RESEARCH AND ANALYSIS

The First Phase of our Work

Craig Farrill

Acting CTO

FirstNet Board Member

FirstNet
U.S. DEPARTMENT OF COMMERCE

This section is about…

- 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
- What FirstNet will be and do for you

Here's our current thinking…

FirstNet has researched many areas to get ready for state consultation.

Network Analysis Areas

- Architecture
- Coverage and Capacity
- Dynamic Priority and Control
- Security
- Resiliency and Reliability

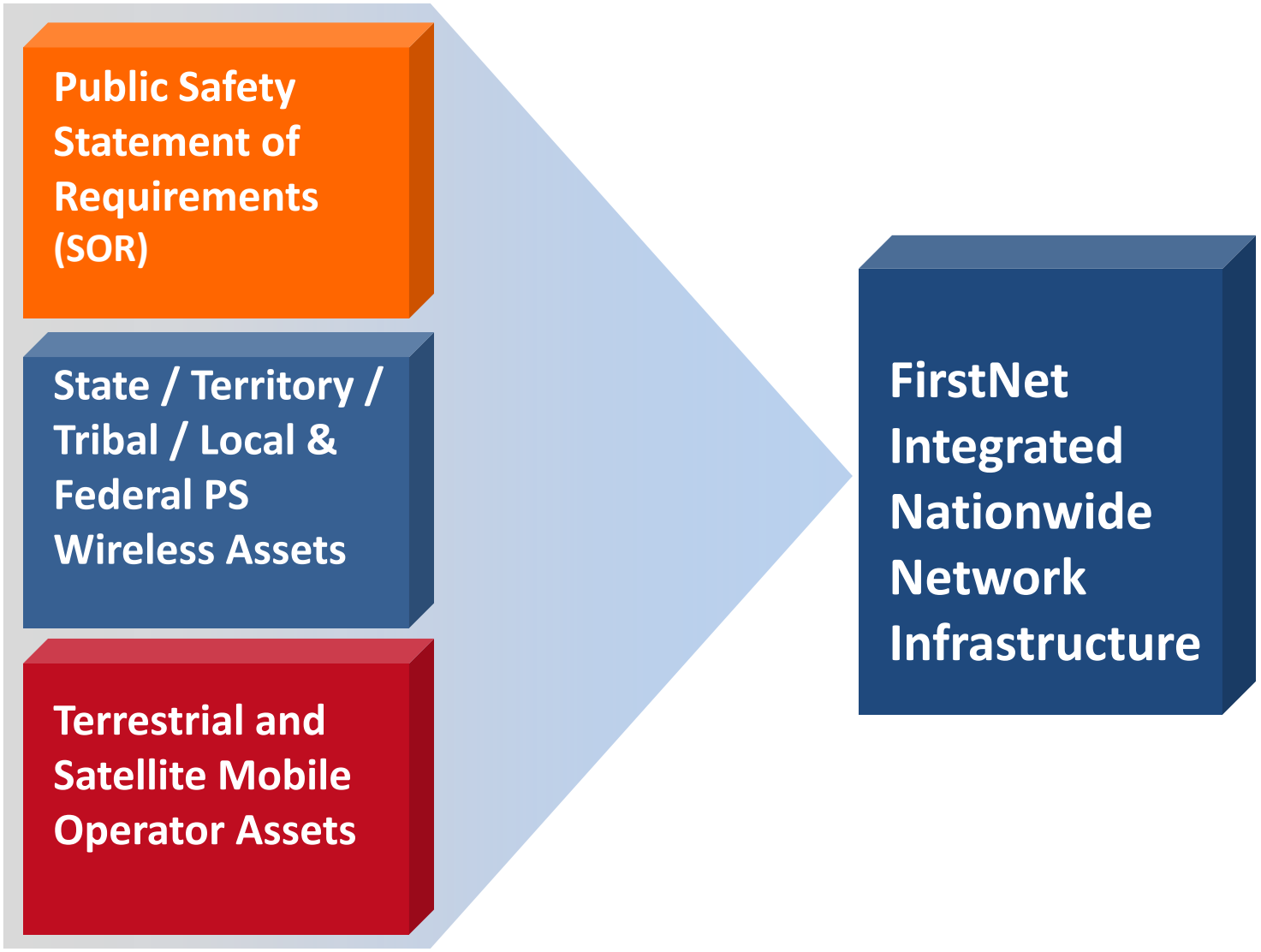
Radio Access Network Analysis Areas

- Performance Optimization
- Cell Range
- Radio Planning Criteria

Core Network Analysis Areas

- Core Architecture and Standards
- Distributed Hubs
- Data Centers

FirstNet will integrate public safety requirements and assets.



What will FirstNet do for you?

Communication

- Video: 1-to-many
- Messaging
- Images
- Group Text
- Voice: Non-Mission Critical

Applications

- Your applications (Private, Selective sharing)
- FirstNet Applications
- Syndicated Applications

