3GPP RAN Workshop on Rel-12 and Onward

11th – 12th June 2012, Ljubljana, Slovenia

LTE addressing the needs of the Public Safety community

RWS-120030

Phil Young

© 2012 IPWireless. All rights reserved. The IPWireless logo is the property of IPWireless Inc. All other marks contained herein are the property of their respective owners.

Summary

What is the Public Safety Community ?

Current Public Safety Communication Systems

Problems with P25 Narrowband LMR in US

US National Broadband Plan

Broadband Task Force & Demonstration Network

Recent Developments in US PS Broadband Initiative

Narrowband to Broadband Migration

Mission Critical Voice

LTE and Provision of MCV Features

Push-To-Talk / Talk Group Calling

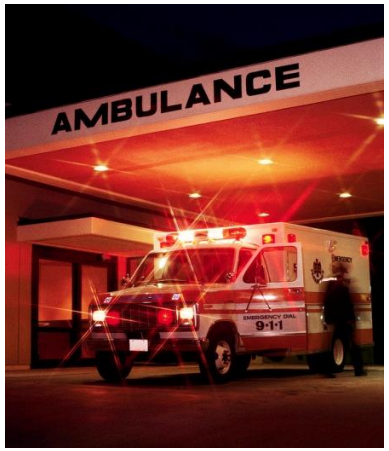
Device-to-Device Calls

Why Should 3GPP Consider Public Safety?

Summary and Recommendations

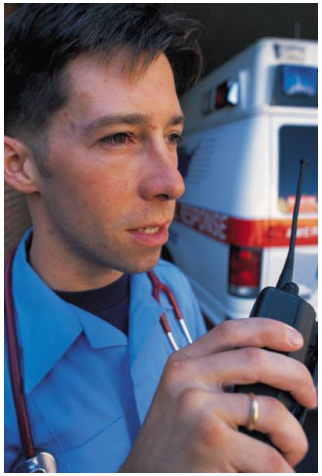
© 2012 IPWireless. All rights reserved.

What is the Public Safety Community ?



First
Responders

Public
Protection
Disaster
Relief



© 2012 IPWireless. All rights reserved.

RWS-120030

IPWireless

Current Public Safety Communication Systems

Digital Narrowband (PMR/LMR) Systems:

- P25 (APCO / TIA-102 series specs)
- TETRA (ETSI)

P25 Characteristics:

- Conventional Direct or Trunked Communications
- FDMA or 2-slot TDMA
- Voice and low rate data
- Talk groups and User identification
- Typical voice service modes:
  - 1-1 individual calls, 1-many group calls, Push-To-Talk calling
  - Emergency calls with pre-emption and alerting
  - Device-to-Device calling (aka Talk Around or Direct Mode Operation)

© 2012 IPWireless. All rights reserved.

Problems with P25 Narrowband PMR in US

Narrowband Limitations:

- Restricted data transfer speed (9.6 kbps)
- Limited to mainly text and images (and voice)

Interoperability Issues:

- Fragmentation of spectrum assignments
- Lack of mandatory standards
- Requirements of jurisdictions / services often uncoordinated
- Incompatibility among vendors' products

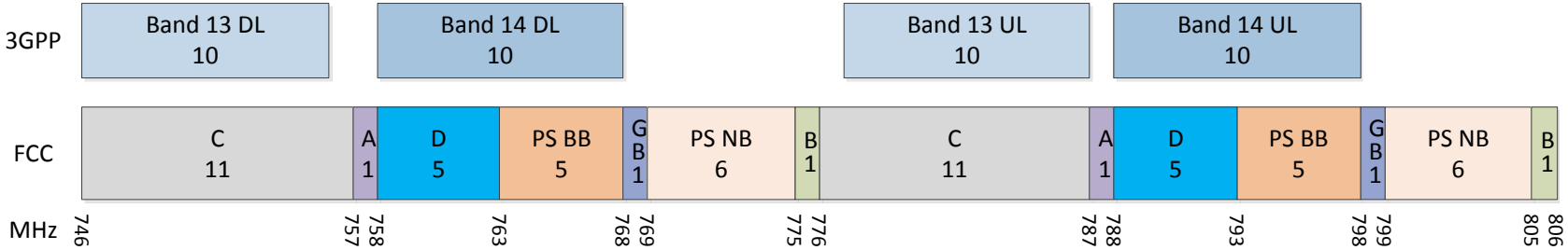
© 2012 IPWireless. All rights reserved.

US National Broadband Plan

2007: National Broadband Plan (http://www.broadband.gov/plan/)

- Opportunity to achieve advanced interoperability for Public Safety
- 5+5 MHz allocated to PS BB (Licensed to Public Safety Spectrum Trust)
- Adjacent D Block envisioned as public/private partnership

700 MHz Band Plan Adopted by FCC in 2007 with Corresponding 3GPP Operating Bands



PS BB — Public Safety Broadband License – Nationwide Licensed to Public Safety Spectrum Trust

D — Nationwide spectrum for auction as public/private partnership or to be allocated to the nationwide PBSL

© 2012 IPWireless. All rights reserved.

