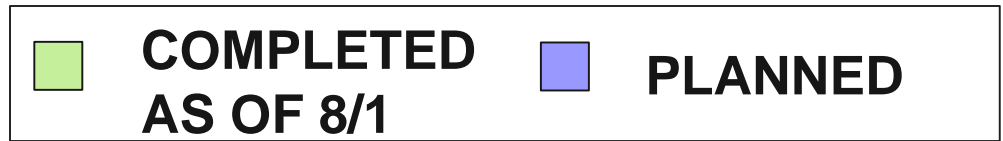
	COMPLETED AS OF 8/1		PLANNED

	American Samoa
	Guam
	Northern Mariana Islands
	Puerto Rico
	Virgin Islands

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Broadband Overview

Data Applications
(LTE)

Messaging CAD RMS AVL Video

Commercial Voice
(2G/3G)

Land Mobile Radio
(UHF/VHF/800)

Coverage

Congestion

Site Outage

Current State:
Public Safety Competes with Public for Priority

MDT / Laptop   Smartphone   Radio

—— Mission Critical

—— Non-Mission Critical

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Data Applications
(LTE)

Messaging CAD RMS AVL Video

Commercial Voice
(2G/3G)

Land Mobile Radio
(UHF/VHF/800)

Immediate Goal:
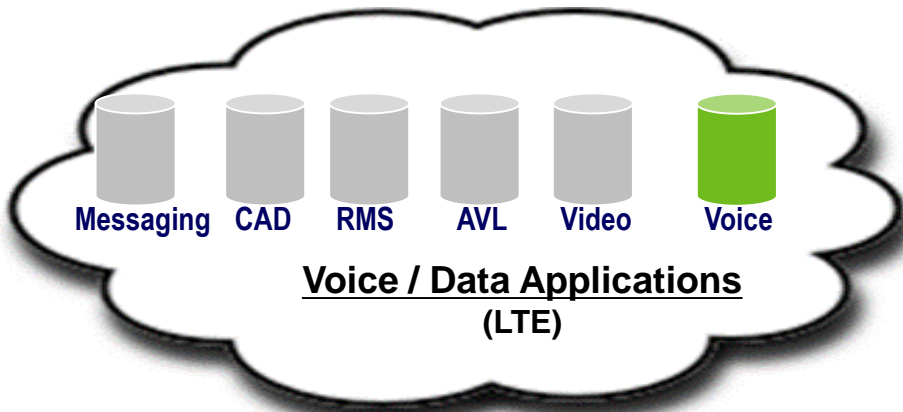**Make Data Mission Critical for Public Safety**

MDT / Laptop   Smartphone   Radio

━━━ Mission Critical

━━━ Non-Mission Critical

POLICE

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Messaging **CAD** **RMS** **AVL** **Video** **Voice**

Voice / Data Applications
(LTE)

Land Mobile Radio
(UHF/VHF/800)

Long-Term Goal:
Develop Mission
Critical Voice
over LTE

MDT / Laptop **Smartphone** **Radio**

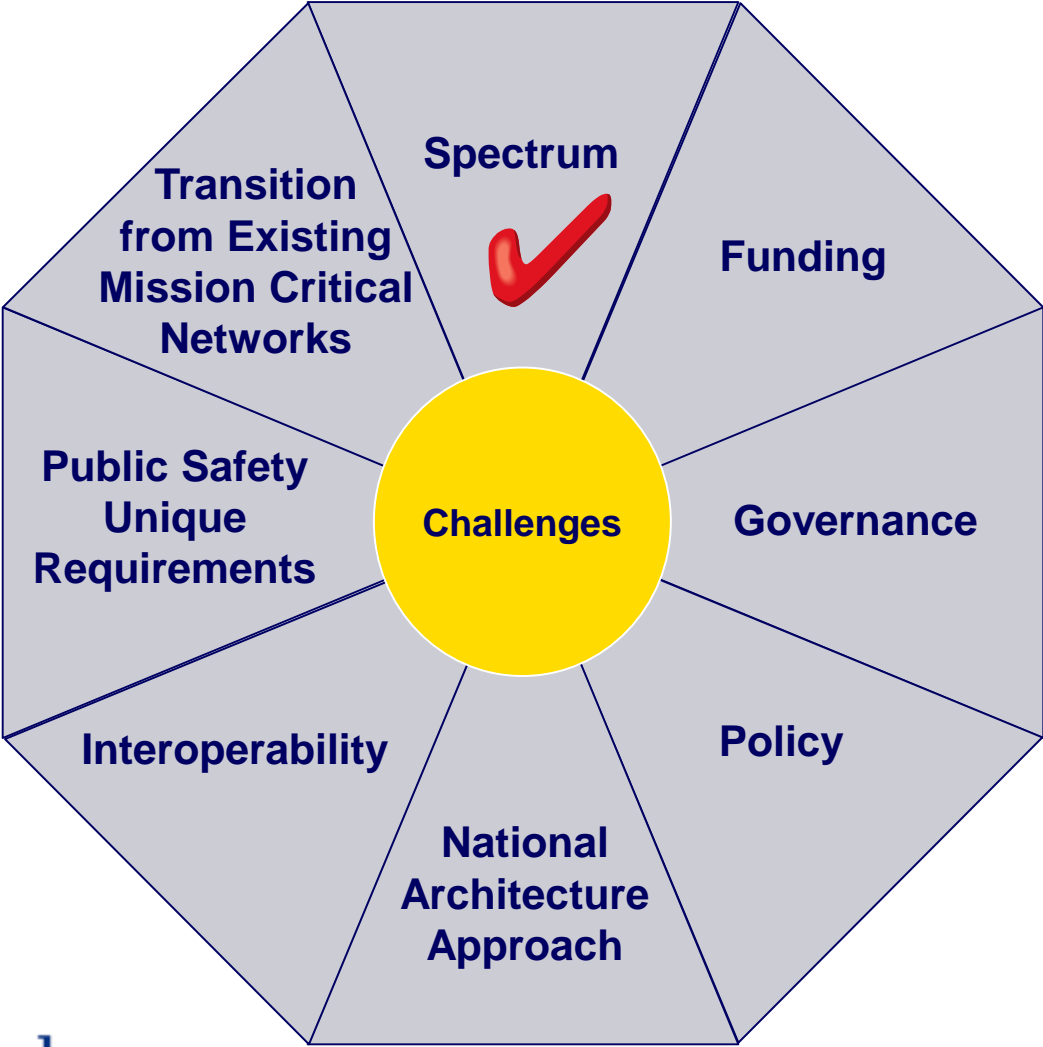―― **Mission Critical**

―― **Non-Mission Critical**

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Planning for Convergence

The Proposed Solution

- **Create next generation nationwide public safety wireless network**

- **Provide high data rates ("broadband") to enable advanced applications**

- **Use industry standards to enable interoperability for public safety**

- **Adopt fourth generation ("4G") cellular technology to leverage fast pace of commercial development**

- **Leverage commercial equipment economies of scale while maintaining public safety unique requirements**

Nationwide Public Safety Broadband Network (NPSBN) deploying Long Term Evolution (LTE)

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Key Challenges to Address

Challenges:
- Spectrum ✓
- Funding
- Governance
- Policy
- National Architecture Approach
- Interoperability
- Public Safety Unique Requirements
- Transition from Existing Mission Critical Networks

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Long Term Evolution (LTE) Technical Highlights

LTE Technical Highlights

- Considered to be one of the **4G** standards (Wi-Max and HSPA+)

- Cellular standard that was designed for **data first** and not voice
     Inclusion of LTE standardized voice is a work in progress

- **All-IP** (Internet Protocol) architecture designed for low latency

- Potential for **economies of scale** by leveraging commercial market

- Inter-network **mobility and interoperability** with commercial carriers

- **Flexible** channel bandwidths of 1.4, 3, 5, 10, 15 and 20 MHz

- **High user data rates** to support new applications

- **Security and authentication** mechanisms

- **Priority and Quality of Service** mechanisms

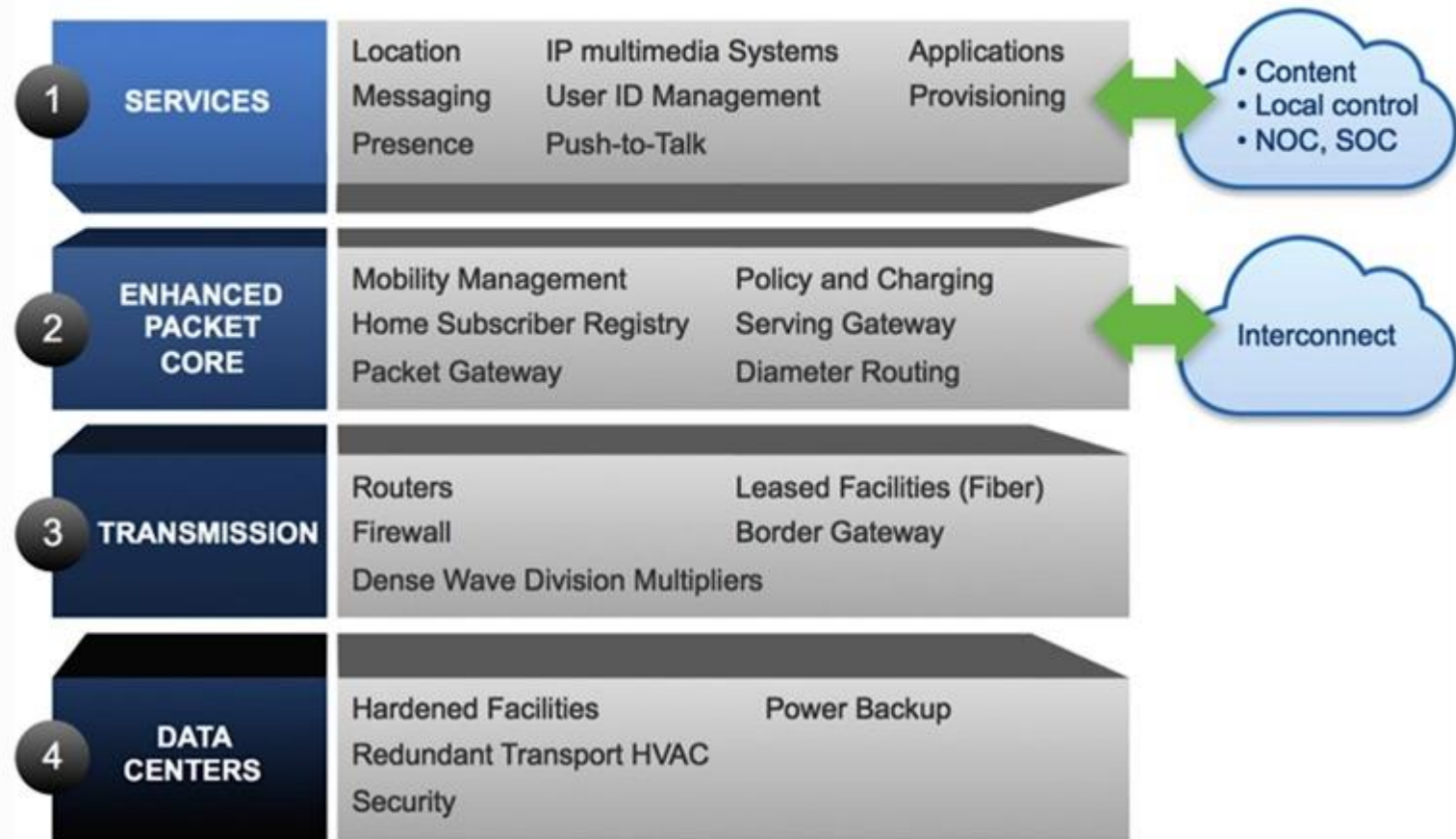- **Modern antenna techniques** to support improved performance

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Basic LTE Network Components

- **At a very high level, the network has 4 basic Components:**

  1. **Core Network Evolved Packet Core (EPC) or "Core"**

  2. **Transport "Backhaul"**

  3. **Radio Access Network (RAN) or "Radio Sites"**

  4. **User Equipment (UE) or "User Device"**
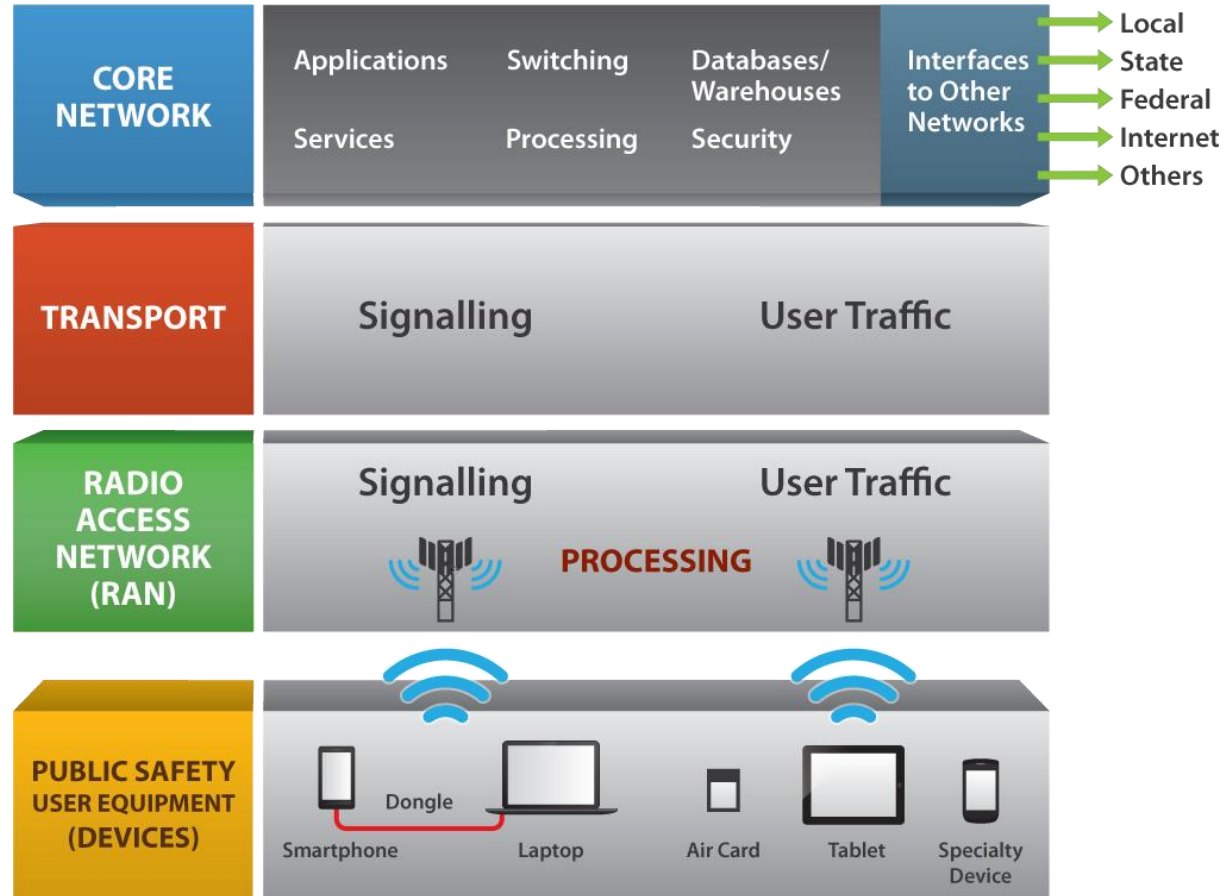
Core Network

FirstNet is responsible for building the enhanced packet core network, a key component for ensuring that users have a single interoperable platform nationwide. The core network has six primary functions: it switches data, processes and reformats information, stores and maintains data and keeps it secure. Applications and services and operational and business support systems also reside in the core network. The core will interface with other state, local and federal networks, including 911 and the Internet. Essentially, the core serves as a giant umbrella covering all of the United States including the territories and the District of Columbia. The core is connected to radio access networks in each state via the backhaul layer of the network.

1 SERVICES	Location	IP multimedia Systems	Applications	• Content
	Messaging	User ID Management	Provisioning	• Local control
	Presence	Push-to-Talk		• NOC, SOC

2 ENHANCED PACKET CORE	Mobility Management	Policy and Charging	Interconnect
	Home Subscriber Registry	Serving Gateway	
	Packet Gateway	Diameter Routing	

3 TRANSMISSION	Routers	Leased Facilities (Fiber)
	Firewall	Border Gateway
	Dense Wave Division Multipliers	

4 DATA CENTERS	Hardened Facilities	Power Backup
	Redundant Transport HVAC	
	Security	

Radio Access Network (RAN)

The RAN portion of the network consists of the radio base station infrastructure that connects to user devices. RAN includes cell towers as well as mobile hotspots embedded in vehicles that backhaul to the core network over satellite or other types of wireless infrastructure.

Comprehensive RAN planning is required to optimize coverage, capacity and performance for a nationwide network. Initial modeling has shown that tens of thousands of radio base stations are needed to cover at least 99 percent of the population and the national highway system. Population coverage alone won't suffice for public safety. State by state, FirstNet needs to understand public safety coverage needs.

Public Safety Factors

- Jurisdictional boundaries
- Rural and unpaved roads
- Population scarcity
- Critical infrastructure
- Incident data

- Natural disasters
- Tribal lands
  - Parks and open space
  - Underserved areas
  - Utility infrastructure

During consultation, FirstNet will work with the states to determine the coverage expectations and priorities that must be included in the RAN deployment plan to enable public safety to meet its mission, no matter where it takes them.

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Device Considerations

FirstNet will work with the vendor community on portable devices and in-vehicle routers

|	Portables	In-Vehicle Routers	Specialized	Accessories
Device Types				
Category Driver	Build out to gain economies of scale		Special operational needs	Unique uses
Function	• Smartphone • Tablets • Modems	• Routers • Hotspots • Consoles	• Drones • Portable repeaters • Rovers	• Ruggedized cases • Battery packs • Chargers, mics.
Connectivity	• LTE, CDMA, HSPA • LMR/ P25 • Wi-Fi, Bluetooth • Direct mode	• LTE, CDMA, HSPA • Wi-Fi • Ethernet • USB	• LTE, CDMA, HSPA • LMR/ P25 • Satellite repeaters • Location services	• Bluetooth • USB • WiFi
Location Enabled	Yes	Yes	Some	n/a
Band 14 Support	2014	2013/2014	2015+	n/a

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700 MHz Band Allocation

- **Public Safety's Broadband allocation is Band Class 14**
    - **FirstNet is the license holder for that spectrum**
- **Major carriers operate in Bands 12, 13 and 17 and bands outside of 700 MHz**
    - **Today's commercial devices won't operate in Band Class 14**
    - **Public Safety's allocation is comparable to commercial carriers LTE nationwide deployments**
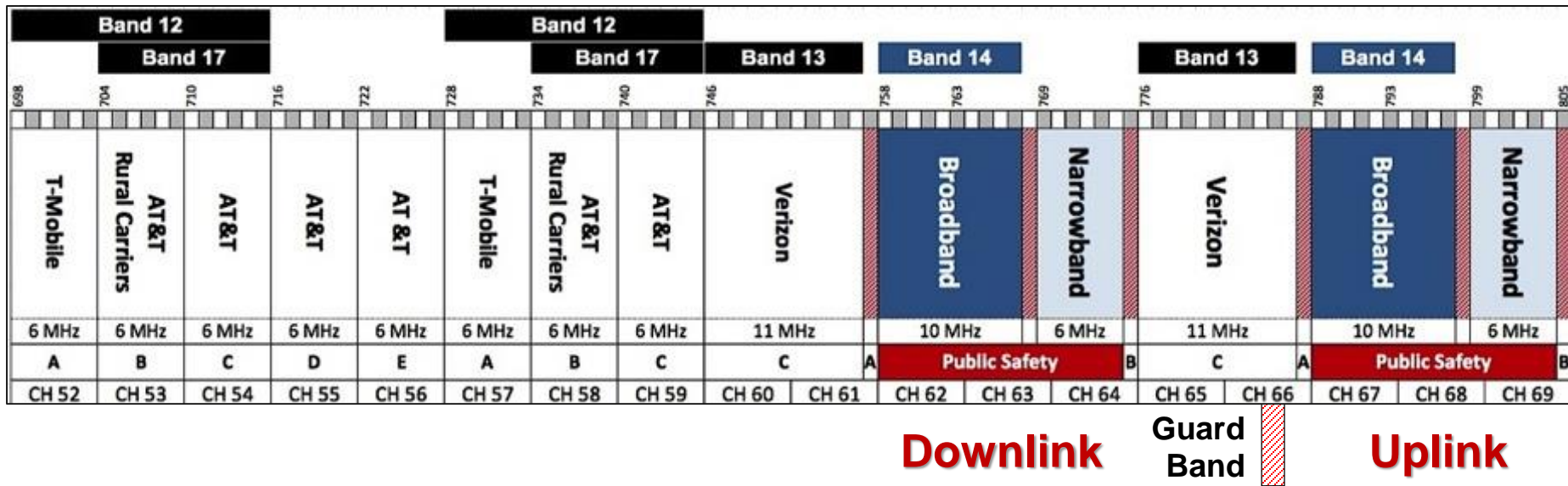
Defining Mission Critical Voice