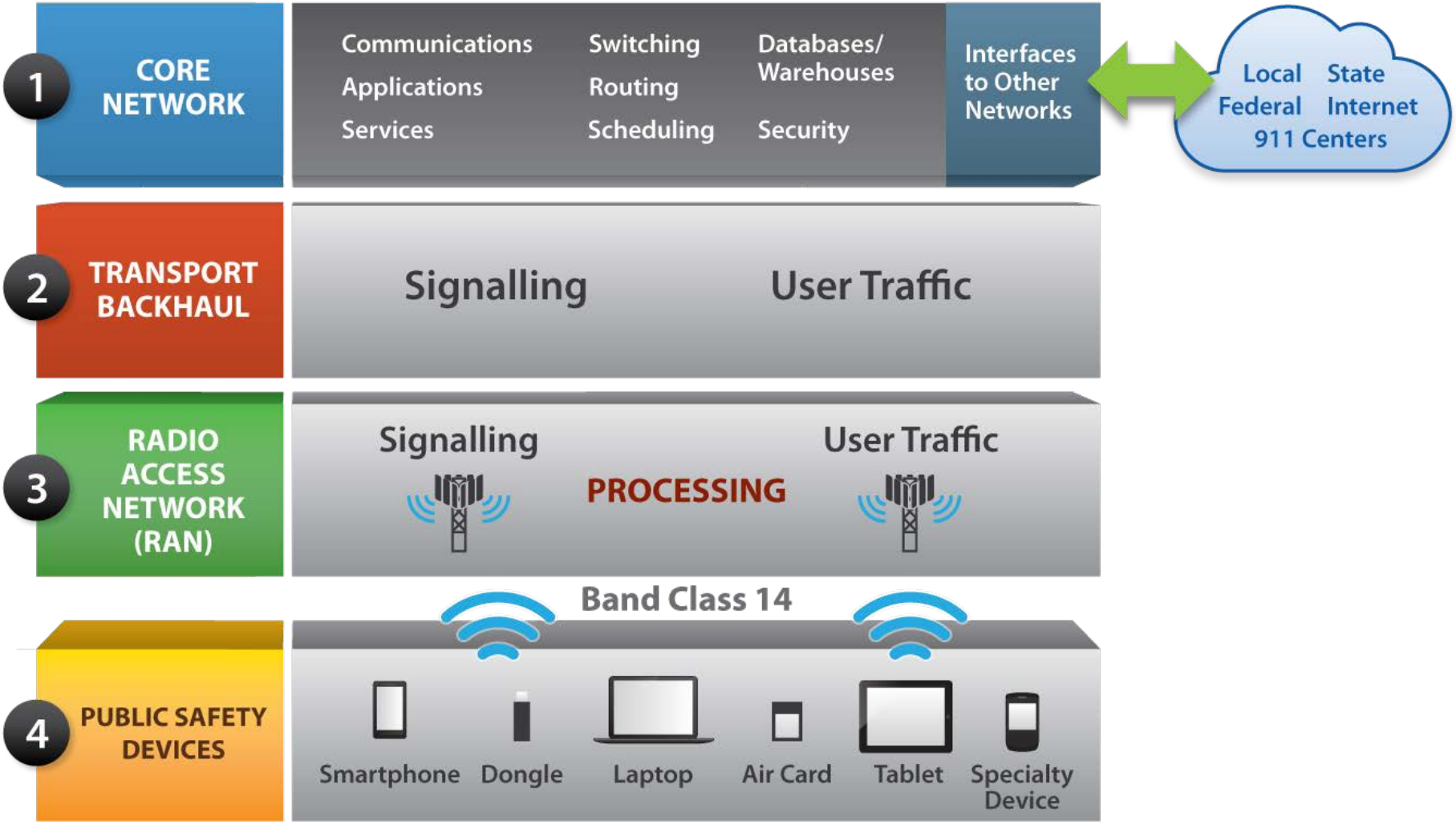
Services

- Data Storage
- Recordkeeping
- Search
- Databases (CJIS, etc.)

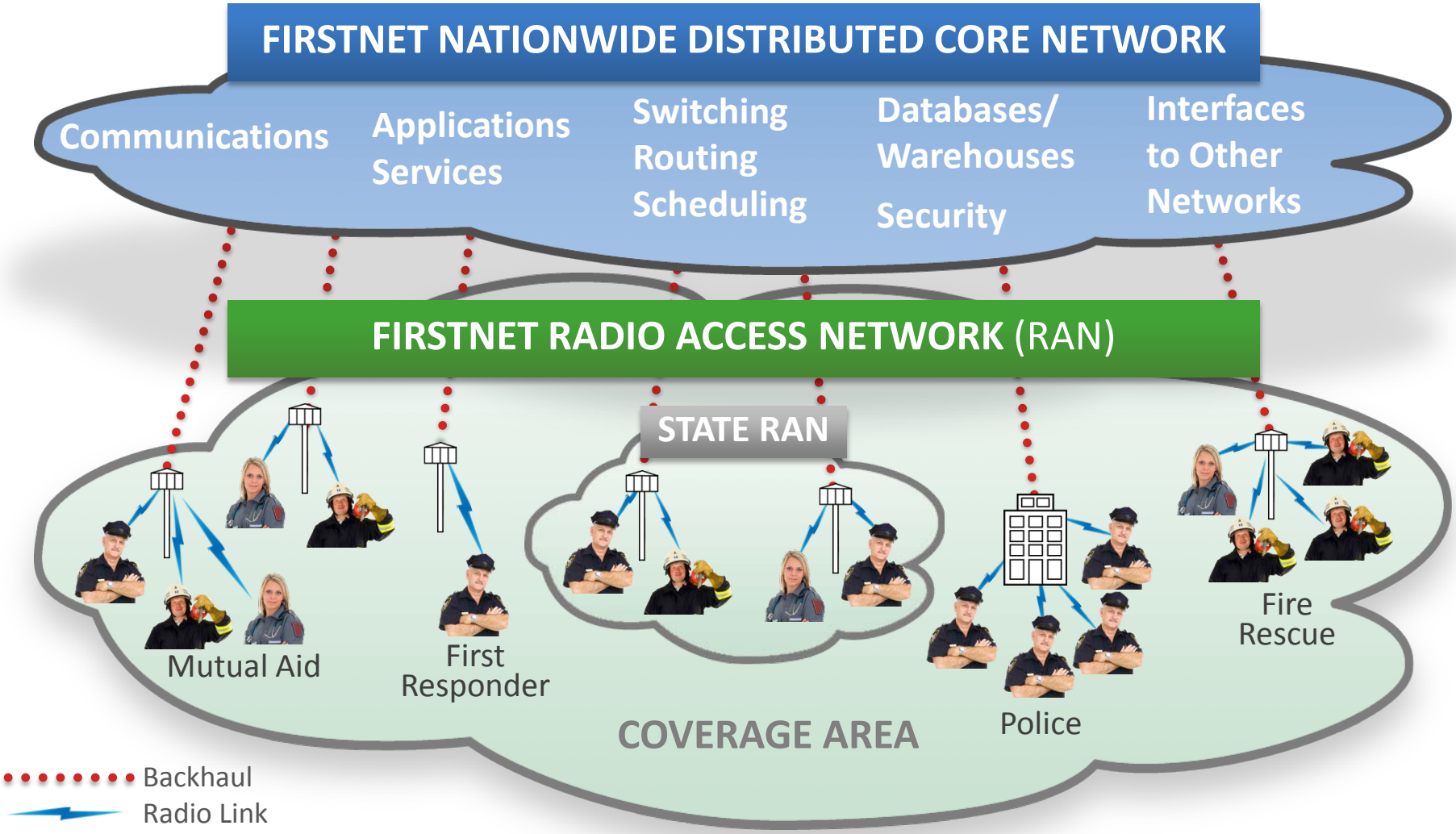
Capabilities

- NOC Status
- Activation
- Product Ordering
- Dynamic Priority Access

Four fundamental building blocks that make up a network



FirstNet: Nationwide Core and Local Radio Access Networks

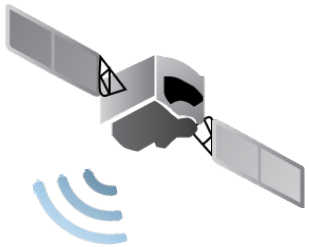


Working with the public safety community, we will define what "public safety grade" means.

