

Broadband Consultation Prep Workshop

Commonwealth of Kentucky

DHS Office of Emergency
Communications

April 2, 2014



FOR OFFICIAL USE ONLY

Today's Agenda

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

Acronym List

3GPP	Third Generation Partnership	NECP	National Emergency Communications Plan
BSA	Baseline State Analysis	NGO	Non Governmental Organization
CASM	Communications Asset and Survey Mapping	NPSBN	National Public Safety Broadband Network
CDP	Census Designated Place	NPSTC	National Public Safety Telecommunications Council
ECPC	Emergency Communications Preparedness Center	NTIA	National Telecommunications & Information Agency
EPC	Evolved Packet Core or "Core"	OEC	Office of Emergency Communications
FirstNet	First Responder Network Authority	PSAC	Public Safety Advisory Council
GIS	Geographical Information System	PTT	Push To Talk
GoS	Grade of Service	RAN	Radio Access Network
ICTAP	Interoperable Communications Technical Assistance Program	SCIP	Statewide Communications Interoperability Plan
LMR	Land Mobile Radio	SLIGP	State and Local Implementation Grant Program
LTE	Long Term Evolution	SOP	Standard Operating Procedure
MDST	Mobile Data Survey Tool	TA	Technical Assistance
MOU	Memorandum of Understanding	TICP	Tactical Interoperable Communications Plan
NCS	National Communications System	UE	User Equipment
		VOIP	Voice Over Internet Protocol

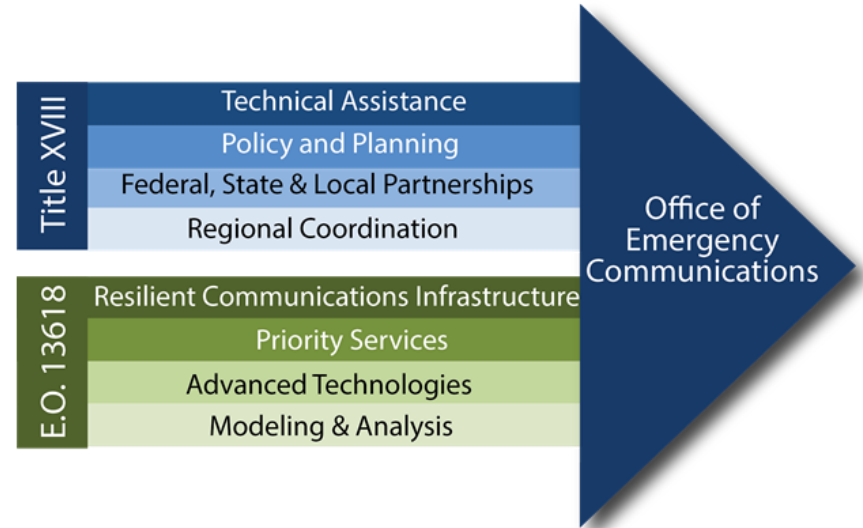


OEC Background

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**



**Homeland
Security**

FOR OFFICIAL USE ONLY

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**
 - **Furtheres 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



**Homeland
Security**

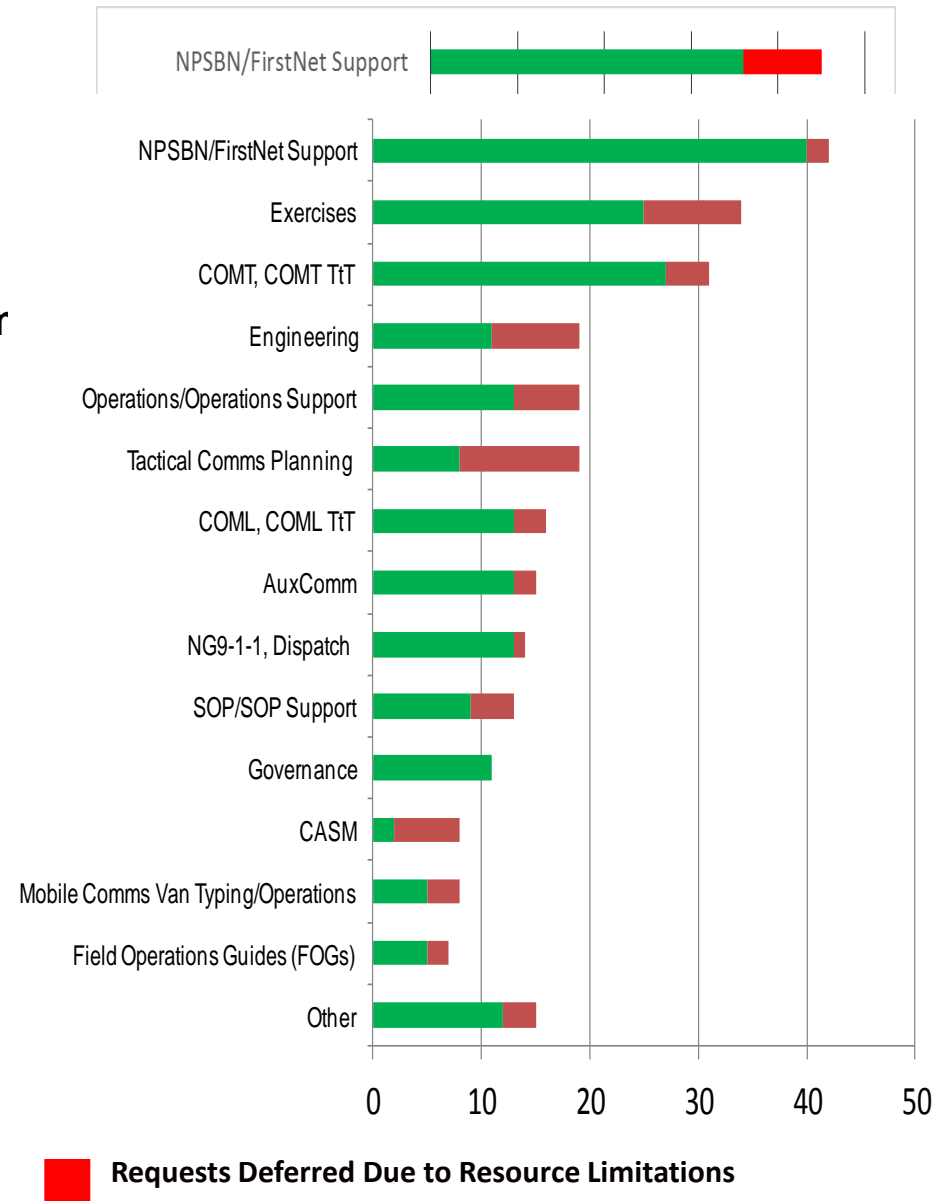
FOR OFFICIAL USE ONLY

FY2014 TA Requests

- Online TA Request and Evaluation Forms:

www.publicsafetytools.info

- FY 2013 Requests
 - Supported a total of 141 requests from 47 States / Territories
- FY 2014 Requests
 - 180 requests to date from 48 states
 - 80 requests accepted to date
 - Next round of acceptances occurred on **December 16**
- States with less than 5 requests for FY 2014 can still submit



Public Safety Tools Website

ICTAP
Interoperable Communications Technical Assistance Program

Public Safety Technical Assistance Tools
Welcome to the Public Safety Technical Assistance Tools Website

Home | Tools | Resources | Training | PStoolsHelp | **What's New (as of 12/09/2013)**

Tools	Resources	Training
FMT Frequency Mapping Tool	NIFOG Info National Interop. Field Operations Guide	Gateways Audio Gateway Training Materials & CBT
MDST Mobile Data Survey Tool	AUXFOG Aux. Communications Field Operations Guide	COMU Communications Unit Overview Training
NLST Narrowband License Status Tool	NPSBN Nationwide Public Safety Broadband Network	AUXCOMM Aux. Communications Overview Training
NSTT Narrowband Summary Tracker Tool	OEC Docs. Office of Emergency Communications	Proj. Mgmt. Project Management Overview Training
PS Library Public Safety Library	TA Request Technical Assistance Catalog, Request & Evaluation Forms	Radio 101 Basic LMR Overview Presentation
CASM NextGen Communication Assets Survey & Mapping Next Generation	FCC Src. Federal Communications Commission	Tribal Outreach Engaging Tribal Governments Overview Presentation



Controlled Access: [* How do I get Access?](#)

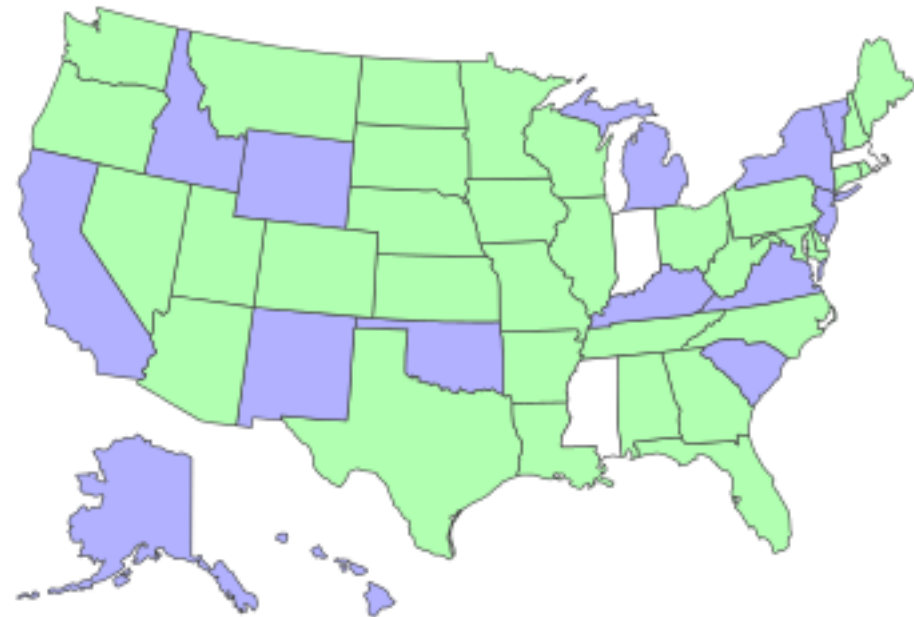
www.publicsafetytools.info

OEC Consultation Prep Workshop

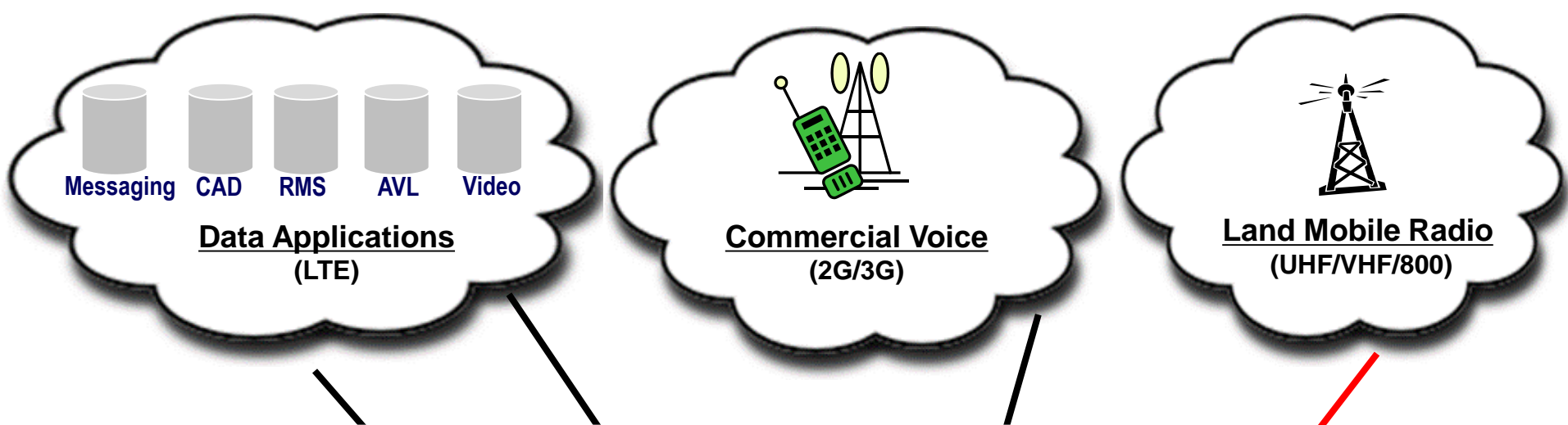
- **On-Site workshop focuses on preparing States for the consultation process with FirstNet**
- **Half day meeting is divided into two components:**
 - **Broadband 101**
 - **Coverage / Users**
- **OEC provides various GIS datasets to assist discussion on public safety operational coverage needs**
- **User Information is compiled from FEMA, Department of Justice, CASM and commercial databases**

Legend:

-  **Completed**
-  **Planned / Requested**

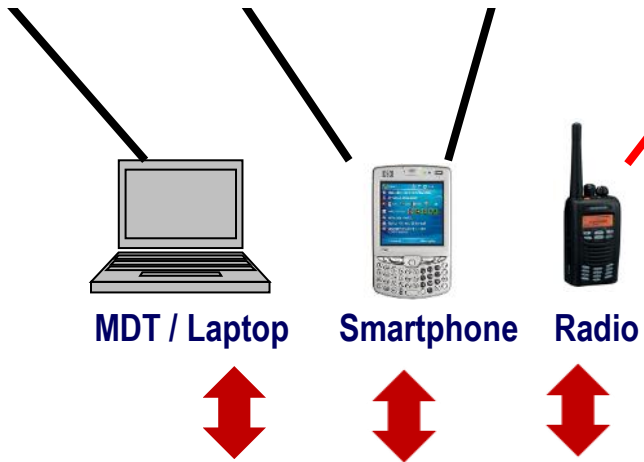


Broadband Overview



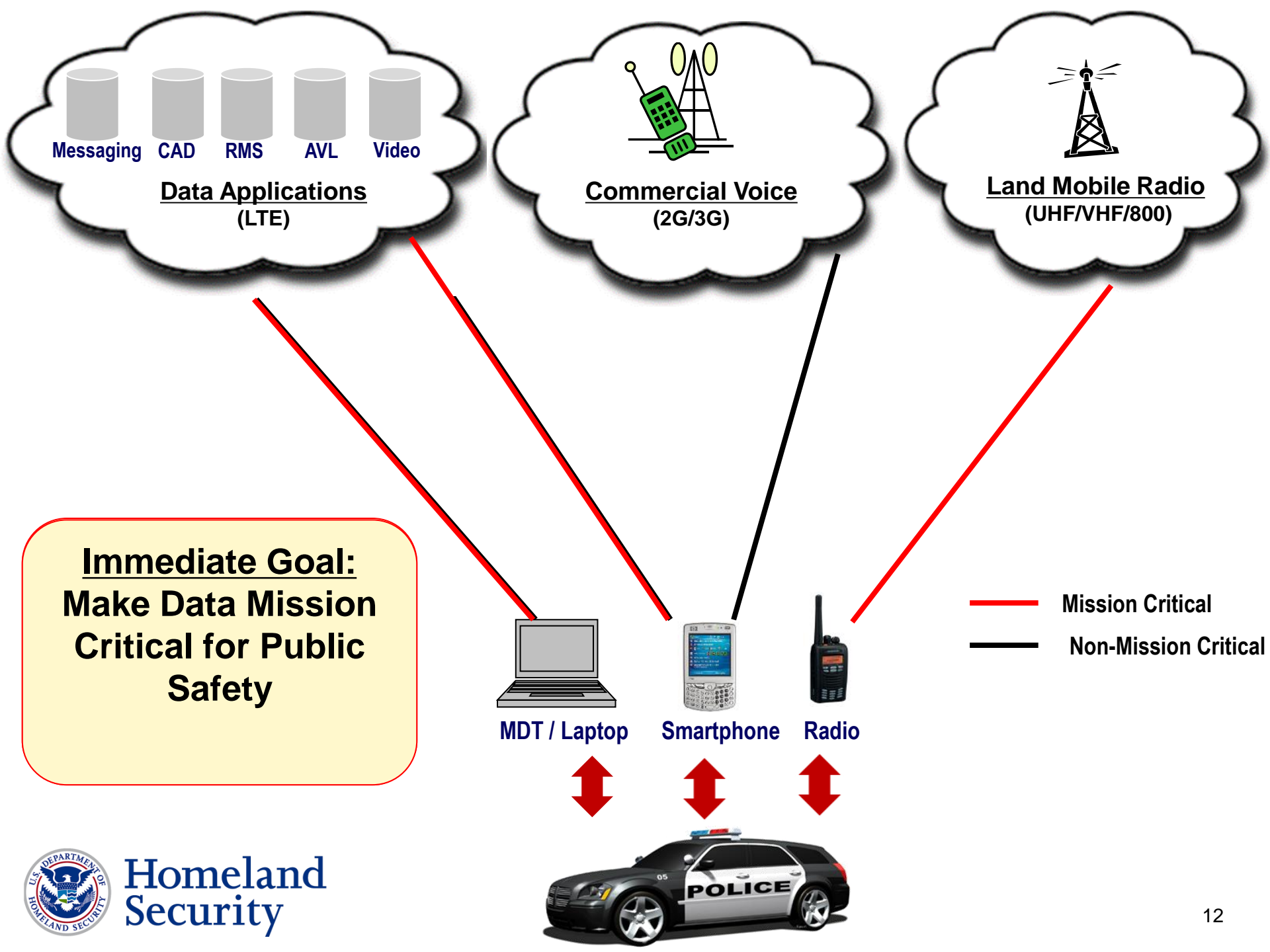
Coverage
Congestion
Site Outage

Current State:
Public Safety
Competes with
Public for Priority



— Mission Critical
— Non-Mission Critical





Messaging CAD RMS AVL Video

Data Applications (LTE)

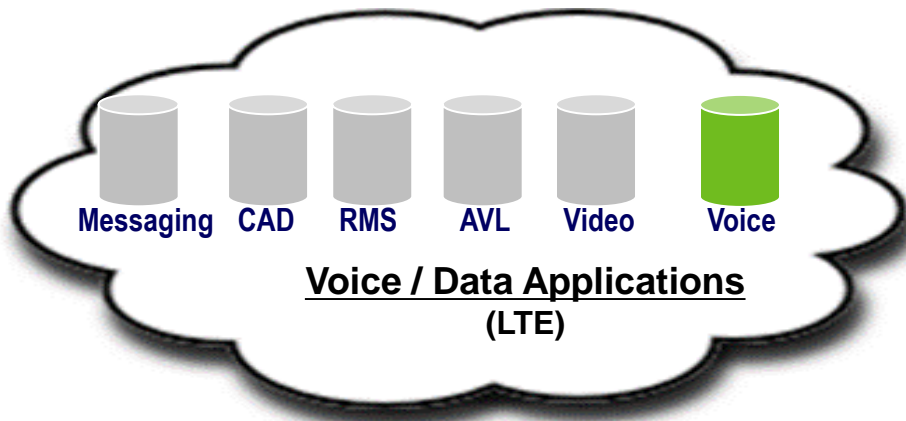
Commercial Voice (2G/3G)

Land Mobile Radio (UHF/VHF/800)

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

— Mission Critical
— Non-Mission Critical

MDT / Laptop Smartphone Radio



**Long-Term Goal:
Develop Mission
Critical Voice
over LTE**



MDT / Laptop



Smartphone



Radio

— Mission Critical
— Non-Mission Critical



Planning for Convergence

CURRENT

TRANSITION Indefinite Time Frame

DESIRED EVOLUTION Long Term

Land Mobile Radio Networks

Mission Critical Voice

Mission Critical Data

Public Safety Wireless Broadband Network Dedicated Spectrum (Long Term Evolution)

Public Safety Mission Critical
Data Applications

Commercial and Unlicensed Wireless Broadband Networks

Public Safety Data Applications

REQUIREMENTS

GENERAL

- Funding
- Governance
 - Planning
 - Partnerships
 - Policy
- Research, Development, Testing and Evaluation

TECHNICAL

- Guaranteed Access
- Quality of Service
- Reliability
- Resiliency
- Roaming
- Spectrum Efficiency and Capacity
 - Coverage
- Standards
- **Talk Around/Simplex**

