# GSMA Activities relating to the deployement and interoperability of IMS services

## ITU Workshop on "Protocol Enhancements for IMS to be used in LTE/IMT-2020 Networks and Beyond"

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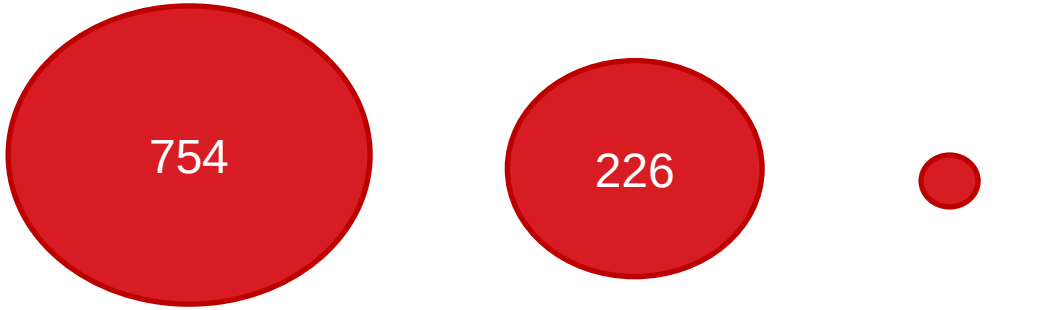
# Background

This deck provides an overview of recent GSMA activities related to the deployment and interoperability of IMS services. These activities are driven by work within the GSMA Networks Group (NG) which is the group within GSMA with responsibility for all core network and service technical aspects, including the user to network, intra-network and network to network interfaces.

# GSMA Network Group (NG) Topics

- Over the last 12 months or so, NG has looked at a number of topics relating to IMS :-
  - (S8HR) VoLTE Roaming Issues
    - LBO option for VoLTE Roaming has been deprecated within GSMA PRDs
  - NNI Interworking between RCS deployment options (single / dual IMS core deployments)
  - Vo5GS

# (S8HR) VoLTE Roaming




**754 LTE launches**
Globally in 200 Markets

**226 VoLTE launches**
Globally in 100 Markets

**30 VoLTE Roaming (all S8HR)**

- VoLTE rollout is slow / has slowed
- VoLTE roaming agreements are even slower
- 2/3G sunsetting and spectrum refarming is compromised

- Various problems were raised in NG relating to VoLTE/Roaming rollout
- Study was initiated covering 6 streams
  - VoLTE Issues,
  - Emergency Call,
  - SMS,
  - Regulatory Issues,
  - IR.21 Updates,
  - Testing.

# Problems Raised

OEMs block unknown VoLTE networks (“OEM Blocking”)

Regional device blocking

Lack of industry VoLTE interoperability experience

OEMs block VoLTE roaming

Scale prevents direct testing
~2000 VoLTE capable devices
~350 new ones per year
Already 225 VoLTE networks
Roaming agreement testing is an “N squared” problem
~ 525 LTE networks yet to launch
VoLTE increases roaming testing exponentially

Testing logistics - shipping of test devices expensive and impractical at volume

Variations in network settings despite GSMA Network Settings Exchange

# VoLTE Issues

- Covers VoLTE aspects impacted by the S8HR. Clarifying what had already been defined in 3GPP since the advent of S8HR together with practical feedback from MNOs that have already launched S8HR VoLTE Roaming.
  - S8HR option was subsequently added by 3GPP to the initial LBO architecture,
  - GSMA has now deprecated the LBO option from its PRDs
- Clarification points:

- IMS Registration
- Enable/Disable IMS-APN when roaming
- QoS considerations/mapping
- Determination of Location / Time Zone (TZ)
- Emergency call impacts (UE/non –UE detected)
- IPv4/IPv6 compatibility
- Local Number Translation & Routing
- SRVCC considerations
- Lawful Intercept impacts
- Charging considerations
- WPS (Wireless Priority Service)
- A summary of HSS & MME impacts

