

RESEARCH AND ANALYSIS

The First Phase of our Work

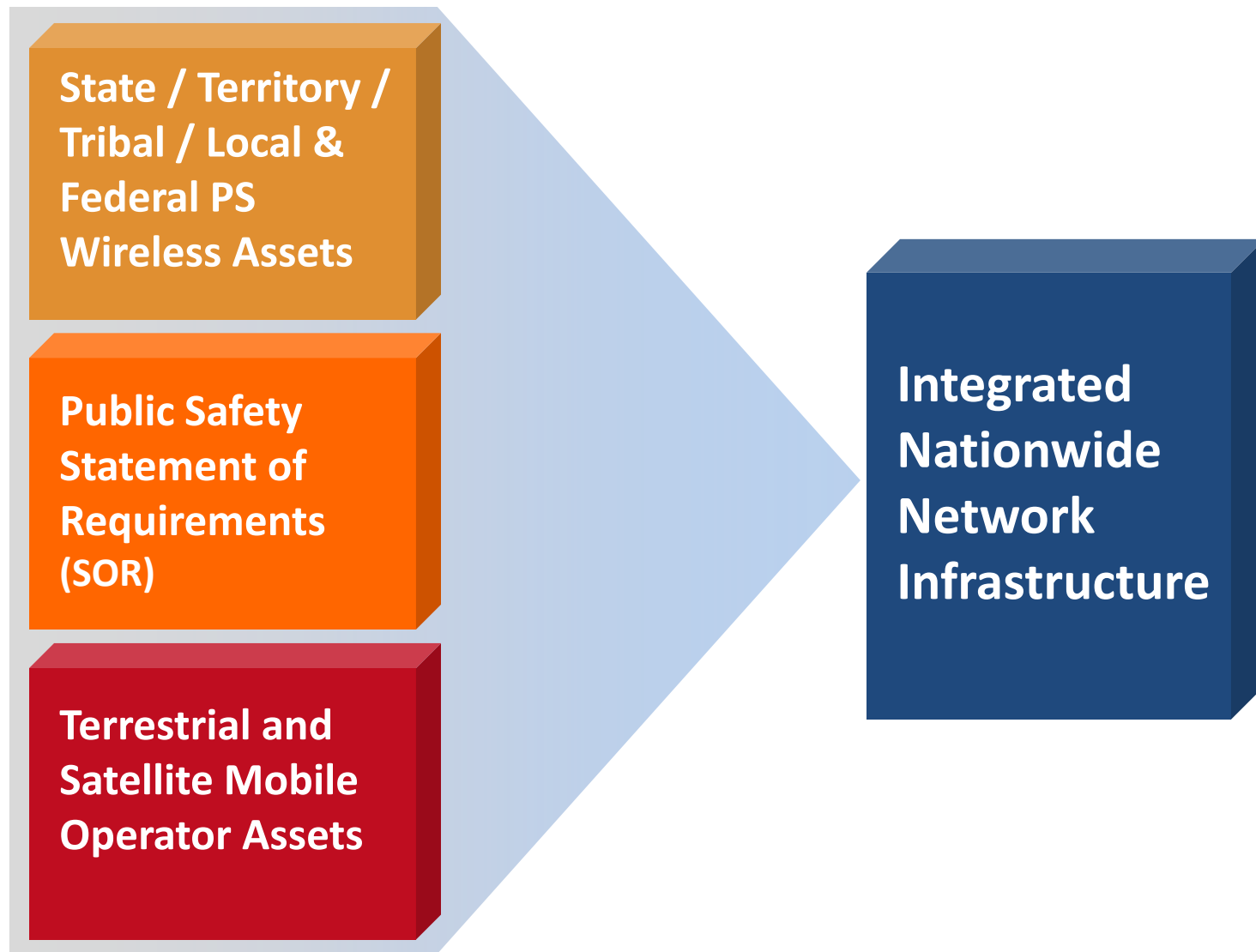


This section is about...

- Our current thinking
- Concepts and analysis, **not** decisions
- Work we need to complete to move FirstNet forward
- Analysis that can't be completed until we get input from you
- Models that help us understand what is possible, technically and financially



