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Public Safety Advisory Committee Meeting

June 1, 2015
San Diego, California



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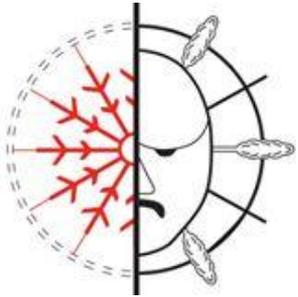
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PSAC Meeting: Tribal Working Group

Richard Broncheau – TWG Chair

Tribal Working Group Membership



FirstNet seeks to maximize tribal participation in the nationwide interoperable public safety broadband network.

The task of the tribal working group is to **advise FirstNet on tribal outreach, education, and inclusive consultation strategies to help achieve this goal.**



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PSAC Meeting: Early Builder Working Group

Darryl Ackley – EBWG Chair
Todd Early – EBWG Vice Chair

Presentation Agenda



- Historical background
- Overview: Previous EBWG tasking
- Overview: Current EBWG tasking
- Review of current work plan
- Member project review and update

Historical Background



- Continuation of work begun in 2010 under the Public Safety Spectrum Trust – Operator Advisory Committee (PSST-OAC)
 - PSST Chair: Harlin McEwen; PSST OAC Chair: Bill Schrier
- Originally represented **21** waiver recipients, **\$372M** in BTOP grant funds
- Significant accomplishments ahead of the passage of the Spectrum Act of 2012:
 - Helped establish PS PLMN-ID 313-100
 - Commissioned the creation of a standard numbering scheme for PS network identifiers
 - Generally served to incubate best-practices in PS broadband among stakeholders and practitioners
- After the passage of the Spectrum Act of 2012
 - August 2012: PSST-OAC transitioned to the Early Builders Advisory Council (EBAC) under chairmanship of Todd Early
 - Monthly calls and supported graciously by DHS/OEC
 - Dissolution of PSST-OAC and transition of license to FirstNet
 - Transition from Early Builder projects to projects with Spectrum Manager Lease Agreements (SMLAs) from FirstNet
 - Creation of the Early Builders Working Group (EBWG) under the FirstNet Public Safety Advisory Committee (PSAC).
 - Chair: Darryl Ackley; Vice Chair: Todd Early
- Until recently, both the EBAC and the EBWG operated concurrently

Historical Background



- EBWG Members
 - ADCOM911*
 - LA-RICS*
 - State of New Jersey*
 - State of New Mexico*
 - State of Texas, Harris County
- Projects enabled by FirstNet to proceed under individually negotiated Spectrum Management License Agreements (SMLAs)
- **Key Factor:** SMLAs require reporting against Key Learning Conditions (KLCs)
 - Provide best-practice and exploratory knowledge on deployment relative to FirstNet's mission
 - Allow judicious application of BTOP and stakeholder funding to be leveraged
- (*) Denotes BTOP grant recipient



Overview: Previous EBWG Tasking



- EBWG established as a working group of the PSAC in a directive from FirstNet Deputy General Manager TJ Kennedy on **11 April 2014**

- Accomplishments
 - Developed mission statement, operating procedures, and membership eligibility developed, reviewed, and approved
 - Conducted several conference call meetings
 - Developed standard template for information sharing & reporting
 - Key by-product: informal key learning conditions
 - Delivered final recommendation to PSAC chair Harlin McEwen

- On the recommendation of the PSAC, the EBWG was reauthorized by TJ Kennedy on **17 February 2015**

Overview: Current EBWG Tasking



- The EBWG is tasked through **31 March 2016** with the following:
 - Holding monthly EBWG calls
 - Providing written deliverables on each project's key learning conditions (KLCs), formal and informal, per requirements developed by the FirstNet OCTO
 - Provide advice and feedback on other related early builder topics as determined by FirstNet
 - Provide quarterly updates to the PSAC, which will then go to FirstNet for consideration
- Today's presentation marks the first such quarterly update under this new tasking.

- The EBWG most recently met by phone on **8 May 2015**, with several important outcomes:
 - Per the FirstNet OCTO, the existing documentation and deliverables for KLCs will be sufficient for reporting via the EBWG
 - FirstNet will be developing evaluation plans, per GAO recommendation, for the formal KLCs
 - With continued support from FirstNet staff, informal key lessons (IKLs) will be discussed and reviewed during the monthly calls
 - The EBAC will be discontinued and subsumed by the work of the EBWG (note: this occurred on **21 May 2015**)

- Additionally the EBWG will continue to act on any tasks as determined by FirstNet

Member Project Reviews and Updates



- **ADCOM 911: Adams County Communication Center**
 - Providing 700Mhz LTE to public safety agencies within the Adams County Communication Center and Denver International Airport (DIA) service areas.
 - Also interconnecting multiple PSAPs in the greater Denver area with multiple school districts and local governments
- **Funding:** Primarily BTOP with matching funds from local agencies
- **Key Learning Conditions:**
 - Real-world test system for FirstNet technical HQ and PSCR
 - Device beta testing
 - Demonstrations with FirstNet and Public Safety stakeholders



Number of Sites

16

Devices

Vehicular Modems
Dongles
Handsets, Tablets
Cameras

1st Resp

2000

Partner Agencies

Adcom911 PD and
Fire agencies (9),
City and County of
Denver, DIA

Apps

Database Lookup
Real Time Video
P25 to LTE PTT
Mobile Secure Intranet

▪ Update:

- 16 sites on air
- Potential expansion sites - 3 DIA sites under planning/signed IGA with City of Denver; 1 additional site (KNCN) east of DIA to fill coverage, part of original scope, tentative
- Backhaul in place between New Mexico and ADCOM 911, with routing details being worked out currently
- All covered police and fire agencies currently installing Cal-amp modems provided by ADCOM911, and beginning initial testing
- Formal drive testing underway now that all initial sites are on the air
- Successful demonstrations of Sonim smart phones and Mutua-link gateways, with demonstrations of Sierra Wireless devices pending
- Initial reactions from first responders using the network have been very favorable
- Currently 46 devices deployed to partner agencies
- Plan to grow/rollout up to 2000 (Original SIM Allocation)



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▪ **Broadband Interoperable Gateway Network (BIG-NET)**

- Sites on air since 2010, BIG-Net was “born of necessity” with the loss of cellular services during hurricane disasters.
- These tough lessons-learned fueled a regional passion toward establishing mobile data systems, setting Harris County on a path to the earliest PSBN deployment.
- Approval of state Interoperability Showing in August 2012, activating the first Band Class 14 PS licenses in the US.



▪ **Funding:** DHS HSGP funding and strong government partnerships

▪ **Key Learning Conditions:**

- Core Transition to FirstNet – Documenting transition issues going from BIG-Net core to the FirstNet core
- Data Analytics – Defining a ‘public safety user’ and impact on the PSBN
- Extended mode – Exploring LTE capabilities beyond a nominal 15-mile range
- Special Events – Identifying LTE abilities and requirements for National Special Security Events
- Training – Identifying how LTE capabilities affect and improve First Responder Training



Approx. No. of Sites

15 33 91

Phase I II III

Devices

**Vehicular Modems
Dongles
Handsets
Cameras**

Current & Potential Partners

**A&M University
Harris County
Port of Houston Authority
Metro Transit Authority
City of Webster**

**Brazoria County
City of Houston
City of Baytown
Brazos County**

Apps

**Database Lookup
Real Time Video
P25 to LTE PTT
Mobile Secure Intranet
Field Reporting
Location Services
*...many envisioned!***

Update

- Texas Public Safety Broadband Program launched two no-cost learning courses in May 2015
 - Courses include an overview of LTE PSBN and a tutorial on completing the Mobile Data Survey (MDS)
- Work on 5 additional LTE sites underway to provide coverage along the IH-45 corridor
- Preparing for Environmental Studies for 15 locations for the 33 Phase II sites
- Working on obtaining local funding for the Phase II build out
- Continued development of process and flow for the support of customers and further operationalization of the system



Approx. No. of Sites			Devices	Current & Potential Partners	Apps
15	33	91	Vehicular Modems Dongles Handsets Cameras	A&M University Harris County Port of Houston Authority Metro Transit Authority City of Webster	Brazoria County City of Houston City of Baytown Brazos County
<i>Phase I</i>	<i>II</i>	<i>III</i>			

- **Los Angeles Regional Interoperable Communications System (LA-RICS)**
 - LA-RICS will provide improved radio and broadband communication for the public safety providers of the greater Los Angeles Region
 - Two distinct and compatible projects: LMR communications and LTE broadband system
 - Project includes eNodeBs, physically hardened and secured EPC, 15 COWs, microwave and fiber optic backhaul, and a procurement vehicle for end user devices
- **Funding:** BTOP
- **Key Learning Conditions:**
 - Interactions with utilities and secondary responder agencies
 - Congestion impacts, Quality of Service (QoS), and pre-emption requirements to drive technical standards development
 - Validation of priority and QoS requirements



Number of Sites

84

Devices

Vehicular Modems
Dongles
Handsets
Cameras

1st Resp

34K
(initial user
base 19K)

Partner Agencies

72 member agencies span over 4,000 sq. mi of highly diverse urbanized areas, mountains, deserts and coastlines

Apps

Database Lookup
Real Time Video
P25 to LTE PTT
Mobile Secure Intranet
...many envisioned!

▪ Update

- 67 PSG permanent sites; 15 COW sites; 2 backhaul sites
- The Authority continues to work with utility providers, including Department of Water and Power and Southern California Edison to develop an agreement for the secondary responder partnership in order to leverage use of existing fiber for the PSBN backhaul design.
- The PSBN contract calls for network mechanism to alert for congestion capability, however, the Authority has not specifically defined how LA-RICS will be alerted and under what conditions the alerts will be provided. This is projected for completion in Quarter 2, 2015.
- The Authority has negotiated compliance with NPSTC SoR with a few outliers that still require discussion.
- The vast majority of the QoS based requirements have been addressed during those discussions. Any QoS requirements based on individual determination, are not supported unless LA-RICS would purchase Motorola's proprietary Priority Service Manager, which LA-RICS does not intend to do.
- LA-RICS will ensure that the supported requirements are tested during the acceptance testing process.



Number of Sites

84

Devices

Vehicular Modems
Dongles
Handsets
Cameras

1st Resp

34K
(initial user
base 19K)

Partner Agencies

72 member agencies span over 4,000 sq. mi of highly diverse urbanized areas, mountains, deserts and coastlines

Apps

Database Lookup
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Mobile Secure Intranet
...many envisioned!

