



Public Safety Communications Research (PSCR)

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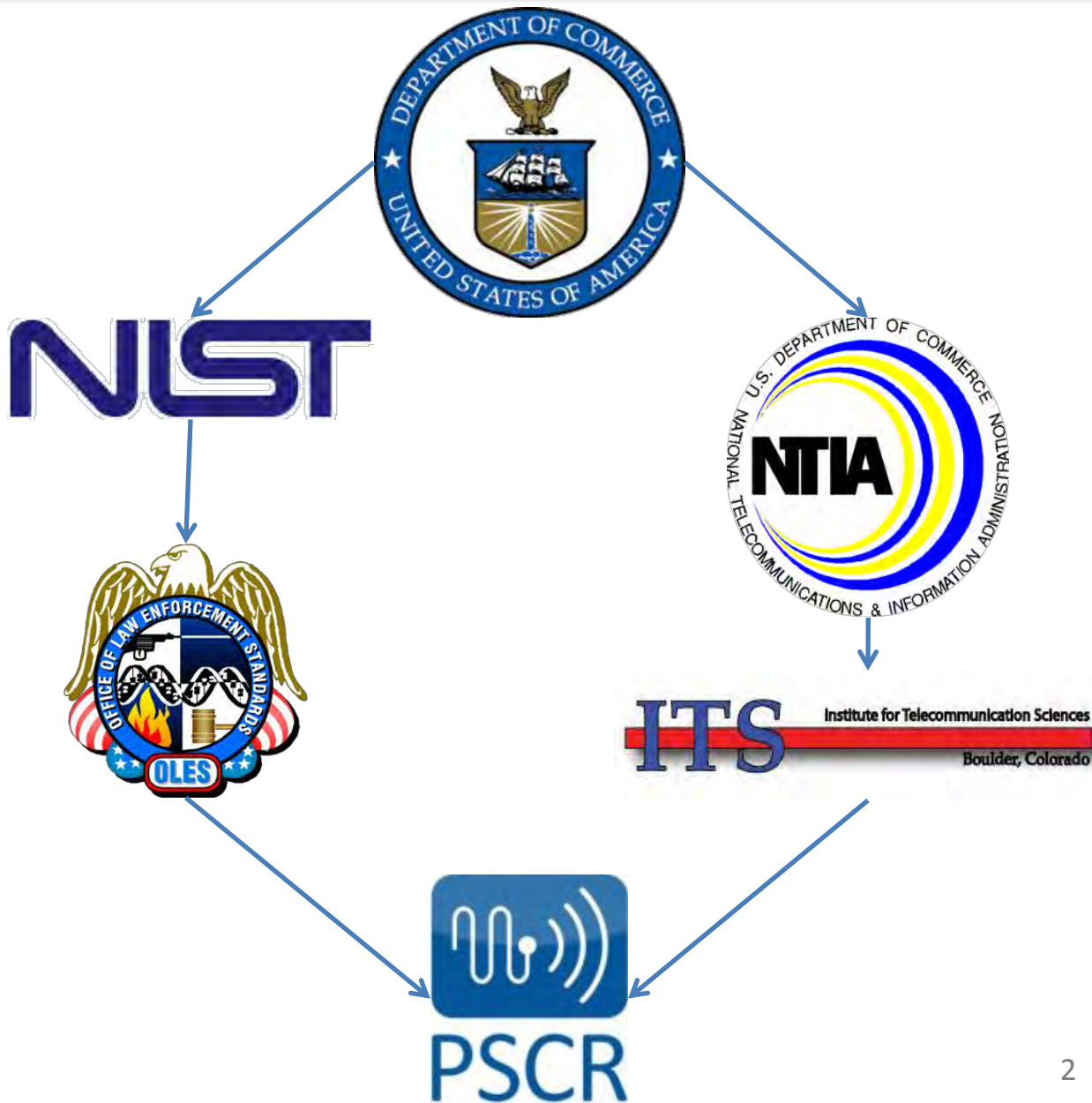
Department of Commerce – Boulder Labs

Public Safety Communications Research Program

*Located at the
Department of Commerce
Boulder Labs in Colorado*

The PSCR Program is a
joint effort between:

