

WHAT IS MISSION CRITICAL SERVICE?



1. WHAT IS THE CHALLENGE?

With the development of technologies, the broadband becomes the overall trend of wireless communication system. The private network system has also been developing in the direction of IP, diversified business, broadband data and multi-mode terminal. LTE meets the needs of customers for image, video and high speed data transmission, however it used to fall short in trunking voice features, which mission and business critical users heavily rely on for their routine job and emergency response. In order to solve these problems, 3GPP proposed the Mission Critical Service (MCS) broadband trunking technology.



2. WHAT IS MCS?

Mission Critical Service (MCS) is a broadband trunking standard defined in 3GPP Release 13/14/15, which includes MCPTT, MCVideo and MCDData service



MCPTT
(Mission Critical Push-To-Talk)

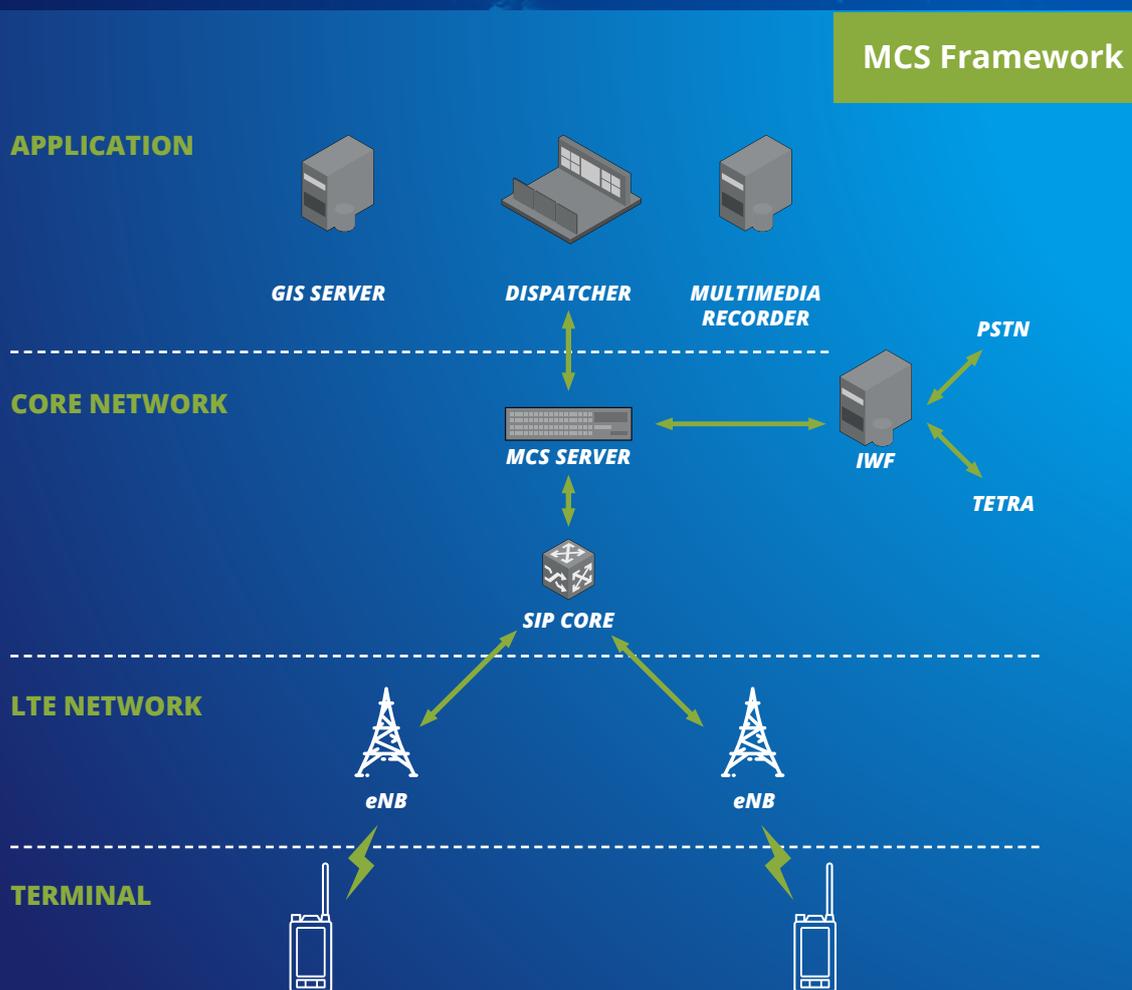


MCVideo
(Mission Critical Video)



MCDData
(Mission Critical Data)

MCS provides System Management Service, Voice Service, Video Service, Data Service and System Level Interworking.



