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WHITE PAPER

IMS – IP Multimedia Subsystem

The value of using the IMS architecture

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Preface

IMS – IP Multimedia Subsystem – is an international, recognized standard; it specifies interoperability and roaming; and it provides bearer control, charging and security. What is more, it is well integrated with existing voice and data networks, while adopting many of the key characteristics of the IT domain. This makes IMS a key enabler for fixed-mobile convergence and value-based charging.

This paper outlines how IMS enables a secure service-driven approach to moving all traffic to the packet switched domain and Session Initiation Protocol (SIP) logic – making the best use of circuit- and packet-switched technologies along the way. It describes how fixed and mobile operators can begin rolling out IMS-standard services that generate revenue while making use of existing investments.

Contents

1 Introduction

The IP Multimedia Subsystem (IMS) standard defines a generic architecture for offering Voice over IP (VoIP) and multimedia services. It is an international, recognized standard, first specified by the Third Generation Partnership Project (3GPP/3GPP2) and now being embraced by other standards bodies including ETSI/TISPAN. The standard supports multiple access types – including GSM, WCDMA, CDMA2000, Wireline broadband access and WLAN.

For users, IMS-based services enable person-to-person and person-to-content communications in a variety of modes – including voice, text, pictures and video, or any combination of these – in a highly personalized and controlled way.

For operators, IMS takes the concept of layered architecture one step further by defining a horizontal architecture, where service enablers and common functions can be reused for multiple applications. The horizontal architecture in IMS also specifies interoperability and roaming, and provides bearer control, charging and security. What is more, it is 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.

For these reasons, IMS will become preferred solution for fixed and mobile operators' multimedia business.

IMS enables services to be delivered in a standardized, well-structured way that truly makes the most of layered architecture. At the same time, it provides a future-proof architecture that simplifies and speeds up the service creation and provisioning process, while enabling legacy interworking.

The horizontal architecture of IMS enables operators to move away from vertical 'stovepipe' implementations of new services – eliminating the costly and complex traditional network structure of overlapping functionality for charging, presence, group and list management, routing and provisioning.

For fixed and mobile operators there are benefits of introducing the IMS architecture today. On longer term, IMS enables a secure migration path to an all-IP architecture that will meet end-user demands for new enriched services.

2 Market trends in communications

User and enterprise needs will drive multimedia service evolution for both mobile and fixed operators. Users expect to be able to do more with their communications services, for less money, and are showing an interest in services beyond voice. They are attracted by services that offer them access to a wide range of communications information and entertainment services in a user-friendly, cost-effective way. Users also want to be always best connected, i.e. they want access to the services wherever, whenever and however they want.

Technologies like broadband access, Voice over IP (VoIP) and wireless LAN (WLAN, or WiFi) are reducing the entry barrier to new service providers in both the fixed and mobile communications worlds.

Today's operators, therefore, need a way to make their services more appealing to users and to maintain their customer relationships and revenue flow. They need to make the best use of their current technology investments and embrace new ones –to create service packages that are easy and attractive for subscribers to use.

2.1 User needs

Today's telecom users are increasingly demanding. They are more individualistic, independent, informed and involved than ever before, and they welcome services that appeal to their emotions as well as their practical needs. New, exciting services and enhancements to existing services have a key role to play in making the communications experience much more like interacting face-to-face. New advanced terminals and communication mechanisms adapted for user needs will enable this and hide technical complexity.

2.1.1 Richer user experience

Users are now used to accessing information, entertainment and other content-rich services through a variety of channels. Telecom operators have a great opportunity to integrate and extend the multimedia experience through new highly personalized person-to-person, person-to-content and group services.

The widespread adoption of mobile telephony, SMS and Instant Messaging shows how readily users adopt services that fulfill an emotional need to communicate in a variety of ways. Operators can help users extend such

behavior with enriched services that enable users to discuss and communicate in real time using any combination of voice, video, picture and messages.

2.1.2 Convenience and ease of use

Any new service has to be natural and intuitive to use if it is to be a mass-market success. Today's subscribers are used to using mobile and fixed phones anywhere in the world to call anyone. Similarly, they will expect new services to offer a seamless experience across multiple access technologies, devices and locations, whether wireline or wireless; narrowband, wideband or broadband; business or personal. The user experience should also be consistent across different device types.

Interoperability between terminals and operators is key – end-users are not concerned which operator their friends use, they simply want the service to work.

