Session: Demonstration Network Overview

Time: December 1st, 10:30 AM – 11:30 AM

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Working Group Creation

- April 2010 Inaugural meeting four working groups created to create open dialogue between PSCR and stakeholder community
  - WRWG: Waiver Recipient
  - ADWG: Application Demonstration
  - ETWG: Evaluation Test
  - NAWG: Network Architecture

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WRWG: Vision & Mission

- Vision: There is a nationwide broadband network that meets public safety's needs
- Mission: To do this the WRWG will provide a forum for relationship building, information sharing and learning to:
  - Lay the groundwork for a nationwide and interoperable broadband network
  - Minimize any transition or interoperability issues with larger national network

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Application Demonstration Working Group (ADWG) Information

Purpose of ADWG: The primary task of ADWG is to develop the initial conditions, procedures, and expected results for each application demonstration. Examples of application demonstrations are video, voice, web browsing, etc.

ADWG Audience: Geared towards public safety communications practitioners and first responders, 700-MHz waiver recipients, and is also open to communications vendors.

URL to Join the ADWG:

http://www.pscr.gov/projects/broadband/700mhz_demo_net/700mhz_ps_demo_net.php

URL to Access ADWG Materials (Must be a Member of ADWG):

https://partnerweb.its.bldrdoc.gov/_layouts/itslogin.aspx?ReturnUrl=%2fPrograms%2fPSI%2fbroadband%2fstakeholders%2fADWG%2fdefault.aspx

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Application Demonstration Working Group (ADWG) Information

- Document titled "Basic Application Demonstrations Outline v3" posted to ADWG work space.
- The document currently contains 30 basic application demonstrations. Some of these application demonstrations are web browsing, email, video, location based services, etc.
- The document also contains a "scenario mapping" section that attempts to illustrate how basic application demos fit with the larger scenarios. The larger scenarios are:
  - Police: Traffic Stop
  - EMS: Heart Attack Victim
  - Multi-Agency: Chemical Plant Fire

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Evaluation & Test Working Group (ETWG) Information

Purpose of ETWG: The primary task of ETWG is to develop and identify BC 14 PS (Band Class 14 public safety) specific engineering centric tests. In addition, this WG has developed demonstration network technical equipment requirements.

Evaluation tests examine the system's ability to meet particular engineering criteria. These tests may involve specialized software or instrumentation and are typically quantitative rather than qualitative in nature.

ETWG Audience: Due to the technical nature of this WG, it is ideal for manufacturers of LTE equipment (i.e. infrastructure, terminals/Ue's, chipsets, etc.) and LTE service providers. The group is open to all stakeholders - public safety communications practitioners, first responders, and 700-MHz waiver recipients.

URL to Join the ETWG:

http://www.pscr.gov/projects/broadband/700mhz_demo_net/700mhz_ps_demo_net.php

URL to Access ETWG Materials (Must be a Member of ETWG):

https://partnerweb.its.bldrdoc.gov/_layouts/itslogin.aspx?ReturnUrl=%2fPrograms%2fPSI%2fbroadband%2fstakeholders%2fETWG%2fdefault.aspx

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Evaluation & Test Working Group (ETWG) Information

- LTE demonstration network equipment requirements document was created. The document is titled: "LTE Demonstration Network Equipment Requirements v1.2" and can be found under the ETWG work space.
- This document points out
  - Existing 3GPP specifications relevant to PS
  - Existing commercial requirements relevant to PS
  - PS RF Requirements
  - PS Access Control Requirements
  - PS QoS Requirements
  - PS Handover Requirements
  - PS Link Security Requirements
  - PS Physical Requirements
  - PS Unique Requirements
  - PS OAM&P Requirements
- This document is a work in progress. PSCR could use help in fleshing out several of the sections.

