Risks of Migration to IMS and a Way to their Mitigation

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***Abstract* — IMS solutions represent a significant element of the shift to NGN, and bring some important benefits in terms of interoperability, flexibility and lower costs of developing, introducing and maintaining services. However, at the same time, the embracement of IMS is not without its risks, adding new management challenges to the NGN service management mix. In this paper we will propose the use of a Service Delivery Platform (SDP) to reduce OPEX and CAPEX expenditures for the operators' community and decrease the risks of their customers churning.**

I. INTRODUCTION

IP Multimedia Subsystem (IMS) is an international recognized standard, first specified by the Third Partnership Project (3GPP/3GPP2) and now being embraced by other standards bodies such as ETSI and TISPAN.

IMS-based technologies are designed to deliver complex multimedia services, such as Voice over IP (VoIP) and Internet Protocol Television (IPTV), over Next Generation Networks (NGN) infrastructures to mobile customers with high-performance connections. IMS promises to bring flexibility, operational effectiveness, openness and standardization to the delivery of applications across the fixed and mobile networks [1].

The IMS technology is being adopted by all sectors of the telecommunications industry including cellular, landline and cable. Gartner forecasts revenues of $2.5 billion and $2 billion, in 2010, respectively from IMS core equipment and system integration in North America and Europe, Middle East and Africa (EMEA) regions. The total revenue from the IMS core equipment is expected to exceed that of traditional voice over IP control equipment in 2009 [2].

The layered IMS structure specifies a Session Initiation Protocol (SIP) control layer with open interfaces to the transport and services layers above and has a centralized end-user profile repository. The horizontal architecture in IMS also specifies interoperability and roaming, and provides bearer control, charging and security. It is also well integrated with existing voice and data networks, while adopting many of the key benefits of the IT domain. This makes IMS a key enabler for fixed-mobile convergence and, based on these reasons, IMS will become the preferred solution for fixed and mobile operators' multimedia business [3].

I would like to express profound gratitude to the open source community responsible for the development of the OS IMS Core project, for their invaluable support and suggestions throughout this research work.

This paper presents the IMS architecture and the major reasons behind the need for IMS. After that, compare the IMS approach against the proprietary development model of island and isolated solutions, and presents the most relevant challenges of migrating to IMS. Finally, it proposes the use of a Service Delivery Platform (SDP) to decrease the migrations risks to IMS.

II. THE IMS APPROACH

A. IMS architecture

IMS architecture is broken into at least three distinct layers: the transport layer, the control layer, and the service layer. A high level vision of the IMS architecture is presented in Figure 1.

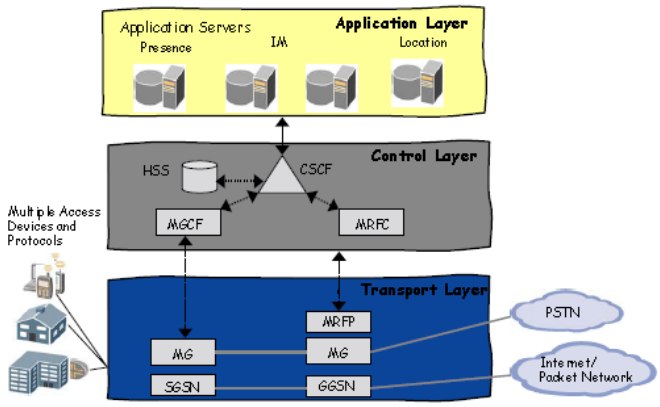

Fig. 1. High level view of IMS architecture [4]

The transport layer is responsible for the abstraction of the actual access networks (fixed-line, packet-switched radio, and so on) from the IMS architecture. In essence, this layer acts as the intersection point between the access layers and the IP network below it.

The control layer controls the authentication, routing, and distribution of IMS traffic between the transport layer and the service layer. Most of the traffic in this layer is based on the session initiation protocol (SIP) that is often associated with VoIP technology. In addition to routing SIP messages to their appropriate services, the control layer also provides the capability to interface the services layer with other services.