Voicemail, e-mail, mobile phones and wireless LANs have already revolutionized how accessible subscribers are. Now subscribers are looking for ways to manage this reachability – or their 'presence' – better, so that they can control how, where, when and by whom they can be reached. For example, research has shown that they would value simply being able to see in advance who they can contact, and how.

2.1.3 Safe communication

Telephony services have always been reliable and largely immune from curses of intrusion, viruses and spam attacks that have come to characterize the Internet. IP-based multimedia communications services must be safe for people to use – free from malware or malicious attacks – whether through their mobile or fixed terminals. Users will also want reassurance that others cannot gain unauthorized access to their personal services and information.

2.2 Enterprise needs

Enterprise is always chasing costs and pursuing ways of running their business more efficiently to improve the bottom line. Enterprises want to have control and will demand flexibility in the way they handle their communications such as moving, adding, and changing user information.

Enterprises are made up of individuals who have the same needs as those outline in Section 2.1. However, there are some requirements that are specific to, or more apparent in, the enterprise world. Those needs are tailored to their work group or work environment.

New technologies are enabling new more flexible ways of working. For example, the remote worker is a relatively new phenomenon but is becoming more commonplace. Working from home, at airports or on the road is very convenient when one has access to the same services as in the office – including buddy lists, presence and stored information. It should be possible to reach remote workers using a single name or number, regardless of location or access device.

With the growth in distance working and international business relationships, enterprise users need intelligent ways of bridging the distance with smart tools like collaborative working and file sharing. Discussing a document or a presentation remotely should be as natural as if both parties were sitting in the same conference room.

With the emerging needs of working outside the company premises, security is an important requirement mainly from the IT departments. The employees need to have secure access to functionality in the IT environment from their mobile devices and the provisioning and management of applications needs to be done in an efficient and secure way.

Communications between enterprises and their own customers are also very important. Call centers for help and support services are growing in significance, for example – capabilities such as video communication will help in the drive to offer a more personal service and assist in problem-solving.

Enterprises, in particular large enterprises, need interoperability with their legacy systems, such as their telecom communication system and IT environment. They want to migrate from the systems they have into new IP and SIP based functionality comprising telephony, messaging, presence, conferencing and collaboration, etc.

2.3 Operator needs

In general, operators are looking for quick and flexible ways to respond to new business opportunities. As users expand their voice telephony behavior into multimedia services, operators want to be able to deliver a seamless and consistent user experience wherever and however the services are accessed.

2.3.1 Expand service offerings and revenues

As subscriber penetration rates approach – or pass – saturation point, operators need ways to expand the range and capabilities of the services they offer in order to protect and build revenues.

One way to support service expansion is to evolve the packet-switched infrastructure that enables the creation and delivery of new person-to-person

multimedia services. This must be done in a way that protects the operator business model and generates new revenue. Operators need to be able to respond to new business opportunities quickly and flexibly.

Many operators will have third-party developers to supply them with a range of new services in order to meet customer demand and strong competition. This demands service creation capabilities that are well connected to the service delivery mechanisms.

2.3.2 Controlled subscriber and business relationships

Both fixed and mobile operators face the perpetual problem of subscriber churn, and the issue is only likely to increase as new service providers offer cheap, or free, calls over the Internet.

One key way to attract and retain subscribers is to offer differentiation in areas like personalization, service bundling, co-branding, business-to-business relationships, tariffs, single sign-on and quality of service.

The ability to bundle content and services in a way that is attractive, fresh and flexible provides a strategic advantage. Mechanisms to handle relationships with content and service providers need to be in place so that the operator can stay in control of the end-user relationship and manage new business models in a favorable way.

2.3.3 Service interoperability for mass market services

Experience shows that creating and expanding a mass market requires standards-based solutions that enable interoperability in several dimensions. Terminal-to-terminal interoperability is essential to create convenience and clarity in user's expectations of person-to-person communications services. At the same time, interoperability between operators is necessary to give users the freedom to roam between different networks.

2.4 Regulatory needs

Beyond users' and operators' own individual needs, there is a wider community of interests that must be served by any public communications system – for example, in areas such as consumer protection, quality of service and safety and security.

Regulatory and standardization bodies are working to ensure that IP-based communications serve the different – sometimes opposing – needs of the various members of the global community. Specific issues that are being, or will need to be, addressed include: universal service obligation, number

planning, number portability, reliability and voice quality, emergency services, inter-carrier compensation, data protection and lawful intercept.