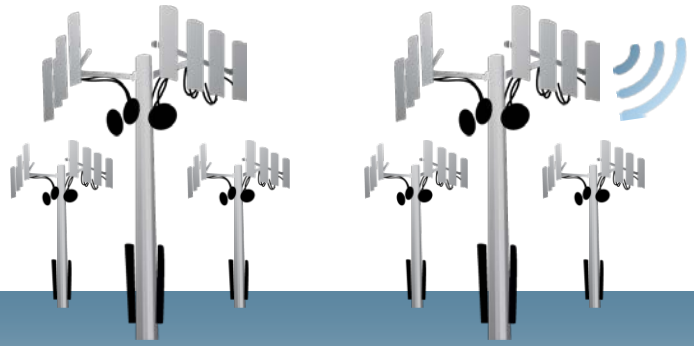
FirstNet Attribute	Defining Public Safety Grade
Coverage	"Where public safety needs it" (Geographic)
Reliability	"You can bet your life on it"
Resiliency	"Multiple back-up options"
Emergency Communications	"Your trusted resource"
Group Communications	"Essential to teamwork"

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

#2:
Mobile Satellite Systems



#1:
Multiple Terrestrial Mobile Systems

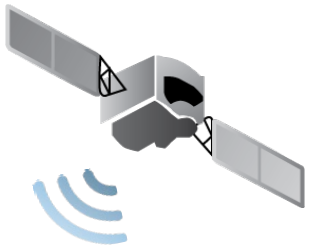


#3:
Deployable Systems

Public Safety User

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

#2:
Mobile Satellite Systems



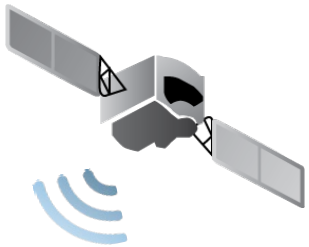
#1:
Terrestrial Mobile System

#3:
Deployable Systems

Public Safety User

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

