APCO 2014
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Voice over LTE and Mission Critical Voice: How Do They Differ, And What Is The Status Of Each

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August 5, 2014

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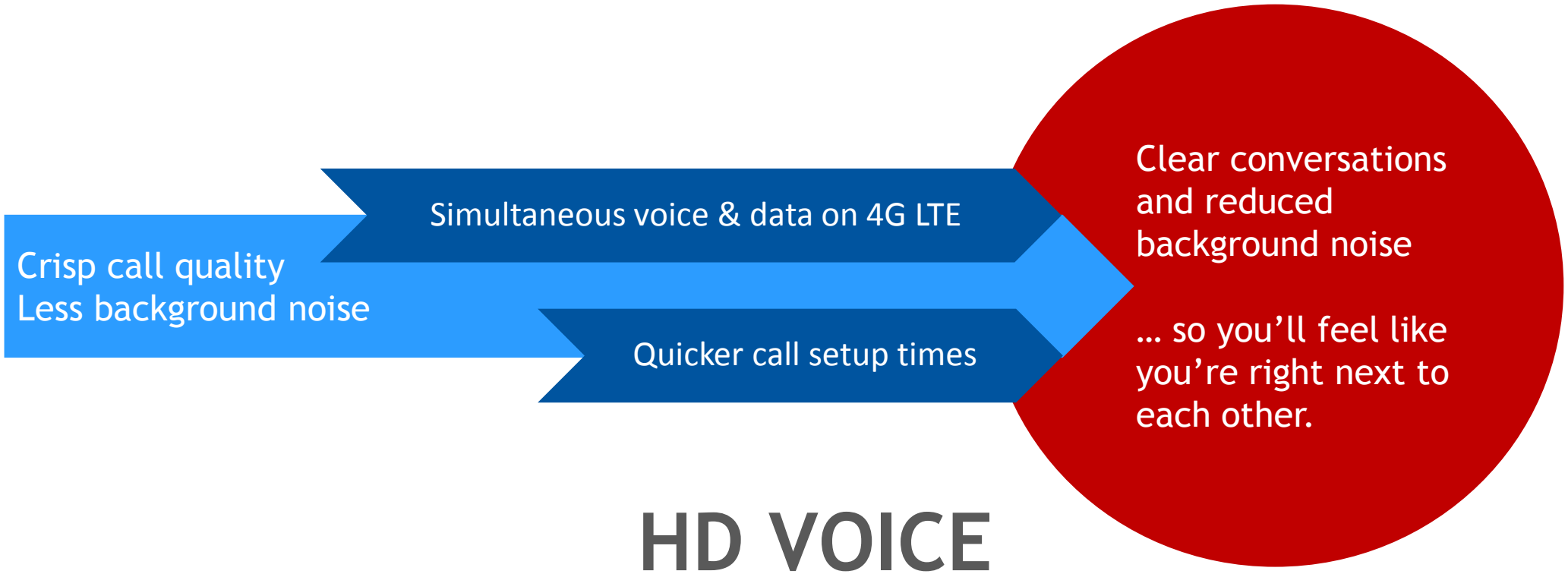
Types of LTE Voice Services

- Cellular Voice
  - Voice over LTE (VoLTE)
  - Push-To-Talk (PTT)
- Mission Critical Voice (MCV)/Mission Critical PTT (MC-PTT)

VoLTE – Crystal-clear Communications



HD VOICE

VoLTE Deployment Status

Operational:
8 Operators
Azerbaijan (Azercell)
Germany (O2 Germany)
Hong Kong (CSL Soft)
South Korea (KT, LG U+, SK Telecom)
US (**AT&T**, Evolve Broadband, MetroPCS/**T-Mobile**,)

Preparing Rollout:
22 Operators
Canada (Sasktel, Telus)
China (China Mobile)
Germany (DT)
Hong Kong (PCCW)
Japan (Softbank)
Lebanon (Alfa)
Netherlands (Tele2)
Russia (Yota)
Saudi Arabia (Mobily)
Singapore (StarHub)
Slovenia (Telekom Slovenije)
Sweden (Tele2, Teliasonera)
UAE (Etisalat)
UK (EE)
USA (C-Spire, US Cellular, Sprint, Verizon)

Trials/Planning:
11 Operators
Australia (Optus)
Austria (TMobile)
Germany (E Plus)
India (Bharti Airtel,Reliance Jio)
Japan (NTT DoCoMo)
Netherlands (Vodafone)
Slovakia (TMobile)
Spain (Telefonica)
Turkey (Avea)
USA (Vtel)

