An Integrated application service platform for user-end IP multimedia and 3G terminals

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Abstract

This paper investigates the end user application requirements in the light of emerging IP multimedia and 3G technologies. It proposes a higher-level architecture, which takes into consideration the issues associated in providing enhanced application service platform to empower the end user applications. Proposed integrated application service platform will facilitate end user terminal applications to seamlessly shuffle between the underlying application protocols as per the application logic requirements through a manageable standard interface in addition to encapsulating application layer protocol specific features.

1.0 Introduction

IP and mobile networks need no introduction, as they are immensely popular and closely followed. Both have seen remarkable growth rates and have extracted concentrated effort from industry participants in contributing to their technical advancements. We are at the moment of witnessing the most celebrated marriage of these two networks. This unification has direct impact on the services that can be offered to the end user.

In the following sections we investigate these emerging architectures, how it come to be enabled and the influencing factors in its emergence. We pay special attention to the service platform and the necessity and problems associated in creating a standard architecture. Finally we propose a higher-level picture of an architecture that can empower the end user terminal applications by exploiting new technologies.

2.1 IP Network

Internet is now inseparable from people's life and it has come to influence immensely the social political and economical conditions. Its key aspects that led to its phenomenal success can be identified as follows.

- It is packet switched. (On its own merit it, it acts as a hub for other technologies to be built upon it)
- It is a redundant network (multiple paths can be established hence providing high fault tolerance)
- It enables fast deployments of various applications.
- It's cost effective.
- It is easily manageable.

One can easily argue that it's the application layer (HTTP, SMTP, FTP and the rest) that paved the way for dot com gold rush. Internet is now characterised and identified by its service platform but it's not without any shortcomings. What are the service issue associated with it? Although the application vendors like SUN and Microsoft have developed intensive web based technologies to exploit IP architecture, the two most important issues that has haunted vendors by forcing them to find hacked solutions can be named as follows.

i) Session related issues

Http is a connectionless protocol (even though the underlying transport protocol like TCP is a connection oriented protocol) and hence does not support sessions. Most of the commercial applications like shopping basket need to hold sessions with client and server. It has been challenging to develop frameworks for application to provide support for sessions and other distributed services. (E.g.: J2EE, .NET-ASP).

ii) Multimedia or time based content issues

Owing to the fact that there are no valid protocols that can adequately support one to one connection and control (due to packet loss nature and different latency of packet arrivals) it is found to be difficult to deliver time based media over IP network such as Internet.

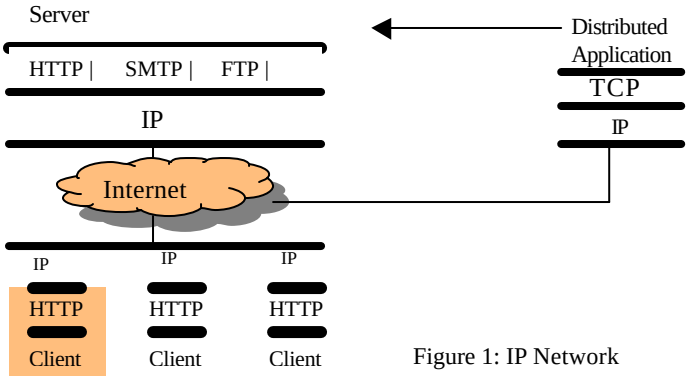
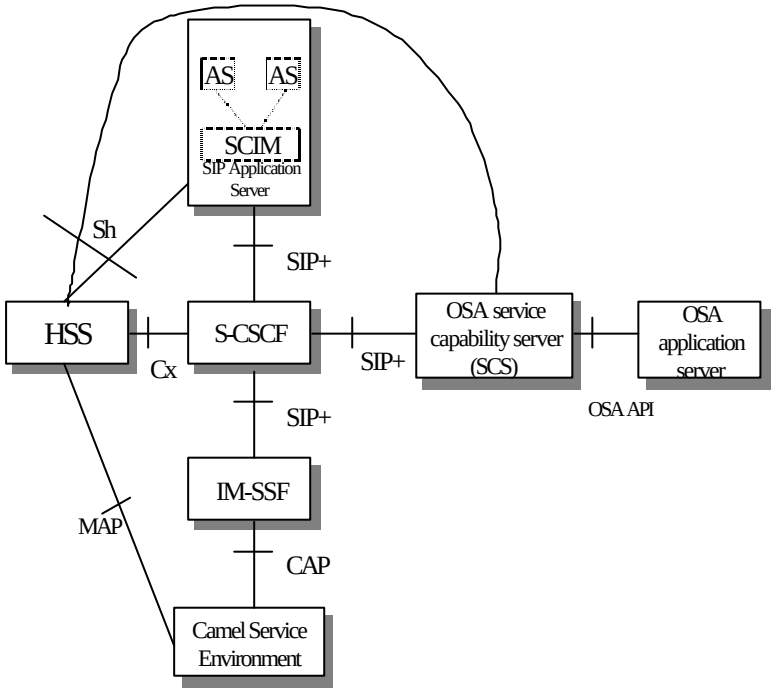