3 How IMS works

IMS provides a very good fit with the user and operator requirements outlined in Section 2 and will therefore be the natural technology solution. It provides an open, standardized way of using horizontal, layered network architecture.

Let's see how IMS supports multimedia communications in practice, and then look at the capabilities required to deliver these capabilities. Many of the functions and enablers described in this section already exist, and are not unique to IMS: the point is that IMS provides a more user-focused, integrated way of using them.

3.1 An everyday scenario

Enriched communication and improved interaction between voice and data are important aspects to person-to-person communication. The following scenario illustrates how IMS enables these capabilities to help in everyday life.

While in a taxi from the airport, Anna calls her work colleague Andrew on his mobile number to discuss some issues with an important construction project. Anna activates the phone's video mode so that she can show Andrew exactly what she is talking about. Andrew views the images on his mobile while they discuss how best to move forward. The two decide that they need a little help from their colleagues back in the office. Anna selects the project work group from her buddy list, sees who is available, and initiates a push to talk group session. John and Jeff answer that they have also been thinking about the problem, and have a few ideas that they would like Anna to look at.

When she gets to the hotel, Anna starts her laptop computer, opens her personal buddy list and invites Andrew, John and Jeff to join a videoconference. John opens up a presentation and shares it with his colleagues. At the start of the videoconference, Andrew is still walking back to the office and participates on his mobile phone, but swaps to his PC when he arrives at his desk a few minutes later.

This scenario shows us how simple rich communications can be when supported by IMS. It is not only technology that will dictate the evolution to these capabilities: end-user and enterprise needs will drive multimedia service demand for both mobile and fixed operators.

3.1.1 How IMS comes into play

So what role does IMS play in Anna's interaction with her colleagues?

The interaction starts with a traditional phone call. During the conversation there is a need to show and share, and the call is enriched with video. This is a service that is based on existing behavior and easily enriched to fulfill users' needs as they change.

Anna is on the move and currently within another operator's network. This does not affect communications – she still has access to the same services, regardless of where she is. Anna can still use her buddy list and invite the predefined work group to a push to talk session. This requires the service interoperability supported by IMS. Presence and group list management are a natural part of the communication and support different services: the same buddy list is presented, regardless of service.

The services are not specific to access type or terminal. The videoconference has participants using both fixed and mobile devices. IMS enables this convergence by supporting services independent of access.

With pictures, images, video-telephony and combinational multimedia services, users will be able to vary their communication modes by using any combination of communications media. To make this happen, IMS is a ***must***.

3.2 IMS architecture overview

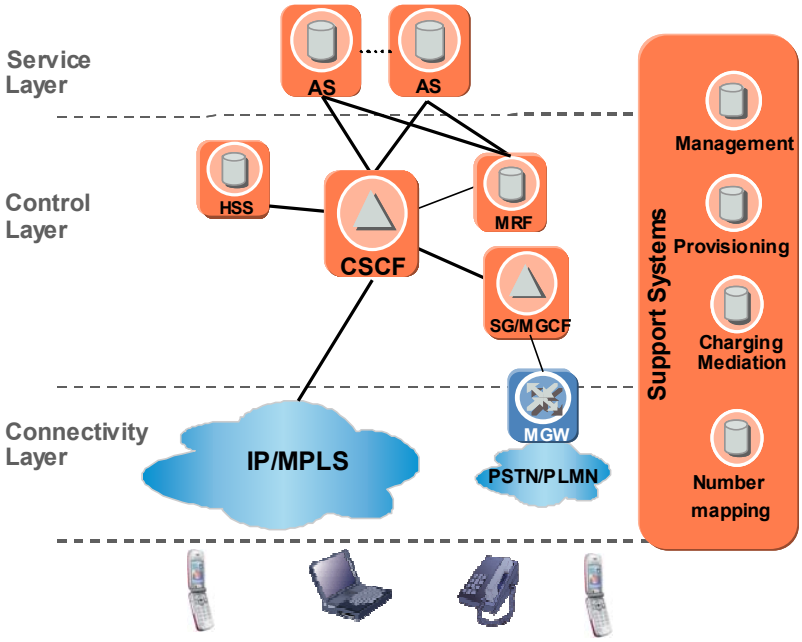

Figure 1: Simplified view of the layered architecture in IMS

The ***application layer*** comprises application and content servers to execute value-added services for the user. Generic service enablers as defined in the IMS standard (such as *presence* and *group list management*) are implemented as services in a SIP Application Server.

