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APCO Emerging Technology Forum

Public Safety Communications Research (PSCR) Update

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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)

PSCR Funding Sources

Department of Homeland Security

Office for Interoperability and Compatibility

Office of Emergency Communications

DISCLAIMER

The full description of the procedures used in the following PSCR presentations require the identification of certain agencies, localities, commercial products and their suppliers. The inclusion of such information should in no way be construed as indicating that such agencies, products or suppliers are endorsed by PSCR, or are recommended by PSCR, or that they are necessarily the best materials, instruments, software or suppliers for the purposes described.

Agenda

- Recent PSCR event summaries
  - 2013 PSCR Stakeholder Meeting
  - PSCR Public Safety Broadband Research and Development Roadmap Workshop
- PSCR efforts update
  - Public safety requirements
  - Broadband standards
  - 700 MHz Public Safety Broadband Demonstration Network
  - Broadband network modeling & simulation
  - Security research and testing

2013 Public Safety Broadband Stakeholder Conference Highlights

- Held June 4-6, 2013 in Westminster, CO
- Meeting well-attended: 450 attendees, including FirstNet board members, employees and consultants
- FirstNet
  - Strong message: FirstNet values input from First Responders, APCO, PSCR, etc.
  - Stakeholder outreach
  - RFIs (Request for Information)
  - SLIGPs (State and Local Implementation Grant Program)

2013 Public Safety Broadband Stakeholder Conference Highlights

- Deployable Systems (several presentations)
  - Fixed or movable
  - Rural coverage
  - Backup for failed site or increased coverage when needed
- Critical topics
  - Security
  - User and device authentication

2013 Public Safety Broadband Stakeholder Conference Highlights

- Presentations related to possible future directions for PSCR testing
  - VoLTE (Voice over LTE)
  - eMBMS (evolved Multimedia Broadcast Multicast System)
- Modeling and forecasting complications
  - Critical to characterize the number of First Responders in a given area
  - Complication: during an incident, multiple departments converge from multiple jurisdictions
  - Conclusion: Public Safety input, real-life examples critical to understanding requirements

Public Safety Broadband Research and Development Roadmap Workshop

- Held November 13-15, 2013 at the NIST Boulder Campus
- Limited to 150 people representing the Public Safety Community, State, Local, and Federal Partners, Industry representatives, International Organizations, and Academia
- Purpose:
  - Engage stakeholders in developing PSCR's Public Safety Broadband R&D Roadmap for the long term (10 years out)
- Outcomes:
  - Enhanced collaboration among the Public Safety, Public Sector, and Vendor Communities
  - Identification of public safety broadband R&D areas that need to be prioritized to support fulfillment of the goals of the National Public Safety Broadband Network (NPSBN)

Public Safety Broadband Research and Development Roadmap Workshop

- Used scenarios derived from the SAFECOM Public Safety Statement of Requirements to inform discussions
- Breakout sessions worked on the following:
  - Identifying enabling capabilities for future communications systems
  - Mapping capabilities to technology layers – software/application, network, and devices
  - Prioritization of the capabilities within the technology layers
- Full workshop report to be posted to the PSCR website by February 2014

