Implementing Conditional Conference Call Use Case over IMS and Non IMS Testbed – an experimental results through comparison approach

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Abstract: - IP Multimedia Subsystems (IMS) is a technology leading towards Next Generation Networks (NGN) which has the ability to provide converged service regardless of any access networks. This paper presents a conference call use case application and the realization of the application based on both IMS and non-IMS infrastructure design approaches. This paper also presents our findings in comparing the two approaches, and the identification of technical gaps and potential issues on IMS in supporting conferencing services through our exploratory and developmental research.

Key-Words: - IMS, SIP, audio conferencing, presence, instant messaging, reusability

1 Introduction

The idea of Next Generation Network (NGN) is services such as voice, data and all sorts of multimedia or communication services to be transported into single infrastructure which will be Internet Protocol (IP) based. IP Multimedia Subsystem (IMS) is one of the underlying technology components of Next Generation Network which services should be independent to any fixed or mobile networks. The IMS is introduced in order to provide converged services in IP-based network. The advent of IP Multimedia Subsystem (IMS) leads fixed and mobile communication services to convergent evolution and improves the user experience. The architecture of IMS is designed for fast deployment of services, assuring end to end Quality of Service and integration of different services.

Nowadays there are many services deployed over IP-based network such as instant messaging, VOIP, presence and video sharing. Those services are deployed in uncoordinated way by service providers. A manageable framework like IMS is required to manage those services and provide flexible integration and deployment for service providers.

In this paper, we present our approach to implement conditional conference application which requires other application services and network to be converged.

In this paper, we briefly describe the related work in section 2. In section 3, we elaborate the conditional conference call use case scenario. We present IMS and non-IMS approaches for the realization of the use case scenario in section 4. Implementation designs of the conference call application with IMS and non-IMS approaches are presented in section 5. In section 6, we discuss our findings based on our exploratory and developmental research and we conclude our paper in section 7.

2 Related Work

The IMS standard specifications were introduced in 3GPP Release 5 as part of 3GPP specifications. In [1], the 3GPP Release 5 defined some features in IMS such as the architectures of IMS, the network entities, signalling, charging, authentication, security etc. 3GPP Release 6 fixes some limitations in Release 5 [2]. The specification of Conference call on IMS network is defined in [3]. It describes the functional entities and SIP signalling flow for conference call using IMS core network.

[4] introduces an extension of the Session Initiation Protocol (SIP) for multiparty conference signalling. The extension of SIP was trying to expand the functionality for conference events such as to discover the participant identities and to notify all participants if new user joins the conference. [4] proposes an approach to optimize signalling traffic for centralized conference. This paper is an extension work for [5] and is trying to improve the work and reduce the signalling traffic at conference server.

[6] proposes a conference control framework for conference call. The proposed framework uses SIP

for session control and SOAP protocol for controlling conference. However the user management component in conference control framework may have similar function as buddy list management in Presence Service. It may be redundant if this conference call service interworks with other services such as Presence Service and Instant Messaging in order to provide converged service.

3 Conference Scenario

Jimmy wants to have a conference call with his colleagues, Janice and Michael. Janice is away from office but she is carrying her PDA terminal while Michael is having another meeting. Jimmy wants to have a conference with them when both of them are available. He makes an automatic conference setup request and invites the participants via web browser. The conference call system will then send notification via IM or SMS to his colleagues about the conference request.

The presence and availability of the participants will be monitored by the system. When all participants are available, the conference call system will automatically establish a conference call for them. Figure 1 shows the flow of conditional conference call scenario.

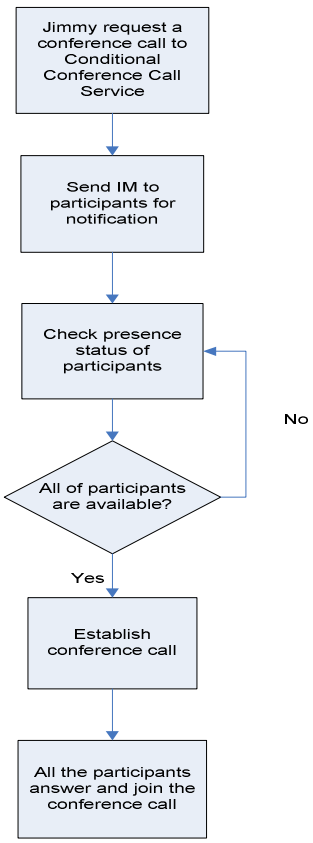

Figure 1 Flow of conditional conference call scenario

4 Architecture

In this paper, we propose two infrastructure architecture design approaches to realize the scenario: 1) with IMS core network: IMS approach 2) without IMS core network: Non-IMS approach.