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Evaluation & Test Working Group (ETWG) Information

- Test Plan for the LTE demonstration network was presented at the April 2010 PSCR meeting.
- This spreadsheet can be found under the ETWG work space and is titled “Evaluation and Demonstration Test Pools v5”.
- This spreadsheet contains 168 test cases that have been determined to be relevant to public safety.
- Roughly 61 out of the 168 test cases are covered by the new BC 14 in PTCRB.

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Network Architecture Working Group (NAWG) Information

- NAWG Purpose: The primary focus of the NAWG is to help determine the Demonstration Network architecture(s) that will represent the various potential Public Safety network deployments and allow PSCR to evaluate each implementation. Several variations may need to be deployed and evaluated (e.g. Leveraged Network Models, PLMN ID, IPX) during the project.

- NAWG Audience: Due to the technical nature of this WG, it is ideal for manufacturers of LTE equipment (i.e. infrastructure, terminals/Ue's, chipsets, etc.) and LTE service providers. The group is open to all stakeholders - public safety communications practitioners, first responders, and 700-MHz waiver recipients.

- URL to join the NAWG: https://partnerweb.its.bldrdoc.gov/regpscr/WorkGroupReg.aspx

- URL to Access NAWG Materials (Must be a Member of NAWG): https://partnerweb.its.bldrdoc.gov/regpscr/WorkGroupReg.aspx

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NAWG Work Items

- NAWG met five times during the year (teleconference) and addressed the following topics:
  - Creation of baseline link budget and network coverage for Boulder
    - Finalizing site locations for eNodeBs and discussing EPC options (local vs. remote)
  - Network architecture & implementation
    - Multiple PLMN ID scenario's & boundaries
    - Enum and MSIN
    - Intra/Inter LTE Handover
    - Managed/Leveraged Network testing – remote EPC elements and backhaul sizing
    - IMS (including VoLTE), APN and application server integration
    - Physical system attributes (size, weight, HVAC, NEBS, TL9000….etc)
  - Multi-network (waiver simulation) integration - IOT
  - Network Security Architecture
  - Quality of Experience (Qoe) TFT, QoS, ARP, QCI
    - Two separate meetings were held to address QoS complexity

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Link Budget Analysis

- Gathered input from Ue and eNodeB vendors regarding Modulation Coding Scheme (MCS) values, noise figure (NF) and other RF related parameters
- Basic Network Parameters for cell edge performance
  - Single User
  - Outdoor coverage only
  - 70% cell load
  - 768 kbps DL
  - 256 kbps UL
  - 95% availability
  - Detailed link budget information available in NAWG folder