PSCR Efforts Update

Public Safety Requirements

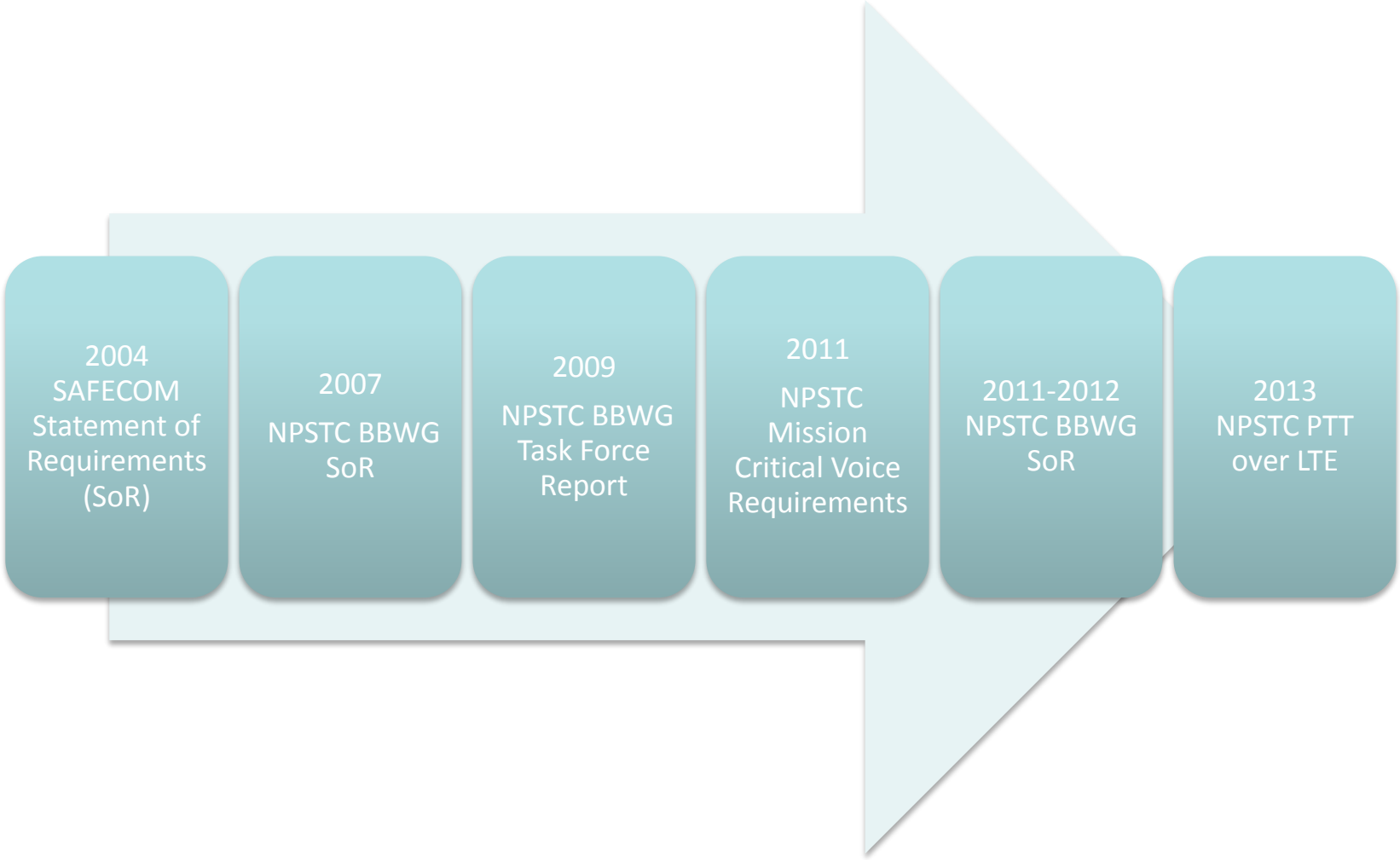
Broadband Standards

700 MHz Public Safety Broadband Demonstration Network

Broadband Network Modeling & Simulation

Security Research and Testing

Public Safety Requirements



Public Safety Requirements

- 2004 SAFECOM Statement of Requirements
  - Who, what, why, when operational understanding
- 2007 National Public Safety Telecommunications Council (NPSTC) Broadband Working Group (BBWG) Statement of Requirements
- 2009 NPSTC BBWG Task Force Report
  - Public safety selects LTE, LMR model for procurement and operation
- 2011 Mission Critical Voice Requirements
  - BBWG seeks to define features/functions that make up mission critical voice

Public Safety Requirements

- 2011-2012 NPSTC BBWG Task Group Efforts
  - Priority/quality of service
  - Local control
- 2012 NPSTC BBWG Statement of Requirements
  - Submitted “Launch Requirements” for FirstNet on December 11, 2012
- 2013 NPSTC PTT Over LTE Requirements document published on July 18, 2013

Public Safety Requirements: Current Efforts

- Continue work within NPSTC BBWG
- Requirements development
  - Quantify FirstNet launch requirements
  - Develop definition of “public safety grade”
  - Stage 2 (1-2 year) requirements
  - Console requirements: dispatch and call taking
  - Video requirements: quality and interoperability
- Global strategy: partner with Europe, Canada, Australia
- Question: Public safety expectations for increased functionality for cellular telephony and messaging