2.2 MCS FRAMEWORK



MCS Server

Provides MC-PTT/Video/Data service.



SIP (Session Initiation Protocol) Core

Complies with 3GPP TS 23.228 standard.

Responsible for MC-PTT/Video/Data user registration, service selection and routing in the signaling control plane.



LTE Network

Provides LTE EPC (including MME, HSS, xGW, eMBMS GW and PCRF etc.) and eNB entities.



IWF (Interworking Functionality)

Provides interface for PSTN and Narrowband system.



Application AS

Provides GIS, Voice/Video Recorder, Dispatching system, etc.

2.3 MCS Evolution in 3GPP

RELEASE	MCS
R12	<ul style="list-style-type: none">• GCSE: Essential for Group Communication over LTE• ProSe (Proximity-based Services)
R13	<ul style="list-style-type: none">• MCPTT• IOPS• Enhancement to Proximity-based Services
R14	<ul style="list-style-type: none">• MCData• MCVideo• Enhancements for Mission Critical Service
R15	<ul style="list-style-type: none">• Interconnection and migration between MC systems• Interworking with LMR systems• Study into Future Railway Mobile Communication System

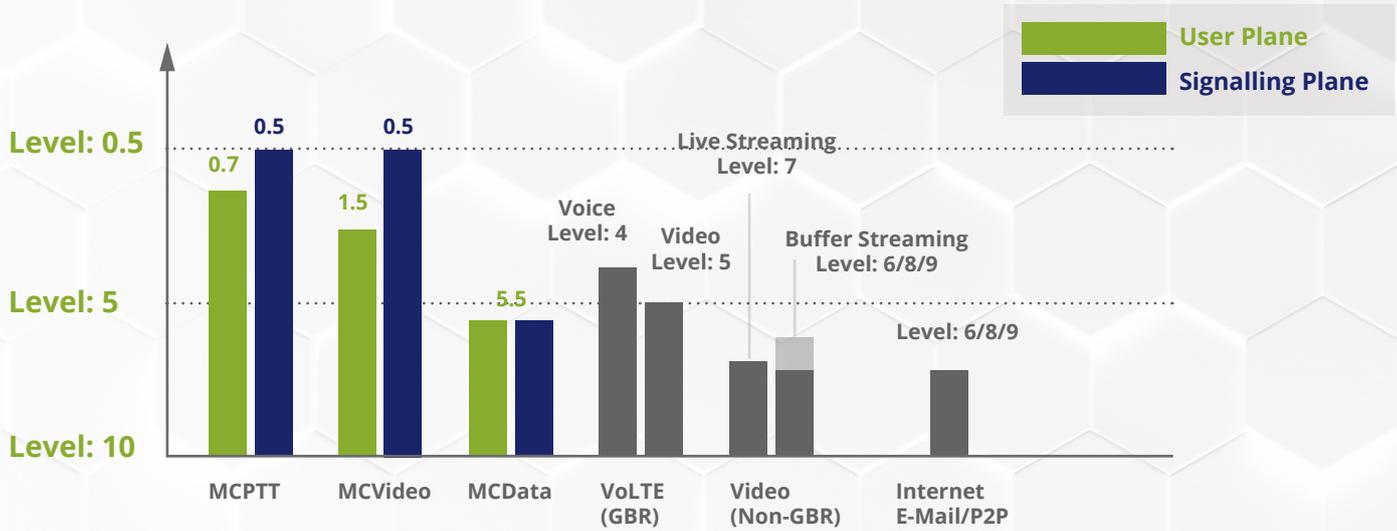
3. HOW TO GUARANTEE *MISSION CRITICAL?*

3.1 QOS

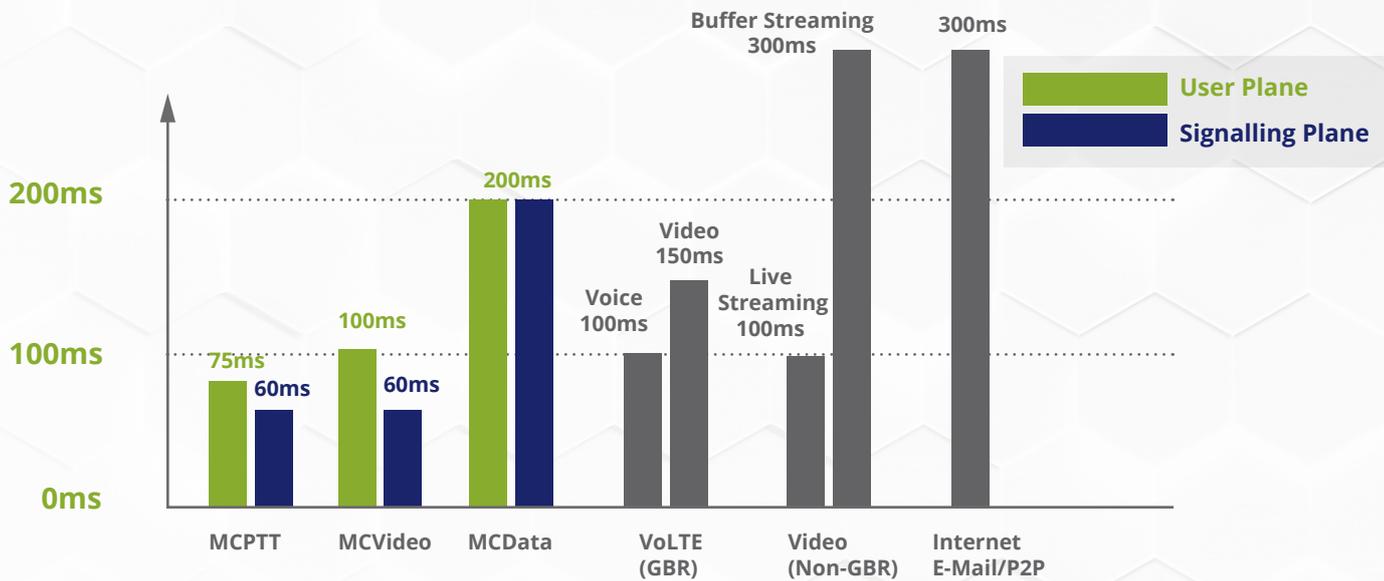
Qos (Quality of Service) guarantees the highest priority for MCS services, and assigns GBR (Guaranteed Bit Rate) type QCI (QoS Class Identifier) to MCPTT, MCVideo and MCDData, which satisfy the end-to-end latency and packet loss requirements, and ensures key voice and business.



High Priority (The smaller the value, the higher the priority)



Latency



* Note:

- 1) Priority Level: The smaller the value, the higher the priority. MCS has TOP PRIORITY when network resources are limited.
- 2) Video (Non-GBR): Video over IP without Guaranteed Bit Rate.

3.2 eMBMS

eMBMS (evolved Multimedia Broadcast Multicast Services) is a point-to-multipoint enhanced feature for 3GPP cellular networks, which is designed to provide efficient delivery of broadcast and multicast services, both within a cell as well as within the core network. It's also known as LTE Broadcast. eMBMS provides multicast / broadcast and unicast services to make the transmission of multimedia content (video, audio, etc.) more fluent. It saves air interface resources while sending the same content (for example, group call) to MCS users. In a single frequency network, it improves the signal quality of the MBSFN (Multimedia Broadcast multicast service Single Frequency Network) at the cell edge. Commercial LTE does not support this function.

RELEASE	eMBMS Evolution in 3GPP
R9	<ul style="list-style-type: none">• eMBMS applied to the LTE network
R10	<ul style="list-style-type: none">• New counting, admission control functions;• MSP(MCH Scheduling Period)=80ms
R11	<ul style="list-style-type: none">• The business continuity of eMBMS is enhanced
R12	<ul style="list-style-type: none">• MSP=40ms
R13	<ul style="list-style-type: none">• SC-PTM (Single Cell Point To Multipoint)
R14	<ul style="list-style-type: none">• For some low delay and high reliability applications, MSP=10ms
R15	<ul style="list-style-type: none">• Enhancements to MBMS service

