Network 2020 Programme

Interconnected Mobile All-IP Communications and the benefits for Operators
Agenda

- Welcome and Introductions – David Pringle, Webinar Moderator

- IP Interconnect, Opportunities and Challenges – Ian Crawford, IOT Programme Manager, Network 2020, GSMA

- Hub interconnection for RCS - Craig Marshall-Nicholls, Senior Director, Product Marketing, Jibe Mobile

- VoLTE Roaming Working Group - Itsuma Tanaka, Lead Core Network Architect, Core Network Development Department at NTT DoCoMo
Network 2020 Programme

IP Interconnect, Opportunities and Challenges

Ian Crawford, IOT Programme Manager, Network 2020, GSMA
Network 2020 and IP interconnection - agenda

- Network 2020 Programme overview
- Evolving operators’ services and delivering the Green Button Promise
- Why establish IP interconnects?
- Interconnect architecture options
- Challenges to establishing IP interconnects
- GSMA support to operators and the ecosystem
GSMA Network 2020 programme – Building the networks of the future

BUILDING BLOCKS OF THE NETWORK OF THE FUTURE

- Definition and charging
- Business models
- Interconnect over IPX

IP Communications services
- Voice
- Messaging
- Video

Traffic management (QoS)

IP Services

Virtualisation

Self – Optimisation

Technology

Security

Customer Relevance

Focus on unlocking revenues growth opportunities

Focus on building more efficient networks / reduce capital intensity

Network Economics

Source: GSMA Strategy

Approved areas: Prioritization for 2014/5
Further areas to explore in 2015/6
Network 2020 webinar series

- Webinar #1 - Achieving IP Communications Interoperability, Global Industry Update
- Webinar #2 - ‘Green Button Promise’, the industry vision to give consumers ubiquitous, reliable and rich IP communication services that just work, regardless of device or network..
- Webinar #3 - All-IP Communication Services Roadmap, Ecosystem Update
- Webinar #4 – Interconnected mobile All-IP communications and the benefits for Operators
Evolving Operator Services - today’s offering

Operator’s traditional ‘Green Button Promise’
communication services

Voice Calls  SMS / MMS  Video Calls
Evolving Operator Services – introducing LTE and IP

Evolution of current voice and video to IP protocols
(interworking with legacy services)
Evolving Operator Services – enriching messaging

VoLTE

RCS enriched Messaging
Chat / Group Chat
File Transfer
Location Share
Video Share
Incremental functionality (from SMS/MMS)
Extension to WiFi

Video calls over LTE
Evolving Operator Services – the Green Button Promise

Device APIs

**Enriched Voice**
- Enriched caller ID
- Enriched call notifications
- In call image/video sharing
- Context aware call completion
- Incremental Functionality
- Extension to WiFi

**RCS enriched Messaging**
- Chat / Group Chat
- File Transfer
- Location Share
- Video Share
- Incremental functionality (from SMS/MMS)
- Extension to WiFi

**Enriched Video**
- Voice to video session evolution
- Video Chat
- Incremental functionality
- Extension to WiFi and 3G

**VoLTE**
- HD Voice

**Video calls over LTE**
Why establish IP interconnect?

Operators extend their services into the advanced communications space

- RICH: exceed the expectations of digital consumers
- REACH: Deliver a rich customer experience without barriers
- GROWTH: Leverage the technological evolution of networks and investments in infrastructure

Network effect drives scale adoption & usage
Interconnect options for RCS

- **Own IMS**
  - e.g. Germany
  - Hosted solution
  - e.g. France

- **Hosted solution**
  - Duplicate of top right
  - e.g. Romania
Interconnecting RCS hosted solutions

Connecting RCS hubs provides opportunity for rapid interconnection in related markets
Interconnect options for VoLTE and RCS
Interconnect options for VoLTE and RCS
Challenges to establishing full IP interconnect

- **Technical**
  - New technology; new components; new architecture, configurations and way of working
  - New devices need to be interoperable and seeded in the market

