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WHITE PAPER

IP Multimedia Subsystem (IMS)

ITU Definition of Next Generation Network

A Next Generation Network (NGN) is a packet-based network able to provide services including Telecommunication Services and is able to make use of multiple broadband, QoS-enabled transport technologies and in which service-related functions are independent from underlying transport-related technologies. It offers unrestricted access by users to different service providers. It supports generalized mobility which will allow consistent and ubiquitous provision of services to users.

Introduction

The traditional circuit switched environment has an infrastructure to provide a telephony service to users on a fixed and/or mobile network. Switches control the voice channel and enables possibilities to charge a user for the use of the voice service.

With the move towards all IP there is a need for standards based Next Generation Networks to ensure a cost efficient and open architecture for IP based multimedia applications. This guarantees a platform for current and new services with embedded functions like availability and interoperability including functionality like e.g. Quality of Service, billing (offline and/or real-time), multi-media, multi-device, multi-access and roaming.

ETSI TISPAN has been the key standardization body for the Next Generation Networks (NGN) specifications. The NGN release 1 adopted the 3GPP IMS (IP Multimedia Subsystem) standard for SIP-based applications. Initially ETSI TISPAN worked on harmonizing the IMS core for both wireless and wireline networks. However in early 2008, the common IMS specifications were transferred back to 3GPP so that one standards organization is responsible for providing a common IMS standard that fits any network (copper, cable, 3GPP, CDMA2000, etc.).

This whitepaper provides background information about IMS and the considerations about using an IMS architecture.

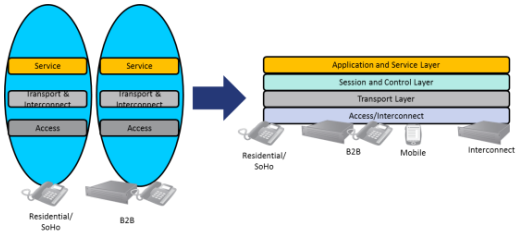

Figure 1 From Stovepipe to NGN

What is IMS?

IMS provides an architecture with a set of common functions for session control, subscriber information, charging, border control routing, etc. The common functions can be shared and used by several services which break the stovepipe implementation of traditional services. The goal for this is to make new service deployment much easier and faster and more cost efficient because the common functions are shared. The open architecture also allows a multi-vendor implementation.

A NGN like IMS is designed to provide a set of common functions and capabilities to reduce CAPEX and OPEX and provides a framework to deliver current and new services to a whole range of customers independent of their access to the system, their subscription type (e.g. mobile, residential, business) or location. This enables a true convergence of the fixed and mobile domain.

The IMS uses a layered architecture with common functions and capabilities.

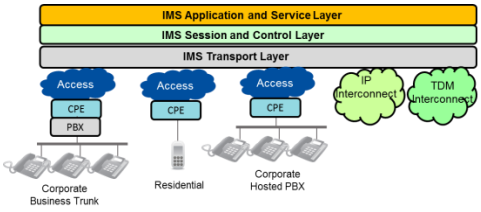

Figure 2 IMS Layered Architecture

The following layers can be identified

Transport Layer

The Transport Layer controls and enables the access from the different users and/or networks and provides signalling and media transport independently of the services used. If required media transcoding could be done to enable connectivity between incompatible destinations. This layer typically contains media and signalling gateways and provides a security

parameter between the external and internal functions.

Session and Control Layer

The Session and Control Layer controls and manage the signalling connections between the different IMS components and the routing between users and/or services and controls the media managed by the transport layer. In addition it provides authentication, authorisation and accounting capabilities.

Application and Services Layer

The Application and Services Layer contrains the services and applications that are provides to the customers of the IMS. Each service can be provided through a specific application server or some functions may be combined. An example of a service is a Telephony Application Server (TAS) which provides traditional telephony services for the IMS users. Other applications can be related to Instant Messaging or file/image sharing functions.

ETSI

At the core of the harmonized 'ALL IP' NGN network is the IP Multimedia Subsystem (IMS) which provides an 'access independent' platform for a variety of access technologies (GSM, 3G, 4G, Wi-Fi, Cable, fibre and xDSL).