**Convergence of
Mission Critical
Voice and Data**

Mar 2011 v. 3.0



**Homeland
Security**

FOR OFFICIAL USE ONLY

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)**

Key Challenges to Address



Long Term Evolution (LTE) Technical Highlights



**Homeland
Security**

FOR OFFICIAL USE ONLY

LTE Technical Highlights

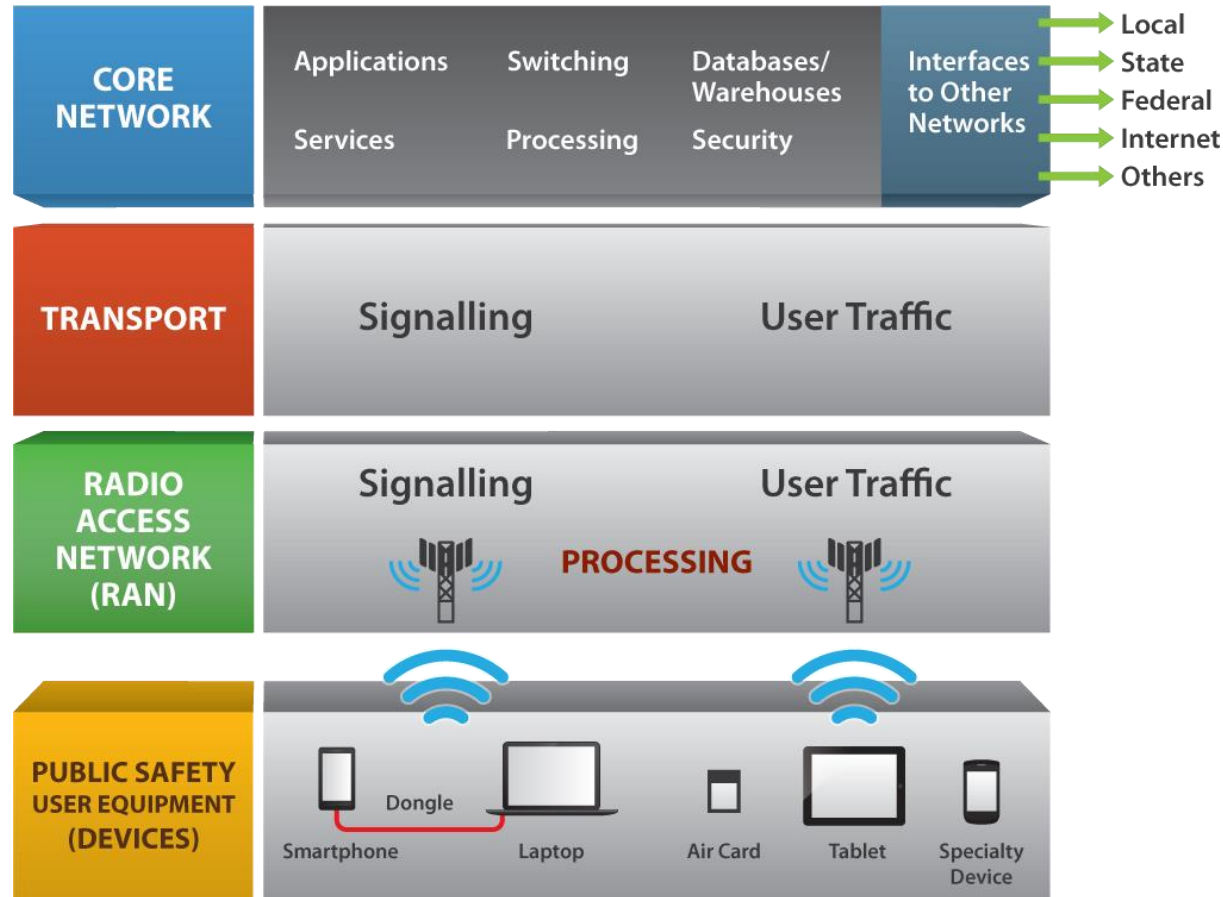
- Considered to be one of the **4G** standards (Wi-Max and HSPA+)
- Cellular standard that was designed for **data first** and not voice
 - Inclusion of LTE standardized voice is a work in progress
- **All-IP** (Internet Protocol) architecture designed for low latency
- Potential for **economies of scale** 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



Basic LTE Network Components

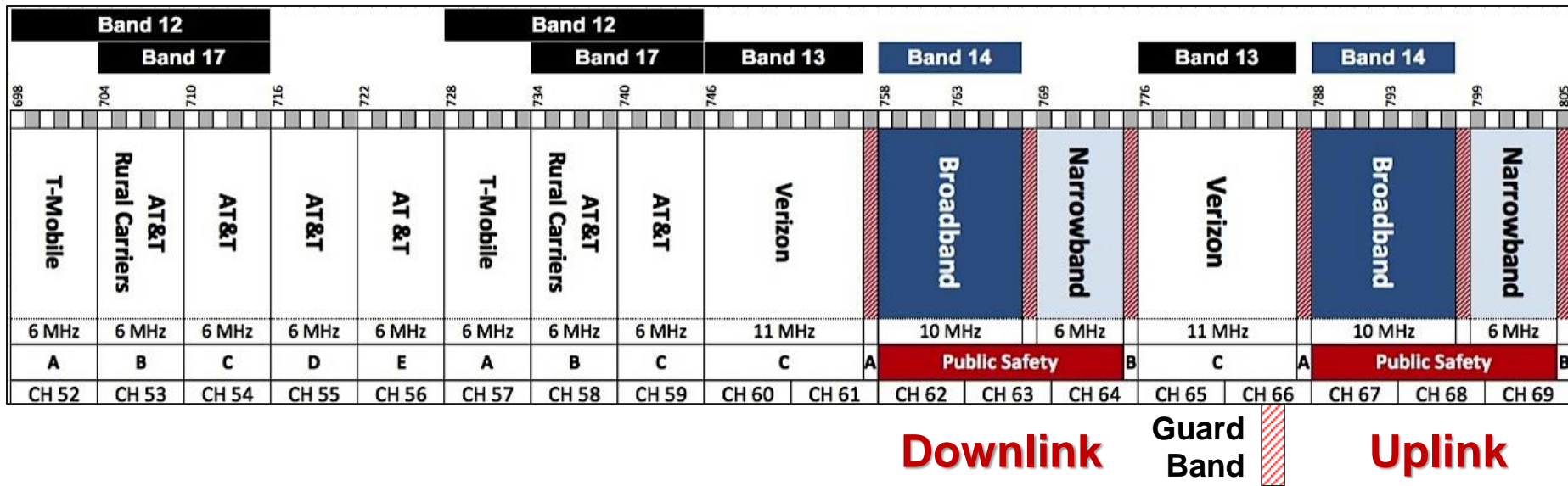
- At a very high level, the network has 4 basic Components:

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”



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**

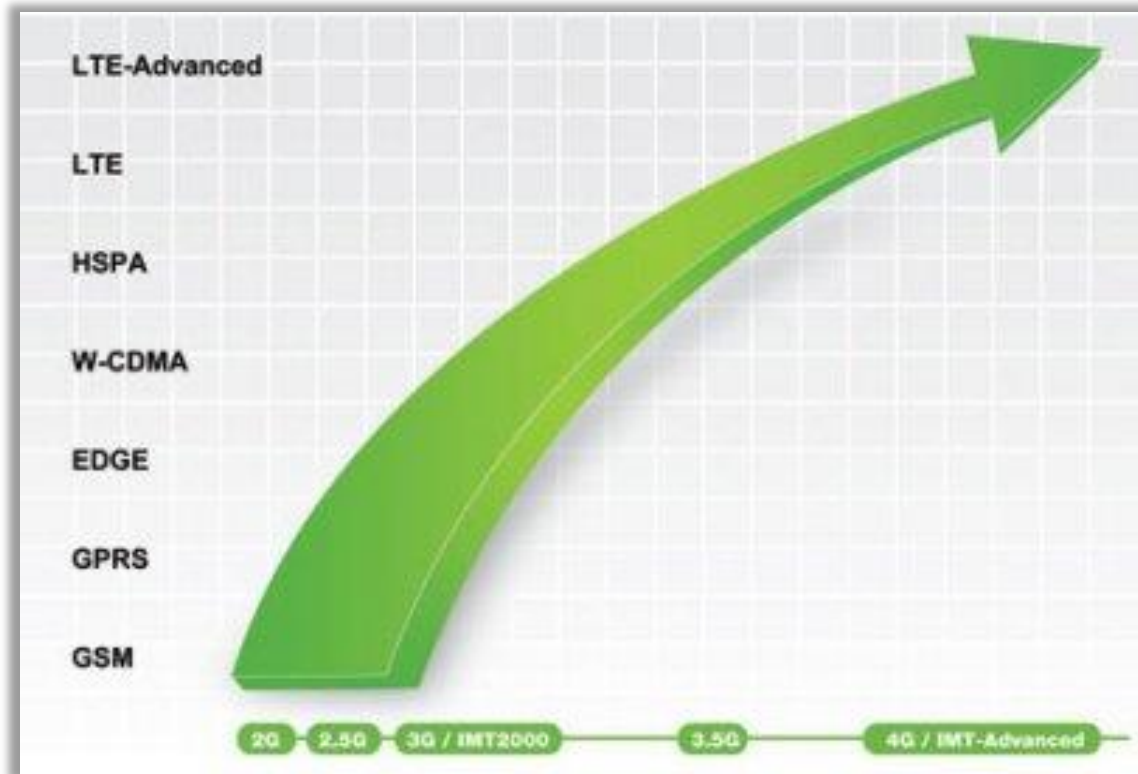


Voice Summary

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

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

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	<p>Network User Fee: Fee from each entity including public safety or secondary user that uses the Network</p> <p>Lease Fee for Network Capacity: Fee for agreement between the FirstNet and secondary user to permit secondary access</p> <p>Lease Fee for Network Equipment/Infrastructure: Fee for entity that seeks access or use of antennas, towers, etc. constructed or owned by FirstNet</p>



FCC Spectrum Auctions

- The Spectrum Act (a portion of the Middle Class Tax Relief and Job Creation Act) mandated the FCC hold spectrum license auctions for frequencies at 1915-1920 MHz, 1995-2000 MHz, and 2155-2180 MHz. The FCC will also auction 15 MHz of spectrum between 1675 and 1710 MHz and identify an additional 15 MHz for auction.
- Much of the \$7 billion in funding for the planning and implementation of FirstNet is expected to come from these auctions.
- FCC expects that most of, if not all of the \$7 billion to fund FirstNet and fund other financial obligations under the statute will come from the first two spectrum auctions; the H Block and the AWS auctions.

FCC Spectrum Auctions Cont.

H block Auction:

- Auction ended on February, 27 2014, with Dish Network meeting the minimum reserve price of \$1,564 billion and winning all 176 licenses.

Future Auctions:

- AWS auction is expected in Fall 2014. 50 MHz of AWS-3 spectrum, comprised of the 1755-1780 MHz airwaves currently used by the Federal government and a block of 2155-2180 MHz frequencies that are currently not in use.
 - The major carriers are expected to be interested in this spectrum
- Broadcast Television Spectrum Incentive Auction is expected in 2015, and is designed to free up spectrum in 600 MHz for more efficient use.
 - The first will be a reverse auction in which current license holders (mostly television broadcasters) are being encouraged to release spectrum usage rights in exchange for a share of forward auction proceeds.
 - The newly freed spectrum will repurposed and repackaged to be sold by the FCC at a forward auction to expand and improve wireless broadband service.

FirstNet Approved Budget

- FirstNet's FY14 budget was approved at the August Board Meeting

in \$000

Major Activity*	Operating Expenses	Capital Expenses	Total
Network Partners	\$9,250	\$174	\$9,424
Mandate: Core Network	\$14,109	\$40,464	\$54,573
Mandate: State Network Plans	\$11,098	\$8,889	\$19,987
Mandate: State Consultation	\$32,830	\$1,224	\$34,054
Early Mover Projects	\$1,266	\$434	\$1,700
Deployable Systems	\$1,102	\$10,238	\$11,340
Wireless Devices	\$2,843	\$420	\$3,263
Company Foundation	\$49,921	\$9,738	\$59,659
Total	\$122,419	\$71,581	\$194,000

Responsibilities of FirstNet by Law

Consultation

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

Management

Select a program manager, consultants and other committees

Standards

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

Certified Equipment List

Ensure the development of a list of certified devices and components

RFPs

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

Commercial Infrastructure

Leverage existing commercial wireless infrastructure to speed deployment of the network

Contracts

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

Cybersecurity

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

PSAPs

Promote integration of the network with PSAPs or their equivalents

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



**Homeland
Security**

FOR OFFICIAL USE ONLY

FirstNet Board Members

Requirements: 15 Total Members

- 3 Permanent Members
- 12 Members (public safety, tech, or financial expertise)
 - 3 Public Safety Professionals
 - 3 State/local/tribal reps

1. **Secretary of Homeland Security** (Term: Permanent)
2. **Attorney General** (Term: Permanent)
3. **Director of the Office of Management and Budget** (Term: Permanent)
4. **Tim Bryan**, CEO, National Rural Telecommunications Cooperative (Term: 3 years)
5. **Charles “Chuck” Dowd**, Deputy Chief, New York City Police Department (Term: 2 years)
6. **F. Craig Farrill**, Wireless telecommunications executive (Term: 3 years)
7. **Paul Fitzgerald**, Sheriff, Story County, Iowa (Term: 2 years)
8. **Samuel “Sam” Ginn** (Chairman), Telecommunications executive (Term: 2 years)
9. **Jeffrey Johnson**, Fire Chief, retired, CEO Western Fire Chiefs Association; Oregon (Term: 3 years*)
10. **Ed Reynolds**, Retired telecommunications executive (Term: 3 years)
11. **Kevin McGinnis**, Chief/CEO, North East Mobile Health Services (Term: 3 years)
12. **Susan Swenson**, Telecommunications/technology executive (Term: 3 years*)
13. **Teri Takai**, DoD CIO; former CIO, States of Michigan & California (Term: 3 years*)
14. **Wellington Webb**, Founder, Webb Group International; former Mayor, Denver, Colorado (Term: 3 years)
15. **Barry Boniface**, Private equity investor and telecommunications executive (Term: 3 years)

** Reappointed to 3 year terms at August 2013 Board Meeting*



**Homeland
Security**

FOR OFFICIAL USE ONLY

First Responder Network Authority



FIRSTNET OFFICES AND DIVISIONS

Chief Administrative Officer
FRANK FREEMAN

Human Resources (Jamesa Moore)
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 & Deputy Chief Counsel (Uzoma Ornyeje)
Commercial Division
Compliance Division
Regulatory Division
NEPA (Genevieve Walker)
Regulatory Affairs
Spectrum Management (Lance Johnson)

Chief Information Officer
Starts March 24th

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 Development Standards
RAN Planning & Engineering
Standards & Research & Development
Technical Project Management
Technical Support to State Plans

As of March 2014

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

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**

FirstNet 3-in-1 Approach

COVERAGE

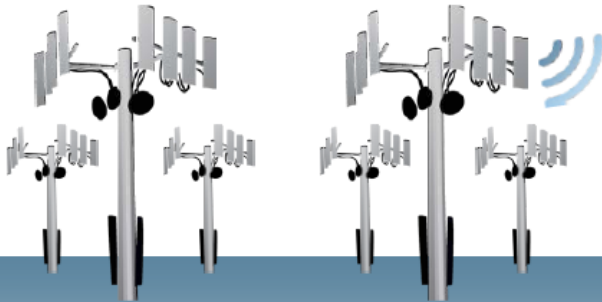
**Diverse Coverage Architecture: considering a “3-in-1” Approach:
Terrestrial + Satellite + Deployable**



**#2:
Mobile Satellite Systems**



**#1:
Multiple Terrestrial Mobile Systems**



**#3:
Deployable Systems**



Public Safety User

FirstNet Will Support



FirstNet and State Consultation



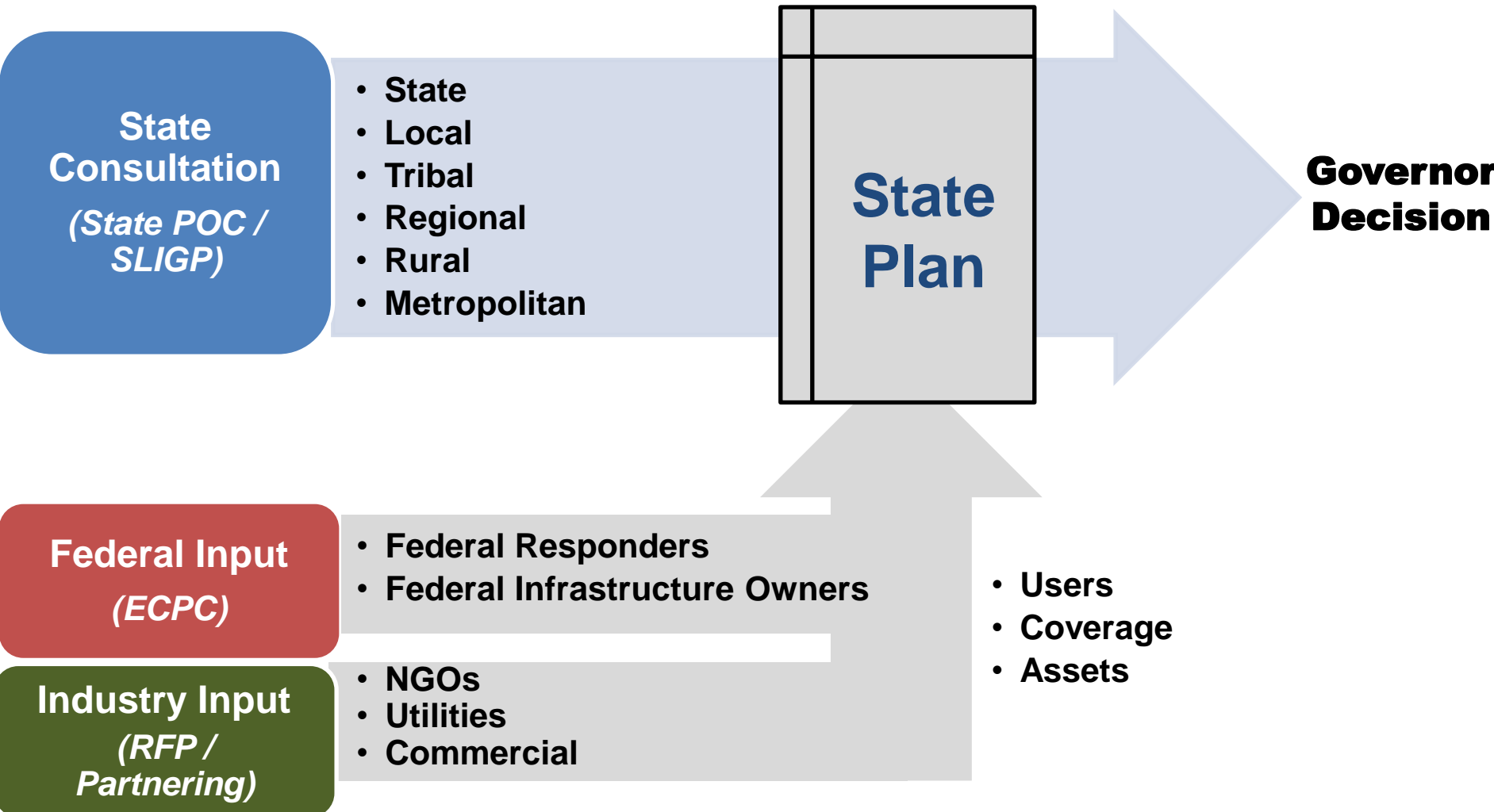
**Homeland
Security**

FOR OFFICIAL USE ONLY

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**

Wide Range of Stakeholder Consultation



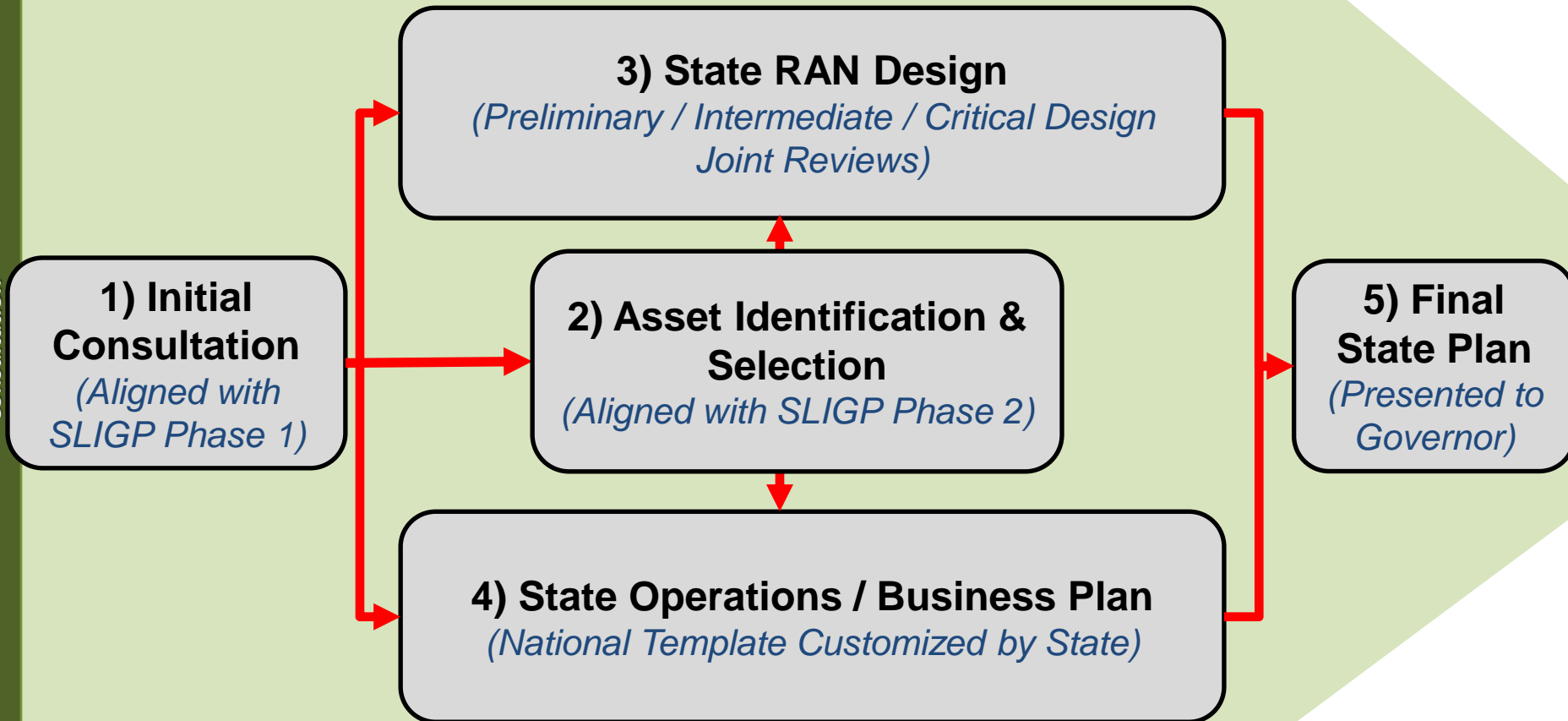
Overview of Consultation Process

- **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.