PSCR Efforts Update

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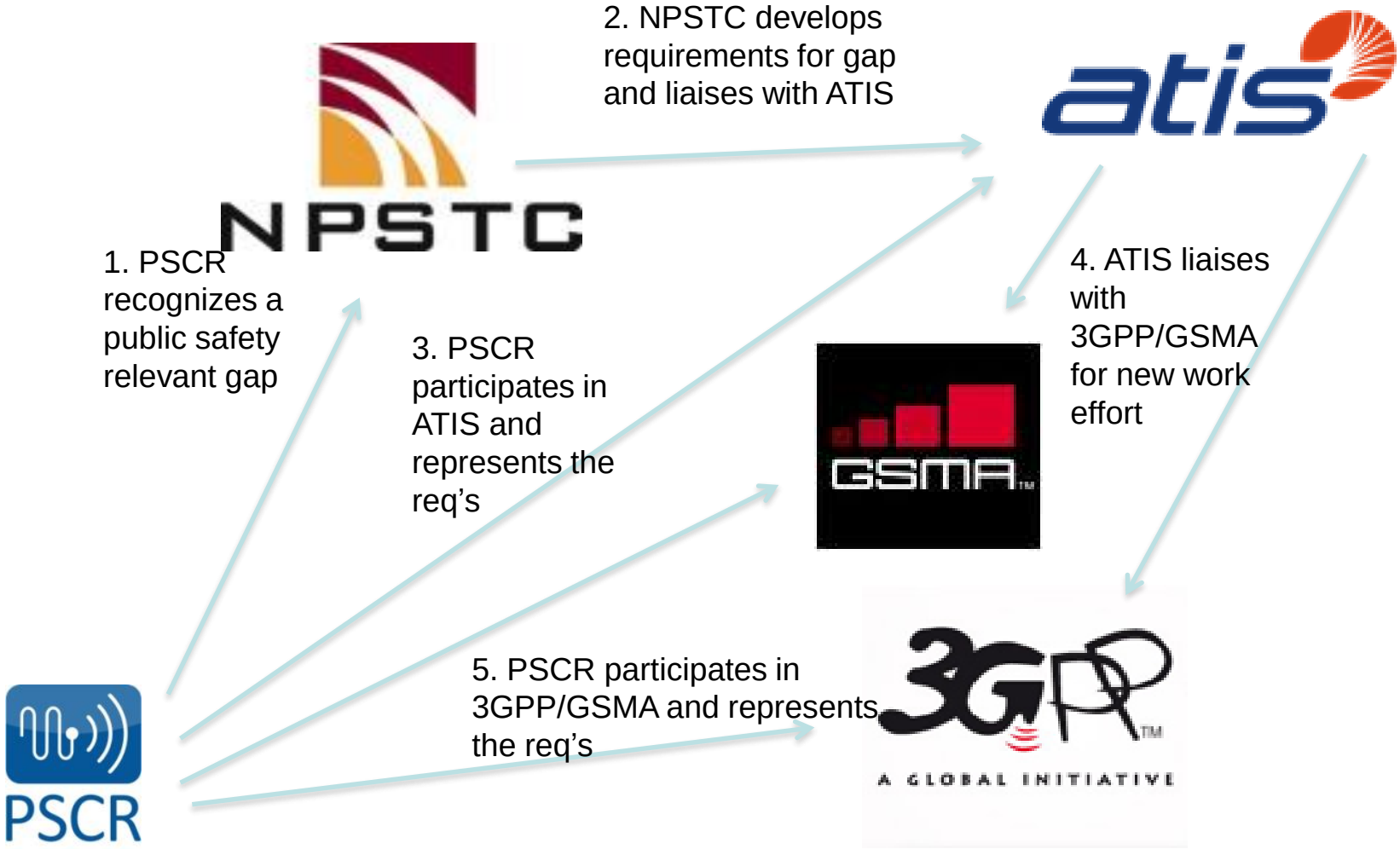
Broadband Standards



Broadband Standards: Current Efforts

- Current Focus
  - 3GPP
    - Proximity Services/ProSe (Talk-around)
    - Group Efficiency (Group communications)
  - ATIS
    - PTT over LTE (Push-to-talk over LTE)
  - GSMA
    - VoLTE (Voice over LTE)
- Lessons Learned
  - Public safety LTE is a global market; PSCR's global partnerships have been successful