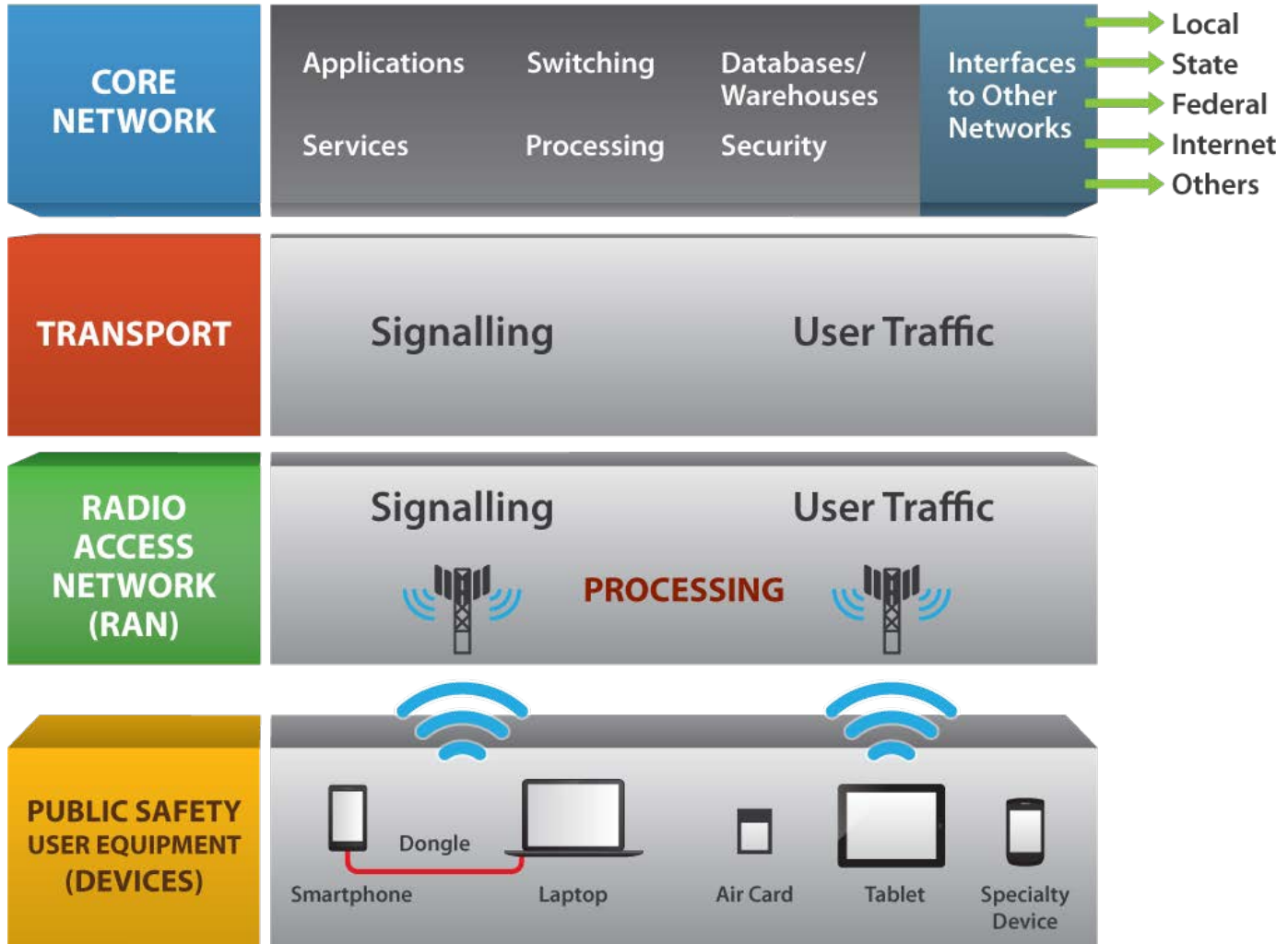
FirstNet integrates public safety requirements and assets.



Working with the public safety community, we will define what “public safety grade” means.

FirstNet Attribute	Defining Public Safety Grade
Coverage Area	“Where Public Safety needs it” (Geographic)
Reliability	“You can bet your life on it”
Levels of Backup	“Multiple fallback options”
Emergency Communications	“Your trusted resource”
Group Communications	“Essential to teamwork”

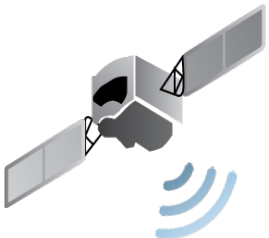
Fundamental building blocks that make up a network



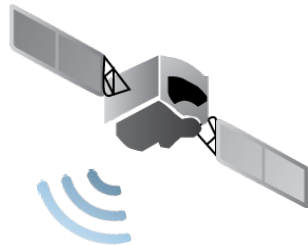
Network Analysis Areas

- **Architecture** – which FirstNet nationwide network (FNN) configuration will best serve public safety users now and into the future?
- **Coverage and Capacity** – how will the FNN perform during major events, large-scale disasters, extended periods without power?
- **Dynamic Priority and Control** – situational management will be needed to support field operations with immediate access needs. How will FNN support this requirement at the nationwide and local level when established hierarchies need to take the lead?
- **Security** – how will the FNN deliver and store data securely and keep confidential and sensitive information safe from cyber or physical attack?
- **Resiliency** – how will FNN ensure the network will perform when the network itself may be damaged during a disaster? How can multiple networks be employed to achieve high reliability?

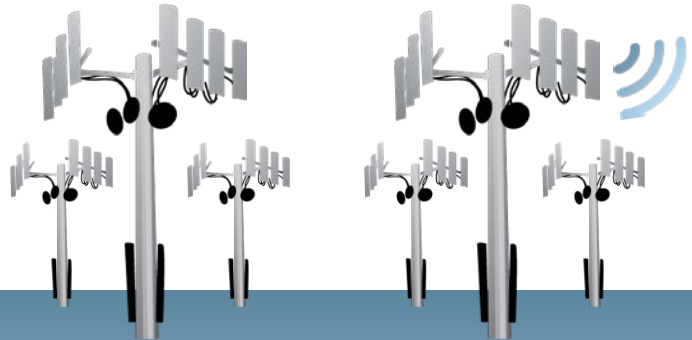
Diverse Coverage Architecture: considering a “3-in-1” Approach: Terrestrial + Satellite + Deployable