Source: Tele Analysis, January 20, 2014

LTE Voice Services For Public Safety

	Standardized	
VoLTE	Supported Today	Standardization in Progress
PUSH-TO-TALK (Network-Based)	Small Groups (Multi-unicast)	Mission Critical Push-to-Talk Over LTE (Release 13) Group Communication Service Enablers for LTE (Release 12/13)
PUSH-TO-TALK (Device-To-Device)		LTE Proximity Services (Release 12/13)
Release 12 Stage 3 Freeze 12/14 Release 13 Stage 3 Freeze 3/16	**Cellular Voice**	**Mission Critical Voice**

Benefits Of FirstNet Voice Service Support

Cellular Voice

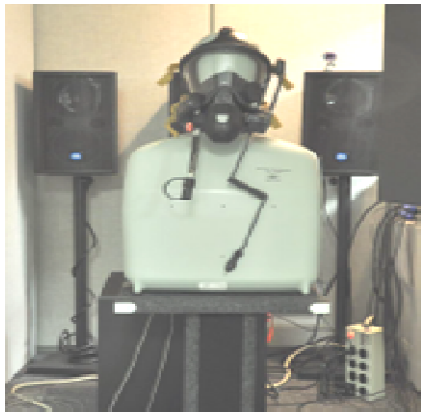
LOWER NET END-USER SERVICE COSTS

LOWER LAND MOBILE RADIO SYSTEM LOAD

BETTER SERVICE

Benefits Of FirstNet Voice Service Support

IMPROVED VOICE QUALITY OVER P25

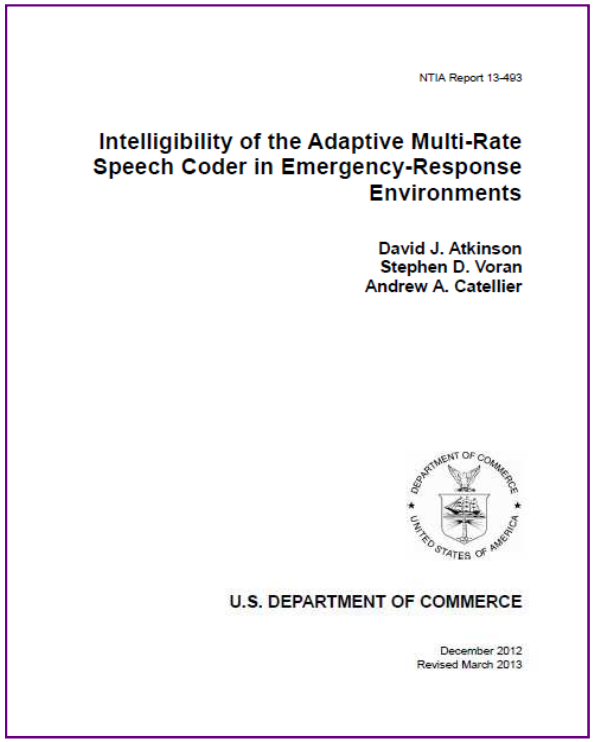


Environments Tested

1. No noise
2. Nightclub noise
3. No noise, mask, mic at vox port
4. No noise, mask, mic in mask
5. PASS alarm, mask, mic at vox port
6. PASS alarm, mask, mic in mask
7. Chainsaw, mask, mic at vox port

AMR7.4 intelligibility higher than P25 in all environments except “no noise” (lower)

AMR12.2 intelligibility higher than P25 in all environments except “no noise” (same)



NTIA Report 13-493

Intelligibility of the Adaptive Multi-Rate Speech Coder in Emergency-Response Environments

David J. Atkinson
Stephen D. Voran
Andrew A. Catellier

U.S. DEPARTMENT OF COMMERCE

December 2012
Revised March 2013

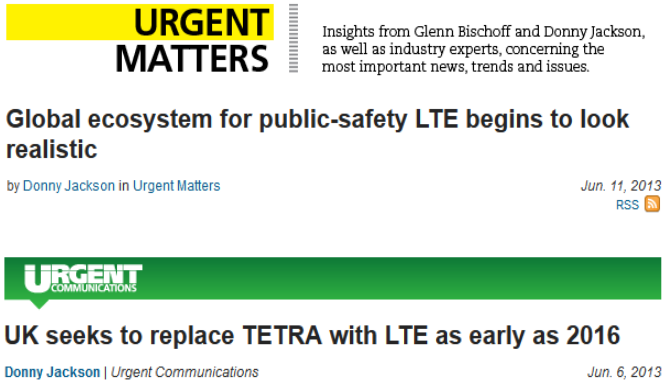
http://www.its.bldrdoc.gov/publications/2693.aspx