The ***control layer*** comprises network control servers for managing call or session set-up, modification and release. The most important of these is the CSCF (Call Session Control Function), also known as a SIP server. This layer also contains a full suite of support functions, such as provisioning, charging and operation & management (O&M). Interworking with other operators' networks and or other types of networks is handled by border gateways.

The ***connectivity layer*** comprises routers and switches, both for the backbone and the access network.

3.3 Service creation and delivery

In the pre-IMS world, services are specified and supported by a single logical node, or set of nodes, performing specialized features for the service. Each service appears as an island, with its own service-specific node(s). The only possible way to interface between services – for example, for service composition – is through protocols. In the absence of any common service framework, each service may have to be designed and implemented from scratch.

With the introduction of the IMS architecture, many functions can be reused for fast service creation and delivery. IMS services are hosted by Application Servers, which means they are implicitly placed in the IMS application layer, and that various aspects of service control are defined. For example, IMS defines how service requests are routed, which protocols are supported, how charging is performed and how service composition is enabled.

A single Application Server may host multiple services – for example, telephony and messaging. Collocation of multiple services has significant advantages, especially with regard to the loading of IMS core network nodes. Collocating services in one Application Server reduces the workload of the CSCF in the control layer.

3.3.1 Common functions

IMS takes the concept of layered architecture one step further by defining a horizontal architecture where service enablers and common functions can be reused for multiple applications. The horizontal architecture in IMS also specifies interoperability and roaming, and provides bearer control, charging and security.

The horizontal architecture of IMS enables operators to move away from traditional vertical ‘stovepipe’ implementations of new services, as shown in Figure 2.

This traditional network structure – with its service-unique functionality for charging, presence, group and list management, routing and provisioning – is very costly and complex to build and maintain. Separate implementations of each layer must be built for every service in a pre-IMS network, and the structure is replicated across the network, from the terminal via the core network to the other user’s terminal.

IMS provides for a number of common functions that are generic in their structure and implementation, and can be reused by virtually all services in the network. Examples of these common functions are group/list management, presence, provisioning, operation and management, directory, charging and deployment.

In addition to speeding up and simplifying the service creation and delivery process, the reuse of common infrastructure, enablers and competence provided by IMS minimizes OPEX and CAPEX for operators – especially in areas such as service provisioning, O&M, customer care and billing.

Another advantage is that the operations competence required across services is more generic – and can be overlaid with service-specific knowledge – rather than demanding specialist operational competence for each service.

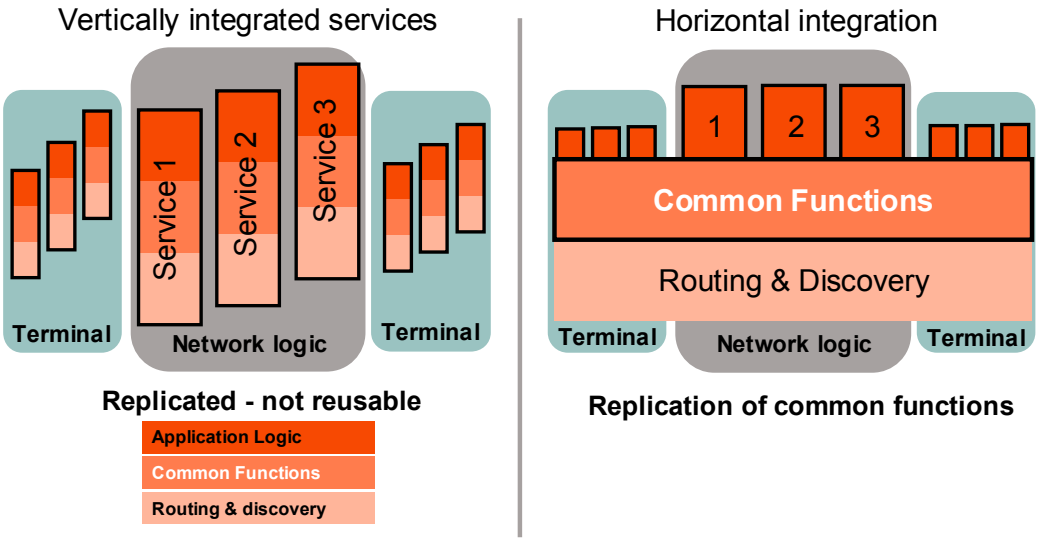

Figure 2. How IMS enables the move from vertical ’stove-pipe’ service implementations to a horizontally layered architecture with common functions.