#2:
Mobile Satellite Systems

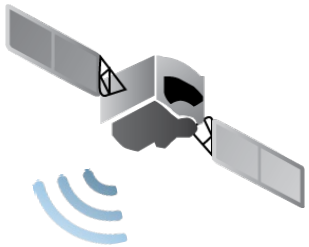


#3:
Deployable Systems

Public Safety User

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

#2:
Mobile Satellite System



#3:
Deployable Systems

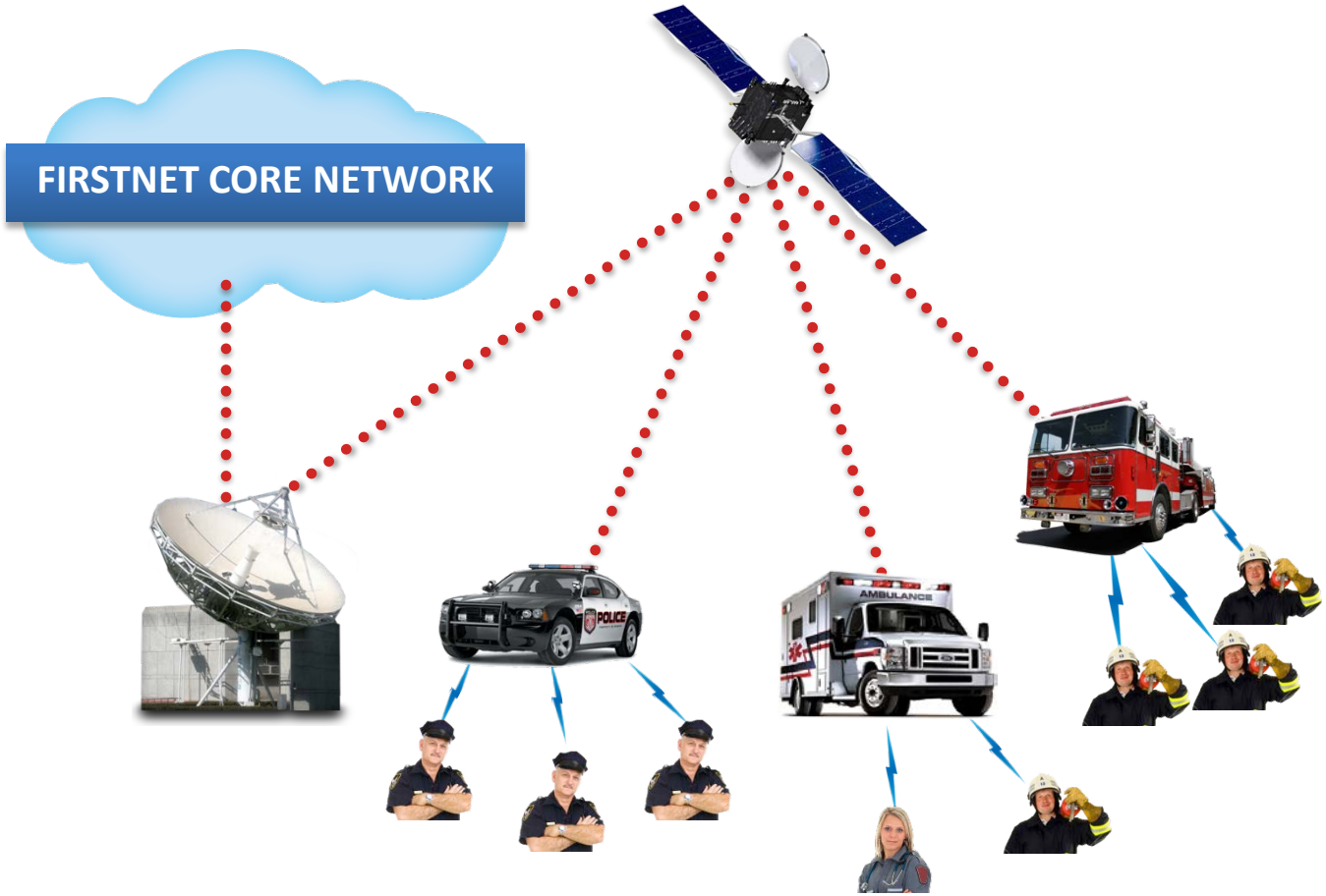
Public Safety User

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

#3:
Deployable Systems

Public Safety User

Using satellite to connect to FirstNet Core services and applications.

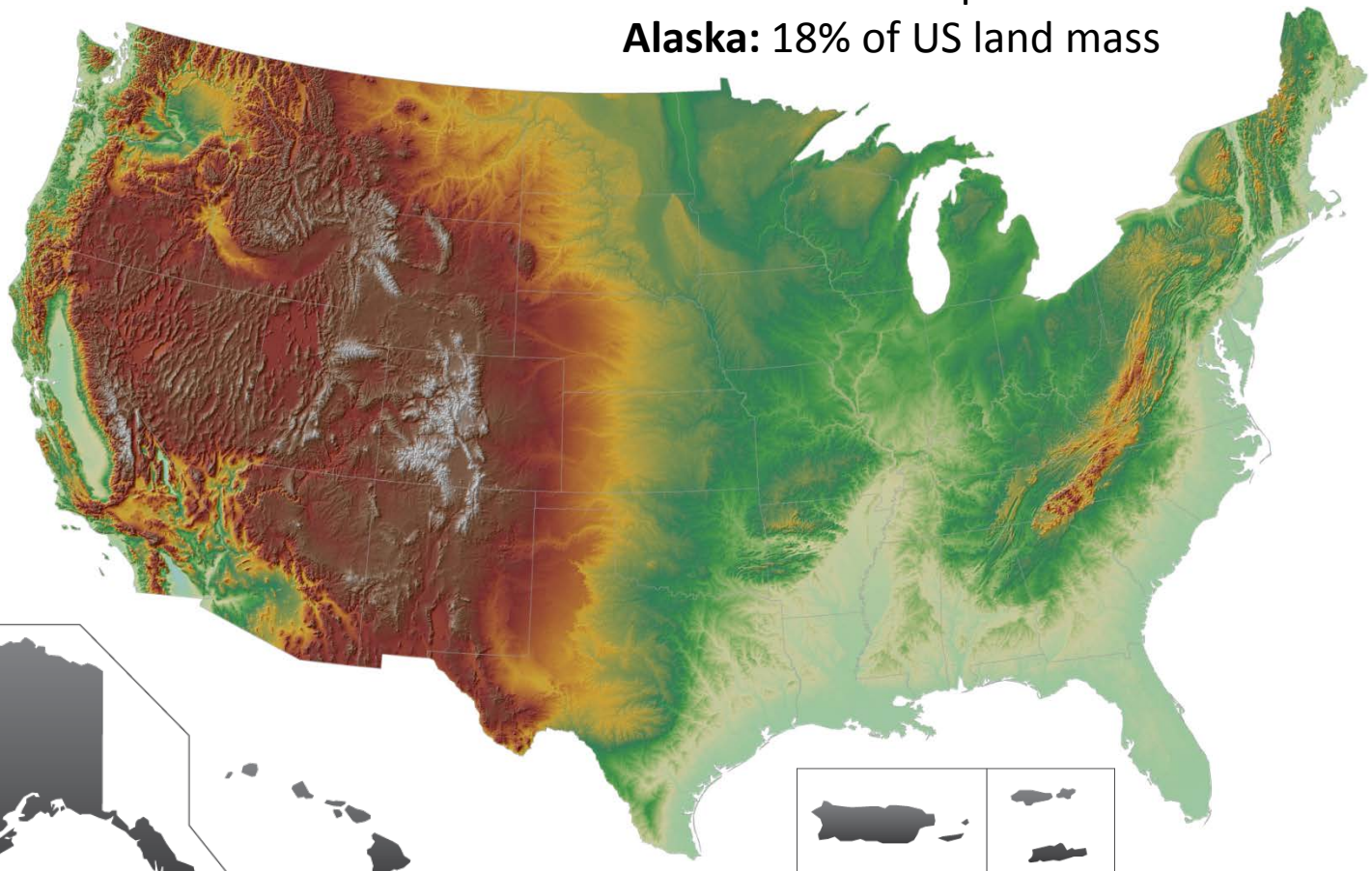


BENEFITS

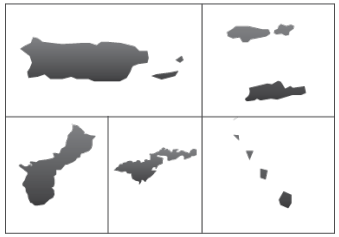
- A vehicle-mounted and powered FirstNet BC14 PicoCell
- Local coverage in and around vehicle
- Works wherever satellite data links can be established
- Can serve:
  - Rural areas
  - Tribal lands
  - Wilderness
  - Parks and federal lands