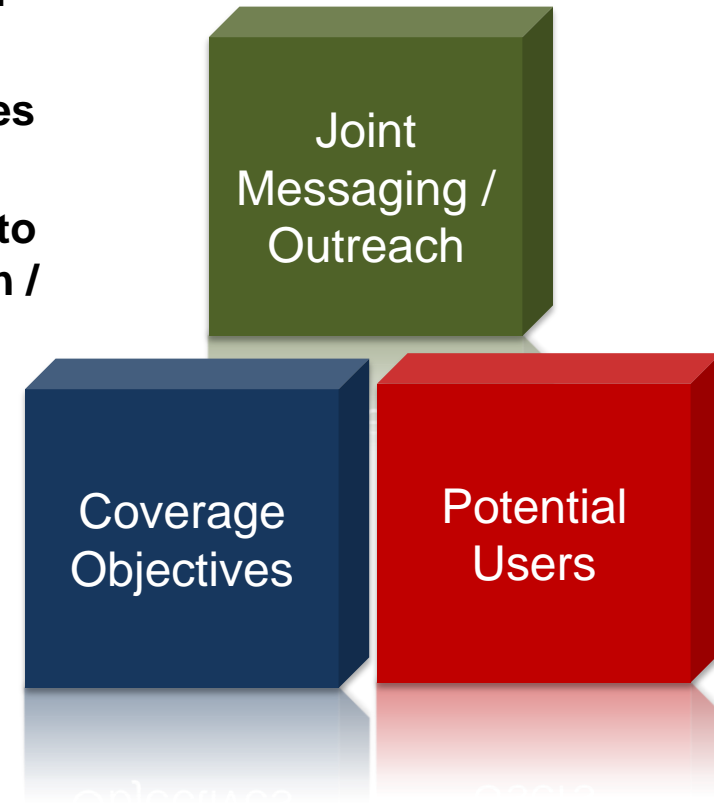
Defining The Process

Consultation



1 – Initial Consultation *(Aligned with SLIGP Phase 1)*

- **Key Steps**
 - Define consultation process & roles / responsibilities
 - Discuss Baseline State Analysis (BSA) with each State / Territory
 - States validate / improve BSA coverage objectives and detailed user information
 - Upon completion by State, hold on-site meeting to review state analysis and discuss joint education / outreach
- **Guiding Principle**
 - Coverage objectives and user information is critical to support the State RAN design efforts
 - All States may begin process concurrently
 - Ask States to validate & enhance rather than recreate
 - Address plan for joint messaging / outreach process and materials to stakeholders at all levels



2 – Asset Identification & Selection

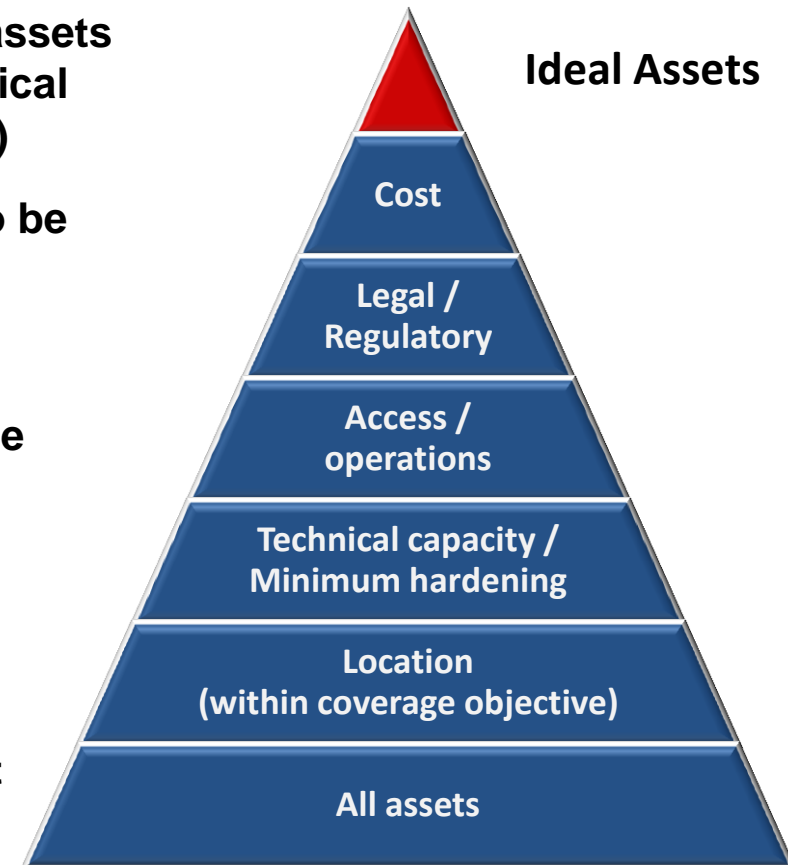
(Aligned with SLIGP Phase 2)

- **Key Steps**

- Define minimum recommended attributes of assets for consideration (Coverage objective / Technical capacity / Site access / Operations / Low cost)
- Request data collection on available assets to be considered
- Assess all assets (commercial & public)
- Select assets based solely on best value to the FirstNet network

- **Guiding Principle**

- Limit data collection to viable assets to save the State time/effort
- Leverage assets to provide better coverage at a lower cost
- Leverage assets to deploy quicker



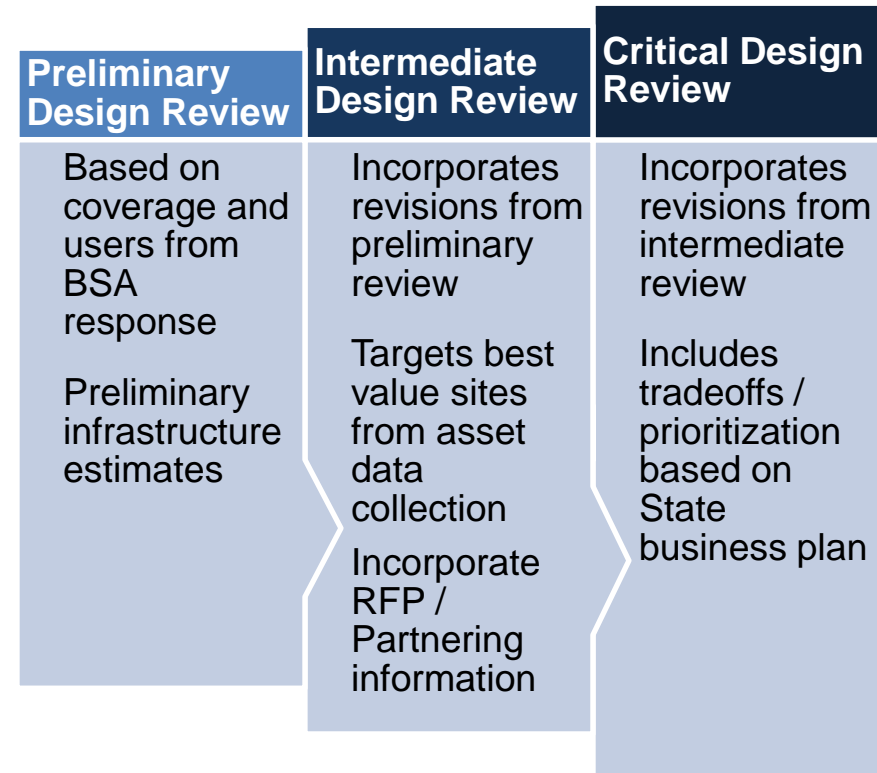
3 – State RAN Design Process

- **Key Steps**

- **Multi-phase (preliminary / intermediate / critical design reviews) review with State to refine design based on identified priorities**
- **Incorporate feedback and additional data as it is collected (SLIGP Phase 2 / RFP Process)**

- **Guiding Principle**

- **Ensures on-going review / refinement process with State**
- **Jointly develop tradeoffs and priorities**



4 – State Operations/Business Plan

- **Key Steps**

- **Leverage PSAC and others to discuss overall approach to:**
 - Local control
 - Prioritization
 - Training
 - Security
- **Develop operations template with areas for input/customization**
- **Develop system cost structure / business plan for State based on preliminary RAN design and potential user base**
- **Customize based on public safety stakeholder input**

- **Guiding Principle**

- **Addresses areas of consultation required by law**
- **Ensure State RAN design is informed by impact to business plan / cost considerations**



5 – Final State Plan Preview

- **Key Steps**

- **Combine State RAN Design with Operations / Business Plan**
- **Projected funding level**
- **Provide final review opportunity by State POC / Governing Body**
- **Submit to the Governor**

- **Guiding Principle**

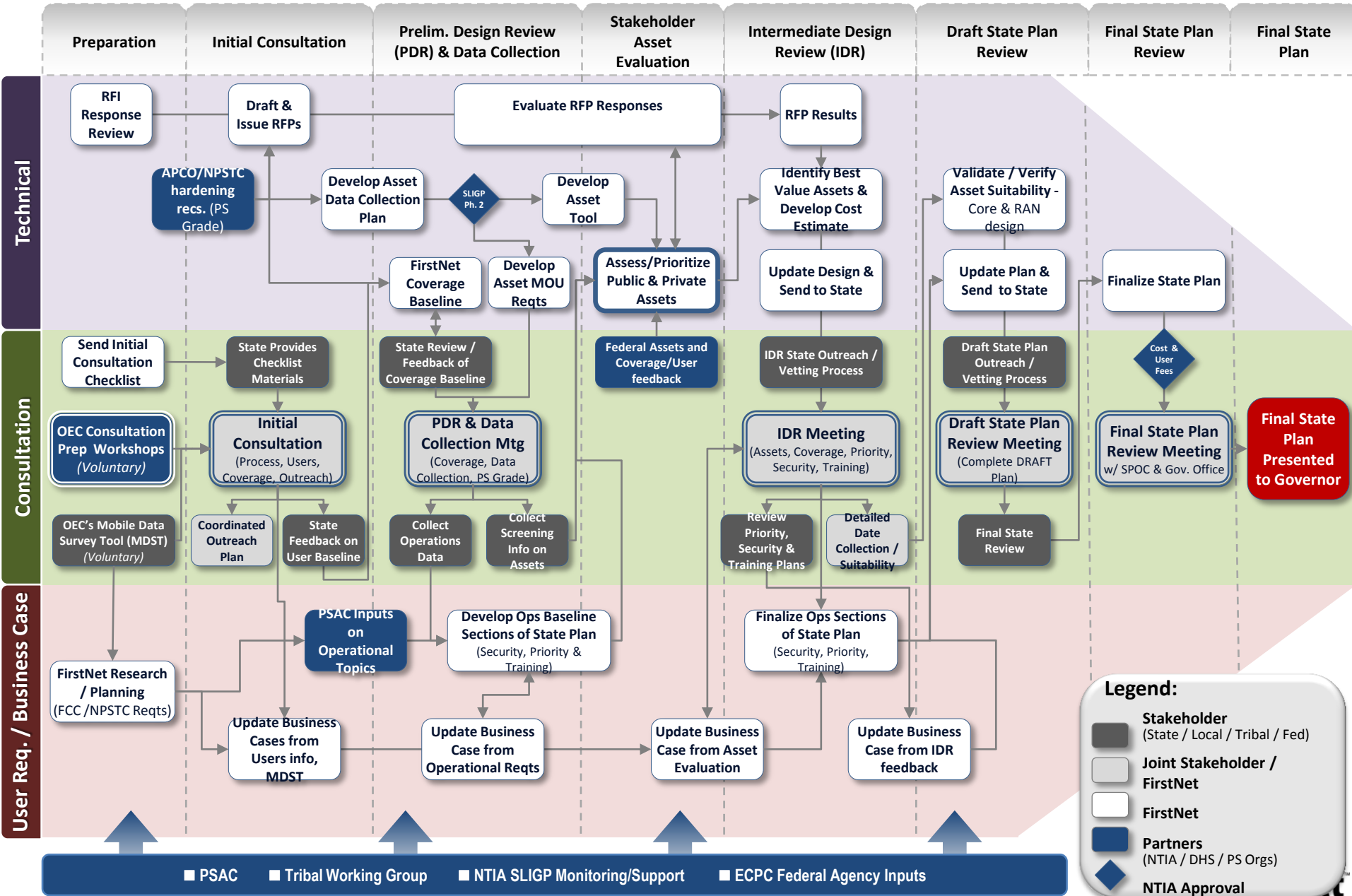
- **Addresses areas of consultation required by law**
- **Ensures Public Safety stakeholders have had robust involvement before State Plan is presented**

State Plan Requirements

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



Preliminary Consultation & State Plan Process



Strategic Planning Process Overview



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.**

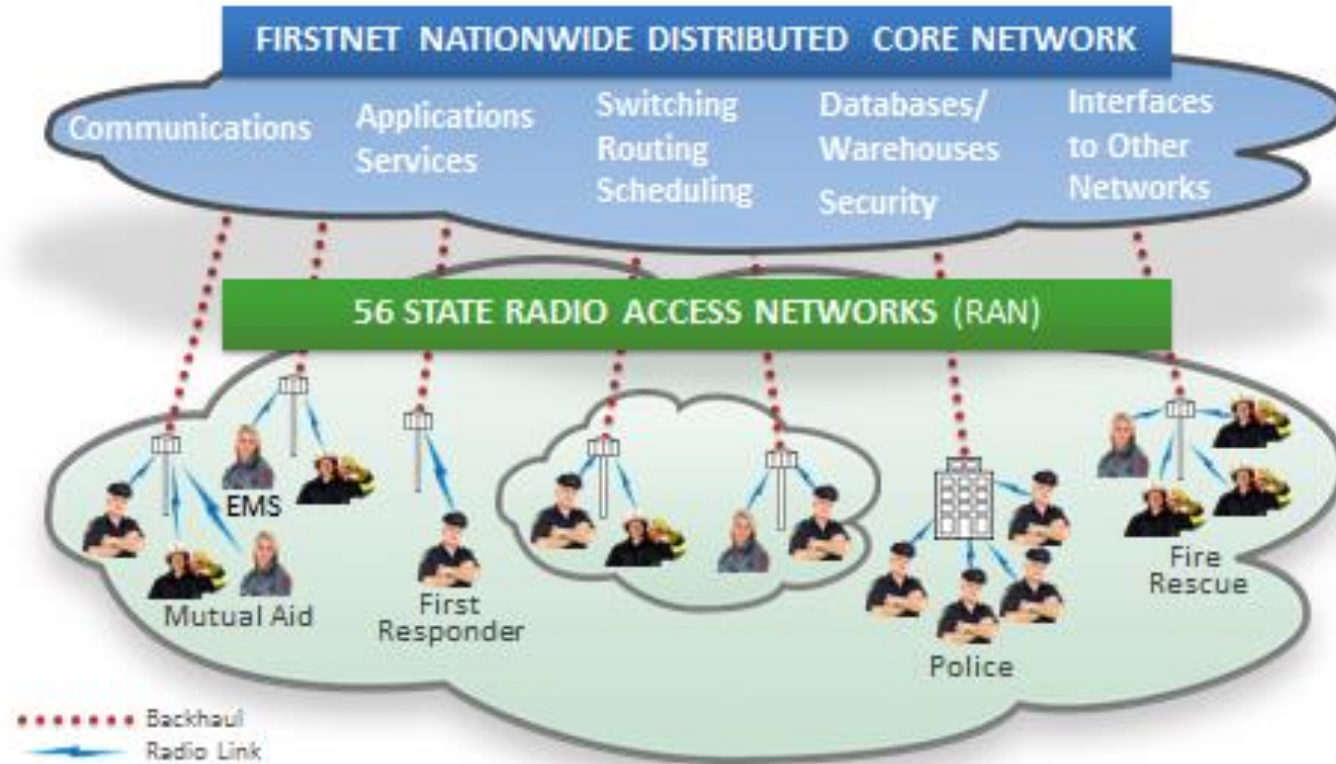
SLIGP Activities

- **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.

FirstNet Vision

NETWORK

FirstNet: Nationwide Core and Local Radio Access Networks



Regional Conference

© First Responder Network Authority



Homeland Security

FOR OFFICIAL USE ONLY

Kentucky Coverage Objectives

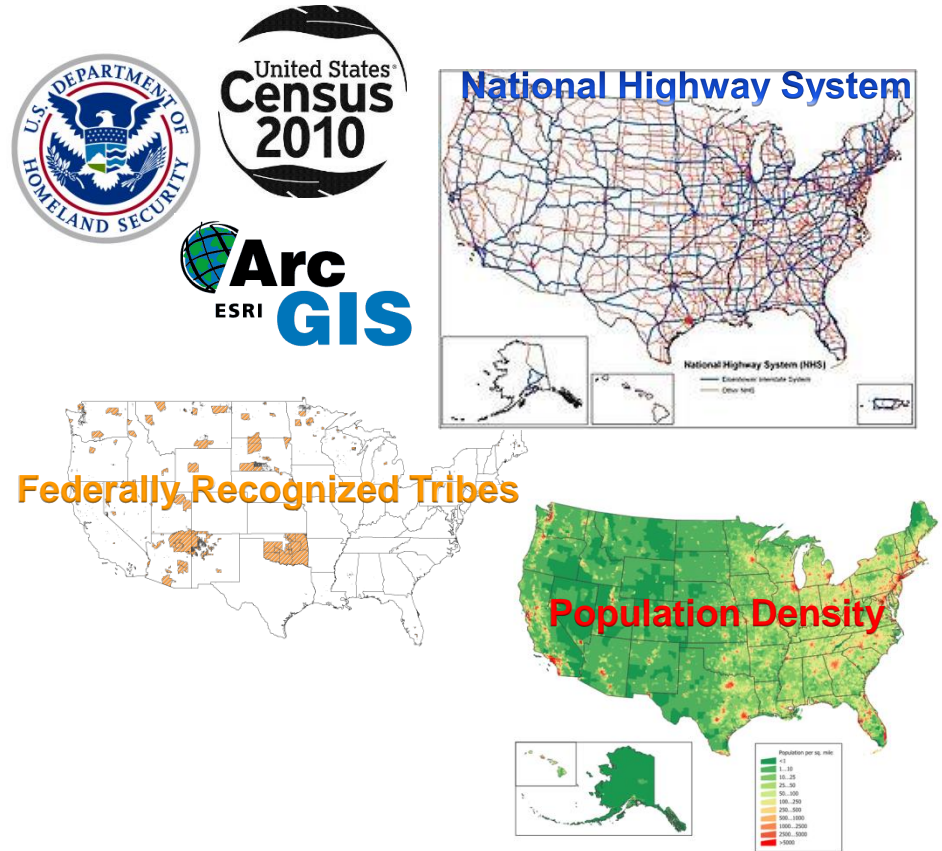


**Homeland
Security**

FOR OFFICIAL USE ONLY

Coverable Objectives Introduction

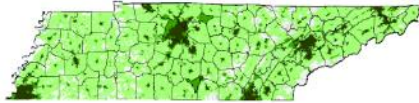
- **Objective:**
 - help states with a starting point of data that can be considered when establishing coverage objectives for FirstNet
- **OEC has gathered a variety of nationwide data from several sources to establish a baseline**
- **OEC has coordinated our baseline with FirstNet to ensure it's a reasonable starting point**
- **States/Territories can then tailor it to unique Public Safety operational needs**



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 own coverage objectives
 - 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)

Focus on Coverage



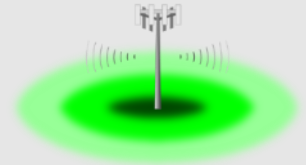
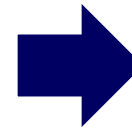
Coverage

- Where is reliable Coverage needed?
- For what level/ device types?
- Using what potential methods?



Capacity

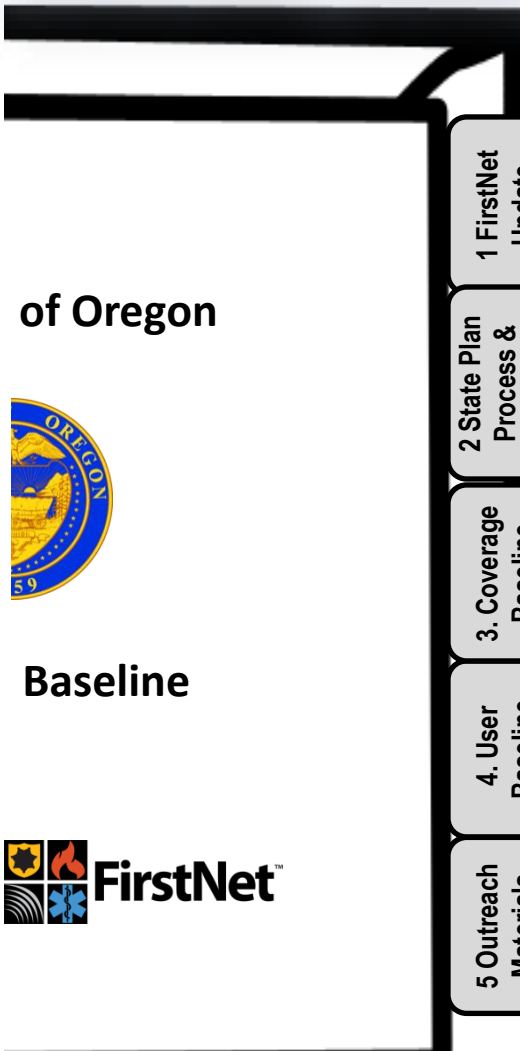
- How many total users?
- What is their operational area?
- What type of applications do they use?



