CHAPTER – 9
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NGNs and IMS will enhance existing wireless services such as voice calls, SMS, MMS, and enable new services such as IM, presence, PoC, UM, and multicast/broadcast. With this research examples advanced conversational communications that would be available to the future telecom users over an NGN composed of converged heterogeneous wireless and wireline access networks. IMS plays a major role in enabling these services.

The development of IP Multimedia Subsystem introduced new multimedia oriented communication service through cooperating telecom with data on access free IP core network. The junction of data, voice and video has enlarged the demand for the service with new presentation characteristics. The customer expectation has increased from service provider due to the new technology.

Research work demonstrated this thesis is a pioneer progress to improve IMS services for future network. The parameter-values used in this work can be modified accordingly to achieve desired performance. With this research work 5 major research tasks finished:

- Evaluation of the functionality of OpenIMS components & evaluation the performance of OpenIMS
- Implementation of interoperability between OpenIMS and SIP
- IMS Client development and deployment over Testbed
- Performance Evaluation of Instant Messaging and Presence service over IMS Network
- Designing and Deploying new innovative service over IMS Client

9.1 Open IMS Core Testbed

For the functional evaluation, this research initiates with implementation of Open IMS Test bed design and works towards validated OpenIMS for conforming to 3GPP TS 24.229 Release 6. The result is that most functionality of OpenIMS is conforming to 3GPP TS 24.229 R6; some of the functionalities are still based on 3GPP TS 24.229 R5. One of the components called SIP2IMS gateway is no longer used in OpenIMS core and can be deleted from it.

For the performance evaluation of OpenIMS, SIPp was used to test all kinds of scenarios. From the testing, results shown that OpenIMS Test bed able to handle at least 100 subscribers. OpenIMS works well in “normal” situation as well as in the abnormal situation, and it always works well for IMS clients. However, for SIP clients, OpenIMS works not reliably. The reason was that for SIP clients who register to the S-CSCF2, which was added by us, but the information of subscribers around S-CSCF2, were always changed randomly.

The last task required implementation of a solution of interoperability between OpenIMS and existing SIP/VoIP solutions. Firstly, solved the interpretability between SIP clients to IMS clients in a single domain. Used two S-CSCFs and let one support the authentication algorithm for SIP clients while the other one supported the algorithm for IMS clients. Therefore both SIP clients and IMS clients could register to OpenIMS at the same time, and the call could be established between SIP and IMS clients. In this step, a result demonstrates that the S-CSCF2 is very unstable.

Permanent work with this Test bed goes ahead with study and implementation of the solutions for OpenIMS to interoperate with existing SIP/VoIP solutions in two domains. The 'client-based' solution proposed for using a redirect server so that the call can be established from a non-IMS network to IMS network. However, this solution hasn't been implemented completely. Clients could register to non-IMS network with redirect server. Not possible to to make call between two domain, and the reason is related to the P-CSCF in OpenIMS domain. As the OpenIMS was only published at the end of last year, it is still under development and improving, some of experiments and valuations are based on the version of OpenIMS of March 2007.

9.2 IMS Session Setup in Mobile Environment

SIP has been selected as the signaling protocol for multimedia sessions over IP based mobile networks due to advantages such as simplicity, extensibility, exibility and scalability. SIP session setup delay performance is shown to be acceptable over the land-based Internet. However, in a converged network environment where wireless networks such as 3G and WLAN coexist, session setup may surfer from unexpected delay and performance degradation due to the limited throughput and/or reliability of the wireless channel causing multiple retransmission of SIP request and response messages, and the need to determine which one of several alternative access networks would best serve the session; i.e., the so-called network selection problem.

Network-assisted user-controlled network selection architecture may be suitable. Multi attribute decision algorithms have been developed to enable network selection, and fuzzy logic has been applied to deal with imprecise network information.

Ongoing with this research needed to design own low sized IMS client for implementing multiple service over it and works ahead with IMS Testbed.