Terrain Ruggedness: a major impact on radio propagation

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

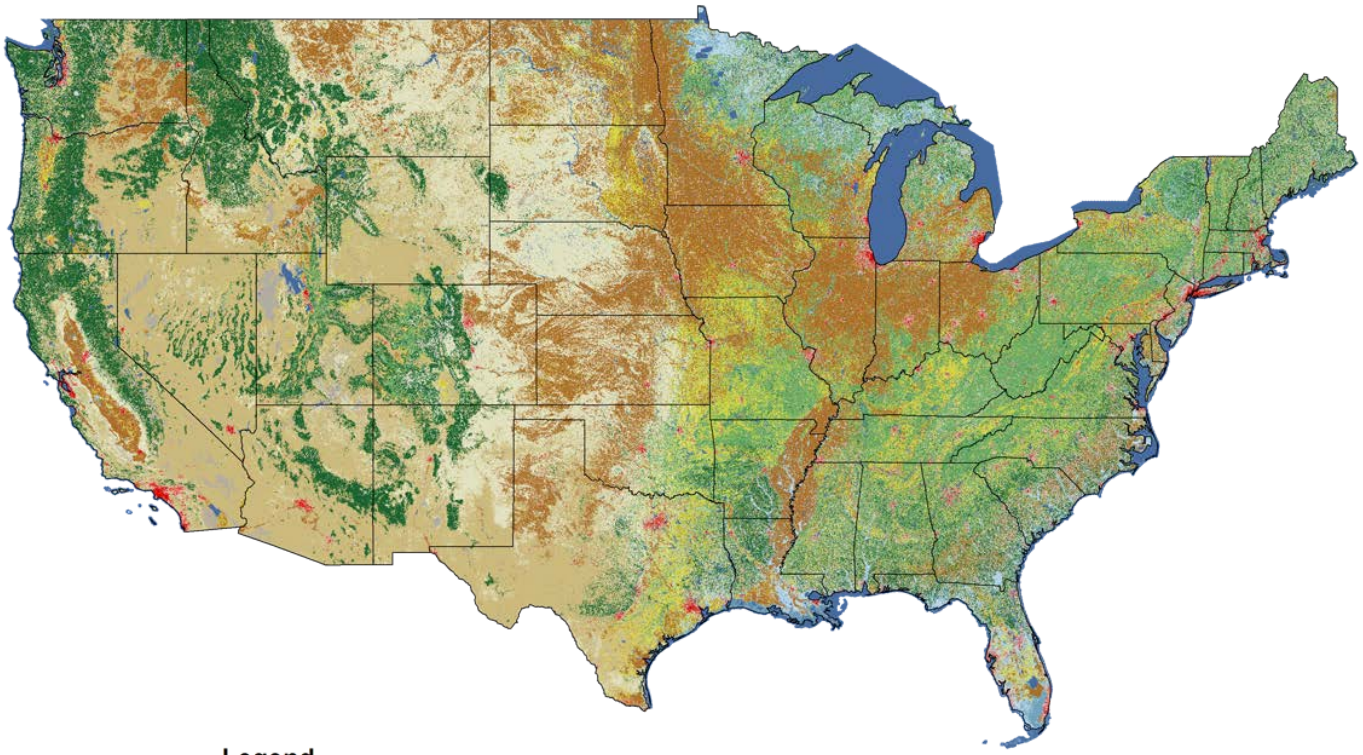


Terrain data for Alaska and Hawaii not immediately available



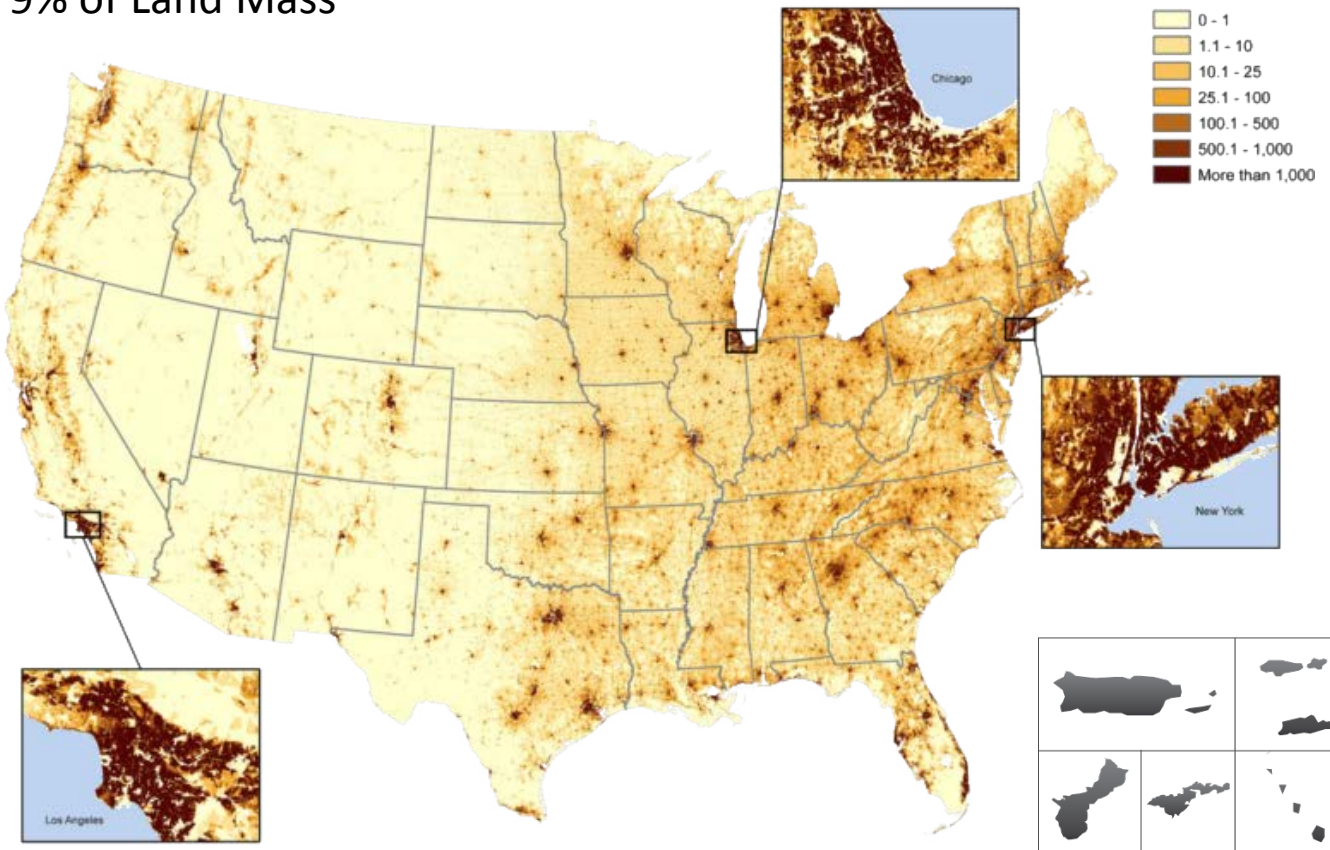
Terrain data for U.S. territories not immediately available

Land use is significant to coverage planning.