GSMA VoLTE provides a standard IP voice service with out-of-the-box device support and possible Wi-Fi offloading capabilities to ensure service continuity, interoperability and roaming using an IP Multimedia Subsystem.

Why use an IMS

So is it worthwhile for an operator to invest in IMS?

As mentioned before IMS is developed by the standardisation bodies for the next generation networks. IMS is widely used in fixed-line networks to replace the traditional circuit switched networks however stovepipe based solutions have been used for this as well. For mobile services the use of IMS was limited so far, but this is about to change with the deployment of all IP based LTE networks.

With the end-of-support of existing soft switch environment and the quad/triple play strategy where both fixed and mobile subscriptions are offered to the customers a common infrastructure like an IMS becomes logical. The GSMA Permanent Reference Document IR.92 describes the “Voice over LTE” (VoLTE) and “SMS over IP” services using an IMS to ensure support for devices, service centralisation and continuity and

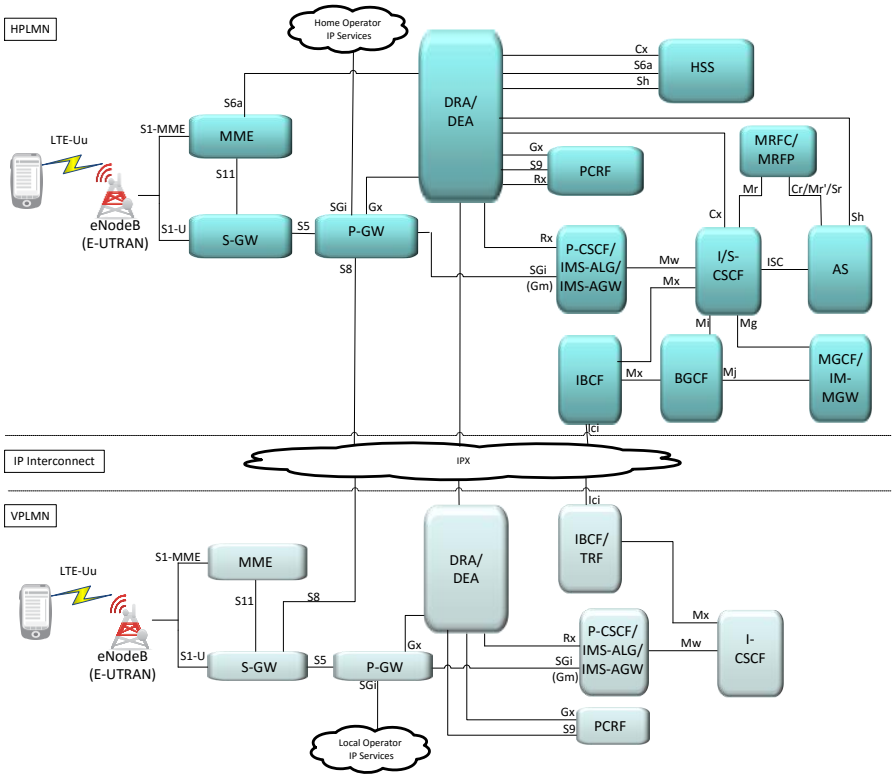

Figure 3 VoLTE Reference Architecture (source: GSMA FCM.01/IR.92)

ensures operator interconnect and roaming.

Next to voice/SMS the IMS architecture framework is an enabler for additional IP based services like for example Instant Messaging, video calling and file sharing. With the support of open APIs (e.g. GSMA OneAPI, WebRTC*)* new services and methods of communication can become available to the end users.

Challenges for IMS implementation

VoIP service on fixed networks may have been deployed using a stovepipe based soft switch infrastructure without an IMS. Subsequently, additional stovepipes can be created for the support of new services. Provided that there is sufficient control from the devices, it is possible to add new services. An 'over the top' service provider typically does not use an IMS, but creates/update an App for each new service.

The goal of an IMS is to provide common functions to decrease the investment of an IMS. However this only helps when multiple services use the same common resource; an IMS with only a single (e.g. voice) service does not benefit from this common infrastructure. So the business case for an IMS depends on the amount of services that can use the common functions. By using network function virtualisation (see Prodapt Whitepaper – SDN & NFV) the business case for an IMS architecture may be improved.