3.3.2 Service enablers

IMS facilitates the creation and delivery of multimedia services based on common enablers in a ’write once, use many’ way. These key elements in the IMS architecture are so-called *service enablers*. They represent generic and reusable building blocks for service creation. The service enablers developed for successful applications can become ’global enablers’ that are automatically included in new applications and services.

There may be a large number of service enablers, but possibly the two most important are *presence* and *group list management*.

Presence

The *presence* service enabler allows a set of users to be informed about the availability and means of communication of the other users in the group. It enables a paradigm shift in person-to-person and other communications – for example, by enabling users to ‘see’ each other before connecting (active address book) or to receive alerts when other users become available.

In IMS, *presence* is sensitive to different media types, users (requestors), and user preferences. IMS *presence* function is also aware of what terminals the user can be reached on across the various wireline and wireless networks. Different rules can be set by the user to define who can view what information.

Group list management

The *group list management* service enabler allows users to create and manage network-based group definitions for use by any service deployed in the network. There are generic mechanisms for notification of changes in group definitions. Application examples for group management include: personal buddy lists; ‘block’ lists; public/private groups (for example, the easy definition of VPN-oriented service packages); access control lists; public or private chat groups; and any application where a list of public identities is required.

3.3.3 Service delivery

IMS enables a much more user-focused approach to deliver personal services than traditional networks.

In the pre-IMS world, users access personal services from one or more service-specific, user-independent access point(s). The routing to the server is also service-specific and often proprietary. The service architecture is also service-centric and scalability is a fundamental, service-specific issue.

With IMS, users access personal services via a dynamically associated, user-centric, service-independent and standardized access point, the CSCF. The CSCF is dynamically allocated to the user at log-on or when a request addressed to the user is received. Routing to the server is service-independent and standardized. The service architecture is user-centric and is highly scalable.

3.3.4 Simple access to services

IMS greatly simplifies the sign-on and authentication process, for both operators and users.

In the pre-IMS world, each service often has its own way of authenticating users, which may be standardized or proprietary. It may not authenticate the user at all, relying instead on lower-level authentication. The operator may need to introduce a special Single Sign On (SSO) service in order to avoid reauthentication for multiple services.

Once authenticated through an IMS service, the user is able to access all the other IMS services that he is authorized to use. Authentication is handled by the CSCF as the user signs on. When it receives a service request, the SIP Application Server (AS) can verify that the user has been authenticated.

Convenience and ease of use

One of the key interfaces towards the end-user is the contact list. This not only lists the user's contacts, it also shows their availability and for which service on what terminal. When an end-user logs on to his mobile phone or PC software client, the system is automatically updated on the user's new presence state.

Service interoperability

IMS enables the reuse of inter-operator relations. Rather than develop different interconnect relations and agreements for each service, IMS enables a single inter-operator relationship to be established and built upon for each service.

Today, when one user wishes to access another user's service – for example, to check status or location – routing to the other user's service is service-specific, and the requesting user's operator service has to be involved. What's more, there has to be service-specific network-to-network interface, routing, service access point and security in place – and therefore a specific inter-operator service agreement as well.

Once IMS is in place, access to other users' services is an IMS network issue, common to all IMS personal services, as shown in Figure 3. The requesting user's operator service does not need to be involved in routing the request.

The inter-operator network-to-network interface is established in IMS , and the general IMS inter-operator service agreement, routing, service network access point and security are all reused.

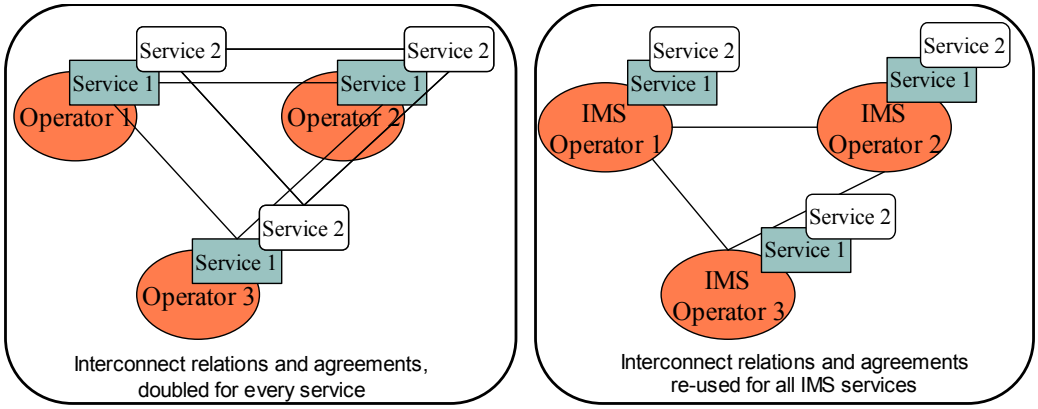

Figure 3. The difference in service interoperability between a pre-IMS network and IMS enabled operators