Jersey Net

- New Jersey is implementing deployable networks utilizing Cells on Wheels (COWs) and Systems on Wheels (SOWs) throughout the state
- Proof-of-concept implementations in three locations: the Route 21 Corridor in north-central NJ, Camden in southern NJ, and Atlantic City on the Jersey Shore



Funding: BTOP Grant



Key Learning Conditions:

- Demonstration and documentation of the use and capabilities of rapidly deployable assets
- Conduct emergency management exercises that showcase the capabilities of a deployable system
- Document a Network Operations Center (NOC) notifications approach aligned with best industry practices for the notification of key personnel of important events associated with the network

Approx. No. Of Deployables *

14 9 7

Devices

Vehicular Routers
Handhelds

Current & Potential Partners

Clifton
Paterson
NJIT
Atlantic City
Camden Transit
Newark

Wallington
Belleville
Montclair State University
Absecon
Cherry Hill
Nutley

Apps

Video
Mutualink
License Plate Reader
eTicket
EMS Applications

Region:

Route 21 Camden Atlantic City

Update:

- Project team continues to execute well, targeting network operations in September 2015.
- Custom developed SOW and COW assets have arrived in state.
- Working groups established to support all aspects of the project and FirstNet KLCs.
- Microwave design challenges encountered, but modifications in progress to address
- 7 incremental deployable assets to be reserved for training and emergency response.



Approx. No. Of Deployables *	Devices	Current & Potential Partners	Apps
<p>14 9 7</p> <p><i>Region:</i> Route 21 Camden Atlantic City</p>	<p>Vehicular Routers Handhelds</p>	<p>Clifton Paterson NJIT Atlantic City Camden Transit Newark</p>	<p>Wallington Belleville Montclair State University Absecon Cherry Hill Nutley</p>
			<p>Video Mutualink License Plate Reader eTicket EMS Applications</p>

▪ **Statewide Interoperable Radio Communication Internet Transport System (SIRCITS)**

- Two-part project:
 - Complete the upgrade of the State's DMW system
 - Deploy a pilot LTE public-safety broadband system along the Southern Border Region.
- For the LTE portion, evaluate the use of PSBN in the complex, multi-jurisdictional landscape of a national border

▪ **Funding:** BTOP Grant and State match and in-kind

▪ **Key Learning Conditions:**

- Evaluate the use of an EPC located remotely (Adams County)
- Spectrum management and network use issues along the US/Mexico border
- Shared use of a state network with local, state, tribal, and federal users



Number of LTE Sites

7

Devices

Vehicular Modems
Dongles
Handsets, Tablets
Cameras

Partner Agencies

Federal: DOI, CBP, DoD
State: DPS, DHSEM, G&F, NMSU
Local: Eddy Co, Dona Ana County,
Las Cruces, Carlsbad

Apps

Database Lookup
Real Time Video
P25 to LTE PTT
Mobile Secure Intranet

▪ Update

- Equipment vendor selected – final design documents due by 12 June 2015
- Site surveys for RAN and DMW backhaul have been completed
- Initial equipment delivery underway, with core sub-system components arriving by mid-June
- First RAN installation scheduled for 23 June 2015.
- Numerous inter-governmental agreements between state and local organizations being evaluated, to include necessary agreements between NM and ADCOM911.



Number of LTE Sites

7

Devices

Vehicular Modems
Dongles
Handsets, Tablets
Cameras

Partner Agencies

Federal: DOI, CBP, DoD
State: DPS, DHSEM, G&F, NMSU
Local: Eddy Co, Dona Ana County,
Las Cruces, Carlsbad

Apps

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PSAC Meeting: User Equipment

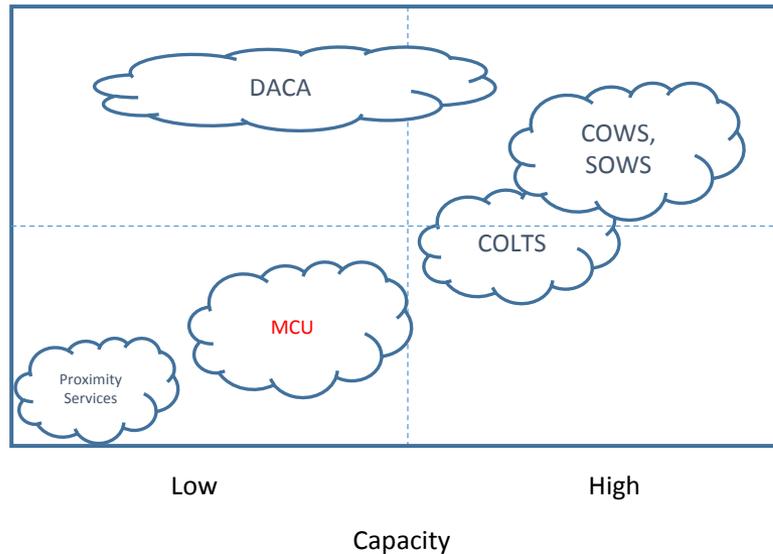
Harlin McEwen, PSAC Chairman
Dave Marutiak, FirstNet Support

- Goals – review CTO Device team assumptions, design decisions, field information, etc. to verify strategies and inputs to any downstream efforts
- Meeting Approach
 - The Device team provides a new, detailed briefing on a topic of interest or a design option
 - Includes a list of Top 10 related questions for feedback
 - The PSAC EC provides feedback on the questions from the previous meeting

Mobile Communications Unit (MCU)

- User Needs Statement
 - Nationwide coverage objective
 - Initial first responder
 - Additional staff on the incident
- Device Technology Elements
 - In coverage situations
 - Satellite backhaul and antenna
 - Local eNodeB and antenna
 - Local core elements
 - Handset implications
- Alternative Solutions
 - High Power UE
 - LTE Relays
 - Direct Mode
- Timing and Cost Estimates
- Top 10 Questions for PSAC EC Guidance