Another challenge is that operators are typically organised around a service, e.g. a department is responsible for mobile and another department is responsible for the fixed-line service. With Fixed-Mobile convergence, ownership of the IMS infrastructure becomes an organisational issue.

An open architecture provides the possibility to purchase different components of an IMS from different vendors. This is not only limited to the application servers but also to proxy servers, border control and Subscriber Database (HSS). This however means that there is additional integration effort required to ensure that the different vendor (releases) work together.

Finally, the regulatory requirements for fixed and mobile service may be different e.g. roaming, lawful intercept. Also in case of a multi-country IMS there will be country specific regulations. The different regulatory requirements will need to be managed over the common functions.

IMS and the end customers

A customer subscribes to one or more services and expects that these services work with an expected quality level. When more services are subscribed to, like a data plan and a voice plan, the customer expect both to work otherwise the operator will be in the spotlight; like what happened when mobile data usage exploded with the introduction of the iPhone.

The end customer (business and/or consumer) in general is not interested in the architecture. The quality of experience (QoE) is more important.

With an IMS there is a potential of controlling and managing services and QoE cross different end user platforms (e.g. smartphone, tablet, PC, fixed-phone), any location and any access. New service models and services can be trailed and implemented using a common infrastructure.

GSMA

With the increased momentum of LTE deployments, IMS is seen throughout the industry as the common service platform for deploying communication services over IP technology (e.g. VoLTE, Video calls, RCS).

IMS or no IMS

An investing on different stove-pipes may initially seem cost effective but can require additional investment to introduce new services and manage the customer QoE.

To comply with the current and future standards based solutions, the IMS architecture ensures availability and support of new and future services by devices, networks and interconnect and roaming support.

Especially in the mobile environment the use of IMS is more obvious. The mobile devices come with pre-installed default IMS clients and enable 'out-of-the-box' support for VoLTE and/or VoWi-Fi services without the need of downloading additional clients.

The IMS reference architecture is setup using logical functions which give operators the flexibility of different software/hardware deployment models and to make use of network functions virtualization (NFV) instead of the traditional distinct hardware centric solutions.

Usage of Open APIs provides developers a method for service development to rapidly introduce new and advanced communication services. This will increase the relevance of the operator core services, and therefore of the operator itself by increasing their usage and the range of use cases in which they serve customers.

Typically the replacement requirement for a particular service (e.g. class 5 voice infrastructure end-of-support) is a moment to consider the alternatives. Such an alternative typically should be an exact copy of the services of the replaced platform. Perhaps instead of just replacing one platform with an exact copy it might be useful to investigate/understand what features are really used (e.g. is a network alarm clock service really used?) and consider new (roadmap) services that might bring the service to a next level (Voice 2.0). In addition there may be other services that may reach end-of-support in the near future which can be provided using a common infrastructure. In addition the introduction of new technics or networks (like e.g. introduction of 4G or Wi-Fi access) benefits from a NGN network architecture (like e.g. voice over LTE).

Prodapt Consulting

An IMS is more complex than a stovepipe based solution due to it's architecture setup and amount of integration points. Prodapt Consulting can provide you with the required insight and can help you build the strategy around IMS. With our experience with both NGN and legacy systems, we can help to make a successful transition.

Our seasoned consultants are experienced with IMS implementations at various operators. Network implications as well as the impact on IT systems and end user equipment are well understood.

We can facilitate RFP, RFI, RFQ projects when selecting the required solutions for your environment and support your organisation with the implementation of the selected solution.

Furthermore Prodapt Consulting can assist you in the architecture design, interoperability testing, end-to-end quality management and integration with OSS/BSS. These are areas that Prodapt Consulting has experience in and can help you with.

References

3GPP TS 23.228
IP Multimedia Subsystem Stage 2

GSMA IR.64
IMS Service Centralization and Continuity Guidelines

GSMA IR.65
IMS Roaming and Interworking Guidelines

GSMA IR.92
IMS Profile for Voice and SMS

GSMA FCM.01
VoLTE Service Description and Implementation Guidelines

GSMA
Business Models for Network APIs

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