ETSI TC INT status of VoLTE interconnection test specification

ITU Regional Conference on "Internet of Things, Telecommunication Networks and Big Data as basic infrastructure for Digital Economy"

San Petersburg 4-6 June 2018

Summary

- *Introduction*
- *Status of VoLTE deployment*
- *Framework for VoLTE Interconnection*
- *The ENUM role for VoLTE Interconnection*
- *Status of TC INT VoLTE Interconnection testing*

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Transformation of communication networks: Convergence towards layered multi-service NGN architecture

19th → 1990's: Plain old telephony service

→ 2000: Plain Land Mobile & Cellular Mobile Networks

→ 2010: Convergence towards horizontal layered multi-service Architecture … still on going

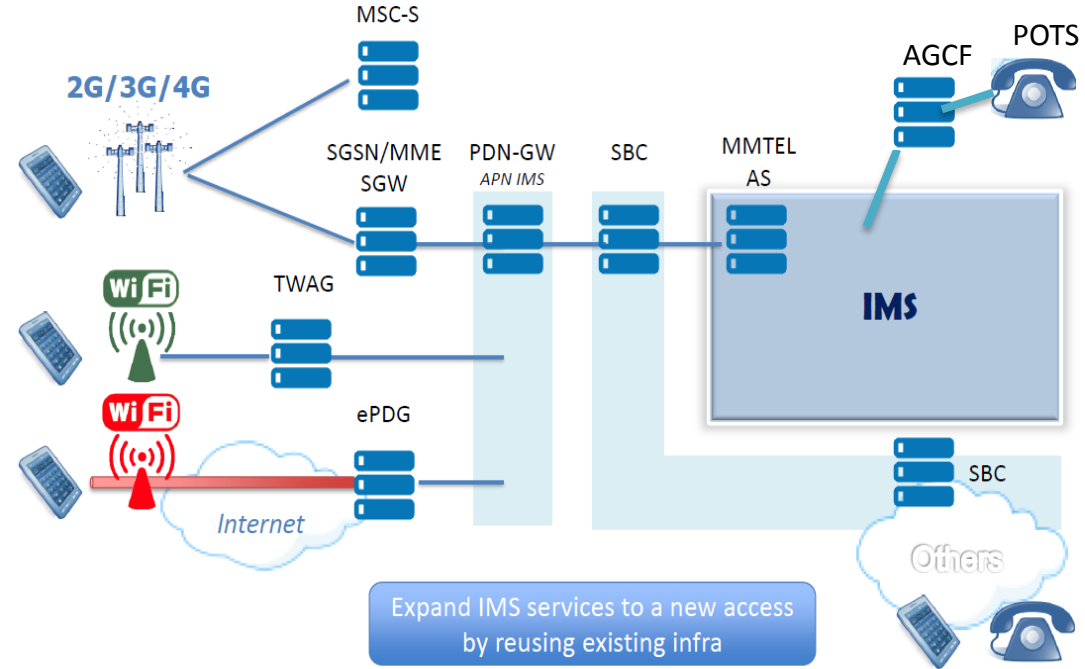*→ 2020: 5G, network slicing, Adaptive Network to traffic and fault condition, SDN*
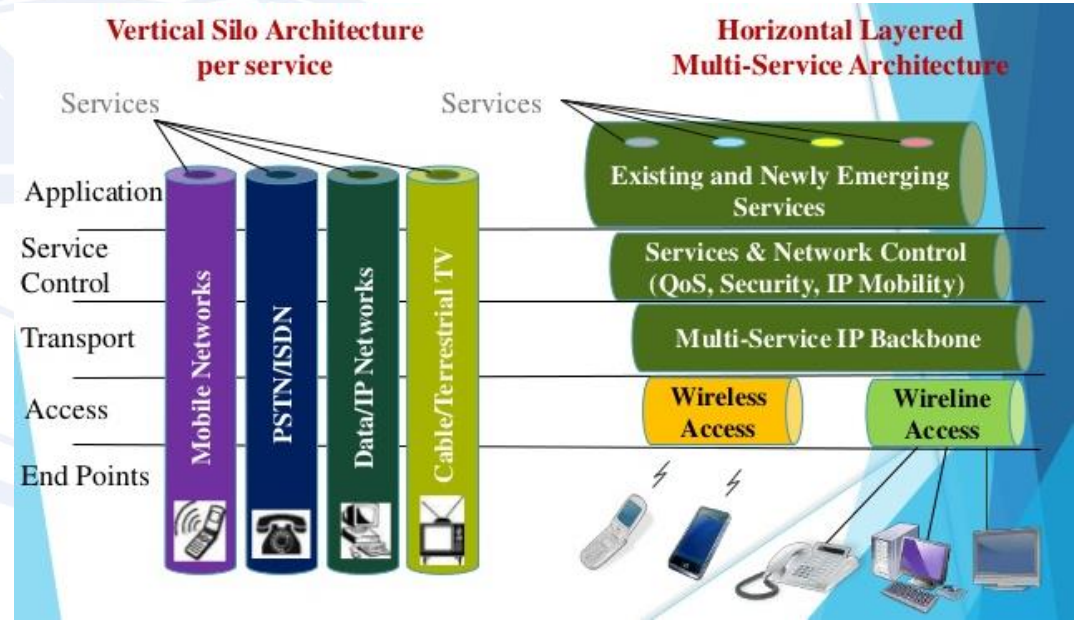
*Picture source: Havar Bathaee, NGN, Next Generation network Concepts.