4.1 IMS approach

From the architecture in Figure 2, the main components of IMS are IMS core network, access network, IMS Application Server Platform and Media Server.

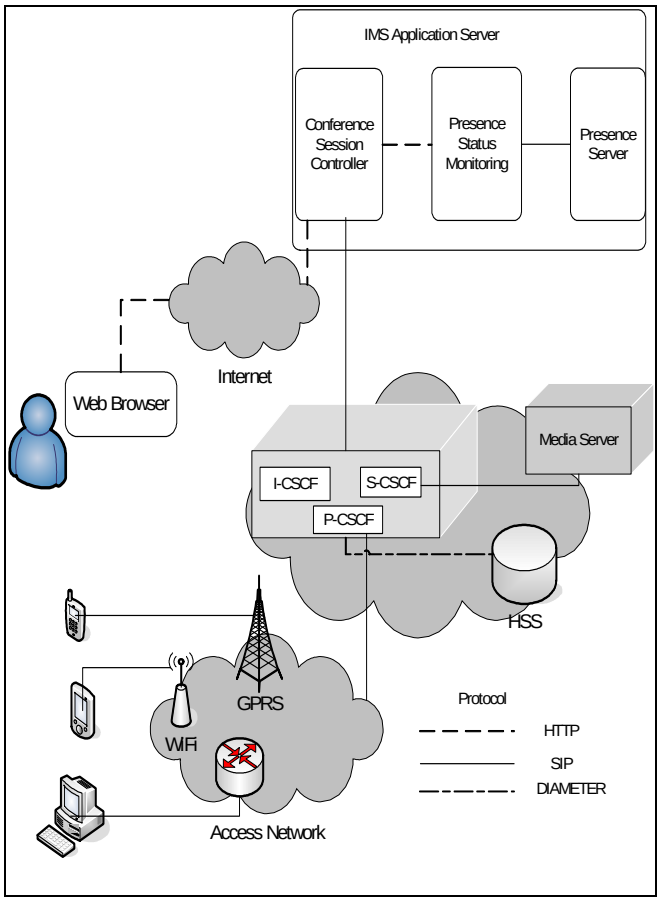

Figure 2 IMS approach for conditional conference call service

4.1.1 IMS core network

Home Subscriber Server (HSS) - It is a user database. It performs authentication and authorization of the user and provides information about user location while CSCF network entities handle call sessions.

Call Session Control Function (CSCF) - It acts as the role of SIP server/proxy. It handles SIP signalling packets in IMS. It contains 3 components which are P-CSCF, I-CSCF and S-CSCF. These 3 components act as different roles and perform particular functions for SIP signalling.

P-CSCF (Proxy-CSCF) is a SIP proxy and a portal for IMS client/terminal. It sits for all the SIP signalling messages and can inspect every message.

I-CSCF (Interrogating-CSCF) is located at the edge of administrative domain and its IP address is published to Public Domain Name Server so that the remote server can locate it. It will perform query to HSS for location of the user.

S-CSCF (Serving-CSCF) is a SIP server. It is a central node of signalling plane. It handles SIP registration for IMS client/terminal in order to bind IP address and SIP address. It handles all the SIP sessions call between IMS application servers and IMS clients and routing services

4.1.2 IMS Application Server

IMS Application Server hosts and executes the services on its platform. It provides interface with S-CSCF using SIP and easy integration and deployment of services for application developer or third party provider.

4.1.3 Media Server

Media Server provides and handles the media resource in IMS network such as playing announcement, audio mixing capability for conference call or Text-to-Speech conversion (TTS) and speech recognition.

4.1.4 Access Network

The users can connect to IMS network using various access methods provided in IP layer. The access network can be WiFi, WiMax, Ethernet, ADSL and GPRS. Non-IMS and legacy network like PSTN can be supported via gateways.

4.2 Non-IMS approach

The architecture of non-IMS approach is shown in Figure 3.