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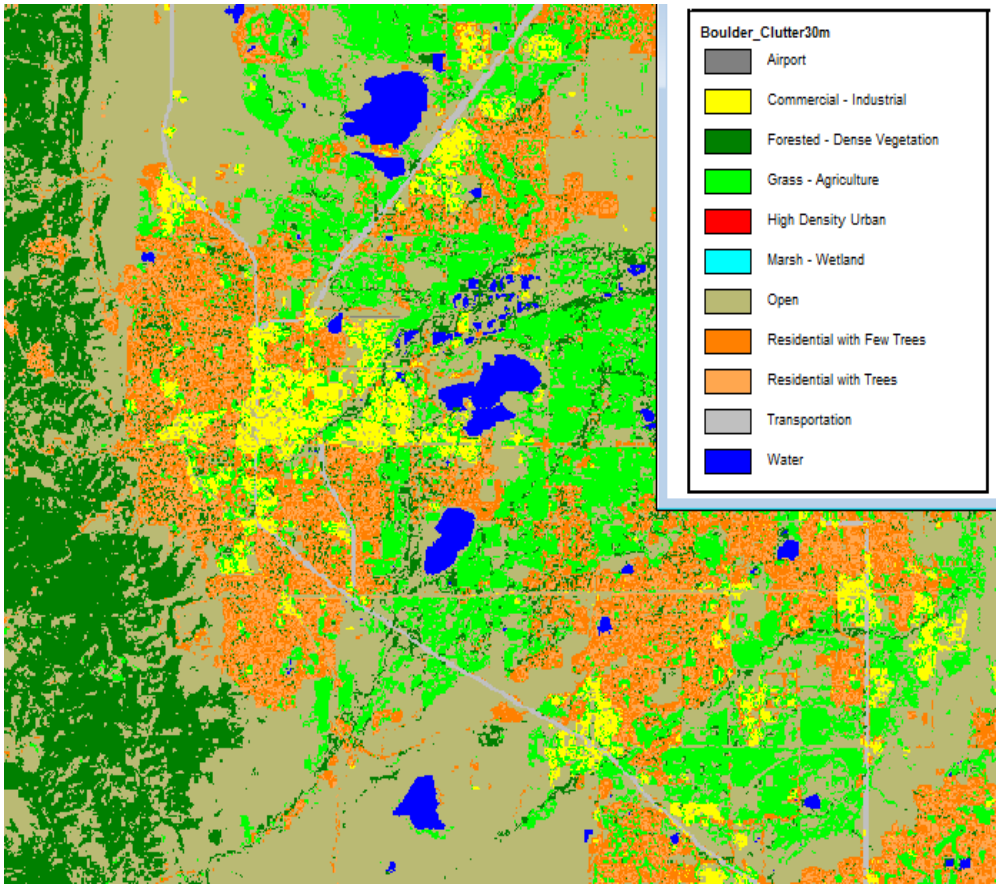
Link Budget – Clutter Classes