**#2:
Mobile Satellite Systems**



**#1:
Multiple Terrestrial Mobile Systems**



**#3:
Deployable Systems**

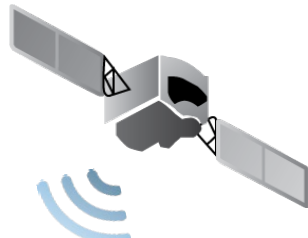


Public Safety User

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



**#2:
Mobile Satellite Systems**



**#1:
Terrestrial Mobile System**

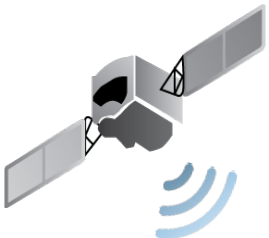


**#3:
Deployable Systems**

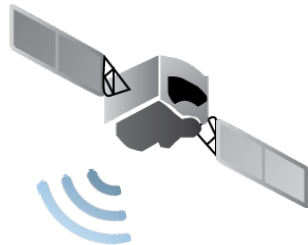


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Diverse Coverage Architecture: considering a “3-in-1” Approach: Terrestrial + Satellite + Deployable



**#2:
Mobile Satellite Systems**



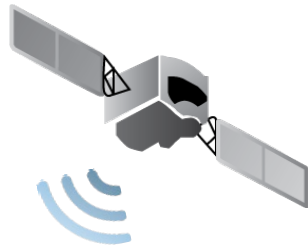
**#3:
Deployable Systems**



Public Safety User

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

**#2:
Mobile Satellite System**



**#3:
Deployable Systems**



Public Safety User

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

**#3:
Deployable Systems**

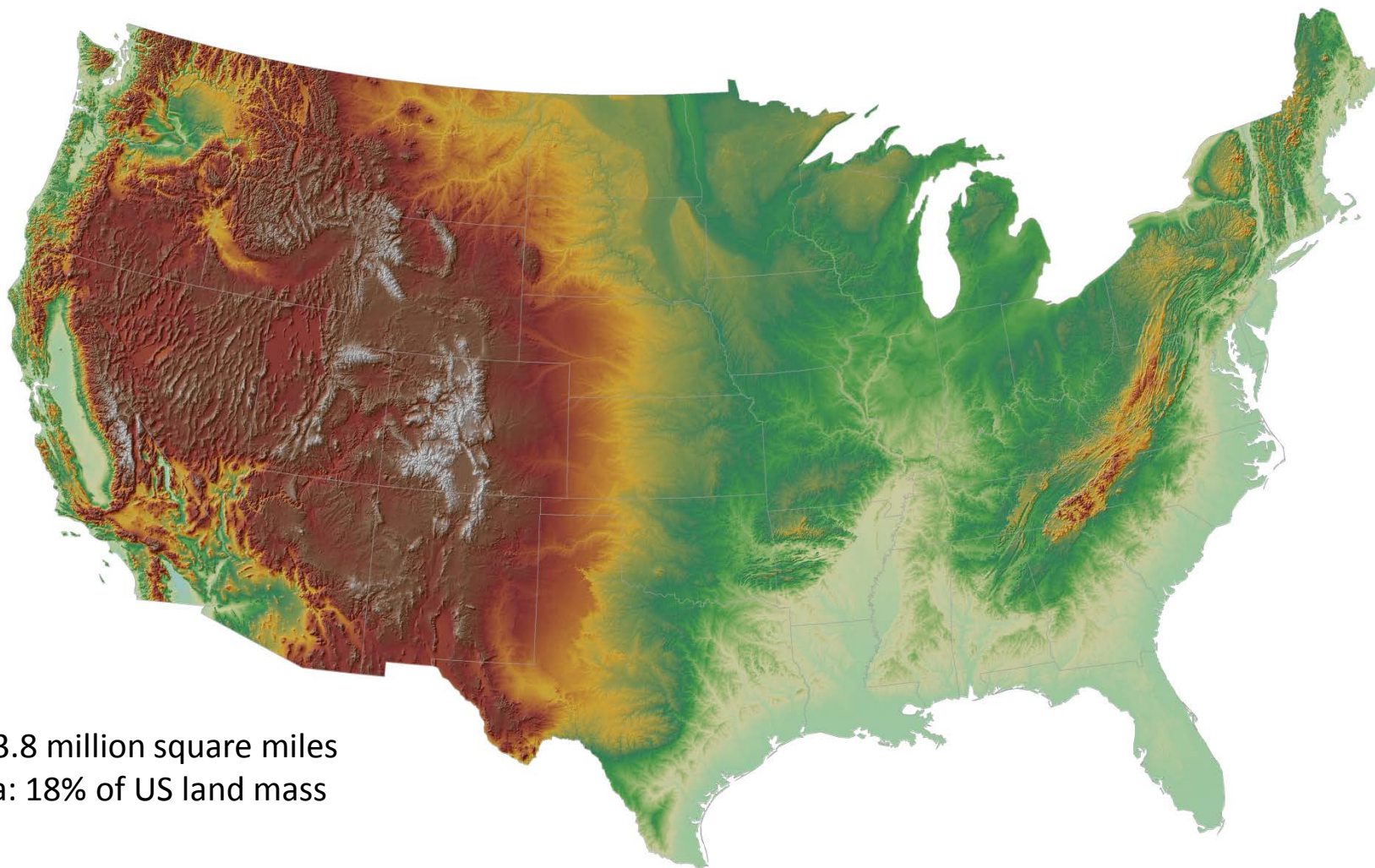


Public Safety User