Figure 1: IP Network

IETF (body responsible for developing internet standards) has proposed many standards to successfully overcome the above issues to make IP network a true multimedia network with capacity to support high quality voice/ video and data communication. IETF standards like RSVP, RTP, RTCP, and RTSP and finally SIP has enhanced IP networks to make it a true multimedia network with the capacity to support all multimedia contents. We pay more attention to this in later sections.

2.2 MOBILE networks

Mobile network, however fast grown, is primarily voice based to an extent it can be called as voice network. Mobile network has seen waves of evolution at all levels of its network elements. Notable revolutionary standards that have given value to the mobile network are GSM and GPRS. It enabled services like SMS and Internet services using WAP to be delivered to the mobile user respectively. Eventually the formation of 3GPP, reflecting the need to realise the potential of converging different networks without compromising on the quality and currently available services, clearly identifies the service requirements. The current release (release 5) proposes IM sub system (IP based multimedia sub system) following the call for all IP network to support enhanced services. For the mobile network to adapt the advantages if IP network is not easily realisable. One key value That IP can bring to mobile network is its enviable service platform. With the exception of SMS mobile networks has suffered from its inability to offer successful services due to lack of standards and service platforms that enable faster delivery of services. While retaining the advantage of being voice carriers mobile network are emerging to incorporate data services while seamlessly integrating with other type of networks. The key factor, which exposes the service platform of IM subsystem, is its CSCF (Serving-CSCF/Proxy-CSCF) element.



3GPP has adopted the IETF standard- SIP for this purpose, which we discuss in detail in the next section. Parlay, OSA and JAIN communities are actively building open standardised service interface to 3G and other networks making the possibility of 3rd party service creation and faster deployment of services a reality. It is discussed further in the following sections

Figure 2: Functional architecture for the provision of service in the IMS

3.1 Birth of SIP

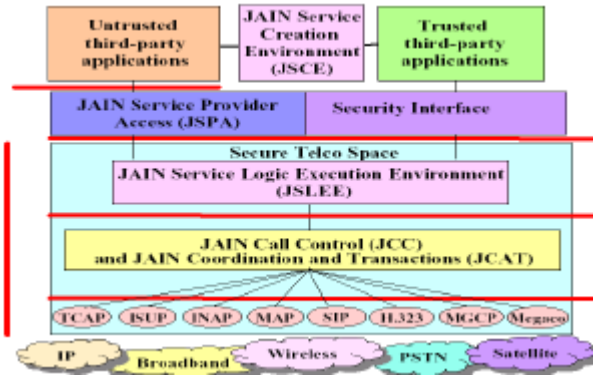
What packet switching did for heterogeneous network, SIP will do for heterogeneous applications. One important IETF standard that plays the crucial role in the marriage of mobile and IP networks is SIP. As a proudly adopted child SIP is capable of taking both mobile and IP network to a different height.

