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SERIES Q: SWITCHING AND SIGNALLING, AND
ASSOCIATED MEASUREMENTS AND TESTS

Signalling requirements and protocols for the NGN –
VoLTE/ViLTE network signalling

Framework of interconnection of VoLTE/ViLTE-based networks

Recommendation ITU-T Q.3640

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Recommendation ITU-T Q.3640

Framework of interconnection of VoLTE/ViLTE-based networks

Summary

Recommendation ITU-T Q.3640 specifies the high-level framework of interconnection of long-term evolution (LTE)-based networks for providing interoperable voice and video services.

History

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FOREWORD

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Recommendation ITU-T Q.3640

Framework of interconnection of VoLTE/ViLTE-based networks

1 Scope

This Recommendation describes the framework and procedures that should be implemented by operators for establishing an interconnection between voice over long-term evolution / video over long-term evolution (VoLTE/ViLTE)-based networks to achieve worldwide interoperability.

This Recommendation identifies additional scenarios and requirements for VoLTE/ViLTE interconnection which have not been defined in existing 3GPP standards and GSMA guidelines, as follows:

- possible E2E scenarios in terms of interconnection and roaming;
- description of the EPC functions which should be supported;
- EPC configuration requirements;
- device and U/ISIM requirements;
- comparison of VoLTE roaming architecture;
- list of mandatory and optional services which should be supported by operators for interconnection and roaming scenarios;
- protocol implementation statement (PICS) needed for the service level agreement (SLA).

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

- [ITU-T Q.1912.5] Recommendation ITU-T Q.1912.5 (2018), *Interworking between session initiation protocol (SIP) and bearer independent call control protocol or ISDN user part*.
- [ITU-T Q.3403] Recommendation ITU-T Q.3403 v.1 (2016), *IP multimedia call control protocol based on the session initiation protocol and the session description protocol – Basic call: Requirements for the user side and the network side*.
- [ITU-T Q.3617] Recommendation ITU-T Q.3617 v.1 (2015), *Terminating identification presentation and terminating identification restriction using IP multimedia core network subsystem. Protocol specification*.
- [ITU-T Q.3618] Recommendation ITU-T Q.3618 v.1 (2016), *Originating identification presentation and originating identification restriction using IP multimedia core network subsystem – Protocol specification*.
- [ITU-T Q.3619] Recommendation ITU-T Q.3619 v1 (2016), *Communication HOLD using IP multimedia core network subsystem – Protocol specification*.
- [ITU-T Q.3620] Recommendation ITU-T Q.3620 v.1 (2016), *Communication diversion using IP multimedia core network subsystem – Protocol specification*.

- [ITU-T Q.3621] Recommendation ITU-T Q.3621 v.1 (2016), *CONF using IP multimedia core network subsystem – Protocol specification.*
- [ITU-T Q.3622] Recommendation ITU-T Q.3622 v.1 (2016), *Communication waiting using IP multimedia core network subsystem – Protocol specification.*
- [ITU-T Q.3623] Recommendation ITU-T Q.3623 v.1 (2016), *Explicit communication transfer using IP multimedia core network subsystem – Protocol specification.*
- [ITU-T Q.3624] Recommendation ITU-T Q.3624 v.1 (2016), *Malicious communication identification using IP multimedia core network subsystem – Protocol specification.*
- [ITU-T Q.3625] ITU-T Q.3625 v.1 (2016), *Completion of communications to busy subscriber and completion of communications by no reply using IP multimedia core network subsystem – Protocol specification.*
- [ITU-T Q.3626] Recommendation ITU-T Q.3626 v.1 (2016), *Message waiting indication using IP multimedia core network subsystem – Protocol specification.*
- [ITU-T Q.3627] Recommendation ITU-T Q.3627 v.1 (2016), *Closed user group using IP multimedia core network subsystem – Protocol specification.*
- [ITU-T Q.3628] Recommendation ITU-T Q.3628 v.1 (2016), *Anonymous communication rejection and communication barring using IP multimedia core network subsystem – Protocol specification.*
- [ITU-T Q.3630] Recommendation ITU-T Q.3630 v1 (2017), *Inter-IMS network to network interface – Protocol specification.*
- [ITU-T T.38] Recommendation ITU-T T.38 (2015), *Procedures for real-time Group 3 facsimile communication over IP networks.*
- [ITU-T V.152] Recommendation ITU-T V.152 (2010), *Procedures for supporting voice-band data over IP networks.*
- [ETSI TS 124 229] ETSI TS 124 229 (2016-01), *Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; IP multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3 (3GPP TS 24.229 Release 10).*
- [ETSI TS 124 604] ETSI TS 124 604 V10.11.0 (2015-10), *Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Communication Diversion (CDIV) using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification (3GPP TS24.604 version 10.11.0 Release 10).*
- [ETSI TS 124 605] ETSI TS 124 605 V10.1.0 (2013-01), *Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Conference (CONF) using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification (3GPP TS 24.605 Release 10).*
- [ETSI TS 124 606] ETSI TS 124 606 V10.2.0 (2012-07), *Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Message Waiting Indication (MWI) using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification (3GPP TS 24.606 Release 10).*