3.3.5 Service creation in terminals

IMS services require an IMS/SIP client (including GUI, service logic, routing and discovery functionality) in the user equipment to communicate with the network servers – in a sense, mirroring the service logic in the network. The IMS/SIP client is structured in such a way that the core functions are reused for many applications, and that many applications can be co-located on the same user equipment. The extra work of deploying a new service with IMS is significantly smaller, as the core functions are already in place.

Implementing IMS logic in the terminals means that the architecture truly will span end-to-end.

3.3.6 Interworking with legacy networks

There are a multitude of services in operators' networks today, and it is vital that IMS-based services interwork successfully with them to avoid churn, encourage the uptake of new services, and leverage existing investments. The possibilities for interworking between legacy services and IMS-based services will vary, according to the actual services supported in each domain and in the user terminals. Any interworking must have end-user experience as its key focus.

As an example, presence in IMS must support interworking between different presence server domains, enabling different users to subscribe to the relevant parts of each others' presence services – and have them in their contact lists.

Another important interworking case is between IMS and existing Intelligent Network (IN) services like VPN. This would enable, for example, IMS services to use existing VPN short numbering: the SIP AS would interrogate the IN VPN for the full number to complete the application.

3.4 An enabler for convergence

One consequence of IMS is as an enabler of true convergence and interworking in several dimensions: across fixed and mobile access; in the control and service layer; and in the connectivity layer.

IMS started as a standard for wireless networks. However, the wireline community, in the search for a unifying standard soon realized the potential of IMS for fixed communication as well.

A standard that was originally designed for mobile operators and adapted for wireline requirements is an excellent vehicle for fixed–mobile convergence.

3.4.1 Common control and application layer

Introduction of IMS can in some aspects be regarded as starting over with a clean slate. The application and control layers are ready to handle both fixed and mobile communication from the start.

Common functions and service enablers are equally equipped to work in both the fixed and mobile worlds and, more importantly, bridge the gap between them. Whether the subscriber is using a mobile phone or a PC client to communicate, the same presence and group list functions in IMS will be used. Additions or changes to a buddy list will directly be reflected on any terminal that the user logs on to.

3.4.2 Access-aware networks

Different services have different requirements. Some services demand high bandwidths, some demand low latency, others demand high processing power in the device. This means that in order for different services to be executed properly, the network has to be aware of the different characteristics of the access methods.

Multi-access functionality is inherent in the IMS architecture. If this is extended with access-aware control and service logic for multimedia services, IMS offers a way for fixed and mobile operators finally to deliver true fixed–mobile convergence. This will enable the delivered service to be adapted to the characteristics and capabilities of the currently selected device and its network access method.

3.4.3 Device types versus networks

With the introduction of portable devices like laptops and PDAs, used in conjunction with wireless LANs, the boundary between fixed and mobile communications has become blurred. Is a VoIP call over a PDA in an airport hotspot a fixed or mobile call?

One traditional distinction between fixed and mobile calls is that with a mobile call, one calls a person; whereas one calls a location using the wireline network. With personal SIP addresses, fixed calls can become personal as well – according to user needs.

In this converged world, the device type will become more important than the underlying network architecture. In the introductory scenario, Anna used a mobile phone in the taxi, which suited her at that point. When she needed a larger screen for the videoconference and application sharing, she switched to a PC. In both cases, Anna was able to continue to work, thanks to the mobility that IMS enables.

3.5 Safe communication

Reliable, secure communication is a top priority for both users and operators. With IMS, operators can implement end-to-end communications services built around a number of IMS security and network architecture cornerstones.

These include the fundamental IMS attribute that *operator-controlled* services are provided to *authenticated* users. The originating operator has end-to-end responsibility in the operator community: no services are delivered to anonymous or untrustworthy end-users, and no service requests are relayed from anonymous and untrusted operators and enterprises. The chain of responsibility is based around the following: IMS authentication; controlled IMS services that provide service to authorized users; inter-operator agreements mandating responsibility, etc.; and secure network interconnect.