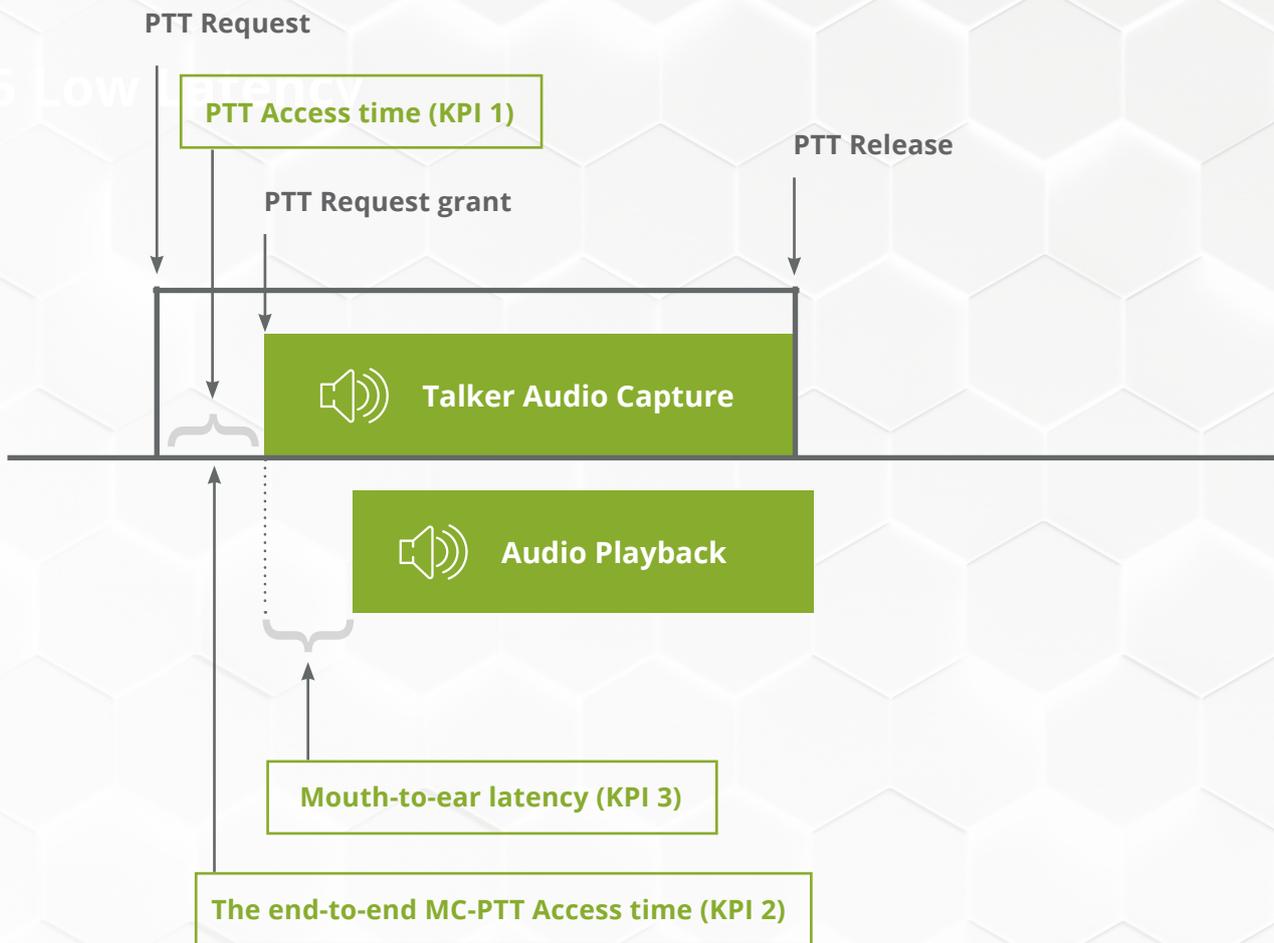
3.3 IOPS

IOPS (Isolated E-UTRAN Operation for Public Safety) guarantees the MCS service function and greatly improves the reliability of system. When the back-haul between core network and base station disconnects, or all the common core networks fail, the base station will connect the embedded core network and provide trunking service such as private / group call, data transmission for the users under this base station. IOPS requires extra hardware, and only private network manufacturers support IOPS.

3.4 ProSe

ProSe (Proximity Services) is a close range direct communication technology, with which adjacent terminals can transmit data through a direct link within a close range without a central node (the base station).