Challenges of multi-media/fixed-mobile converged network architecture

Complexity:
- *Multiple standards;*
- *Multiple technologies;*

*Picture source: blog.3g4g.co.uk

Challenges of multi-media/fixed-mobile converged network architecture

❖ *Complexity:*
  ➢ *Multiple standards;*
  ➢ *Multiple technologies;*
  ➢ *Multiple services (voice, data, video, …)*
  ➢ *Complex multi-layered architecture;*
❖ *Conformity:*
  ➢ *A lot of new network elements;*
  ➢ *Multiple new interfaces and protocols;*
  ➢ *ETSI on-going: conformity test standards;*
❖ *Interoperability:*
 ❖ *Multi-vendor environments;*
  ❖ *Multi-operator environments.*

*Picture source: https://realtimecommunication.info/tag/5g-call-flow/
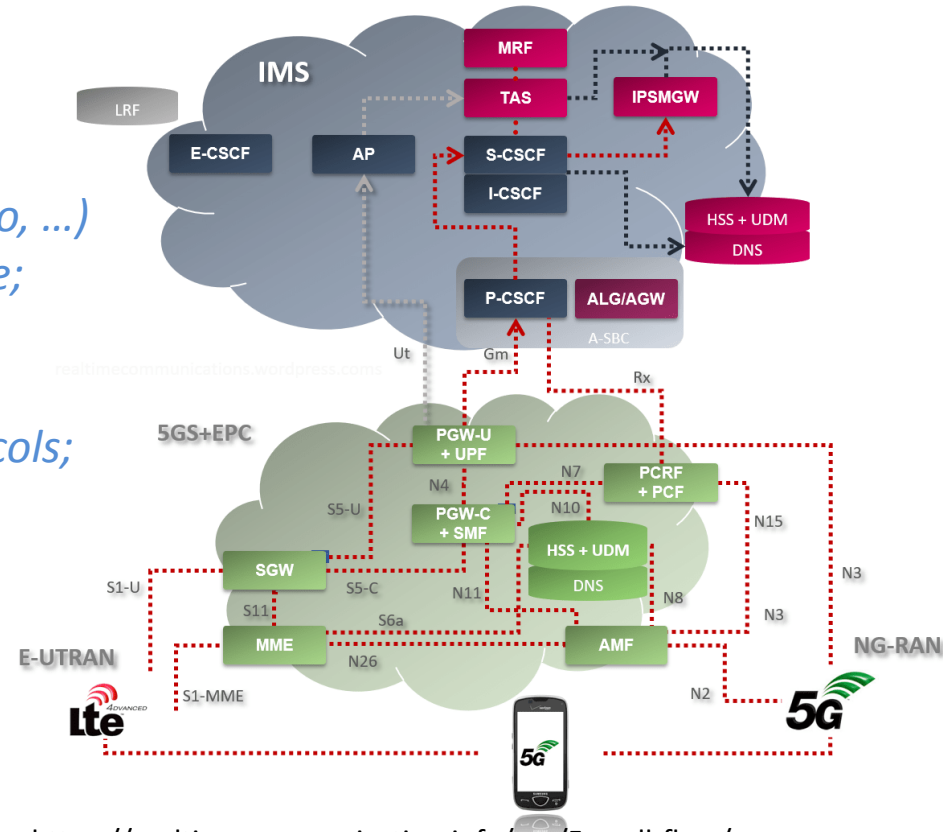
VoLTE Overview

