

TECHNICAL CODE

VOICE OVER LONG-TERM EVOLUTION (LTE) – SYSTEM AND DEVICE COMPATIBILITY

Developed by



Registered by



Registered date: 26 June 2025

© Copyright 2025

MCMC MTSFB TC G054:2025

Development of technical codes

The Communications and Multimedia Act 1998 ('Laws of Malaysia Act 588') ('the Act') provides for Technical Standards Forum designated under section 184 of the Act or the Malaysian Communications and Multimedia Commission ('the Commission') to prepare a technical code. The technical code prepared pursuant to section 185 of the Act shall consist of, at least, the requirement for network interoperability and the promotion of safety of network facilities.

Section 96 of the Act also provides for the Commission to determine a technical code in accordance with section 55 of the Act if the technical code is not developed under an applicable provision of the Act and it is unlikely to be developed by the Technical Standards Forum within a reasonable time.

In exercise of the power conferred by section 184 of the Act, the Commission has designated the Malaysian Technical Standards Forum Bhd ('MTSFB') as a Technical Standards Forum which is obligated, among others, to prepare the technical code under section 185 of the Act.

A technical code prepared in accordance with section 185 shall not be effective until it is registered by the Commission pursuant to section 95 of the Act.

For further information on the technical code, please contact:

Malaysian Communications and Multimedia Commission (MCMC)

MCMC HQ Tower 1
Jalan Impact
Cyber 6
63000 Cyberjaya
Selangor Darul Ehsan
MALAYSIA

Tel : +60 3 8688 8000
Fax : +60 3 8688 1000
Email : stpd@mcmc.gov.my
Website: www.mcmc.gov.my

OR

Malaysian Technical Standards Forum Bhd (MTSFB)

Level 3A, MCMC Tower 2
Jalan Impact
Cyber 6
63000 Cyberjaya
Selangor Darul Ehsan
MALAYSIA

Tel : +60 3 8680 9950
Fax : +60 3 8680 9940
Email : support@mtsfb.org.my
Website: www.mtsfb.org.my

Contents

	Page
Committee representation	ii
Foreword	iii
0. Introduction	1
1. Scope	1
2. Normative references	1
3. Abbreviations.....	2
4. Terms and definitions	2
5. VoLTE architecture.....	5
6. VoLTE network interoperability	6
6.1 VoLTE emergency call.....	6
6.2 VoLTE international/domestic roaming and interconnect.....	7
6.3 VoLTE service continuity	10
6.4 VoLTE supplementary services	12
6.5 UE requirement.....	13
Annex A Normative reference.....	14
Annex B Abbreviations.....	15
Bibliography	17

MCMC MTSFB TC G054:2025

Committee representation

This technical code was developed by VoLTE, VoNR & VoWiFi Sub Working Group under the International Mobile Telecommunications and Future Networks Working Group of the Malaysian Technical Standards Forum Bhd (MTSFB), which consists of representatives from the following organisations:

CelcomDigi Berhad

Digital Nasional Berhad

Fraunhofer IIS

Maxis Broadband Sdn Bhd

Politeknik Sultan Haji Ahmad Shah

U Mobile Sdn Bhd

Universiti Teknologi Malaysia

Wideminds Pte Ltd

Foreword

This technical code for Voice over LTE - System and Device Compatibility ('this Technical Code') was developed pursuant to Section 185 of the Communications and Multimedia Act 1998 (Laws of Malaysia Act 588) by the VoLTE, VoNR & VoWiFi Sub Working Group under the International Mobile Telecommunications and Future Networks Working Group of the Malaysian Technical Standards Forum Bhd (MTSFB).

This Technical Code shall continue to be valid and effective from the date of its registration until it is replaced or revoked.

(THIS PAGE IS INTENTIONALLY LEFT BLANK)

VOICE OVER LONG-TERM EVOLUTION (LTE) - SYSTEM AND DEVICE COMPATIBILITY

0. Introduction

Voice over Long-Term Evolution (VoLTE) is a technology standard that delivers voice communication and multimedia services over Long-Term Evolution (LTE) networks, commonly referred to as Fourth Generation (4G) networks. Unlike traditional voice services that rely on circuit-switched technologies, VoLTE uses a packet-switched approach based on Internet Protocol (IP), allowing voice to be transmitted as data packets over LTE. It leverages the IP Multimedia Subsystem (IMS) to manage session control and media services, providing high-quality, efficient, and seamless voice communication.

However, the implementation of VoLTE introduces several technical challenges that must be addressed to ensure reliable service delivery. Maintaining end-to-end Quality of Service (QoS) is critical to prevent call drops and ensure uninterrupted voice communication. Additionally, VoLTE's all-IP architecture makes it susceptible to security vulnerabilities similar to other internet-based services. Interoperability issues also arise due to the diversity of networks, devices, and vendor platforms involved in VoLTE deployment. Furthermore, the integration of IMS essential for enabling VoLTE can be complex, requiring careful coordination of signalling, authentication, media handling, and QoS mechanisms.

This Technical Code outlines the functional and interoperability requirements for VoLTE implementation in mobile networks. It serves as a comprehensive reference for mobile network operators and device manufacturers to address deployment challenges, ensure consistent service quality, and facilitate seamless communication across diverse systems. By standardising the key aspects of VoLTE deployment, this code aims to support a secure, interoperable, and high-quality voice communication experience over LTE networks.

1. Scope

This Technical Code specifies the system and device requirements for implementation of VoLTE for:

- a) VoLTE emergency call;
- b) VoLTE international or domestic roaming and interconnect;
- c) VoLTE service continuity; and
- d) VoLTE supplementary services.

2. Normative references

The following normative references are indispensable for the application of this Technical Code. For dated references, only the edition cited applies. For undated references, the latest edition of the normative reference (including any amendments) applies.

Refer to Annex A.