Radio Access Network Analysis Components

- **RAN Planning:** Analysis consists of radio planning assumptions and engineering rules to optimize coverage, capacity and performance for a nationwide deployment.
- **Cell Count Reference Point:** Initial modeling has shown that approximately 35,000 sites could cover 99.6% of the population and the nation's highway system.
 - This is an initial model and estimate and subject to change.
 - Requirements and data from each of you will adjust the model and improve it.
- **Cell Range:** Several techniques for extending rural coverage are under evaluation.
- **Radio Planning Tools:** Planning tools will be used to provide a consistent prediction of radio coverage and for comparison of RAN alternatives.

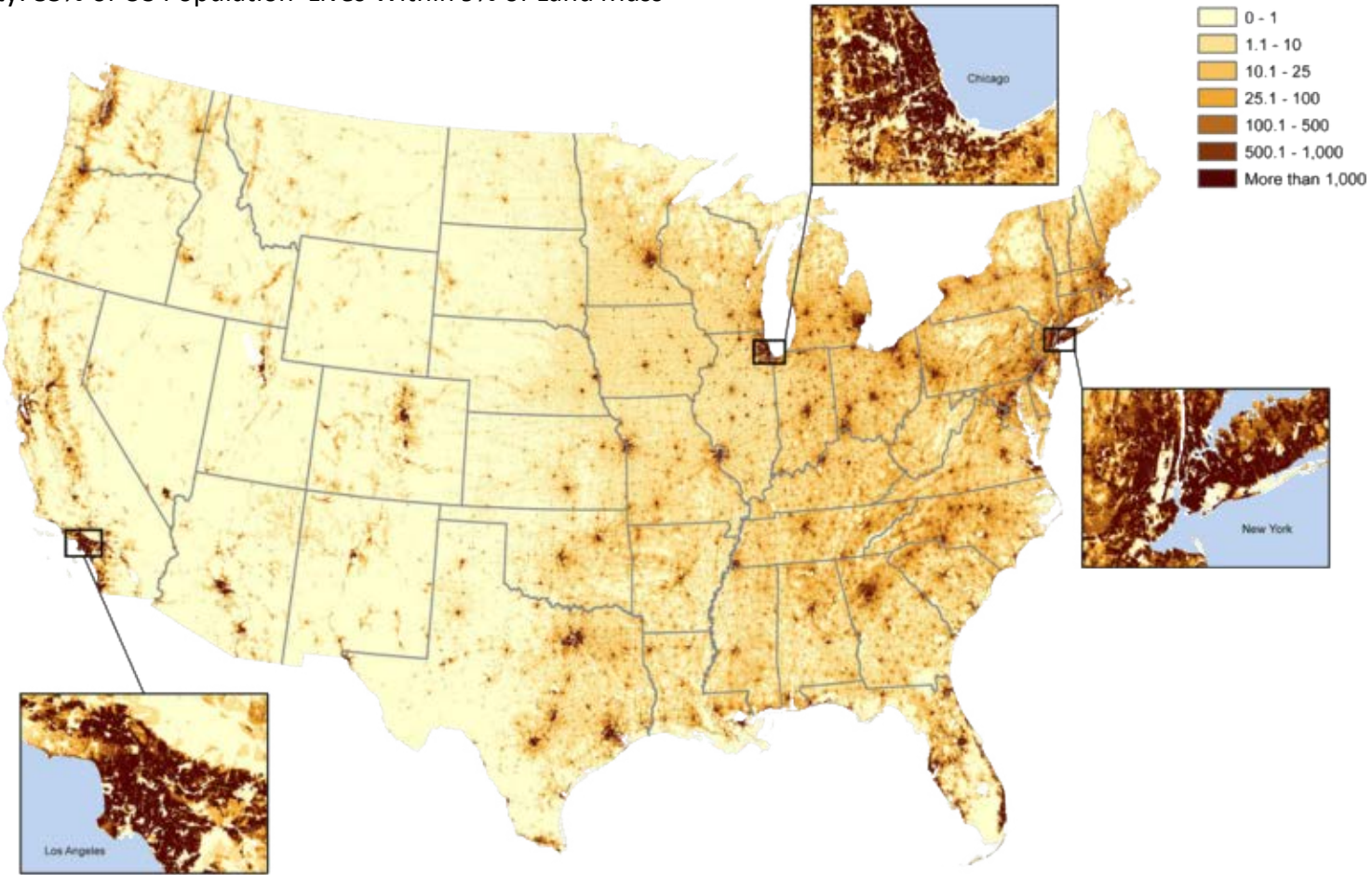
Terrain Ruggedness: a major impact on radio propagation



USA: 3.8 million square miles
Alaska: 18% of US land mass

Population is a starting point, but public safety events don't always happen where people live.