Needs Statement: MCU Fills A Gap in Deployables Arsenal

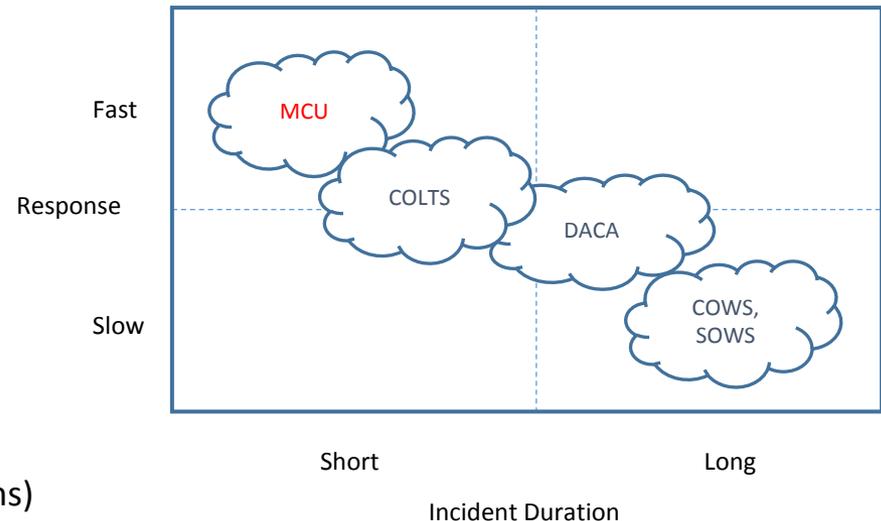


Deals with smaller incidents (95%)

Coordinates communications as incidents grow in staff/geography

Fast Response = As Fast As You Can Drive There; Or

Immediate = If You Come Across An Incident

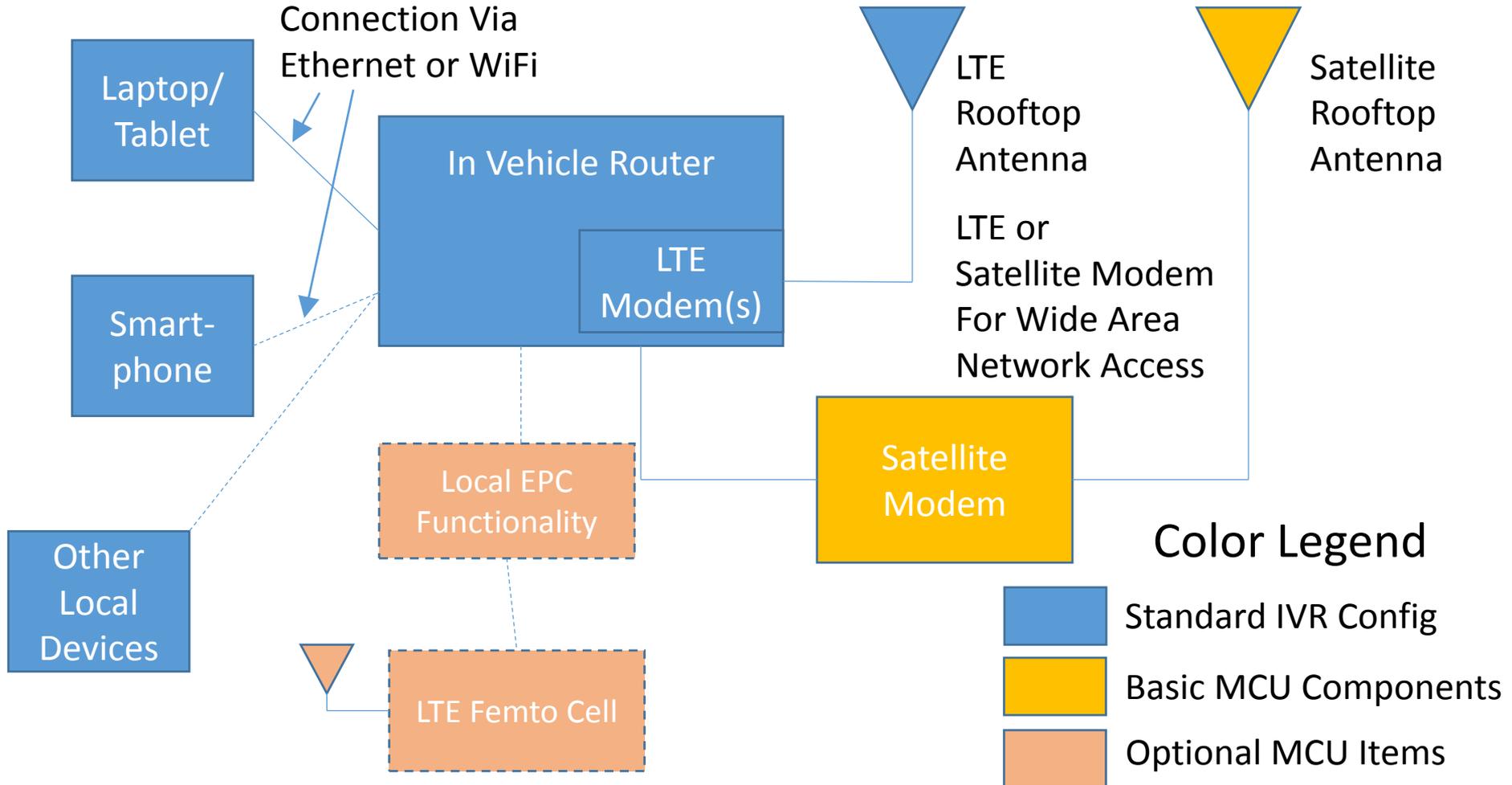


DACA - Deployable Aerial Communications Architecture (Balloons)
 COLT – Cell On Light Trucks, COWs – Cell On Wheels, SOWs – System on Wheels