VoLTE (Voice over LTE) is the evolution of Voice over IP: it provides **high service quality** and «**enhanced experience**» in terms of **performance and multimedia**

Service Description

▸ **Voice experience on LTE Carrier Grade, native on device**, closely linked to the "Green key" of the phone, offering an enriched experience on the Mass Market:

Reason Why
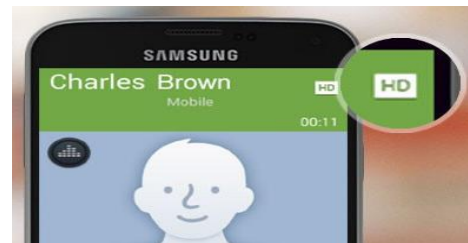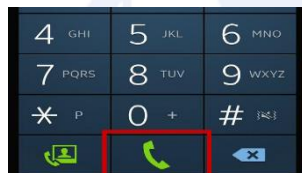
▸ **Strong boost in the Industry**

▸ Improve Customer Satisfaction providing voice on **high level of "quality of experience"**

▸ Support **Retention and Win-back** in "Massive LTE" scenario

▸ **Slow down revenues erosion** towards OTT providers

Why VoLTE

For the subscriber:

No changes at call setup or call termination.

Better voice quality.
3G Bit rate: AMR-NB 12,2 kbps
4G Bit rate: AMR-WB 23,85 kbps
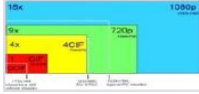
Better video calls quality

Faster call setup time
3G: 5s
LTE: 0,5s-1,5s

Longer battery lifetime.
Improvement in voice calls of 35%

For Operators:

New services opportunities (RCS + UC)

Devices interoperability: VoLTE will be everywhere

Spectral efficiency improvement
3x less frequency spectrum usage, when compared to R99 CS voice calls (at same quality level)

Core Network simplification
From CS centric to IMS centric

Reutilization of the same network architecture, for both VoLTE and VoWiFi.

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VoLTE Interconnect / Roaming Stats & RCS Interconnect Stats (May 2018)

GSMA Maintain a monitoring exercise of the markets and keep a tally of :-

- *VoLTE Launches*

- *VoLTE Interconnects (both Roaming NNI & Interconnect NNI)*

- *RCS Interconnects*

The following slides provide a summary of Interconnect counts (both VoLTE and RCS related).

VoLTE Interconnections Commercial Launches

13 operators launched commercial VoLTE interconnection

13 Voice (VoLTE)
(1) HK <> Macau
(1) KPN (NL) <> SKT (S.Korea)
(1) ATT, Verizon (USA)
(1) AIS, DTAC (Thailand)
(1) O2, EE(BT) (UK)
(3) KT/LGU Plus/SKT (S.Korea)
(1) DT/Vodafone (Germany)
(3) Zain/Viva/Ooredoo (Kuwait)
(1) Telefonica/DT (Germany)

AT&T

Verizon

KT

SKT

LG U+

NTT DOCOMO

SoftBank

KDDI

China Mobile (HK)

SmarTone

CSL (PCCW)