- **NPSTC produced a 7 page document defining mission critical voice**

  http://www.npstc.org/broadband.jsp

- **Requirements identified the following:**

  Direct or Talk Around Mode (off network communications)

  Push-to-Talk (PTT) w/ low latency

  Full Duplex Voice (commercial/PSTN calls)

  Group Call (one to many)

  Talker Identification

  Emergency Alerting (highest level of priority)

  Audio Quality

- **Definition being used as a reference for standards developments**

- **No standardized solutions exist today that can meet all of these requirements**

Voice Summary

Voice Category	Status	
VoIP	Demonstrated in several applications	🟩
LTE Voice Standard	VoLTE preferred solution; just being implemented by some carriers	🟨
Non-mission critical PTT	Standard and proprietary options available	🟨
Mission critical PTT	Standardized approach being worked on within current standards developments	🟥
Direct mode	Also being worked on within standards efforts; includes peer-to-peer data as well	🟥

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Evolution of Cellular Standards

- **LTE is a global standard developed by 3GPP (3rd Generation Partnership Program)**

- **Roadmap for future growth of the technology into LTE Advanced**

- **Future releases will include public safety requirements**

- **All US carriers migrating to a single standard for the first time**
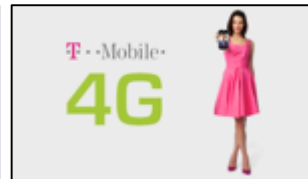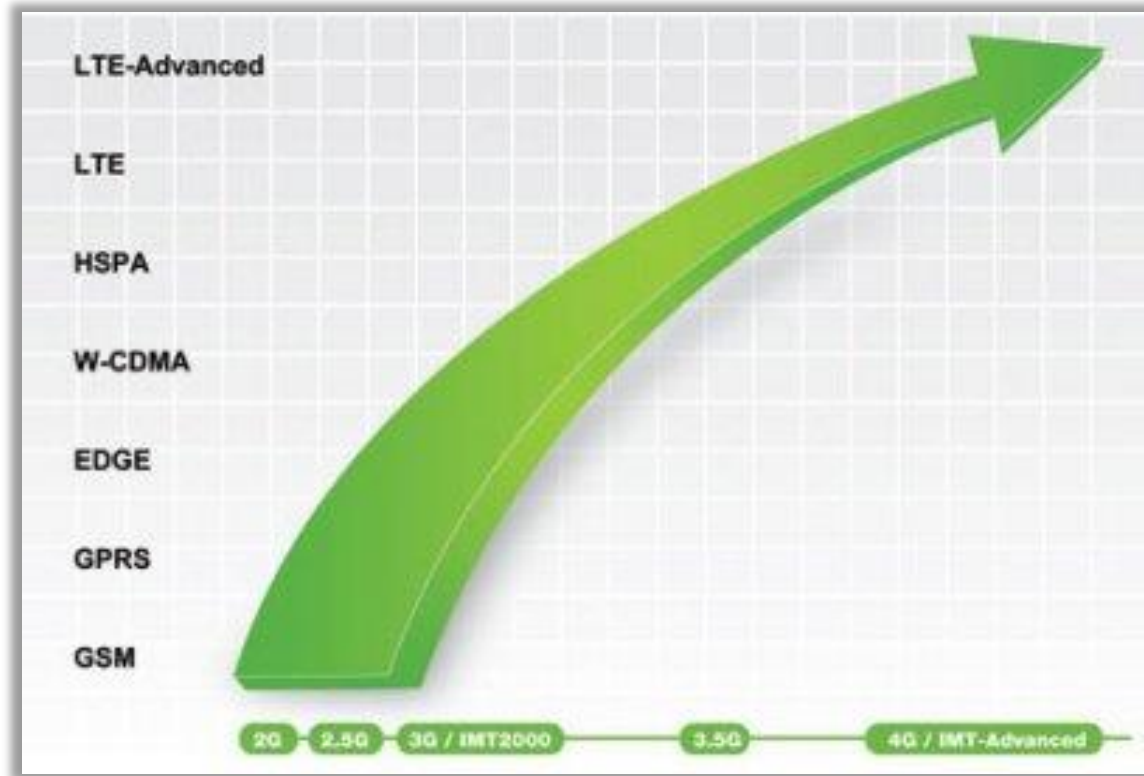
FirstNet and the
Nationwide Public Safety Broadband Network

Creation of FirstNet

Middle Class Tax Relief and Job Creation Act of 2012

- **Public Safety Priority:** Passage of legislation to reallocate spectrum was top legislative priority of every public safety association in the United States

- **D Block:** D Block 700 MHz spectrum was reallocated to public safety

- **FirstNet:** Law created First Responder Network, an independent authority under NTIA / Dept. of Commerce

- **Nationwide Approach:** License for public safety broadband given to "FirstNet"

- **FirstNet Funding:** FirstNet provided $2 billion upfront and a total of up to $7 billion for network construction

- **State Planning Funds:** Up to $135 million State and Local Implementation Grant program (SLIGP) is provided by the NTIA to help State planning efforts in support of FirstNet consultation

- **Opt In/Out Provision:** States have the opportunity to opt-out of the nationwide build-out and develop its own interoperable system with FCC approval

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Network Funding

- **Planning and Implementation funding is provided through the spectrum auctions**
- **Funds are available until Sept. 30, 2022; revert to the Treasury for deficit reduction after**
- **By law, the network is to be self sustaining upon expending $7 Billion**

Phase	Funds	Purpose
Planning	**$135 Million**	Grants to assist States/Territories with planning & implementation. Requires 20% match
	$7 Billion	$2 Billion provided up front to start planning, designing and early implementation
Implementation		Remaining $5 Billion to be provided from spectrum auctions; used to complete network build out
Sustainment	**Ongoing**	**Network User Fee:** Fee from each entity including public safety or secondary user that uses the Network **Lease Fee for Network Capacity:** Fee for agreement between the FirstNet and secondary user to permit secondary access **Lease Fee for Network Equipment/Infrastructure:** Fee for entity that seeks access or use of antennas, towers, etc. constructed or owned by FirstNet

FCC Spectrum Auctions

- **Planning and Implementation funding is provided through the spectrum auctions**

- **Funds are available until Sept. 30, 2022; revert to the Treasury for deficit reduction after**

- **By law, the network is to be self sustaining upon expending $7 Billion**

Auction	Funding	Spectrum Auction Details
H Block	**$1.56 Billion**	• Auction Completed in February 2014 • Dish Network was the successful bidder for all 176 licenses
AWS	**$10.6 Billion +**	• Auction to begin in **November 201**4 • Bidding Threshold set at $10. 6 Billion
Broadcast Television	**TBD**	• Auction is expected to begin in **2015** • Auction rules and timelines are currently being developed by the FCC

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FirstNet Strategic Roadmap

- **March 11, 2014 Strategic Roadmap Approved**
  - Focuses on several milestones required for the development of a definitive business plan

- **2014 Roadmap Milestones**
  - Initiate public notice and comment on certain program procedures, policies, and statutory interpretations;
  - Release draft requests for comprehensive network proposals for offeror comments;
  - Release draft requests for certain network equipment and services proposals for offeror comments; and
  - Begin formal state consultations.

Responsibilities of FirstNet by Law

Consultation
Consult with Federal, State, local and Tribal public safety entities, NIST, FCC and the PSAC

Commercial Infrastructure
Leverage existing commercial wireless infrastructure to speed deployment of the network

Management
Select a program manager, consultants and other committees

Contracts
Manage and oversee the implementation and execution of contracts or agreements with non-Federal entities

Standards
Ensure nationwide standards for use and represent public safety on standards bodies

Cybersecurity
Ensure the safety, security and resiliency of the network to protect against cyberattacks

Certified Equipment List
Ensure the development of a list of certified devices and components

PSAPs
Promote integration of the network with PSAPs or their equivalents

RFPs
Issue RFPs for the purposes of building, operating, and maintaining the network

Rural
Implement deployment phases with substantial rural coverage milestones

Prohibition on Consumer Service
FirstNet CANNOT offer, provide, or market commercial telecommunications or information services directly to consumers

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First Responder Network Authority

Board of Directors

Samuel (Sam) Ginn, Chair
Sue Swenson, Vice Chair
Barry Boniface
Tim Bryan
Sylvia Mathews Burwell (OMB)
Charles (Chuck) Dowd*
F. Craig Farrill
Paul Fitzgerald*
Eric Holder (U.S. Attorney General)
Jeff Johnson*
Jeh Johnson (DHS)
Kevin McGinnis*
Ed Reynolds
Teri Takai
Wellington Webb

* Represents Public Safety

GENERAL MANAGER

TJ Kennedy (Acting)

DEPUTY GENERAL MANAGER

TJ Kennedy

Chief of Staff

Anthony Wilhelm (Acting)

Program Management and Strategy

Mark Daley

Deputy General Manager | User Advocacy
TJ KENNEDY

Government Affairs (Ed Parkinson)
Communications (Corey Ray)
Outreach (Amanda Hilliard)
Product Management
Offering and Pricing
Project Management
State Consultation (David Buchanan)
State Plans (Richard Reed)
Strategy and Business Planning

FIRSTNET OFFICES AND DIVISIONS

Chief Administrative Officer
FRANK FREEMAN

Human Resources (Jamesa
  Moone)
  Recruitment & Staffing
  Payroll & Benefits
  Workforce Development
Facilities Management
  Emergency & COOP
Operations Support
  Records Management & Training

Chief Financial Officer
RANDY LYON

Deputy CFO (David Socolof)
Budget and Finance
  Budget Operations & Controls
  (Alice Suh)
  Finance & Accounting
Strategic Fin. Planning (John
  Quinlan)
Performance Measurement &
Risk Management (Lea-Ann
  Bigelow)

Office of Chief Counsel
STUART KUPINSKY

Board Secretary (Uzoma Onyeije)
Commercial Division
Compliance Division
Regulatory Division
  NEPA (Genevieve Walker)
  Regulatory Affairs
  Spectrum Management (Lance
  Johnson)

Chief Information Officer
Jim Guinn

IT Services
Office Systems and Applications
IT Network Security
ERP

Chief Technical Officer
JEFF BRATCHER (Acting Deputy)

Applications
CORE Network and Service
Platform
Deployable Systems
Quality / Tech Performance
Device DevelopmentStandards
RAN Planning & Engineering
Standards & Research &
Development
Technical Project Management
Technical Support to State Plans

FIRSTNET REGIONAL STRUCTURE

The FirstNet operational outreach model aligns with 10 FEMA regions.

10 Regional Teams
Work through the State POCs
Reach into cities and other localities
Current Focus: State consultation
Future Focus:

- **Solution sales**
- **Support**
- **Account Management**
- **Outreach**
- **Education and training**

FEDERAL TEAM

TRIBAL TEAM

2 Nationwide Teams
Gather input and requirements
Serve users

FirstNet

Public Safety Advisory Committee (PSAC)

- **The PSAC was created by law to provide input and guidance to FirstNet**

- **It consists of 41 member representing public safety organizations**

- **The PSAC has a 5 member Exec. Committee:**
    - **Harlin McEwen, Chair (IACP)**
    - **Bill McCammon, Vice Chair (Metro Fire Chiefs)**
    - **Paul Patrick, Vice Chair (NASEMSO)**
    - **Heather Hogsett, Vice Chair (NGA)**
    - **Tom Sorley, Vice Chair (USCM)**

- **Current PSAC initiatives for FirstNet**
    - **Defining requirements that meet Public Safety Grade**
        - Coverage, Reliability, Resiliency, Emergency communications, Group communications
    - **Developing over the horizon/human factors**
    - **Use cases by entity/discipline**
    - **Identity management**

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FirstNet 3-in-1 Approach

Diverse Coverage Architecture: considering a "3-in-1" Approach: Terrestrial + Satellite + Deployable

#2:
Mobile Satellite Systems

#1:
Multiple Terrestrial Mobile Systems

#3:
Deployable Systems

Public Safety User

FirstNet

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FirstNet Will Support

Communication

- Video
- Voice (non-mission critical)
- Messaging
- SMS/Text
- Data (Internet)

Applications

- CAD, RMS, NLETS
- FirstNet applications (e.g., AVL)
- Syndicated applications
- Currently used Agency applications

Services

- Records management
- Data storage
- Audio storage
- Database inquiries

Capabilities

- Network monitoring and status
- Integrated solution and services
- Priority
- Hardened and secure
- Provisioning

FirstNet and State Consultation

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FirstNet Consultation with State

- **The single officer or governmental body is expected to consult with FirstNet on several policies, including:**

  - **Construction of a Core and RAN build out**

  - **Placement of towers**

  - **Coverage areas of the network**

  - **Adequacy of hardening, security, reliability, and resiliency requirements**

  - **Assignment of priority to local users**

  - **Assignment of priority and selection of secondary users**

  - **Training needs of local users**

- **SLIGP funding is intended to support State consultation**

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SLIGP Activities

- **Governance:** Establish or enhance a governance structure to consult with FirstNet;

- **Representation:** Ensure local and tribal representation when the State is consulting with FirstNet;

- **Education:** Conduct education and outreach for all relevant stakeholders that will be involved in the PSBN;

- **Users:** Identify potential public safety users for the PSBN;

- **MOU:** Develop a standard Memorandum of Agreement appropriate for the State to facilitate the possible sharing of infrastructure with FirstNet;

- **Staffing:** Develop staffing plans to involve local and tribal stakeholders in a future data collection in consultation with FirstNet; and

- **SCIP:** Prepare a comprehensive plan as part of the Statewide Communications Interoperability Plan (SCIP), or a plan complementary and similar to the SCIP, describing the public safety needs that the grantee expects FirstNet to address, plus relevant milestones.

- **Infrastructure Data Collection (Phase 2) -** Maximize use of existing public/private assets to reduce cost and speed deployment.

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Wide Range of Stakeholder Consultation

State Consultation *(State POC / SLIGP)*

- State
- Local
- Tribal
- Regional
- Rural
- Metropolitan

State Plan

Governor Decision

Federal Input *(ECPC)*

- Federal Responders
- Federal Infrastructure Owners

Industry Input *(RFP / Partnering)*

- NGOs
- Utilities
- Commercial

- Users
- Coverage
- Assets
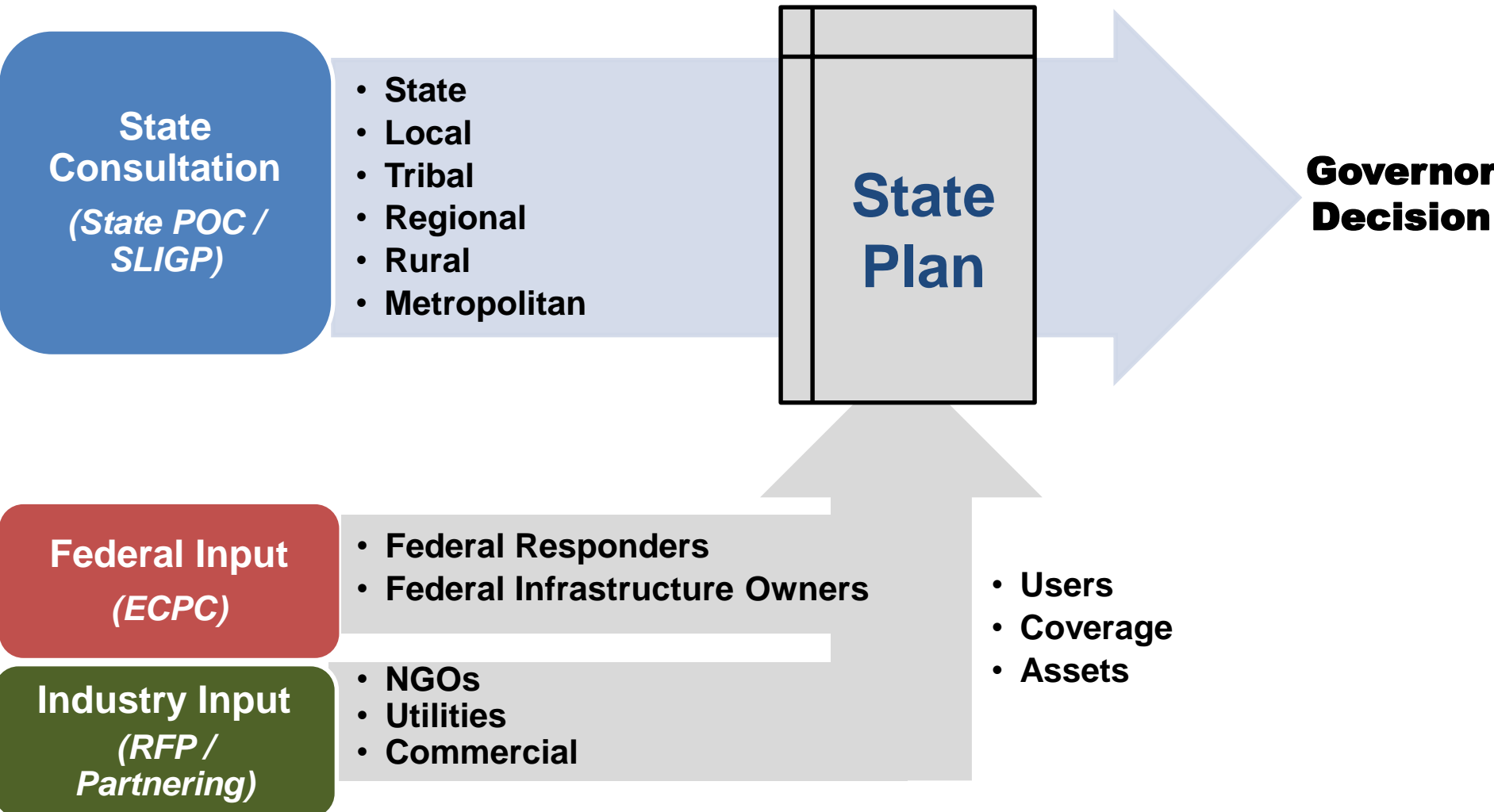
FirstNet

Overview of Consultation Process

- **Consultation is an active process, not a single event**. FirstNet will collaborate and partner with stakeholders in a meaningful consultation process.

- **FirstNet will communicate the consultation process and necessary roles and responsibilities**. It will be clear to the stakeholders what the process is and what the expectations are for those involved.

- **Consultation will focus only on critical information and data**. FirstNet will focus on gathering only absolutely necessary data to help build the network.

- **Plan development will be iterative**. Stakeholders and FirstNet will have the opportunity to refine information and improve drafts.

- **Consultation culminates with the creation of the State Plan**. State Plans will be created with the information gathered during the consultation process.

Together, Stakeholders and FirstNet will have engaged in a process that provides meaningful and thorough information for the State Plans.

FirstNet

Initial State Consultation

Initial Consultation Package
To The State

- FirstNet initial consultation letter sent to the SPOCs
- Enclosed checklists explained
- Further instructions for follow up provided
- Online meeting with all SPOCs held for any questions and clarifications

SPOC Confirmation
From The State

- Readiness confirmation letter sent by SPOC to FirstNet
- Checklist items returned
- State continues to gather information necessary prior to meeting

Analysis, Clarifications & Planning
Joint Effort

- 56 packages reviewed by FirstNet on a rolling basis
- Initial consultation agenda is sent and meeting is planned

Initial Consultation
Joint Effort

- Meeting held within each state/territory
- Open dialog between FirstNet and the state
- Materials presented and reviewed
- Follow-up activities planned

Initial state consultation will cover a number of items to help FirstNet and the states begin the exchange of information, which will ultimately lead to the development of a state plan.