- In vehicle router – when the MCU is on-net, it acts like every other IVR, using terrestrial LTE options
- Satellite backhaul – once it's fully off-net, it can switch over to satellite backhaul to the terrestrial network
- Satellite antenna – new technologies can improve some of the physical installation aspects as well as costs
- Local eNodeB and antenna – when it's on satellite, it can automatically act like a remote base station to other users
- Local EPC elements – varies, depending on design and use cases as well as new technologies
- Handset implications – some to none, in some scenarios the UE sees it as just the regular network others vary

MCU Block Diagram

Local Area
Connection Via
Ethernet or WiFi



- High Power User Equipment
- Range Extension Relay Node
- Direct Mode/Proximity Services

- Mobile device management specifications(s)
- User and agency operational support
 - Device return/replace process
 - Training for customer service representatives
- BYOD specifications and requirements
- Portfolio plan for devices and common accessories
- New device design guidance and planning
- Device recycle and reuse options
- Power management mechanisms
- Continuous quality improvement programs
- Tracking process and administration of change requests
- Embedded application requirements and tests



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PSAC Meeting: Quality of Service Priority and Preemption Framework

Barry Fraser – Chair of Priority and Preemption Task Team

Brian Kassa – Director of Technology Planning & Development

Third Generation Partnership Project - LTE

- 3GPP Release 8-10 LTE offers many technical tools to manage Quality of Service, Priority and Preemption (QPP)
- There are numerous ways to utilize these tools in multiple combinations to affect QPP for Public Safety users, devices and applications

Public Safety

- Public Safety practices vary between jurisdictions and especially between disciplines
- FirstNet spectrum will be shared by multiple disciplines and users with diverse roles and tasks

Result

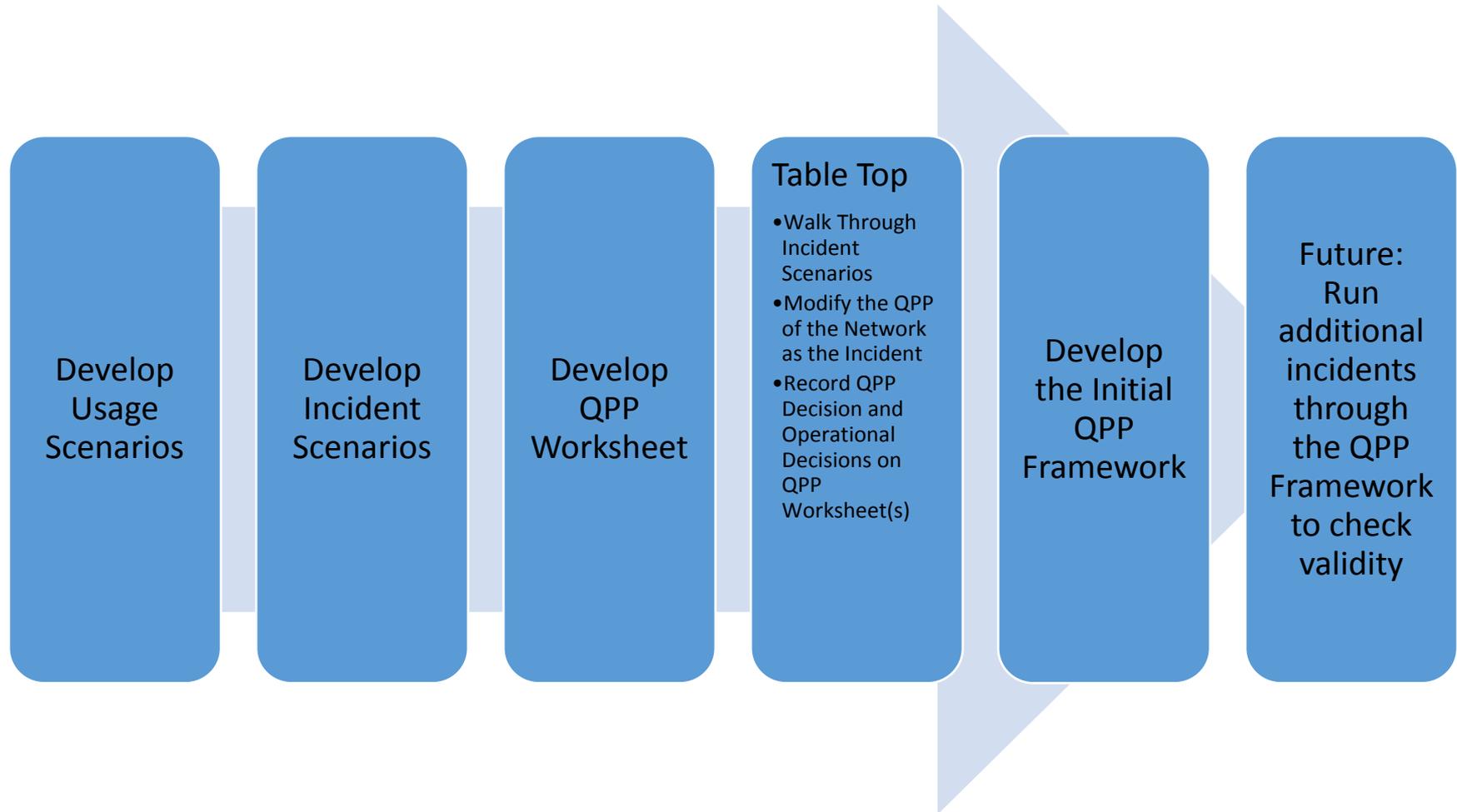
- Managing network capacity for all Public Safety users will be a complex task.
- There is no one-size-fits-all approach to QPP