9.3 IMS Client Design and Deployment over Open IMS Core Testbed

The aim of Light-Weight IMS Client that could be used to improve, qualify and finalize the specification and implementation of service discovery, and management platform for Personal Networks (PN) and the federations of PNs. Following the specifications and recommendations by the major IMS

standardization bodies, these are the salient points of the findings of this study.

1. To fast track the rollout of IMS by mobile network operators, it is important to have mobile user equipments that are compliant with the 3GPP IMS.
2. J2ME is a well supported and powerful platform for the development of multimedia applications, which are suitable for small devices such as memory and power-limited mobile devices
3. This study has shown that a 3GPP and lETF-compliant IMS Client can be developed using the J2ME platform for the mobile devices, hence is called the Light-Weight IMS Client.
4. Quality of Service (QoS) between two IMS Clients was ensured by the use of SDP offer/answer mechanism during the session setup
5. The IMS Client developed in this study was able to communicate with the home IMS network by registering to the Open IMS Core Testbed, establishing the session and communicating with another similar IMS Client.

9.3.1 Necessitate for IMS low size client

Although the IMS Client was developed from and based on 3GPP and IETF specifications and recommendations, it is important to note that IMS is not yet a mature technology. As a result, most available open IMS testbed are still work in progress, hence they are unstable and not fully functional as per the 3GPP, IETF and ETSI specifications.

The IMS Client developed in this study focused on and was targeted to be tested over Open IMS Core Testbed, where an IMS testbed had been developed. Although the developed IMS Client was functional within the IMS testbed, it will require some modifications to perform some functions within other available IMS test beds such as the FOKUS Open IMS testbed.

In this chapter, the experimental setup for the testing of two identical low-size IMS Clients within the IMS testbed was presented. The equipment and requirements for conducting the demonstration were also provided. The discussion of results was based on the SIP signalling messages exchanged between the IMS Clients and the IMS testbed for the registration and establishment of the session. The SDP content was also carried within these signalling SIP messages, and used to negotiate the type of media used as well as the preconditions for the QoS agreement.

The results presented shows that the IMS Client is compliant with the 3GPP technical specifications and IETF SIP recommendations. The IMS Client memory size is about 37 Kilo Bytes (KB) as compared to 6 305 KB of Fokus Open IMS Client and 86,953 KB of UCT IMS Client version 1.0.4. As opposed to these available IMS Clients, the Light-Weight IMS Client presented in this project is light-weight, and can be deployed within the CLDC mobile devices which are J2ME compliant.

9.3.2 Findings from IMS Client

The success of FMC in the NGN will depend on how quickly the IMS gains acceptance into the telecommunication industry. This in turn will rely on the availability of internationally standardized IMS compliant devices. This project has shown that J2ME platform can be used to develop IMS Client that is light-weight when compared to those currently available IMS Clients which are too heavy for CLDC-based mobile devices.

The demonstration results showed that the IMS Client was capable of performing the registration with the IMS network, by sending a SIP REGESTER request. The results also indicated that the IMS Client could establish a SIP session using a SIP INVITE request; negotiate QoS and media codec, using the SDP answer/offer mechanism. Finally text based message communication was established between two IMS Clients within the same IMS network. The functionalities provided by this Light-Weight IMS Client make the client to be compliant to the 3GPP and the IETF recommendations and specifications.

- A low sized IMS Client that can be deployed within the Java-compliant mobile devices. This can be used for the testing of IMS services within the memory and processing power-limited mobile devices,
- The improvement and near finalization of a service discovery and management platform for PNs in the MAGNET Service Management Platform, which is the 3G and beyond platform for the Personal Networks.

9.4 Instant Messaging and Presence Service over IMS core network

Instant messaging services have enjoyed a constant growth ever since their introduction. Real-time messages and presence information are the pieces of technology that makes instant messaging different from previous communication services. However, the success of instant messaging is not based on technical differences only; also the methods and concepts used in instant messaging clients, such as popup windows and buddy lists, have contributed to the birth of a completely new type of communication.