https://www.gsma.com/futurenetworks/resources/all-ip-statistics
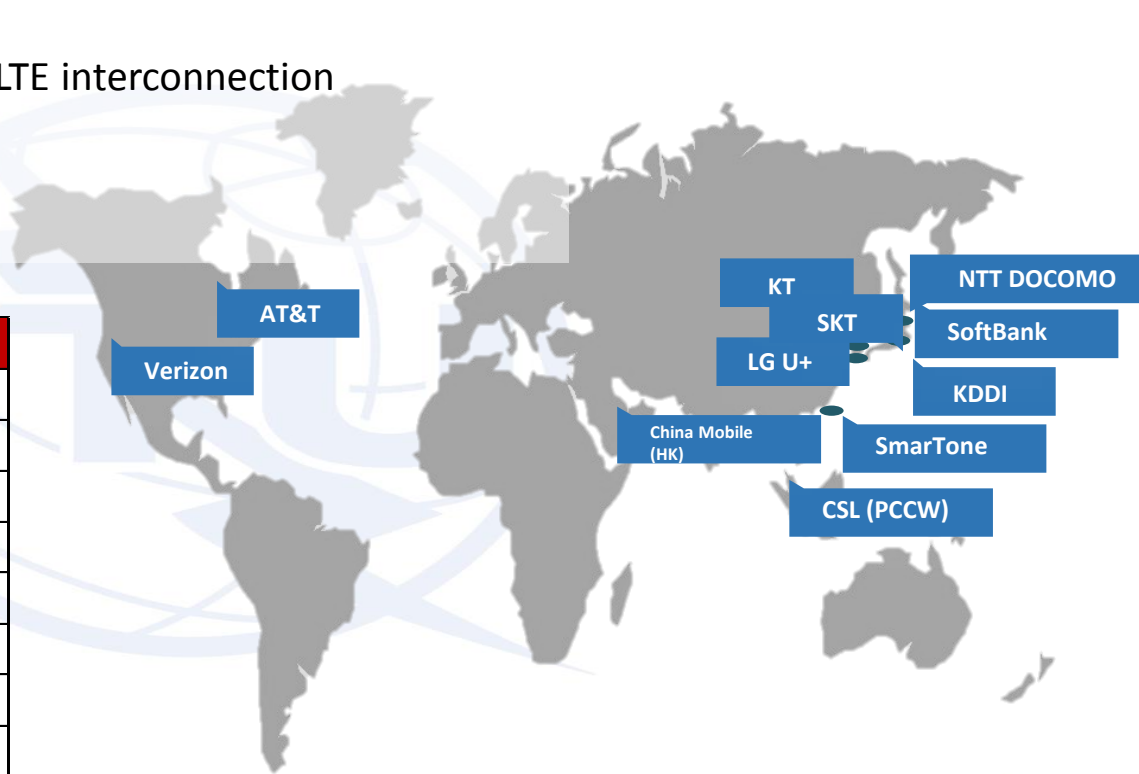
VoLTE Roaming Commercial Launches

11 operators launched commercial VoLTE roaming, including **9 bilateral** and **14 unilateral** launches. All roaming commercial launches are based on **S8 Home Routed** Architecture.

23 VoLTE Roaming	
9 Bi-directional	14 Unidirectional
NTT DoCoMo - KT	LG Uplus - SmarTone
LG Uplus - KDDI	SKT - CSL(PCCW)
Verizon Wireless - LG Uplus	SKT - SoftBank
NTT DoCoMo - Verizon Wireless	AT&T - China Mobile HK
Verizon Wireless - KDDI	KDDI - Verizon Wireless
AT&T- SK Telecom	AT&T - SmarTone
AT&T - KT	AT&T- HK Telecom
AT&T - NTT DoCoMo	AT&T - KPN
LG Uplus - AT&T	NTT DoCoMo - DPAC
	AT&T - Dialog Axiata
	AMX - Verizon Wireless
	DoCoMo Pacific - KDDI
	AT&T - Rogers
	AT&T - Chunghwa (Taiwan, China)

https://www.gsma.com/futurenetworks/resources/all-ip-statistics

RCS Interconnections

Interconnection		AMX	ATT	Sprint	Rogers	US Cell	Tracphone							
Launched Networks		3	1	1	1	1	1							
Connected Networks		2	0	1	1	0	1							
AMX	2		0	1	1	0	1							
ATT	0			0	0	0	0							
Sprint	1				1	0	1							
Rogers	1					0	1							
US Cell	0						0							
Tracphone	1													
	0													
	0													
	0													
	0													
	0													6

Interconnection		DT	Orange	Telia	Telenor	VF								
Launched Networks		4	1	2	2	13								
Connected Networks		4	1	2	1	12								
DT	5		5	0	5	60								
Orange	1			2	1	12								
Telia	2				2	24								
Telenor	1					12								
VF	12													
	1													
	0													
	0													
	0													
	0													
	0													123

RCS	
Previous i/c's	2
By 05.04.18 (US&LATAM)	6
By 05.04.18 (Europe)	123
VoLTE	13
Roaming	23
Total	**167**

14

https://www.gsma.com/futurenetworks/resources/all-ip-statistics

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Why VoLTE Interconnection (1)

- Faster call setup Higher-quality voice and video calling, and class of service (using IPX)

- Efficient use of spectrum, releasing extra capacity for data Moving traffic from the 3G network (GSM or even CDMA) to the 4G network helps to free up additional spectrum that can be realigned to support the growth of 4G data.