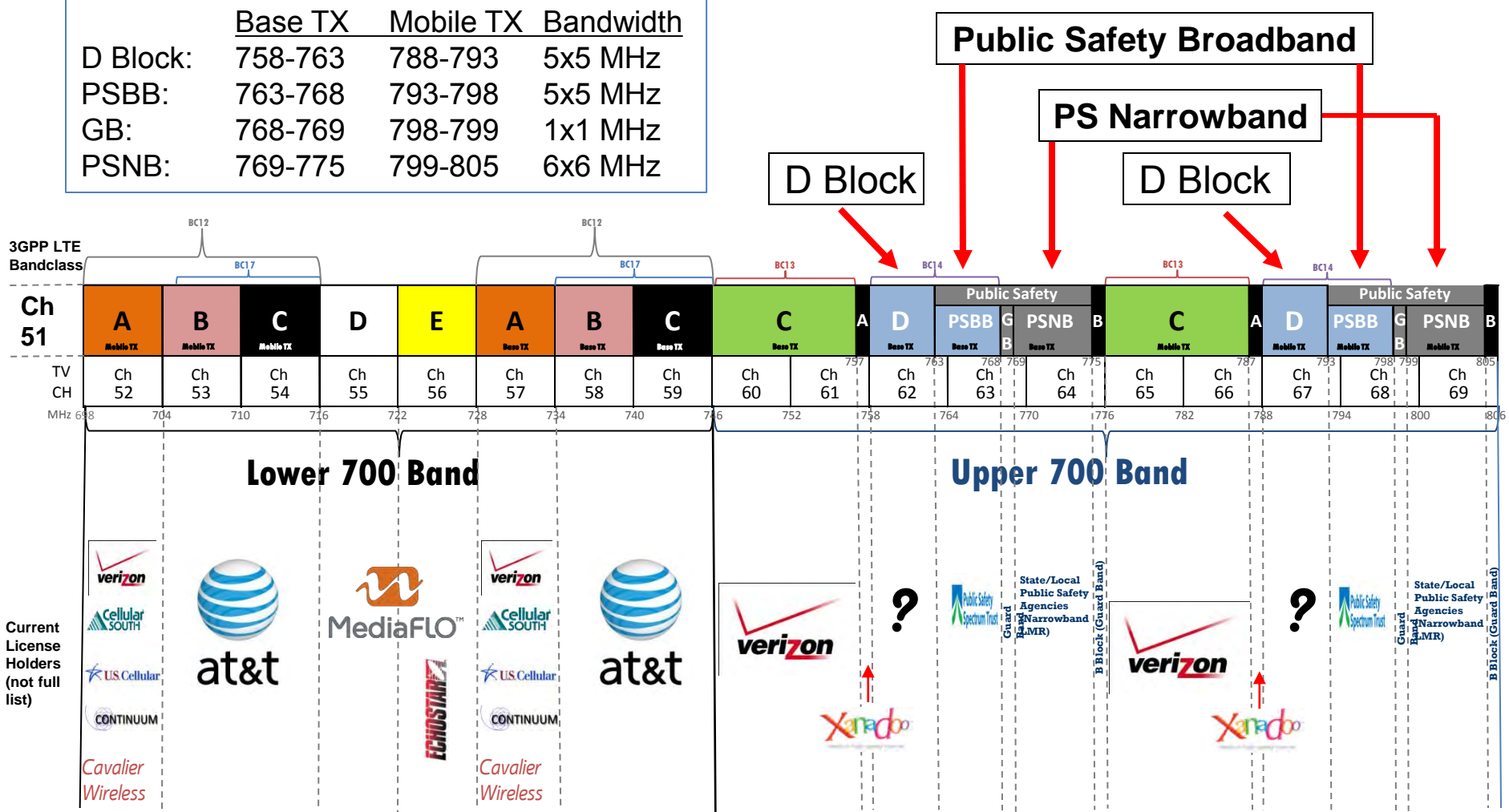
NIST's
Office of Law
Enforcement Standards
(OLES)
and
NTIA's
Institute for
Telecommunication
Sciences
(ITS)