Topic	Description
State or Territory Update	
FirstNetUpdate	
Consultation Process	
Roles and Responsibilities	
Eligible Users	
Coverage	
Joint Outreach Planning	
Next Steps	

Preliminary Consultation and State Plan Process

FirstNet — U.S. DEPARTMENT OF COMMERCE

| Preparation | Initial Consultation | Prelim. Design Review (PDR) & Data Collection | Stakeholder Asset Evaluation | Intermediate Design Review (IDR) | Draft State Plan Review | Final State Plan Review | Final State Plan |

Technical

- RFI Response Review
- Draft & Issue RFPs
- Evaluate RFP Responses
- RFP Results
- APCO/NPSTC hardening recs. (PS Grade)
- Develop Asset Data Collection Plan
- SLIGP Ph. 2
- Develop Asset Tool
- Identify Best Value Assets & Develop Cost Estimate
- Validate / Verify Asset Suitability - Core & RAN design
- FirstNet Coverage Baseline
- Develop Asset MOU Reqts
- Assess/Prioritize Public & Private Assets
- Update Design & Send to State
- Update Plan & Send to State
- Finalize State Plan

Consultation

- Send Initial Consultation Checklist
- State Provides Checklist Materials
- State Review / Feedback of Coverage Baseline
- Federal Assets and Coverage/User feedback
- IDR State Outreach / Vetting Process
- Draft State Plan Outreach / Vetting Process
- Cost & User Fees
- OEC Consultation Prep Workshops (Voluntary)
- Initial Consultation (Process, Users, Coverage, Outreach)
- PDR & Data Collection Mtg (Coverage, Data Collection, PS Grade)
- IDR Meeting (Assets, Coverage, Priority, Security, Training)
- Draft State Plan Review Meeting (Complete DRAFT Plan)
- Final State Plan Review Meeting w/ SPOC & Gov. Office
- **Final State Plan Presented to Governor**
- OEC's Mobile Data Survey Tool (MDST) (Voluntary)
- Coordinated Outreach Plan
- State Feedback on User Baseline
- Collect Operations Data
- Collect Screening Info on Assets
- Review Priority, Security & Training Plans
- Detailed Date Collection / Suitability
- Final State Review

User Req. / Business Case

- FirstNet Research / Planning (FCC / NPSTC Reqts)
- PSAC Inputs on Operational Topics
- Develop Ops Baseline Sections of State Plan (Security, Priority & Training)
- Finalize Ops Sections of State Plan (Security, Priority, Training)
- Update Business Cases from Users info, MDST
- Update Business Case from Operational Reqts
- Update Business Case from Asset Evaluation
- Update Business Case from IDR feedback

Legend:
- Stakeholder (State / Local / Tribal / Fed)
- Joint Stakeholder / FirstNet
- FirstNet
- Partners (NTIA / DHS / PS Orgs)
- NTIA Approval

■ PSAC ■ Tribal Working Group ■ NTIA SLIGP Monitoring/Support ■ ECPC Federal Agency

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Asset Identification & Selection (Aligned with SLIGP Phase 2)

All Assets in →

| Location (within coverage objective) | Technical capacity/ minimum hardening met | Access/ operations | Legal/ regulatory | Cost |

→ **Ideal Assets out**

Final State Plan
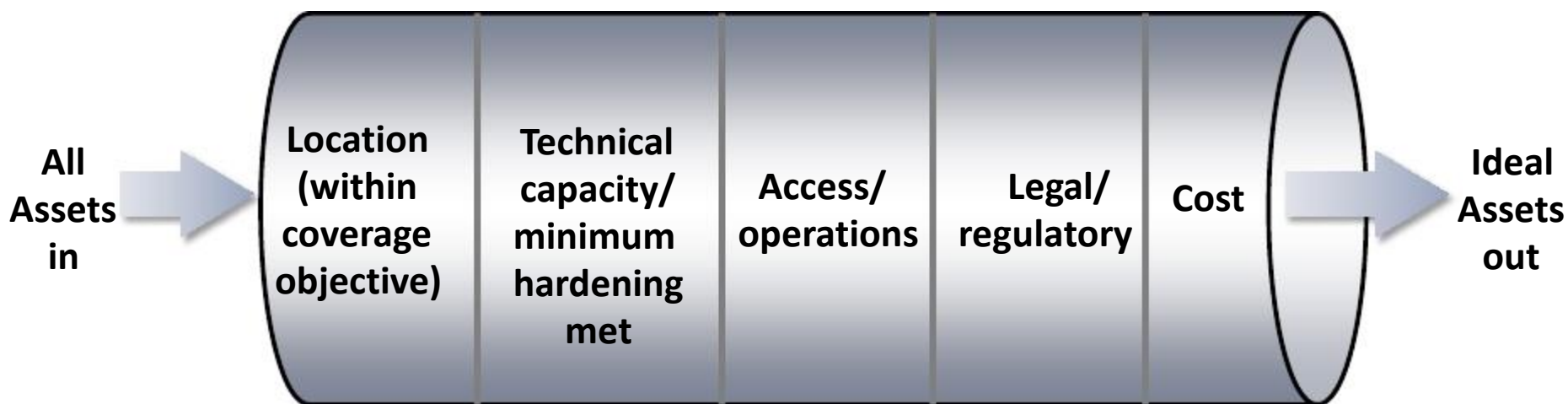
Key Steps
- Document proposed coverage and associated cost
- Supply projected funding level
- Provide final review with state's SPOC / governing body
- Submit to the Governor

Guiding Principles
- Address areas of consultation required by law
- Ensure public safety stakeholders have robust involvement before state plan is presented to the Governor

State Plan Requirements

- Completion of the RFP process
- Details of proposed build-out in the state
- Funding level for the state

State Participation   Opt In/Out Option

- **FirstNet will initially provide a plan/RFP to States including their proposed allocation of network construction funding.**

- **Within 90 days, each State can decide if they want to participate in the NPSBN deployment, or they can opt out and build out their own individual State network.**

- **States opting out have 6 months to submit a plan to the FCC to show that they are interoperable with the nationwide network.**

- **State Plans must demonstrate:**
  Technical and fiscal capability to operate the State radio access network
  Ability to maintain ongoing interoperability with the nationwide network
  Capacity to complete the project within specified comparable FirstNet timelines
  Cost-effectiveness
  Comparable security, coverage, and quality of service to that of FirstNet

- **If FCC approves the plan, the State may apply to the NTIA for a construction grant and lease spectrum capacity from FirstNet.**

- **If FCC disapproves the plan, the FirstNet plan will move forward in the State.**

Homeland
Security

FirstNet Vision

NETWORK

FirstNet: Nationwide Core and Local Radio Access Networks

FIRSTNET NATIONWIDE DISTRIBUTED CORE NETWORK

56 STATE RADIO ACCESS NETWORKS (RAN)

EMS

Mutual Aid

First Responder

Police

Fire Rescue
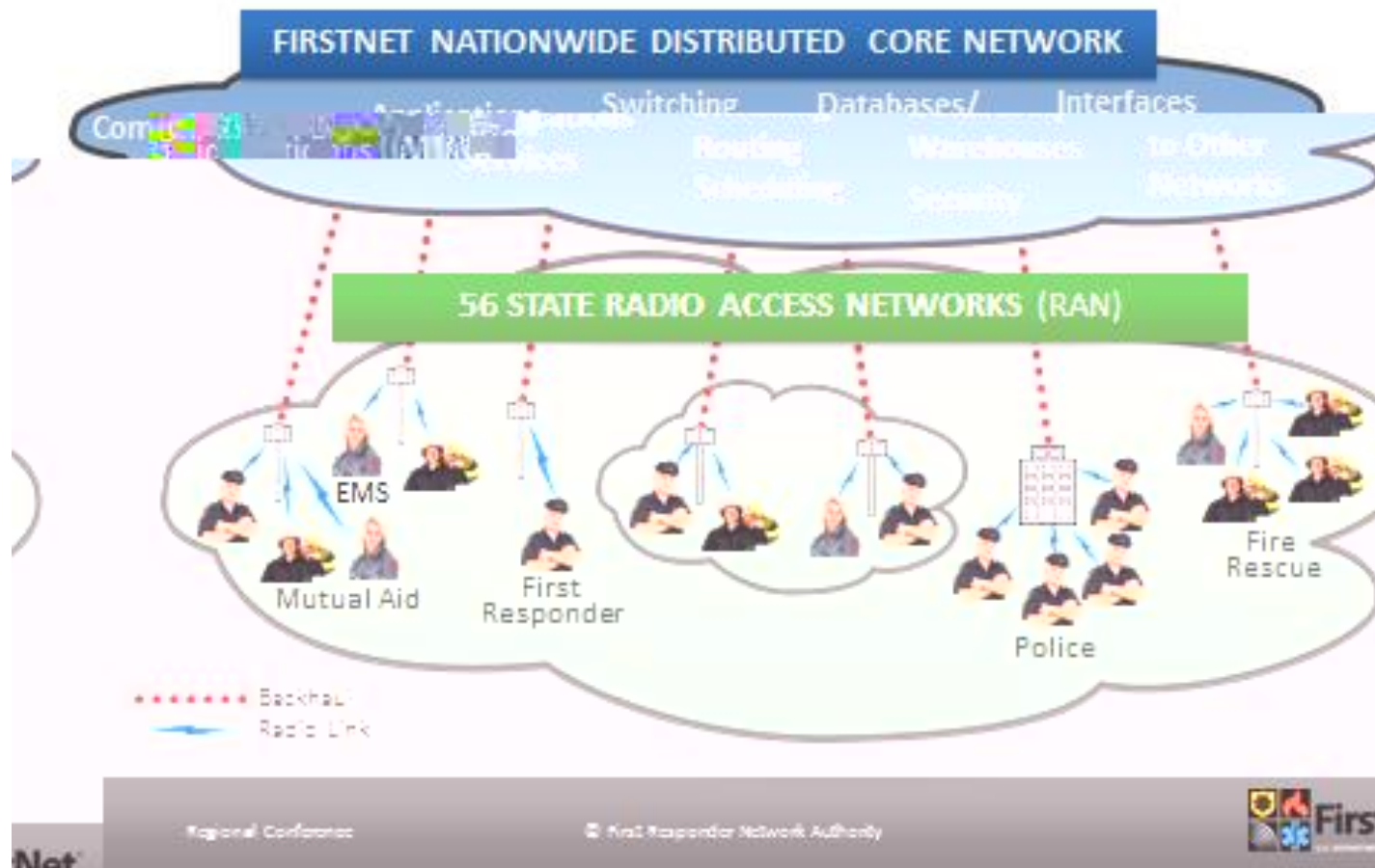
Homeland Security

Nevada Coverage Objectives

Coverable Objectives Introduction

- **Objective:**

  help states with a starting point of data that can be considered when establishing coverage objectives for FirstNet

- **OEC has gathered a variety of nationwide data from several sources to establish a baseline**

- **OEC has coordinated our baseline with FirstNet to ensure it's a reasonable starting point**

- **States/Territories can then tailor it to unique Public Safety operational needs**

National Highway System

Federally Recognized Tribes

Population Density

Homeland Security
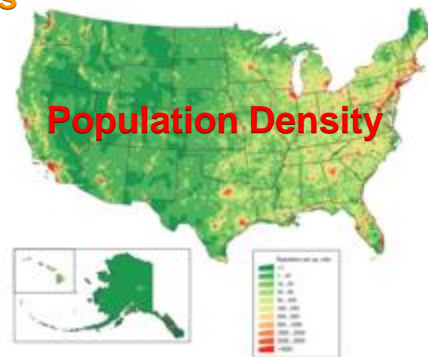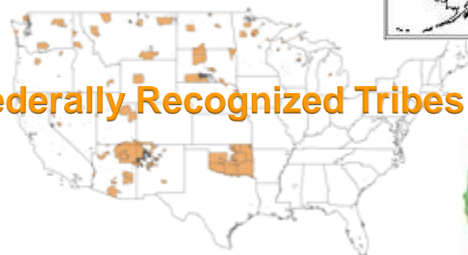
Guidelines

- **Focus on coverage….not infrastructure**

  The goal is to define and prioritize operational coverage needs

  RAN site selection, backhaul, hardening requirements, etc. are for a later discussion

  These site selection factors will be addressed through SLIGP funding

- **This is a starting point…..nothing is final**

  The maps provided by OEC are to help States identify its <u>own coverage objectives</u>

  Many coverage factors/approaches that the State develops can/will adjust throughout the consultation process

- **LTE is a mobile data solution first…..mission critical voice is yet to come**

  NPSBN will initially support mission critical data and (potentially) supplementary voice

  System will not replace need for land mobile radio systems (based on current technology)

Homeland
Security

Focus on Coverage

Coverage

- Where is reliable Coverage needed?

- For what level/ device types?

- Using what potential methods?

+

Capacity

- How many total users?

- What is their operational area?

- What type of applications do they use?

→

RAN Design

- Estimated number of sites

- Initial cost estimate

- Parameters for asset data collection

Homeland Security
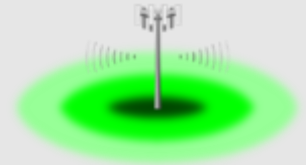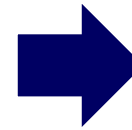
Boundaries

☐	State
☐	Counties
■	Census Designated Places
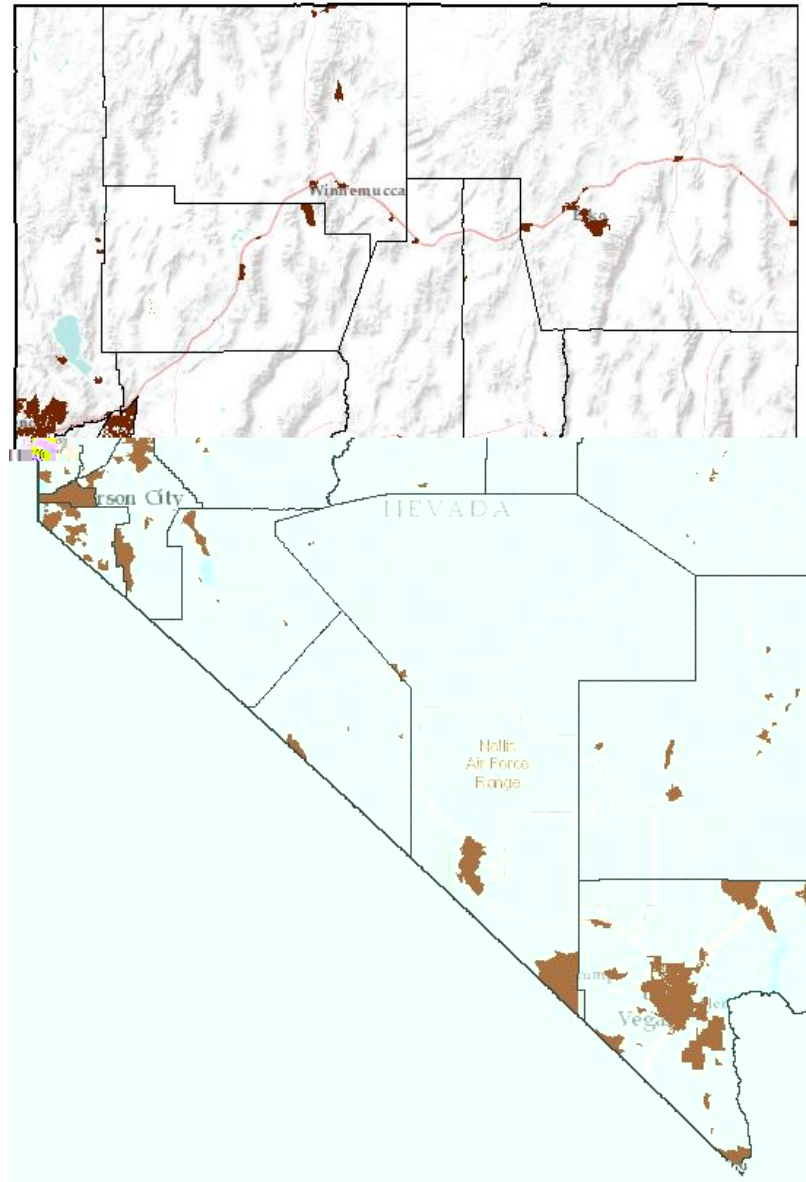
# Boundaries & Roads
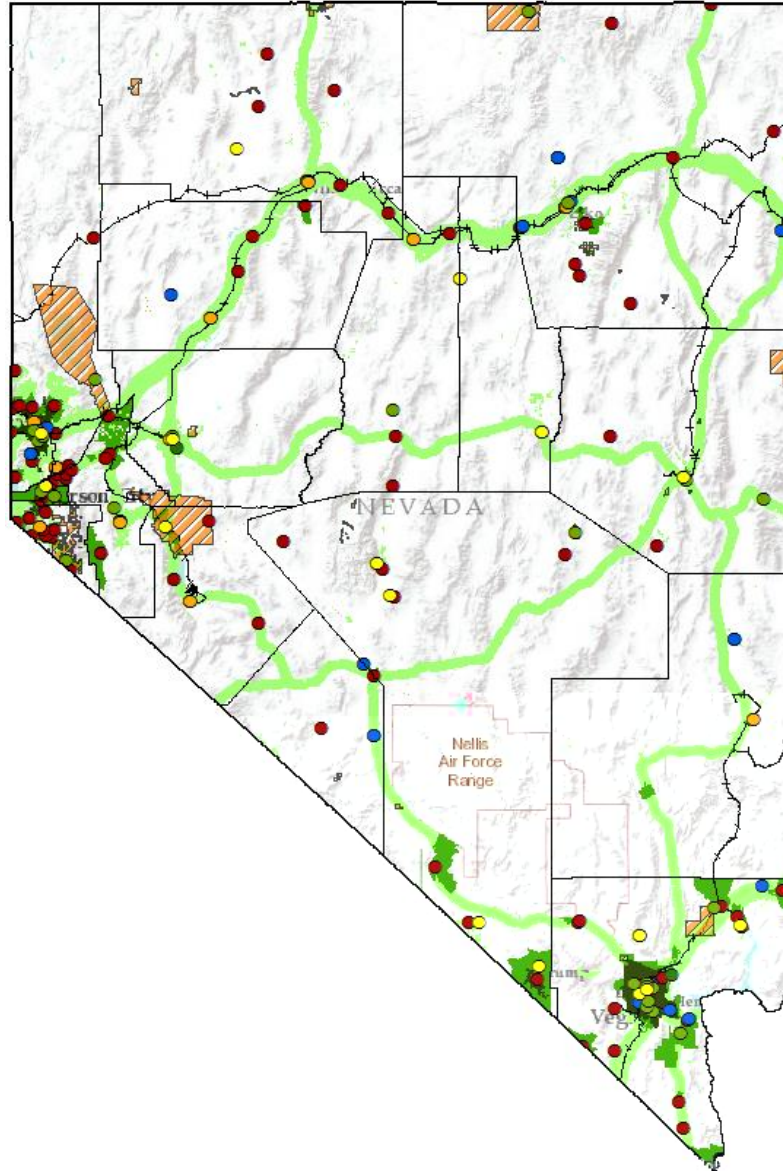

State
Counties
Federally-Recognized Tribes
USA Railroads
USA Major Rivers
Census Designated Places
National Highway Network
Interstate
US Highway
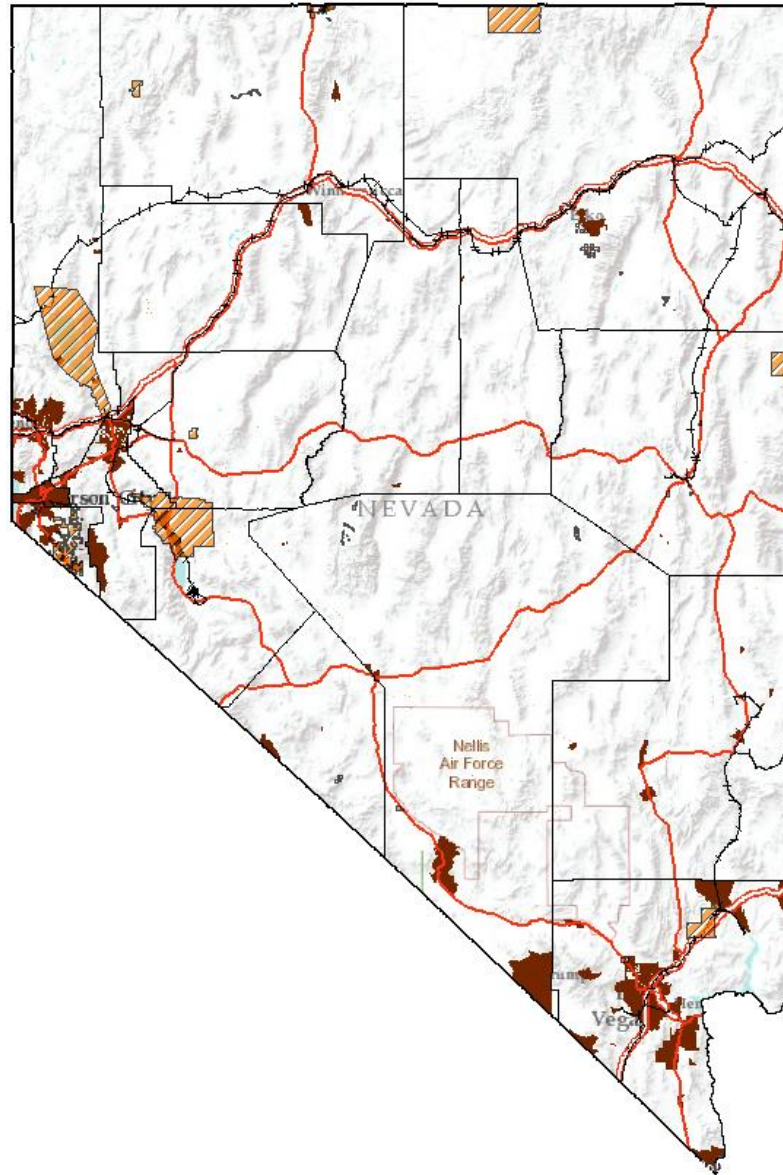
Homeland Security

Population Density

Population Density

- 🟩 Population Density 2,500+ ppsqmi
- 🟥 Urban Areas & Clusters (1,000+ ppsqmi)
- 🟦 Population Density 5+ ppsqmi

Homeland Security

Translating Data
to Coverage Levels

Coverage Objective Levels

- **Coverage objective levels (in-building, handheld, vehicle, etc.) does not mean that coverage will only be provided at that level**

- **It means that level of coverage will be provided _reliably_ and at a _minimum data rate_**

- **A lower reliability and/or minimum data rate would result in greater coverage from the same site**

- **Service could extend beyond this but at a lower data rate**

In building
Handheld
Vehicle

Homeland
Security
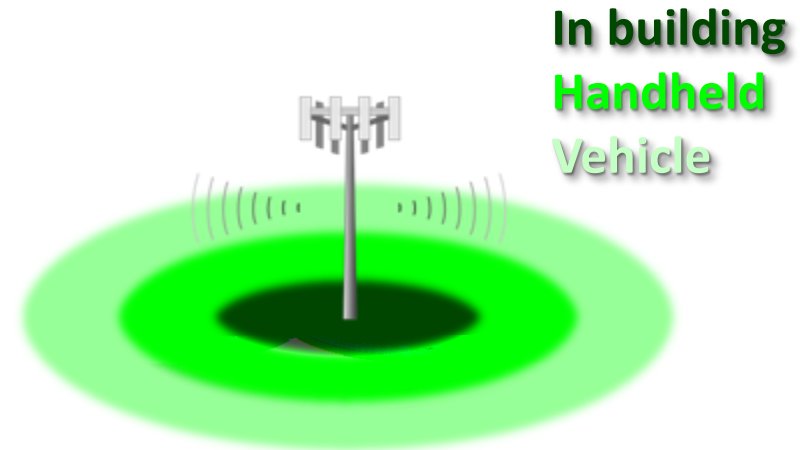
Coverage Objective vs. Coverage Map

- ***Coverage objectives*** identify the State's coverage goals
- ***Coverage maps*** show predicted coverage for the network build out
- Once the towers are selected to satisfy the coverage objectives, the resulting coverage map may yield greater coverage.