3GPP Working Group Structure

Technical Specifications Group (TSG) Structure

TSG GERAN
GSM EDGE Radio Access Network

GERAN WG1
Radio Aspects

GERAN WG2
Protocol Aspects

GERAN WG3
Terminal Testing

TSG RAN
Radio Access Network

RAN WG1
RL 1 Spec

RAN WG2
RL 2 Spec
RL 3 RR Spec

RAN WG3
Lub, Iur, Iu specs
UTRAN O&M Reqs

RAN WG4
Radio Perf
Protocol Aspects

RAN WG5
Mobile Terminal Conformance Testing

TSG SA
Service & Systems Aspects

SA WG1
Services

SA WG2
Architecture

SA WG3
Security

SA WG4
Codec

SA WG5
Telecom Mgt

TSG CT
Core Network & Terminals

CT WG1
MM/CC/SM (Iu)

CT WG3
Interworking w/ Ext networks

CT WG4
MAP/GTP/BCH/SS

CT WG6
Smart Card App Aspects

3GPP Standards: Proximity Services

- Proximity Services (ProSe)
  - What it is
    - The equivalent of direct mode or talk around in Land Mobile Radio terminology. It has two main aspects:
      - Discovery: ability to discover if other UE of interest is in physical proximity
      - Communications: ability to directly communicate with 2 or more UEs in physical proximity without infrastructure
  - The Strategy
    - Public safety vs. commercial: prevent development of separate solutions, maximizing use of commercial products
    - Global: coordinate with global public safety community (critical to drive unified standards solution)
  - The Risks
    - Some commercial operators are expressing interest in public safety; most are disinterested in ProSe from a commercial perspective

3GPP Standards: Group Communications

- Group Communications System Enablers (GCSE)
  - What it is
    - Making the 3GPP ecosystem more group aware, allowing more efficient group and broadcast communications by forcing 3GPP RAN and EPC to track group membership in addition to UE location and facilitate group communications setup
  - The Strategy
    - Push as much of this work into 3GPP as possible, making standards based solutions globally available for all public safety operators given operating needs (most communications are group based)
    - Expand this work into commercial areas (social network, gaming, etc.) as much as possible to grow market opportunity
  - The Risks
    - Some vendors are trying to limit level of group awareness in 3GPP
    - This will lead to proprietary group enablement across each group based application/service deployment, increasing procurement and operations costs, and maintenance of multiple group management systems

