Review Article | Impact Factor: 0.621 | ISSN: 2319-507X
Neeraj Shukla, IJPRET, 2014; Volume 2 (9): 154-163 | IJPRET

INTERNATIONAL JOURNAL OF PURE AND APPLIED RESEARCH IN ENGINEERING AND TECHNOLOGY

A PATH FOR HORIZING YOUR INNOVATIVE WORK

A REVIEW ON IP MULTIMEDIA SUBSYSTEM

MR. NEERAJ SHUKLA, MR. NILESH GODE, MR. MOHD FARHAN

Accepted Date: 27/02/2014 ; Published Date: 01/05/2014

Abstract: One of the most important aim of IMS to make the easier network management, therefore it separates bearer and control functions. It means that IMS features an overlay service delivery network on a packet switched infrastructure. Furthermore IMS should allow the migration of circuit switched services for example voice telephony to the packet switched domain. As a result IMS can make network management easier because all IP integrated network is easy to manage. IMS is an end-to-end architecture that should support different kind of equipments. In addition, IMS service delivery should be independent of the underlying access technology. Therefore the use of open Internet protocol is specified In IMS for better interoperability. While several network operators getting trouble because of decreasing average revenue per user, IMS is seen as a solution for network operators. It permits the network operator to play a vital role in service delivery, and bundle smart services with their basic offer.

Keywords: IP Multimedia Subsystem, IPv6, 3GPP, RTP, SIP

Corresponding Author: MR. NEERAJ SHUKLA

Access Online On:

www.ijpret.com

How to Cite This Article:

Neeraj Shukla, IJPRET, 2014; Volume 2 (9): 154-163

PAPER-QR CODE

INTRODUCTION

The IP Multimedia Subsystem (IMS) is a key enabler for the convergence of fixed and mobile communications —devices, networks, and services[6][8]. It is designed to allow the gradual migration of existing core infrastructures to a new IP framework that enables the easy and cost-effective launch of new services and can substantially reduce operating costs, providing benefits to both subscribers and service providers.

3GPP introduced IMS in a standard called Release 5 in early 2002. The standard specified what the core network should look like and provided for compatibility with existing networks such as GSM and UMTS. Release 6, in late 2004, added to IMS's functionality with support for the Generic Access Network, what is commonly called heterogeneous access (e.g. from Wireless LANs (WLAN) or DSL etc). Also included were new core services such as presence and conferencing, plus the optional support for IPv4 (IMS uses IPv6 natively). In 2007, Release 7 included VoIP technology. And as of early-2009, 3GPP ratified Release 8, which deals with the next generation – the 4th in this case – of wireless network infrastructure under the auspices of the Long Term Evolution (LTE) project.

To enable person-to-person and person-to-content communications, IMS uses a layered architecture in which service enablers and common functions can be reused for multiple applications. This horizontal approach involves a plethora of gateways and media servers. The first layer translates the bearer and signaling channels of traditional networks to packet-based streams and controls. The second provides elementary media functions to the higher-level applications. In addition, IMS uses a higher level of application services and API gateways to allow third parties to take control of call sessions and access subscriber preferences.

The horizontal nature of IMS provides an opportunity for system and application enablers, such as Dialogic, to direct their rich web-based development environments and platforms in line with this paradigm. As a result, taking advantage of our deep understanding of media processing, flow management, signaling, and provisioning, Dialogic is making new offerings available to service providers. At the same time, our family of media servers and gateways and our system building blocks allow equipment providers and developers to economically build modular, highly available, scalable solutions for their service provider customers.

II. RELATED WORK

The concept of self-organizing IMS networks is relatively a new topic and has not been widely studied. It is important to understand that the self-organizing IMS is different than P2P-SIP concept where significant research results are available. Basics describes performance analysis and benefits of running multiple SIP servers on the same host. That paper shows how to design the IMS networks in order to maximize IMS server co-location and explains which types of SIP calls can benefit from the co-location of IMS servers. Fabini et al. describe a minimal optimal IMS configuration with respect to architecture and QoS aspects. A virtual IMS test-bed (i.e., any IMS component is assigned its own virtual host), with different domains has been setup on one physical machine. It demonstrates the feasibility of an IMS system implementation within a single device (all-in-one). Matus et al. propose a distributed IMS architecture by representing network functional elements in Distributed Hash Tables (DHT) overlay networks. The main focus was to distribute S-CSCF, I-CSCF and HSS functionalities by using an overlay network where these functionalities are merged in one node (called IMS DHT). Manzalini et al. describe a platform to provide autonomic and situation-aware communication services. However, none of these papers have looked into methods of supporting self-organizing capabilities of IMS[5]. Furthermore, these papers did not take into account reconfiguration of the functions when, for example nodes fail or for load balancing reasons. Most recently, the Next Generation Service Overlay Network (NGSON), a standards activity launched by the IEEE Communications Society in March 2008, is specifying a framework for service overlay networks. This framework will include context-aware, dynamically adaptive, and self-organizing networking capabilities including advanced routing and forwarding schemes that are independent of underlying transport networks.