The service layer is where all of the actual services live. This includes traditional voice services (like voicemail, announcements, interactive voice response, and so on) as well as new applications built on the IMS architecture. This is the final layer of abstraction that gives IMS architecture the power and flexibility to rapidly deploy new services.

B. Reasons behind the need and desire for IMS

There are drivers behind the need and desire for IMS from both the service provider (SP) standpoint as well as from the enterprise or end user standpoint.

From the SP standpoint, the IMS infrastructure gives them the flexibility and adaptability to survive in the modern information world. Currently, each service that a SP provides is built within a single purpose siloed environment due to the constraints of the existing architecture. This poses several problems. First of all, it is expensive, due to the fact that every application must re-invent its own authentication systems, billing systems, and others. Secondly, it adds significant complexity to the network, because the systems are not integrated, can't communicate directly to each other and must be managed separately [5]. Combining these two issues, it becomes apparent that developing new services and applications for the user is an extremely risky proposition. As a result, SPs are reluctant to develop new services unless they are definitively sure of the market success of these new services [6].

The IMS architecture solves many of these problems for the SP. Not only does the separation of the services from the access network enable them to open up new markets, but the modular nature of IMS significantly reduces the cost and complexity of developing these new services. The IMS architecture breaks down the silos of application and service deployment by enabling the reuse of services, much like Service Oriented Architecture (SOA) is proliferating the enterprise IT department [7].

The vision of IMS will also completely change what end users and enterprises expect from their communications experience. Instead of having to wait until SPs provide the service they want, the users can control when and how they communicate, choosing the most appropriate medium or combination of media (e.g., video, voice, text, images, instant messages) all available simultaneously and in real time. In general, users want to have an enriched communication experience, anywhere, anytime and to any device.

C. IMS vs. Proprietary Island Solutions

There are other technological solutions which can, at least in part, provide services similar in functionality to those enabled via IMS. However, in this section we will illustrate how and why IMS is preferable to these individual "island" solutions.

Island solutions are thus named as they provide a set of dedicated components to realize only the specific service they support, independent of any other service-related infrastructure. In this sense, a Push-to-Talk island solution would be a set of specialized components (such as a proxy, a database, some gateways, billing/charging, etc.). Due to island solutions' proprietary and specialized nature, it is very difficult to reuse the island solutions' components for other services. By the same token, when a Mobile Network Operator (MNO) implements multiple island solutions (e.g., one for presence, one for conferencing, etc.) there will be an inevitable amount of redundancy amongst the island services' components due to the specialized and proprietary nature of the solutions. This translates into increased Capital Expenditure (CAPEX) as well as greatly increased Operational Expenditure (OPEX) for the MNO [8]. Additionally, the MNO loses out on significant synergistic gains which could be achieved through combining the functionalities of each island solution (e.g., integrating a presence service with conferencing).

IMS on the other hand represents a standardized, reusable platform which can be used to create, deploy and execute a wide array of different and innovative services. The standardized nature, combined with the core functionality of IMS entities, enables it to act as a reusable service platform. In most cases, new services would only require the creation and deployment of the new service on a SIP application service and a corresponding client plug-in. IMS would provide most of the underlying components and functionality on behalf of the new service (registration, session setup, security, billing, etc.). This translates in massive CAPEX as well as OPEX savings for the MNO, especially in a complex service environment where a large number of services have been deployed [8].

Figure 2 presents a concise overview of the difference between IMS and Proprietary Island Solutions.

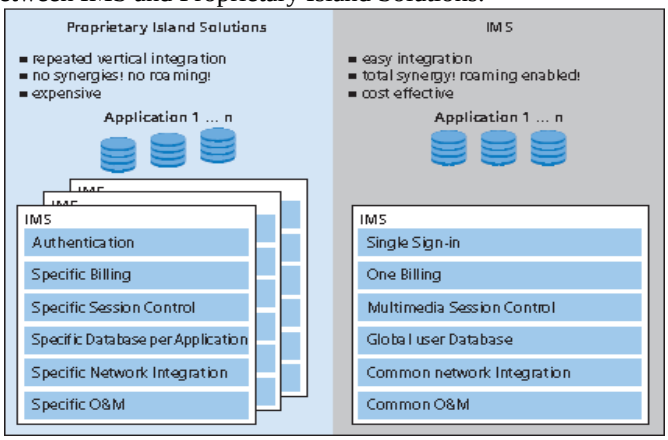

Fig. 2. Comparison of IP Multimedia Subsystem and Proprietary Island Solutions [8]

