Best Practices for Designing and Deploying Robust VoLTE networks

Architectural Alternatives, and Product Choices

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3 Questions in This Session

1. How did we get to VoLTE?
2. What are the challenges of building a functional and robust VoLTE network?
3. What are the architectural and product choices available for overcoming these challenges?
Core Network Evolution - GSM

- GSM covered both the RAN and the core network supplying Circuit Switched Telephony

- Over time the need to support IP traffic was identified and the GPRS system was created

- Packet-switched core was developed
Core Network Evolution – UTRAN

- Core Network reused much of the GERAN core network and added IU-CS and IU-PS interfaces that represented one common way to access the network.
- GSM/GPRS and WCDMA/HSPA form the basis for the evolution towards Evolved Packet Core.
Basic EPC Architecture
VoLTE Components

- VoLTE – only way in 4G/LTE networks to deliver voice services
- Just another data service - fully IP based with no CS components
- Solution based on IMS/MMTEL architecture
- Utilizes both SIP and Diameter signaling
VoLTE-VoWiFi Key Components

- **Part of Oracle Portfolio**
- **3rd Party Product**

Diagram showing various components such as:
- **UE**
- **SGW**
- **LTE RAN**
- **WLAN RAN**
- **MSG (ePDG)**
- **P-GW**
- **DSR (DRA)**
- **PM (PCRF)**
- **MGCF**
- **IMS-MGW**
- **CS Networks (PSTN)**
- **ENUM**
- **EAGLE (NP & NP IWF)**
- **BRM (CDF)**
- **BRM (OCS)**
- **MRF**
- **ECAS (TAS & SCC-AS)**
- **JSR 309**
- **ISC**
- **HSS**
- **CAS-SC (IM-SSF)**
- **SBC (IBCF)**
- **IP Networks**

These components are interconnected with various interfaces such as Gm, Gx, S2b, Rx, Ro, and Rf.
# VoLTE Building Blocks

<table>
<thead>
<tr>
<th>Network Element(s)</th>
<th>Function</th>
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<tbody>
<tr>
<td>P-CSCF, E-CSCF, IMS-AGW</td>
<td>Network edge security, interoperability enablement, regulatory compliance and media anchoring</td>
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<tr>
<td>S-CSCF</td>
<td>Provides Session Routing functions and Service Invocation logic</td>
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<tr>
<td>TAS and SCC-AS</td>
<td>Provides IR.92/IR.94 Supplementary Services (e.g. Call Diversion, Call Barring, Multi-Party Conferencing) and Call Continuity support (i.e. SR-VCC)</td>
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<td>PCRF</td>
<td>Provides Network Resources mediation for the IMS Network and the (e.g. QoS reservation) and Charging Control rules</td>
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<td>ePDG</td>
<td>Provides an anchoring to the EPC network for the non-3GPP untrusted accesses (WiFi)</td>
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<tr>
<td>MRF</td>
<td>Media Resource Function responsible for Announcements playing (i.e. in Call Barring) and Media Mixing for Conferencing (e.g. Multi-Party calls)</td>
</tr>
<tr>
<td>MGCF, IMS-MGW</td>
<td>Media Gateway and respective Control function to secure IP Voice (RTP and SIP) interworking with CS Voice (TDM and SS7)</td>
</tr>
<tr>
<td>HSS, ENUM</td>
<td>Subscriber Data base, mainly responsible for IMS Subscriber authentication, Mobility Management and Service Profiles; IMS network Call Routing enabler and Number manipulation</td>
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<tr>
<td>Challenges</td>
<td>Description</td>
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<tr>
<td>Architectural complexity</td>
<td>There are many IMS interfaces, protocols, and components</td>
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<tr>
<td>QoS and location recovery</td>
<td>Complex integration with PCRF of multiple elements to ensure QoS and location retrieval</td>
</tr>
<tr>
<td>Integration with legacy</td>
<td>Many popular services continue to be in legacy SS7 networks with no clear way for access them from IMS. Also required for call continuity</td>
</tr>
<tr>
<td>Integration with other vendors &amp; UEs</td>
<td>VoLTE networks are built with equipment from different vendors. UEs from a number of vendors need to be supported</td>
</tr>
<tr>
<td>Linear scalability from a few to millions of subscribers</td>
<td>Operators like to start small but grow linearly to millions in a controlled manner</td>
</tr>
<tr>
<td>Wire rate encryption and high capacity transcoding</td>
<td>VoLTE mandates use of IPSec tunnels using IMS-AKA encryption. Transcoding may be required for interconnects, PS to CS handoff, etc.</td>
</tr>
<tr>
<td>Regulatory</td>
<td>Several requirements such as emergency calling, local number portability, and lawful interception need to be built-in from day one</td>
</tr>
</tbody>
</table>
Key Considerations in VoLTE Deployments

- Easy to use Network Service Design
- Voice Call Continuity and IMS Service Centralization
- Scalability
- Crucial for NFV with IP front end load balancing
- Regulatory Compliancy
- Interconnect & Roaming
- Security
- Quality of Experience
VoLTE Strategy: High Performance Purpose-Built

• Add to your existing purpose-built network

• Pros & Cons
  – Uncompromised and predictable performance
  – Leverage years of experience
  – But, potentially viewed as legacy

• How
  – Choose products that facilitate easy migration to NFV (cap-and-go not rip-and-replace)
  – Assured coexistence
  – Hybrid MANO
VoLTE Strategy: Flexible, Virtualized, and Cloud Oriented

• Start a greenfield or take steps to transform your existing appliance network to NFV

• Pros & Cons
  – Future oriented – gain from coming technological innovations
  – But, lack of standards and potentially immature products could add to risk

• How
  – Since this is a “multi-disciplinary” technology, choose well established vendors with deep telecom, IT, and cloud expertise
VNFs – Reality & Promise

1. Forklift VNFs
   – Simply porting network-appliance code onto a virtual machine does not make it ready for NFV. Instead, it adds an extra layer of complexity, causing significant performance degradation.