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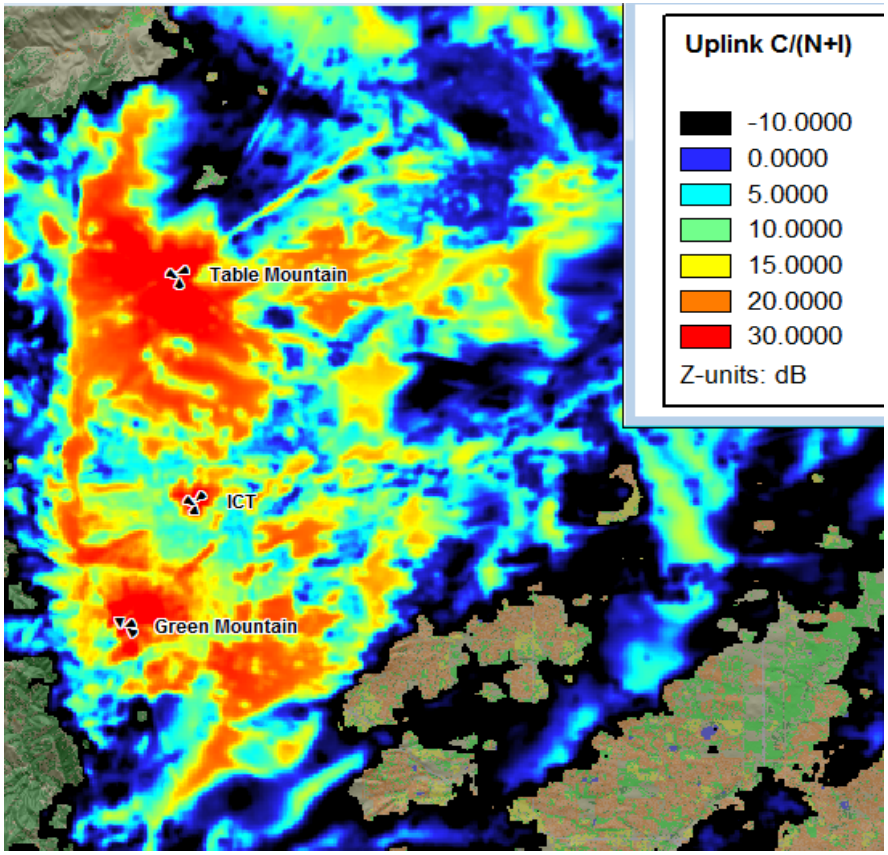
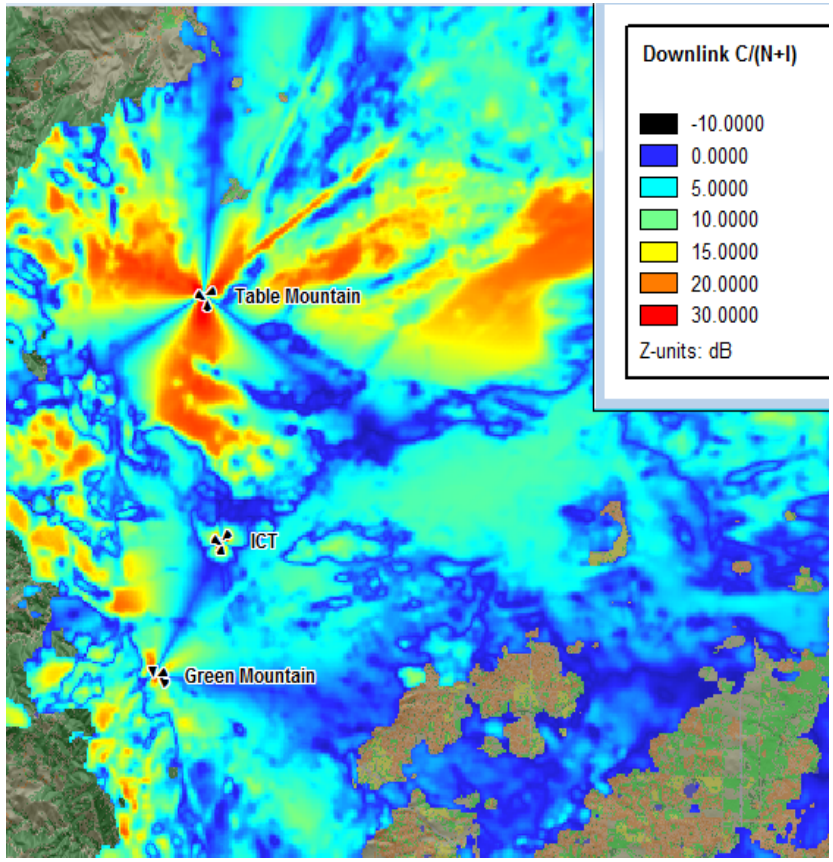
UL & DL C(N+I)