This thesis has summarized the main work ongoing in the IETF SIMPLE. The aim of present work is to compare SIP protocol with Instant Messaging and Presence functionalities with IMPS respecting the requirements. Present work defines a general framework for Instant Messaging and Presence, and SIMPLE builds a SIP-based solution on top of the IMPP framework.

As IMPS is specifically defined for usage in mobile environments and the IP Multimedia Subsystem (IMS) brings SIMPLE to forthcoming 3G networks, these two services are the top alternatives for mobile instant messaging. IMPS is a more mature service than SIMPLE. SIMPLE has not yet reached standard status and parts of the service are still ongoing work. However, the main elements of SIMPLE are ready and the service should be adopted as an IETF standard in 2005.

The functionality of both services is very similar from a user's point of view, but the techniques used to provide the functionality differ considerably between the services. IMPS is based on a rather simple architecture where all client communication passes through servers. SIMPLE on the other hand is a fairly complex solution that relies on SIP for much of its functionality but other protocols such as XCAP and MSRP are also utilized. Both services utilize techniques for optimizing the performance in mobile environments. Overall, SIMPLE is slightly more efficient than IMPS when it comes to bandwidth usage and delays. Performance-wise, the most notable flaw in SIMPLE is the inability to traverse proxies. This affects the applicability of the service since a global service cannot be created. IMPS is able to handle proxy traversal without problems.

SIMPLE includes mechanisms for providing the service with relatively strong security. Due to the complexity of the SIMPLE architecture, applying an even level of security throughout a network requires a great deal of cooperation between network administrators. IMPS provides sufficient security only between the client and its local server, end-to-end security can not be requested by clients and is therefore not guaranteed in all networks. Since the IMPS protocols are completely based on XML and function on top of several different transport bindings, IMPS qualifies as an extensible and flexible solution.

Finally, both services are built based on the requirements formulated by the IMPP working group, thus enabling good interoperability with other instant messaging systems. However, IMPS does not support the PIDF presence format, whereas SIMPLE is fully compliant with IMPP.

9.4.1 Analysis of presence server traffic load over IMS

Continuous with IMS Test bed, the IMPS service successfully deployed and results taken for surveillance over IMS. Managing bulk user always need for today's mobile operator, with this concept over own Open Source IMS Core Test Bed, the queuing mechanism of NOTIFY message in presence server and evaluate its performance parameter. The presence server is a central part in IMS architecture. The presence server performance is vital for almost all applications in IMS.

In this thesis examine presents NOTIFY message is mainly responsible for big portion of traffic load in presence server. Here used mathematical model to describe queue length distribution of NOTIFY message. There are still lots of work for further study, possible to think one service policy but in case of real system there are many variation.

Demonstrating this IMPS work, also explained different optimal characteristics to dimension a PoC server. See from cost point of view, in the whole service delivery chain optimized expertise required for deployment. A service provider can be easily benefited from the models, which discussed in chapter 7. Proposed models are fine□tuned to implement in IP Multimedia Subsystems to provide resourceful PoC service to IMS terminals.

For further study about the case of prioritizing and classifying PoC traffic in expressions of session dropping probabilities. In the other area of this thesis

explore different model for IMS session set up in mobile environment, introduction to IMS and basic architecture of IP multimedia subsystems. Expansion of IMS architecture needs a meticulous change in the existing network of service providers. Service provider should be monitor and optimize the network performance to meet up the assurance levels of service committed to their customers. Service providers should be model and dimension their network to estimate trends in the network before deploying it.

9.5 Designs and Deploy MoBlog over IMS Client

The aim of this thesis is to provide a popular Internet application that is compliant with the IP Multimedia Subsystem. This application, MoBlog provides a complete framework from client to server. Therefore the creation of two application was required, one which acts as a server and handles all the storage and the other acting as a client and the main interface between user and the server.

With an simple aim to sharing photo, video and text over Internet with Mobile Equipment, MoBlog designed with Java 2 Micro Edition. The server side is a Siemens-Ubiquity SIP application server for rendering MoBlog service. It uses the Session Initiation Protocol (SIP) as its signaling protocol. SIP is used because it is required by IMS.