- Optimization of network and service management while simplifying service delivery

- Security based on IPX

- Support for GSMA IR.92/IR.94 Drives the parameters and standards for allowing partner networks to communicate with each other.

Why VoLTE Interconnection (2)

- Signaling protocol shift from SS7 to Diameter and SIP

- Sip normalization

- Ability to work with the variations in standards IR.34 (GUIDELINES FOR IPX PROVIDER NETWORKS)

- Bandwidth management

- Charging and accounting

- Emergency and priority calls

- Multimedia interworking between operators

- Voice transcoding This includes delivering a call to a legacy voice network, which may not support the AMR codec.

Requirements for VoLTE Interconnection

Interworking Function

- SIP normalization and mediation
- Transcoding
- Codec mediation
- VoLTE to CS interworking

Session and Policy Control

- Network:
- Session throttling
- Bandwidth utilization management
- CoS prioritization
- Commercial:
- Black/white listing
- Service management control
- IWF control

ENUM (IR.67)

- Electronic Number Mapping
- Translation of E.164 to an IP address
- Supports migration from legacy to IP-based services

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ENUM: IR67 DNS/ENUM Guideline for Service Providers & GRX/IPX Providers

GSM Association   Non-confidential
Official Document IR.67 - DNS/ENUM Guidelines for Service Providers & GRX/IPX Providers

DNS/ENUM Guidelines for Service Providers & GRX/IPX Providers
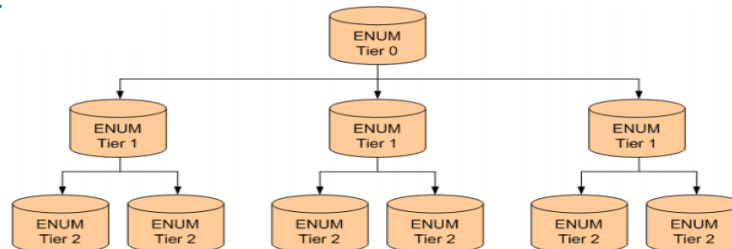**Version 8.0**
23 November 2012

Figure 11: ENUM logical hierarchy

ENUM NG.105 - ENUM Guidelines for Service Providers and IPX Providers

GSM Association   Non-confidential
Official Document NG.105 - ENUM Guidelines for Service Providers and IPX Providers

GSMA

ENUM Guidelines for Service Providers and IPX Providers
Version 1.1
28 May 2018

This is a Non-binding Permanent Reference Document of the GSMA

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- Extend IR67
- Hierarchical Structure
- ENUM and DNS separation
- Public ENUM and Private ENUM
- ENUM Proxy
- ENUM and NON ENUM management
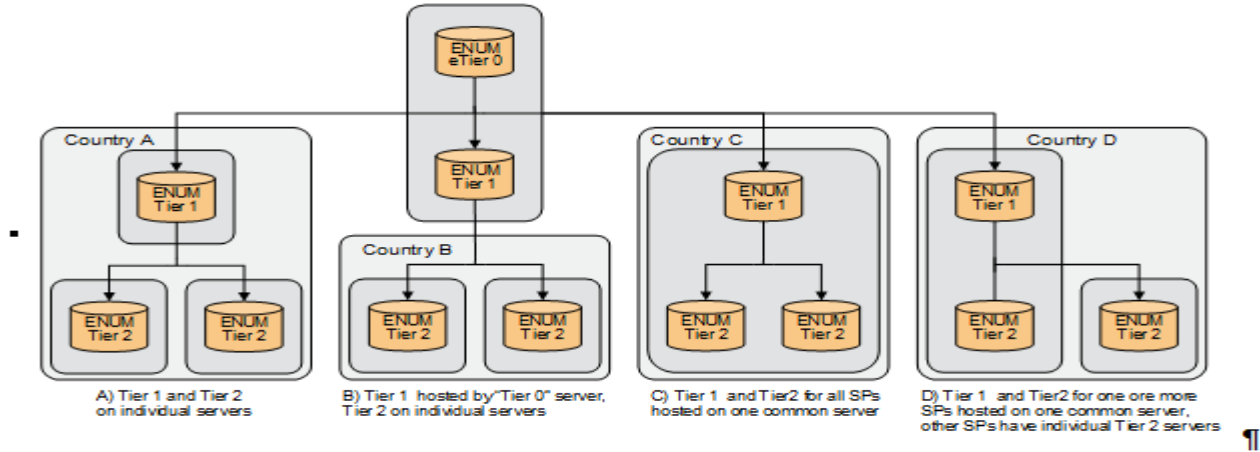
ENUM Logical Architecture