- **Commercial**
  - New IP communications services, relationship to current services and business case for their introduction
  - Interconnect charging principles for IP Communications Services

- **Regulatory**
  - Oversight on interconnection dates and agreements
  - Classification of IP communications services and position on MTRs
GSMA role in supporting operators and the ecosystem in delivering interoperable IP services

<table>
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<tr>
<th>Service Creation</th>
<th>Implementation and Interoperability</th>
<th>Interconnection</th>
<th>Ecosystem</th>
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<tr>
<td>Requirements</td>
<td>Issues Register</td>
<td>Guidelines</td>
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<td>Roadmaps</td>
<td>Test Cases</td>
<td>Charging Principles</td>
<td>Time to Market</td>
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<tr>
<td>Service Descriptions</td>
<td>Accreditation / Conformance</td>
<td>Collaboration</td>
<td>Reach</td>
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<td>Guidelines</td>
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Source: GSMA Network 2020
Current & proposed changes to charging principles

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<tr>
<th>Service</th>
<th>Unaware</th>
<th>Aware</th>
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<tr>
<td>VoLTE</td>
<td>- -</td>
<td>Same as for CS voice (CROG)</td>
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<tr>
<td>ViLTE</td>
<td>- -</td>
<td>Duration (Min)</td>
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<tr>
<td>Video-Share</td>
<td>Volume (Mbs)</td>
<td>Duration (Min) or Volume (Mb)</td>
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<td>Image-Share</td>
<td>Volume (Mbs)</td>
<td>n.a.</td>
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<tr>
<td>File Transfer</td>
<td>Volume (Mbs)</td>
<td>Event + Vol (Mb)</td>
</tr>
<tr>
<td>Chat</td>
<td>Volume (Mbs)</td>
<td>Event + Vol (Mb)</td>
</tr>
<tr>
<td></td>
<td>Event (Sessions)</td>
<td>Event + Vol (Mb)</td>
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* In the originating and in the terminating networks
# GSMA support for IP communications implementation

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<td>LessonsLearned_Registry.xlsx</td>
<td><a href="https://infocentre2.gsma.com/gp/pr/V2020/N2020/ICLI/WorkingDocuments/Forms/AllItems.aspx">https://infocentre2.gsma.com/gp/pr/V2020/N2020/ICLI/WorkingDocuments/Forms/AllItems.aspx</a></td>
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<td>IP Communications Issues Registry</td>
<td><a href="https://infocentre2.gsma.com/gp/pr/V2020/N2020/ICLI/WorkingDocuments/Forms/AllItems.aspx">https://infocentre2.gsma.com/gp/pr/V2020/N2020/ICLI/WorkingDocuments/Forms/AllItems.aspx</a></td>
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### Other

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<td>RCS: Deployments map</td>
<td><a href="http://www.gsma.com/network2020/rcs/#map1">http://www.gsma.com/network2020/rcs/#map1</a></td>
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<td>VoLTE and RCS map</td>
<td><a href="http://www.gsma.com/network2020/volte/#map2">http://www.gsma.com/network2020/volte/#map2</a></td>
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<td>GSMA PathFinder Number Portability in Next Gen.pptx</td>
<td><a href="https://infocentre2.gsma.com/gp/pr/V2020/N2020/ICLI/WorkingDocuments/Forms/AllItems.aspx">https://infocentre2.gsma.com/gp/pr/V2020/N2020/ICLI/WorkingDocuments/Forms/AllItems.aspx</a></td>
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Global status of IP communications implementations

HIGHLIGHTS:
IP Communications Landscape in 2014/15

The future is here and IP is at the centre of it. The strategic importance of IP-based solutions is clear; having all-IP based infrastructure and services enables operators to deliver a broader, deeper communications portfolio – incorporating voice, data, video and other rich communication services.