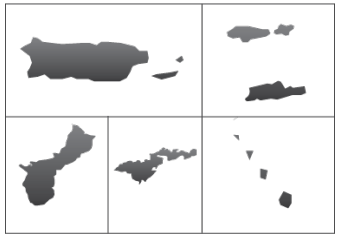


Population is a starting point, but public safety events don't always happen where people live.

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

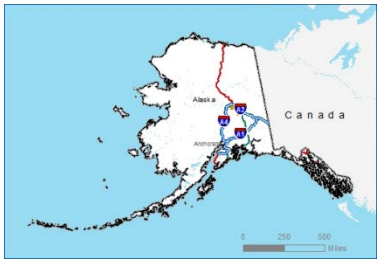


Population data for Alaska and Hawaii not immediately available



Population data for U.S. territories not immediately available

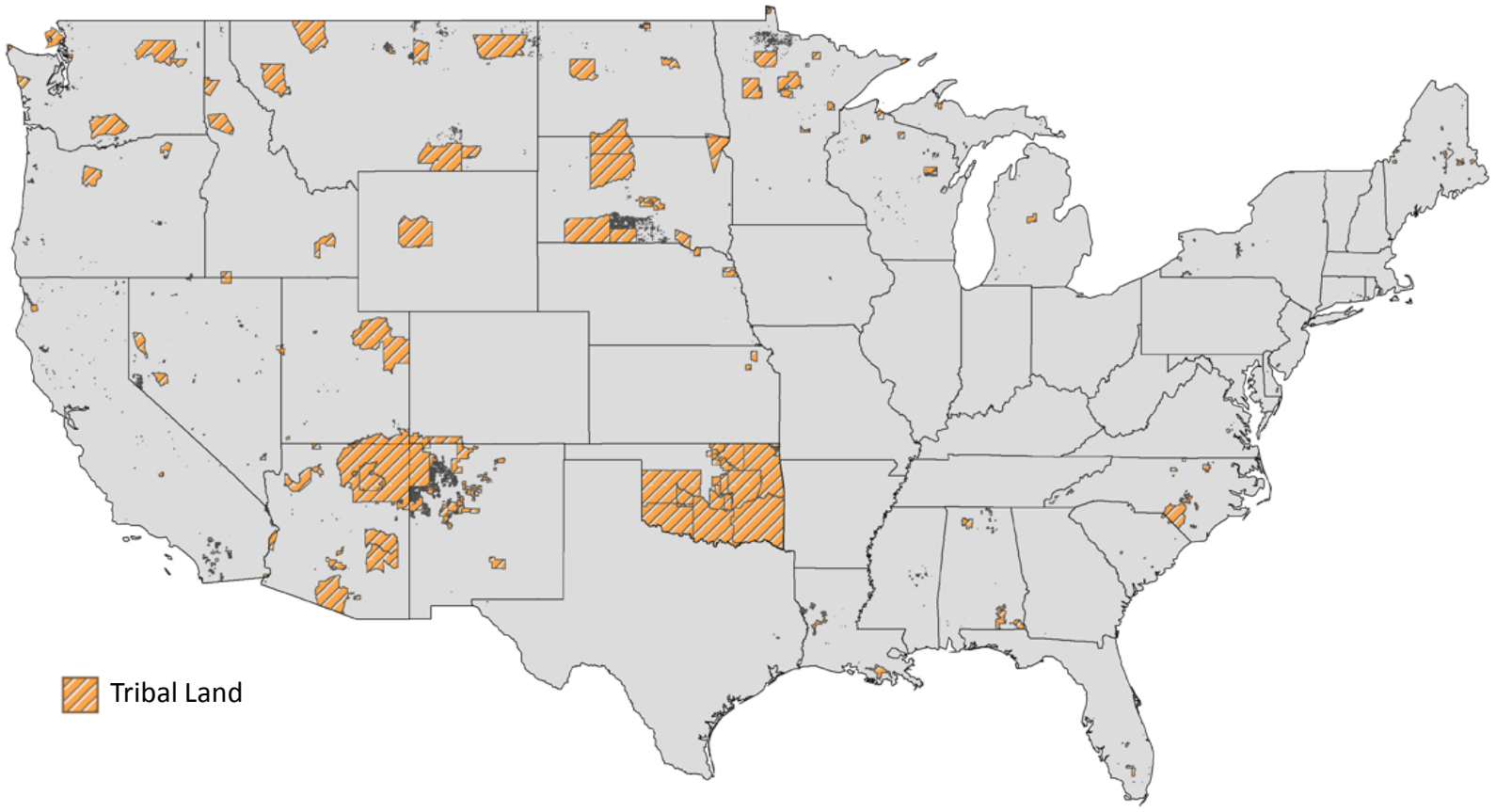
Our nation's roads and highways are used extensively by first responders.



Highway data for U.S. territories not immediately available

National Highway System: as Defined by the Federal Highway Administration

FirstNet has a mandate to provide rural coverage which includes tribal lands.

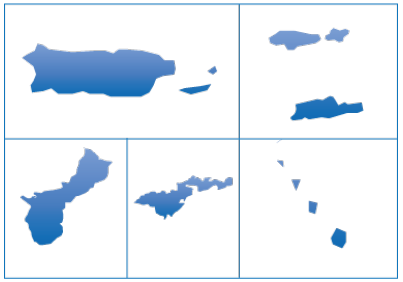


FirstNet coverage considerations go far beyond those of commercial networks.

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



RELIABILITY

The majority of cell site outages are due to loss of power and data links.

Public safety-grade design includes:

- Extended battery life
- Back-up power systems
- Diverse cell site links
- Diverse cell site link technology (fiber, coax, microwave, telco)

A redundant and diverse network is essential for reliability.