  Highway example: The coverage objective is to provide mobile coverage on the highway. The resulting coverage will be much greater.

In building
Handheld
Vehicle

Homeland Security
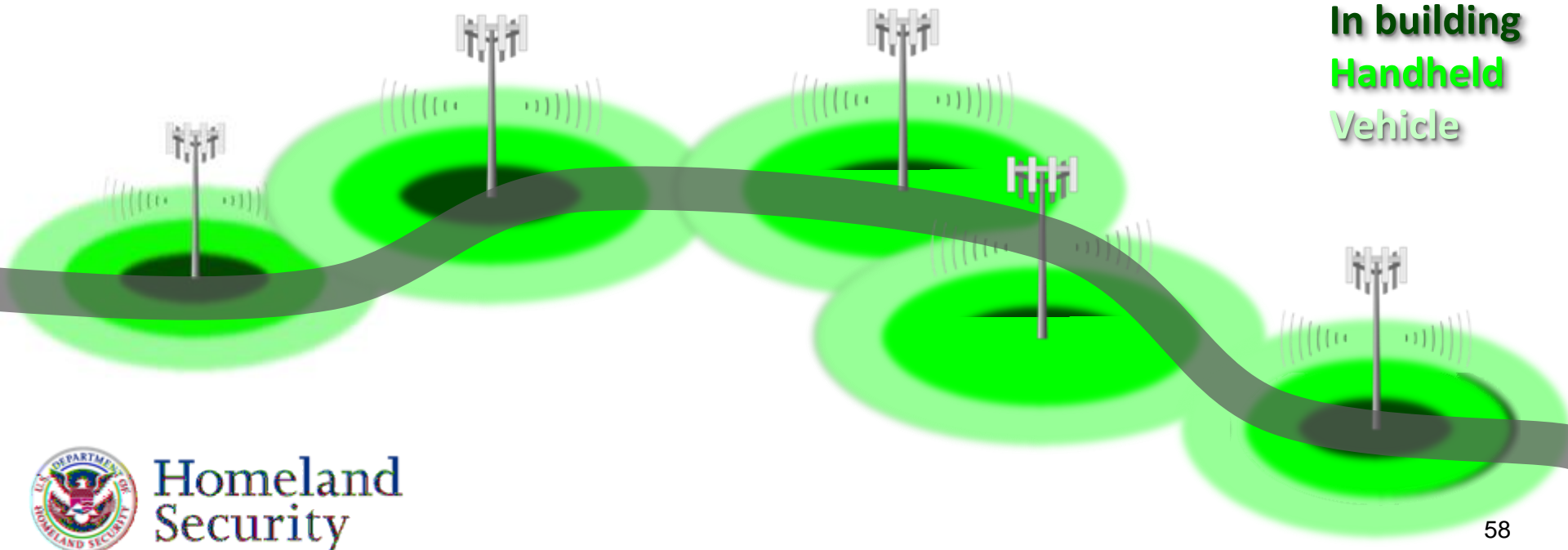
LTE Coverage   Varying Levels of Performance

- **Performance can vary greatly based on signal strength**

- **Stronger signal results in higher throughput**
  - **Shown by different colors surrounding each site**
  - **System will adjust automatically**

- **Thus coverage is defined by throughput thresholds**
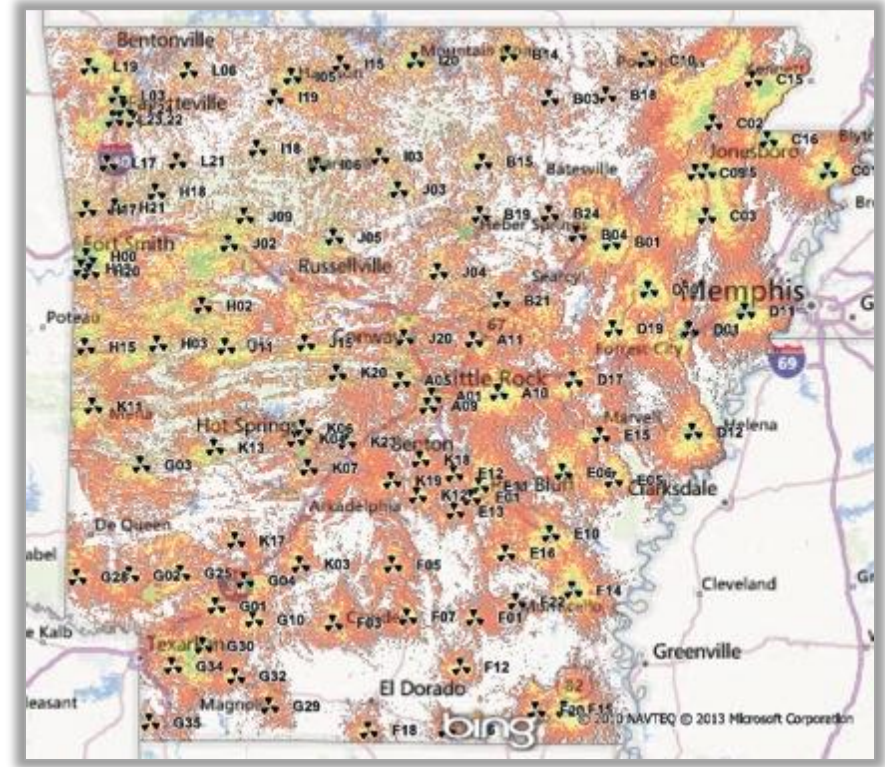
Example plot from old coverage prediction provided simply to illustrate point

Homeland Security

LTE Coverage: Device Type Comparison

- **Like portable vs. mobile LMR radios, different LTE device types will have different performances**
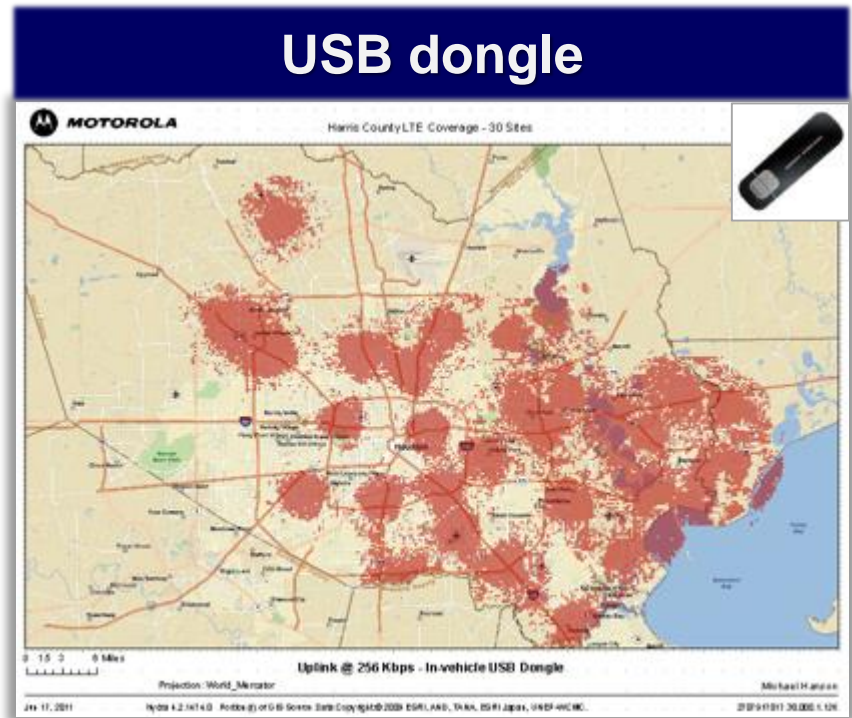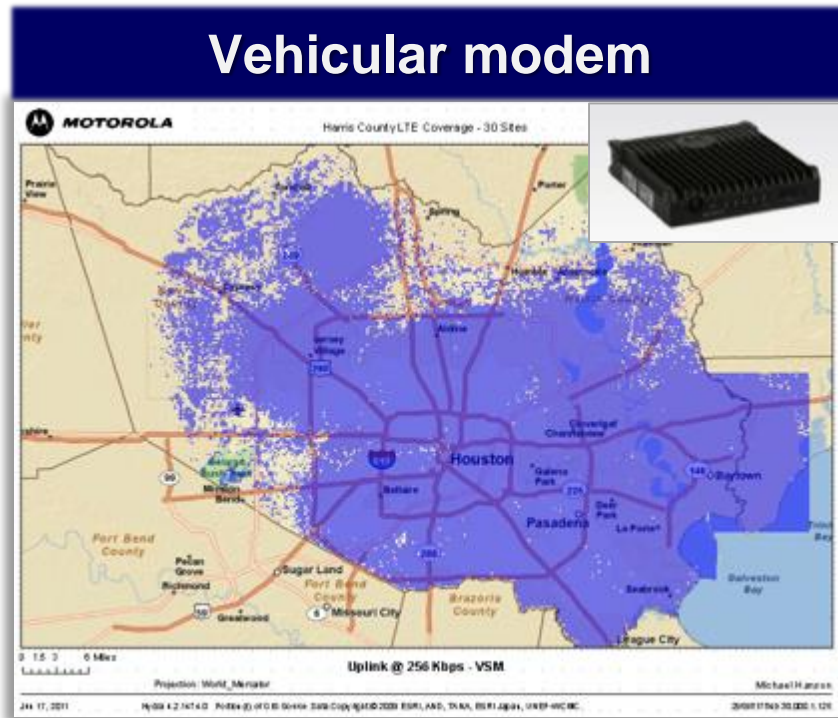
Example plots from old coverage predictions provided simply for comparison purposes.

OEC Baseline

The following is OEC's proposed approach to coverage levels, <u>NOT</u> FirstNet's requirements.

<u>In-Building Handheld Coverage</u>: Coverage provided to a handheld device through minimum one wall

- *OEC Starting Point* – Urban Areas and Clusters (1,000 people per square mile) as defined by US Census

<u>Handheld / Partial In-Building Coverage</u>: Coverage provided to a device outdoors or "on the street" including some in-building coverage

- *OEC Starting Point* – Outside of Urban Areas and Clusters, Census Designated Places (CDPs) with more than 500 people

<u>Vehicular Modem / Partial Handheld Coverage</u>: Vehicle-based user equipment, as well as some handheld coverage

- *OEC Starting Point* – Interstates, major U.S. highways and non-CDP areas with more than 5 people per square mile (using census blocks)

<u>Satellite / Deployable Coverage</u>: Outside of fixed terrestrial coverage; mobile or satellite connectivity only

- *OEC Starting Point* – All areas with less than 5 people per square mile

In-Building Coverage

OEC Starting Point
Urban Areas and Clusters
(1,000 people per square
mile) as defined by US
Census Bureau

■ **In-Building**
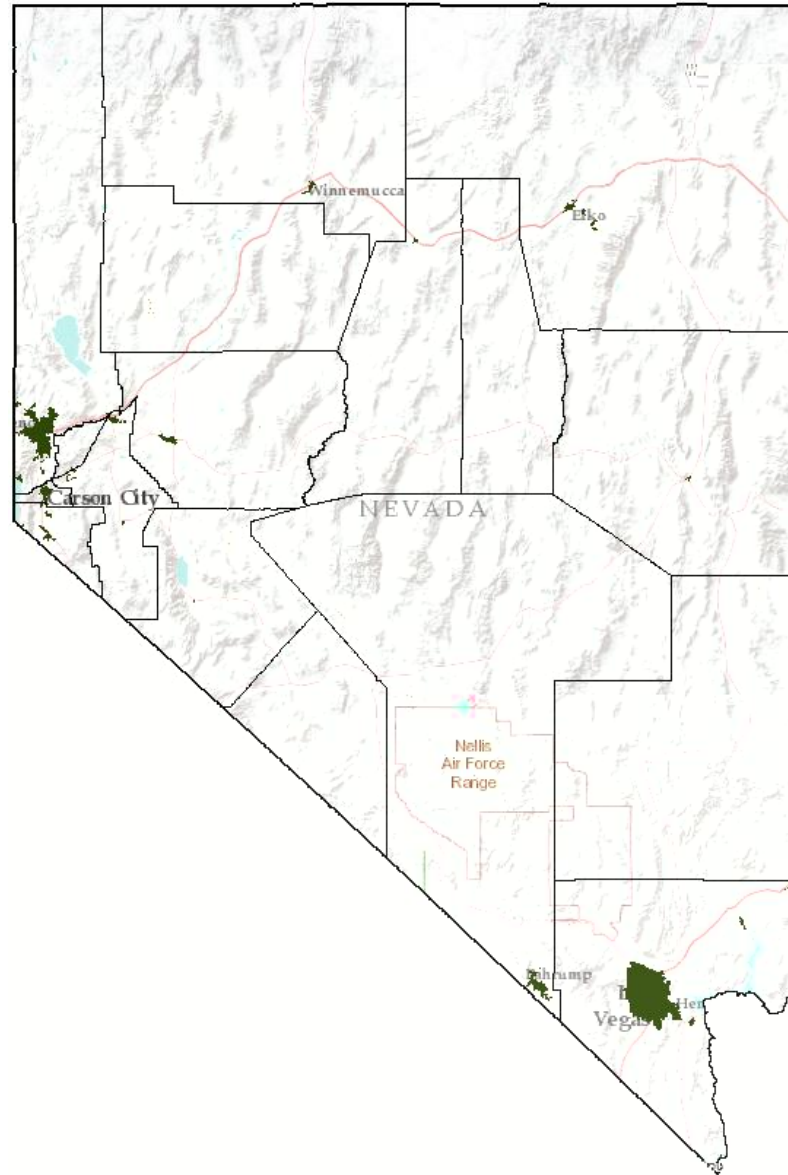
Handheld Coverage

OEC Starting Point
Outside of Urban Areas
and Clusters, Census
Designated Places (CDPs)
with more than 500 people

In-Building

**Handheld/Partial
 In-Building**
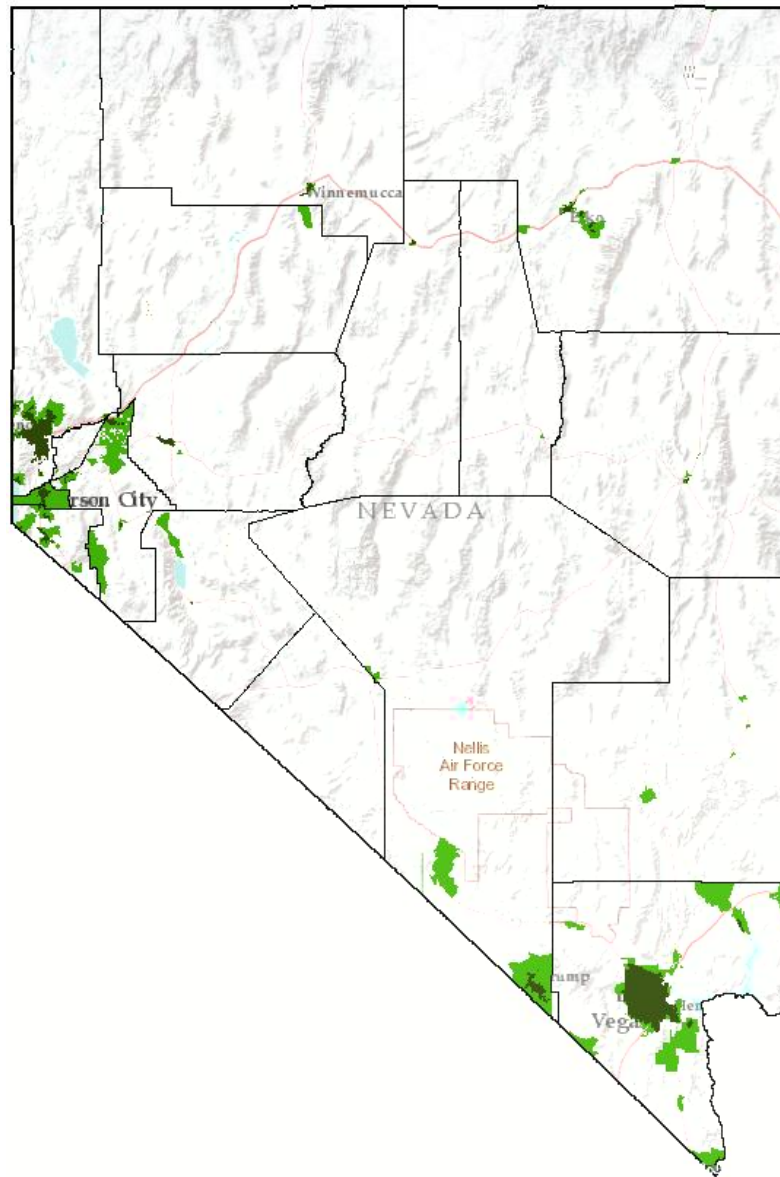
All Coverage

OEC Starting Point
Interstates, major U.S. highways and non-CDP areas with more than 5 people per square mile (using census blocks)

All other areas would use Satellite/ Deployable coverage.