PSCR Efforts Update

Public Safety Requirements

Broadband Standards

700 MHz Public Safety Broadband Demonstration Network

Broadband Network Modeling & Simulation

Security Research and Testing

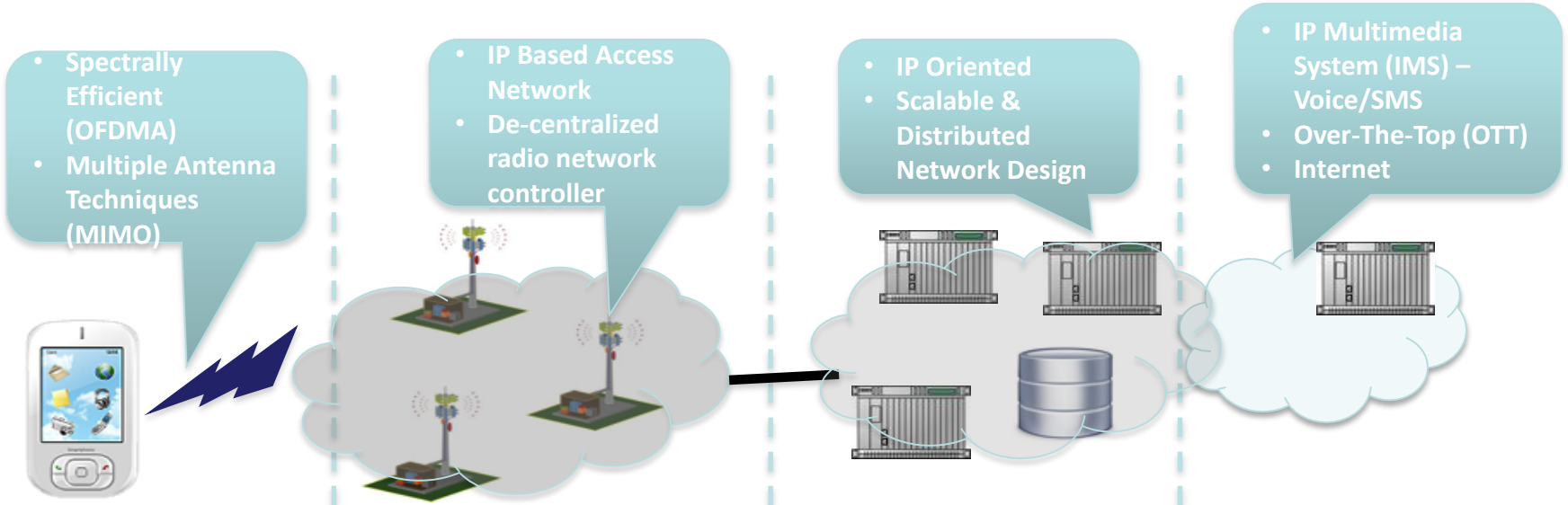
PSCR Demo Network

- Obtain, procure, and generate interest from broadband vendors to develop a 700 MHz broadband equipment ecosystem - including Band Class 14, Long Term Evolution (LTE)
- Demonstrate broadband air-interface and core network capabilities
- Interoperability with existing cellular, broadband and LMR technology
- Validation of key public safety functionalities and requirements
- Modeling & simulation of various potential public safety LTE deployments

PSCR Demo Network

- R&D **nationwide interoperability** through a unified approach to network design and implementation
  - Testing (conformance, performance and evaluation)
  - Multi-site/vendor Over-The-Air network – allows consistent testing between vendors
  - Develop guidelines/industry requirements for network architecture
  - Advanced feature testing

LTE Network Architecture



Air Interface

Radio Access Network

Evolved Packet Core Network

Service Network

PSCR Boulder Sites

- **PSCR Demonstration network cellsites:**

Cellsite On Wheels (COW)

Green Mountain

Table Mountain Mesa

PSCR Boulder Sites

Site locations for the Boulder Demo Network:

A. Green Mountain
   - Dept. of Commerce Labs

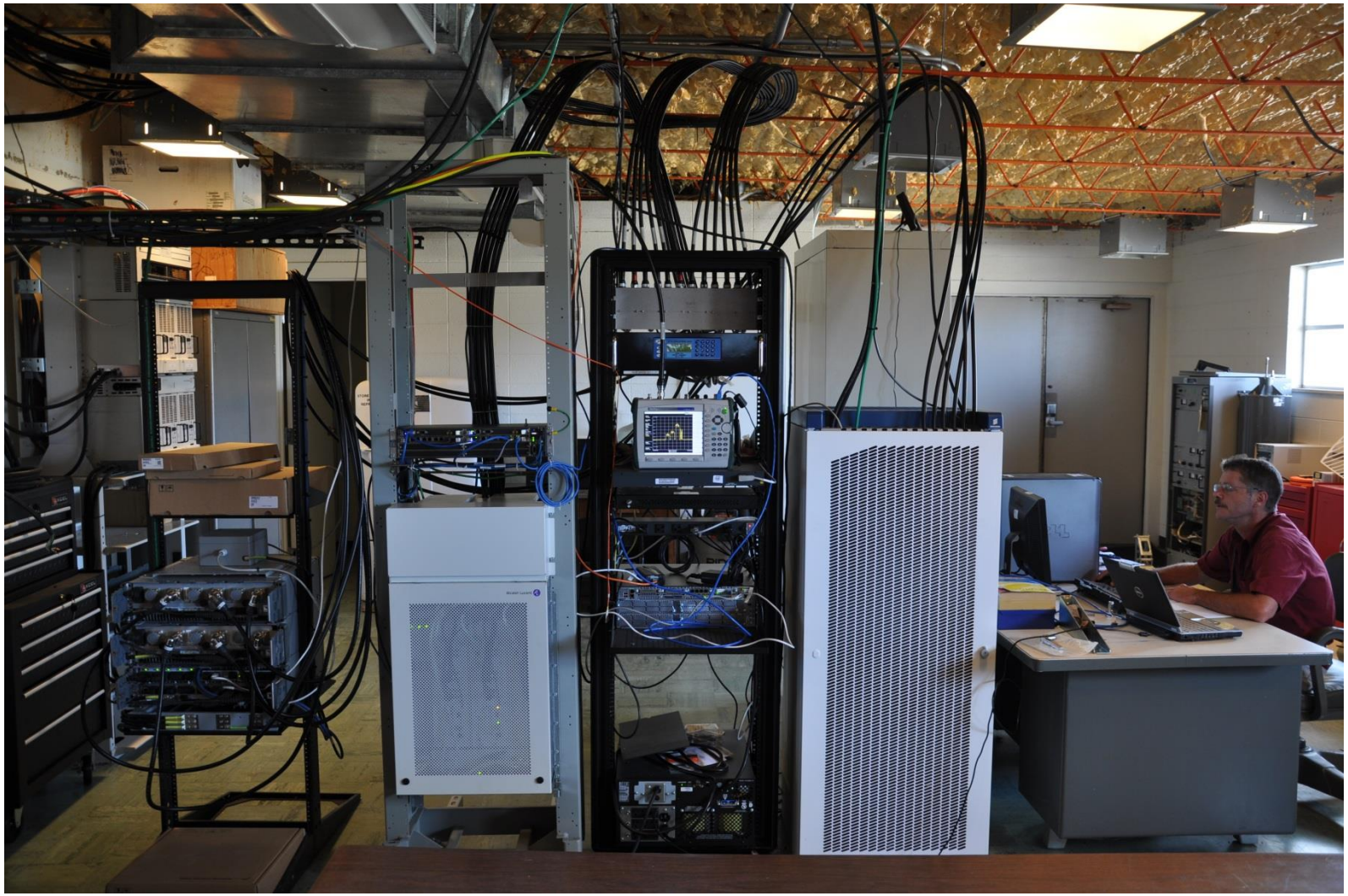
B. Table Mountain Mesa
   (9 miles NE of DOC Labs)
   - Radio Quiet Zone
   - Managed by NTIA/ITS