III. IMS REQUIREMENTS

The situation operators were facing right before the conception of the IMS was not encouraging at all. The circuit-switched voice market had become a commodity, and operators found it difficult to make a profit by only providing and charging for voice calls. On the other hand, packet-switched services had not taken off yet, so, operators were not making much money from them either.

Thus, operators needed a way to provide more attractive packet-switched services to attract users to the packet-switched domain. That is, the mobile Internet needed to become more attractive to its users. In this way the IMS (IP Multimedia Subsystem) was introduced.

IMS aims to:

1. Combine the latest trends in technology;
2. Make the mobile Internet paradigm come true;
3. Create a common platform to develop diverse multimedia services;
4. Create a mechanism to boost margins due to extra usage of mobile packet-switched networks.

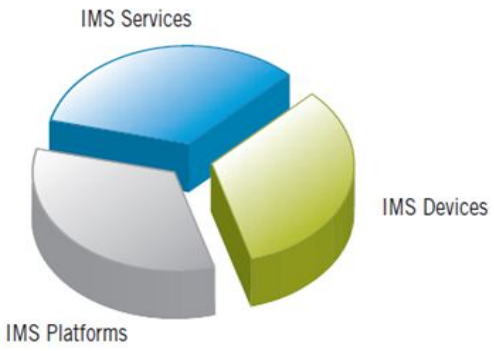

Fig. 1 Vision of IMS

The requirements that led to the design of the 3GPP IMS (captured in 3GPP TS 22.228 Release 5). In these requirements the IMS is defined as an architectural framework created for the purpose of delivering IP multimedia services to end-users

This framework needs to meet the following requirements.

1. Support for establishing IP Multimedia Sessions.
2. Support for a mechanism to negotiate Quality of Service (QoS)[1].
3. Support for interworking with the Internet and circuit-switched networks.
4. Support for roaming.
5. Support for strong control imposed by the operator with respect to the services delivered to the end-user.
6. Support for rapid service creation without requiring standardization.

IV. ARCHITECHTURE OF IMS

The IMS architecture gives service providers the opportunity to deliver new and better services, with reduced operating costs, across wireless, wireline, and broadband networks. IMS is defined by the Third Generation Partnership Project (3GPP) and supported by major Network Equipment Providers (NEPs) and service providers. IMS unifies applications enabled by the Session Initiation Protocol (SIP) to connect traditional telephony services and non-telephony services, such as instant messaging, push-to-talk, video streaming, and multimedia messaging[4][8]. The IMS architecture (see Figure 1) involves a clear separation of three layers:

• Transport and Endpoint

• Session and Control

• Application Services

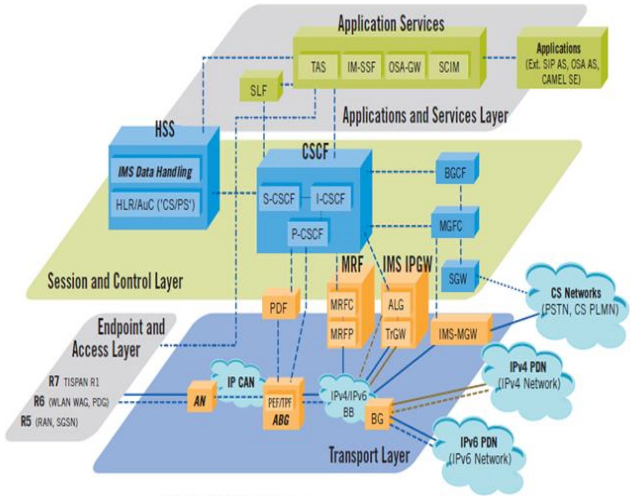

Fig. 2 IMS Architecture

- **Transport and Endpoint Layer**

The Transport and Endpoint Layer unifies transports and media from analog, digital, or broadband formats to Real-time Transport Protocol (RTP) and SIP protocols. This is accomplished by media gateways and signaling gateways. It also includes media servers with media processing elements to allow for announcements, in-band signaling, and conferencing. These media servers are shared across all applications (voicemail, interactive response systems, push-to-talk, and so on), maximizing statistical use of the equipment and creating a common base of media services without “hard-coding” these services into the applications.