REDUNDANCY

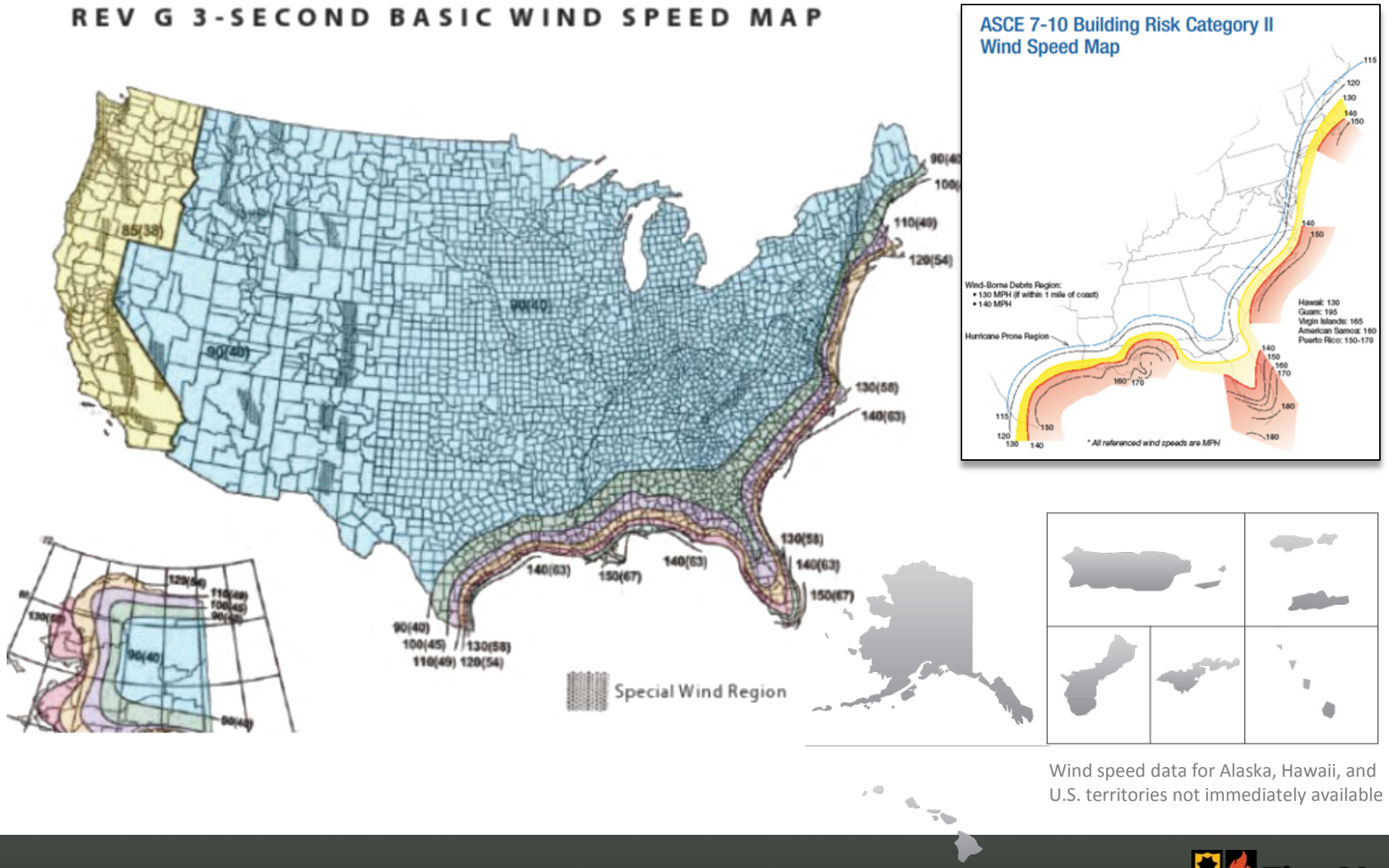
PHYSICAL

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

OPERATIONAL

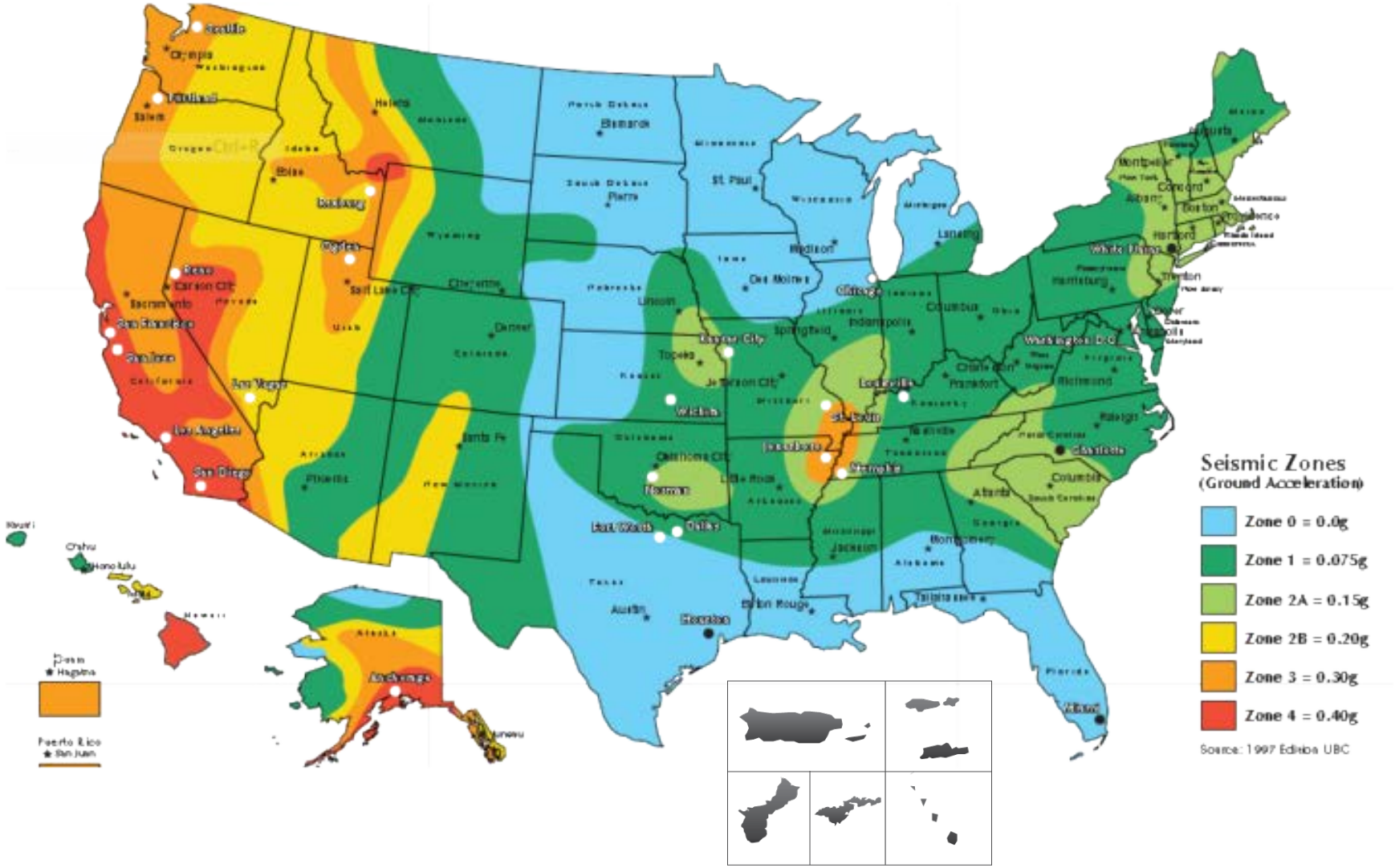
- Backup equipment
- Deployables
- Commercial carrier roaming/direct mode