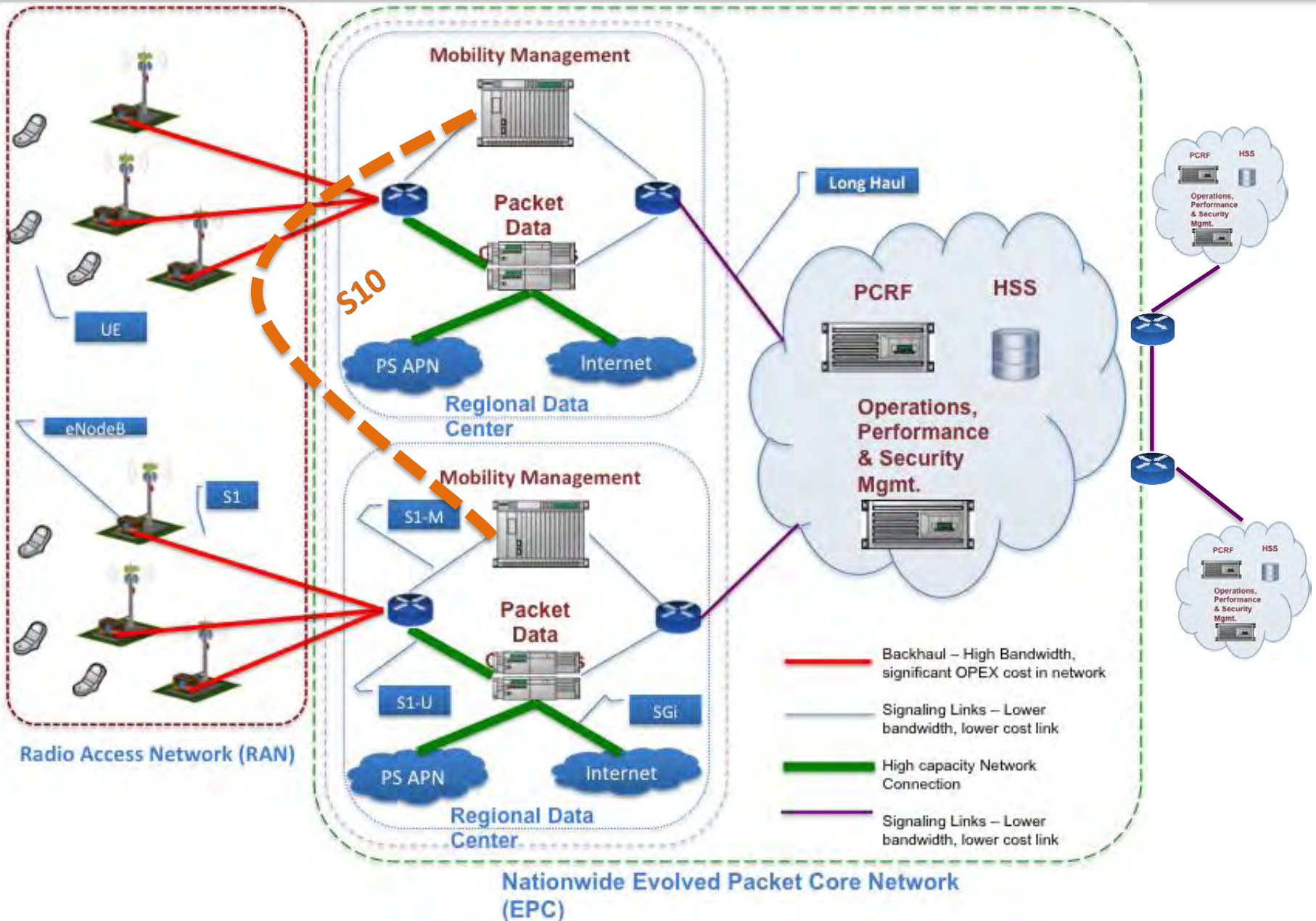
Public Safety Broadband Demonstration Network

700 MHz Spectrum

	Base TX	Mobile TX	Bandwidth
D Block:	758-763	788-793	5x5 MHz
PSBB:	763-768	793-798	5x5 MHz
GB:	768-769	798-799	1x1 MHz
PSNB:	769-775	799-805	6x6 MHz

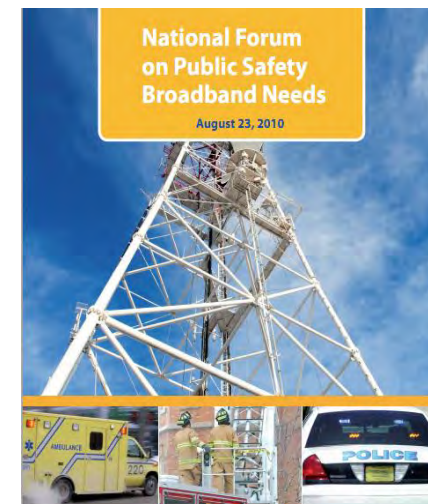


Base Assumption – PSBB Nationwide Network



Requirements Development Groups

- PSCR chairs the NPSTC Broadband Working Group
 - 200+ public safety members
 - Developed the [700MHz Broadband Statement of Requirements](#)
 - Defined [Mission Critical Voice](#)
- PSCR leads 5 BBWG Task Groups
 - Local Control
 - Multimedia Emergency Services
 - Priority/Quality of Service
 - Security
 - Mission Critical Voice
- PSCR is active in other broadband requirements gathering efforts
 - APCO Broadband Working Group
 - DOJ's National Forum on Public Safety Broadband Needs
 - PSST Operators Advisory Council



Standards and Specifications Organizations

PSCR has historically provided insight and direction to IT and wireless standards committees that are developing standards for voice, data, image, and video communication specific to public safety. PSCR's work is currently focused in these SDOs:



The **3rd Generation Partnership Project (3GPP)** produces the technical standards and specifications for LTE, uniting numerous telecommunications standards bodies under one group.