2. NFV is too complex and costly
   – 67% of operators cite integration as a barrier to NFV deployment.

3. Physical and virtual do not coexist
   – Utilizing VNFs means building and managing an additional network in parallel with the existing physical network.

1. Network function code has been built from the ground up to be cloud-native. VNFs need to:
   – Leverage a microservices architecture
   – Dynamically adjust compute and network resources
   – Support full lifecycle orchestration to achieve automation

2. Rapid VNF Onboarding
   – Select well-enabled VNFs, which include all the technical and business data needed to allow same-day onboarding and deployment.

3. Hybrid MANO
   – Leverage an NFV-management and orchestration architecture that makes the most of the capabilities and coexistence of physical and virtual functions.
Creating VoLTE & VoWiFi Services on Demand

Oracle OSS/BSS Suite

Oracle Service and Network Orchestration Solution

Lifecycle Management

Radio Access Network

Internet

Network Monitoring & Management

Virtualized and Orchestrated IMS Core

Interconnect Partners and Media Gateways

Other IP Networks

PSTN

PNF

VNF

Service Order
VoLTE Strategy: Pay-as-you-go Managed Service

- Leave the hard work for others
- Pros & Cons
  - Best of breed and proven components pre-integrated for smooth deployment
  - Budget-friendly pay-as-you-go growth model (graduated deployments means lower costs/capacity in early stages)
  - Someone else manages your core competency & user satisfaction
- How
  - Find a reliable provider - Oracle + Tech Mahindra
Oracle Communications Service Provider Portfolio

- SIP Application Execution
- IMS-Legacy integration
- API Exposure and Control

- Core Session Management
- IMS S/I-CSCF
- Session Routing

- Edge Session Management
- IMS P/E-CSCF
- Security, Quality, Interworking

- Small Cell & WiFi Access
- Secure Tunnel Termination
- Secure Backhaul

Platforms: Acme Packet Appliances, COTS, Common NFV, Transcoding, Compliance
Oracle Communications Key VoLTE Products

• Session Border Controller
  – Security, interoperability, regulatory, media processing, QoS, interconnect & roaming, voice call continuity
  – P/E-CSCF, IMS-AGW, ATCF, ATGW, IBCF, TrGW

• Evolved Communications Application Server
  – IR.92/IR.94 supplementary services and call continuity; IMS Centralization Services; GSM, MMTel Supplementary Services
  – TAS, SCC-AS

• Core Session Manager
  – SIP session management and coordination with other network entities for session control
  – S/I-CSCF, BGCF

• Policy Management
  – Network resource mediation, charging control rules, programmable multimedia policy, configuration management platform, subscriber profile repository
  – PCRF
Oracle Communications Key VoLTE Products

• Mobile Security Gateway
  – Security for non-3GPP access such as WiFi; Small-Cell; WiFi backhaul
  – ePDG

• Session Delivery Manager
  – Full FCAPS (fault, configuration, audit, performance, security) element system management; report generation; software upgrades

• Diameter Signaling Router
  – Secure signaling architecture for elastic growth, interoperability and rapid introduction of new services, enhances network visibility by providing a centralized monitoring point
  – DRA

• Operations Monitor
  – Deep visibility into network operations, rapid troubleshooting, growth planning, voice quality analysis and reporting, SLA enforcement
Vodafone Germany
First virtualized IMS network for VoLTE services

- VoLTE service launch & SR-VCC in Q1 2014
- Oracle involvement in E2E network design and implementation
- 3x Site Geo-Redundant solution for 1.2M subscribers in the initial phase
- A-SBC clustering (w/ SLB) to create a logical single entity A-SBC/P-CSCF distributed over multiple sites
- First VoLTE launch within the Vodafone Group
- First NFV Core Network implementation within the Vodafone Group
Vodafone Group
IMS For Messaging

• Access SBC: 56x AP6300
• SLB: 8x HA pairs of AP4500
• Interconnect SBC: 1x HA pair of AP6300
• CSCF: 90x CSM HA VM
• OCOM 1x ME, 1x Standalone Probe and 18x Embedded SBC probes, used for both network monitoring and Sub usage measurement
• OCSDM single cluster used for Element Management
• Installed Capacity for 15M registered subs (>9M active users already). Live since early 2015
Telefonica Digital
IMS for VoWiFi and Messaging

- OTT service for Voice, Chat, file sharing, location sharing
- Based on Oracle Communications USM, SBC, SLB, SR
- Based on home-based client for iPhone, Android, PC, MAC, Windows Phone
- OCUSM used as P-CSCF with IMS-AKA termination
- 3M subs in UK
- 4M subs in LATAM affiliates
Why Oracle Communications?

- **Unparalleled in IT**
  - Industry Applications
  - HW/SW Platforms
  - Robust Portfolio
  - Analytics

- **Network Depth**
  - Servers & Gateways
  - Session Control
  - Signaling
  - Policy

- **Trusted Ally**
  - Global Reach
  - Partner Network
  - Reliable Support
  - Expert Consulting
  - Industry Leadership

- **Corporate**

- **Cloud Focus**
  - SDN/NFV
  - Telco Cloud
  - IaaS, PaaS, SaaS
  - Private, Public, Hybrid

- **IT Expertise**

- **Network Heritage**
Safe Harbor Statement

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Applications & Platform Services