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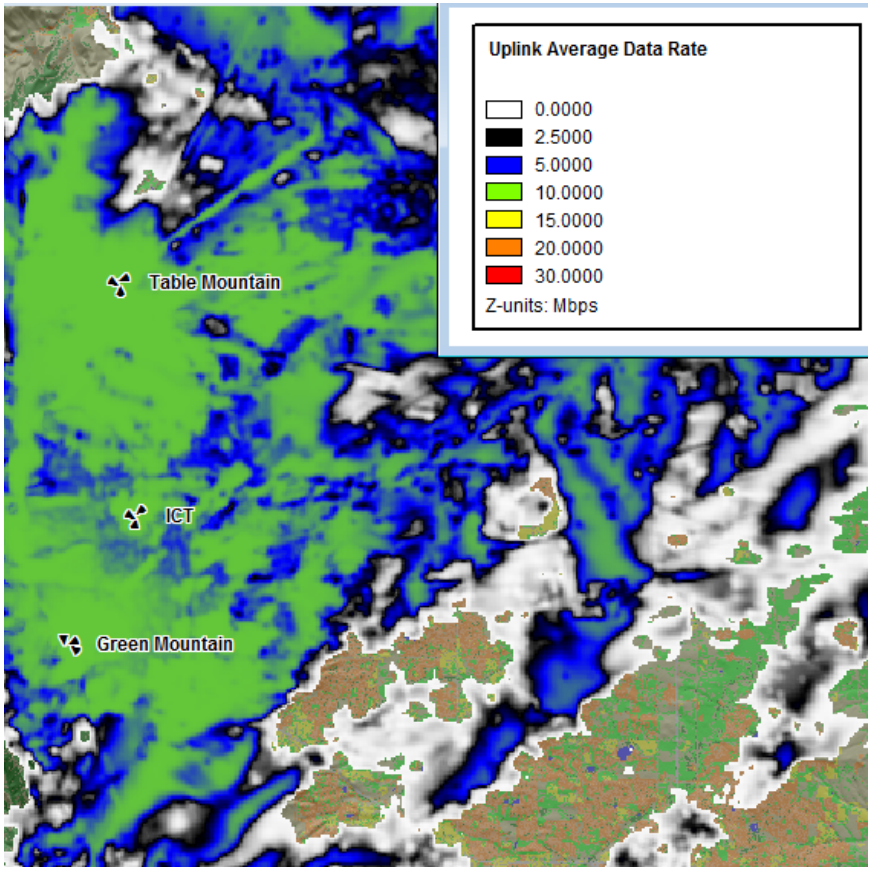
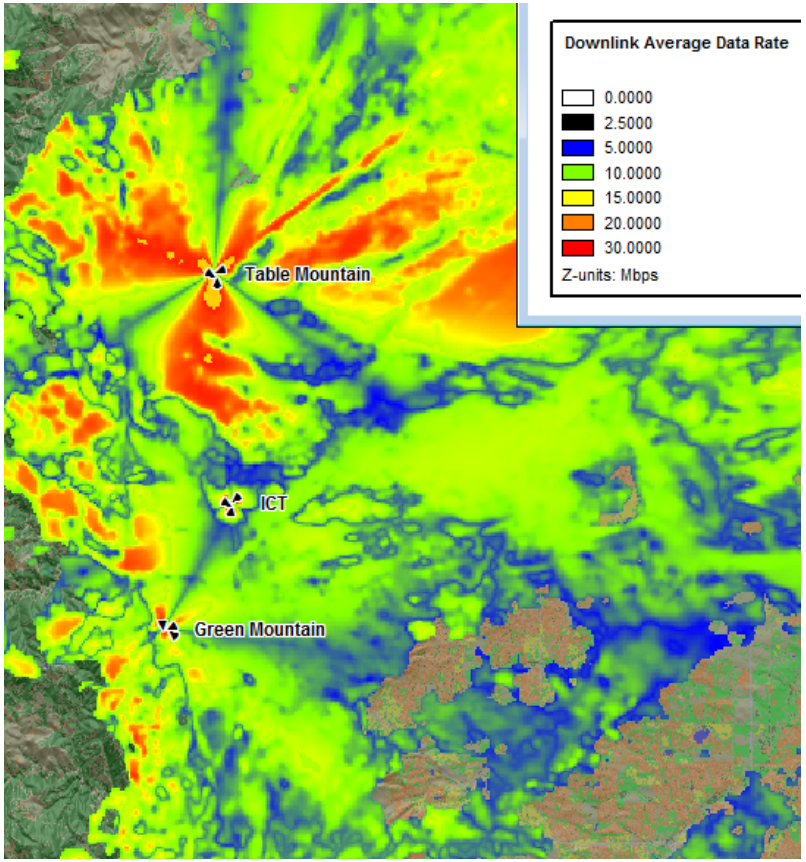
UL and DL Peak Data Rates