- **Session and Control Layer**

The Session and Control Layer orchestrates logical connections between various other network elements. It provides registration of end-points, routing of SIP messages, and overall coordination of media and signaling resources. It contains the two most significant IMS network elements — the Call Session Control Function (CSCF) and the Home Subscriber Server (HSS) database. The HSS maintains the unique service profile for each end user, including registration information, preferences, roaming, voicemail options, and buddy lists. This centralization of subscriber information enables easier provisioning of services, consistent application access, and profile sharing among multiple access networks. For example, HSS allows the same voicemail settings to apply to mobile phones and landline phones, and to be fully integrated with Unified Messaging (UM) applications.

- **Application Services Layer**

The Application Services Layer contains multiple Application Servers (AS), such as a Telephony Application Server (TAS), IP Multimedia Services Switching Function (IM-SSF), Open Service Access Gateway (OSA-GW), and so on. Each of these servers is responsible for performing functions on subscriber sessions, maintaining the state of the call. More importantly, they bridge legacy Advanced Intelligent Network (AIN) services in the new world of IMS. For example:

- An IM-SSF service bridges SIP and Customized Applications for Mobile Network Enhanced Logic (CAMEL) to allow for 800 services and Local Number Portability.
- A TAS provides IP Centrex business features.
- An OSA-GW bridges telephony services to back office applications, enabling IT groups to access instant messaging services, manipulating legs of a call and registration of network resources.

Using Application Servers, service providers have the option to enable developer partners located outside of the core domain to create new applications. Service providers still maintain control of the core services and ensure network integrity, and can offer partners access to the subscriber base with their preferences, along with billing and infrastructure components.

- **End-to-End Solutions**

The power of the IMS is unleashed only when all three of these layers, including the devices (for example, mobile phones, PCs, and so on), are harmonized and working together. Services like push-to-talk, collaborative multimedia conferencing, and other combinational services, require a direct capabilities exchange between the IMS services on one end and the IMS devices on the other end. These end-to-end associations are possible through special brokers residing in the IMS Application Services Layer, called Service Capability Interaction Managers (SCIM). The SCIM exploits the power of SIP to connect the two extreme end points together — the specific IMS service with the specific IMS device.

V. PROTOCOLS USED IN IMS

1. Session Control Protocol

The protocols that control the calls play a key role in any telephony system. In circuit switched networks the most common call control protocols are TUP (Telephony User Part, ITU-T Recommendation), ISUP (ISDN User Part, ITU-T Recommendation), and the more modern BICC (Bearer Independent Call Control, ITU-T Recommendation). The protocols considered to be used as the session control protocol for the IMS were obviously all based on IP. The candidates were as follows:

- **Bearer Independent Call Control (BICC):** BICC (specified in ITU-T Recommendation) is an evolution of ISUP. Unlike ISUP, BICC separates the signaling plane from the media plane, so that signaling can traverse a separate set of nodes than the media plane. Additionally, BICC supports and can run over a different set of technologies, such as IP, SS7 (Signaling System No. 7, ITU-T Recommendation), or ATM (Asynchronous Transfer Mode).
- **H.323:** like BICC, H.323 (ITU-T Recommendation H.323) is an ITU-T protocol. H.323 defines a new protocol to establish multimedia sessions. Unlike BICC, H.323 was designed from scratch to support IP technologies. In H.323, signaling and the media do not need to traverse the same set of hosts.
- **SIP (Session Initiation Protocol, RFC 3261):** specified by the IETF as a protocol to establish and manage multimedia sessions over IP networks, SIP was gaining momentum at the time 3GPP was choosing its session control protocol. SIP follows the well-known client–server model, so much used by many protocols developed by the IETF. SIP designers borrowed design principles from SMTP (Simple Mail Transfer Protocol, RFC 2821) and especially, from HTTP (Hypertext Transfer Protocol, RFC 2616). SIP inherits most of its characteristics from these two protocols. This is an important strength of SIP, because HTTP and SMTP are the most successful protocols on the Internet. SIP, unlike BICC and H.323, does not differentiate the Userto- Network Interface (UNI) from a Network-to-Network Interface (NNI). In SIP there is just a single protocol which works end to end. Unlike BICC and H.323, SIP is a text-based protocol. This means that it is easier to extend, debug, and use to build services. SIP was chosen as the session control protocol for the IMS. The fact that SIP makes it easy to create new services carried great weight in this decision. Since SIP is based on HTTP, SIP service developers can use all the service frameworks developed for HTTP, such as CGIB(Common Gateway Interface) and Java servlets.