4.2.1 Non-IMS architecture

Figure 3 shows the non-IMS approach architecture solutions. The main components of this architecture solution are Conference Bridge Server, Presence Server, Presence Status Monitoring, Conference Mediator and Sip clients. The communication protocols in this architecture are SIP and HTTP.

The main differences between the IMS and non-IMS approaches are the IMS core network and their communication protocols. Conference Mediator provides web interface to allow user to initiate conference. The Conference Mediator will then request for monitoring of presence status of participants from Presence Status Monitoring. The Conference Bridge Server performs comparable functions as Conference Session Controller and Media Server in IMS approach. The Conference Bridge Server receives request from Conference Mediator (when all participants has become available) to establish conference call for the SIP clients.

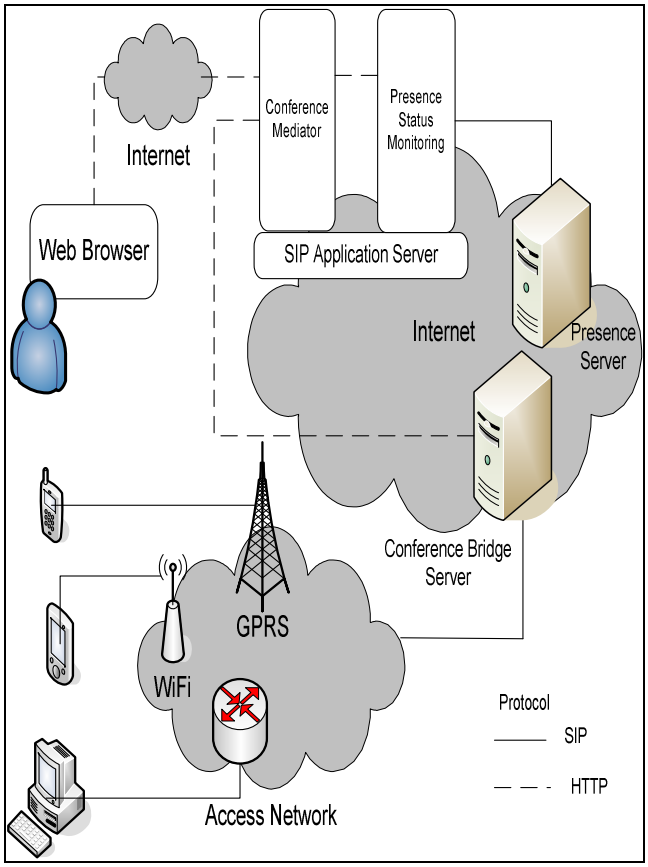

Figure 3 Non-IMS approach for conditional conference call service

5 Implementation

We have developed prototypes based on our architecture approaches as discussed above. Followings describe how we implemented our prototypes using the two difference approaches to achieve the conditional conference call scenario.

5.1 Implementing Conference Call with IMS approach

Figure 4 shows the conditional conference call flow sequence with IMS core network. The Conference Session Controller application provides web interface (we use a JSP page in this implementation) for user to log in, create conference request and send notification to the participants.

The Conference Session Controller application will then create a conference for Jimmy and send notification to the participants about the conference information via Instant Messaging. At the same time, Conference Session Controller application triggers Presence Status Monitoring to monitor the status of the participants. Presence Status Monitoring sends request to Presence Server via SIP protocol to gather participants' status information.

SIPoint Server [8] is used as Presence Server to get presence and availability of the users in our implementation. SIPoint Server is compliance to IETF SIMPLE (SIP for instant messaging and Presence Leveraging Extension) standards [13].