The IMS client deployed MoBlog and renders all features of sharing and storing user's data over Network. The MoBlog client on the mobile devices has a traffic model according to the IP Multimedia Subsystem standards (e.g. SIP).

As the MoBlog initiates for considering ability of Open IMS Core network adaptation for new services, this service tested over few UEs only. For providing service over multiple nodes and considering size of user data sharing this sized in to limited storage space over server only.

For future work, MoBlog service able to be provide on live IP thorugh the IMS network and place MoBlog service into MRF of IMS Network and thorgh HSS provide proper charging structure for each service assessment over here.

9.6 Future work

Future work in this area, a specific base provided with this Thesis, This work is pioneer and unique in this area. With continuation of this research for Next Generation Network, and provide IMS services for future network. The parameter-values used in this work can be modified accordingly to achieve desired performance. While multimedia services can be delivered to end-users without the IMS framework, however the deploy of IMS will benefits both users and operators:

The IMS can offer very rich communication scenarios that can attract users to employ this platform. Where the addition of IMS enhances service integration and interaction. Users can concurrently manage multiple sessions with far richer interactions and greater levels of personalization. In addition to the appropriate charging mechanisms that the IMS can provide.

In the path to Telco 2.0 and transitioning to the future generation of wireless networks, convergence of IP based core networks with heterogeneous wireless access networks is inevitable. IMS aims at providing a standardized solution for multimedia services in an access agnostic manner within a unified framework. While IMS opens up new business and revenue generating perspectives for service providers and network operators, several business and technical issues are still to be solved. The future users of communication systems will subscribe to multiple services and domains and in the foreseeable future deployment of a single logical database will be the way in which all network operators will agree. Multimedia calls are becoming common and chances of failure of a multimedia call can lead to excessive delay in signaling and waste of network resources.

NGNs and IMS will enhance existing wireless services such as voice calls, SMS, MMS, and enable new services such as IM, presence, PoC, UM, and multicast/broadcast. Shown some examples advanced conversational communications that would be available to the future telecom users over an NGN composed of converged heterogeneous wireless and wireline access networks. IMS plays a major role in enabling these services. Towards the integration of heterogeneous networks with IMS, various challenges such as billing, QoS provisioning, mobility support, bandwidth management, resource allocation, customer providing, security and location management issues have been presented.

IMS enables the creation of new services, which were not possible previously, or might have been too costly and complex to implement, such as video sharing. The creation of new multimedia services can be developed and delivered in a very short time-to-market cycle while dramatically reducing the support cost of the applications. This provides the operators new and increased revenue streams, and reduces the capital and operating expenses. Because IMS supports roaming between different networks, new services developed to a single platform can be made available across multiple access networks.

Global Roaming is one of the future needs in mobile and wireless communications that enables users to initiate a call from any access network and seamlessly roam across heterogeneous wireless access networks. Another aspect of global seamless roaming is the continuity of a call or a session when a mobile terminal is moving to different coverage areas with different access network. This leads to initiation and performing a vertical handover. IMS should be able to manage various access related constraints at different layers that are imposed by heterogeneous access technologies. Providing a seamless vertical handover for applications that are sensitive to delay and have strict QoS requirement is a challenge and has attracted extensive research work.

Research is continuous process, always aims to bring best to all. In future work, aims to bring more and more services in convergence form like including MoBlog application, which integrates multiple facets of user needs.

Future work aim integrate web 2.0 with IMS for upgrading MoBlog services also for Instant Messaging and Presence this research, aim to combine some aspect of Location based service, with which user able to set his own location

automatically into presence message status. With this ahead to companioning existing services as well as create new service under the umbrella of IMS.

Future work aspects for IMS:

- Charging service architecture for Content billing,
- User personalization services
- Integration of Location Based services over IMS
- Convergence of Web 2.0 with IMS 2.0
- Adaptation of SMIL over IMS for provides supplementary Multimedia Services.
- Security aspects for new introduced services (e.g. MoBlog)