Wind zones will require more robust hardening...



Wind speed data for Alaska, Hawaii, and U.S. territories not immediately available

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



Seismic data for U.S. territories not immediately available

RESILIENCY

Recovering quickly after an network incident is imperative.

RESILIENCY

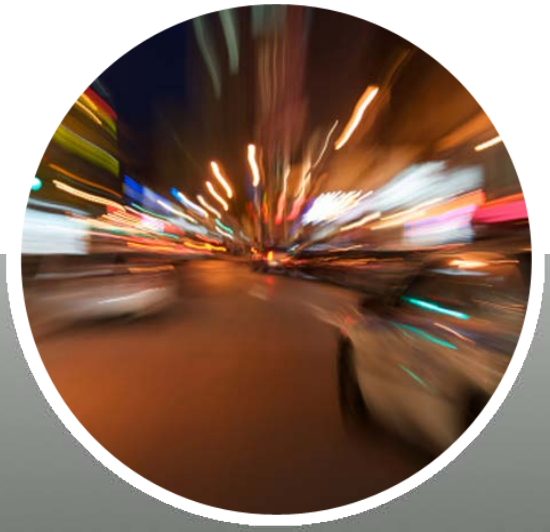
PHYSICAL

- Diverse Routing- Switching and Backhaul
- Mirrored Databases
- Geographically Distributed Processing

OPERATIONAL

- Deployables
  - Cells on Wheels
  - Systems on Wheels
- Capacity Management/Load Shifting
- Spares Management

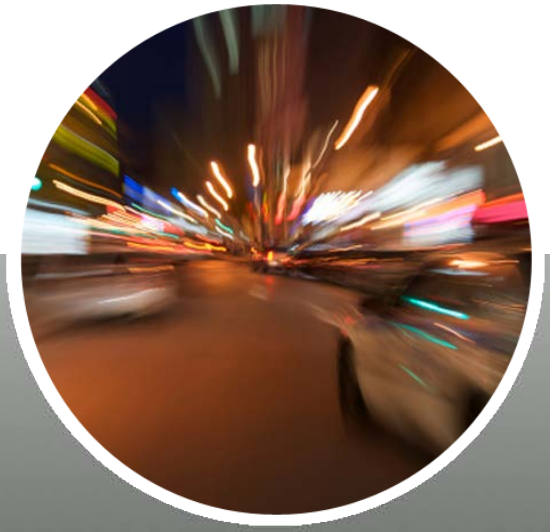
DEVICES



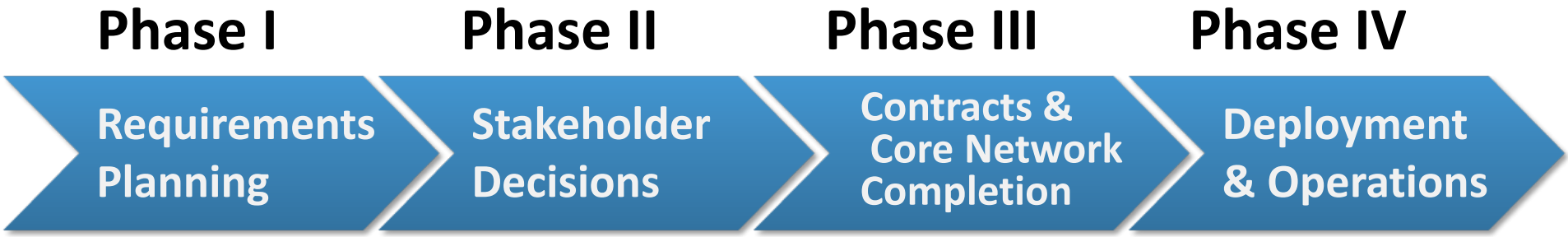
FirstNet devices will be designed to meet public safety requirements and support critical application and service needs.

An RFI was issued for devices on April 15, 2013.
These are device type examples for illustration only.

PROJECT PHASES



FIRSTNET PROJECT PHASES



FIRSTNET PROJECT PHASES

Phase I

Requirements Planning

Phase II

Stakeholder Decisions

SLIGP Phase 1 – Requirements Gathering	SLIGP Phase 2 - Data Collection
User and Network Requirements	Core and RAN specifications
Network RFIs issued	Network RFPs issued
BTOP Spectrum Leases	Pilot Project integration and device planning
Initial design concepts documented	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**

FIRSTNET PROJECT PHASES

- **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.**
- **Optimizing the use of existing wireless facilities to reduce network spend.**
- **Building relationships with all 56 states and territories.**
- **Working together based on your requirements**
- **Deploying a fully-integrated public safety-grade nationwide wireless broadband network serving first responders and public safety for decades to come.**

Please join us in this mission.

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.

Q&A




www.firstnet.gov

FirstNet
U.S. DEPARTMENT OF COMMERCE