- In light of this complexity, FirstNet tasked the PSAC to help develop a QPP Framework to help the engineers apply the various QPP tools to Public Safety, both in day-to-day operations and during major incidents
- A Framework will not answer every potential situation but should be designed to handle most identifiable use cases
- For those situations where the framework does not prevail, a human must step in via local control; however, QPP should be designed to minimize those situations

PSAC Priority and Preemption Task Team Members



Individual Name	PSAC Organization
Barry Fraser	National Association of Telecommunications Officers and Advisors, Task Team Chair
Captain Chris Lombard	Interagency Board
Brent Lee	Association of Public-Safety Communications Officials-International
Chief Gary McCarraher	International Association of Fire Chiefs
Chief Harlin McEwen	International Association of Chiefs of Police and PSAC Chair
Captain Mike Worrell	At Large, Fire Non-Management First Line Responder
Phil Mann	American Public Works Association
Tom Sorley	U.S. Conference of Mayors
Michael Varney	National Council of Statewide Interoperability Coordinators
Trey Forgety	National Emergency Number Association
Mel Maier	Major County Sheriffs' Association
Mark Ryckman	International City/County Management Association



Nov 2014	Presentation to PSAC on QoS, Priority and Preemption
Dec 2014	Development of PSAC Tasking to help FirstNet Develop Initial QPP Framework
Jan-Apr 2015	Working Session on QPP
Apr 2015	Face to Face Task Team Meeting in Boulder
Apr-May 2015	Initial QPP Framework Development
May 18, 2015	PSAC Task Team Review of Initial QPP Framework
June 1, 2015	Task Team Presentation to PSAC
June 4, 2015	Initial QPP Framework Presented to PSCR



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PSAC Meeting: Public Safety Grade

Chris Lombard – Chair of Public Safety Grade Task Team

Patrick Schwinghammer – Director of RAN

Andrew Merson – FirstNet Support

PSAC Public Safety Grade Tasking



- **Mission:** The PSAC Task Team is advising FirstNet on the application of NPSBN hardening within the following framework:
 - Definition of “critical infrastructure”:
 - Mapping high-value Critical Infrastructure geographic locations such as evacuation centers, comms centers, fire stations, law enforcement, local emergency operations (LEO) centers, EMS (emergency medical service), hospitals, airports, large public venues requiring higher level of availability/hardened coverage
 - Hardening priority determination and “Tiering” framework
 - Define levels/”tiers” of high availability and hardening that considers most common reasons for outages and prior PSAC PSG definition recommendations
 - Evaluate RFPs relative tiering strategy in implementation of NPSBN as applicable
 - Geographic and localized threat application framework
 - Use geographically-defined Risk Analysis to apply “threat-appropriate” hardening of NPSBN

PSAC Public Safety Grade Task Team Members



Individual Name	PSAC Organization
Captain Chris Lombard	Interagency Board, Task Team Chair
Barry Fraser	National Association of Telecommunications Officers and Advisors
Brent Lee	Association of Public-Safety Communications Officials-International
Charlie Sasser	National Association of State Technology Directors
Dan Eaton	National Conference of State Legislatures
Chief Gary McCarraher	International Association of Fire Chiefs
Chief Harlin McEwen	International Association of Chiefs of Police and PSAC Chair
John Sweeney	National Criminal Justice Association
Jonathan Olson	National EMS Management Association
Michael Varney	National Council of Statewide Interoperability Coordinators
Captain Mike Worrell	At Large, Fire Non-Management First Line Responder
Tom Sorley	U.S. Conference of Mayors
Trey Forgety	National Emergency Number Association

The Task Team is quantifying the “3-legged stool” of Hardened Availability



Public Safety requires high availability every day... but, more importantly, during disasters and other incidents that coincide with outages and overload on traditional networks