Voice & Video calls over LTE

360 commercially launched LTE networks in 124 countries
21 operators have launched VoLTE
114 VoLTE enabled devices

Rich Communications

44 operators
87 operators committed to launch in 2015

HD Voice

125 HD Mobile Networks in 77 countries
24 operators
22 suppliers of hosted solutions
40+ commercially available RCS native devices

Sources: GSA and GSMA. 22 April 2015
Hub interconnection for RCS

Craig Marshall-Nicholls
Senior Director, Product Marketing
Jibe Mobile
Europe exemplifies interconnection scaling challenges

- Many countries
- Many operators
- Many connections
Interconnection without a Hub

10 RCS platforms
11 national connections
34 international connections
45 direct NNI connections
Hubs make interconnection scalable

- One physical network connection per operator
- Normal effort for first Hub route
- “Touch of a button” to enable new routes
- Test efficiencies from proxying and normalisation

Europe today
10 networks = 45 routes

All of Europe
100 networks = 4,950 routes

The world
800 networks = 319,600 routes

10 physical connections
45 possible routes
• Orange France
  – 27m mobile customers (#1 in France)
  – Launched RCS June 2013
  – IMS-based solution
  – Native clients and downloadable apps

• SFR
  – 23m mobile customers (#2 in France)
  – Launched RCS April 2015
  – Cloud-hosted solution
  – Native clients and downloadable apps

• Interconnected today via Jibe Hub
Romania: Vodafone, Deutsche Telekom

• **Vodafone**
  – 8m mobile customers in Romania
  – Group platform serves multiple countries
  – IMS-based solution
  – Native clients and downloadable apps

• **Deutsche Telekom**
  – 6m mobile customers in Romania
  – Group platform serves countries outside Germany
  – Cloud-based solution
  – Native clients and downloadable apps

• Interconnecting via Jibe Hub

• Foundation for pan-European interconnection
The likely landscape ahead

- Multiple hubs
- Choice of routing
- Direct connections
- **One global IP service**
Itsuma Tanaka

Lead Core Network Architect, NTT DOCOMO, Inc

My works

System architecture design

Standardization (Chair in GSMA working groups)

Future infrastructure

5G

LTE Roaming

VoLTE
HIGHLIGHTS:
IP Communications Landscape in 2014/15

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21 Operators have launched VoLTE
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44 OPERATORS LAUNCHED IN 33 COUNTRIES
87 OPERATORS COMMITED TO LAUNCH IN 2015
22 SUPPLIERS of hosted solutions
40+ COMMERICALLY AVAILABLE RCS native devices

HD Voice
125 HD Voice Mobile Networks in 77 countries
24 OPERATORS launched HD Voice in 2014

Sources: GSA and GSMA, 22 April 2015
LG Uplus’ Successful VoLTE Roaming Commercial Launch in Japan with LG G-Flex 2

April 10, 2015 | Member Press Release

Seoul, South Korea - On April 10, 2015, LG Uplus, one of the leading mobile operators for LTE technology, announced the world’s first commercial launch of VoLTE roaming services featuring HD voice by leveraging the LTE data roaming from LG Uplus to KDDI in Japan. While many operators worldwide have trialed VoLTE roaming services, this is the world’s first successful commercial launch.

Since August 2012, LG Uplus has offered subscribers Hybrid VoLTE services via multiple LTE networks. Also, LG Uplus launched Single VoLTE services in July 2013 based on LTE-A Carrier Aggregation technology for enhanced bandwidth. LG Uplus now supports the world’s first HD voice and video calls on its partners’ VoLTE networks unlike other roaming operators only supporting voice calls over 3G networks.

Through this successful VoLTE roaming launch, subscribers can enjoy HD voice and video calls offering enhanced quality, nearly real-sound experience, and minimal call connection delay. This quality standard is made possible by enhanced 50-7000 Hz speech bandwidth via AMR-WB (Adaptive Multi-Rate Wideband) codec. VoLTE technology allows subscribers to enjoy calls 90 times faster than 3G (0.25 sec. faster).

Source: http://www.gsma.com
LG Uplus' Successful VoLTE Roaming Commercial Launch in Japan with LG

Trials?