Figure 3 Logical architecture for Carrier ENUM on the IPX

- It is still logical Architecture
- Companies are proceeding with Bilateral agreement

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Key issues of interconnection

- different options for signaling 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)

TS 106 011-2: IMS NNI Interoperability Test Speficication

ETSI TS 186 011-2 V5.1.1 (2013-10)

Technical Specification

Core Network and Interoperability Testing (INT);
IMS NNI Interoperability Test Specifications
(3GPP Release 10);
Part 2: Test descriptions for IMS NNI Interoperability

- Used in the last GSMA/ETSI Interoperability event in 2012

- It includes verification on the NNI interfaces included ENUM Queries according to IR67

ETSI TS 103 397: VoLTE and ViLTE interconnect, interworking and roaming test specification with QoS/QoE (3GPP Release 12)

ETSI·TS·103·397·V0.0.32·(2017-11)¶

Interruzione di sezione (pagina successiva)

EUROPEAN·STANDARD¶

Core·Network·and·Interoperability·Testing·(INT);¶
VoLTE·and·ViLTE·interconnect,¶
interworking·and·roaming·test·specification·with·QoS/QoE¶
(3GPP·Release·12)¶
¶

- Interconnection test between two operators
- QoE verification
- Call set-up time (post dialling delay)
- Listening speech quality
- Connections with one voice channell
- General aspects of Listening Speech Quality
- General aspects of voice channel test calls
- End-to-end audio delay
- End -to-end audio delay variation (ETSI TS 103 222-3)
- Early media call flow options and listening speech quality
- Early media listening speech quality convergence quality test (ETSI TS 103 222-1)
- Fax Transmission
- ViLTE KPI (ETSI TS 126 114)