- PSCR is a member of 3GPP and represents public safety's requirements
- PSCR has introduced a work item into 3GPP to address Direct Mode (Proximity Services) communications



The **Alliance for Telecommunications Solutions (ATIS)** is the North American standards body representative in 3GPP.

- PSCR is a member of ATIS and represents public safety's requirements
- PSCR has created an issue statement that would give the ATIS WTSC the ability to work on public safety specific issues



The **GSM Association (GSMA)** is an association of mobile operators and related companies that support the standardization of the GSM system.

- PSCR is actively seeking membership to GSMA in order to represent public safety's requirements to their Voice over LTE (VoLTE) initiative

Formal Testing Organizations



The **PCS Type Certification Review Board (PTCRB)** was created by network operators to provide an independent evaluation process for cellular devices.

- PSCR worked with PTCRB to change rules in order to allow public safety involvement in the group
- PSCR has also submitted an initial list of tests for Band Class 14 devices.
- Based on this list, PTCRB has identified official test equipment and laboratories are preparing to certify Band Class 14 devices



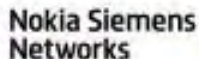
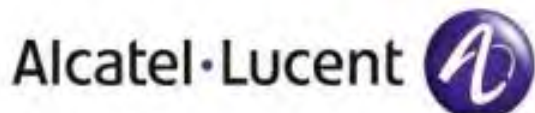
The **MultiService Forum (MSF)** is an organization of service providers and equipment vendors charged with interoperability testing of cellular infrastructure.

- PSCR is working with MSF to understand how other segments of the cellular industry are performing interoperability testing
- Public safety can then leverage this process or model a process similar on best practices from industry

Demonstration Network Testing

- Demonstration Network has three major stages for stakeholder participation:
 1. Stage 1—Network and Test Planning
 - Stakeholders will be involved in creating a common test plan for all vendors and creating a common network deployment and coverage scheme.
 2. Stage 2—Deployment (3 sub-phases)
 1. Equipment is scheduled for delivery to site locations.
 2. Coverage, network planning, site preparation is completed.
 3. Systems are installed and commissioned.
 3. Stage 3—Testing and Demonstrations
 - Test plan execution takes place. This is staggered into three main phases with sub-phases as equipment and features become available. Network is available to perform system level testing and demonstrations on.
- New webpage created just for testing updates:
http://www.pscr.gov/projects/broadband/700mhz_demo_net/testing/about_testing.php