FirstNet Public Safety Grade Network

Threat-focused Terrestrial Network Strategy

- High availability and hardened network and cellsite solutions

Disaster Response Strategy

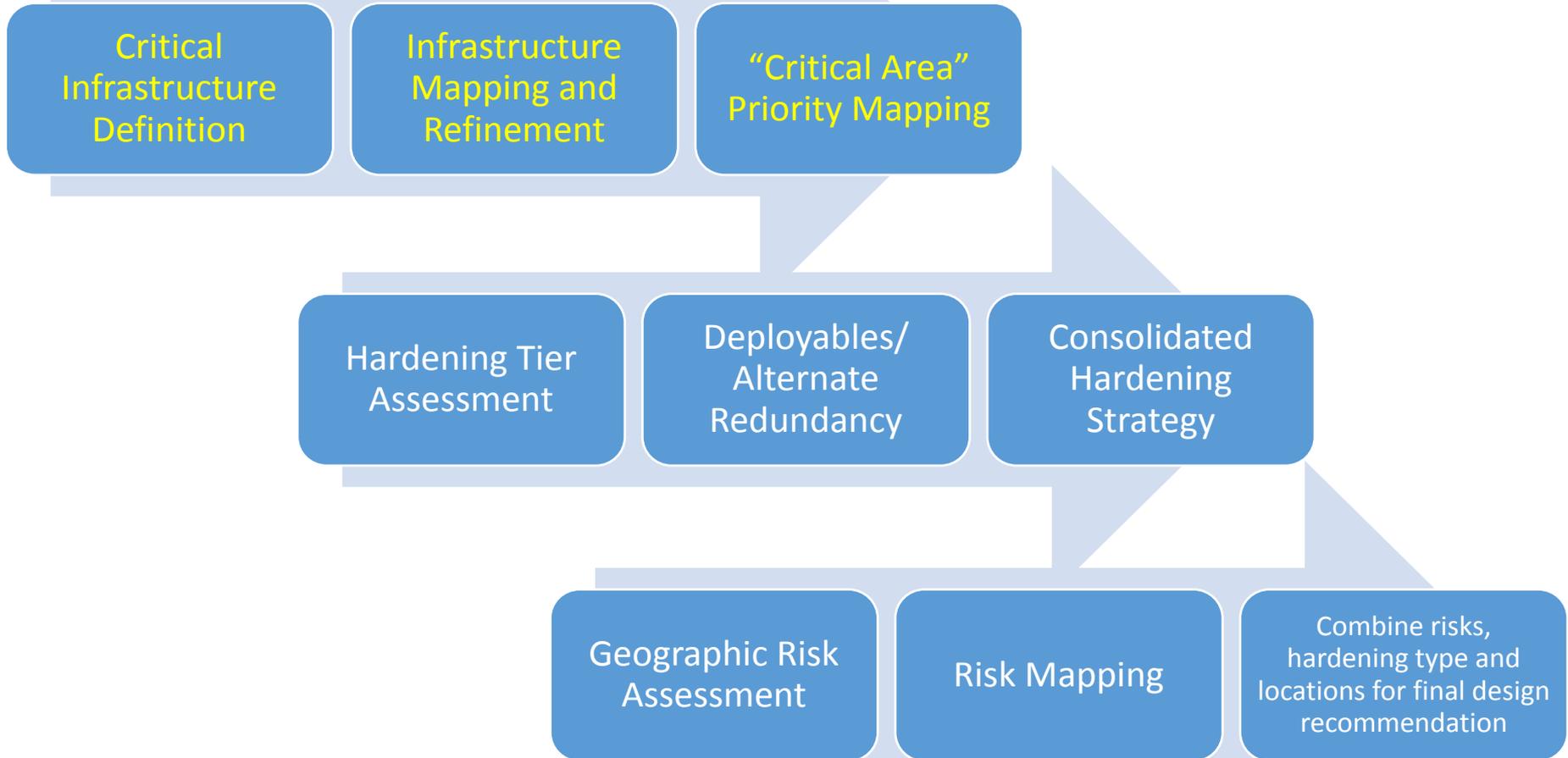
- Rapid temporary deployments (COWs, COLTs, Relay...)
- Rapid network restoration capability

Coverage Recovery for localized outages

- Robust Priority/Preemption algorithms limiting usage/ network load to critical need
- LTE parameter optimization expands surviving site coverage

PSAC Public Safety Grade

Next Steps



Substantially Complete

Critical Infrastructure Definition



- **Critical infrastructure:** “systems and assets, whether physical or virtual, so vital to the United States that the incapacity or destruction of such systems and assets would have a debilitating impact on security, national economic security, national public health or safety, or any combination of those matters.”- Department of Homeland Security (DHS)
- **Source Data:** Homeland Security Infrastructure Program (HSIP) Gold is a unified homeland infrastructure geospatial data inventory assembled by the National Geospatial Intelligence Agency (NGA) in partnership with DHS for common use by the Federal Homeland Security and Homeland Defense (HLS/HD) Community. It is a compilation of over 560 geospatial datasets, characterizing domestic infrastructure and base map features, which have been assembled from a variety of federal agencies, commercial vendors, and state mission partners.

Agricultural	Finance	Levees
Chemicals	Food Industries	Public Health
Commercial	Government	Public Venues
Communications	Law Enforcement	Transportation (Air)
Education	Mail / Shipping	Transportation (Ground)
Emergency Services	Manufacturing	Transportation (Water)
Energy	Mining	Water Supply

More Info: <http://www.dhs.gov/critical-infrastructure-0>

Critical Infrastructure Quantification



	Definition
Communications	Specifically, only central Network Core facilities instrumental to providing voice and data communications services to Public Safety.
Education	Schools/universities only to the extent that they serve as emergency or evacuation locations. Generally, the educational venues would need to be of such size to warrant use as evacuation centers.
Emergency Services/Law Enforcement	Primary and large Police, Fire, EMS, EOC and PSAP locations. Generally, Police, Fire, EMS and EOC locations sizeable enough to warrant designation as “large” including district headquarters or similar.
Energy	Primary locations that, if breached, could impact large segments of the population. Specifically excluded are electrical substations, electrical transmission and smaller distribution hubs.
Government	Locations housing critical government functions required to be operational during times of emergency.