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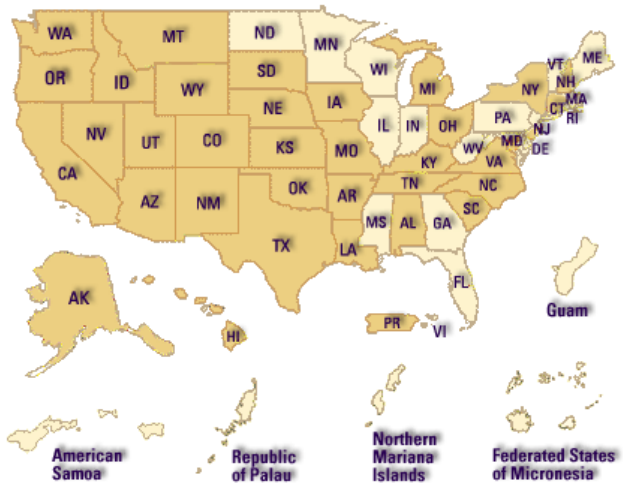
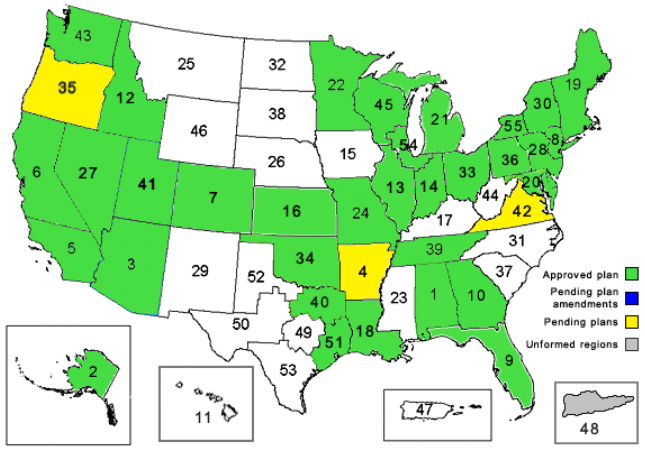
PLMN ID

- PSCR worked with ATIS IOC, FCC, CDG and Motorola to modify v11 of the IMSI Guidelines to allow public safety access to PLMNs and IMSIs
  - Section 6.1: The HNI applicant must be, and certify that it is, a public network operator (commercial or government), or an authorized agent operating on behalf of a public network operator, offering mobility services in the United States with a need to roam onto/from commercial networks or that it is a provider of a service profile management system (e.g. Home Location Register [HLR], Home Authentication, Authorization, and Accounting [AAA]) based in the United States for end user devices that can access public networks in the United States.
- ATIS IOC has tentatively approved PLMN usage plan from PSCR – Potentially assign MCC to PS and assign between 1 and 60 PLMN IDs initially and leave the remaining ~39 for growth.
  - **eNodeB transmits minimum two (2) PLMN IDs (maximum of 6)**
  - **National PLMN ID - Use of a single nationwide network in which everyone is treated equally as a roamer and would be used to identify users that have no HPLMN such as Federal users. E.g. Blanket or Umbrella PLMN**
- PS eNB would broadcast HPLMN and National PLMN and could support commercial PLMN as agreed upon
- Ue/USIM whitelist would contain National PLMN and HPLMN – would also contain approved commercial network PLMNs





Note that having a PLMN ID does not necessitate that each of these regions have or require their own core network. Multiple regions could share a packet core to reduce the cost and alleviate the region from the management aspects associated with the EPC. EPC functions would be logically separated to the end user

System Info

- 3GPP Release 8 December 2009 Freeze will be minimum baseline
  - Specific CR and/or feature support will be required for advanced features such as ARP, QoS, E-SMLC and eMBMS
  - Initially deploy "Best Effort" data during system integration and rapidly move to QoS enabled system
- IPv4 initial implementation