■ **In-Building**

■ **Handheld/Partial In-Building**

□ **Vehicular Modem/ Partial handheld**

□ **Satellite/Deployable**
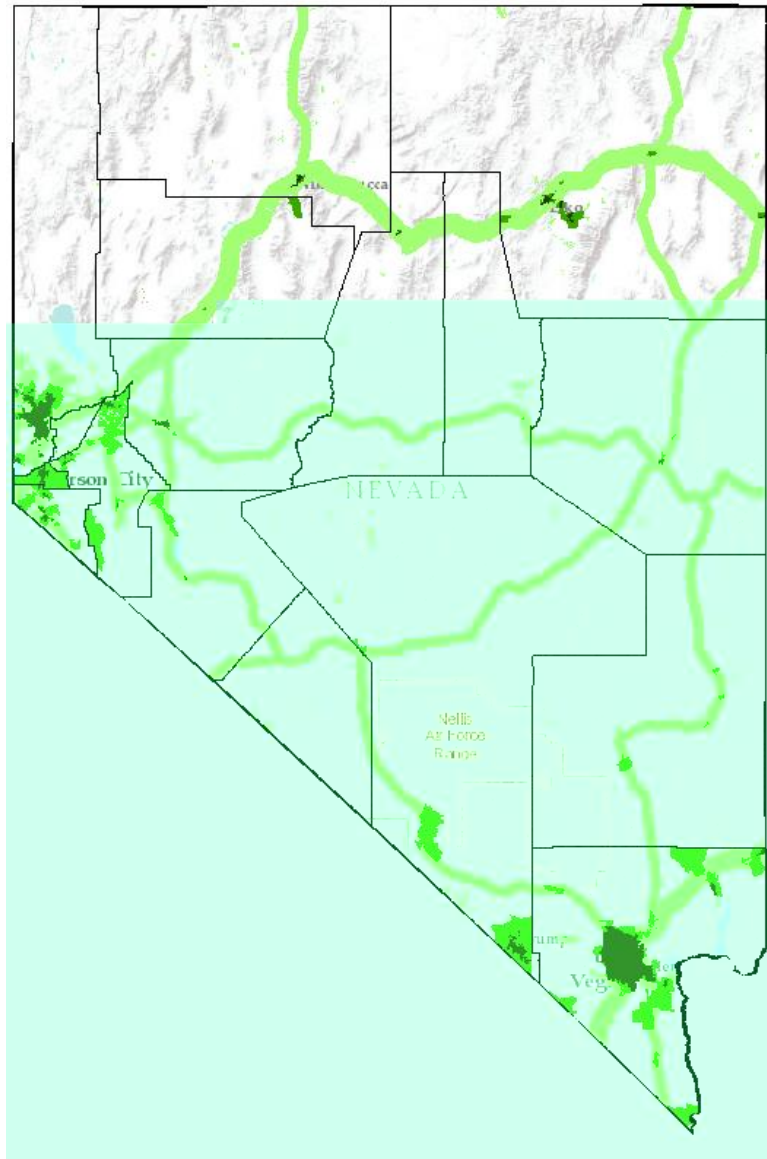
Homeland Security

Adjusting the Baseline Based on Public Safety's Need

Homeland Security

Tribal Lands

State

Counties

Federally-Recognized Tribes

USA Railroads

USA Major Rivers

Census Designated Places

National Highway Network

Interstate
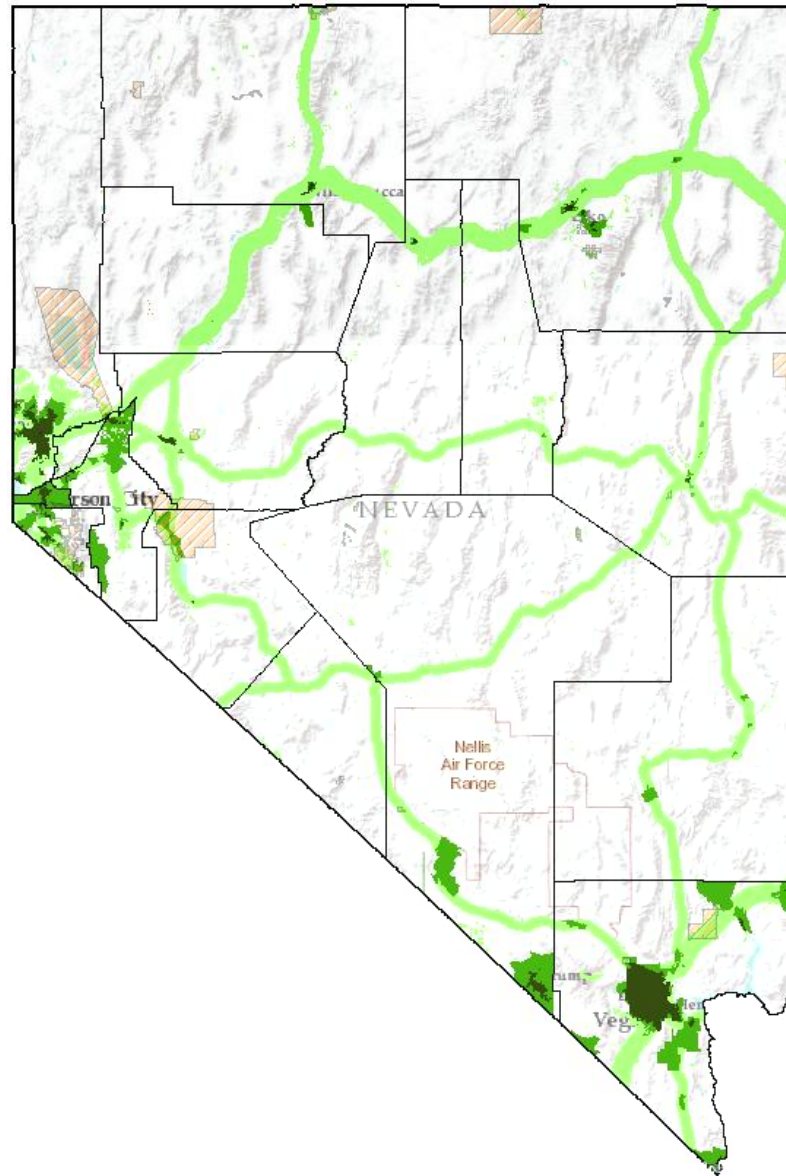
US Highway

Boundaries and Roads

State

Counties

Federally-Recognized Tribes

USA Railroads

USA Major Rivers

Census Designated Places

National Highway Network

Interstate

US Highway
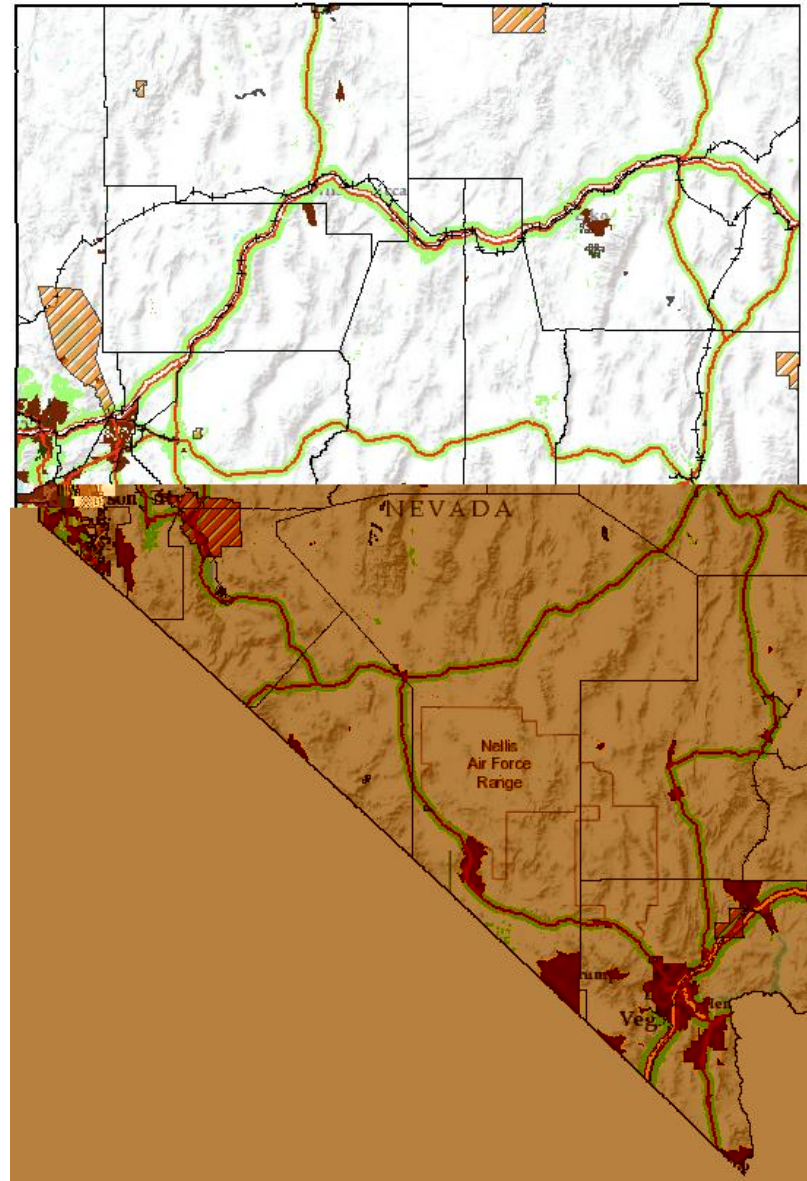
Agencies

Agencies

- ⬤ EMS Departments
- ⬤ Federal
- ⬤ Military
- ⬤ Emergency Management
- ⬤ Law Enforcement
- ⬤ Fire Departments

*Several agencies may overlap on the map

Facilities

Facilities

- ⬜ Major State Government Building
- 🟦 Court Houses
- ▨ Prison Areas
- ⬜ Corrections
- ▨ Airport
- ✛ Airports
- 🟧 Local Emergency Operations Centers
- 🟧 State Emergency Operation Centers
- 🟨 Urgent Care Facilities
- 🟨 Hospitals
- 🟪 PSAP
- · Schools
- ⚓ Ports
- Ⓜ Amtrak Stations
- 🟩 Air National Guard (ANG) Sites
- ▨ Army National Guard (ARNG) Installations
- 🔲 Canada and Mexico Border Crossings

Homeland Security
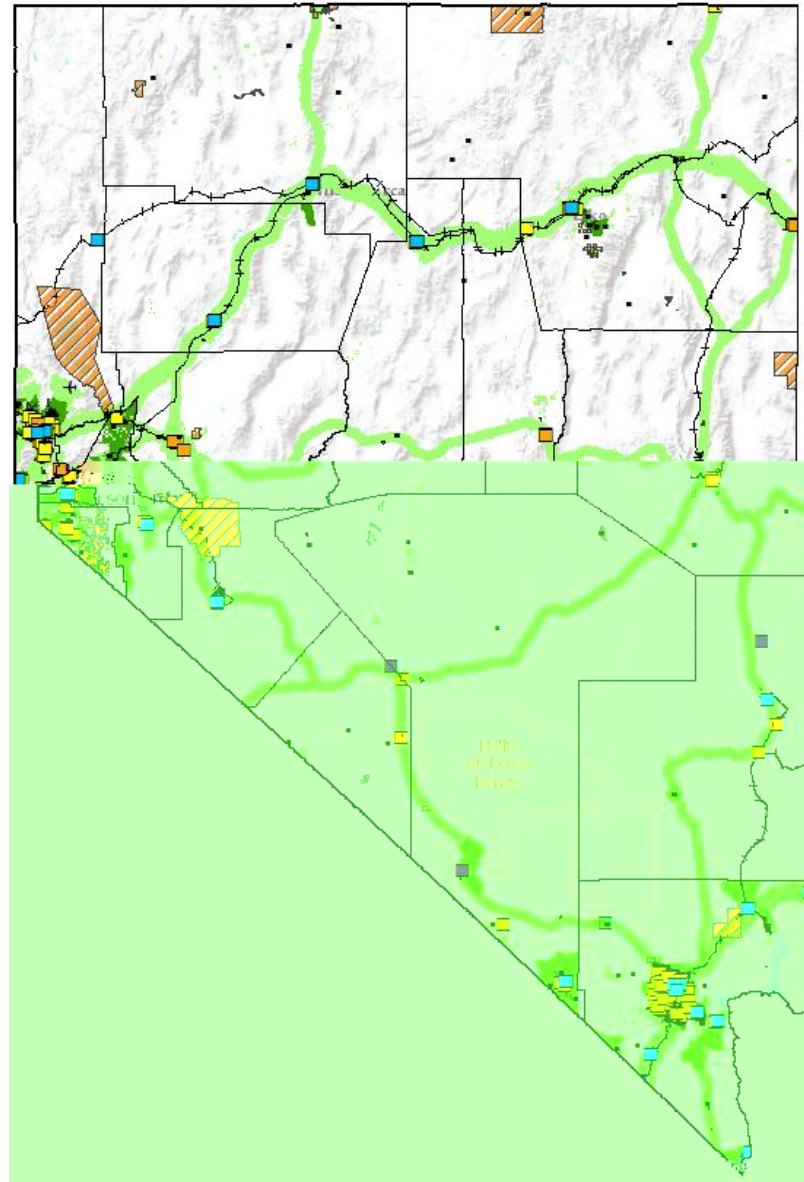
Critical Infrastructure

Critical Infrastructure

◆ Manufacturing

— Hazardous Materials Routes

◆ Energy

☢ Nuclear Plants

◆ Dams

◆ Public Venues
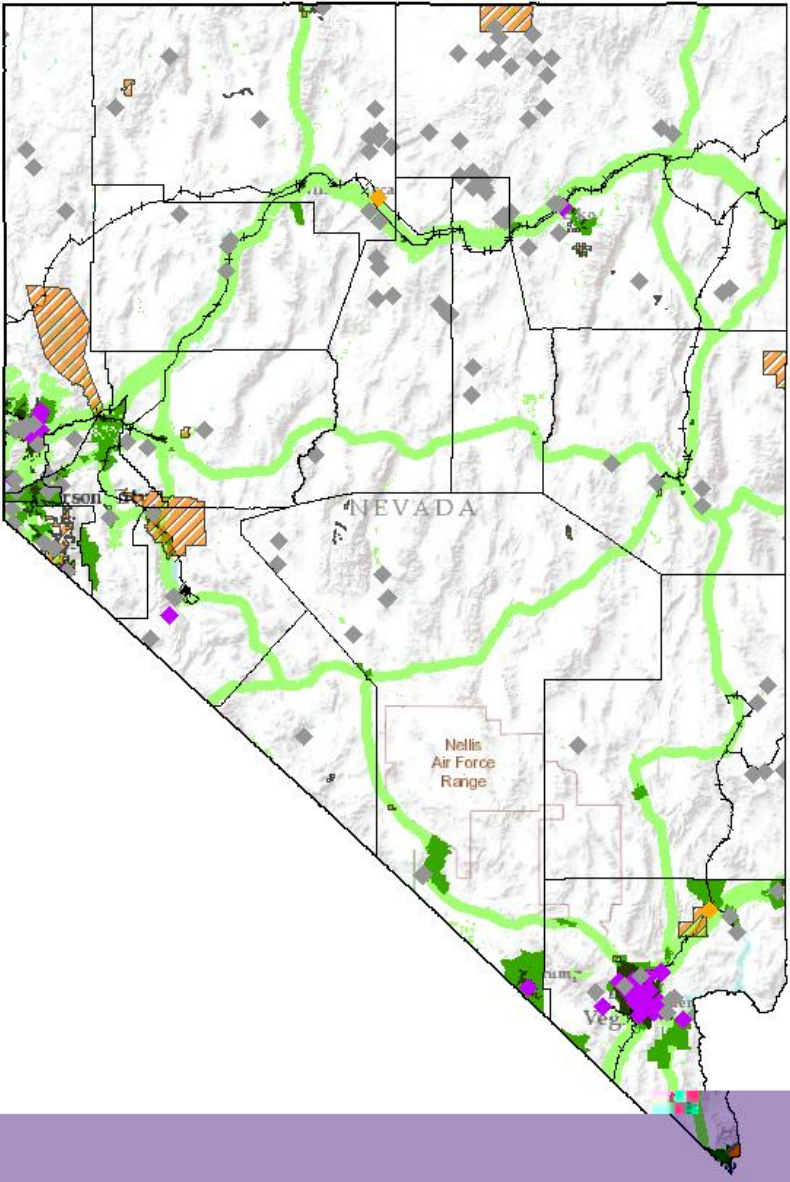
Agencies / Facilities / Critical Infrastructure

Agencies
- ○ EMS Departments
- ● Federal
- ● Military
- ● Emergency Management
- ● Law Enforcement
- ● Fire Departments

Facilities
- ■ Major State Government Building
- ■ Court Houses
- ▨ Prison Areas
- ■ Corrections
- ▨ Airport
- ✛ Airports
- ■ Local Emergency Operations Centers
- ■ State Emergency Operation Centers
- ■ Urgent Care Facilities
- ■ Hospitals
- ■ PSAP
- ▪ Schools
- ± Ports
- ▣ Amtrak Stations
- ▣ Air National Guard (ANG) Sites
- ▨ Army National Guard (ARNG) Installations
- ▣ Canada and Mexico Border Crossings

Critical Infrastructure
- ◆ Manufacturing
- ▬▬ Hazardous Materials Routes
- ◆ Energy
- ● Nuclear Plants
- ◆ Dams
- ◆ Public Venues

Homeland Security

71
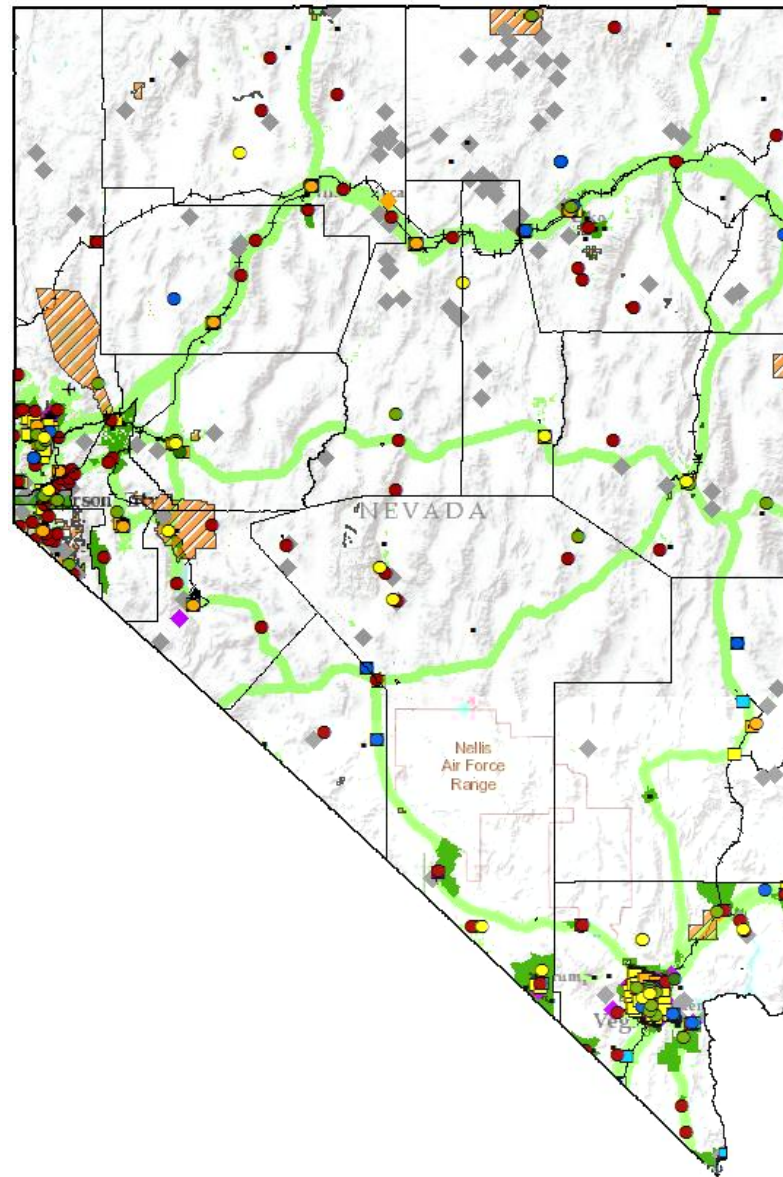
All Coverage Levels

In-Building

Handheld/Partial In-Building

Vehicular Modem/ Partial handheld

**Satellite/Deployable**

Homeland
Security

72
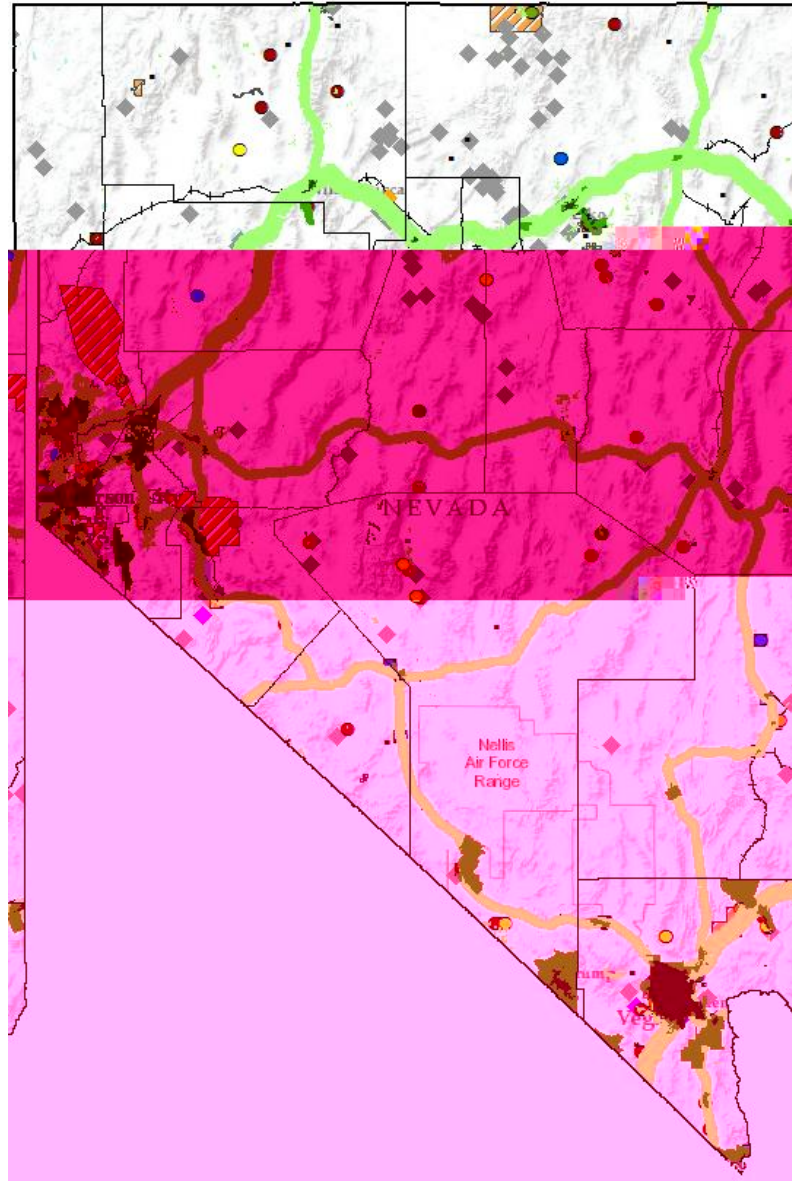
Coverage with Federal Overlay

This map shows the proposed coverage levels with the Federal Lands in the State.