"Sip is an application layer control protocol for creating, modifying, and terminating sessions"[2] In addition to call control dialogs SIP's strength lies in providing location service element and in its capacity to make routing decisions. Routing decisions that SIP-proxies can make helps create location service to give mobility to the terminals. And it also defines the behaviour of the proxy by allowing possibilities of forking requests, which helps locate different terminals if necessary. SIP is basically simple, text-based and extensible making it an ideal candidate for building multimedia sessions. By inter-working with other IETF protocol like SDP and RTP, SIP makes the IP networks a true multimedia network.

SIP's mobility mechanism has attracted 3GPP's attention leading to its adaptation. In this way SIP plays an important part of bridging mobile network and IP network at application protocol level. Hence making application to be totally independent of these underlying network by making them s SIP based application. In this context, SIP plays an important part in the vision of creating an application layer which hides all primary networks and its differences from applications, making application vendors to offer integrated services and deliver them efficiently and quickly.

3.2 Other initiative on service platform (OSA/ Parlay/ JAIN)

These initiatives share the common aim of abstracting away the complexity of network elements securely by creating an interface, which will serve as platform for creation of services. OSA is more open and independent of programming languages unlike JAIN, which is Java based. This way of providing interfaces to the network resources allows third party service providers to participate securely and reliably. This paper concerns itself only with APIs that are specifically interfaces the application layer protocols like SIP. JAIN SIP offers such a sip specific API that can be exploited on an end user terminal.



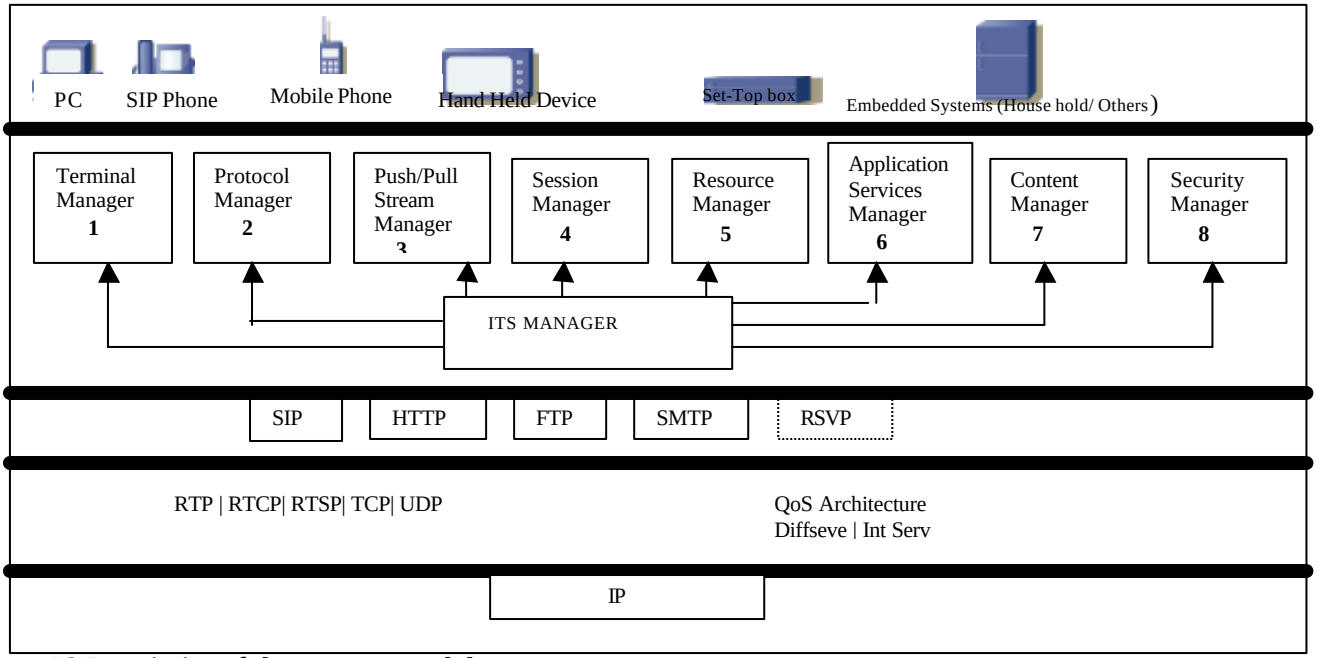
- Service portability
- Network convergence
- Secure network access.

