Improvement of VoLTE Domain HO with Operators Vision

NW Strategy Group, Global Standardization Team
Network Development Department
NTT DOCOMO R&D Center

KOSHIMIZU, Takashi
2012/03/06
WTC 2012 @ Miyazaki
Motivation of the Work (eSRVCC)

This slides primary explains an improvement scheme of SRVCC Domain HO (eSRVCC)

Single Radio VCC (SRVCC) is an essential technology for Voice Domain HO (Between CS and EPC domain)
VoLTE (Voice Over LTE) Migration Scenario

- LTE Data only => Voice with CSFB => VoLTE (eSRVCC)
- eSRVCC shall be mandatory applied in roaming & interworking scenario based on GSMA_IREG specification.
- UE can be normal SRVCC terminal, eSRVCC only upgrade the NW.

**LTE Data Since DEC 2010**

- Internet/PDN
- EPC
- CS CN
- EUTRAN
- UTRAN
- Data
- Voice

**CSFB since NOV 2011**

- While connected on LTE, a CSFB capable UE will switch from LTE to 3G for voice service upon incoming (or outgoing) call.

**Today**

**VolTE & eSRVCC (2014)**

- Internet/PDN
- IMS
- EPC
- CS CN
- EUTRAN
- UTRAN
- Data
- VolTE
- VoLTE
- SRVCC
- Voice

NTT DOCOMO, INC., Copyright 2012, All rights reserved.
## OTT VoIP and VoLTE

<table>
<thead>
<tr>
<th></th>
<th>OTT VoIP</th>
<th>VoLTE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Treated as</strong></td>
<td>A Data stream</td>
<td>A Voice Grade Call</td>
</tr>
<tr>
<td><strong>QoS Class</strong></td>
<td>Non-GBR Best Effort data service: QCI = 7</td>
<td>High quality GBR: QCI=1 Conversational Voice</td>
</tr>
<tr>
<td><strong>Emergency Call</strong></td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td><strong>Service Set</strong></td>
<td>NO  Stand alone voice</td>
<td>Service Orchestration Operator provides a set of service.</td>
</tr>
<tr>
<td><strong>Infrastructure support</strong></td>
<td>Treated as a data stream (in LTE-&gt;3G HO, quality degradation may occur)</td>
<td>Infrastructure supports the quality. (e.g., SRVCC/eSRVCC)</td>
</tr>
</tbody>
</table>
The concept of AIPN and SEN

Mobile Simultaneous Interpretation System

A service that automatically translates the language on the one party into the language on the other party during a call in progress.

Maki’s mother (Japanese)

She talks and listens in Japanese

Japanese

Japanese ↔ English Translation

English

Maki and her host family

They talk and listen in English

Network Cloud

I am mother of MAKI. Thank you for your help my daughter.

Maki's mother (Japanese)

真希の母親です。娘がお世話になっております。

They talk and listen in English

Maki and her host family

日本語に話して聞きましょう。

They talk and listen in Japanese

Maki’s mother (Japanese)

She talks and listens in Japanese

Japanese

Japanese ↔ English Translation

English

Maki and her host family

They talk and listen in English

Network Cloud

I am mother of MAKI. Thank you for your help my daughter.

Maki's mother (Japanese)

真希の母親です。娘がお世話になっております。

They talk and listen in Japanese

Maki’s mother (Japanese)

She talks and listens in Japanese

Japanese

Japanese ↔ English Translation

English

Maki and her host family

They talk and listen in English

Network Cloud

I am mother of MAKI. Thank you for your help my daughter.

Maki's mother (Japanese)

真希の母親です。娘がお世話になっております。

They talk and listen in Japanese

Maki’s mother (Japanese)

She talks and listens in Japanese

Japanese

Japanese ↔ English Translation

English

Maki and her host family

They talk and listen in English

Network Cloud

I am mother of MAKI. Thank you for your help my daughter.

Maki's mother (Japanese)

真希の母親です。娘がお世話になっております。

They talk and listen in Japanese

Maki’s mother (Japanese)

She talks and listens in Japanese

Japanese

Japanese ↔ English Translation

English

Maki and her host family

They talk and listen in English

Network Cloud

I am mother of MAKI. Thank you for your help my daughter.