C. Cell on Wheels (COW)
   - Shown at GunBarrel

Green Mountain Base Station

Table Mountain Mesa

Table Mountain Mesa (inside)



Cellsite on Wheels (COW)

GunBarrel Co-Located Cellsite

PSCR Demo Network: Current Efforts

- Three phase test plan
  - Basic Functionality Testing (completed)
    - Macro and Small Cell
  - System and Node-Level Testing (canceled)
  - Network Interoperability & Drive Test (finalizing)
- In process of upgrading equipment to 3GPP Release 9
- Researching future directions for demo network testing

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Network Modeling: Current Efforts

- Evaluate the performance of Long Term Evolution (LTE) networks and their capacity to support Public Safety requirements
  - Optimize different scenarios for the demonstration network
  - Estimate the resources required to build a nationwide public safety broadband network
  - Define performance metrics to facilitate the comparisons of network scenarios and deployments
  - Obtain area, population, and user coverage
  - Determine maximum supported capacity

PSCR Efforts Update

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Security Research and Testing

Security Research and Testing

- Kicked off at the PSCR stakeholder meeting in June 2013
- Takes a holistic approach to security for public safety communications
- Leverages existing mobile security efforts within the government and industry

Security Research and Testing: Current Efforts

- Public safety requirements
  - Participating in the NPSTC BBWG effort to quantify the "launch requirements" provided to FirstNet
- Broadband standards
  - Participating in 3GPP SA3 (Security) and SA3 Lawful Intercept working groups
  - Supporting the standardization of Proximity Services/ProSe (Talk-around) and Group Efficiency (Group communications)

Security Research and Testing: Current Efforts

- Researching approaches to identity management for mobile devices including
  - How existing issued credentials might be leveraged
  - Technology supporting credential storage on mobile devices
    - Software
    - Hardware
  - Published report will capture findings

Security Research and Testing: Current Efforts

- Security enhancements to the PSCR Demo Network
  - Implement security controls in the demo network and test impact
  - Based on public safety security requirements
    - NPSTC “Launch Requirements”
  - Mapping public safety security requirements to standard security controls
    - 3GPP specifications
    - ATIS standards and best practices
    - NIST Special Publication 800-53: Recommended Security Controls for Federal Information Systems and Organizations

Security Research and Testing: Current Efforts

- Secure mobile application development for public safety
  - Mobile application lifecycle
    - Identification of requirements
    - Application development
    - Application vetting
    - App store availability
    - Purchase application
    - Install application
  - Current focus on application vetting, identification of public safety mobile application requirements, and application development.

Security Research and Testing: Current Efforts

- Secure mobile application development for public safety (continued)
  - Mobile application vetting
    - Leveraging DRAFT NIST SP 800-163: Technical Considerations for Vetting Applications for Android Mobile Devices
  - Secure mobile application development
    - Participated in AT&T's public safety hackathon in May 2013
    - Leverage the NIST Software Assurance Metrics and Tool Evaluation (SAMATE) program
  - Identification of public safety mobile application requirements
    - Leverage the APCO key characteristics
    - Planning workshop with APCO to identify security requirements

Thank You!

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Q & A

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