Demo Network CRADA Partners



Demonstration Network Pics

eNodeB



eNodeB Antenna

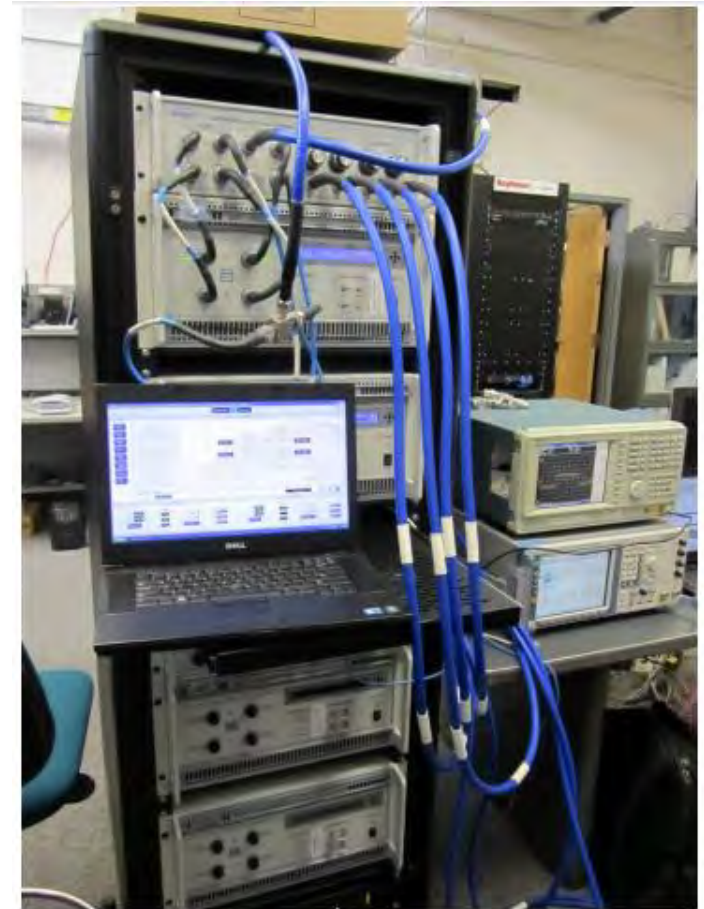


Demonstration Network Pics

Evolved Packet Core



Channel Emulator



Demonstration Network Pics

User Equipment Emulator



Testing Status

- Phase 1 tests published & available on www.pscr.gov
 - Test plan stable at v1.12
 - Completed Phase 1 testing with Alcatel-Lucent
 - Started testing with MSI and NSN
- Phase 2.1 testing complete with Alcatel-Lucent (in review now)
- Phase 2.2 scheduled to start late August (ALU)
- Phase 3 TBD start date
- Once we have multiple vendors that have executed all tests we will publish data (non-attributable)

Mission Critical Voice over Broadband

What is Mission Critical Voice?

- Many first responders have a strong intuition for what mission critical voice is
- When working to articulate that vision, we find that while there are many common ideas, there are also many unique ideas
- There are many ways to begin to define mission critical voice, but let's start with:
 - Qualitative features
 - Quantitative requirements

What is Mission Critical Voice? Cont'd

- In order to help have a consistent conversation about Mission Critical Voice, the National Public Safety Telecommunications Council (NPSTC) reactivated the Broadband Working Group to develop a definition
- Over a period of 8 months, the BBWG developed a descriptive list of qualitative features that are required for Mission Critical Voice

What is Mission Critical Voice? Cont'd

- Qualitative features:
 - Direct mode
 - Group communications
 - PTT and cellular modes
 - Emergency alerting
 - Talker identification
 - Audio quality

Why does it matter for broadband?

- Public safety's technology of choice for broadband in 700MHz is 3GPP's Long Term Evolution (LTE)
- It will take some time before the vision of a nationwide public safety broadband network is realized
- Land mobile radio will continue to be used for mission critical voice with the broadband network providing data services, but...

Why does it matter for broadband? Cont'd

- There are many that expect public safety to transition to broadband for mission critical voice at some point in the future
- If public safety starts to address its needs in this space now, they will ultimately have more control over how and what the transition looks like

Is Mission Critical Voice different for Broadband?

- Absolutely, probably, maybe, no?
- Will the way public safety operates change as it has ubiquitous access to broadband data services?
 - Examples include cellular telephony vs. PTT
- Are there some aspects of mission critical voice as it stands today that must exist?
 - What, if any, are those aspects?

What needs to happen?

- Standards
 - Voice (VoLTE)
 - Talkaround (Proximity Services)
- Interconnection
 - P25 (TIA TR-8 Initiated Effort in October)
 - Other LMR?
- Testing
 - New Vocoder? (AMR is fallback for VoLTE)
 - Transcoding
- Trials

What are the technology gaps?

- Recall features from the NPSTC BBWG:
 - Direct mode
 - Group communications
 - PTT and cellular telephony
 - Emergency alerting
 - Talking identification
 - Audio quality
- Where are the gaps?

What are the technology gaps?

- Initial take
 - Direct mode
 - Group communications
 - PTT

Moving Forward

Providing objective technical information about the network

- The PSCR Demonstration Network provides a central and independent test bed/laboratory to help public safety understand 3GPP Release 9, 10, etc.
 - Provides an objective forum for public safety to test and verify new capabilities

Ensuring the network has the crucial long-term capabilities to meet public safety's needs

- Coordinating development of crucial capabilities to make the network successful across multiple requirements efforts and standards bodies:
 - Mission Critical Voice Capability
 - Audio Quality over LTE testing
 - LMR to LTE

Uniting public safety to ensure the network meets long-term needs

- PSCR is currently interacting with the vast majority of the key stakeholders across these multiple efforts
- The next step is for PSCR to pull them into a coordination point that ensures public safety's requirements are being met by the various organizations



For Additional Information:
<http://www.pscr.gov>

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