How do Federal Lands affect the State's Coverage Objectives?

- **In-Building**

- **Handheld/Partial In-Building**

- **Vehicular Modem/ Partial handheld**

- **Satellite/Deployable**
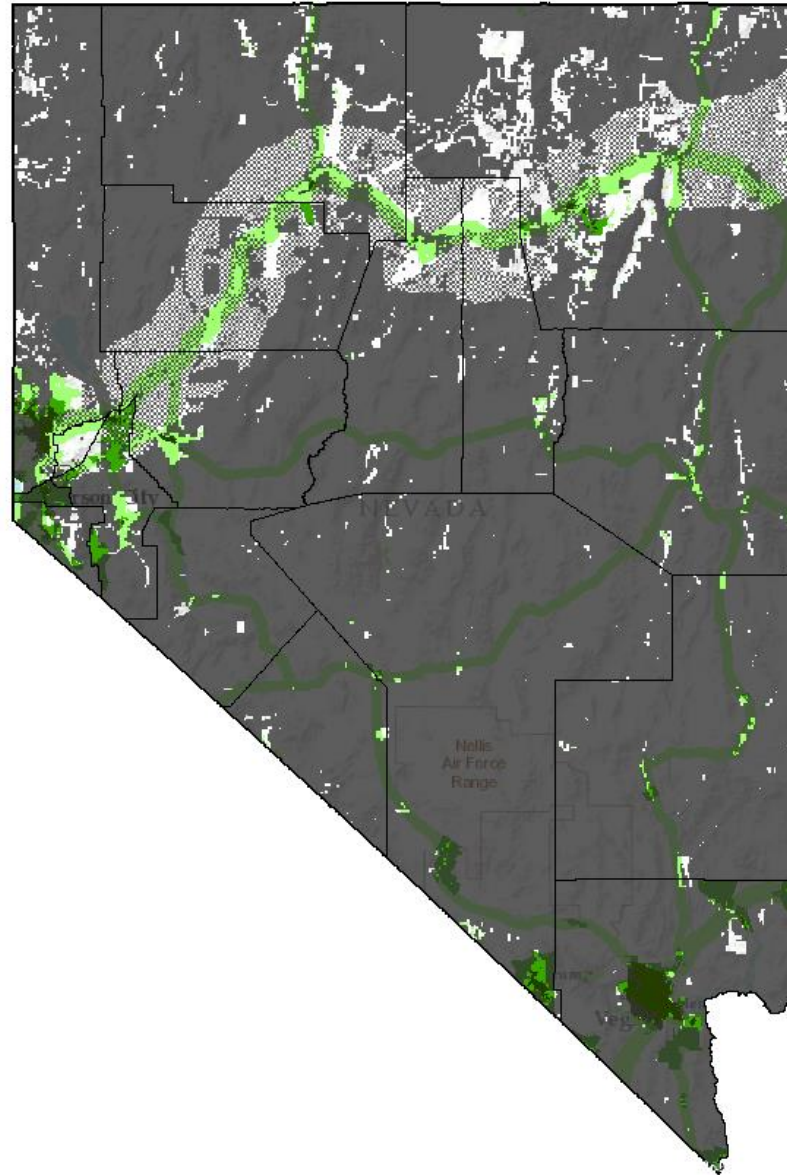
Coverage with LTE Overlay

This map illustrates advertised Commercial LTE coverage. Providers include: AT&T, Verizon, Sprint, and T-Mobile.
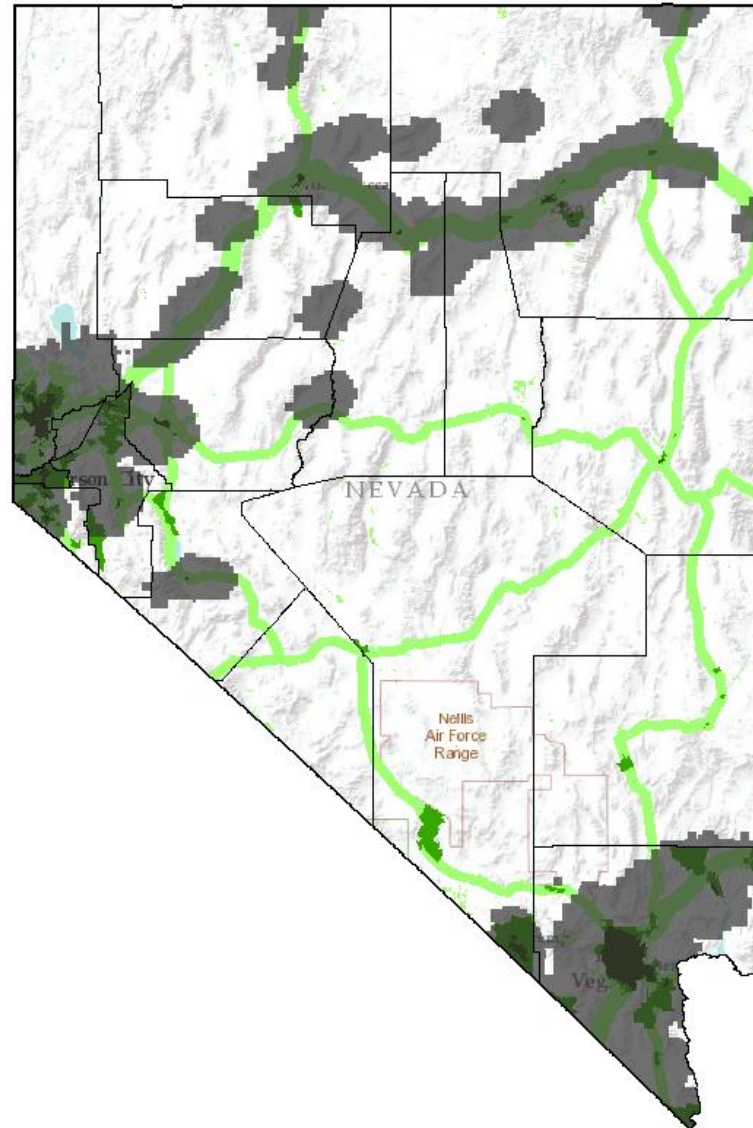
In-Building

Handheld/Partial In-Building

Vehicular Modem/ Partial handheld

Satellite/Deployable

Homeland Security

Coverage as of September 2013

Commercial Provider Overlay

This is a map of
<u>advertised</u>
Commercial 2G, 3G,
and 4G service.
Providers include:
AT&T, Verizon,
Sprint, T-Mobile, U.S.
Cellular, and other
regional carriers.

■ **In-Building**

■ **Handheld/Partial
In-Building**

■ **Vehicular Modem/
Partial handheld**

□ **Satellite/Deployable**
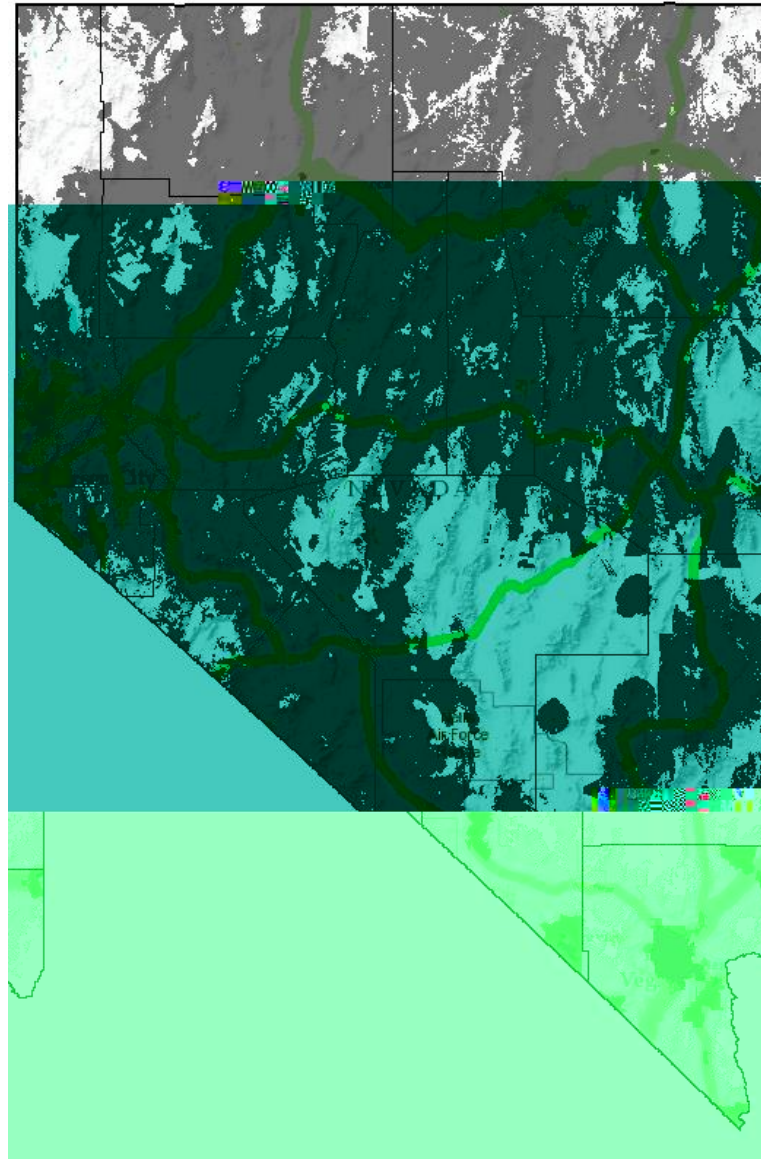
*Coverage as of December 2012

Nevada Baseline

What are the State's objectives for each of the following coverage levels?

In-Building Handheld Coverage: Coverage provided to a handheld device through minimum one wall

> *Buildings where data communications is critical, schools, critical infrastructure, and public venues. GIS and CAD data may be helpful in identifying this requirement.*

Handheld / Partial In-Building Coverage: Coverage provided to a device outdoors or "on the street" including some in-building coverage

> *Areas where personnel will be using a portable device such as public venues, buildings and other facilities in suburban and rural areas. GIS and CAD data may be helpful in identifying this requirement.*

Vehicular Modem / Partial Handheld Coverage: Vehicle-based user equipment, as well as some handheld coverage

> *Rural areas of the State, evacuation routes, and special events.*

Satellite / Deployable Coverage: Outside of fixed terrestrial coverage, deployable, or satellite connectivity only

> *Areas where there is currently minimal or no commercial coverage, and special events.*

Example of Coverage Deliverable to FirstNet

Deliverable to FirstNet: GIS file broken down into the 4 coverage areas

- ■ **In-Building**

- ■ **Handheld/Partial In-Building**

- ■ **Vehicular Modem/ Partial handheld**
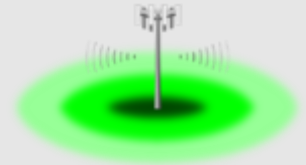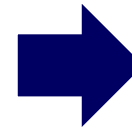
- □ **Satellite/Deployable**

Homeland Security

Identifying Users

Homeland Security
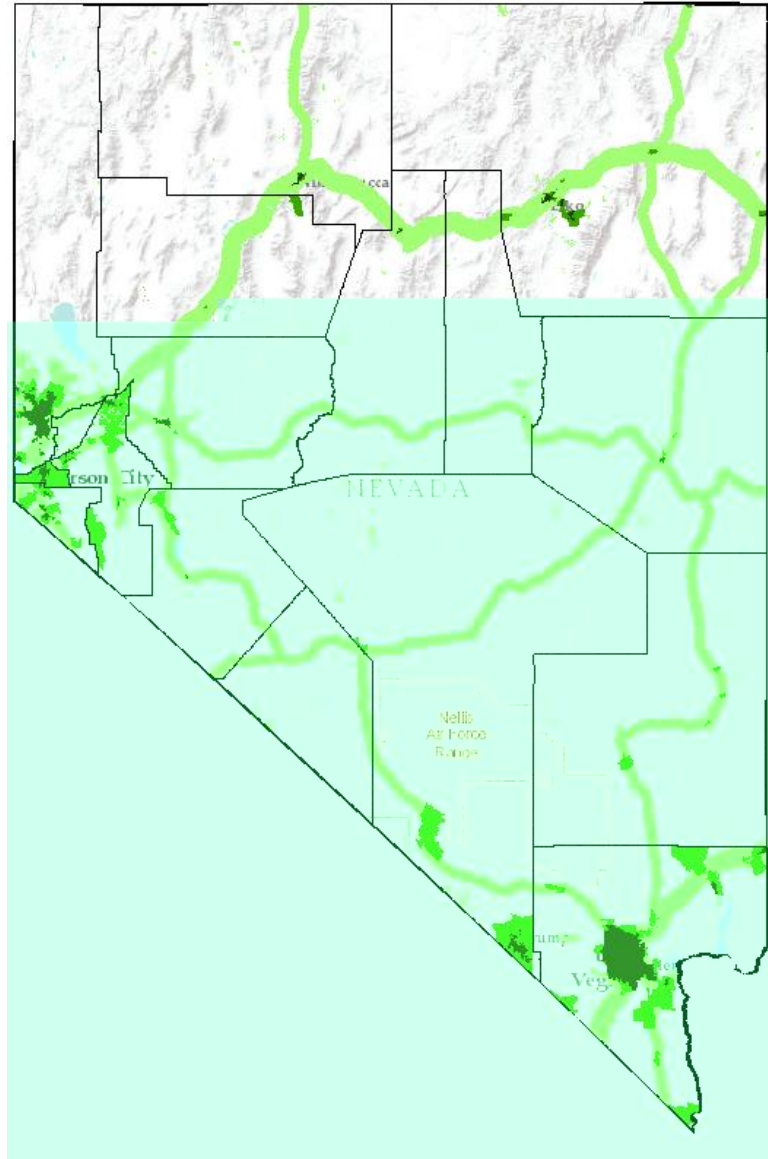
Focus on Users

Coverage

- Where is reliable Coverage needed?

- For what level/ device types?

- Using what potential methods?

+

Capacity

- How many total users?

- What is their operational area?

- What type of applications do they use?

→

RAN Design

- Estimated number of sites

- Initial cost estimate
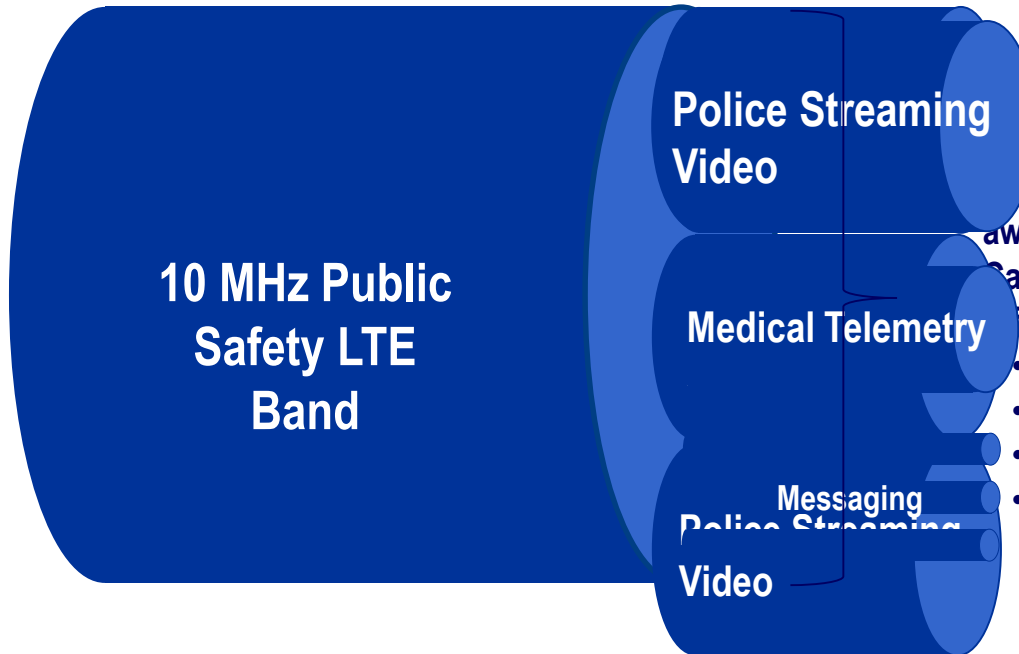
- Parameters for asset data collection

Homeland Security

LMR vs. LTE Capacity

LMR Tx

| LMR Channel 1 |
| LMR Channel 2 |
| LMR Channel 3 |
| ⋮ |
| LMR Channel n |
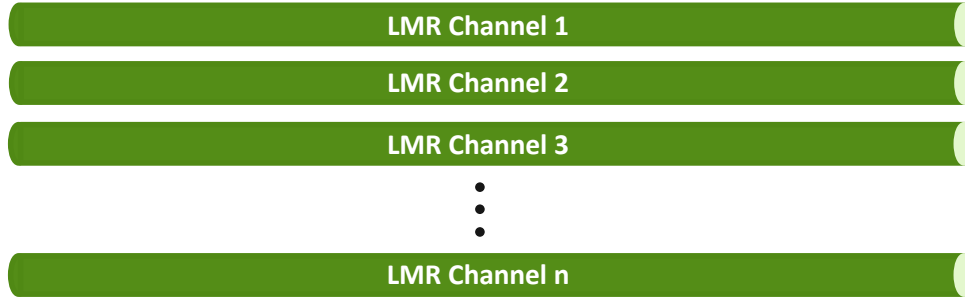
Each channel supports a conversation

LTE Tx

10 MHz Public Safety LTE Band

Police Streaming Video

Medical Telemetry

Messaging

Police Streaming Video

Large Data much as r call to pacity re away from Can handle ffering da
- Stream
- Field
- Large
- Dispa

Too Much Demand for Available Throughput. Must Either:
  Lower resolution of one or more users
  Drop one (or more) users
Size of Pipe Shrinks When Channel Gets Noisy – Move Away from Cell Tower

Variable Data Rate per User – 1 to 100 Simultaneous Users

LMR vs. LTE Capacity, cont.