3.5 Low Latency



The Definition of KPI in 3GPP		Latency
KPI 1	The MCPTT Access time for 95% of all MCPTT Request	<300 ms
KPI 2	The End-to-end MCPTT Access time for users under coverage of the same network when the MCPTT Group call has not been established prior to the initiation of the MCPTT Request	<1000 ms
KPI 3	The Mouth-to-ear latency for 95% of all voice bursts	<300 ms

*** Note:** The KPIs defined in this sub-clause shall apply in a LTE network under traffic load not exceeding 70% of each network nodes capacity. Some manufacturers' KPI are far below the 3GPP standard.

4. WHAT CAN MCS DO?

4.1 Trunking Service

The rich trunking service meets the customers' demands for voice, video and data.



MCPTT

(Mission Critical Push-To-Talk)

- Group / Private Call
- Emergency Group Call
- Imminent Peril Group Call
- Ambient Listening Call
- User Broadcast Call
- User Regroup
- MCPTT Private Call Call-back Request
- Floor Control for Audio Cut-In Enabled Group
- MCPTT Group Selection
- Enhanced MCPTT Group Call Setup Procedure with MBMS Bearer



MCVideo

(Mission Critical Video)

- Similar to MCPTT voice, but for video, such as: Group Call, Private Call, Emergency Group Call, Imminent Peril Group Call, User Broadcast Call etc.
- Video Push / Pull
- Transmission Control



MCDData

(Mission Critical Data)

- Short Data Services
- File distribution
- Data streaming
- Conversation management