# Emergency Call

- Provision of the emergency call service to inbound VoLTE roamers using S8HR.
- Covers both IMS Emergency Call and CSFB Emergency call as per TS 23.167
- Topics covered :-
  - UE & Non-UE Detected Emergency Calling
  - Anonymous Emergency Calling
  - SIM-less Emergency Calling
  - eCall
  - Additional management of national Emergency Calling (local emergency numbers)

# SMSoIP

- Describes the minimal requirments for the provision of SMSoIP to inbound VoLTE roamers using S8HR.
- Note that a VoLTE Roaming UE VoLTE roamer can continue to use legacy solution to transport Short Message if SMSoIP is not supported by Home Network.

# Regulatory Aspects

- Covers the key regulations are defined along with standardized solutions to facilitate support.
- All regions/countries have different regulations and MNOs need to consult with their internal legal and specific country/local regulations for each of these topics
- Topics covered:-
  - Lawful Intercept
  - Retained Data
  - Priority Service (WPS, MPS)
- Disabling of IMS encryption is a key aspect if required by the VPMN

# IR.21

- This is the RAEX database (Roaming Exchange)
- Included additional VoLTE roaming information as identified in other streams .

# Testing

- Test methodology to both separately test network & device and also in combination
  - For combined case, test the network first and then the device
- Cover both non-roaming and roaming scenarios
  - Test non-roaming first and then roaming afterwards
- Definition of six service-oriented device profiles to fully test device functionality
  - Intent to fully test the IMS functionality of a device
- Definition of four VoLTE network types in evolving stages
  - Type1 - VoLTE, (SMSoNAS, CSFB emergency)
  - Type2 - VoLTE, SMSoIP, (CSFB emergency)
  - Type3 - VoLTE, IMS emergency, (SMSoNAS)
  - Type4 - VoLTE, SMSoIP, IMS emergency
- Test suites to cover all Network Types
- Roaming test matrix between four types of VoLTE networks
  - In general, there are different “Network Types” at each end

# VoLTE Roaming Results / Next Steps

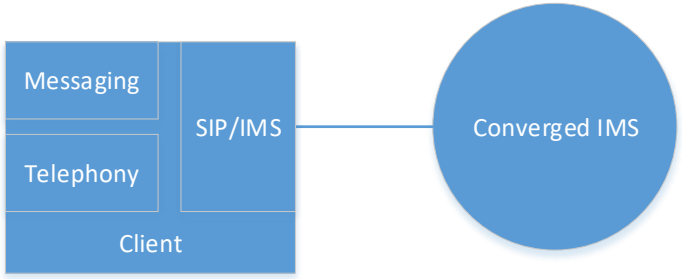
- Update of GSMA PRDs to reflect output of the six streams
- Summaries of the work included in the GSMA “VoLTE implementation Guide” published on gsma.com
  - See https://www.gsma.com/aboutus/workinggroups/wp-content/uploads/2021/01/VoLTE-Implementation-Guide-Jan-2021.pdf
- Launch of GSMA Interoperability Testing initiative
  - Based on Testing stream work as documented in GSMA PRD IR.25
  - See https://www.gsma.com/services/interoperability-testing/

# NNI Interworking between different RCS deployment options

- There are different deployment options for the provision of RCS services (on top of MMTEL services) in the market
- The deployment options are related to whether the RCS services are provided by the same IMS core that provides MMTEL or whether there are separate IMS cores for MMTEL & RCS services respectively
- Impact on the number of IMS registrations
  - Single Single IMS registration to a converged IMS core for all services,
  - Two separate registrations (one for MMTEL and one for RCS services) to (typically) different IMS cores.
- There is a need to interwork the NNI between the different deployment options
- In the dual IMS case, a single telephone number is used to address the user for both MMTEL & RCS services
  - Different numbers can therefore not be used as a basis for any solution