D. The challenges of migrating to IMS

Despite the clear and substantial business and technology benefits, the transformation of telecom businesses through IMS deployments can carry substantial risks for operators. If traditional basic and value-added services that consumers have used throughout their lives have to be accessed and controlled in radically different ways, it will be difficult to get users to migrate (and pay for it) to an all-IP network, irrespective of the potential future lower costs, higher performance and increased service benefits. It is vital, therefore, that the migration of existing services to IMS and NGN be seamless, if customer dissatisfaction and churn are to be avoided. The scale of this problem is huge, with some

fixed operators already having announced plans to move one million customers per month to NGN-based services [9].

The quality of the basic voice services currently offered cannot be compromised. Any substantial deterioration in the quality of voice connections or slowing of system response times may cause irritation amongst subscribers and result in skepticism about the potential and performance of the new and hopefully attractive multimedia services. Customers are not willing to pay for poor quality voice services if there are cheaper alternatives for peer-to-peer VoIP telephony provided free-of-charge or for cheap flat-rate tariffs from alternative providers with models such as Skype [10]. The quality of today's peer-to-peer VoIP services delivered on best-effort basis may not be great, but is certainly sufficiently acceptable for millions of users to adopt them enthusiastically. If this business model wins, the role of the existing operators can only become even more marginalized.

In response, the only way that operators can compete with independent VoIP providers is through quality of service. The core task for operators and vendors migrating to VoIP services, therefore, is to provide an IMS infrastructure that can ensure high quality and reliable voice services. In the long run, this is the only way to guarantee that users will be happy to pay for the entire set of NGN services [6].

E. Service migration through service convergence

The full deployment of IMS will take long years. Until then, IMS and next generation networks must co-exist peacefully with legacy networks. It is in the interest of operators that those revenue-generating value-added services that are being deployed on fixed and mobile networks today can also be seamlessly provisioned in an IMS environment.

Over the years we have seen the continued convergence between the Internet and the PSTN, between fixed and mobile networks, and between different types of mobile terminals such as PDAs and smart phones. In particular, new business opportunities created by fixed-mobile convergence have led several incumbent operators to re-integrate their fixed and broadband operations by co-operating with or re-acquiring mobile units that they had previously spun off.

IMS's all-IP infrastructure will play a key role in supporting this convergence, enabling a common transport and switching infrastructure to replace the current disparate networks. However, IMS has an even more dominant role to play in convergence on the service layer, enabling the same services to be delivered to different terminals across different access networks. The fundamental paradigm behind IMS service migration involves enabling existing and future services simultaneously on both IMS and legacy networks.

This convergence approach to service migration requires a new service delivery infrastructure capable of spanning multiple networks simultaneously. The concept of a horizontal service delivery platform (SDP) can do exactly the same for the service layer as IMS is planned to do for core networks. It enables operational cost savings and speeds up return on investment through re-use of service logic, service provisioning and even business processes [10].

III. EASING THE IMS MIGRATION: A SERVICE DELIVERY PLATFORM

The central concept behind a convergent SDP lies in the idea of a homogenous Network Abstraction Layer, based on open telecom and IT standards such as OSA/Parlay or Web Services, and enabling the creation of a broad range of truly network-independent voice and data applications.

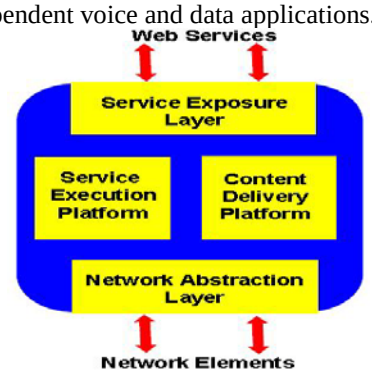

Fig. 3. Generic architecture of an SDP [11]

A typical architecture of a SDP contains the following elements: Service Execution Platform, which provides an execution environment for broad range of voice and data applications; Network Abstraction Layer, which provides standardized interfaces to core network elements and services; Service Exposure Layer, which is an optional element exposing services capabilities (usually via Web Services) to 3rd party services providers and enterprises; Content Delivery Platform, which is another optional element usually present in mobile SDPs for the provisioning of multimedia content to mobile devices.