MCMC MTSFB TC G054:2025

3. Abbreviations

For the purpose of this Technical Code, the following abbreviations applies:

Refer to Annex B.

4. Terms and definitions

For the purposes of this Technical Code, the following terms and definitions applies.

4.1 Access and Mobility Function (AMF)

A Fifth Generation (5G) core function responsible for managing access and mobility for 5G devices.

4.2 Access Point Name (APN)

The packet data network that will be providing the services to the User Equipment (UE).

4.3 Allocation Retention Priority (ARP)

Use during network congest to determine whether existing bearer that has lower precedence be replaced with new bearer with higher precedence value.

4.4 Call Re-establishment (CRE)

A process that allows a UE to reconnect a dropped call by switching to a different cell or network to maintain call continuity.

4.5 Call Session Control Function (CSCF)

A key component in IMS architecture that manages the setup, maintenance, and termination of multimedia sessions such as voice and video call over IP in LTE network.

4.6 Emergency Access Transfer Function (EATF)

A logical function to enable access transfer between packet-switched and circuit-switched networks.

4.7 Evolved Packet Core (EPC)

A framework for providing converged voice and data on a LTE network.

4.8 Evolved Packet System (EPS)

The long-term evolution of Universal Mobile Telecommunication System, composed of Evolved Universal Terrestrial Radio Access Network (E-UTRAN) and Evolved Packet Core (EPC).

4.9 Evolved Universal Terrestrial Radio Access Network (E-UTRAN)

The radio technology used between mobile terminals and the base stations.

4.10 Home Subscriber Server (HSS)

A node that serves as a central database within LTE network. It stores essential information about network subscribers, including their service profiles, preferences, and authentication data.

4.11 Home Public Mobile Network (HPMN)

Identifies the public mobile network where the user's profile is held.

4.12 IP Multimedia System (IMS)

A framework for delivering IP multimedia services such as voice, video and text messaging over IP networks.

4.13 Location Retrieval Function (LRF)

A function that provides precise location information for mobile devices, especially during emergency calls, by interfacing with network systems.

4.14 Mobile Management Entity (MME)

A key control node responsible for managing user authentication, session establishment, and mobility between LTE networks.

4.15 Mobile Network Operator (MNO)

A provider of wireless communication service that owns or controls the network infrastructure necessary to sell and deliver services to their subscribers.

4.16 Multi Operator Core network (MOCN)

A functionality for multiple MNO to share radio access network, instead of building each own radio network.

4.17 Next Generation Emergency Services 999 (NG999)

Advanced emergency response system that enhances the traditional 999 service with improved technology for faster, more efficient communication and location tracking during emergencies.

4.18 Policy and Charging Control Function (PCRF)

Manages the service policy and sends QoS setting information for each user session and accounting rule information.

4.19 Public Safety Access Point (PSAP)

Terminate the emergency call and direct the call to the nearest public safety services.

4.20 QoS Class Identifies (QCI)

An index to sets of node-specific settings that control bearer level packet forwarding treatment.

4.21 Quality of Service (QoS)

The capability of a network to offer service with certain quality.

4.22 Routing Determination Function (RDF)

A network component that determines the optimal route for calls to travel through the network to reach their destination efficiently.

MCMC MTSFB TC G054:2025

4.23 Serving Gateway (S-GW)

An essential element in LTE network handling mobility of mobile devices, routes and forwards user data packets between mobile devices and Packet Data Network Gateway (P-GW).

4.24 Session Management Function (SMF)

A function Responsible for managing the sessions between user devices and the 5G network.

4.25 Session Initiation Protocol (SIP)

A signalling protocol to create and control multimedia sessions in IP Multimedia System (IMS).

4.26 Telephony Application Server (TAS)

A key component in IMS architecture delivering advanced telephony features and services over IP in LTE network.

4.27 Unified Data Management (UDM)

A 5G core function that manages user subscription data.

4.28 User Plane Function (UPF)

The data plane of the 5G core, that responsible for packet routing and forwarding, interconnection to the data network, policy enforcement and data buffering.

4.29 User Equipment (UE)

Any device used directly by an end-user to communicate over LTE network including but not limited to, cellular mobile terminals, handheld, portable and vehicle-mounted equipment and Radio Frequency (RF) interface cards and modems as long as the UE support voice call.

4.30 Visited Public Mobile Network (VPMN)

Identifies the network that a mobile subscriber uses when roaming outside of their Home Public Mobile Network (HPMN).

4.31 Voice over LTE (VoLTE)

The service that delivers voice communication over packet switch network of LTE.

4.32 XML Configuration Access Protocol (XCAP)

A protocol that allows user to read, write and modify their supplementary subscription.

5. VoLTE architecture

The VoLTE architecture shall comprise the following key components in Figure 1 as referred from ITU-T X.1041.

a) Mobile Station (MS)

The mobile device permitted to access the network and utilise the VoLTE service.

b) Evolved Universal Terrestrial Radio Access Network (E-UTRAN)

eNodeBs are responsible for wireless transceiving and base station control. eNodeBs handle signalling transmission via the Mobile Management Entity (MME), while data transmission is routed to the Serving Gateway (S-GW) and P-GW.

c) Evolved Packet Core (EPC)

Consists of Policy and Charging Control Function (PCRF), MME and S-GW or P-GW. The MME is vital in the core network, managing most control plane functions, while the S-GW ensures QoS. The P-GW assigns IP addresses to User Equipment (UE), selects routing paths, and provides interfaces to the internet and IMS.

d) IP Multimedia System (IMS)

The control infrastructure for VoLTE service that consists of Proxy CSCF (P-CSCF), Interrogating CSCF (I-CSCF), Serving CSCF (S-CSCF). The P-CSCF forwards all Session Initiation Protocol (SIP) messages between the UE and IMS, the I-CSCF locates the appropriate S-CSCF by querying the HSS, and the S-CSCF manages session-related tasks such as setup, deletion and control.

e) Home Subscriber Server (HSS)

The component holds subscriber information and shares these details with other network entities. Part of the HSS, the authentication centre, generates authentication vectors for each subscriber.

f) Application servers

The Telephony Application Server (TAS) handles signalling and media manipulation for services like local number portability, free-call routing, unified messaging, and conference bridging.