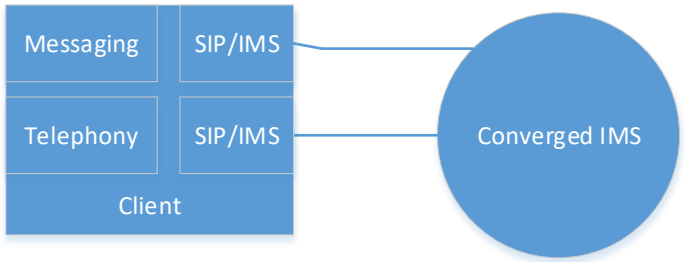
# Registration Options

- Single Registration



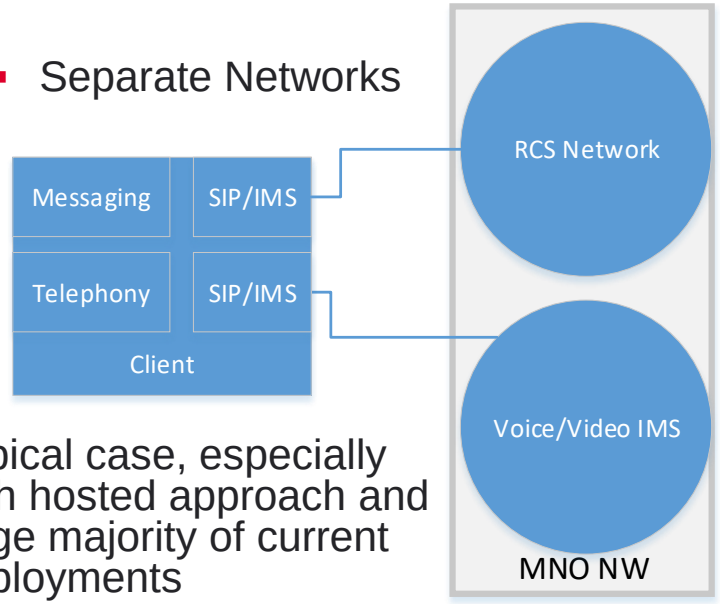

- Single IMS registration for all services
- Exhibits a single IMS NNI

- Dual Registration (converged)




- Not a typical case
- Two IMS registrations (MMTEL & RCS)
- Exhibits a single IMS NNI

- Separate Networks




- Typical case, especially with hosted approach and large majority of current deployments
- Two IMS registrations
- Exhibits separate IMS NNIs

Registration issues are dealt with via configuration on the device – see GSMA PRD NG.102 (“Converged IP Comms”)

**Problem scenario is when routing from a converged IMS core to two separate IMS cores.**

- Session signalling must be sent to the correct terminating core dependent on the service (MMTEL vs RCS)
- RCS Capability Exchange (used to determine the common set of services) must be sent to both cores and responses merged into a single response

# Enhancement to ENUM

- A single E.164 number is required to be resolved to two distinct SIP URIs when dual registration mode is used and there are two distinct and separate IMS core networks (one providing MMTEL services and one providing RCS services).
- The ENUM mechanism does not permit any service specific parameters to be included in the ENUM Request.
- The existing/previous SIP URI response is defined in RFC 3764 is a “Protocol Based Class” response of “Type:SIP” with no Subtype.
  - It was confirmed by the ENUM Experts Group at the IETF that adding a Subtype to differentiate between MMTEL and RCS services is not permitted.
  - It was recommended that a new “Application Based Class “ be defined to return a SIP URI and be distinguishable from the existing/previous SIP URI response.
- Therefore, to align with IETF advice and to be backwards compatible, it was decided to
  - Define a new “Application Based Class” to enable a second SIP/IMS URI response to represent the IMS core network providing RCS services,
  - Re-use the existing SIP/IMS URI response to represent either a MMTEL-only IMS core network or a converged IMS core network (i.e. providing both MMTEL and RCS services).
- The new “Application Based Class” was defined in a new annex F to GSMA PRD NG.105 (Carrier ENUM).