Maki's mother (Japanese)

真希の母親です。娘がお世話になっております。
VCC and NW Architecture in VoLTE

- **eNodeB**
- **S-GW**
- **P-GW**
- **P-CSCF**
- **S-CSCF**
- **PCRF**
- **TAS**

**EPC**

**IMS**

**Bearer Setup Req. for Voice**

**Bearer for SIP (always-on)**

**Call Req. (SIP)**

**Bearer for Voice media (established as required)**

**Originating UE**

**Terminating UE**
SRVCC Procedure

**Visited NW**
- RNC/NodeB
- MSC
- MME
- HSS
- UE2
- eNodeB
- SGW
- PGW

**Voice media / SIP paths**
- After Handover (Step 6)

**Handover Detection**
- CS Resource Reservation Request (Step 2)

**Media path**
- Transfer Request (Step 3)

**Handover Request**
- (Step 5)

**Home NW**
- IMS
- SCC AS
- EPC
- UE2

**Media path**
- Transfer Request (Step 4)

**Anchor for Voice media**
- After Handover (Step 6)

NTT DOCOMO, INC., Copyright 2012, All rights reserved.
## SRVCC Drawback and the Improvement

<table>
<thead>
<tr>
<th></th>
<th>SRVCC</th>
<th>eSRVCC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>U-Plane</strong></td>
<td>Locates at Home NW</td>
<td>Locates at Visited NW (ATGW Anchors it)</td>
</tr>
<tr>
<td><strong>(Voice Media)</strong></td>
<td><strong>UE2</strong></td>
<td><strong>ATGW</strong></td>
</tr>
<tr>
<td><strong>Anchor point</strong></td>
<td><strong>Anchor for Voice media</strong></td>
<td><strong>Anchor for Voice media</strong></td>
</tr>
<tr>
<td></td>
<td><strong>C-Plane</strong></td>
<td><strong>C-Plane</strong></td>
</tr>
<tr>
<td><strong>Anchor point</strong></td>
<td>Also locate at Home IMS <strong>IMS</strong></td>
<td>Locates at Visited NW (ATCF Intercepts it)</td>
</tr>
<tr>
<td></td>
<td><strong>SCC AS</strong></td>
<td><strong>ATCF</strong></td>
</tr>
<tr>
<td><strong>HO Signaling Path</strong></td>
<td>Have to travel to the Home NW, always.</td>
<td>Visited NW only</td>
</tr>
<tr>
<td><strong>Because</strong></td>
<td>In principle, IMS controls in the Home NW,</td>
<td>eSRVCC improved the drawbacks</td>
</tr>
</tbody>
</table>
Enhanced SRVCC

Visit NW

MSC

RNC/NodeB

Handover Detection

CS Resource Reservation Request (Step 2)

Handover Request (Step 5)

Session Transfer Request (Step 3)

Media path Transfer Request (Step 4)

Voice media / SIP paths After Handover (Step 6)

MSC

ATCF

ATGW

UE1

eNodeB

SGW

PGW

Handover Detection

IMS

SCC AS

CSCF

Voice media / SIP paths over LTE (Step 1)

Voice media / SIP paths over VoLTE (Step 1)

Session Transfer Request (Step 3)

Media path Transfer Request (Step 4)

Anchor for voice media

Voice media / SIP paths After Handover (Step 6)

Handover Detection

MSC

ATCF

ATGW

UE2

IMS

SCC AS

CSCF

Voice media / SIP paths over VoLTE (Step 1)

Voice media / SIP paths over LTE (Step 1)

Session Transfer Request (Step 3)

Media path Transfer Request (Step 4)

Anchor for voice media
Performance Improvement SRVCC to eSRVCC

**Delay Factor #1**

- UE
- Source E-UTRAN
- Measurement reports
- Source MME
- Decision for HO
- Handover Required
- Bearer Splitting
- PS to CS Req
- Prep HO Req
- Prep HO Resp
- HO Request/Ack
- Initiation of Session Transfer (STN-SR)

**Radio Access Update**

1-2 hundreds of ms*

- UE tunes to UTRAN
- HO from EUTRAN command
- HO Detection
- Handover Command
- PS to CS Resp
- Establish circuit
- Initiation of Session Transfer (STN-SR)

**Major Delay Factor**

- Source MME
- MSC Server/ MGW
- Target MSC
- Target SGSN
- Target BSS
- SGW
- IMS (SCC AS)

**Delay Factor #2**

- IMS Remote Leg Update & Session Transfer
- Session transfer and Update remote end
- Release of IMS access leg

**Not a critical latency**

In a roaming case, potential of 1/2 sec or more in SRVCC.

**In a roaming case, potential of 1/2 sec or more in SRVCC.**

eSRVCC reduced it to negligible one
Conclusion & Way Forward

This Presentation Explained

• The needs of eSRVCC with DOCOMO’s NW Migration Plan
  – LTE radio coverage are limited, not full covered yet.

• Infrastructure Sustain Voice Quality in Domain HO
  – SRVCC and eSRVCC

• We provides various service set + the SEN-Platform
  – OTT VoIP (single service) v.s. Service Set

• Mechanism of VoLTE and SRVCC
  – Basic Mechanism Explained

• Improved Scheme of eSRVCC
  – ATGW/ATCF locates at Visited NW
  – And eSRVCC is mandatory used as in GSMA_IREG spec.
Thank you for listening

New Smartphone series

User-friendly & brings more fun to life

Innovative & broadens your potential

FY2011 winter-spring models