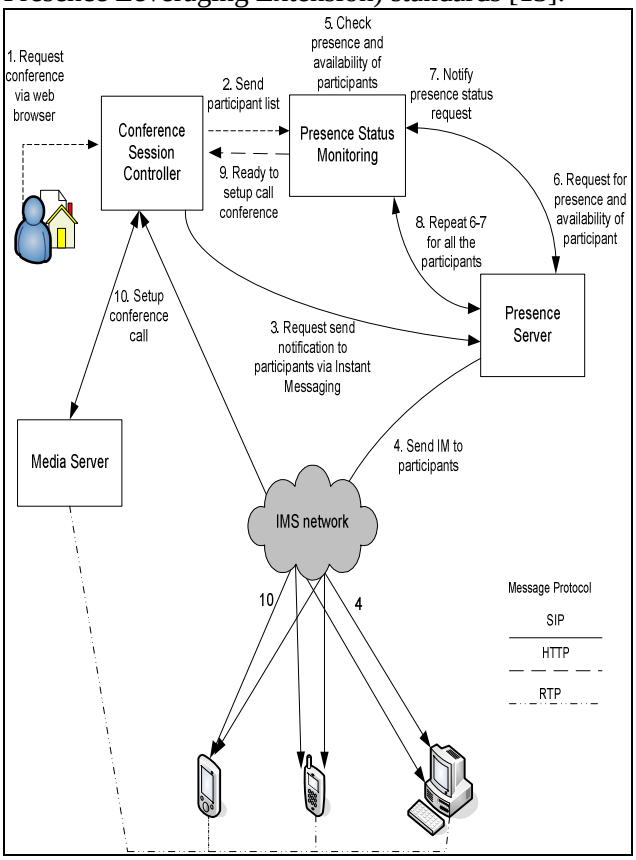

Figure 4 Conditional Conference call flow sequence with IMS core network

Presence Status Monitoring and Conference Session Controller are deployed and running on BEA Weblogic® SIP Server [7]. BEA Weblogic® Sip Server is a converged SIP-IMS application server platform which is also a J2EE application platform. Presence Status Monitoring monitors the presence status and availability of the participants periodically. When all participants become available and ready to join the conference, Conference Session Controller (acts as a conference SIP Servlet) establishes the conference call when it receives the request from Presence Status Monitoring . Conference Session Controller is responsible to handle SIP session call between the users and media server.

SnowShore IP Media Server™ by Cantata Technology [14] is used for media session control. The SnowShore IP Media Server™ is a SIP-based media server and supports Java development environment running on wired, wireless and broadband networks including 3GPP IMS network architecture. The media server handles the media resources for all the conference participants joining in the conference.

The development prototype was tested on computer terminal and Dopod 818 Pro using CounterPath Sip Softphone [11] and Kapanga Softphone mobile version [12] as IMS client.

5.2 Implementing Conference Call with Non-IMS approach

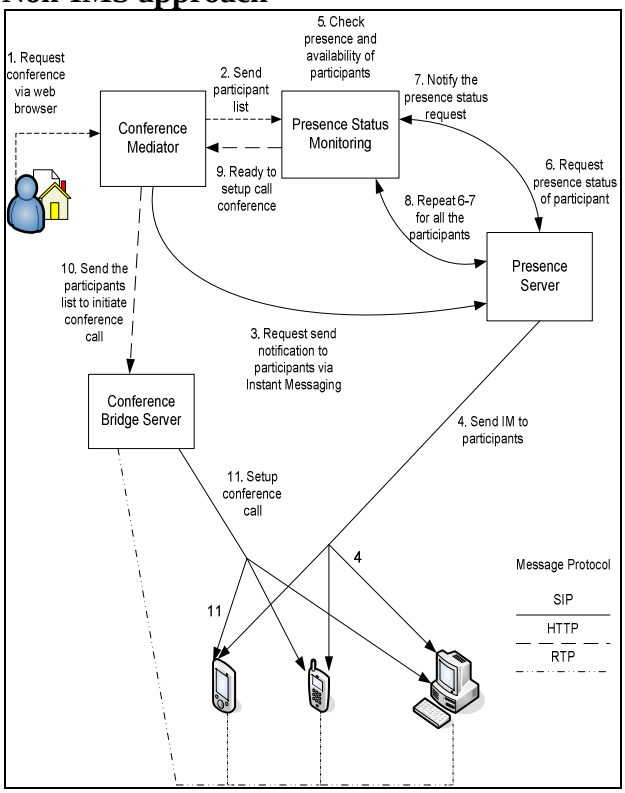

Figure 5 Conditional Conference call flow sequence without IMS core network

A prototype is developed based on IP-based infrastructure. Conditional conference call flow sequence without IMS core network is shown in Figure 5. As shown in Figure 5, Conference Mediator allows user to invite conference participants to join a conference and send notification to participants via Instant Messaging from web browser. Conference Mediator will then send the request to Presence Status Monitoring server via Web Service to request for monitoring the presence status of the participants. Both Conference Mediator and Presence Status Monitoring are deployed on an application server.