GLOBAL ECOSYSTEM

Benefits Of FirstNet Voice Service Support

Mission Critical Voice

TETRA → TCCA (TETRA + Critical Communications Association)



Mission Critical Voice

1. Challenging issues
2. Standards update
3. Integration (Evolution or Revolution….?)

Mission Critical Voice Elements

The National Public Safety Telecommunications Council has identified the following elements as critical to public safety Mission Critical Voice (MCV) operation.

1. **Direct or Talk Around *Required Mode***
2. **Push to Talk (PTT) *Required Mode***
3. Full Duplex Voice Systems
4. **Group Call (One to Many)**
5. Talker Identification (Unit ID)
6. Emergency Alerting
7. Audio Quality

Mission Critical Voice Elements

The desire to implement Mission Critical Voice within LTE is having impact on the market globally

1. US estimated at 3-5 million public safety users
2. UK estimated 300,000 public safety users
3. Canada, France, Australia, Germany, South Korea all working towards solutions that support Mission Critical Voice within LTE.
4. A global estimate of up to 45 million users with Mission Critical Voice needs within LTE will provide leverage to US efforts.

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Critical Points

- Direct Communications (off network)
- Mission Critical PTT over LTE
- Group Communications

3GPP Proximity Services

Direct/Talk Around

Being considered for LTE Release 12 as Proximity Services (Direct Mode)

- Communications
  - in and out of network operations included in Release 12
- Discovery
  - In network only included in Release 12
- Relaying

  For Relay Nodes at this time, not for UE to UE or UE to network

3GPP Proximity Services, Cont.

- Next Steps for Release 13
  - Release 13 anticipated to continue work on pending Release 12 issues
  - Adding priority to LTE Direct Mode

What spectrum supports Direct Mode when in coverage and out?

Band Class 14 700 MHz 10 X 10 spectrum cannot support direct mode and on-network users simultaneously in the same cell. A direct mode protocol needs to be put into place locally so all users are aware when users are accessing direct mode. 3GPP Ran 1 WG continues to work on proximity issues.

3GPP Group Efficiency (Group Communications)

- Releases 12 and 13 support Group Communications with continued work on Group Management maturing through Release 13.
- eMBMS, (MultiMedia Broadcast Multicast Services) point to multi-point interface designed to support broadcast and multi-cast services within both a cell and a network. Testing to ensure eMBMS meets public safety's one to many voice needs BY PUBLIC SAFETY in a LTE environment will be critical.

3GPP Mission Critical PTT

Release 13

Some feel progress for finalization of Mission Critical PTT standard in 3GPP is 60 percent complete, others feel more work than that is needed.

Parallel efforts to standardize Mission Critical PTT in Open Mobile Alliance (OMA) and ETSI-TCCE (European Telecommunications Standards Institute-Tetra and Critical Communications Evolution) and any requirements that could result from these efforts could lead to delays in PTT standardization within 3GPP.

3GPP Mission Critical Voice/PTT

In general, public safety anticipates utilizing non-Mission Critical Telephony/PTT within LTE in conjunction with their current voice solutions before migrating their Mission Critical Voice solution and PTT to LTE.

The lessons learned by public safety utilizing non-Mission Critical Telephony/PTT will contribute greatly to an agency's comfort level when considering meeting their Mission Critical PTT voice needs within LTE.

3GPP Mission Critical Voice/PTT

The big question, WHEN?

For public safety agencies to be comfortable enough for their Mission Critical Voice solutions to be provided within LTE, they'll need to ask themselves a number of questions:

Do I have sufficient coverage in my jurisdiction?

Has my entire jurisdiction been tested for coverage? BY whom and to what degree?

Will voice/PTT voice be prioritized above all other traffic (in a cell, region or throughout the entire network) or will Mission Critical Voice be superseded by other applications?

Will cost to maintain my current system be a factor in determining my agency will migrate to Mission Critical Voice within the NPSBN and LTE?

Questions?

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