RAN Design

- Estimated number of sites
- Initial cost estimate
- Parameters for asset data collection




Baseline State Analysis– Getting Ready for Consultation

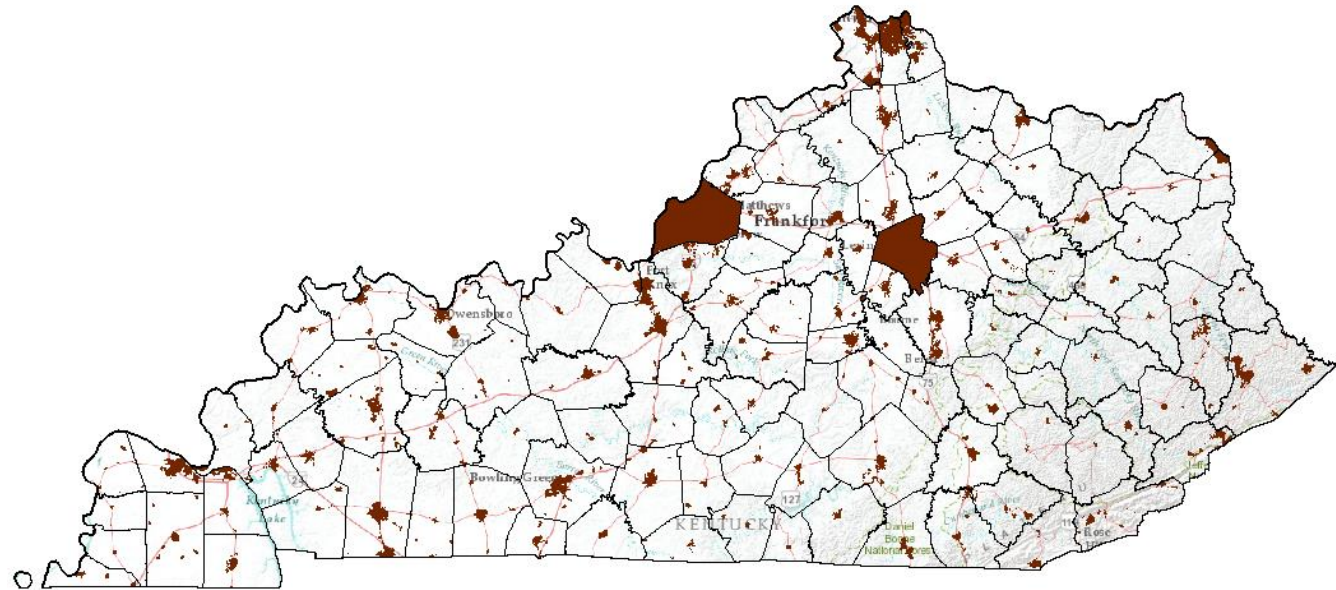


Prior to any in-person consultation, FirstNet will provide SPOCs with key information and materials to prepare States for consultation. This information will come in the form of a Baseline State Analysis (BSA). This BSA includes:

- ← Updated information on FirstNet progress to date
- ← High level process flow for State Plan development including roles and responsibilities of stakeholders and FirstNet
- ← FirstNet’s preliminary coverage objective map for the State as well as instructions for update/enhancement by the State
- ← FirstNet collected information on primary responders in the State for verification, as well as categories for estimated numbers of potential secondary users
- ← FirstNet developed materials that can be used/customized by the State to support outreach activities

Boundaries









-  State
-  Counties
-  Census Designated Places

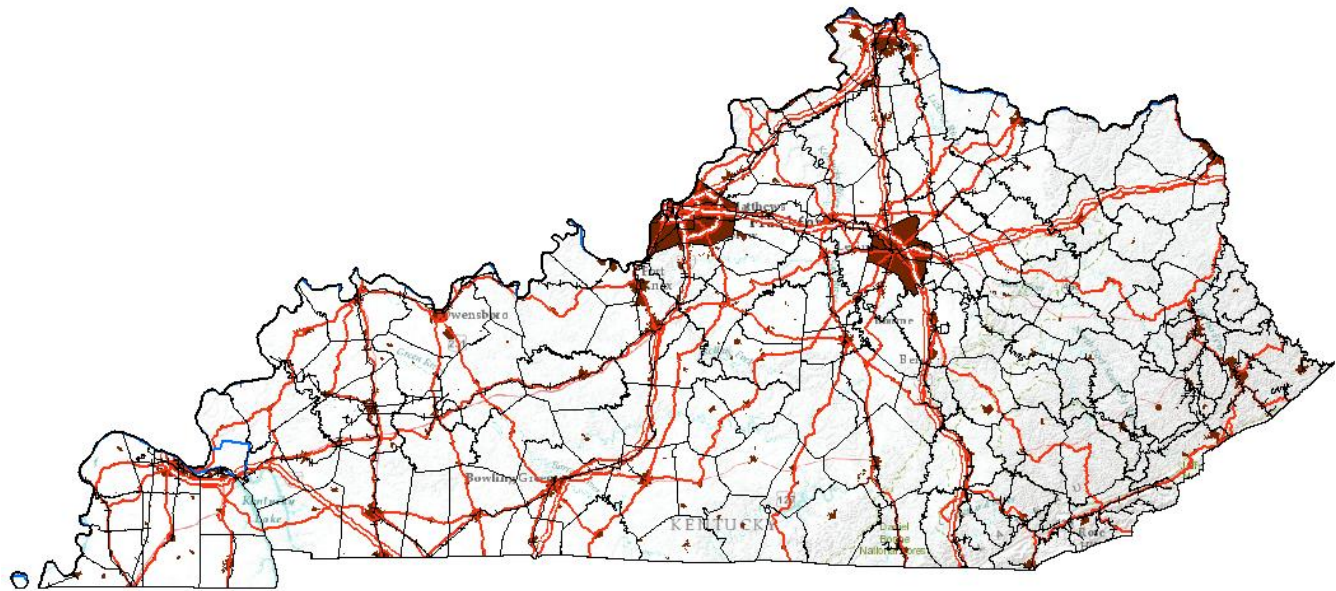


**Homeland
Security**

FOR OFFICIAL USE ONLY

Boundaries & Roads

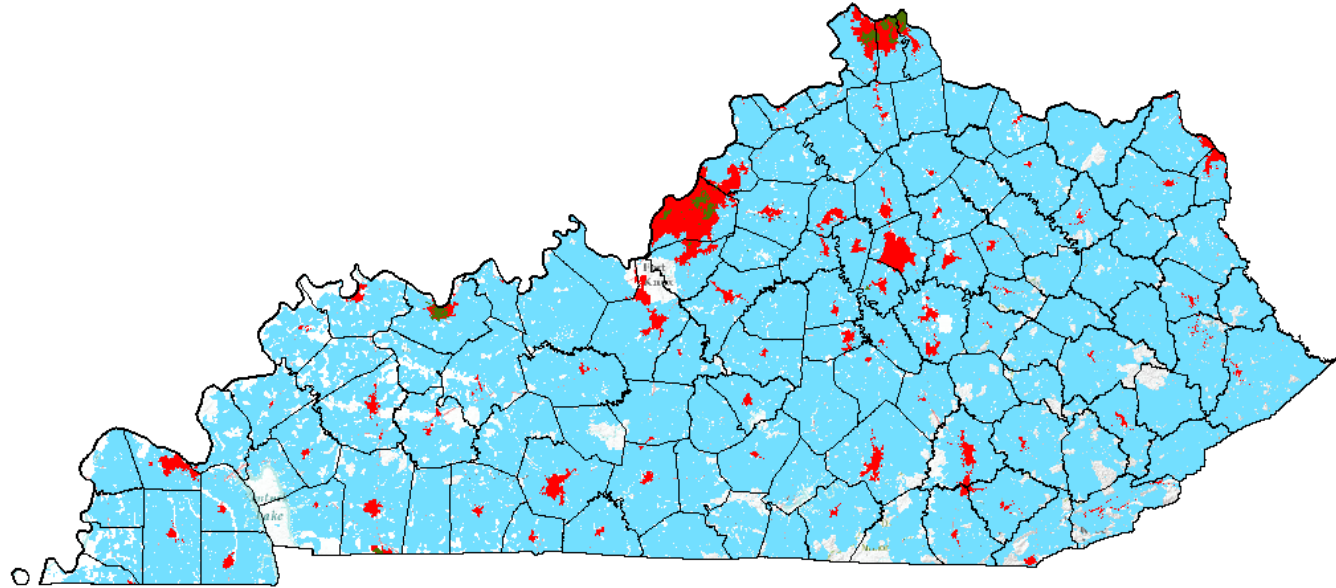
-  State
-  Counties
-  Federally-Recognized Tribes
-  USA Railroads
-  USA Major Rivers
-  Census Designated Places
- National Highway Network**
-  Interstate
-  US Highway



Population Density

Population Density

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



Homeland
Security

FOR OFFICIAL USE ONLY

Translating Data to Coverage Levels

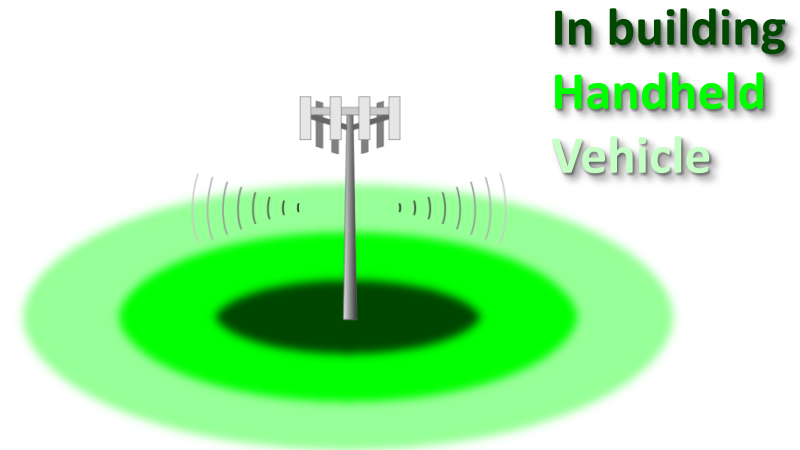


**Homeland
Security**

FOR OFFICIAL USE ONLY

Coverage Objective Levels

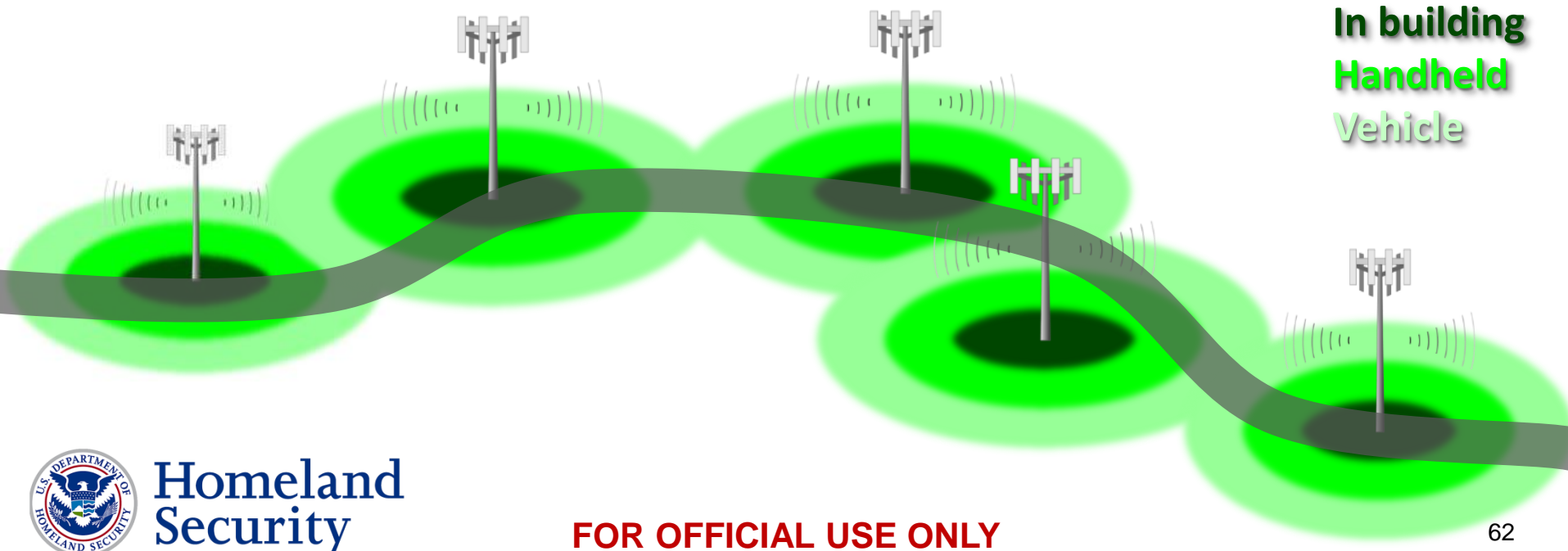
- Coverage objective levels (**in-building**, **handheld**, **vehicle**, etc.) does not mean that coverage will only be provided at that level
- It means that level of coverage will be provided reliably and at a minimum data rate
- A lower reliability and/or minimum data rate would result in greater coverage from the same site
- Service could extend beyond this but at a lower data rate



Coverage Objective vs. Coverage Map

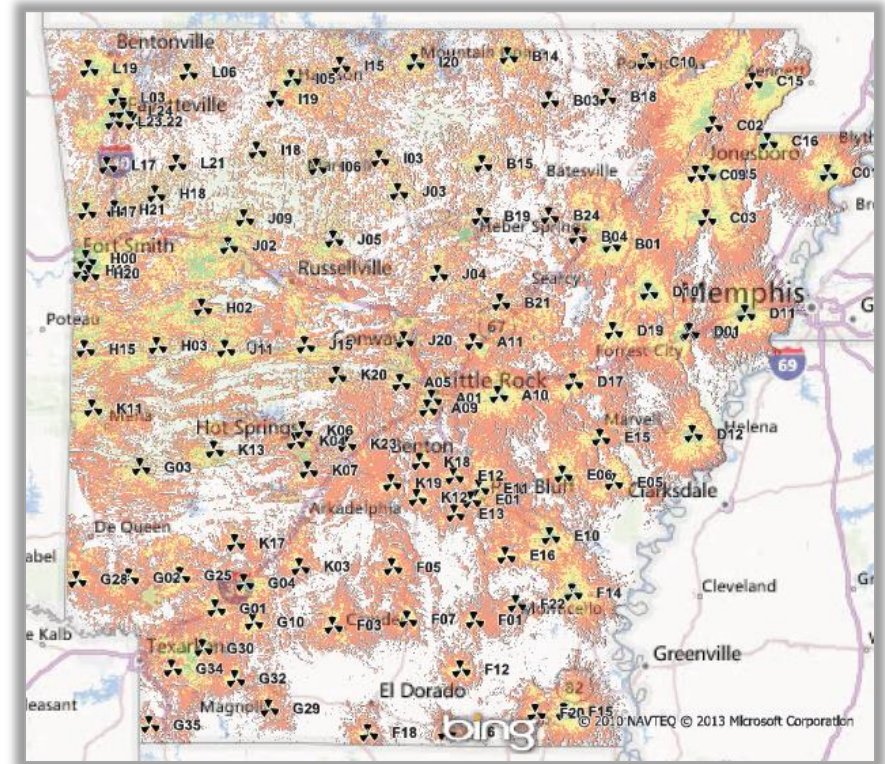
- **Coverage objectives** identify the State's coverage goals
- **Coverage maps** show predicted coverage for the network build out
- Once the towers are selected to satisfy the coverage objectives, the resulting coverage map may yield greater coverage.

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



LTE Coverage – Varying Levels of Performance

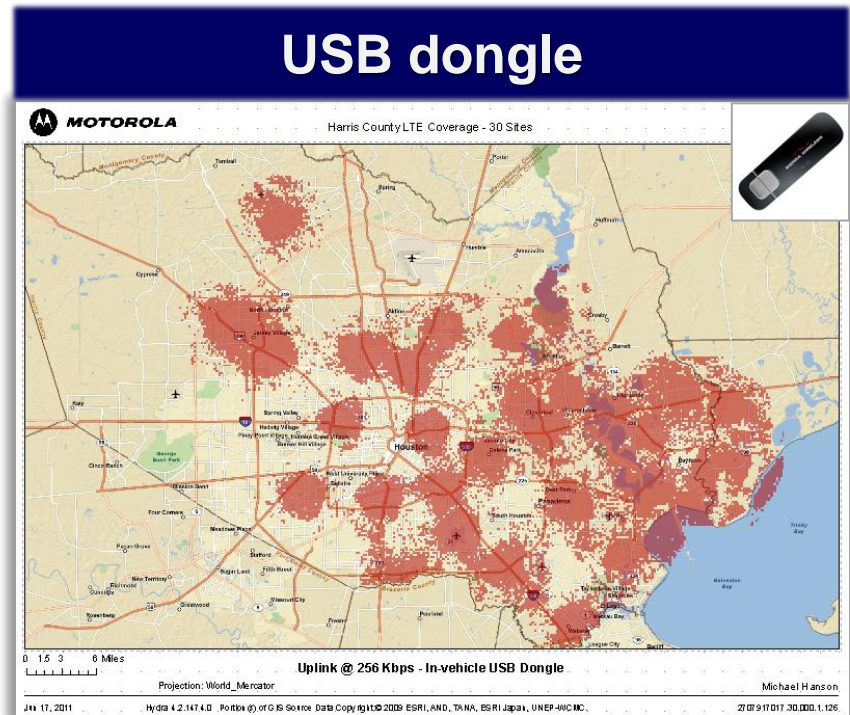
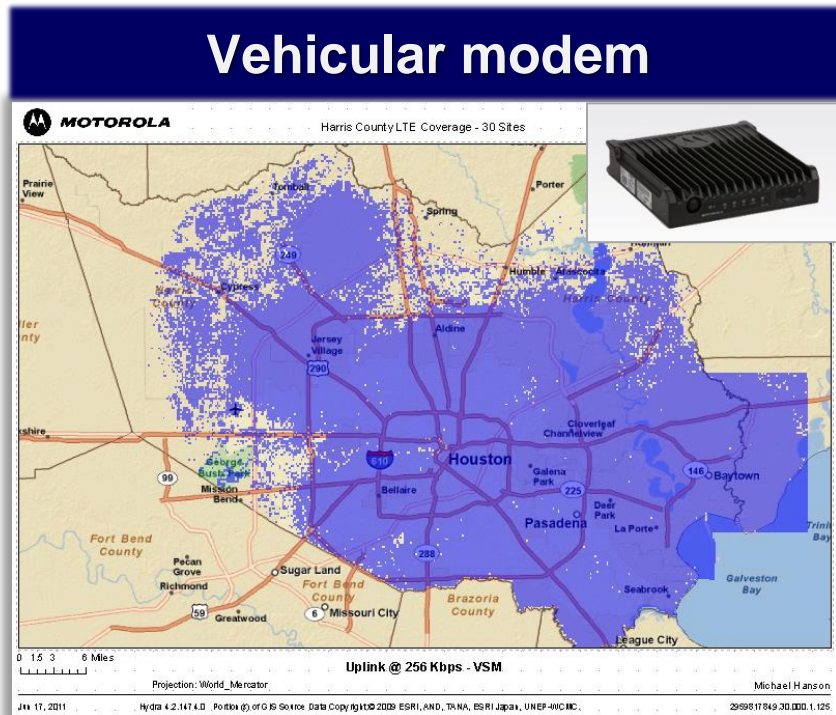
- Performance can vary greatly based on signal strength
- Stronger signal results in higher throughput
 - Shown by different colors surrounding each site
 - System will adjust automatically
- Thus coverage is defined by throughput thresholds



Example plot from old coverage prediction provided simply to illustrate point

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, NOT FirstNet's requirements.