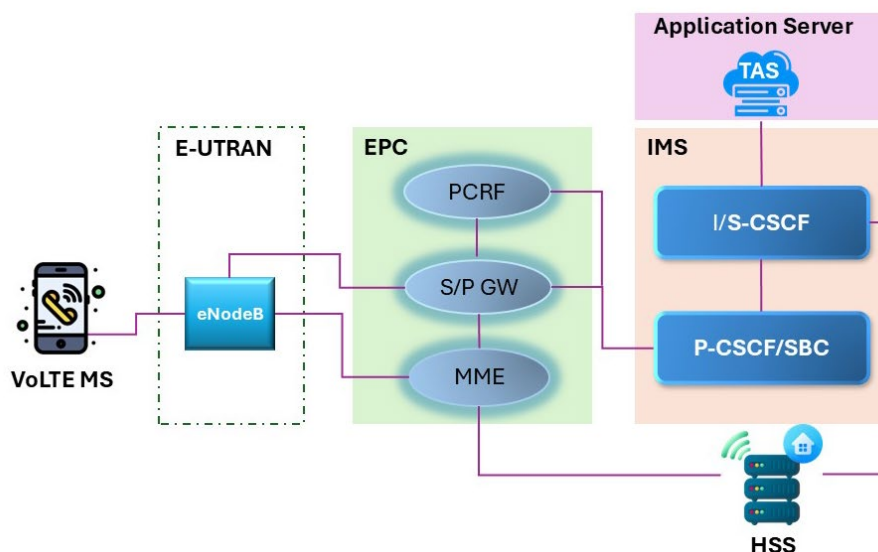


Figure 1. VoLTE architecture

MCMC MTSFB TC G054:2025

6. VoLTE network interoperability

This section describes the requirements for VoLTE emergency calls, VoLTE international roaming and interconnect with other operator networks, VoLTE service continuity, VoLTE supplementary services, and their requirement on UE.

6.1 VoLTE emergency call

VoLTE shall support the IMS emergency call in the Circuit Switched (CS) domain according to GSMA IR.92 Version 15.0. In areas where LTE radio coverage and/or IMS network is not available, the network shall be able to reject an IMS emergency attempt and the VoLTE UE shall support the CS emergency calls as currently implemented. If the network or the UE do not support CS fallback, the UE must autonomously select the Radio Access Technology (RAT) that supports CS.

6.1.1 Delivery of emergency communication services

The Next Generation Emergency Services 999 (NG999) shall involve several key architectural and standard considerations as follows.

a) VoLTE uses the IMS to handle voice calls, including emergency calls.

A dedicated emergency Access Point Name (APN) or SOS APN, as referred to in 3GPP TS 23.167, shall be used to assign bearer resources for emergency calls to ensure reliable call setup, routing, and prioritisation of emergency services. The emergency APN will have highest priority on the network and the emergency call will get pre-emption over non-emergency calls and data sessions.

As a prerequisite the UE shall recognise emergency number NG999 for the UE to detect that this is an emergency call.

The high-level emergency call flow includes the following processes as illustrated in Figure 2.

1. The UE shall perform emergency registration with the Home Public Mobile Network (HPMN)'s P-CSCF, including an emergency indicator in the registration request.
2. Once UE registration is successful, UE will send SIP INVITE with emergency indicator to the P-CSCF.
3. Upon detecting an emergency request, the P-CSCF shall prioritise the call and select the Emergency Call Session Control Function (E-CSCF) to handle the call processing.
4. The SIP INVITE message from UE to P-CSCF includes the UE's location information in the form of a UTRAN cell ID. The Public Safety Access Point (PSAP) is required to map the cell ID information into actual coordinate or streetwise information. As an option, E-CSCF can also get the UE location from Location Retrieval Function (LRF). Using the UE location information, E-CSCF can direct the emergency call to the nearest local emergency service PSAP.
5. In the event the PSAP terminated to non-IMS network (i.e., legacy circuit switch network), the E-CSCF will transfer the call to Emergency Access Transfer Function (EATF) or Media Gateway Control Function (MGCF) for CS call termination.
6. Calls is established over SIP if PSAP is connected using IP trunk or ISUP if connection is over legacy Time Division Multiplexing (TDM) trunk.