VoLTE Roaming?

RAVEL?

S8HR?

Standards?
Two VoLTE Roaming Architecture Options

**LBO (RAVEL)**

- O-HPMN
- SCSCF
- PCSCE
- P/S-GW
- O-VPMN

- T-HPMN
- HSS
- SCSCF
- PCSCE
- P/S-GW
- T-VPMN

**S8HR (new)**

- O-HPMN
- SCSCF
- PCSCF
- P-GW
- O-VPMN

- T-HPMN
- SCSCF
- PCSCF
- P-GW
- T-VPMN

- S-GW
- S-GW

- LBO (RAVEL)
- S8HR (new)
LBO (RAVEL) Architecture:
- The current official GSMA model, based on 3GPP (Rel-11) standards
- Maintains traditional voice roaming (CS) models using IMS
LBO / RAVEL Roaming Architecture

- **RAVEL**: Roaming Architecture for VoicE over IMS with Local breakout
- 3GPP Rel-12; GSMA PRDs are available = currently the only official model.
- Emulate the media routing and “cascade billing” model from CS voice roaming.
- IMS network required for both visit and home network.

**Pros**:
- Mutual charging model and consistent user experience inherited from 2/3G roaming

**Cons**:
- Investment in network upgrade to support RAVEL
- Relatively slow market penetration for VoLTE roaming in short-term
- UE - P-CSCF interop issue
Two VoLTE Roaming Architecture Options

LBO (RAVEL)

- O-HPMN
- SCSCF
- PCSCE P/S-GW
- O-VPMN

- T-HPMN
- SCSCF
- PCSCE P/S-GW
- T-VP MN

S8HR (new)

- O-HPMN
- SCSCF
- PCSCF
- P-GW
- S-GW
- O-VPMN

- T-HPMN
- SCSCF
- PCSCF
- P-GW
- S-GW
- T-VP MN

S8HR (S8 Home Routed) Architecture – NEW!
- VoLTE roaming, on top of existing data roaming framework
- Removes IMS level interaction as much as possible – OTT Style.
- Recently as agreed as VoLTE Roaming candidate by the GSMA
Industry Discussions on VoLTE Roaming

GSMA N2020 Programme
- The idea of S8HR introduced
- Lots of debate.....

July 2014
Industry Discussions on VoLTE Roaming

VoLTE Operators claim IMS UNI very complex..

Can VoLTE Roaming compete with the alternatives? (e.g. WiFi + OTT)

GSMA N2020 Programme
- The idea of S8HR introduced
- Lots of debate.....

How can we make deployment faster + easier..
Industry Discussions on VoLTE Roaming

VPLMN of A-Party

E-UTRAN
SGW
MME

HSS
PCRF
PGW
IBCF/TrGW/BGCF/MGCF

TAS
S-CSCF
P-CSCF

HPLMN of A-Party

IPX

TDM or IPX

B-PARTY

Control Plane (SIP)
User Plane (RTP media)
Debate on S8HR: Key technical Points

■ Voice Quality?
  - All calls must go back to home NW (…sounds bad)
  - Let’s try it and see, rather than academic analysis

■ Business Models?

■ Emergency Call?

■ Lawful Intercept?

■ SRVCC?
Industry Discussions on VoLTE Roaming

GSMA N2020 Programme
- The idea of S8HR introduced
- Lots of debate.....

Nov 2014 -

GSMA Trials (LBO + S8HR)
- “Get real data” to decide

July 2014 -
VoLTE Roaming Trial

Features tested:
- IMS Registration, Voice and Video calls between two roaming devices
- Voice quality was measured to evaluate feasibility of basic voice/video services
CMCC & KPN – LBO (HR & VR)

CMCC & KPN - LBO HR & VR trial with commercial IPX successful.