Population Density: 85% of US Population Lives Within 9% of Land Mass



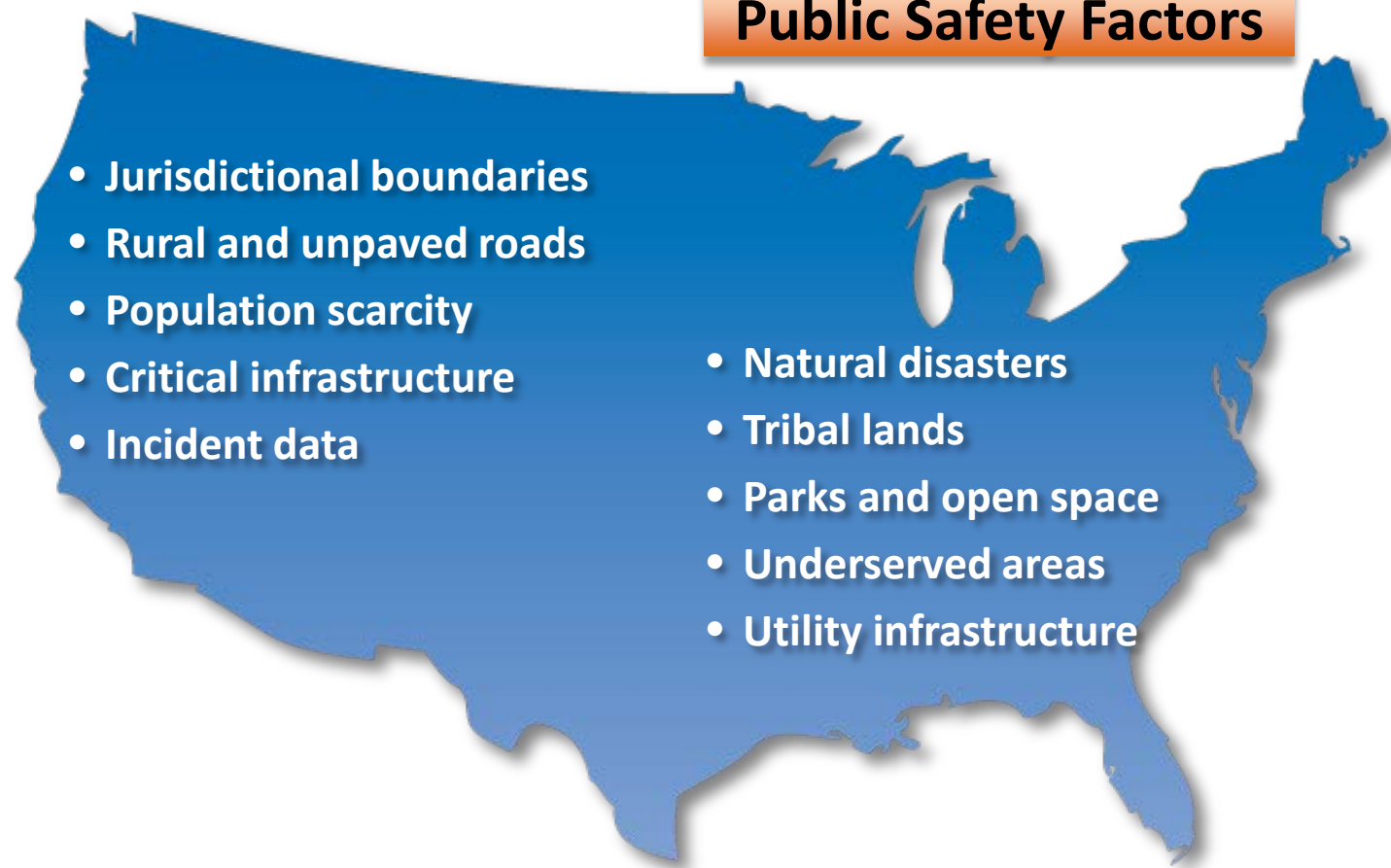
Our nation's highways are assets to leverage.



National Highway System: as Defined by the Federal Highway Administration

FirstNet coverage considerations go far beyond those of commercial networks.

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

Core Network Analysis Components

- **Nationwide Core Network Architecture:** Most public safety traffic is local. To optimize routing, ensure latency requirements and implement local control, a distributed nationwide architecture is being conceptualized.
- **National Core Network Hubs:** FirstNet is analyzing multiple regional locations with redundant transmission systems to be located in or near existing hardened, fiber backbone networks.
- **National Data Centers:** The RFI FirstNet will issue will welcome state-owned assets that may represent lower cost alternatives. They must also meet FISMA and TIA security requirements.
- **Network Services and LTE / Public Safety Standards:** NPSTC requirements will be supported at launch. FirstNet will help drive critical public safety functionality into the next LTE standards releases.

The majority of tower failures are due to power, not the elements.



- Public-safety grade back up strategies include ability to “de-feature” to extend battery life
- Solar
- Diesel generators

Network resilience, fault tolerance, redundancy, diversity in all aspects of the network and its operations.