- LTE

  All sites (sectors) operate on same frequency thus overlapping coverage needs to be minimized

  "Channels" (slots) managed dynamically at each site

  Bandwidth determined by need and availability

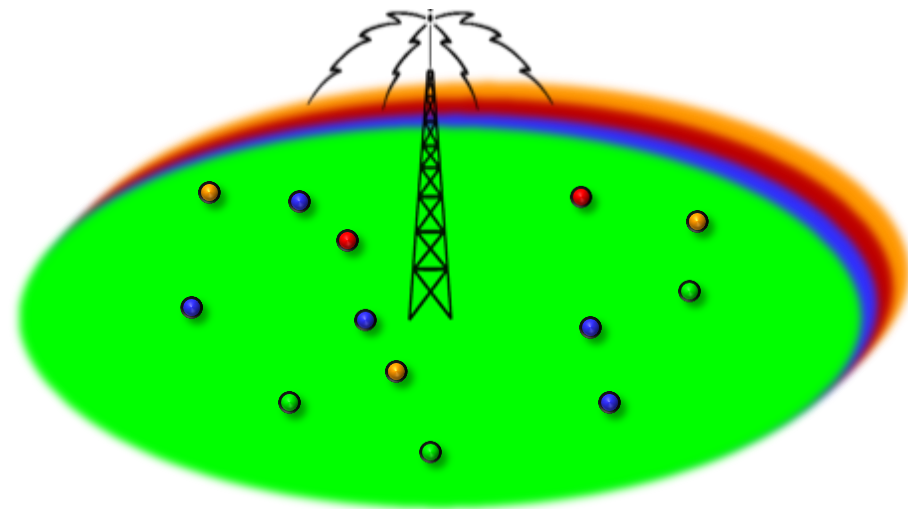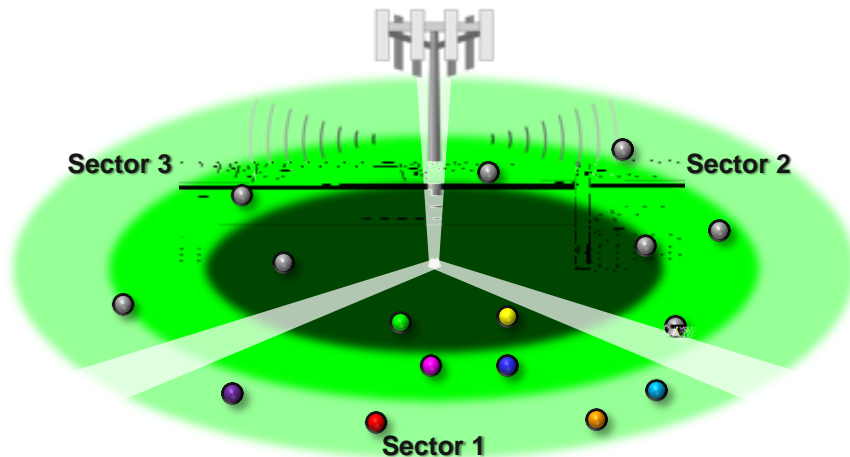 Number of users at a site can impact coverage

- LMR

  Channels pre-configured per site

  Overlapping coverage using different frequency

  Fixed bandwidth / throughput per channel
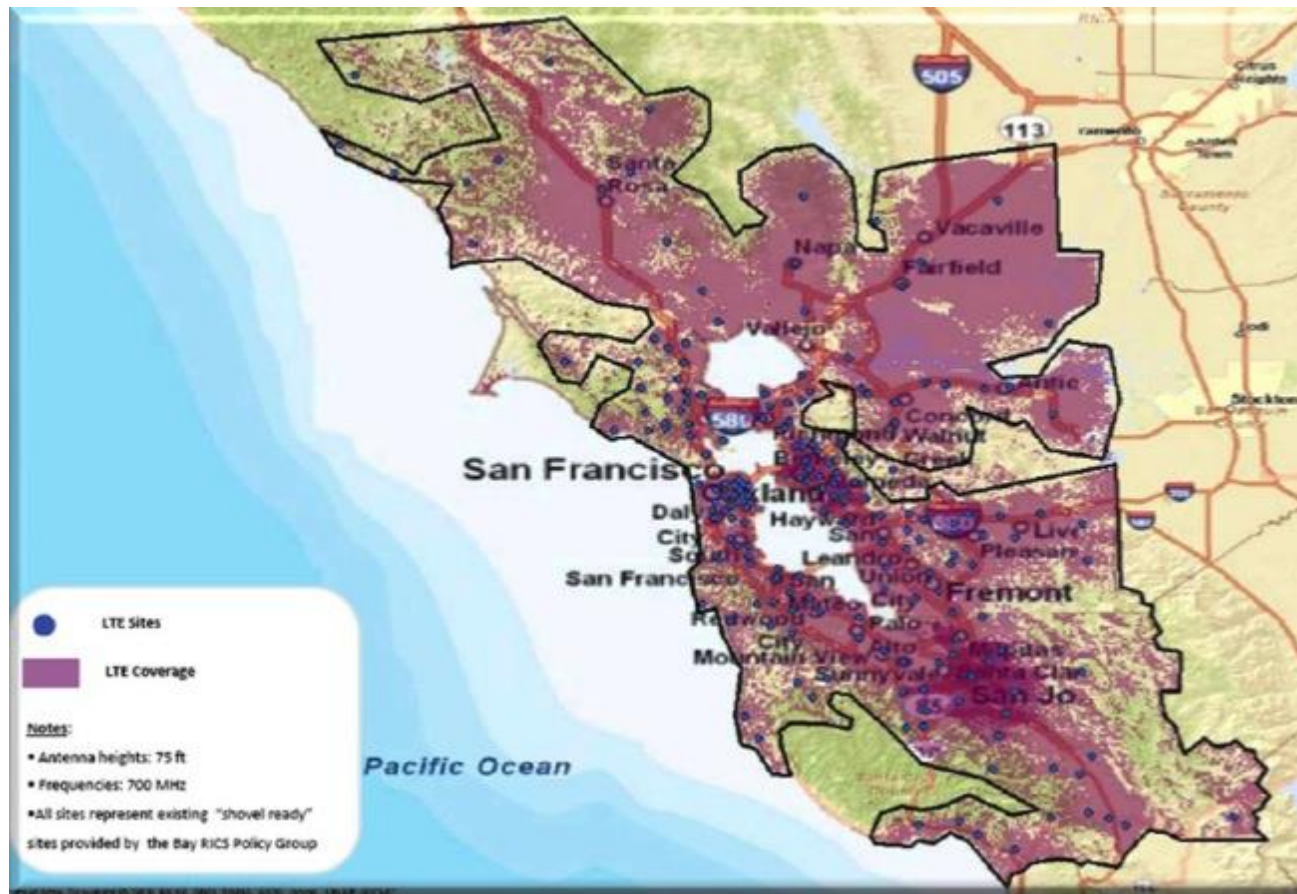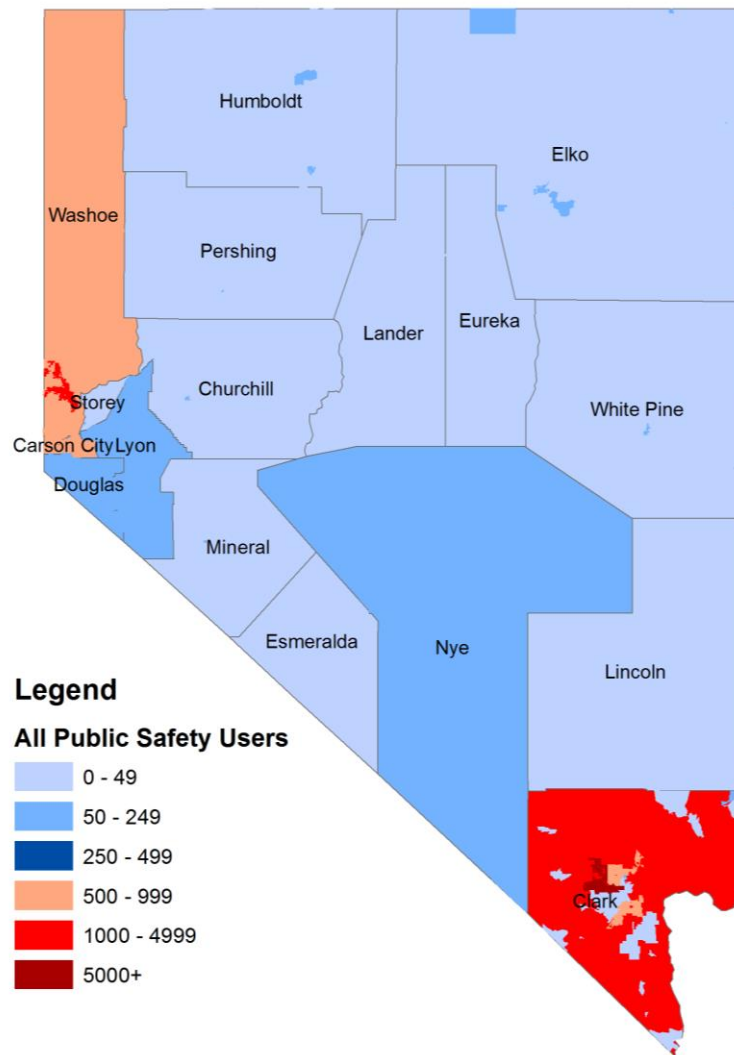
  Users on one channel don't impact others

LTE Spectrum

LMR Spectrum

Sector 3   Sector 2

Sector 1

Modeling to predict performance is not easy and difficult to compare

LTE Site Density

- **There will be a significant number of sites required to provide the network capacity in metro areas**

- **BayRICs Example shows high site density in San Francisco and Oakland area**

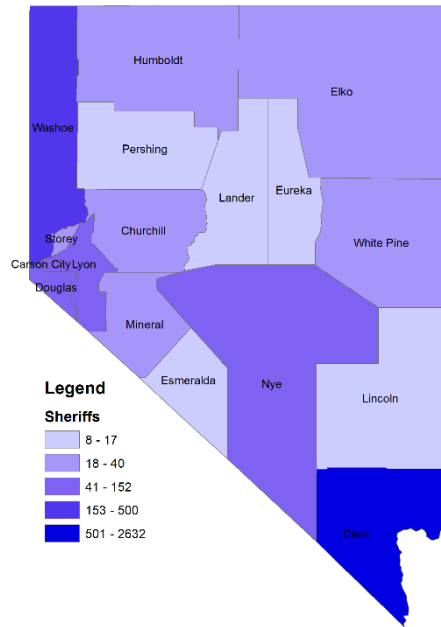**Source: APCO Broadband Summit presentation**

Homeland Security

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Public Safety Population (Sworn Personnel)

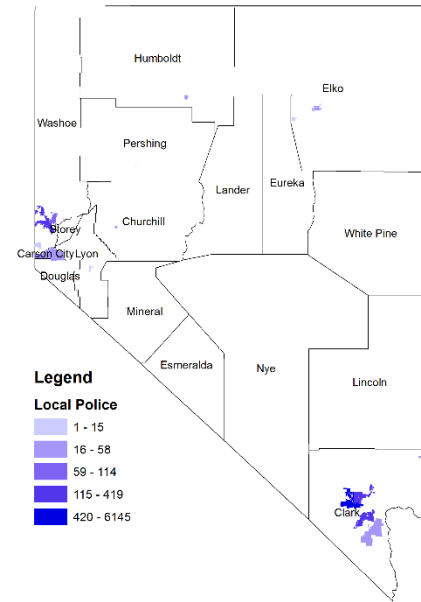| Agency Type	Total Agencies	Total Sworn
Police (Local Law Enforcement)	14	4,072
Sheriff (County Law Enforcement)	18	3,864
State Police (State Law Enforcement)	1	417
Fire Departments (All/Most Career)	29	2,276
Fire Departments (All/Most Volunteer)	84	1459
Emergency Medical Services (partial)	18	1009
TOTAL	163	13,097

Legend

All Public Safety Users

- 0 - 49
- 50 - 249
- 250 - 499
- 500 - 999
- 1000 - 4999
- 5000+

Homeland Security

Public Safety Users

Sheriffs

Local Police

Career Firefighters
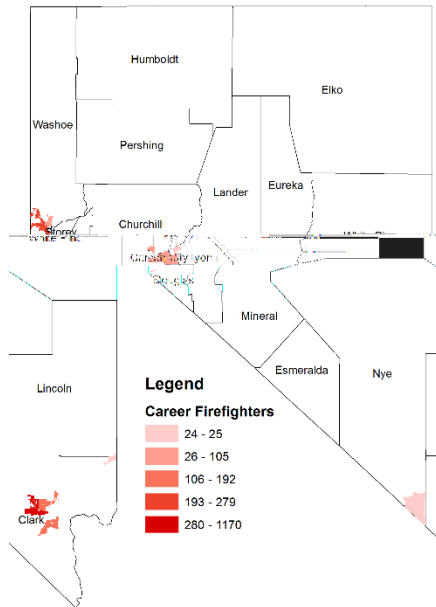
Volunteer Firefighters
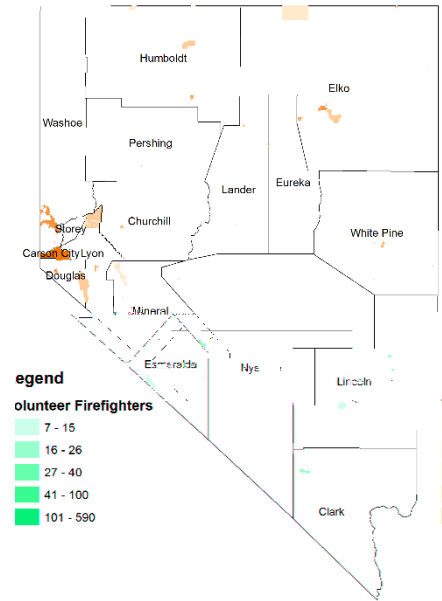
Summary Table of Users

Agency Type / Discipline	Agency Count	# of Personnel	# of Devices (non-LMR)
Emergency Medical Services (EMS)		.	
Fire Services (Career and Volunteer)		.	
Law Enforcement (Municipal Police, State Police, Highway Patrol, etc.)		.	
Courts, Corrections and Security			
Education Establishments			
Emergency Management			
Facilities and Land Management			
Highway and DOT			
Hospitals and Medical Facilities			
Military/National Guard			
National Security/Intelligence			
Public Administration and Support Services			
Public Health			
Public Safety Communications			
Specialized Law Enforcement (Intelligence, Dignitary Protection, etc.)			
Transportation Operations (Air, Pipeline, Rail, Sea, Waterway)			
Utilities (Electricity, Gas, Water, Telecom and Sewer)			
Other			
TOTAL			

Homeland Security

National Mobile Data Survey Results

- **8 States Represented**
- **776 Survey Responses**
- **73,265 Agency Personnel Responses**
- **Collection Period from Aug 2012 – May 2013**

Iowa: (168 agencies / 9,137 personnel)

Wisconsin: (224 agencies / 15423 personnel)

Indiana: (1 agency / 30 personnel)

Oregon: (25 agencies / 8424 personnel)

Ohio: (1 agency / 28 personnel)

Nevada: (45 agencies / 16452 personnel)

Kansas: (130 agencies / 6803 personnel)

Alabama: (182 agencies / 16968 personnel)

☐ American Samoa

☐ Guam

☐ Northern Mariana Islands

☐ Puerto Rico

☐ Virgin Islands

Homeland Security

Public Safety Tools Website

www.publicsafetytools.info

MDST Example Questions

1. Agency Info: Name, Discipline, Location, Contact info

2. Commercial Systems: Provider, Cost, Devices, Contracts
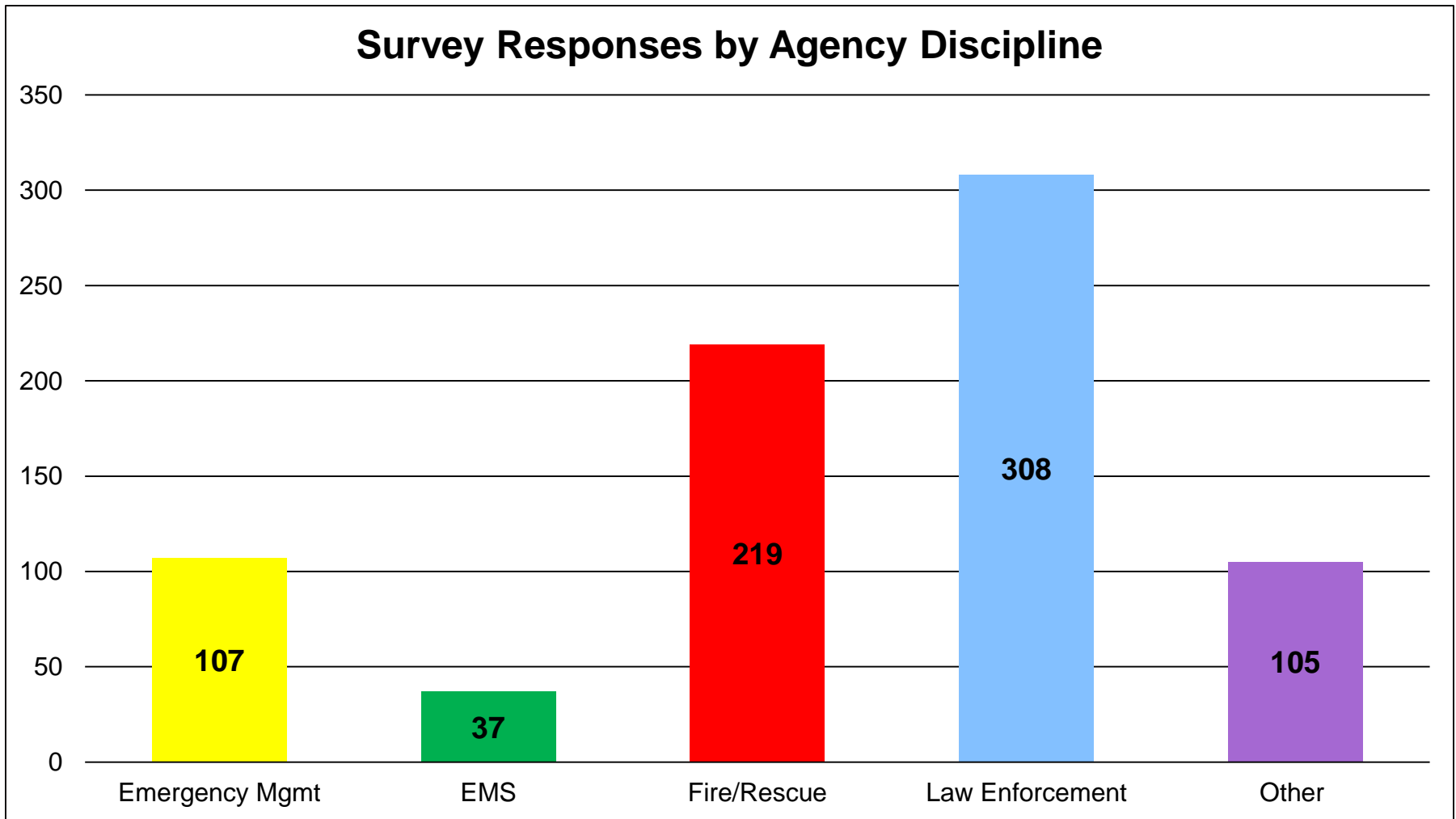
3. Private Systems: Provider, Cost, Radios

4. Wireless Services: Barriers, Personal Use, Coverage

5. NPSBN Info: Awareness, Applications, Potential Assets, MOAs
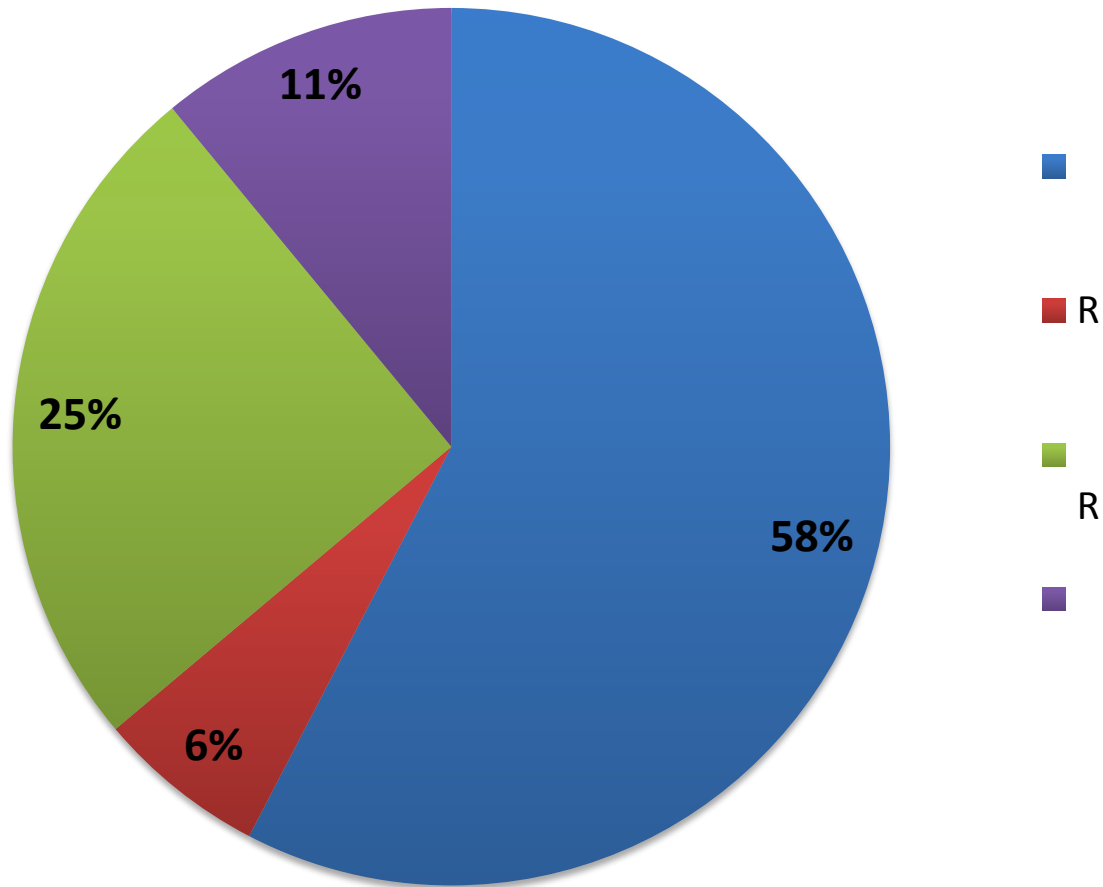
6. LMR: **Radio counts, cost, end of life**