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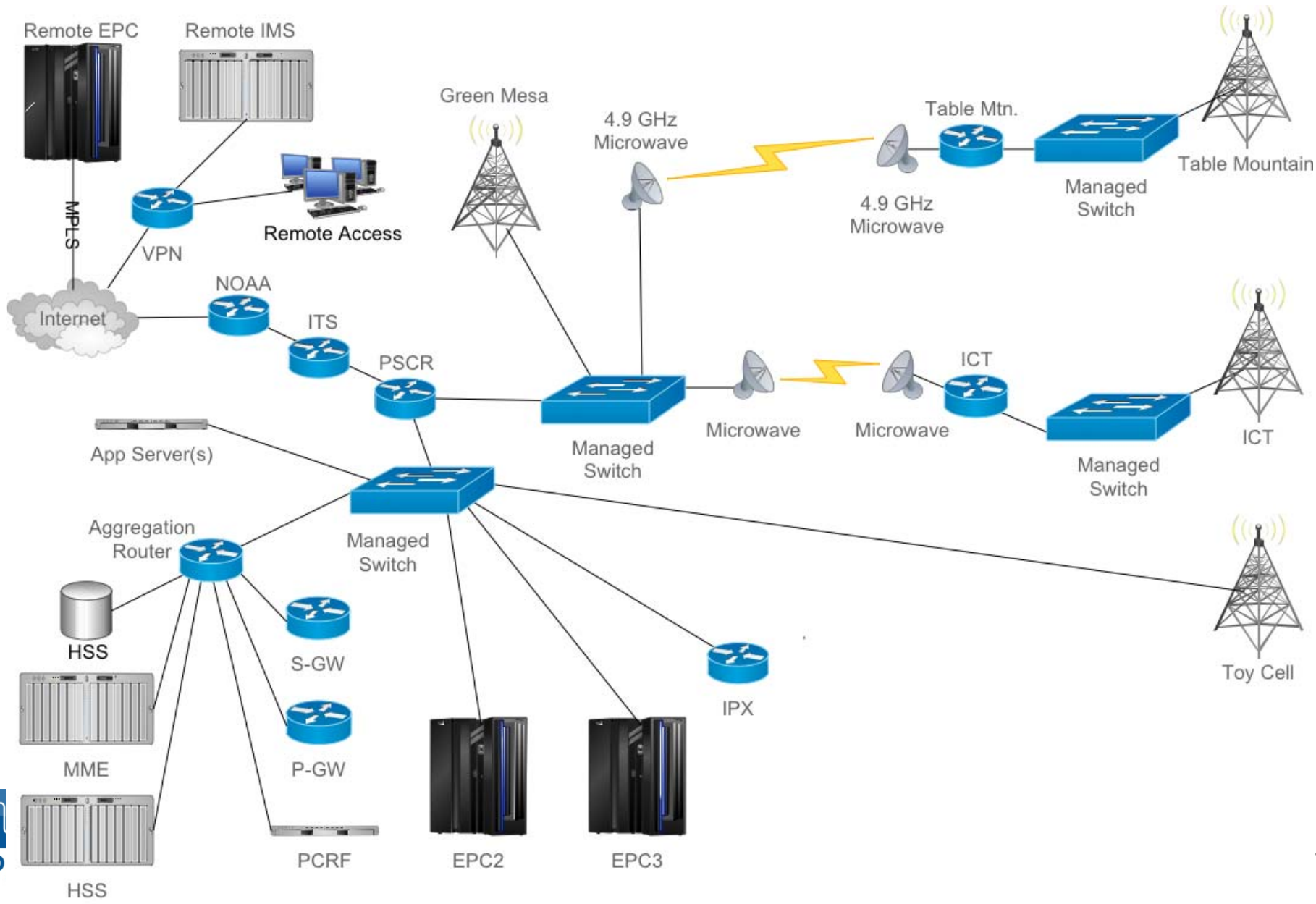
PSCR Network Diagram



Remaining Issues

- Voice, Security and QoS work items will be discussed in detail during the remaining sessions
  - Details can be found in archives
- Initial network tuning and testing to start early Q1 2011
- Remainder of 2010 focusing on integrating existing vendors and scheduling new vendors
- Multi-vendor IOT planning starting early 2011

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Q&A

Thank You

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