In-Building Handheld Coverage: 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

Handheld / Partial In-Building Coverage: 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

Vehicular Modem / Partial Handheld Coverage: 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)

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

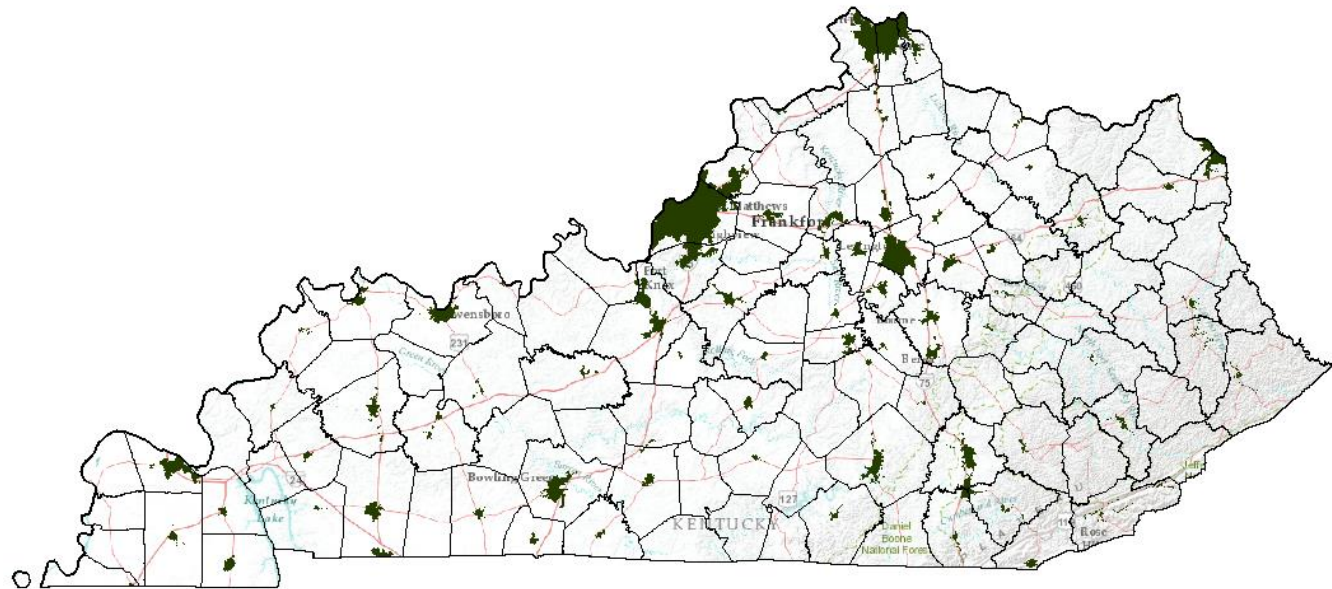
- ***OEC Starting Point*** – All areas with less than 5 people per square mile

In-Building Coverage

OEC Starting Point

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

 In-Building

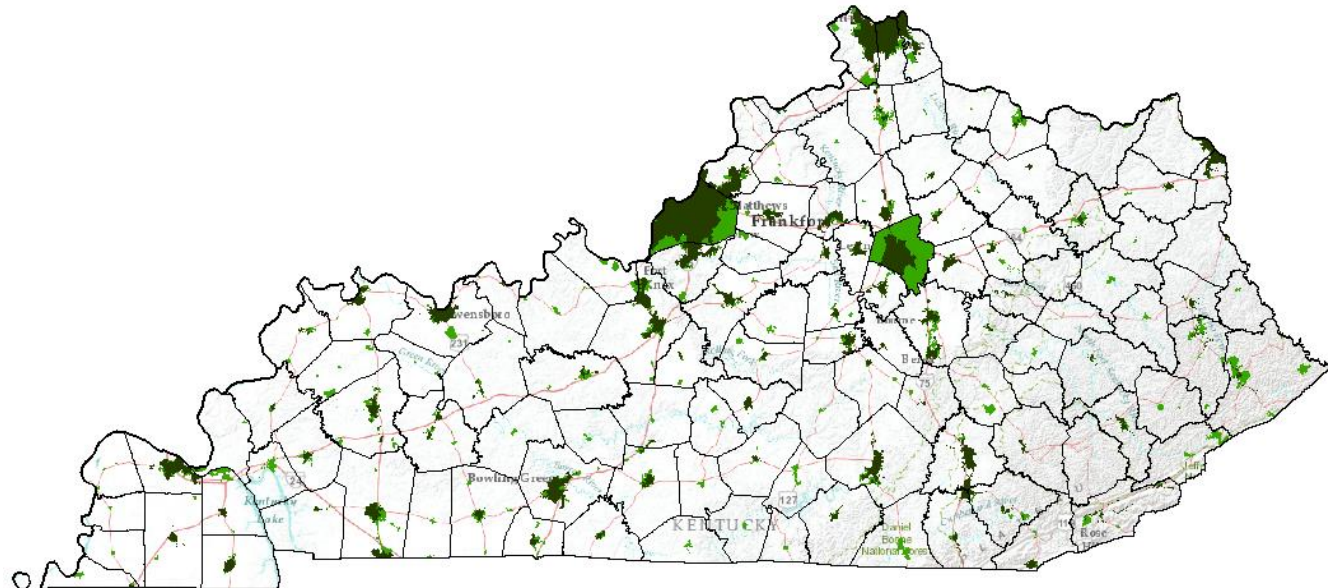


Handheld Coverage

OEC Starting Point

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

-  In-Building
-  Handheld/Partial In-Building







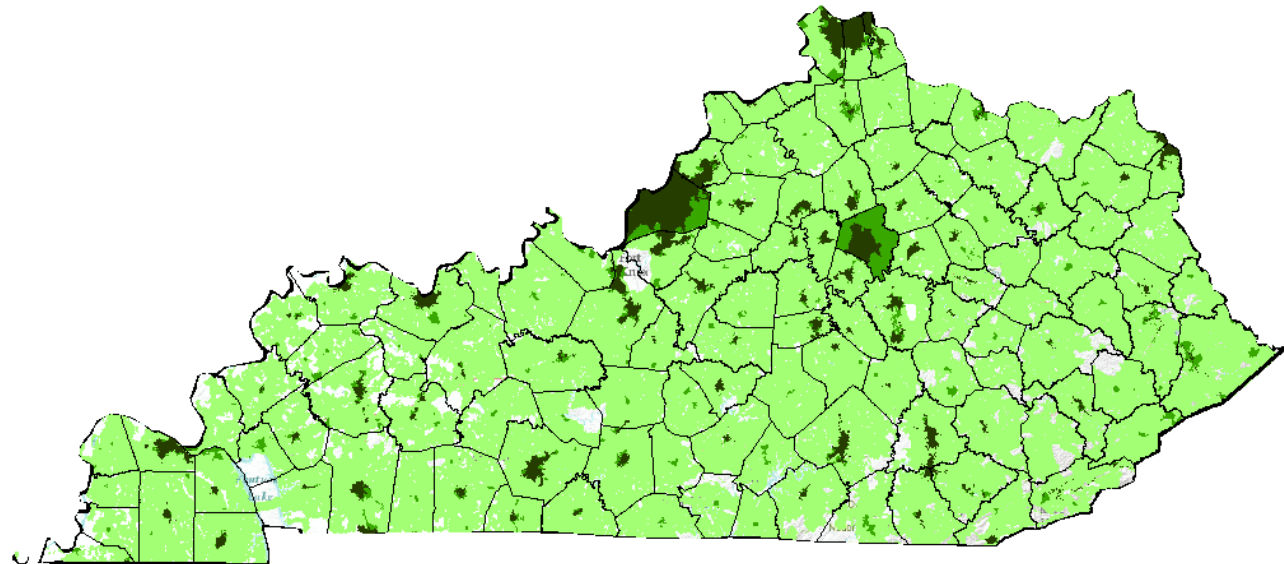
All Coverage

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**











Adjusting the Baseline Based on Public Safety's Need

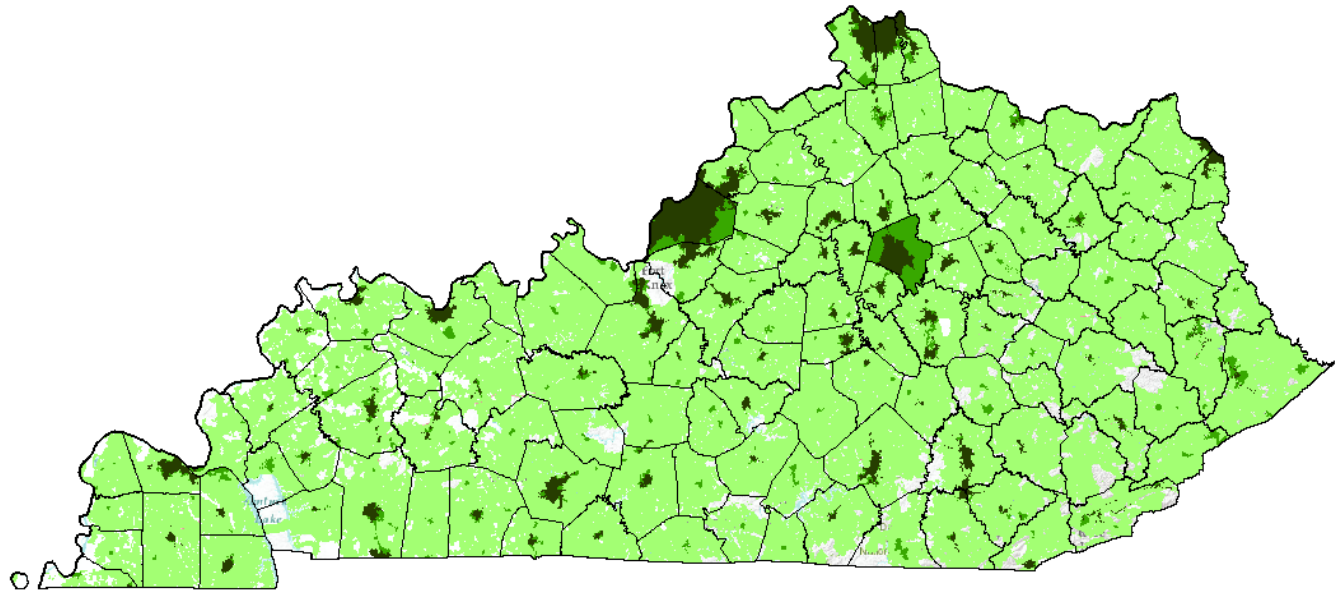


**Homeland
Security**









FOR OFFICIAL USE ONLY

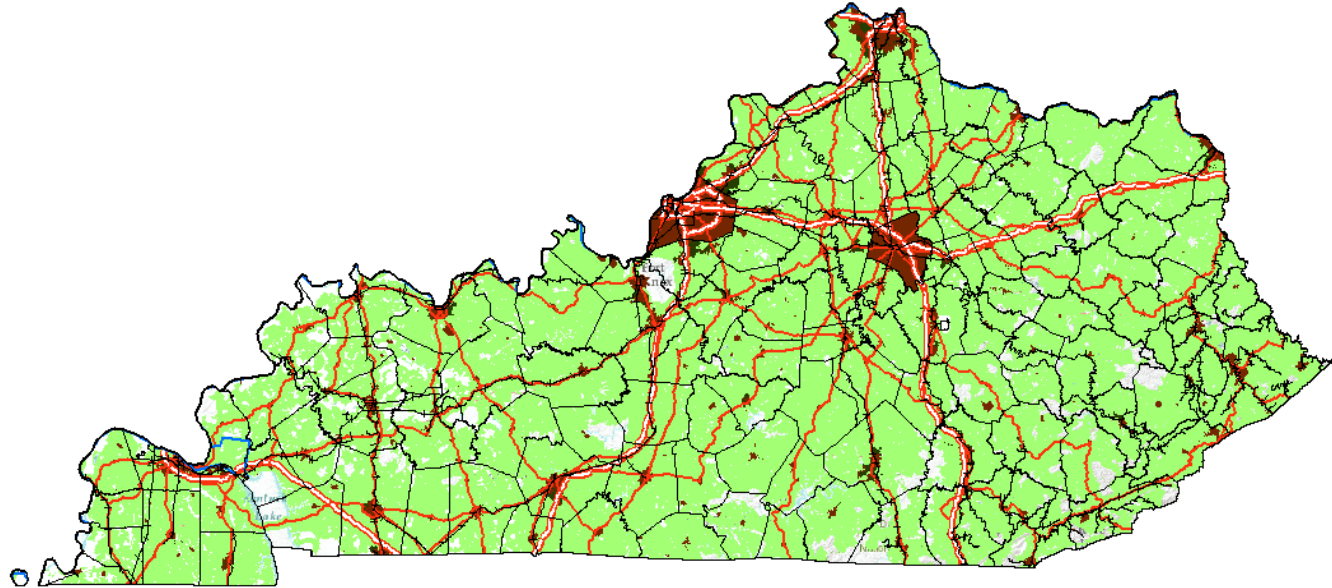
Tribal Lands

-  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



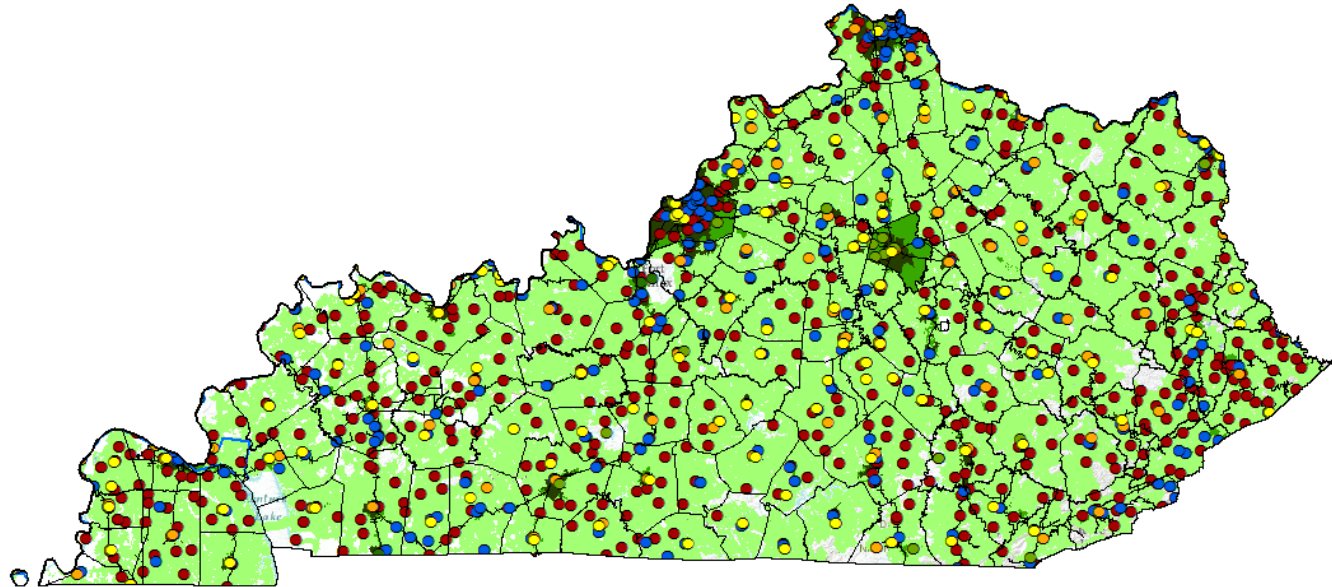
**Homeland
Security**

FOR OFFICIAL USE ONLY

Agencies

Agencies

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



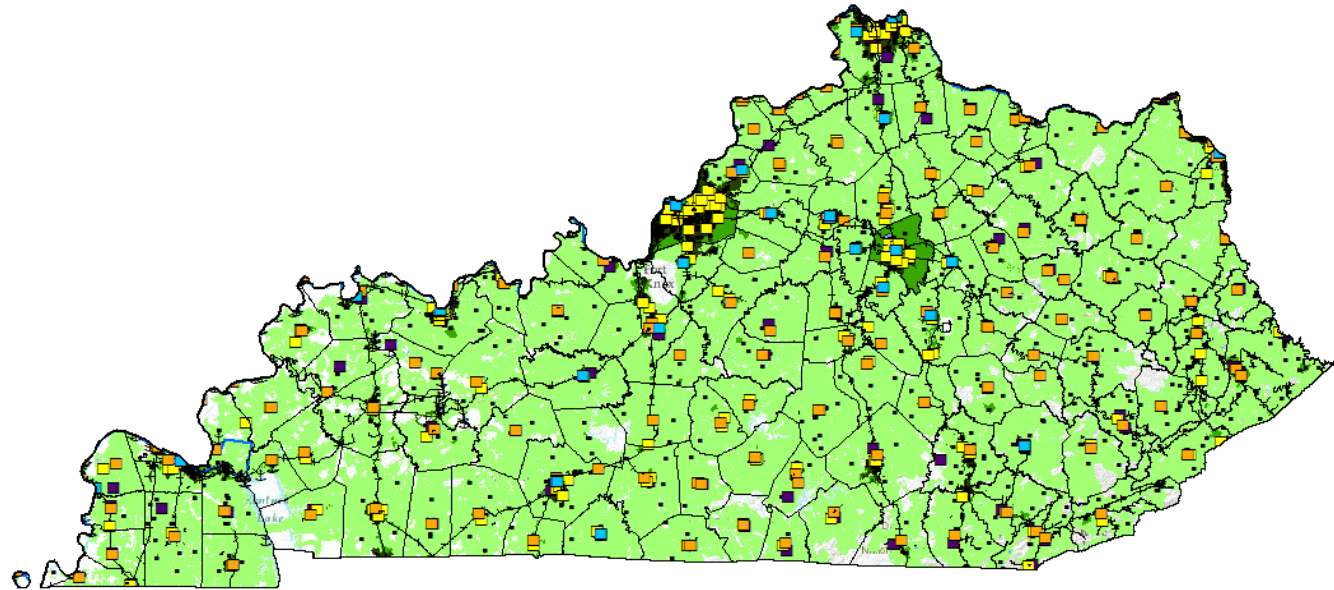
**Homeland
Security**

*Several agencies may overlap on the map
FOR OFFICIAL USE ONLY

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



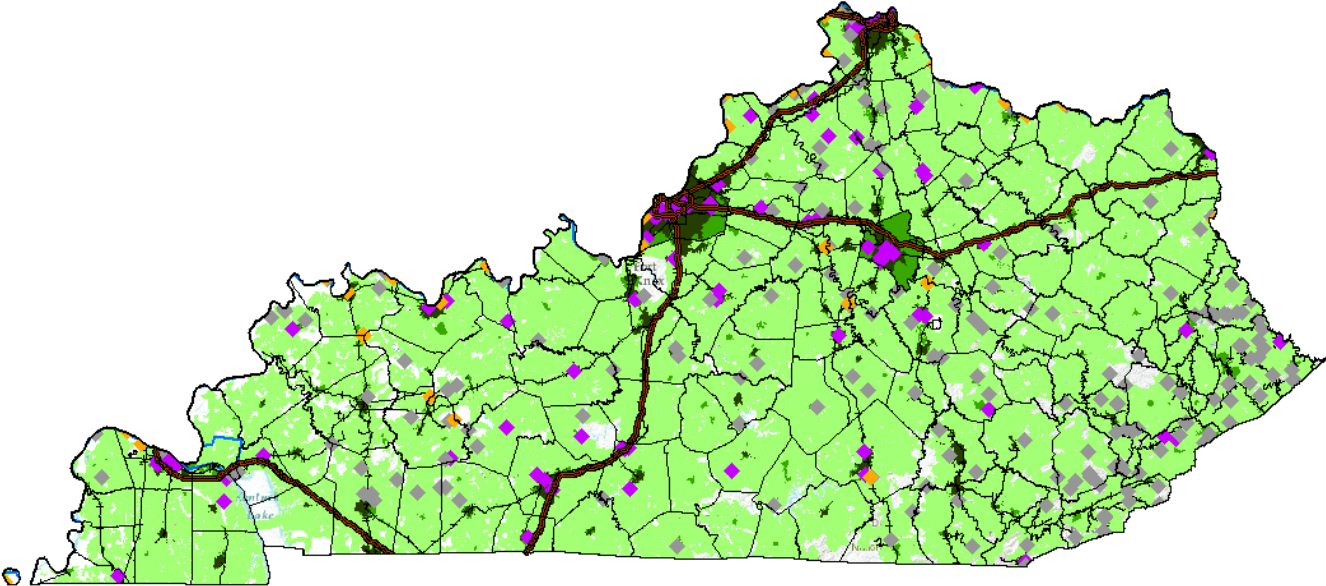
Homeland
Security

FOR OFFICIAL USE ONLY

Critical Infrastructure

Critical Infrastructure

- ◆ Manufacturing
- Hazardous Materials Routes
- ◆ Energy
- ☢ Nuclear Plants
- ◆ Dams
- ◆ Public Venues



Homeland
Security

FOR OFFICIAL USE ONLY

Agencies / Facilities / Critical Infrastructure

Agencies

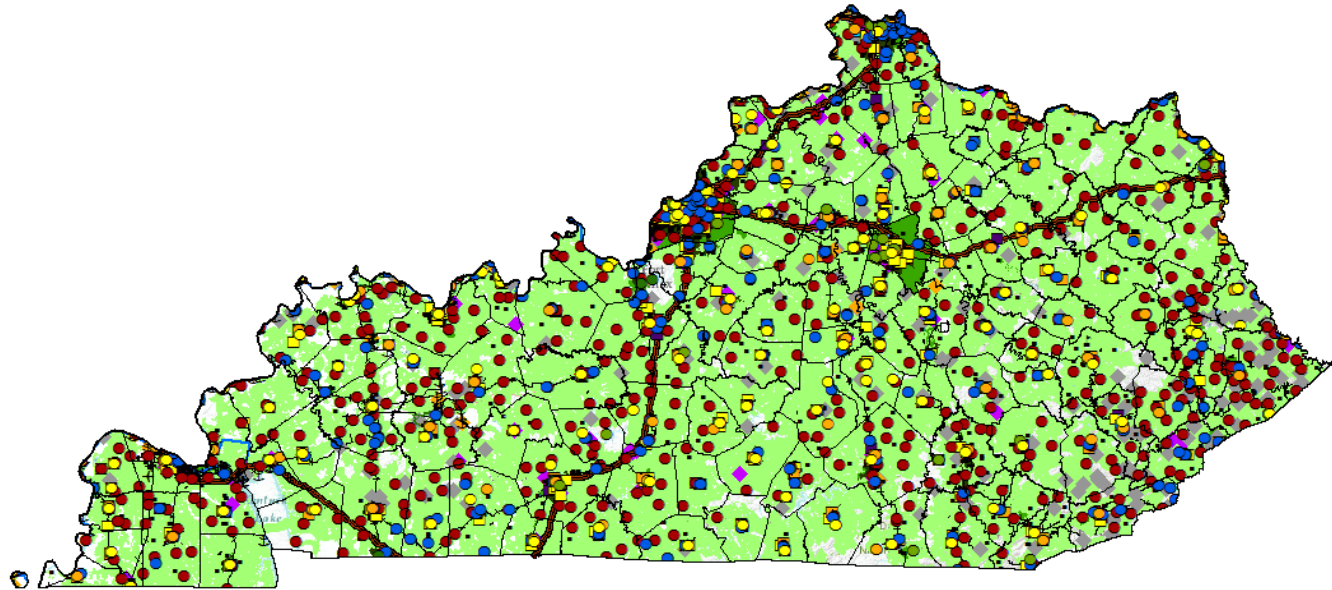
- EMS Departments
- Federal
- Military
- Emergency Management
- Law Enforcement
- Fire Departments