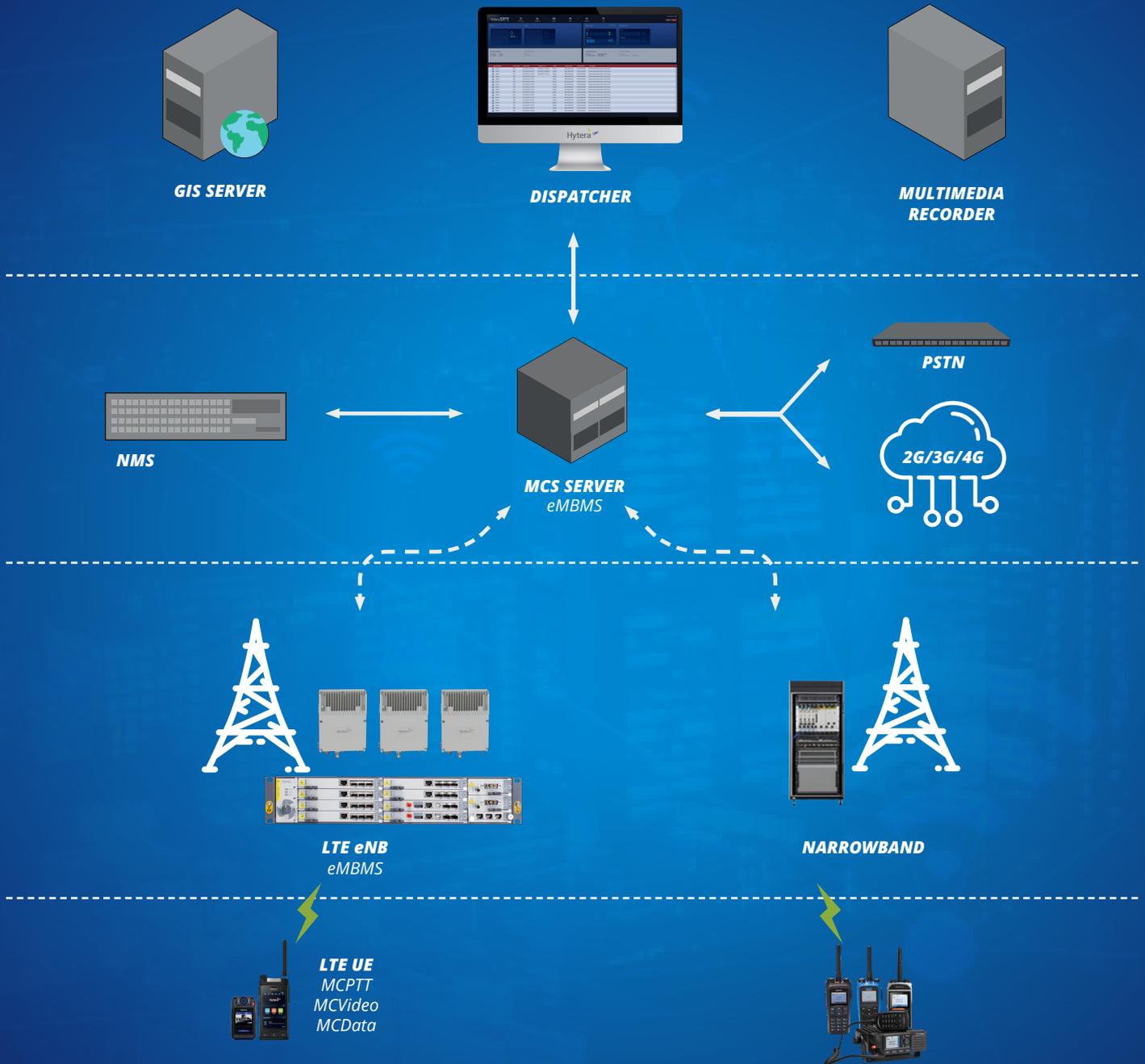
4.2 System Level Interworking

3GPP defines the interworking interface between MCS and narrowband systems in R15 version, which supports the interconnection between MCS and TETRA/P25.



Note: more info about Mission Critical Services in 3GPP: http://www.3gpp.org/NEWS-EVENTS/3GPP-NEWS/1875-MC_SERVICES

5. HYTERA MCS SOLUTION



6. THE DIFFERENCE BETWEEN MCS, VoLTE, PoC



VoLTE (Voice over Long-Term Evolution)

VoLTE is a standard for high-speed wireless communication for mobile phones and data terminals which based on all IP conditions on the IP Multimedia Subsystem (IMS) 4G network. It is an end-to-end voice scheme, providing not only high speed data services, but also high quality audio and video calls. Dedicated hardware is required for terminals to be able to support VoLTE.

PoC (Push-to-talk over Cellular)

PoC is a new mobile technology, which can make one-to-one or one-to-many calls quickly. PoC originated from PTT trunking service. It is a mobile data service with PTT function implemented on public mobile network.

Difference	MCS	voLTE	PoC
Network	LTE	LTE	2G, 3G, LTE
Terminal Hardware Requirements	Chip support	Chip support	No need
Type of Group Call	Signaling: Point-to-point access between called and MCS Server. Media: eMBMS access, Downlink point-to-multipoint	No group call	Point-to-point access between called and PoC Server.
QoS Guarantee	Yes	Yes	No
Call setup latency	Low	Medium	High

In terms of latency, performance and service, MCS has a great advantage and it is so far the best technology combining broadband access with trunking communication. It is the first choice for mission and business critical users who want to tap into the latest development of both broadband and narrowband communication technologies.

7. WHO SPECIFIES AND SUPPORTS MCPTT?

The First Responder Network Authority (FirstNet)

The government network operator for the public safety community in the United States

The United Kingdom Home Office

The office responsible for the development of the next generations public safety communications system in the UK

The work of the National Public Safety Telecommunications Council (NPSTC)

An organization made up of all the major public safety organizations in the United States

The TETRA and Critical Communications Association (TCCA)

Which is considering LTE for Mission Critical Push to Talk

The Association of Public safety Communications Officials (APCO) Global Alliance

Which has also endorsed LTE as the technology of choice for public safety communications worldwide

Telecommunications Industry Association (TIA)

Is considering LTE for critical communications involving LTE mission-critical voice service and interworking with the P25 and is creating related requirements for PTT

Open Mobile Alliance (OMA)

Has defined Push to talk over Cellular (PoC) specifications with several components that could provide partial support for Mission Critical Push to Talk.

European Telecommunications Standards Institute (ETSI) TC TETRA and Critical Communication Evolution (TCCE)

Has opened a work item: DTR/TETRA-01201 User Requirements Specification Mission Critical Broadband Communications Part 2 Critical Communications Application



(Source: Quote from 3GPP TSG SA4 Meeting #82, January 2015, <http://mcptt.fi/>)

Other regional requirements not listed may also be reflected in the work. While previous such standards have often been regional, there is a strong desire for the next generation of Mission Critical Push To Talk to be based on a single, widely adopted global standard.



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