RESILIENCY

PHYSICAL

Building to sustain network in adverse conditions

OPERATIONAL

Maintaining the network to ensure reliability (spares management and preventative maintenance, primary assets recovery after outages)

REDUNDANCY

PHYSICAL

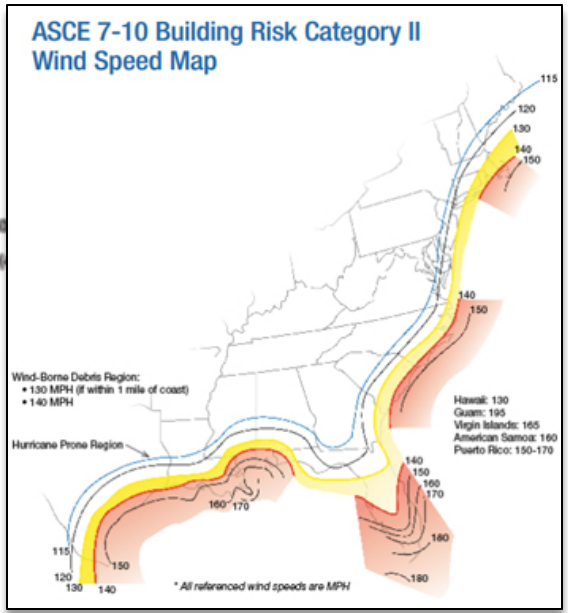
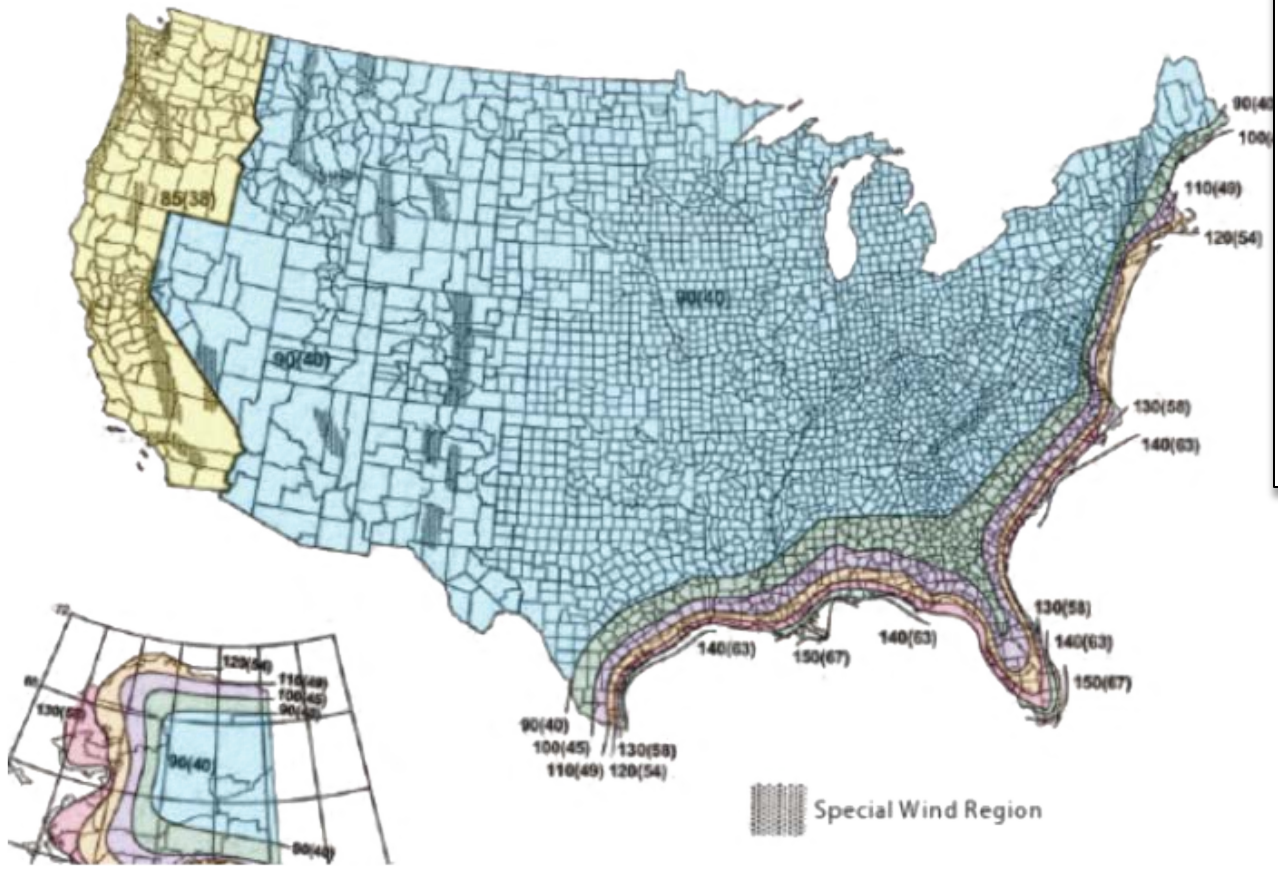
Avoiding single points of failure across the network (power, backhaul, sites, coverage)