Kick off meeting
Agreed to test LBO HR & LBO VR
Network configuration begins
Ready for test
LBO HR successful
First LBO VR call successful

13 Jan 2015
26 Jan 2015
28 Jan 2015
4 Feb 2015
12 Feb 2015
14 Feb 2015

Trial environment:
- CMCC:
  - Commercial EPC, lab IMS
  - TRF & OMR enabled
- KPN:
  - Lab EPC & IMS
  - TRF & OMR enabled
- CMI: Commercial IPX for CMCC
  - IBCF deployed, OMR enabled
- iBasis: Commercial IPX for KPN.
  - IBCF deployed, work in transparent mode (no OMR)
S8HR Trial: Summary

- **NTT DOCOMO, KT, Verizon Wireless and CMCC**

- **Trials confirmed:**
  - Great voice/video quality (call set up time, media delay, POLQA)
    - All parties consider the quality “satisfactory for commercial service”
    - Better than legacy 3G (CS domain) voice roaming
  - Fast “time-to-market”
    - Technology (network and device) can be ready within astonishing 2 months – on top of existing LTE data roaming framework.
    - KT, Verizon and CMCC had LTE roaming agreement with DOCOMO, prior to the trial.

*POLQA : Perceptual Objective Listening Quality Assessment*
TOKYO, JAPAN, February 26, 2015 — NTT DOCOMO, provider for smarter living, announced today that it and Verizon Wireless of the United States have successfully verified international voice over LTE (VoLTE) roaming between their networks.

The trials used S8 Home Routed (SHR) architecture, a roaming platform that allows voice and video roaming services with full end-to-end QoS. As a result of the successful efforts, DOCOMO is now able to provide its first transoceanic VoLTE roaming service.

In the trials, DOCOMO and KT achieved the world’s first full end-to-end VoLTE roaming call. Also, DOCOMO and Verizon achieved the world’s first full end-to-end VoLTE roaming call between Japan and the United States.
Next Steps – “Trial Phase 2”

- **More operators** to try S8HR
  - More participation from Europe

- Trial Phase 2 (TBD): features not tested in Phase 1
  - SRVCC
  - Billing aspects
  - Emergency calls / Lawful intercept
  - Comparison b/w LBO and S8HR
Industry Discussions on VoLTE Roaming

GSMA Trials (LBO + S8HR)
- “Get real data” to decide

GSMA N2020 Programme
- The idea of S8HR introduced
- Lots of debate.....

More and more discussions
- S8HR endorsed as candidate
- Technical issues to be resolved
- More (S8HR) trials to happen
- Commercialization...
Debate on S8HR: Key technical Points

- **Voice Quality?**

- **S8HR Business Models?**
  - GSMA WGs agreed on concept, pending for GSMA decision
    - APN / QoS based charging
  - Commercialization (LG U+ - KDDI) already took place

- **Emergency Call?**

- **Lawful Intercept?**

- **SRVCC?**
Debate on S8HR: Key technical Points

- S8HR Business Models?
  Requirement depends on regions. So some MNOs can already start S8HR, based on bilateral agreement.
  e.g. Use CSFB for emergency call
  e.g. no LI requirements for roamers
  e.g. ~100% LTE coverage

- Emergency Call?
  e.g. Use CSFB for emergency call

- Lawful Intercept?
  e.g. no LI requirements for roamers

- SRVCC?

- Voice Quality?
  But to support global requirements, discussion for feasibility review recently started in 3GPP.
  → Timeframe TBD
- 46% operators say they already have plan to deploy S8HR
- 80% operators say they want S8HR supported by the standards

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<th>Reply</th>
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<td>Number of Surveys Answered</td>
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<tr>
<td>Your Company's VoLTE Roaming Deployment Plan?</td>
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<td>LBO Only</td>
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<td>Both - Inbound outbound LBO or S8HR per operator</td>
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<tr>
<td>Undecided</td>
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<td>Which of the below do you want to see supported by the GSMA as the viable VoLTE roaming option?</td>
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<td>Both (i.e. add S8HR as the option, along with LBO)</td>
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<td>Survey Participants*</td>
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*Online survey taken within GSMA N2020 programme – Feb 2015
THANK YOU