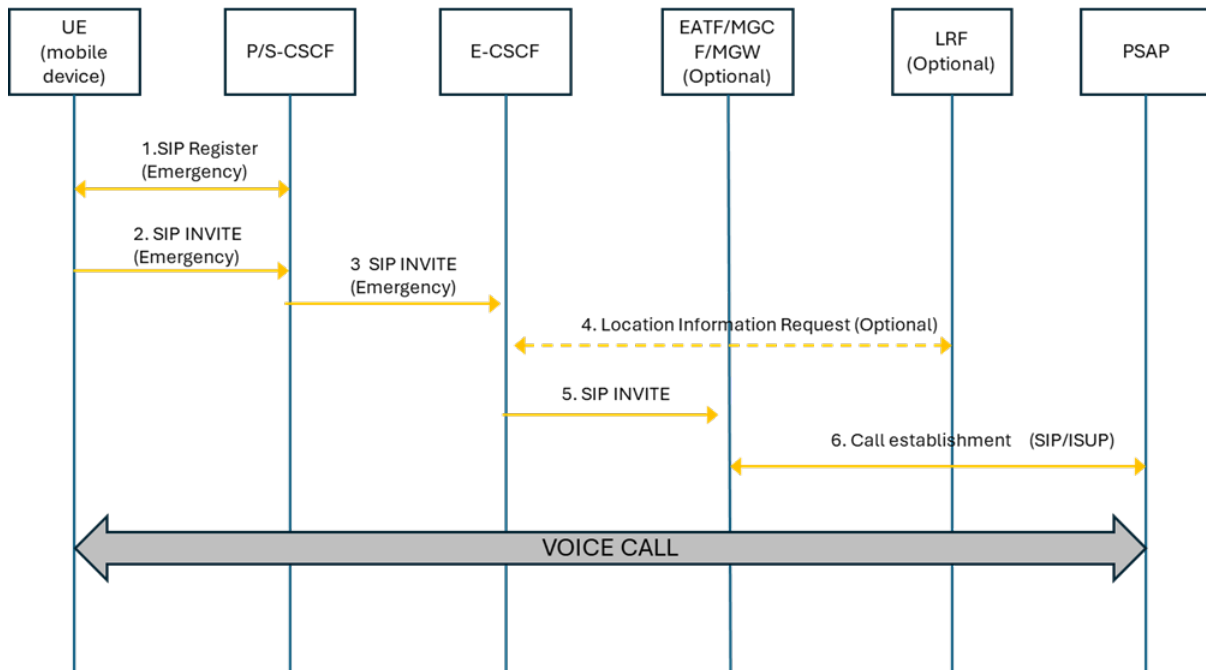


Figure 2. VoLTE Emergency Call Flow

b) Emergency call for inbound roamer

GSMA IR.88 Version 25.0 recommended that the applicability of IMS emergency services shall be agreed between the Visited Public Mobile Network (VPMN) and the HPMN in the IMS voice roaming agreement.

c) Location services

VoLTE shall support advanced location services in accordance with 3GPP TS 23.167 for emergency call routing and response.

d) NG999 compliance

VoLTE shall comply with emergency call handling and effectively interface with NG999 as a national emergency systems. 999 shall be recognised as the primary emergency number. VoLTE networks shall prioritise the 999 emergency number, ensuring correct routing to emergency responders and central agencies. Additionally, VoLTE shall recognise the international emergency number 112 and seamlessly redirect these calls to 999 for proper handling.

e) Emergency call prioritisation

VoLTE shall ensure that emergency calls receive priority over regular calls through QoS mechanisms, guaranteeing that emergency communication is not disrupted during network congestion. VoLTE emergency calls use a dedicated emergency APN.

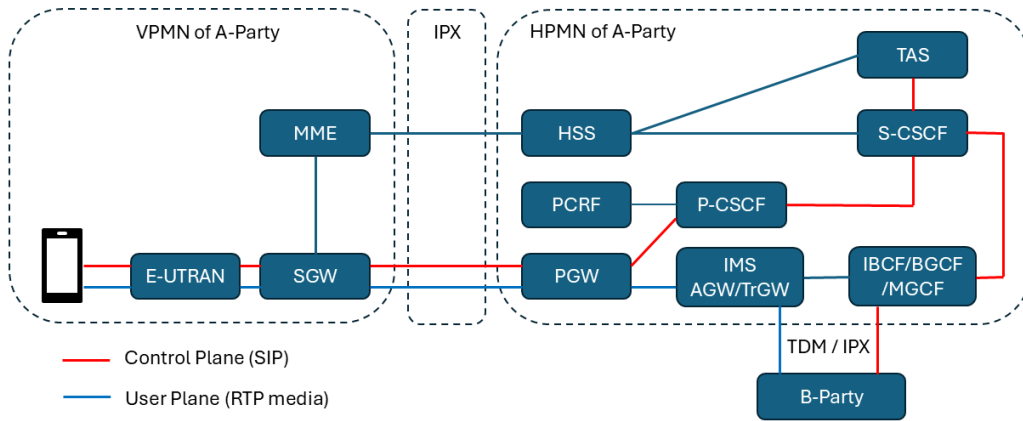
6.2 VoLTE international / domestic roaming and interconnect

This clause outlines the requirements and technical considerations for enabling seamless VoLTE services while users are roaming internationally or domestically, the QoS and the IMS interconnect.

MCMC MTSFB TC G054:2025

6.2.1 VoLTE roaming

The VoLTE international roaming deployment shall comply with GSMA IR.65 Version 36.0 and GSMA IR.88 Version 25.0. GSMA recommended S8HR architecture is deployed to support IMS services excluding emergency services. In this model, the UE has obtained IP connectivity and IMS functionality from the HPMN. A high-level architecture diagram is represented in Figure 3.



Source: GSMA IR.65 Version 36.0

Figure 3. S8HR IMS Roaming Architecture

For enabling S8HR VoLTE roaming, the core network nodes in both VPMN and HPMN shall support the specific core network conditions (parameter setting), to ensure seamless interoperability as tabulated in Table 1. Each parameter must be correctly configured in both VPMN and HPMN to facilitate end-to-end VoLTE service. For instance, SIP signalling is expected to use 'QCI=5', while video and voice bearers use 'QCI=2' and 'QCI=1' respectively. The presence or absence of these capabilities is indicated in the table to highlight the support requirements across both networks.

Table 1. VPMN and HPMN conditions requirement for VoLTE roaming

Conditions	VPMN	HPMN
IMS APN	/	/
SIP Signalling with QCI=5;	/	/
Video media bearer with QCI=2 (or non-GBR QCI);	/	/
Voice media bearer with QCI=1;	/	/
Indication from MME to the UE "IMS Voice over Packet Switch (VoPS) (Support Indicator) = supported" if the VPMN has a roaming agreement that covers support of IMS voice with the HPMN	/	N/A
Indication from MME to the HSS "Homogeneous Support of IMS VoPS"	/	N/A

6.2.2 QoS for VoLTE roaming

The VoLTE Roaming QoS policy shall follow the recommended minimum QoS parameters as stated in GSMA IR.88 Version 25.0. However, bilateral agreements may allow operators to negotiate other values. Guidelines for proposed minimum QoS parameters for the S8HR roaming scenario, as stated in GSMA IR.88 Version 25.0, are shown in Table 2.