Critical Infrastructure Quantification (continued)



	Definition
Levees	Public water facilities in medium to high population areas.
Public Health	Major medical facilities and hospitals, specifically those that contain greater than 100 beds.
Public Venues	Evacuation shelters, temporary scenarios: large covered sports facilities, convention centers
Transportation (Air)	Major airports, specifically, ones that provide service to commercial airlines vs private aviation.
Transportation (Ground)	Primary/major evacuation routes as defined by the states and territories.
Transportation (Water) - Ports	Major commercial port facilities including commercial shipping and cruise ship terminals.

Essential Services and Coverage Concepts



Maintain “Essential Connectivity” during/after catastrophic event based on criteria for essential services:

- Example: Maintain essential data and low-bandwidth video
- Text/IM- typically requires <10kbps
- Voice/VOIP/PTT- typically requires 15-50 kbps both uplink/downlink
- CAD/ Sensor telemetry (Location updates, wearable monitors, etc)- <10kbps
- Essential Video Service for critical responder feeds- 50-100kbps (H.264 320x240)

Maintain “Essential Coverage” leveraging high power device capabilities:

- Example: Maintain Vehicle Router coverage
- IVRs typically have 6dB gain roof-mount antennas, maximizing coverage
- Vehicle routers can support Wi-Fi coverage to local UEs- tablets, wearables, smartphones
- Define “Essential” coverage as Outdoor/On-Street to IVRs

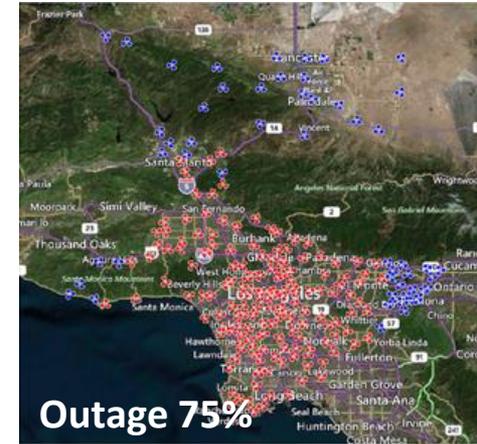
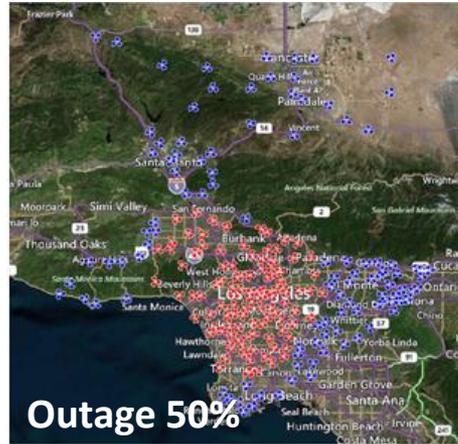
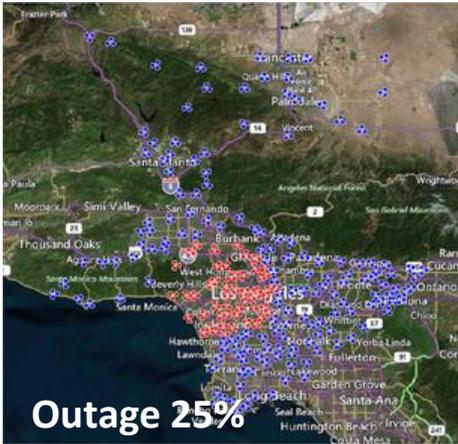
PSCR: Helping FirstNet evaluate LTE technology opportunities



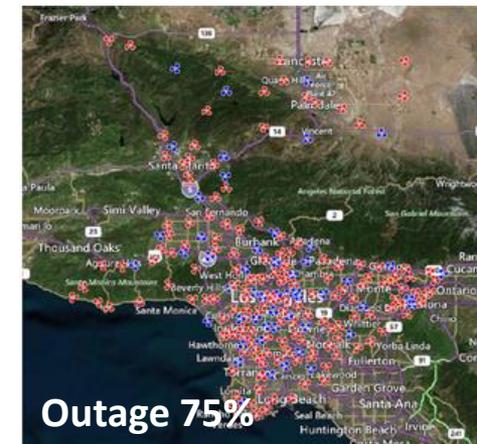
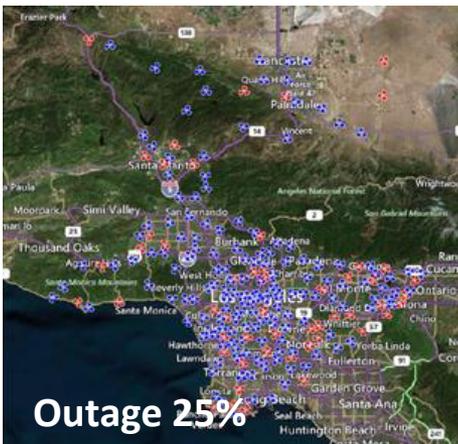
- PSCR is investigating LTE high power operations for providing resiliency during partial outages:
 - Assessing 1.2Watt user devices, high power cellsites, and Extended Range technology
 - Leveraging Early Builder LTE designs as models
 - Implementing simulations and scenario analyses to assess coverage and data throughput for various outage types

Use Case Scenarios

- Local Outage



- Random Outage



- December 8 – FirstNet Committee Meetings
- December 9 – FirstNet Board Meeting (am)
- December 9 – PSAC Meeting (pm – open)
- December 10 – PSAC Meeting (am – closed)



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Thank You