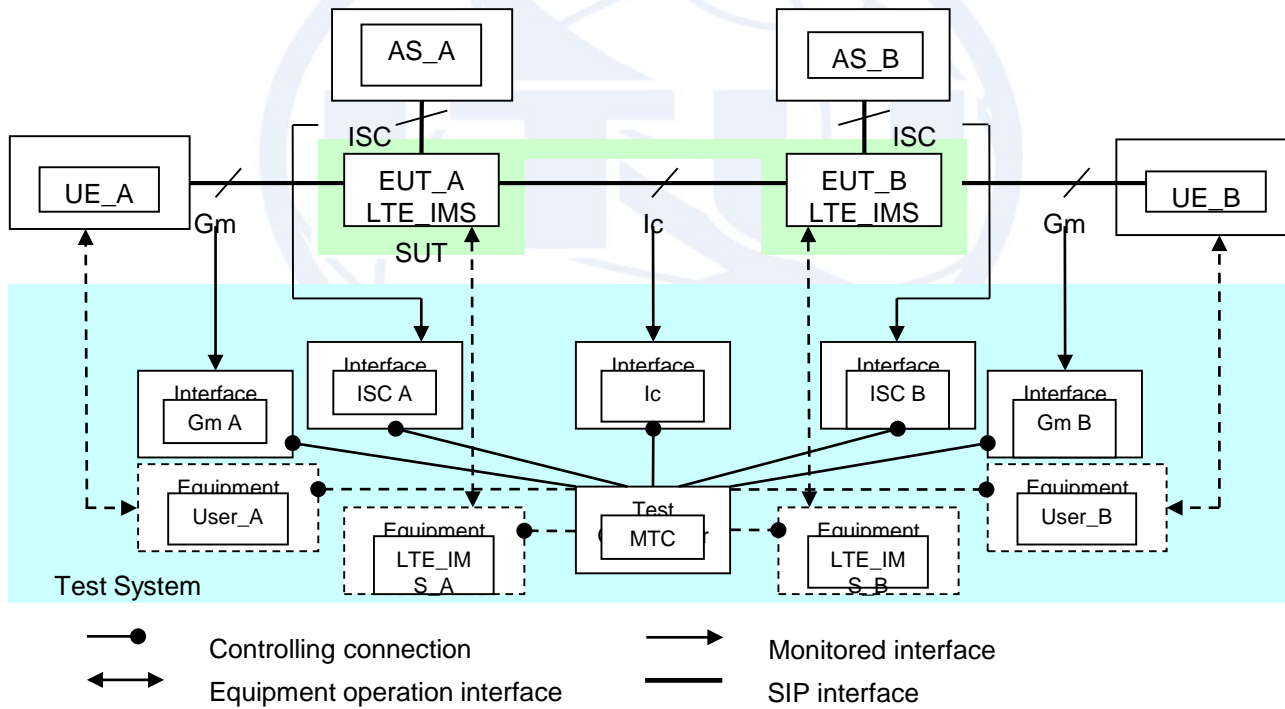# VoLTE E2E scenarios in terms of interworking, interconnection and roaming
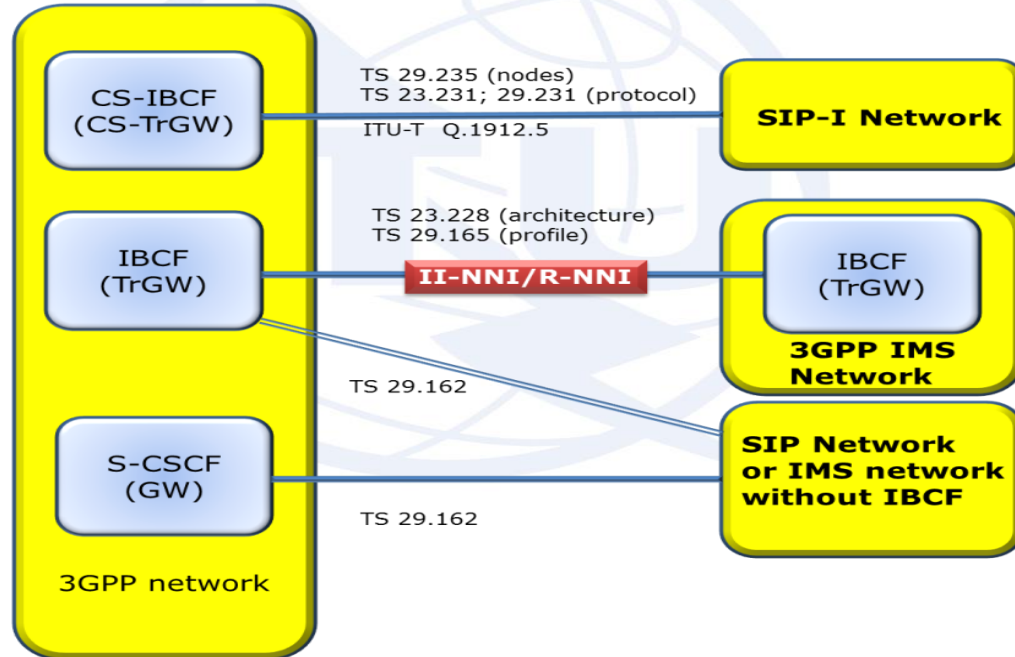
TC INT – proposal of Extension of TS 103 397

- STF proposal for a test plan for interoperability and interconnection on an interregional level in 3 steps.

- Step 1: Interoperability monitoring test suite based on the current TC INT work done on the VoLTE/ViLTE document TS 103 397 checking the Ic interface and its messages.

- A step 2 with other interfaces inside operator A or B network, and an extension of the document TS 103 397 could be required. Test cases should contain other test purposes related to interfaces and an extension of monitoring test suite.