National Mobile Data Survey Results

Survey Responses by Agency Discipline

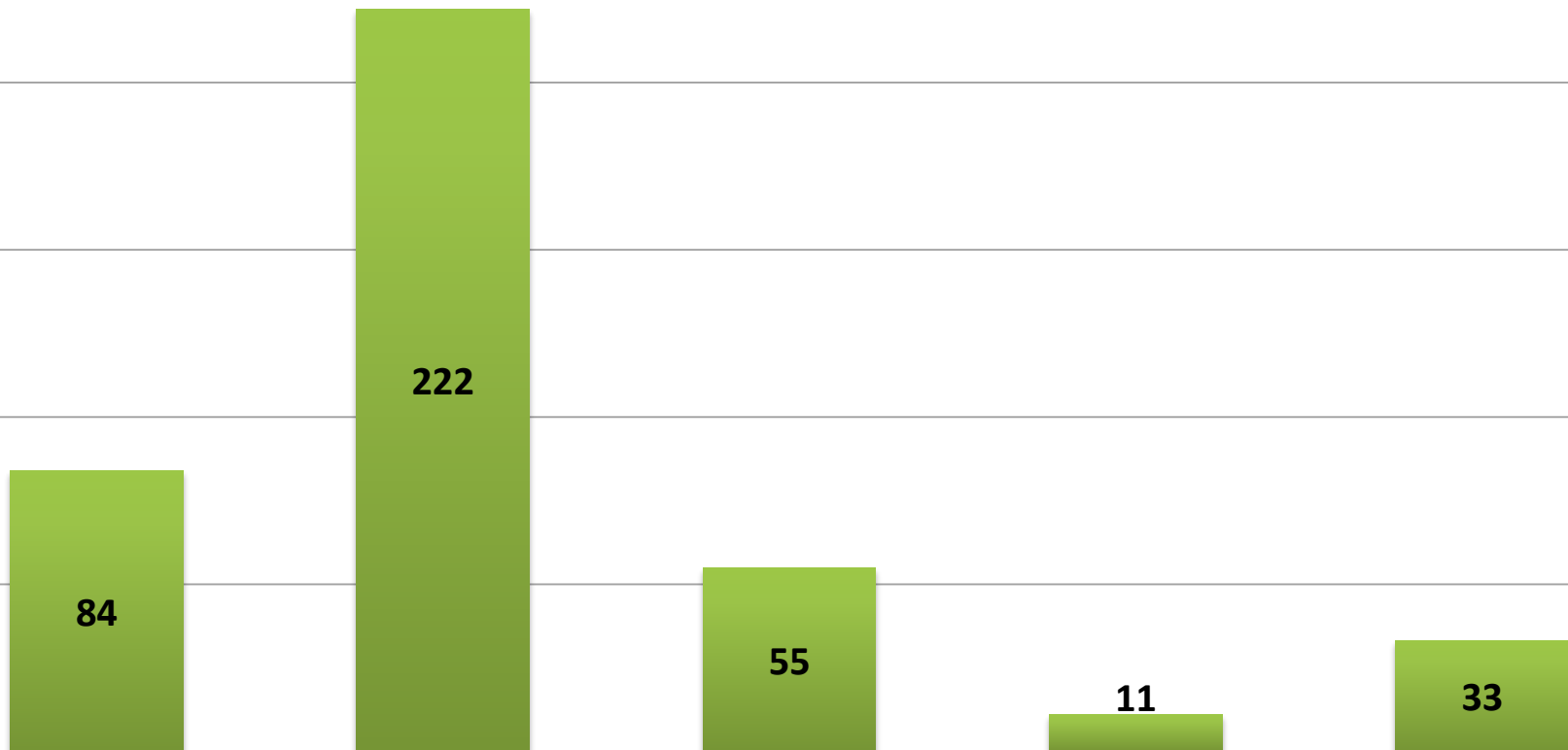| Emergency Mgmt	EMS	Fire/Rescue	Law Enforcement	Other
107	37	219	308	105

Homeland
Security

National Mobile Data Survey Results

Wireless Data Systems (All Agencies)

National Mobile Data Survey Results
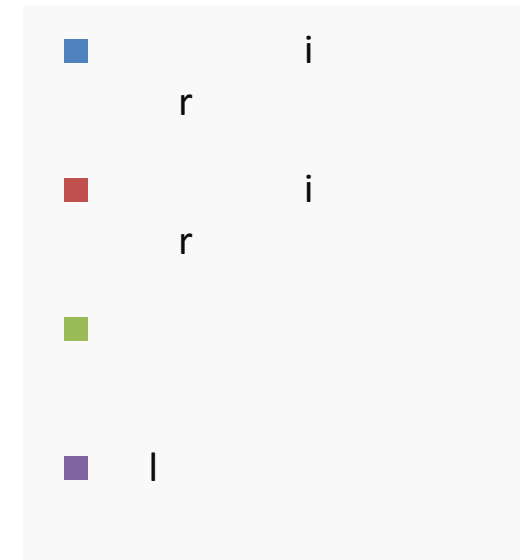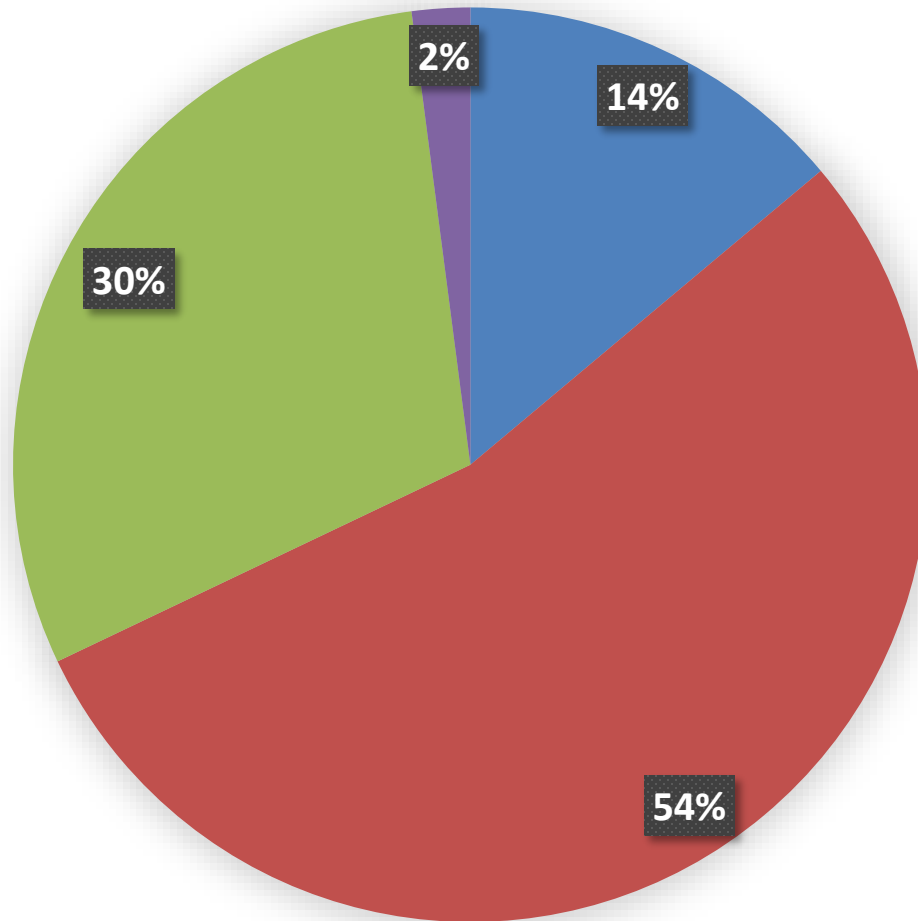
Average Monthly Device Costs for Commercial Systems

Bar chart values: 84, 222, 55, 11, 33

National Mobile Data Survey Results

Average Number of Wireless Data Devices per Responder (does not include LMR)

Bar chart showing average number of wireless data devices per responder: r = 0.36, 0.30, 0.11, 0.22, ff = 0.37, i = 0.42
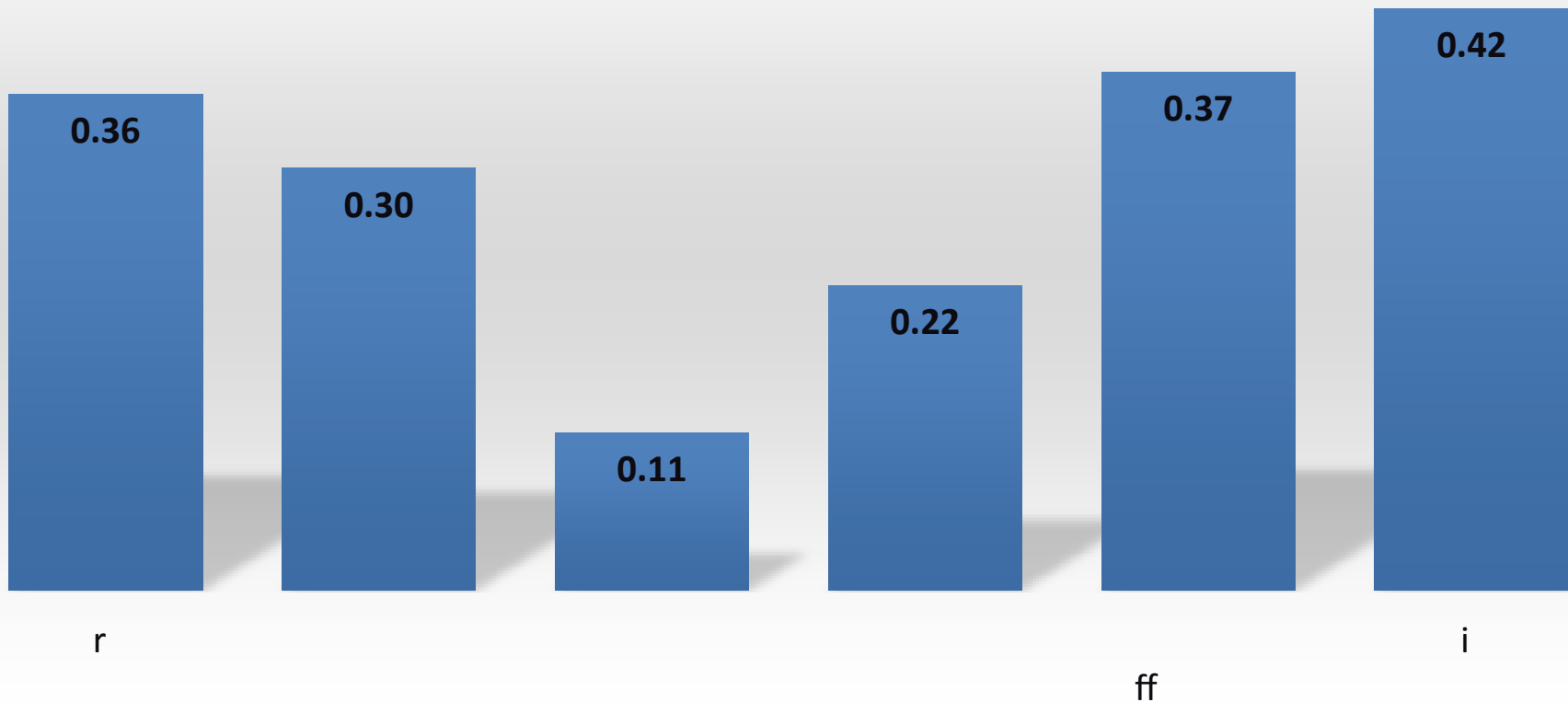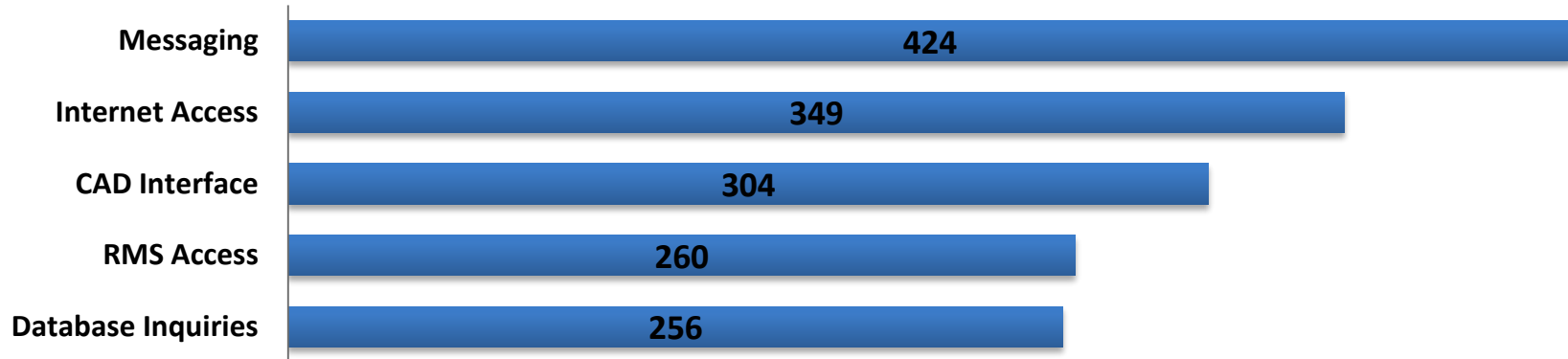
National Mobile Data Survey Results

Use of Personal Devices (All Agencies)

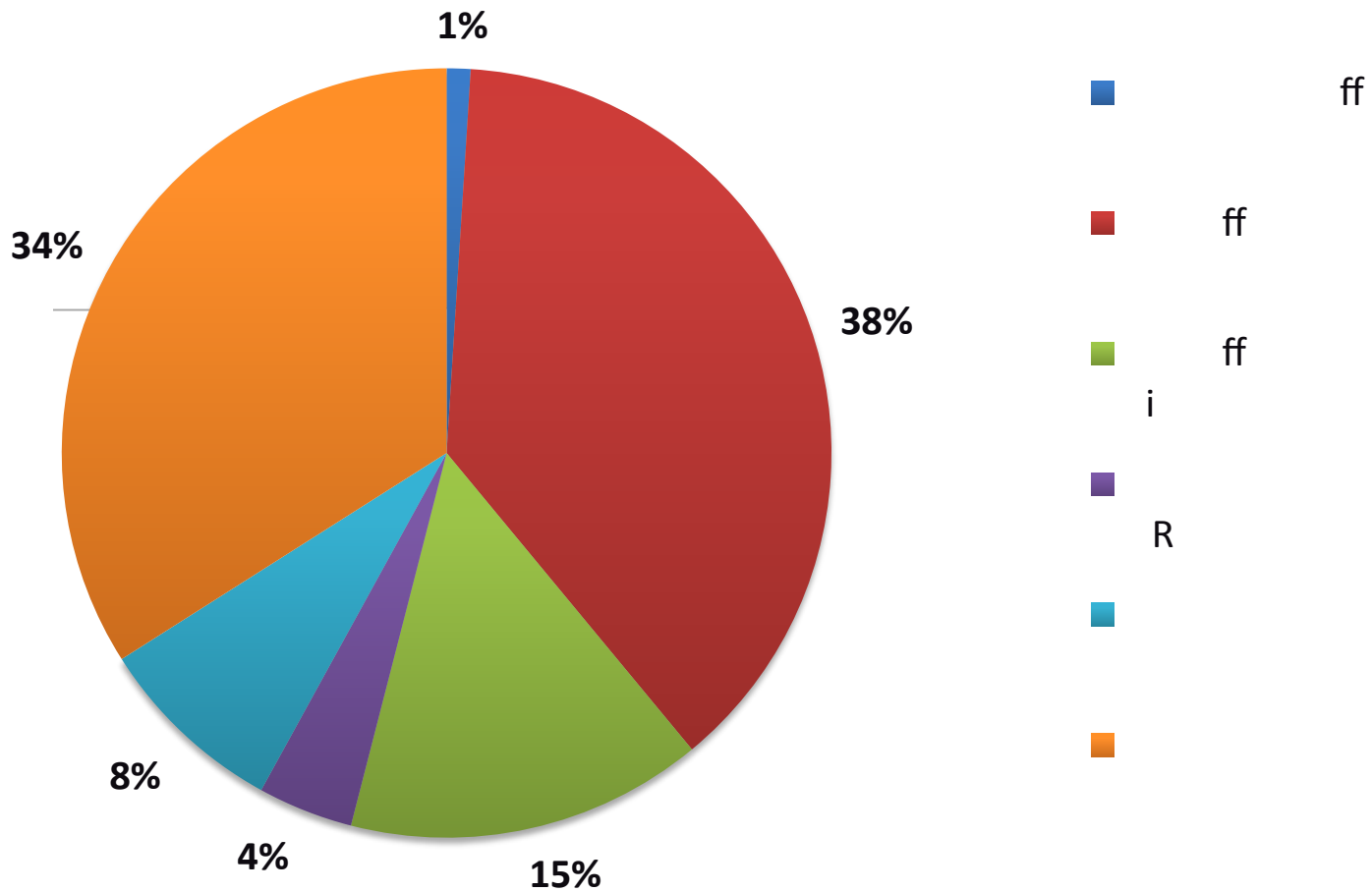# National Mobile Data Survey Results

Top Current Applications

Application	Value
Messaging	424
Internet Access	349
CAD Interface	304
RMS Access	260
Database Inquiries	256

Top Desired Applications

Application	Value
GIS/Mapping	209
Field-based Reporting	198
CAD Interface	189
High-res Video	188
RMS Access	173

Homeland Security
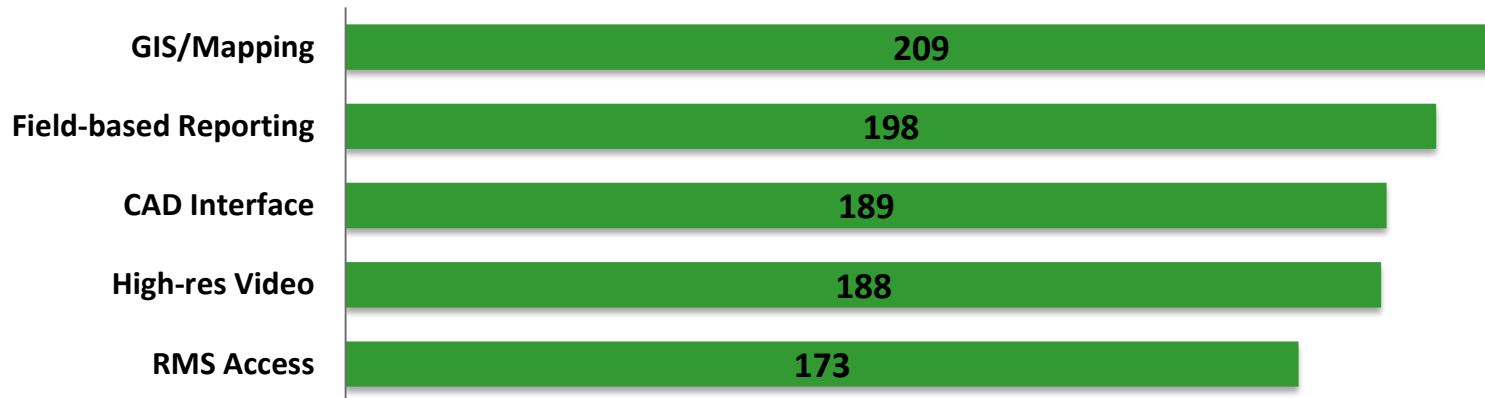
National Mobile Data Survey Results

Cost as a Factor in Decision to Migrate to NPSBN

Homeland
Security

Workshop Summary

- **State should develop an understanding of their operational user requirements to be communicated to FirstNet**
  - **Coverage**
  - **Users (Capacity)**

- **FirstNet will develop a system design based on these needs which will be refined through consultation.**

- **Focus outreach on the near-term needs of consultation**

- **OEC and tools available to public safety agencies**

  Coverage and User Information

  Mobile Data Survey Tool

  Broadband Resources

Homeland
Security