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

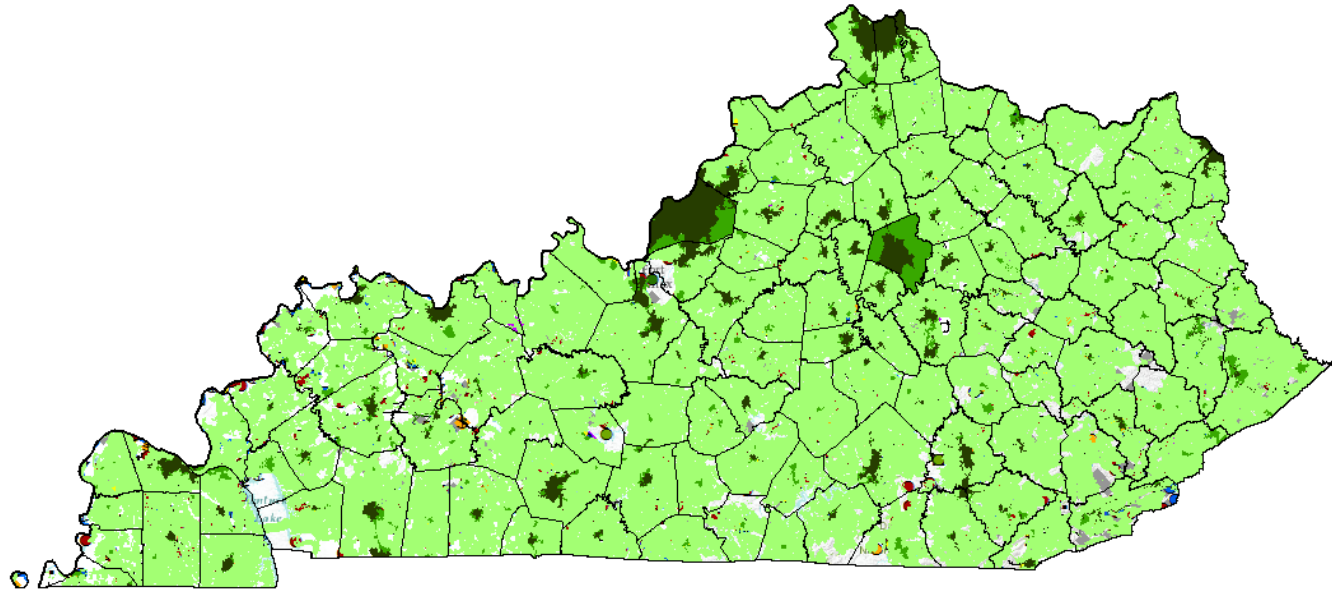


**Homeland
Security**

FOR OFFICIAL USE ONLY

All Coverage Levels

-  In-Building
-  Handheld/Partial In-Building
-  Vehicular Modem/ Partial handheld
-  Satellite/Deployable







**Homeland
Security**

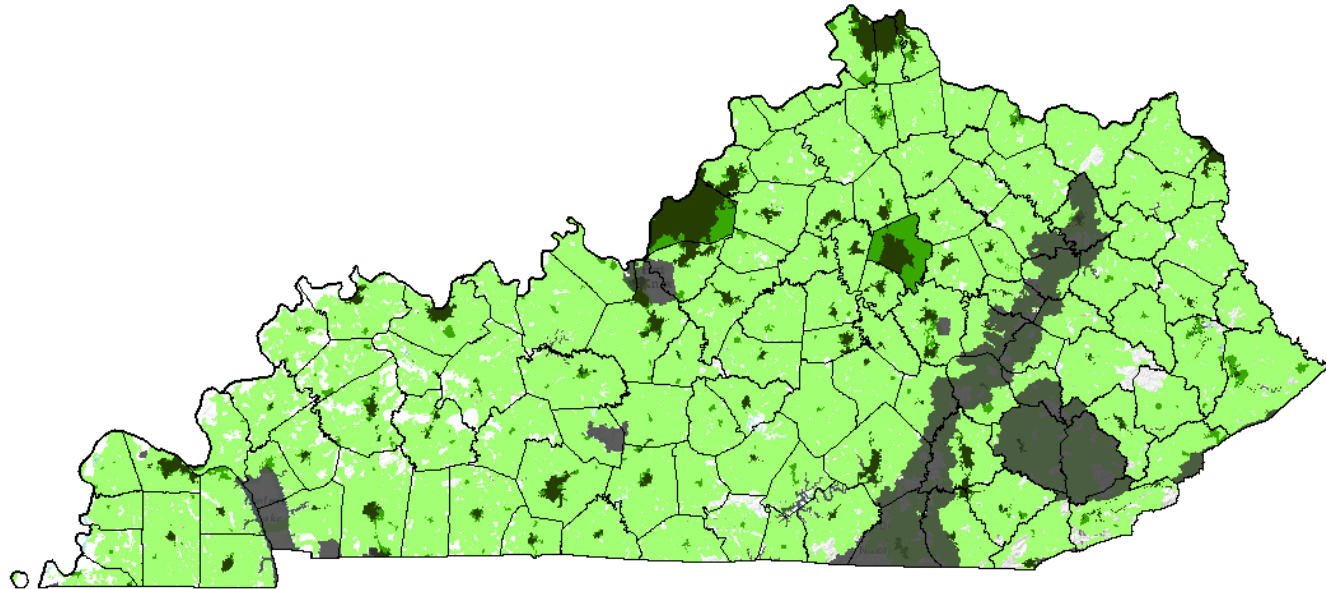
FOR OFFICIAL USE ONLY

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?

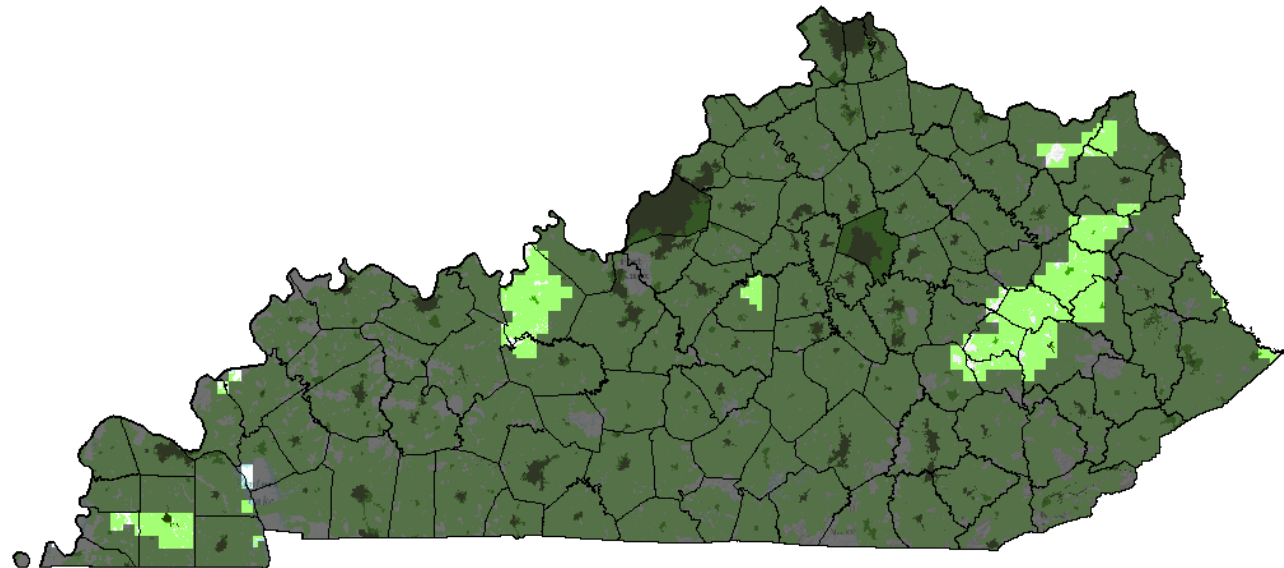
-  **In-Building**
-  **Handheld/Partial In-Building**
-  **Vehicular Modem/Partial handheld**
-  **Satellite/Deployable**



Coverage with LTE Overlay





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

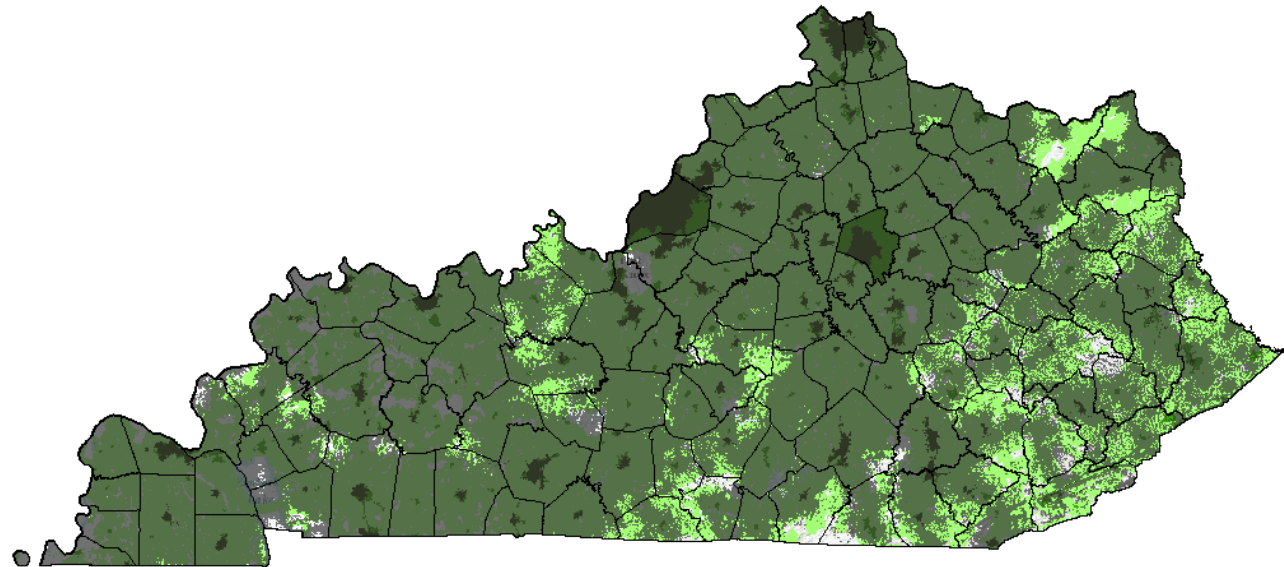
-  In-Building
-  Handheld/Partial In-Building
-  Vehicular Modem/Partial handheld
-  Satellite/Deployable



Commercial Provider Overlay

This is a map of advertised 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**



Kentucky 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.

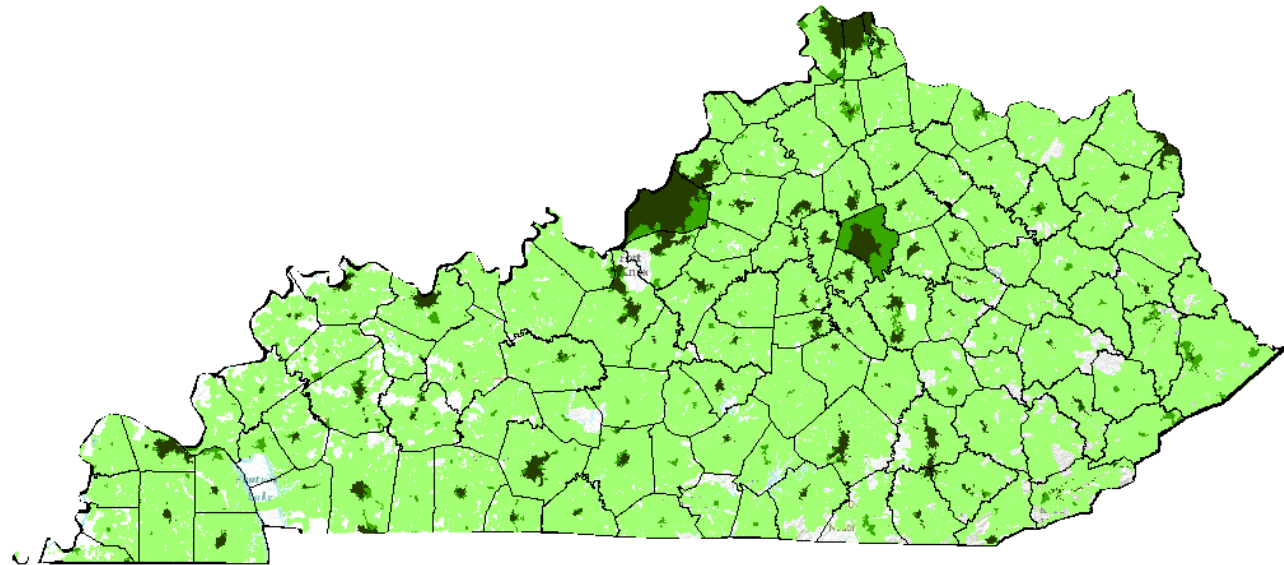
Satellite / Deployable Coverage: Outside of fixed terrestrial coverage, deployable, or satellite connectivity only

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



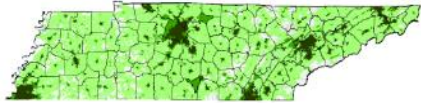
Identifying Users



**Homeland
Security**

FOR OFFICIAL USE ONLY

Focus on Users



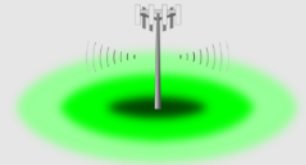
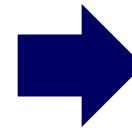
Coverage

- 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

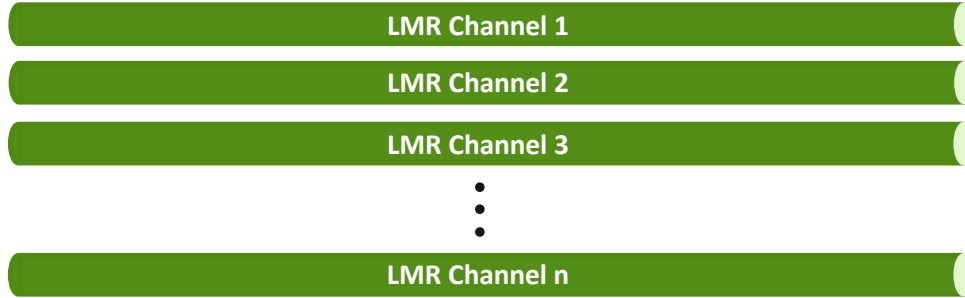
- Estimated number of sites
- Initial cost estimate
- Parameters for asset data collection



LMR vs. LTE Capacity



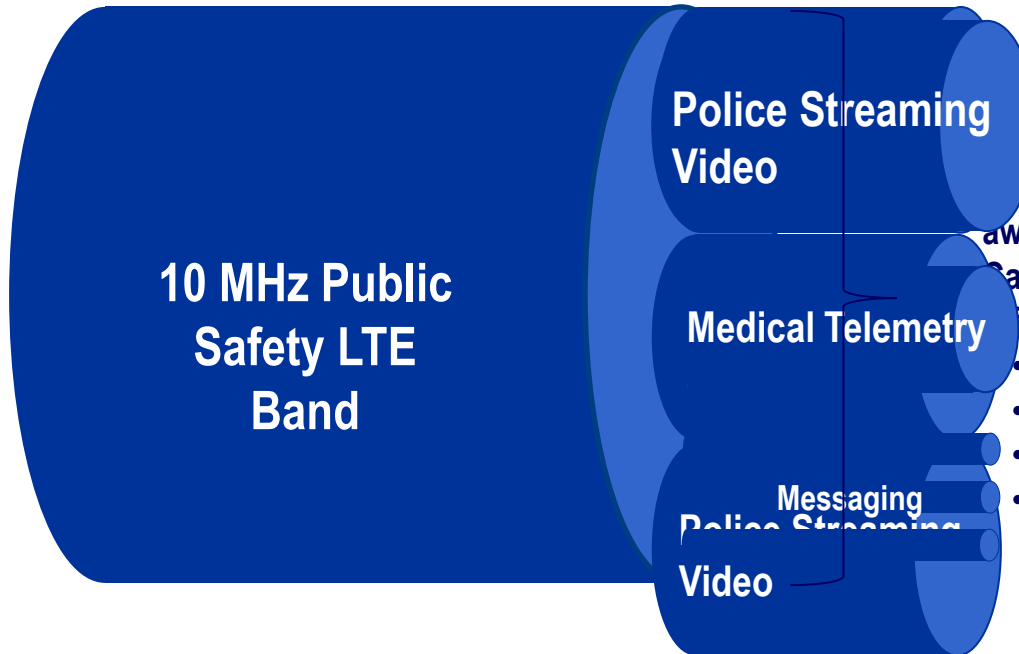
LMR Tx



Each channel supports a conversation



LTE Tx



10 MHz Public Safety LTE Band

Police Streaming Video

Medical Telemetry

Messaging
Police Streaming Video

Large Data
Available Throughput
Must Either:
Capacity Lower resolution of one
away from
can handle Drop one (or more)
Offering da
Size of Pipe Shrinks When
Field
Channel Gets Noisy -
Large
Move Away from Cell
Dispa
Tower

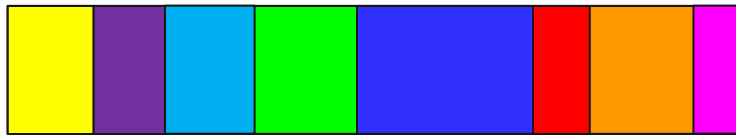


Variable Data Rate per User – 1 to 100 Simultaneous Users

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



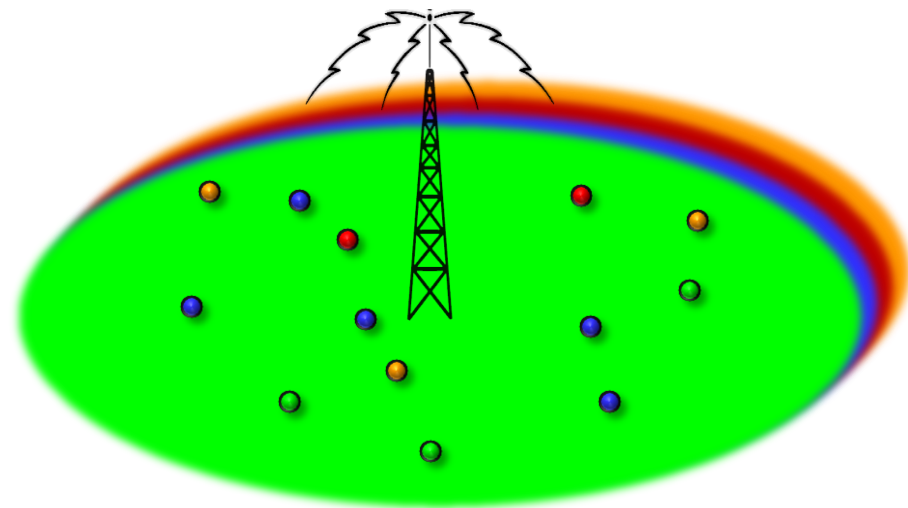
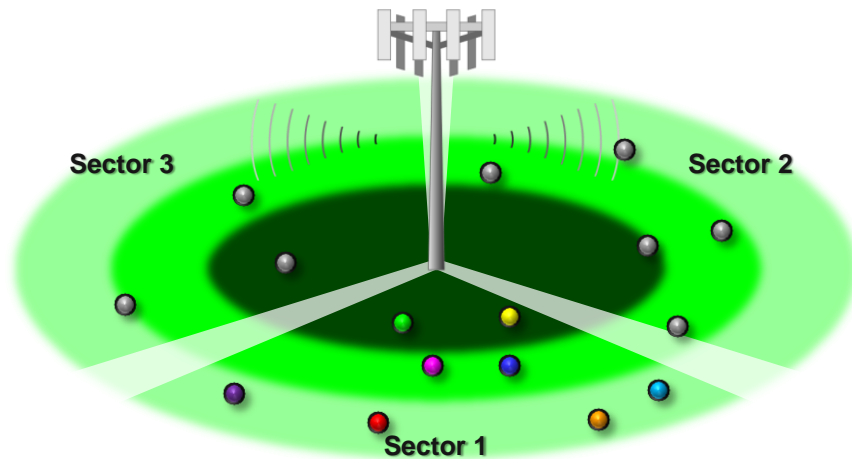
LTE Spectrum

- LMR

- Channels pre-configured per site
- Overlapping coverage using different frequency
- Fixed bandwidth / throughput per channel
- Users on one channel don't impact others