Figure 3: JAIN APIs

4.1 Integrated Terminal Service Platform

This architecture is a result of realising the necessity to handle the end user requirements in a comprehensive way in order to empower the end user applications with encapsulated service platform. By separating the end user application from the application protocol level by introducing manager (like a broker) platform we gain the following advantages.

- Administrative panel can be built on the user end, which can be controlled remotely to deliver future protocols or application specific features to the end user terminal.
- It also allows, "Protocol merging" for next generation application. Interesting service scenarios can be realised by merging protocol streams in the style of video and audio steams merging.
- It, in essence, facilitates encapsulates services that can be delivered to the end user in a modular way so that end user application can exploit them seamlessly.
- The manager architecture gives extensibility to the application platform and acts as a future proof.
- Taken with device unifying service concept, it can also support existing non-sip terminals. [1]



4.2 Description of the manager modules

1. Terminal Manager

   This is responsible for handling terminal specific queries to determine the capacity as well as the subscribed services. (e.g USIM interaction)

2. Protocol Manager

This manages addition of new protocols to the architecture as well as selections of protocols for application specific needs. Further it encapsulates packetisers and parsers of a protocol.

3. Stream Manager

This manages both push and pull type streams that is built on the protocol messages. It also encapsulates stream multiplexers, demultiplexers and effect filters.

4. Session Manager

This manages protocol specific sessions and exposes session control specifics.

5. Resource Manager

This manages network specific and terminal specific resources.

6. Application service manager

This encapsulates the core application services like presence management, instant messaging and application specific requirements like periodic sending of register requests. This also encapsulates extensible mechanisms of the protocols, for example to support instant messaging. Further it also encapsulates additional application specific protocols and parsers like SDP, SOAP, XML, and HTML.

7. Content Manager

This manager encapsulates content specific aspects like codec mechanisms.

8. Security Manager

This encapsulates the security specific requirements.

4.3 Service Scenarios that exploits this architecture

i) Clever pushing of Http content as sessions.

During videoconferencing, participants (who happen to be Share brokers) can share custom analysis done using a web tool. (e.g. trend analysis, stochastic analysis)

ii) Using SMTP with SIP

Part of video conferencing (minutes) may be specified by the participants seamlessly, to be delivered as video/audio mails to non-participants of interests

4.4 Evaluation

We attempt to clarify some of the most common questions regarding the above architecture.

- Where does Parlay / JAIN and other service platform comes into it?

→ As this architecture focuses on the empowerment of the end user application platform, it concern itself only with APIs that are at application layer level like JAIN SIP.

- Where do 3G come into it?

→ Given the proposal of all-IP Relese 5 network, it is clear that 3G by adapting SIP and IP seamlessly merges with IP network to provide integrated service platform. ITSP is extendable to the air interfaces by adding proprietary control protocols. More importantly using its terminal manager it can be configured communicate to the mobile device as well as USIM at application level.

- How does it differ from other user agent architectures such as Ubiquity's Helmsman desktop agent?

→ Helmsman desktop agent, although it reaches the desktop, is primarily a middleware. Moreover, it does not propose enhanced services like protocol merging. Helmsman desktop agent is not completely an end user product. For instance it can be used to build location services hence it lacks end user empowerment. Further ITSP can be made to work with Helmsman desktop agent to exploit its features.

- How does the service scenarios differ from whiteboard applications?

→ White board applications are supported by a server where as the ITS architecture is a peer architecture and it also exploits session mobility.

5.0 Conclusion

This paper by putting the und user first attempted to capture the requirements of end user applications in order to exploit the new services in the light of emerging technologies. It has also explored the possibilities of using SIP to gain session specific services to http based and other application. In a nutshell it envisions a new layer (stream layer) between applications protocols and applications to empower applications by leveraging the underlying application protocols.

References

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