In the context of S8HR roaming, Allocation and Retention Priority (ARP) parameters specifically ARP pre-emption Capability (ARP-PCI) and ARP Pre-emption Vulnerability (ARP-PVI) are crucial for ensuring bearer prioritisation during network congestion. For example, as shown in Table 2, the IMS

Voice service is recommended with ARP-PVI set to "Disable" and ARP-PCI set to "Enable", meaning it cannot be pre-empted but can pre-empt other lower-priority bearers. If the visited public mobile network (VPMN) does not support such prioritisation (i.e., it cannot honour ARP-PCI as "Enable"), it may negotiate this down to "Disable". Similarly, when a bearer request with ARP-PVI set to "Disable" is received by the HPMN, but the HPMN prefers stricter pre-emption controls (e.g., "Enable"), it may choose to apply its policy and upgrade it accordingly. Such negotiation ensures flexibility while still adhering to the minimum recommended roaming QoS values for each service (e.g., IMS signalling, IMS video, internet).

Table 2. S8HR Roaming QoS Value

Parameter	Minimum recommended roaming QoS values						
	IMS Voice		IMS Signalling		IMS Video		Internet
QCI	1		5		8		9
ARP-PL	12		12		14		14
ARP-PVI	Disable ⁵	Enable ⁵	Disable ⁵	Enable ⁵	Enable ⁵	N/A	Enable ⁵
ARP-PCI	Enable ⁵	Disable ⁵	Enable ⁵	Disable ⁵	Enable ⁵	Disable ⁵	Disable ⁵
MBR-UL	156 ³		N/A		N/A		N/A
MBR-DL	156 ³						
GBR-UL	156 ³						
GBR-DL	156 ³						

NOTE:

- Values not shown in the table are out-of-scope of this recommendation and should be agreed bilaterally between operators prior to use.
- Values in this table are the values that an inbound operator at a minimum should support. If a lower value is requested for any parameter, it should be accepted (e.g. ARP-PL=14 has a lower priority than 12 hence it will be accepted for QCI=1).
- Maximum Bit Rate (MBR) and Guaranteed Bit Rate (GBR) settings (in kbps) are based on the highest values needed to support three concurrent streams of QCI1 voice for all codecs, profiles, and level in 3GPP TS 26.114. Currently, AMR-NB, Round Trip Time (RTT), AMR-WB are covered.
- IMS signalling may include SIP signalling for IMS Voice, IMS Video, Short Message Service (SMS) over IP, and Rich Communication Services (RCS) services.
- These are recommended PCI and PVI values; however, the bearer request should not be denied based on PCI or PVI; instead, the VPMN can downgrade the requested PCI and/or PVI and accept the request. PVI downgrade is used to change the HPMN Disabled request to Enabled in the VPMN while PCI downgrade is used to change the HPMN Enabled request to disable in the VPMN, and vice versa for PVI/PCI upgrade

6.2.3 VoLTE interconnection between Mobile Network Operators (MNO)

VoLTE interconnection shall enable end-to-end VoLTE calls between MNO. The architecture for inter-operator IMS interconnects shall follow the design as outlined in GSMA IR.65 Version 36.0, as shown in Figure 4.

The IBCF (Interconnection Border Control Function) is handles the control plane for the purpose of topology hiding, application layer gateway, screening of SIP signalling information and generation of Charging Data Records (CDRs). The TrGW (Transition Gateway) provide functions for the user plane such as Network Address Translation – Protocol Translation (NAT-PT) and IPv4/6 conversion for the user plane. The Ici interface is used to transport SIP signalling, and the Izi interface handles media traffic.

MCMC MTSFB TC G054:2025

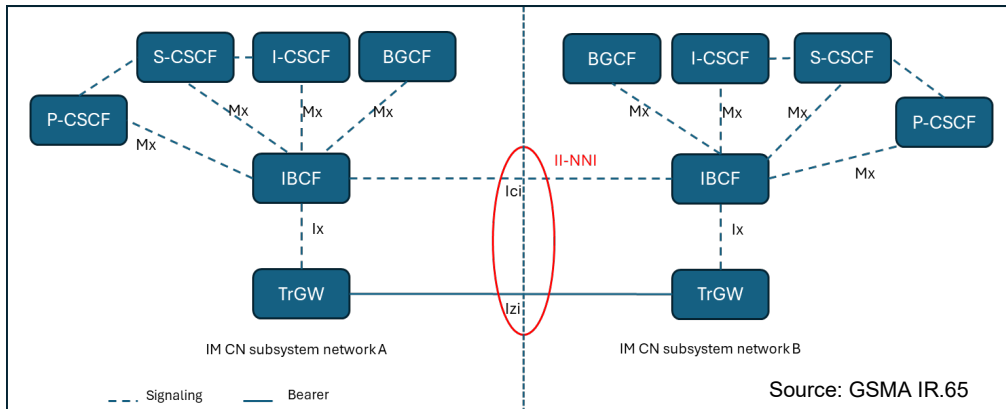


Figure 4. Interconnection for inter-IMS scenario

6.3 VoLTE service continuity

VoLTE service shall support service continuity when a user moves between different network areas, such as from a 4G LTE network to a 2G network. It seamlessly transfers ongoing calls to the appropriate network without dropping the connection. This continuity is crucial for maintaining high-quality voice service and user experience during mobility.

With 5G, Voice over New Radio (VoNR) introduces enhanced call quality, faster connections, and seamless continuity. Complementing this, Voice over Wi-Fi (VoWiFi) enables reliable calling over Wi-Fi connections, ensuring uninterrupted communication in areas with poor cellular coverage. However, it is important to note that VoNR and VoWiFi are not within the scope of this technical code.