Asterisk [9], an IP PBX open source software by Digium Inc. is used as conference bridge server running on Linux CentOS 4.4 Operating System. A customized CGI/Perl scripts is written in Conference Bridge Server which act as a gateway between Conference Mediator and Asterisk server.

Conference Bridge Server receives conference participants' contact information provided by the Conference Mediator when all participants are ready to join the conference, and dynamically creates Asterisk call files for each participant in real-time. The call files created are used to trigger and automate a conference call setup by ringing and connecting (through auto-call dial-plan) all participants' devices to its MeetMe conference room.

6 Discussion

Based on the two architecture designs and implementation approaches that we discussed in section 4 and 5, our findings showed that both approaches are able to achieve the common functionalities for the conference call use case scenario application.

In the following sections, we evaluate the capabilities of the IMS architecture by comparing it with non-IMS approach in supporting conditional conference call.

6.1 Reusability of Media Server

As compare with non-IMS approach, the media server on IMS network can be reused by other applications on IMS application server. The Conference Bridge Server in non-IMS approach is a tightly-coupled system, i.e. Conference Bridge Server is required to be customized (created a CGI/Perl program) in order to function as a gateway.

6.2 Presence information

With IMS core network, the Presence Server gives unified user profiles to all of the services. On the other hand, the non-IMS approach resulted in redundancy and additional development effort for the replication of user profiles created for Asterisk Server.

6.3 Deployment Time and Integration of Services

Based on the reusability and redundancy aspects that we have observed and discussed above, it is proven that the IMS network has given some advantages as compared to non-IMS network, which are:

- Shorten deployment time because of reusability capability
- Integration among the services running on IMS application server is easier
- Low maintenance due to the decrease of redundancy in the system

6.4 Standard Specification of IMS

IMS is a standardized architecture defined by European Telecommunications Standards Institute (ETSI) and 3GPP. The IMS standards are still evolving in order to achieve and support full potential of IMS for converged services.

There are still immature in some aspects as we observed when implementing the Conditional Conference Call Service. For example, a media control protocol (markup language) is required in between media server and application services. The media control protocol should contain media resource descriptions such as conference control, voice announcement, recording and playback recording, as well as, start and end time of conversations. The Cantata Media Server used in our prototype implementation adopts MCML to describe conference URI and media information, as well as, time to start and stop the conversations. There are a number of media control protocols proposed nowadays such as MSML, MOML, and VXML, however to-date none of them has gained adoption in IMS common architecture.

7. Conclusion

In this paper we have presented the IMS and non-IMS approaches in realizing the use case scenario of conference call, and made comparisons of both architecture design approaches. Prototypes are implemented based on the architectures of both

approaches for proof-of-concept purposes. Our findings of this work are also presented in the discussion section of this paper.

References:

[1]3GPP, *Overview of 3GPP Release 5*, ETSI Mobile Competence Centre, version 9th, September 2003

[2] 3GPP, *Overview of 3GPP Release 6*, ETSI Mobile Competence Centre, Version TSG #33, 2006.

[3] 3GPP, *Conferencing using the IP Multimedia (IM) Core Network (CN) subsystem*, Stage 3 (Release 6), 3rd Generation Partnership Project (3GPP), 2006

[4] I.Miladinovic and J.Stadler, Multiparty Conference Signalling using Session Initation Protocol (SIP), *Conference Proceeding, INC 2002*, pp191-198.

[5] I.Miladinovic and J.Stadler, Optimization of Signalling Traffic in Centralized Conference using SIP, *WSEAS International Conference on Multimedia, Internet and Video Technologie*s 2002

[6] Petri Koskelainen, Henning Schulzinne and Xiaotao Wu, A SIP-based Conference Control Framework, *Proceedings of ACM NOSSDAV*, 2002

[7] BEA Weblogic® SIP Server, URL http://www.bea.com

[8] Micromethod SIPoint Server, URL http://www.micromethod.com

[9] Asterisk software. Digium, Inc., URL http://www.asterisk.org

[10] Digium Inc, URL http://www.digium.com

[11] CounterPath SIP Phone, URL http://www.xten.com

[12] Kapanga SIP Phone, URL http://www.kapanga.net

[13] SIP for Instant Messaging and Presence Leveraging Extensions (SIMPLE) URL http:// www.ietf.org/html.charters/simple-charter.html

[14] CantataShowShore IP Media Server™, URL http://www.cantata.com/products/mediaserver