LMR Spectrum

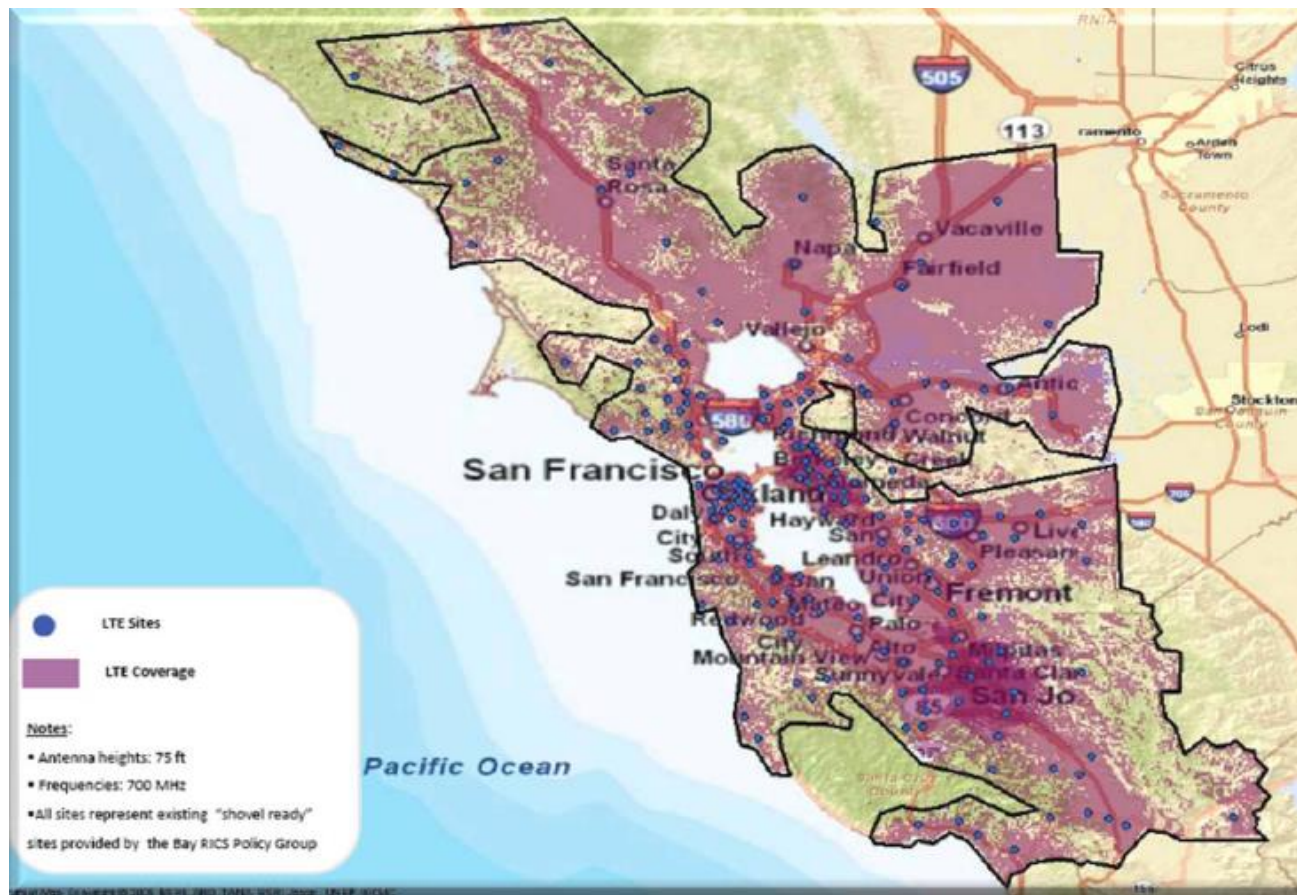


Homeland
Security

Modeling to predict performance is
not easy and difficult to compare

LTE Site Density

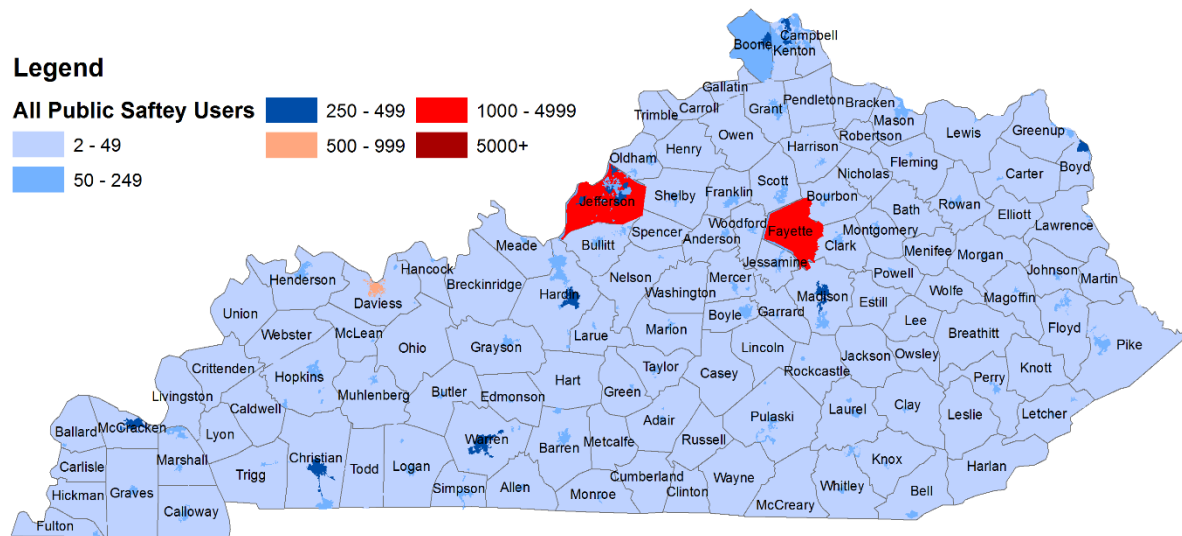
- There will be a significant number of sites required to provide the network capacity in metro areas
- BayRICs Example shows high site density in San Francisco and Oakland area



Source: APCO Broadband Summit presentation

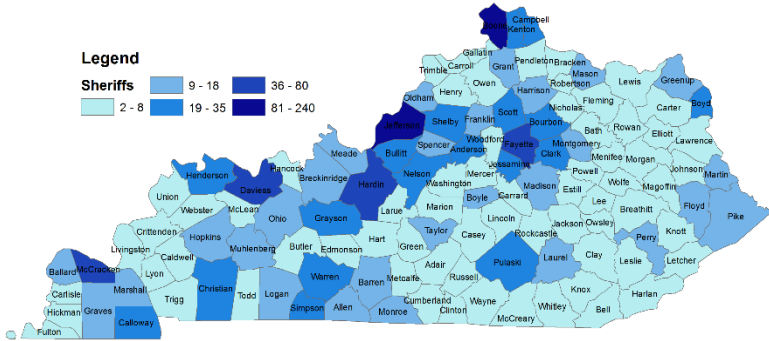
Public Safety Population (Sworn Personnel)

Agency Type	Total Agencies	Total Sworn
Police (Local Law Enforcement)	227	4,753
Sheriff (County Law Enforcement)	120	1,702
State Police (State Law Enforcement)	1	882
Fire Departments (All/Most Career)	115	6,265
Fire Departments (All/Most Volunteer)	667	13,211
Emergency Medical Services (partial)	107	2,618
TOTAL	1,237	29,431

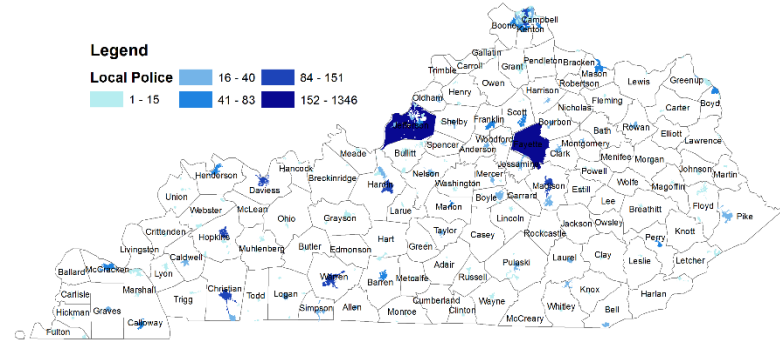


Public Safety Users

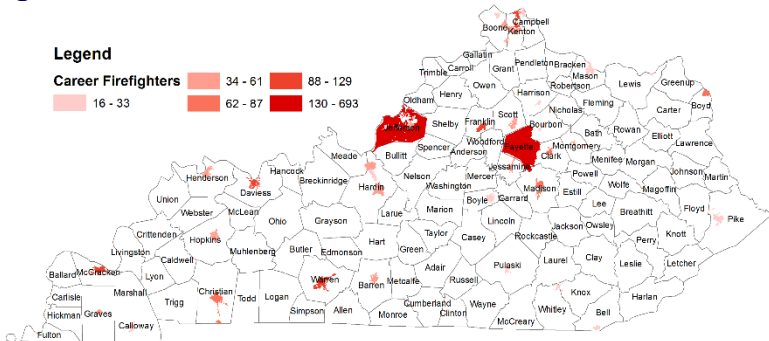
Sheriffs



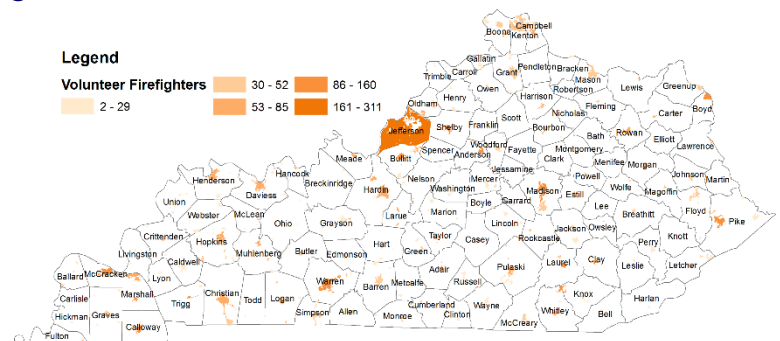
Local Police



Career Firefighters



Volunteer Firefighters



Summary Table of Users

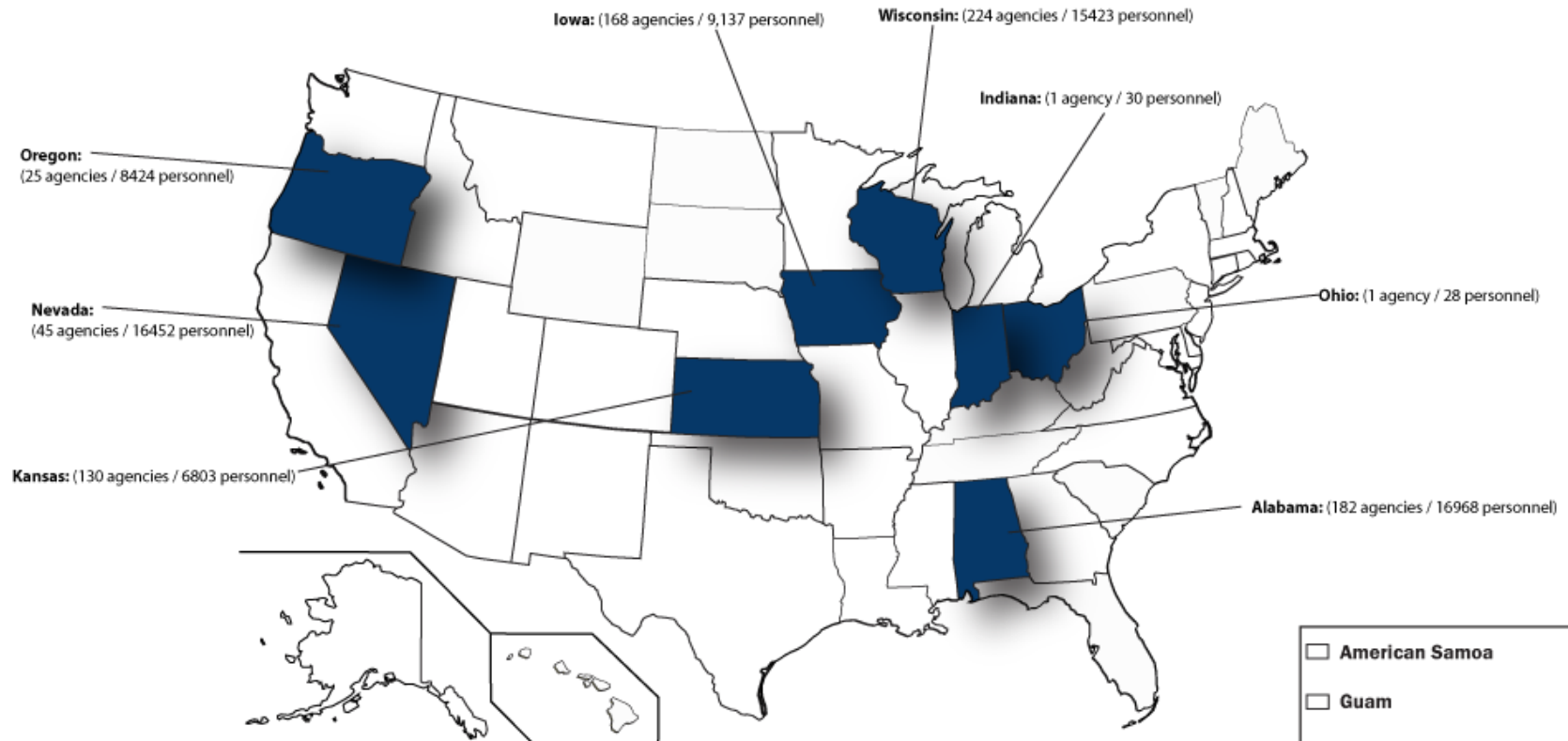
Sources: CASM, DOJ, FEMA and Commercial

Agency Type / Discipline	Agency Count	# of Personnel	# of Devices (non-LMR)
Emergency Medical Services (EMS)	107	2,618	
Fire Services (Career and Volunteer)	782	19,476	
Law Enforcement (Municipal Police, State Police, Highway Patrol, etc.)	348	7,337	
Courts, Corrections and Security	356		
Education Establishments			
Emergency Management	120		
Facilities and Land Management			
Highway and DOT	1		
Hospitals and Medical Facilities			
Military/National Guard	3		
National Security/Intelligence			
Public Administration and Support Services			
Public Health			
Public Safety Communications	120		
Specialized Law Enforcement (Intelligence, Dignitary Protection, etc.)	49		
Transportation Operations (Air, Pipeline, Rail, Sea, Waterway)			
Utilities (Electricity, Gas, Water, Telecom and Sewer)			
Other			
TOTAL			



National Mobile Data Survey Results

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



**Homeland
Security**

FOR OFFICIAL USE ONLY

Public Safety Tools Website

ICTAP

Interoperable Communications Technical Assistance Program

Public Safety Technical Assistance Tools

Welcome to the Public Safety Technical Assistance Tools Website

[Home](#) | [Tools](#) | [Resources](#) | [Training](#) | [PSToolsHelp](#) | [What's New \(as of 12/09/2013\)](#)

Tools

FMT
Frequency
Mapping
Tool

MDST
Mobile Data
Survey
Tool

NLST
Narrowband
License Status
Tool

NSTT
Narrowband
SummaryTracker
Tool

PS Library
Public Safety
Library

Controlled Access:

[* How do I get Access?](#)

CASM NextGen
Communication Assets
Survey & Mapping
Next Generation

RLCT
Response Level
Communications
Tool

Resources

NIFOG Info
National Interop.
Field Operations
Guide

AUXFOG
Aux. Communications
Field Operations
Guide

NPSBN
Nationwide Public
Safety Broadband
Network

OEC Docs.
Office of
Emergency
Communications

TA Request
Technical Assistance
Catalog, Request
& Evaluation Forms

FCC Src.
Federal
Communications
Commission

Training

Gateways
Audio Gateway
Training Materials
& CBT

COMU
Communications Unit
Overview
Training

AUXCOMM
Aux. Communications
Overview
Training

Proj. Mgmt.
Project Management
Overview
Training

Radio 101
Basic LMR
Overview
Presentation

Tribal Outreach
Engaging Tribal
Governments Overview
Presentation

www.publicsafetytools.info



Homeland
Security

FOR OFFICIAL USE ONLY

MDST Example Questions

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

2. Commercial Systems: Provider, Cost, Devices, Contracts

3. Private Systems: Provider, Cost, Radios

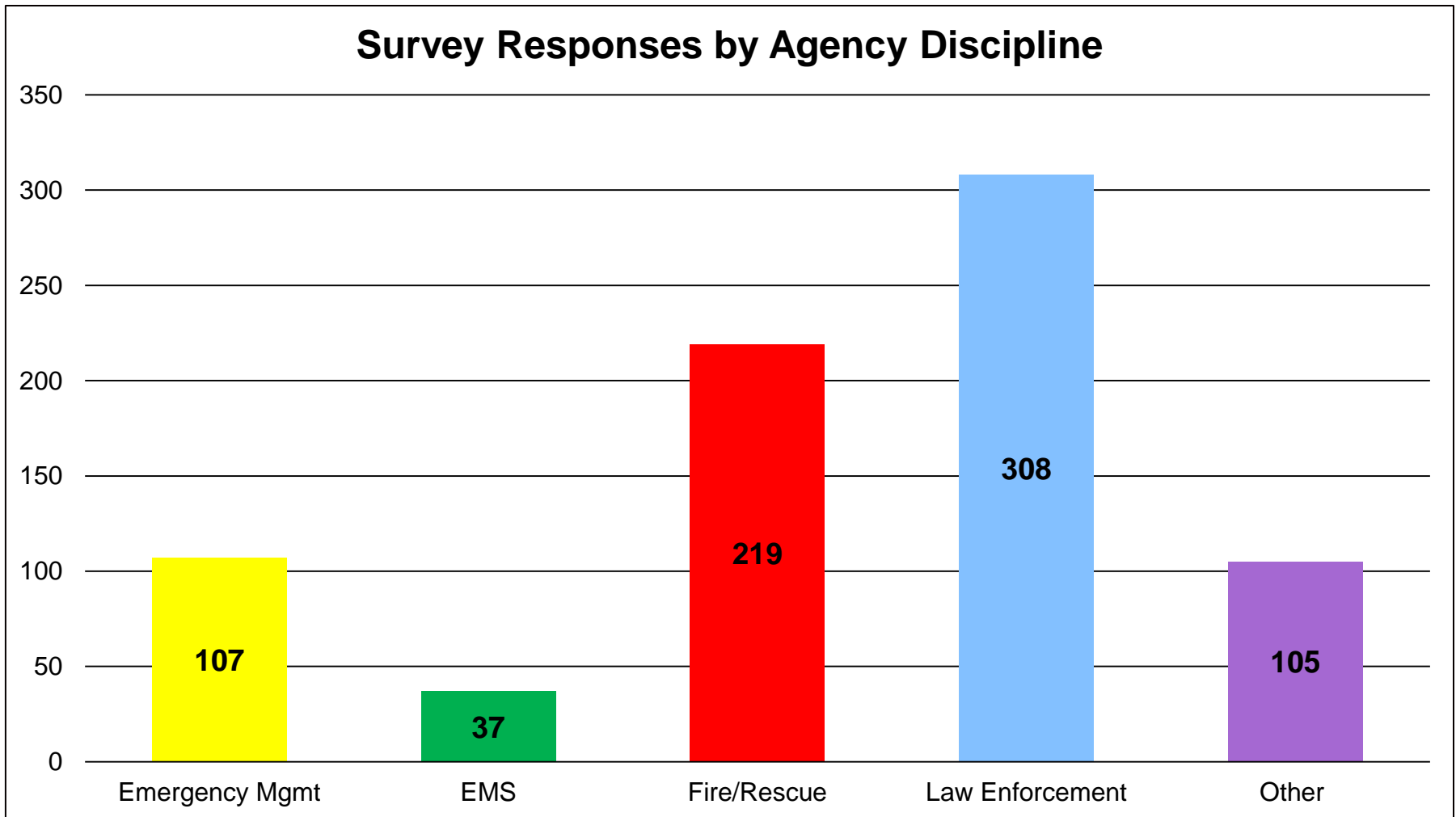
4. Wireless Services: Barriers, Personal Use, Coverage