# ENUM Example

- GSMA PRD NG.105 provides a number of ENUM examples. The following ENUM example illustrates an E.164 number of +447700900123 resolving to two separate SIP URIs with both identified IMS core networks owned by a MNO with E.212 number range of MNC 01 and MCC 234:-

$ORIGIN 3.2.1.0.0.9.0.0.7.7.4.4.e164enum.net.←Carrier ENUM
NAPTR 100 10 "u" "E2U+SIP“ ←Old/previous response
"!^.*$!sip:+447700900123@ims.mnc001.mcc234.3gppnetwork.org;user=phone!" .
NAPTR 100 10 "u" "E2U+rcs“←New/RCS response
"!^.*$!sip:+447700900123@rcs.mnc001.mcc234.3gppnetwork.org;user=phone!"

- There is a need for the recipient of the ENUM response to use the correct URI on the basis of the context of the ENUM request, e.g. an INVITE relating to RCS Chat would be sent to the SIP URI under “E2U+rcs”
  - A RCS Capability Exchange request would need to be split and sent to both SIP URIs and subsequent responses merged
    - This requires a new function to perform the splitting/merging of the request/rsponse
      - The two different protocol options for Capability Exchange (Presence vs Options) is also taken into account
- See also GSMA PRD NG.125 which provides an overview of the NNI interworking problem and a summary of the solution.

# IR.67 (“DNS Guidelines”) Impacts

- The changes to Carrier ENUM enables a SIP URI pertinent to RCS services to be returned,
- In addition, there are a number of deployment options regarding the provision of the RCS IMS core which impact in the structure of the related URI and which are documented in IR.67.
- There are 3 such options for the RCS SIP URI :-
  - rcs.mnc<MNC>.mcc<MCC>.3gppnetwork.org
    - MNO provided RCS core
  - <provider>.rcs.mnc<MNC>.mcc<MCC>.3gppnetwork.org
    - 3rd Party provided RCS core with MNO consent (e.g. hosted solution)
  - <provider>.rcs.3gppnetwork.org
    - 3rd Party provided RCS core without MNO consent
- See also GSMA PRD NG.125 which provides an overview of different RCS deployment options.

# Vo5GS

The NG group has been developing a number of PRDs covering the

UNI for voice/video/messaging services via 5GS

# Vo5GS PRDs

- NG has been developing 2 PRDs for the provision of voice/video/messaging over 5GS
  - NG.114 (“IMS Profile for Voice, Video and Messaging over 5GS”)
    - Equivalent of IR.92 (VoLTE) and IR.94 (ViLTE) for 4G
    - Messaging includes both SMS and RCS services,
    - RCS services are mandatory,
    - Supports both single and dual IMS registration deployments for RCS services,
    - Describes 3GPP deployment scenario 2 (“standalone”) – VoNR+5GC
    - NG.114 is currently at v3.0, published May 2021
  - NG.115 (“IMS Profile for Voice, Video and Messaging over Untrusted WLAN connected to 5GC”)
    - Equivalent of IR.51 (VoWiFi via untrusted WLAN access),
    - Access to the 5GC via the N3IWF
    - Dependency on NG.114 (cf. IR.51 dependency on IR.92)
    - NG.115 is currently at v1.0, published August 2020 with version 2.0 imminent.

# 5G Voice Roaming

- NG has been developing PRD NG.113 (“5GS Roaming Guidelines”)
  - Equivalent of IR.88 (“LTE Roaming Guidelines”)
  - QoS table in NG.113 shows the recommended QoS mappings for different 5QIs (QCIs) covering IMS signaling, voice, video and Internet services (“N9HR VoLTE Roaming”)
  - IMS aspects of roaming are unaffected by the swapping of 5GC for EPC
  - NG.113 is currently at v4.0, published late May 2021

# Thank You

Questions / Comments ?