OPERATIONAL

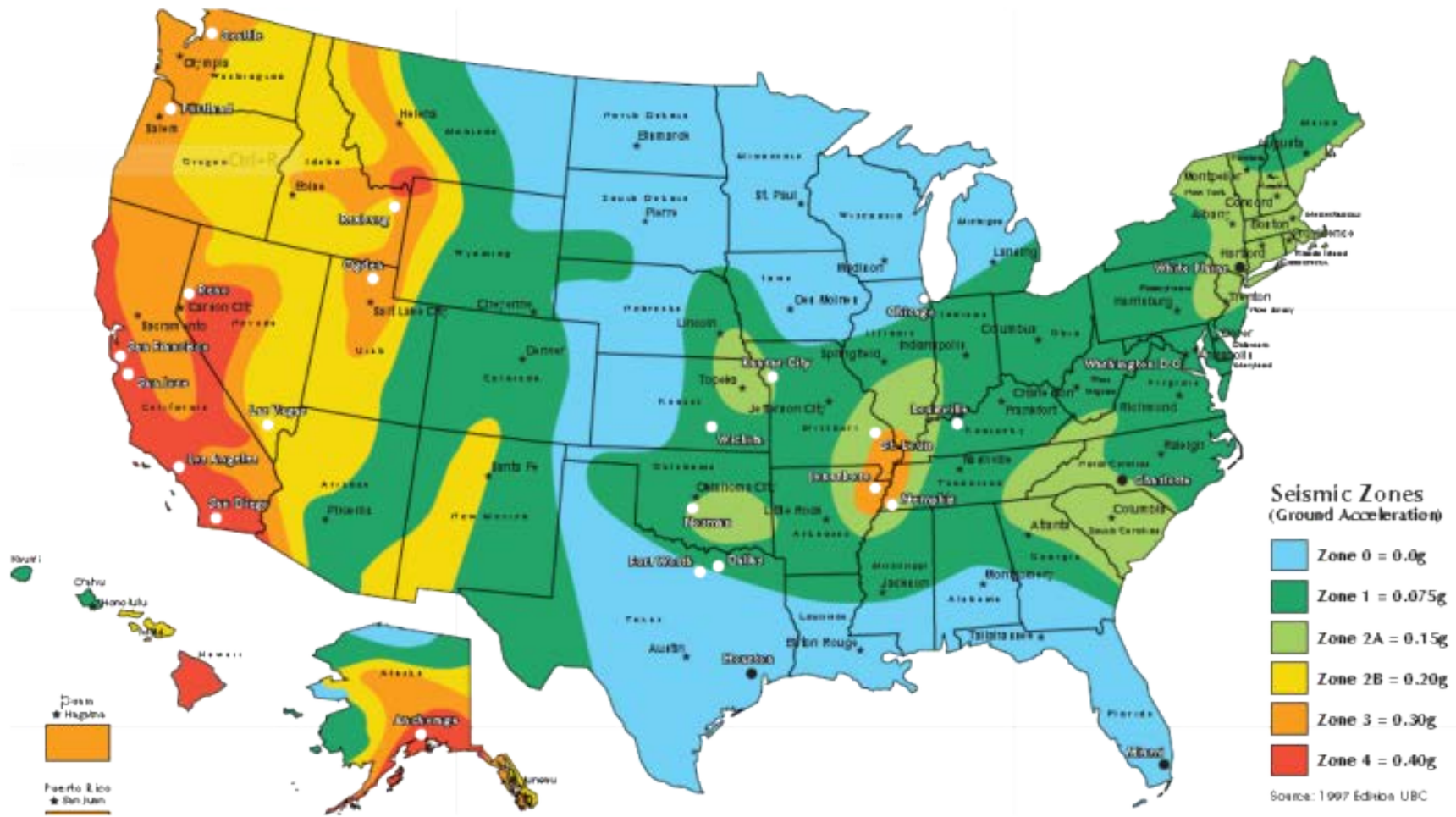
Providing backup equipment (Deployables) and technology (commercial carrier roaming/direct mode) that facilitate operations during primary network failure

Wind zones will require more robust hardening...

REV G 3-SECOND BASIC WIND SPEED MAP



...as will seismic zones. Hardening is not one size fits all.



Dynamic Priority and Control

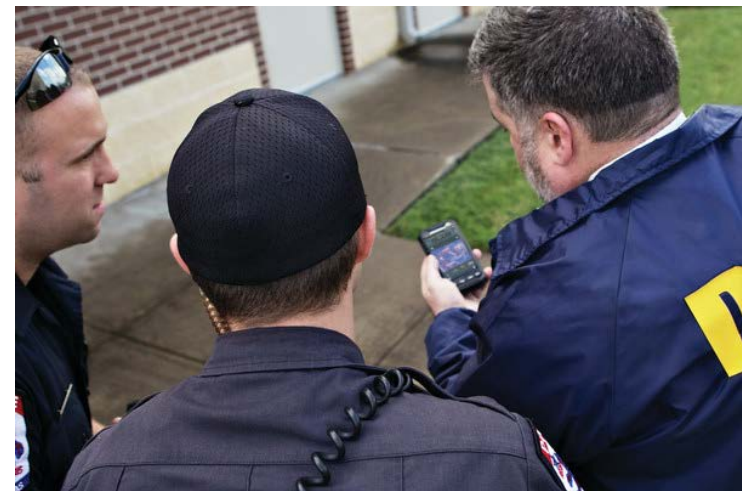


- During emergencies, some public safety users, applications and situations require elevated access levels depending on various factors and authorizations.
- FirstNet needs a prioritization scheme that can be enacted at the local level. This is especially true in large-scale events where established hierarchy with role-based levels of priority will be key to maintain services to first responders.
- Need to define a nationwide process for **dynamic priority access**
- Solutions for prioritization will be tested and evaluated

DEVICES AND APPS



All devices – smartphones, tablets, and supporting utilities, components and software – must be public safety grade.