5. NPSBN Info: Awareness, Applications, Potential Assets, MOAs

6. LMR: Radio counts, cost, end of life

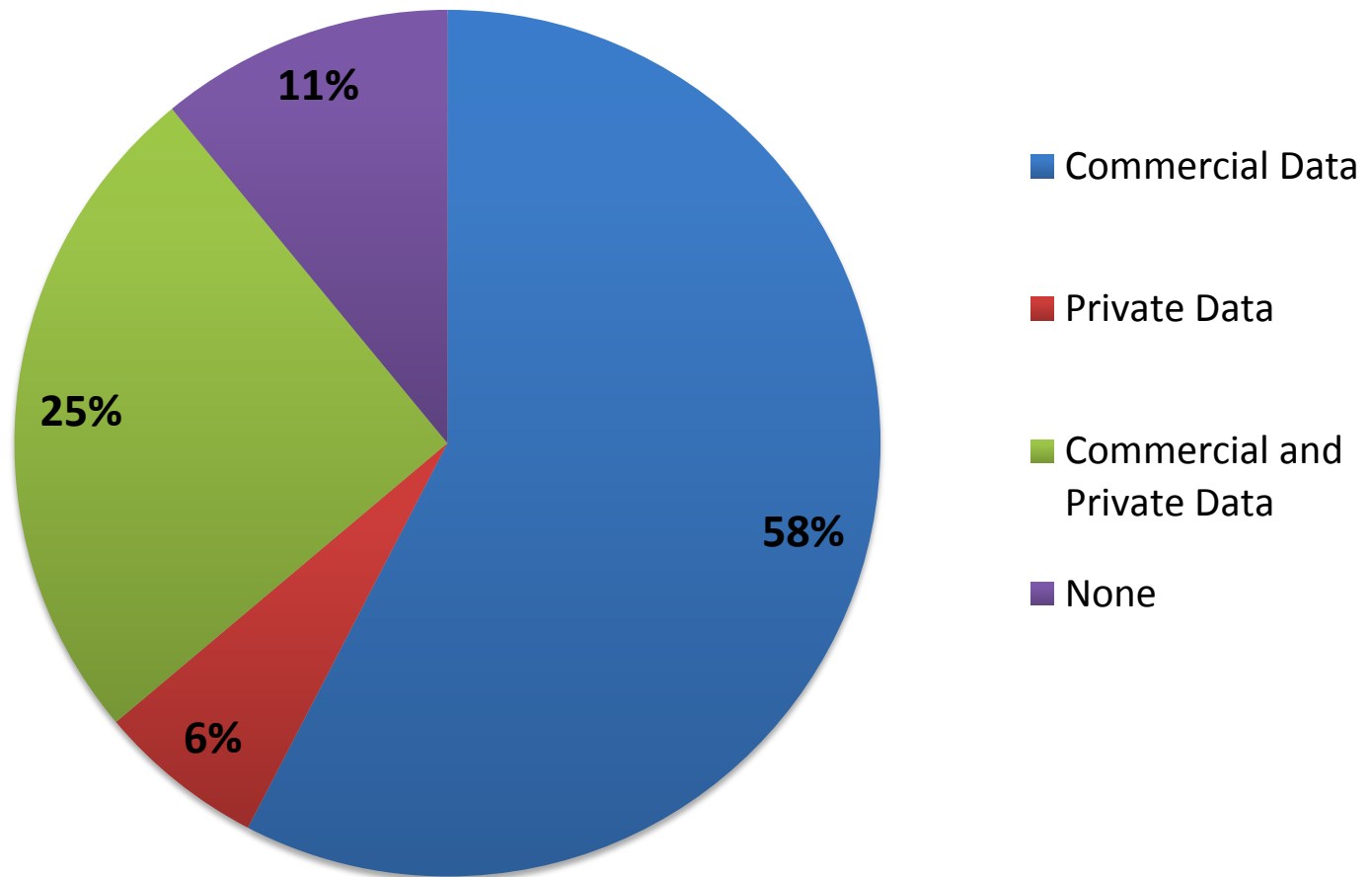
National Mobile Data Survey Results

Survey Responses by Agency Discipline



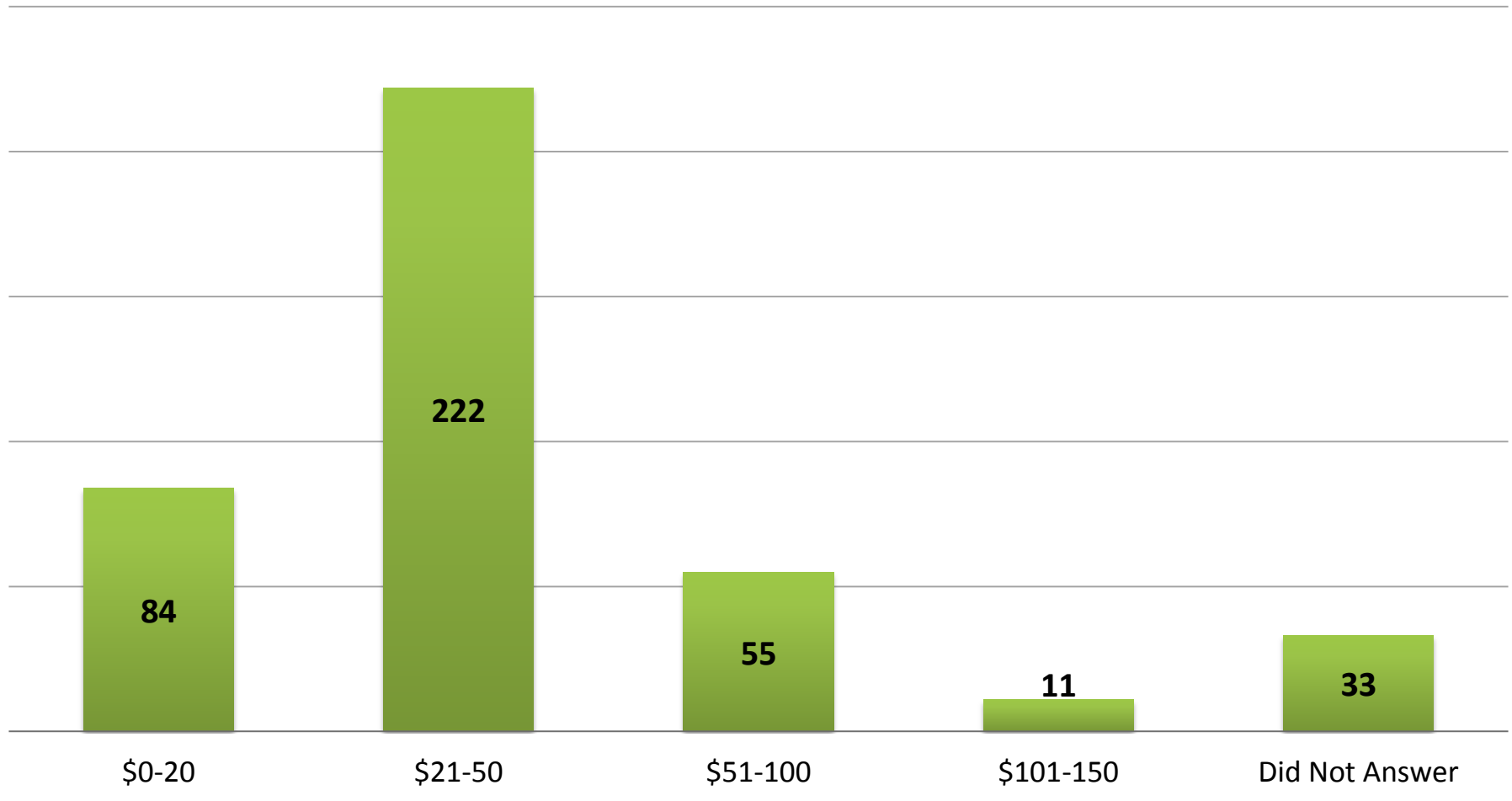
National Mobile Data Survey Results

Wireless Data Systems (All Agencies)



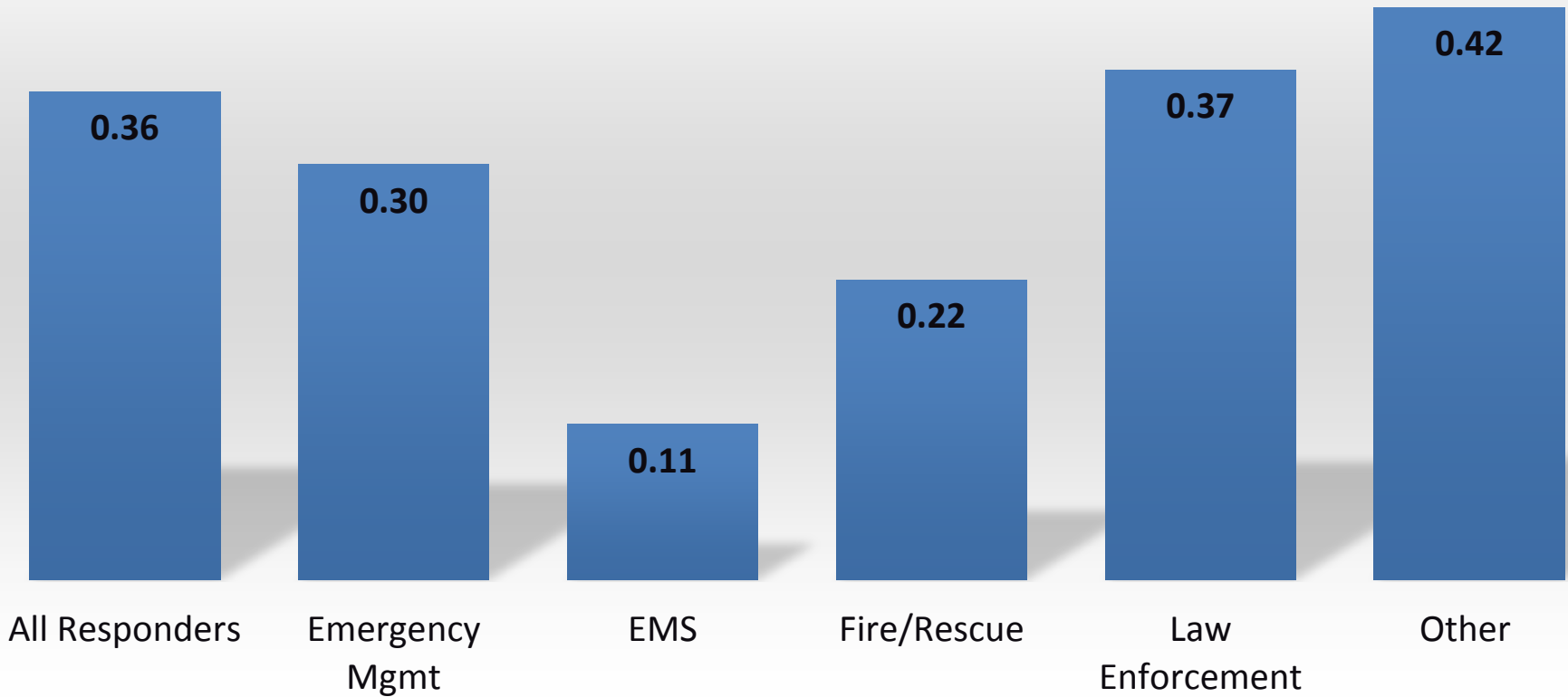
National Mobile Data Survey Results

Average Monthly Device Costs for Commercial Systems



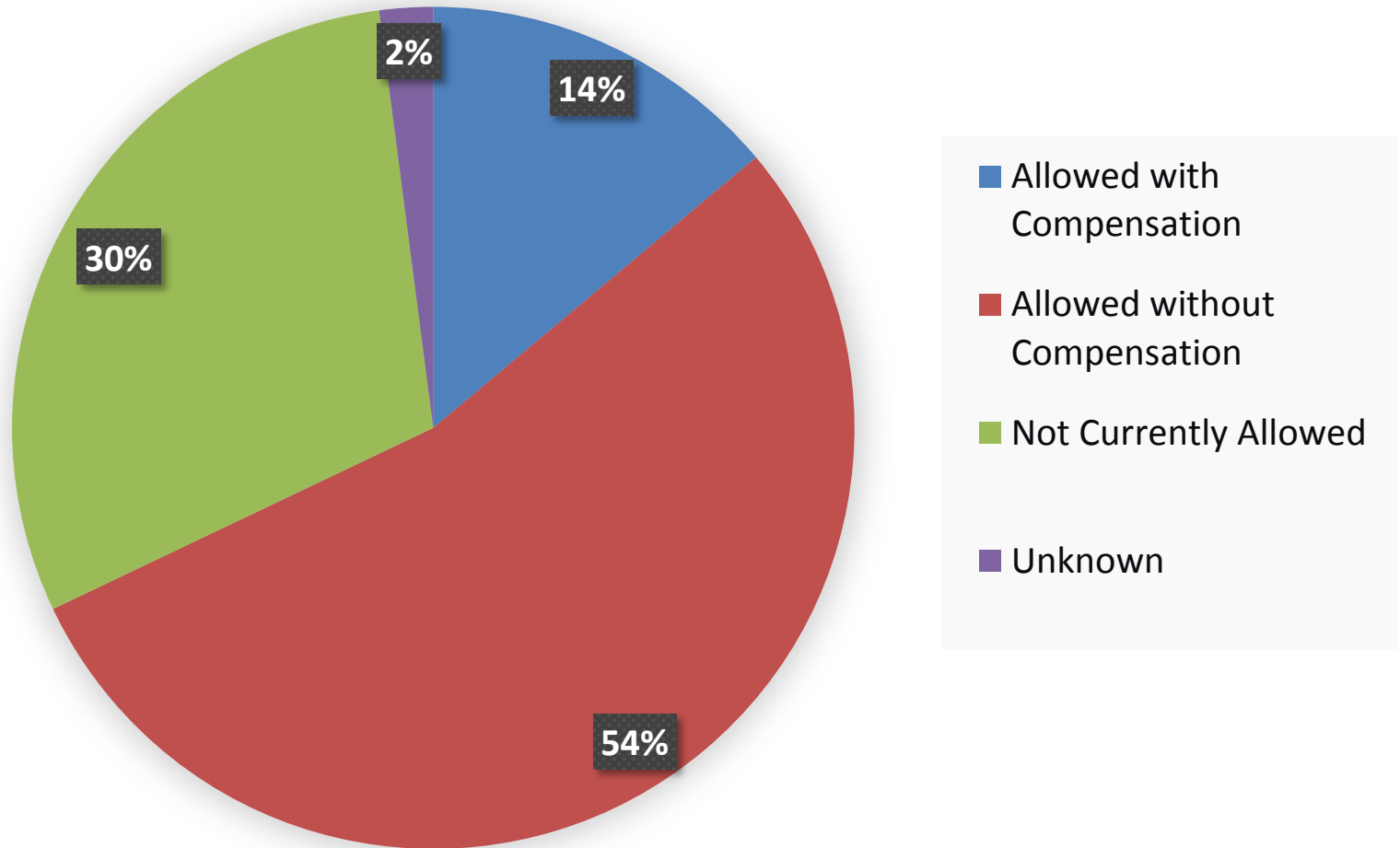
National Mobile Data Survey Results

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



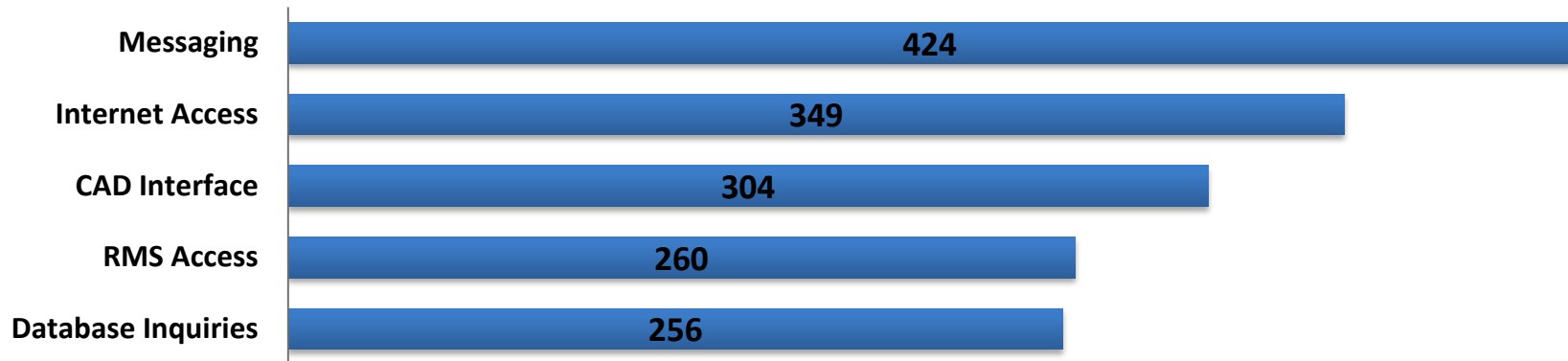
National Mobile Data Survey Results

Use of Personal Devices (All Agencies)

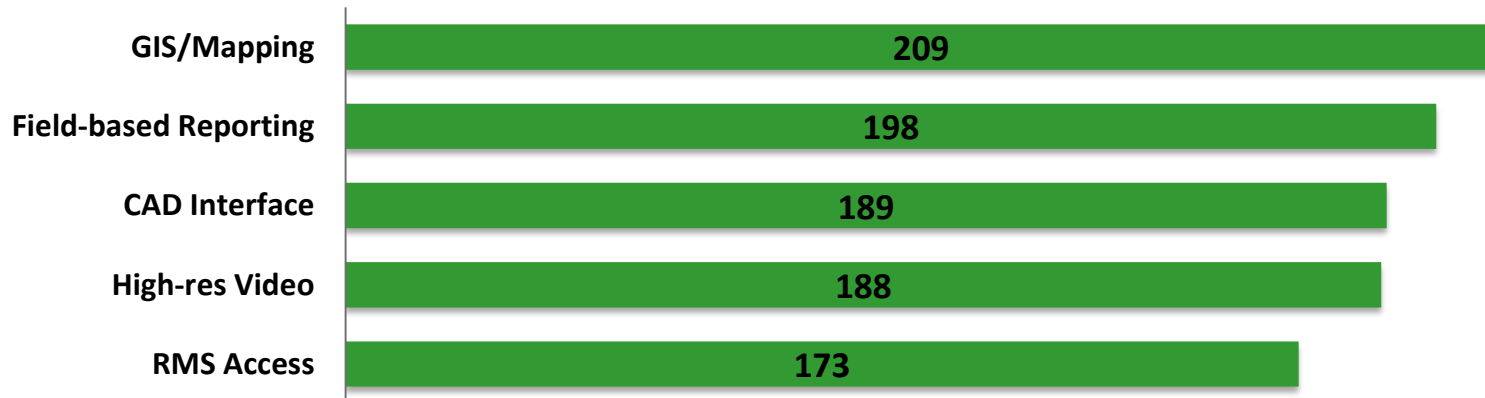


National Mobile Data Survey Results

Top Current Applications

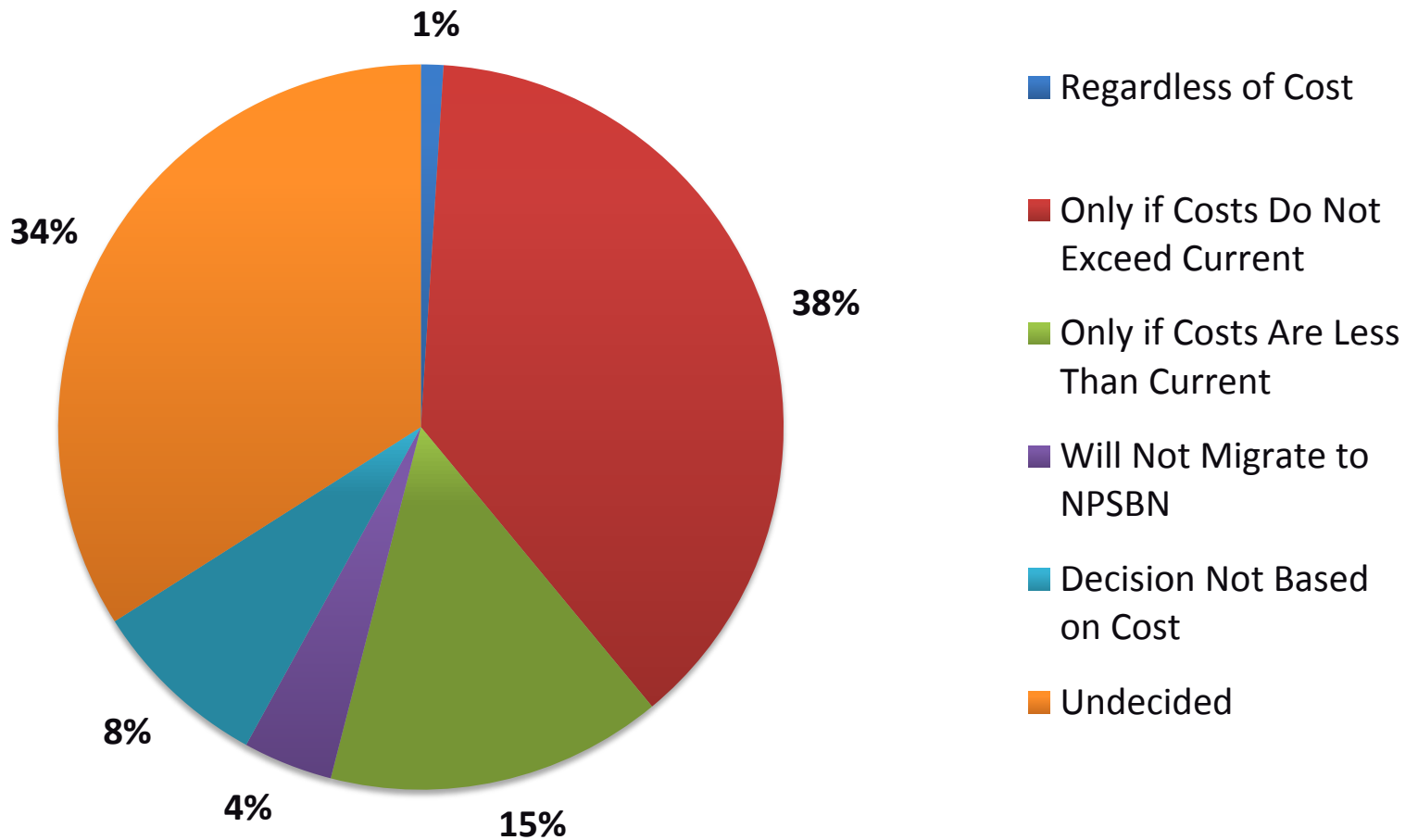


Top Desired Applications



National Mobile Data Survey Results

Cost as a Factor in Decision to Migrate to NPSBN



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



Homeland
Security

FOR OFFICIAL USE ONLY