- [ETSI TS 124 607] ETSI TS 124 607 V10.1.0 (2014-03), *Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Originating Identification Presentation (OIP) and Originating Identification Restriction (OIR) using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification (3GPP TS 24.607 Release 10).*
- [ETSI TS 124 608] ETSI TS 124 608 V10.1.0 (2013-07), *Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Terminating Identification Presentation (TIP) and Terminating Identification Restriction (TIR) using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification (3GPP TS 24.608 Release 10).*
- [ETSI TS 124 610] ETSI TS 124 610 V10.2.0 (2013-10), *Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Communication HOLD (HOLD) using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification (3GPP TS 24.610 Release 10).*
- [ETSI TS 124 611] ETSI TS 124 611 V10.2.0 (2012-01), *Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Anonymous Communication Rejection (ACR) and Communication Barring (CB) using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification (3GPP TS 24.611 Release 10).*
- [ETSI TS 124 615] ETSI TS 124 615 V10.6.0 (2015-07), *Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Communication Waiting (CW) using IP Multimedia (IM) Core Network (CN) subsystem; Protocol Specification (3GPP TS 24.615 Release 10).*
- [ETSI TS 124 616] ETSI TS 124 616 V10.0.0 (2011-03), *Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Malicious Communication Identification (MCID) using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification (3GPP TS 24.616 Release 10).*
- [ETSI TS 124 629] ETSI TS 124 629 V10.2.0 (2013-04), *Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Explicit Communication Transfer (ECT) using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification (3GPPTS 24.629 Release 10).*
- [ETSI TS 124 642] ETSI TS 124 642 V10.7.0 (2013-07), *Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Completion of Communications to Busy Subscriber (CCBS) and Completion of Communications by No Reply (CCNR) using IP Multimedia (IM) Core Network (CN) subsystem; Protocol Specification (3GPP TS 24.642 Release 10).*
- [ETSI TS 124 654] ETSI TS 124 654 V10.3.0 (2013-04), *Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Closed User Group (CUG) using IP Multimedia (IM) Core Network (CN) subsystem, Protocol Specification (3GPP TS 24.654 Release 10).*

3 Definitions

None.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

ENUM	telephone Number Mapping
GRX/IPX	GPRS Roaming exchange / IP exchange
HPMN	Home Public Mobile Network
IBCF	Interconnection Border Control Functions
II-IMS	Inter-IMS
II-NNI	Inter-IMS Network to Network Interface
IMS	IP Multimedia Subsystem
LBO	Local Breakout
LI	Lawful Interception
LTE	Long-Term Evolution
NNI	Network Network Interface
OTT	Over The Top
PS	Packet Switched
R-NNI	Roaming Network to Network Interface
SAE	System Architecture Evolution
SIP	Session Initiation Protocol
SLA	Service Level Agreement
ViLTE	Video over LTE
VoLTE	Voice over LTE
VoPS	IMS voice over PS Session
VPMN	Visited Public Mobile Network

5 Conventions

None.

6 Rationale

The LTE is a popular wireless technology used for providing customers access to IP core networks. By using broadband wireless technology such as LTE, telecommunication operators have finally reached the concept of "all over IP networks" and may provide with a wireless interface any telecommunication service using an all IP environment.

Among others, LTE may have been used for providing the most popular services such as real-time voice and video (e.g., telephony). However, the implementation of VoLTE/ViLTE poses some challenges to the operators, which aim to establish end-to-end connections between calling parties, because there is only a packet-switched (PS) network and the service control is provided by an IP multimedia subsystem (IMS).

Different VoLTE/ViLTE solutions are available for operators. However these solutions are not always interoperable and VoLTE/ViLTE roaming procedures are not agreed and therefore may not be implemented.

This Recommendation aims to specify common requirements to the interconnection of VoLTE/ViLTE-based networks.

7 Key issues of interconnection

There are the following key issues of interconnection among VoLTE/ViLTE-based networks:

- different options for signalling protocols used for Inter-IMS interconnection, which can support all existing services (basic call and supplementary services);
- different options for roaming scenarios (there are no strict requirements for operators and no default option);
- charging (e.g., roaming charges, calls using interconnection networks);
- numbering/addressing (e.g., ENUM resolution, ITU-T E.164 → SIP-URI conversion);
- floating delay (problem of providing legacy services and applications, e.g., Fax/Modem over IP);
- lawful interception;
- data retention;
- emergency services (e.g., emergency call 112).

8 General principles of interconnection of VoLTE-based networks

The voice over LTE (VoLTE) and video over LTE (ViLTE) services are the services that aim to deliver voice and video communication over packet-based networks which include LTE technology, on the access stratum. It means that VoLTE/ViLTE services might be provided by either traditional fixed or mobile telecommunication operators who implemented LTE technology as access technology to its core IP network.

Also, VoLTE/ViLTE services are so-called "managed" voice and video services which are based on standardized SIP/IMS signalling and provided by telecommunication operators, while over-the-top (OTT) applications are services which are basically provided in public Internet by independent third parties, without standardized signalling protocols, traffic prioritization and guaranteed quality of services.

An IMS platform is used as a service control stratum which is used for managing VoLTE/ViLTE sessions. The reference architecture of IMS is shown in Figure 8-1.

Figure 8-1