Broadband Task Force & Demonstration Network

2009: National Public Safety Telecommunications Council

- Endorsed LTE as technology of choice for NBDS
- Broadband Task Force established
  - Minimum recommendations necessary to ensure roaming and interoperability
  - http://www.npstc.org/broadband.jsp

2009- : 700-MHz Broadband Demonstration Network

- Aim is to provide manufacturers and first responders a location for early deployment of their systems in a multi-vendor, neutral, host environment
- Goal is to demonstrate and evaluate the behaviours of 3GPP LTE technology, as deployed in the 700 MHz bands
- Run by *PSCR* a joint program established by NIST and NTIA
- http://www.pscr.gov/projects/broadband/700mhz_demo_net/700mhz_ps_demo_net.php

© 2012 IPWireless. All rights reserved.

Recent Developments in US PS Broadband Initiative

2010/11: FCC Waiver for Early Implementers

- Affirmed clear goal of nationwide broadband interoperability
- Re-endorsed LTE as technology of choice
- Permitted early deployment of systems meeting a minimum set of requirements pending resolution of the broader issues
- http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-10-79A1.pdf

2012: Middle Class Tax Relief and Job Creation Act

- $7 billion dedicated to broadband network build-out
- 5+5 MHz D block in upper 700MHz also allocated to public safety
- First Responder Network Authority (FirstNet) proposed
- Early deployment waiver suspended pending FirstNet deliberations

© 2012 IPWireless. All rights reserved.

Narrowband to Broadband Migration

Issues

- Large base of deployed PMR systems and terminals
- Reliance upon PMR systems for mission critical communications
- LTE is missing certain mission critical features

Migration Phases

I. Initially separate Narrowband and Broadband systems

II. Inter-working (e.g. via P25 ISSI interface)

III. Full migration to LTE BB once it provides full service requirements

© 2012 IPWireless. All rights reserved.

Mission Critical Voice

High Level features:

- Device-to-Device calls
- One-to-many group calling / Talk group management
- Push-To-Talk calling
- Full duplex / cellular voice
- Emergency alerting / pre-emptive access
- Talker ID

Qualitative/Performance characteristics:

- Audio quality
- High power (+33dBm) in-vehicle UE option
- Secure voice and data
- Low latency
- Inter-agency interoperability

© 2012 IPWireless. All rights reserved.

LTE and Provision of MCV Features

Existing features in LTE:

- ✓ Full duplex / cellular voice
- ✓ Emergency alerting / access
- ✓ Talker ID
- ✓ Band 14 high power UE (work item in progress)
- ✓ Secure voice and data

Missing features:

- ✘ Device-to-Device calls
- ✘ One-to-many group calling / Talk group management
- ✘ Push-To-Talk calling

Features needing evaluation:

- Audio quality of 3GPP codecs in mission critical environments
- Call-setup & media latency in mission critical situations
- Interoperability

© 2012 IPWireless. All rights reserved.

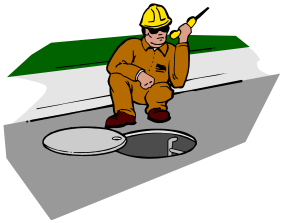
Device-to-Device Calls

Observations:

- Essential for MC voice and provided by current Narrowband PMR
- Must be supported natively by LTE for full migration to broadband
- Existing SA1 requirements study item for Proximity-based Services (target Rel-12 Stage 1)

Proposal for Rel-12 RAN Study Item:

- Study methods for device discovery
- Study options for device-to-device communication
- Operation when no network coverage is essential for public safety
- Both FDD and TDD should be considered for global applicability
- Study options for in-band relay (device-to-device-to-network)



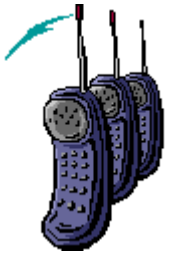
© 2012 IPWireless. All rights reserved.

Group Calls / Talk Group Management

Observations

- Available from proprietary PMR solutions now
- Migration should be to an Open Standards solution providing for inter-agency interoperability when supported natively on LTE
- Should the Open Standards solution be a new 3GPP LTE feature or an Over-The-Top application (e.g. OMA PoC) ?
- SA1 are proposing a work item to define the requirements for supporting group communications over LTE (target Rel-12 Stage 1)

Native LTE or OTT Solution Considerations



- Call setup latency
- Voice / media latency
- Spectrum efficiency – use of Over-The-Air broadcast ?

© 2012 IPWireless. All rights reserved.

Why Should 3GPP Consider Public Safety?

Global Interest

- US has committed to LTE for Public Safety broadband
- In Europe LTE is considered to be the best option by many of the relevant technical committees
- Other national PS authorities (e.g. in Australia, S-E Asia and the Gulf States) have chosen or are considering LTE

Network Deployment Models

- Some Public Safety authorities may contract out network provision providing an opportunity for commercial operators
- Other Public Safety authorities may choose to rely upon mixed public/private network models offering similar commercial opportunities

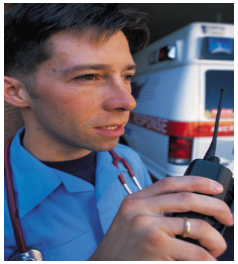
© 2012 IPWireless. All rights reserved.

Summary and Recommendations

Mission Critical Voice is the Priority

1. Device-to-Device calling
   - **3GPP RAN should study options for device-to-device communication and device discovery in Rel-12**
   - Ensure both Public Safety and commercial requirements are addressed

2. Talk Group / Push-To-Talk Calling
   - **3GPP RAN should study options for group and PTT communication in Rel-12/13 if architecture studies indicate that a native LTE solution is required**



© 2012 IPWireless. All rights reserved.