2. AAA Protocol

In addition to the session control protocol there are a number of other protocols that play important roles in the IMS. Diameter (whose base protocol is specified in RFC 3588) was chosen to be the AAA (Authentication, Authorization, and Accounting) protocol in the IMS.

Diameter is an evolution of RADIUS (specified in RFC 2865), which is a protocol that is widely used on the Internet to perform AAA. For instance, when a user dials up to an Internet Service

Provider (ISP) the network access server uses RADIUS to authenticate and authorize the user accessing the network.

Diameter consists of a base protocol that is complemented with so-called Diameter Applications. Diameter applications are customizations or extensions to Diameter to suit a particular application in a given environment. The IMS uses Diameter in a number of interfaces, although not all the interfaces use the same Diameter application. For instance, the IMS defines a Diameter application to interact with SIP during session setup and another one to perform credit control accounting.

3. Other Protocols

In addition to SIP and Diameter there are other protocols that are used in the IMS. The COPS (Common Open Policy Service) protocol (specified in RFC 2748) is used to transfer policies between PDPs (Policy Decision Points) and PEPs (Policy Enforcement Points). H.248 (ITU-T Recommendation H.248) and its packages are used by signaling nodes to control nodes in the media plane (e.g., a media gateway controller controlling a media gateway). H.248 was jointly developed by ITU-T and IETF and is also referred to as the MEGACO (Media Gateway Control) protocol. RTP (Real-Time Transport Protocol, defined in RFC 3550) and RTCP (RTP Control Protocol, defined in RFC 3550 as well) are used to transport real-time media, such as video and audio. We have mentioned a few application-layer protocols used in the IMS. We will describe these in Parts II and III of this book, along with other application-layer Internet protocols that may be used in the IMS in the future, and other protocols that belong to other layers.

VI. APPLICATIONS

1. Voice services.
2. Data services.
3. Cable TV.
4. Mobile TV Service.
5. Content-based services
6. Location based Services.
   - Emergency services
   - Navigation services
   - Information services
7. VoIP (Voice over IP)

8. Digital Video Broadcast(DVB)
9. Video Conferencing.
10. Highly advanced end user devices.

CONCLUSION

IMS is the future architecture for IP multimedia telephony. It has been defined by operators that want to continue to deliver telephony services when their legacy networks are replaced by an IP network.

IMS is both a challenge and an opportunity as the foundation for the telephony, applications and services businesses over the coming decade. It is necessary to elaborate strategies of business development in value added IP services based on IMS.

- Development of new multimedia services handled by IMS and the principles of charging them.
- Migration scenarios towards an IMS architecture and in particular migration of services from IN to IMS
- Necessary investment in IMS

EFORT IMS course permanently integrate the ultimate state of new technologies presenting the concepts, architectures, vendors solutions, service offers and competition. is confronted with their practical application. They have already been taught in India, US, France, Sweden, Belgium, Chile. They provide the keys for developing and deploying IMS service and network architectures and for developing the business of value added IP services.

ACKNOWLEDGEMENT

I would like to thank my guide Prof. Supriya yadav from Atharva College of Engineering and my college LTCOE for their support and guidance.

REFERENCES

1. W. Zhuang, Y.S. Gan, K.J. Loh, K.C. Chua, “Policy-Based QoS Architecture in IP Multimedia Subsystem of UMTS” , RFC 2753, Jan. 2000.

2. Madhu J. Sharma and Victor C.M. Leung “Improved IP Multimedia Subsystem Authentication Mechanism for 3G-WLAN Networks” The First International Workshop on Security in Computers, Networking and Communications 2011

3. Miran Mosmondor, Lea Skorin-Kapov, and Renato Filjar "Location conveyance in the IP Multimedia Subsystem"

4. Gilles Bertrand "The IP Multimedia Subsystem in Next Generation Networks"

5. Vinay Kumar.S.B, Manjula N Harihar "Diameter-based Protocol in the IP Multimedia Subsystem" International Journal of Soft Computing and Engineering (IJSCE) , Volume-1, Issue-6, January 2012.

6. Qasim Jan, Shahzad Latif " IP MULTIMEDIA SUBSYSTEM (IMS) SECURITY MODEL" International Journal of Advance Research, IJOAR .org Volume 1, Issue 3, March 2013.

7. White paper written by KJ (Ken) Salchow, Jr. | Manager, Product Management "Introduction to the IP Multimedia Subsystem (IMS): IMS Basic Concepts and Terminology".

8. White paper presented by Dialogic "The Architecture and Benefits of IMS"