- The step 3 would include an E2E testing with automatically controlled UE's to trigger tests from TS 103 397 and monitor already implemented interfaces in the real time.
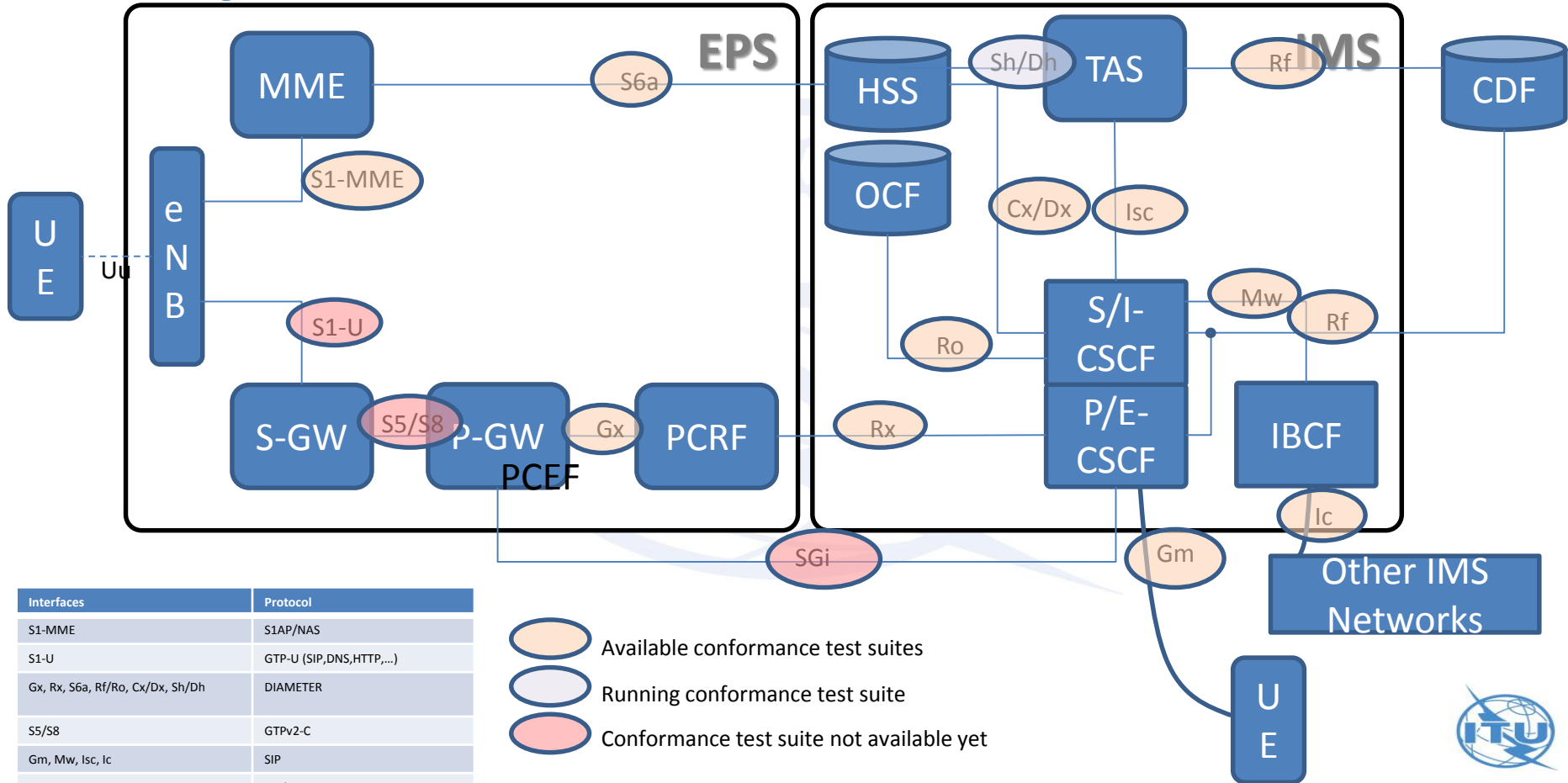
Interoperability testing framework

– Interface conformance testing -> Interoperability testing -> E2E integration testing;
– Ultimate goal: End-to-end integration testing that support efficient automated regression testing when upgrading the network architecture or introducing new features

VoLTE/ViLTE architecture with interfaces

Interfaces	Protocol
S1-MME	S1AP/NAS
S1-U	GTP-U (SIP,DNS,HTTP,…)
Gx, Rx, S6a, Rf/Ro, Cx/Dx, Sh/Dh	DIAMETER
S5/S8	GTPv2-C
Gm, Mw, Isc, Ic	SIP
SGi	SIP/RTP

Available conformance test suites

Running conformance test suite

Conformance test suite not available yet

Roadmap to ViLTE & VoLTE interoperability and end-to-end integration testing

- VoLTE/ViLTE interoperability test description
- VoLTE/ViLTE development of interoperability monitoring test suite
- Interoperability validation
- E2E remote control testing development
- E2E testing with automatically controlled UE's to trigger tests from test description standards and monitor already implemented interfaces in the real time

do svidanja