An RFI was issued for devices on April 15, 2013.

In the future, a vibrant developer community contributing useful apps for first responders.

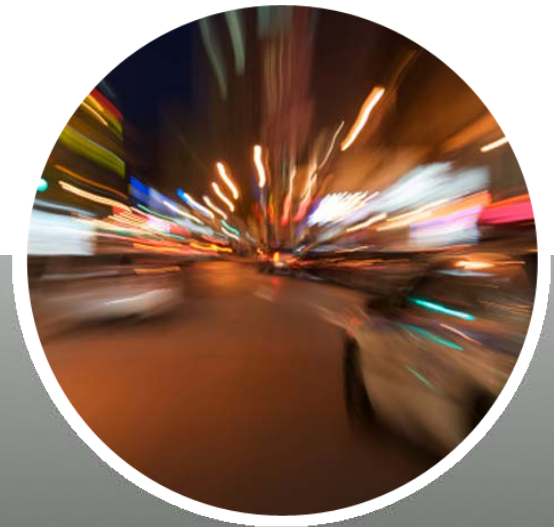


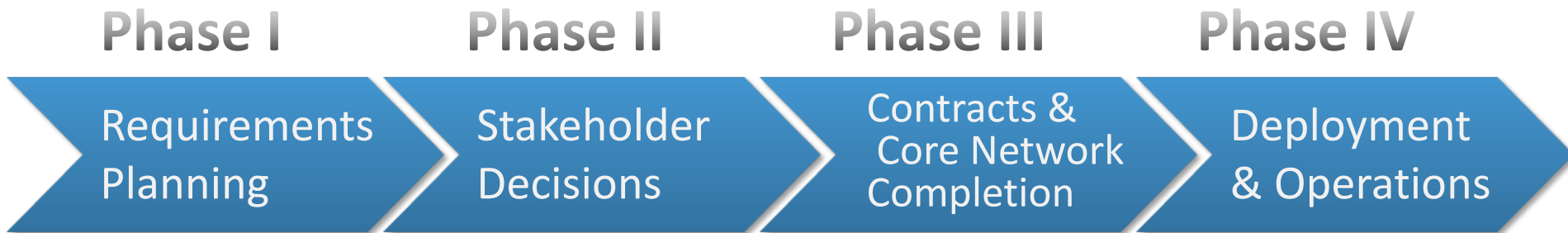
- **TODAY:** work with developers to showcase existing and new apps
- **FUTURE**
 - All apps would be 100% vetted by FirstNet prior to availability
 - FirstNet will define new standards:
 - Performance
 - Security
 - Identity management, etc.
 - Work to build a developer community with expertise in public safety needs



PROJECT PHASES

Timeline and Gating Items





Phase I



- Stakeholder consultation (state, local and tribal)
- User and network requirements
- Network RFIs
- SLIGP Phase 1 - Requirements Gathering
- Initial design concepts documented

Phase II

Requirements
Planning

Stakeholder
Decisions

Contracts &
Core Network
Completion

Deployment
& Operations

- SLIGP Phase 2 - Data Collection
- Core and RAN specifications
- Network RFPs issued
- Pilot Project integration and device planning
- FirstNet business model
- State RAN plan build-out documents issued

Phase III



- Contracts and contractors (operating partners, core, RAN, site development, user support services)
- Core network deployment/integration
- Device original equipment manufacturer (OEM) agreements
- Data center integration
- Initial pilot project (BTOP) integrations

Phase IV

Requirements
Planning

Stakeholder
Decisions

Contracts &
Core Network
Completion

Deployment
& Operations

- Spectrum clearing
- Network deployment
- Network testing/interworking
- Billing/user support services
- Device testing and field deployments
- Operational process trials

FirstNet is Committed to:

- Creating a nationwide architecture and standards with local management and adaptation.
- Working with all key stakeholders to plan, coordinate and optimize the use of existing wireless facilities to reduce network spend.
- Building relationships with all 56 states and territories. Working together from your requirements, we will build a fully-integrated public safety-grade nationwide wireless broadband network which serves first responders and public safety for decades to come.

Please join is in this mission.

CLOSING THOUGHTS



FIRSTNET IS COMMITTED TO:

Balancing the need for input with the desire to make progress.

- We have to invest time listening to all of our stakeholders up front. We need to understand state and local requirements, supplier capabilities and potential operating partner arrangements.

Following the requirements mandated by law that govern how we operate.

- We will leverage existing public safety, wireless operator and utility infrastructure.
- All fees from the use of FirstNet spectrum will be reinvested to build, operate, maintain and improve the network.
- We will operate with transparency but will not make public information that could jeopardize our ability to negotiate the best arrangements for network equipment, devices and services.

Offering public safety-grade services at a cost that's compelling and attractive to users.

- We will build a network that will be tailored to meet the needs of public safety. We will seek out scale economy advantages. We will work to save states millions of dollars by building, managing and maintaining FirstNet on their behalf.

We're committed to listening to you and what your state needs.



FirstNet will build a network for millions of public safety users who need to be able to send data and talk to one another to meet their mission.

Creating FirstNet will require an unprecedented level of public-private partnership, collaboration and shared commitment to the well-being of all Americans.



Thank you.

www.firstnet.gov

Q & A