In addition, payload (primarily non-voice and video) is checked for viruses. Access domain security is provided through user authentication and Single Sign On. Network domain security is provided through site security for hosted solutions, node hardening, virus protection and audit logging. While O&M security is supported by management traffic protection and virus protection.

3.6 Scalability

IMS services are primarily intended to address a mass market, with telecom-grade quality of service. In addition, to cater for millions of users IMS also needs to provide support for a complex service mix, that is, different service bundles that meet specific customer needs. These service bundles will most

likely have different numbers of users, with different user behavior, which will affect dimensioning of the network.

In this situation, the IMS network architecture offers a big advantage, since it is designed to scale independently of the traffic mix. This means that CSCF capacity can grow in proportion to the number of subscribers, and that the number of application servers can grow in proportion to utilization of the different services. In addition, the amount of interdomain (for example, VoIP to PSTN) interworking capacity can grow as services that utilize these capabilities are introduced.

3.7 Regulatory issues

Regulatory issues are important in all types of networks. However, the IP revolution has seen the emergence of many networks where these issues have been neglected. Providing cheap, or free, Internet calls has been more attractive than providing mechanisms for lawful intercept and other regulatory functions. There are strong forces in the VoIP community that argue that IP telephony should not be regulated in the same way as the classic telephony network has been.

A number of regulatory functions have been standardized in the IMS architecture. Lawful intercept is one. The ability to determine the geographic location of the user will be implemented in the next release of the IMS standard. This function will be applicable for both wireline and wireless networks.

4 Service-driven evolution to all-IP

Operators who see their future in offering IP multimedia services should begin implementing IMS without delay. The reason is that IMS provides a standardized, well-structured way of delivering services, legacy interworking and fixed–mobile convergence. At the same time, it provides a future-proof architecture that simplifies and speeds up the service creation and provisioning process.

4.1 Evolution tracks to all-IP

The IMS standard is being adopted by an ever growing section of the telecom community. It is today the only standard for SIP-based communication.

Operators can implement IMS solutions today, in order to derive its benefits as soon as possible. The evolution tracks described here are intended to show how the IMS architecture not only delivers revenue-generating services straight away, but can also leverage existing user behavior.

From a network infrastructure perspective, IMS can be very cost efficient – not only as a result of the benefits of horizontalization, but also in terms of operation and maintenance. The all-IP vision enables one core network for multiple accesses and so reduces cost of ownership.

4.2 Wireless evolution

From a mobile perspective, the rationale is to introduce multimedia services using a common IMS infrastructure and service enablers. The implementation of IMS is starting today, with services such as Push to talk over Cellular (PoC) standard services. Additionally, the IMS architecture can also be used to enrich mobile circuit-switched telephony, by combining capabilities of the circuit- and packet-switched domains. VoIP will also be introduced over time on wireless networks but is today limited due to the available packet bearers in the radio network. This will however improve over time.

New multimedia capabilities will be added over time – including video, messaging, personalized push services, etc. in order to further enhance the packet switched service offering. This will be done in line with market demands, and in accordance with standards defined by 3GPP, OMA, etc.

4.2.1 Initial services

Push to Talk over Cellular (PoC) is one of the first IMS based applications that are available in the wireless network. PoC offers feature-rich services for person-to-person and group communication, including do–not-disturb settings, transparency (show speakers and members in a group call) and presence management. It operates entirely in the packet-switched domain and is based on IMS service enablers and common functions, i.e. group, list and presence management, multi-party conferencing, security, charging and O&M.

4.2.2 Telephony enrichment with combinational services

Combinational services enable the user to instantly and interactively share information such as images, live video and web content with the person they are talking to, while talking.

The combinational service approach enables new mobile multimedia services, like some of the ones described in section 4.2, to be introduced in parallel to existing voice services. In that way, new services are introduced in evolutionary steps.

This enables operators to utilize their circuit-switched infrastructure, with its telephony performance. The combinational approach leverages on established user behavior, combining a traditional telephony call with any type of media. This type of service is also easily taught from person to person during the ongoing call/session giving the service a low entry barrier for new users – a key factor for successfully bringing a new service to the market.

Even when all-IP networks are the norm, circuit-switched telephony enrichment will be maintained until all users have moved entirely to the all-IP network.

4.2.3 IP telephony

The wireless packet-switched/VoIP multimedia component will be evolved over time to gradually improve areas such as spectrum and infrastructure efficiency with IP over the air and end-to-end quality of service. It is important to note that this VoIP component already provides a telecom-grade voice experience for other accesses such as Wireline broadband access, WLAN etc.