6.3.1 Compatibility between VoLTE and VoNR

This clause addresses the compatibility between VoLTE and VoNR. VoNR refers to the communication service that delivers voice calling capabilities over a 5G New Radio (NR) network. However, VoNR is not within the scope of this technical code.

Both VoLTE and VoNR shall utilise IMS as the service platform for supporting communication services over Evolved Packet System (EPS) for 4G and 5G System (5GS) for 5G.

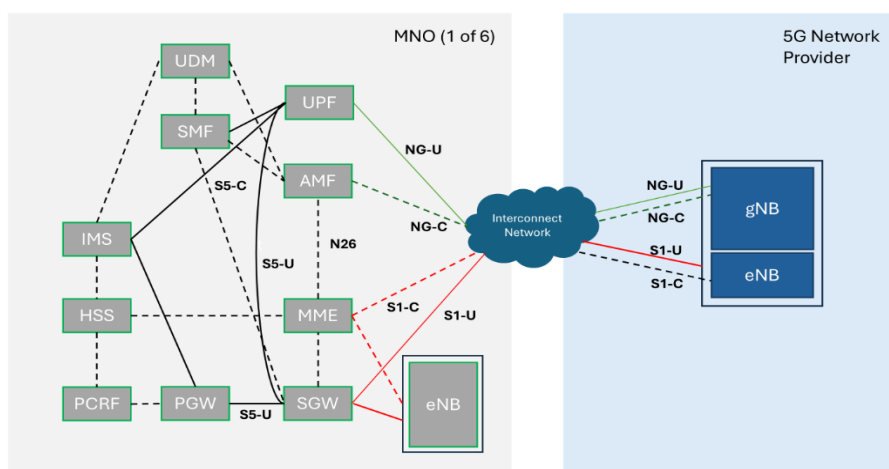


Figure 5. 5G Standalone and Non-Standalone Multi Operator Core Network (MOCN) architecture

Figure 5 shows the interworking interface between Evolved Packet Core (EPC) and 5G Core (5GC) required for NR - LTE mobility. The service continuity between VoLTE and VoNR will be supported with the N26 interface that connects AMF and MME. The support for the N26 interface between AMF in 5GC and MME in EPC is required to enable seamless session continuity for inter-system handover, which will be critical for voice services.

5G NSA uses the existing 4G LTE core network EPC and base stations (eNodeB) while adding new 5G NR base stations (gNodeB). UE registered with 5G NSA need to have EPS fallback directing the device to switch to LTE to establish voice calls via VoLTE.

5G UE with SA capability and supporting VoNR is able to make voice call on 5G bands. Interworking with VoLTE occur when UE moves from 5G bands to MNO LTE at 5G bands coverage edge. UE will move from MNO LTE to 5G bands when voice call is released and 5G bands coverage is available. UE with VoLTE call will not move to 5G bands while call is active.

For UE with SA capability but not supporting VoNR, UE need to perform EPS fallback to MNO LTE when voice call is made. When call terminates, UE returns to 5G bands.

6.3.2 VoLTE call continuity in 5G NSA

In a 5G NSA setup, which relies on LTE and uses 700MHz as the anchor band, the 5G provider shall provide smooth transitions between 5G and MNO's 4G networks. Poor optimisation of the 700MHz band, which only carries data and has wider coverage than LTE, can result in issues like VoLTE call drops and setup failures.

When a radio link failure occurs in the LTE network during VoLTE calls, the UE attempts for Call Re-Establishment (CRE) to the 5G network provider in 700MHz. 5G network provider in 700MHz shall allow QoS Class Identifier 1 (QCI1) during the CRE process and within two seconds the VoLTE call is handed back to the MNO's LTE network to ensure smooth call continuity. Figure 6 shows the layering strategy of call re-establishment setup in an area where 700MHz overlay with MNO's LTE layer.

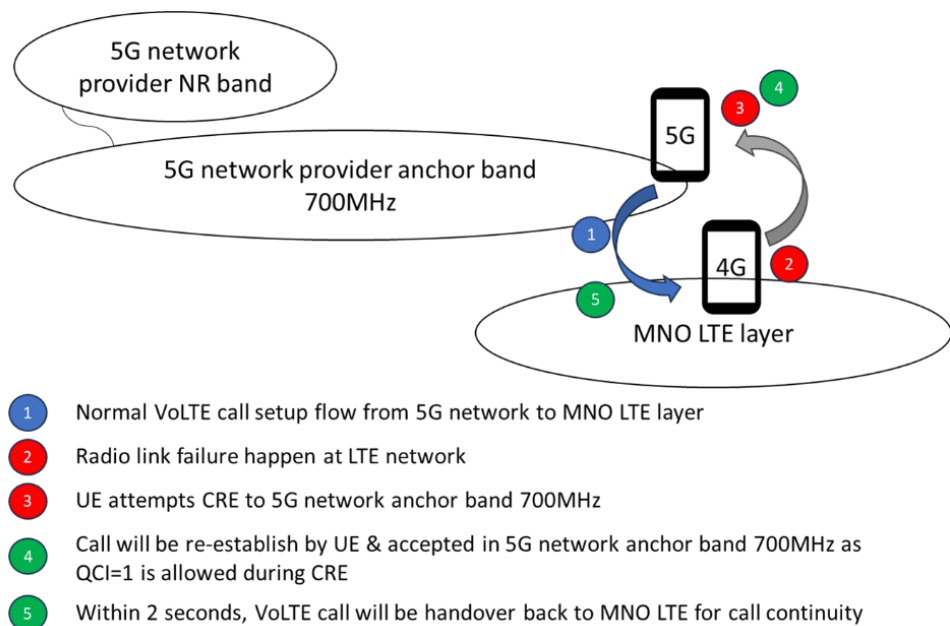


Figure 6. Layering strategy for VoLTE call re-establishment scenario

MCMC MTSFB TC G054:2025

6.3.3 Compatibility between VoLTE and Circuit Switched (CS)

The VoLTE network shall support the Single Radio Voice Call Continuity (SRVCC) procedure to allow customer to handover between LTE and Global System for Mobile Communications (GSM) coverage according to the guidelines stipulated in GSMA IR.64 Version 4.0 . For more detailed explanation of the SRVCC process, including signalling flows and network interactions, refer to GSMA IR.64 Version 4.0 as described in Figure 7.