The process of services creation becomes greatly simplified, with applications using high-level concepts of call management, messaging, charging or user location as opposed to low-level, protocol-specific features [10]. This also allows for the simultaneous provisioning of the same application logic to different networks using the newer SIP-based signaling.

However, network operator can face another serious threat: their equipment vendors might attempt to replicate infrastructure networks (IN) service delivery models and create new "IMS silos". As a result, instead of a broad range of operator-hosted and third party services, only a limited number of IMS vendor-specific services will be commercially deployed, severely limiting potential revenues, flexibility, market share and competitive agility.

To avoid the creation of these handicapping "IMS silos", operators have already started to create a new type of service delivery infrastructure able to support fixed-mobile convergence or global service provisioning across many mobile networks within the operator's overall national or international group. Extending such convergent, horizontal Service Delivery Platforms to IMS will be a natural next step.

Network-dedicated SIP/IMS application servers that will be certainly used for delivering IMS-specific multimedia and telephony services in the same way as IN service control points are currently being used in legacy networks. However during the years of transition to IMS, vertical service solutions will not reduce service logic and management redundancy, but actually rather increase it, this way limiting the OPEX savings facilitated by IMS [10].

IMS architecture opens great new opportunities not only to service providers and network operators, but also to their customers and application developer communities. One of the major challenges on this path to all-IP networks powered by IMS architecture will be ensuring that the migration of services from the legacy to new infrastructure happens seamlessly and, to the end user, almost invisibly.

A convergent, horizontal SDP architecture capable of spanning the IMS and legacy networks will play a crucial role in achieving this seamless migration of services to the IMS environment. Only by using a truly convergent SDP architecture can an operator simultaneously provide the same services on both legacy and IMS-enabled networks. This will not only reduce the risk of customers churning away while the operator migrates to IMS, but will also deliver potentially massive OPEX and CAPEX reductions for the operators community, which in turn will result in lower bills for the end customer.

A service delivery platform can help service providers achieve high performance by taking a consistently assertive position in the value chain for service delivery. It is possible to create, manage and deploy innovative service quickly for rapid revenue generation. Simple services, like location, presence or conferencing, can be leveraged for multiple end user services. SDP defines how these services are implemented, how they interact, and how they tie into operations and business support systems. This reduces operational complexity and expense, while increasing operational agility.

At the same time, SDP facilitates a more collaborative approach to product development, enabling third-party and internal developers to create new, value-added services faster, more consistently and with less expense. It offers a single standard interface to all third parties to effectively manage third party content and application service provider partners to interact seamlessly and create an open yet secure environment where personalized services can be easily introduced. Besides that, SDP provides a better total customer experience. Provide innovative, high-quality service offerings keeps consumers engaged and loyal, and keeps revenue-producing volume flowing across the network.

IV. CONCLUSIONS

Understanding market dynamics and properly interpreting current trends is a prerequisite to plan future actions. To successfully execute this task, a number of elements are crucial for avoiding operational pitfalls. Some of the risks and the key to mitigating them resolve around internal barriers to innovation and misunderstanding end-user needs and their evolution.

Improperly managed risk can result in lost opportunities, spoiled investments, offended shareholders and lost consumers. Apart from the service themselves, offering the right user experience is a cornerstone for success in today's environment. From a business perspective, it is crucial to have the lowest possible cost structure because the new competitive reality involves players with nimbler infrastructures and simpler operational systems.

Mobile Network Operators must be able to launch new services flexibly, while reducing the significant costs associated with service creation, deployment, operation and billing. They will need to experiment with different mixes of media (telephony, web, video and other offers). In order to do so, MNO must break down barriers between internal service "silos" in order to provide a single, rich, end-user experience. The ability to readily and seamlessly access the assets within each silo becomes critical in responding to end users behavioral trends, and the use of a Service Delivery Platform would be of great help.

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