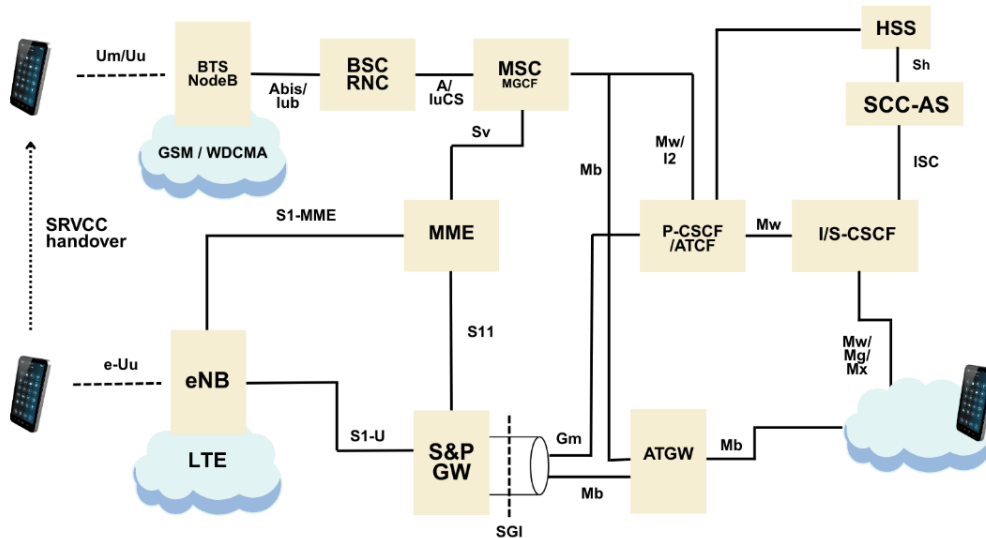


Figure 7. SRVCC Procedure

6.3.4 Compatibility between VoLTE and Voice over Wireless-Fidelity (VoWiFi)

The compatibility between these technologies ensures smooth transitions between LTE and Wi-Fi without dropping calls. This is made possible by standardised processes in the IMS architecture, allowing for seamless handovers between VoLTE and VoWiFi based on network availability. However, VoWiFi is not within the scope of this technical code.

6.4 VoLTE supplementary services

UE and IMS core shall support supplementary service configuration as depicted in GSMA IR.92 Version 15.0, in which the support of XML Configuration Access Protocol (XCAP) over the Ut interface to carry the communications for supplementary service transactions. The supplementary services offered by devices are dependent on the network service provider. The list of supplementary services supported by the network and devices is not limited to:

- originating identification presentation;
- communication forwarding unconditional;
- terminating identification presentation;
- communication forwarding on busy;
- communication forwarding on not reachable;
- communication forwarding on no reply;

- g) barring of all incoming calls;
- h) barring of all outgoing calls;
- i) barring of outgoing international calls;
- j) communication hold;
- k) message waiting indication;
- l) communication waiting;
- m) ad-hoc multi party conference; and
- n) explicit communication transfer.

6.5 UE requirement

All UE shall support VoLTE and shall comply with the requirement stated in 3GPP TS 34.229-1 or any equivalent standards.

The UE may include, but not limited to, cellular mobile terminals, handheld, portable and vehicle-mounted equipment, and Radio Frequency (RF) interface cards and modems. As long as the UE supports voice calls, it shall comply to the requirement.

The UE shall ensure support for all supplementary services that are supported by the network functions, in accordance with this Technical Code, whenever the UE supports the corresponding functionality as specified in Clause 6.

Annex A

(informative)

Normative reference

Recommendation ITU-T X.1041, *Security framework for voice-over-long-term evolution (VoLTE) network operation*

3GPP Release 17: TS 34.229, *3rd Generation Partnership Project; Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); User Equipment (UE) conformance specification; Part 1: Protocol conformance specification*

3GPP Release 18: TS 23.167, *3rd Generation Partnership Project. Technical Specification Group Services and System Aspects; Internet Protocol (IP) Multimedia Subsystem (IMS) emergency sessions.*

3GPP Release 18: TS 26.114, *3rd Generation Partnership Project. Technical Specification Group Services and System Aspects; Internet Protocol (IP) Multimedia Subsystem (IMS); Multimedia Telephony; Media handling and interaction.*

GSMA IR.92 Version 15.0, *IMS Profile for Voice and SMS*

GSMA IR.88 Version 25.0, *EPS Roaming Guidelines*

GSMA IR.65 Version 36.0, *IMS Roaming, Interconnection and Interworking Guidelines*

GSMA IR.64 Version 4.0, *IMS Service Centralization and Continuity Guidelines*

Annex B
(informative)

Abbreviations

For the purpose of this Technical Code, the following abbreviations apply:

AMF	Access and Mobility Management Function
AMR-NB	Adaptive Multi-Rate Narrowband
AMR-WB	Adaptive Multi-Rate Wideband
APN	Access Point Name
ARP	Allocation Retention Priority
ARP-PCI	ARP pre-emption Capability
ARP-PL	ARP Priority Level
ARP-PVI	ARP Pre-emption Vulnerability (PVI)
ATGW	Access Transfer Gateway
BGCF	Breakout Gateway Control Function
BSC	Base Station Controller
CRE	Call Re-establishment
CSCF	Call Session Control Function
CS	Circuit Switched
E-CSCF	Emergency-Call Session Control Function
EATF	Emergency Access Transfer Function
enB	Evolved node B
EPC	Evolved Packet Core
EPS	Evolved Packet System
E-UTRAN	Evolved Universal Terrestrial Radio Access Network
GBR	Guaranteed Bit Rate
GBR-DL	Guaranteed Bit Rate - Downlink
GBR-UL	Guaranteed Bit Rate - Uplink
GSM	Global System for Mobile Communications
HPMN	Home Public Mobile Network
HPLMN	Home Public Land Mobile Network
HSS	Home Subscriber Server
IBCF	Interconnection Border Control Function
I-CSCF	Interrogating-Call Session Control Function
IMS	IP Multimedia Subsystem
IP	Internet Protocol
LTE	Long-Term Evolution
LRF	Location Retrieval Function
MBR	Maximum Bit Rate
MBR-UL	Maximum Bit Rate-Uplink
MBR-DL	Maximum Bit Rate-Downlink
MGCF	Media Gateway Control Function
MME	Mobile Management Entity

MCMC MTSFB TC G054:2025

MNO	Mobile Network Operator
MOCN	Multi Operator Core Network
MS	Mobile Station
NG999	Next Generation Emergency Services 999
NSA	Non-Standalone
P-CSCF	Proxy-Call Session Control Function
P-GW	Packet Data Network Gateway
PCRF	Policy and Charging Control Function
PSAP	Public Safety Access Point
QCI	QoS Class Identifier
QoS	Quality of Service
RCS	Rich Communication Services
RDF	Routing Determination Function
RTT	Round Trip Time
SCC-AS	Service Centralisation and Continuity Application Server
S-CSCF	Serving-Call Session Control Function
S-GW	Serving Gateway
SA	Standalone
SIP	Session Initiation Protocol
SMF	Session Management Function
SMS	Short Message Service
SRVCC	Single Radio Voice Call Continuity
TAS	Telephony Application Server
TDM	Time Division Multiplexing
UDM	Unified Data Management
UPF	User Plane Function
UE	User Equipment
VoLTE	Voice over Long-Term Evolution
VoNR	Voice over New Radio
VoPS	Voice over Packet Switch
VPMN	Visited Public Mobile Network
VPLMN	Visited Public Land Mobile Network
XCAP	XML Configuration Access Protocol

Bibliography

- [1] MCMC MTSFB TC T015:2017, *Long Term Evolution (LTE) - User Equipment (UE)*
- [2] 3GPP Release 18.6: TS 23.401, *3rd Generation Partnership Project: General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access*
- [3] 3GPP Release 8: TR 24.604, *3rd Generation Partnership Project: Communication Diversion (CDIV) using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification; Technical Specification (Release 18)*
- [4] 3GPP Release 18: TR 24.605, *3rd Generation Partnership Project; Conference (CONF) using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification*
- [5] 3GPP Release 18: TR 24.606, *3rd Generation Partnership Project; LTE: Message Waiting Indication (MWI) using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification (Release 18)*
- [6] 3GPP Release 18: TR 24.607, *3rd Generation Partnership Project; Originating Identification Presentation (OIP) and Originating Identification Restriction (OIR) using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification (Release 18)*
- [7] 3GPP Release 18: TR 24.608, *3rd Generation Partnership Project; Terminating Identification Presentation (TIP) and Terminating Identification Restriction (TIR) using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification (Release 18)*
- [8] 3GPP Release 18: TR 24.610, *3rd Generation Partnership Project; Communication HOLD (HOLD) using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification (Release 18)*
- [9] 3GPP Release 18: TR 24.611, *3rd Generation Partnership Project; Anonymous Communication Rejection (ACR) and Communication Barring (CB) using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification (Release 18)*
- [10] 3GPP Release 18: TR 24.615, *3rd Generation Partnership Project; Communication Waiting (CW) using IP Multimedia (IM) Core Network (CN) subsystem; Protocol Specification (Release 18)*
- [11] 3GPP Release 18: TR 24.629, *3rd Generation Partnership Project; Explicit Communication Transfer (ECT) using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification (Release 18)*

MCMC MTSFB TC G054:2025

Acknowledgements

Members of the VoLTE, VoNR & VoWiFi Sub Working Group

Working Group Leaders

Mr Ahmad Azizuddin Abdul Aziz	CelcomDigi Berhad
Ms Chong Siew Kwee	Maxis Broadband Sdn Bhd
Mr Pua Ze Long	Rohde & Schwarz Malaysia Sdn Bhd

Drafting Committee

Ir Dr Hazilah Mad Kaidi (Draft Lead)	Universiti Teknologi Malaysia
Mr Khairul Ekhwan Kamarudin (Secretariat)	Malaysian Technical Standards Forum Bhd
Mr Ahmad Azizuddin Abdul Aziz	CelcomDigi Berhad
Mr Sharad Sadhu	Fraunhofer IIS
Ms Chong Siew Kwee	Maxis Broadband Sdn Bhd
Dr Kesavan Ulaganathen	Politeknik Sultan Haji Ahmad Shah

By invitation:

Mr Ameer Abd Rashid	Digital Nasional Berhad
Mr Muhammad Faiz Rahmat	SIRIM Berhad
Mr Shin Chee Hoe	U Mobile Sdn Bhd
Mr Zulkifly Hasan	U Mobile Sdn Bhd
Ts Low Wei Yap	Wideminds Pte Ltd
<i>Ms Nur Aziemah Binti Azizan</i>	<i>Jie Business Sdn Bhd (OPPO Malaysia)</i>
<i>Mr Ahmad Shab Fizie</i>	<i>Xiaomi Technologies Malaysia</i>
<i>Mr Muhammad Akmal Zohizam</i>	<i>Xiaomi Technologies Malaysia</i>