The advantages of starting the IMS introduction with PoC and combinational services and later on introducing the VoIP component is that the main IMS architecture elements are already in place. Operators will then be able to implement a real-time mass-market VoIP solution in service-driven, business motivated steps using the required infrastructure and service enablers that are part of the IMS architecture. Operators also get an early route to fixed–mobile convergence, without the need for architectural changes.

4.3 Wireline evolution

There are several factors that indicate a faster evolution to an all-IP based IMS network than in mobile networks. For example, there are essentially no bandwidth constraints, no roaming issues, and terminals have easily enough processing power to drive even highly advanced applications.

All these IMS-favorable characteristics imply that wireline operators can start implementing IMS to enable the introduction of new revenue-generating services and reductions in OPEX and CAPEX.

Circuit-switched telephony replacement based on broadband and VoIP technology has started to happen. However, in many cases, these solutions are only based on proprietary architectures and not built according to the IMS standard.

IMS is the only existing standard architecture for SIP-based communication in wireline networks, as it is being adopted by ETSI/TISPAN. An ever-growing part of the wireline telecom community is uniting behind the standard.

4.3.1 Expand existing service offering

Wireline operators have invested a lot of money in their broadband infrastructure. They are now ready to take the next step in the evolution, and start getting a payback on their infrastructure investments.

With the appropriate service mix, service providers can address the early adopter segment while also expanding business into the profitable mass-market segment. For example, with an IMS-based wireline solution, an operator can directly offer IP telephony, while also using IMS' key building blocks (the common functions and service enablers) to enrich the VoIP service with multimedia capabilities such as videoconferencing, presence management, buddy lists and instant messaging.

4.3.2 Address the enterprise market

One of the most suitable and profitable segments for enriched multimedia communication services is the enterprise market. Within this segment there is a high demand for reliable communication services that facilitates day-to-day operations.

One interesting application that will drive revenue in the enterprise market is IP Centrex, also known as a virtual hosted PBX solution. Combining IMS multimedia services with IP Centrex can create advanced collaboration services suitable for targeting at both the SME and large enterprise markets. The combined solution will host a complete set of personal and group services,

with the addition of multimedia support like video communication, conferencing, collaboration, presence management, instant messaging, Outlook integration and support for remote workers.

5 Summary

Using IMS, operators can adopt a strategy of first exploring the opportunities of IP multimedia, and then taking appropriate steps to mass-market IP multimedia services, according to market and business motivations.

The hard lessons of the Internet bubble have brought us back to sound business logic, based on increased revenues and cost control. The introduction of new services and capabilities must not disturb the current profitable mix of telephony services. They should rather use it as a base for a superior user experience making it even more compelling.

By introducing the concept of horizontalization in IMS, the operators get an excellent opportunity to capitalize even further on the layered architecture that is being introduced in both wireline and wireless networks. Utilizing the horizontal architecture, with its reusable common functions, the operator can in a service oriented and revenue focused way start the journey towards all-IP.

IMS provides sound, business-focused evolution options for delivering attractive, easy-to-use, reliable and profitable multimedia services. It also enables operators achieve fixed–mobile convergence. .

Strategies are in place for operators to begin rolling out IMS-based services that take advantage of fast, flexible service creation and provisioning capabilities, while also providing for legacy interworking and combinational services that make the most of existing investments.

Operators can then build onwards toward the all-IP vision of offering rich, multi-access multimedia services.

6 Glossary

3GPP	Third Generation Partnership Project
AS	Application Server
CDMA	Code Division Multiple Access
CSCF	Call Service Control Function
ETSI	European Telecommunications Standards Institute
GSM	Global System for Mobile communications
GUI	Graphical User Interface
HSS	Home Subscriber Server
IMS	IP Multimedia Subsystem (3GPP standard)
IP	Internet Protocol
LAN	Local Area Network
MGCF	Media Gateway Control Function
MGW	Media Gateway
MPLS	Multi Protocol Label Switching
MRF	Media Resource Function
OMA	Open Mobile Alliance
PDA	Personal Digital Assistant (Handheld computer)
PLMN	Public Land Mobile Network
PoC	Push to Talk over Cellular
PSTN	Public Switched Telephony Network
PTT	Push to talk
SG	Signalling Gateway
SIP	Session Initiation Protocol

SSO	Single Sign On
TISPAN	Technical Committee within ETSI that works with standards for Next Generation Networks
VoIP	Voice over IP
VPN	Virtual Private Network
WCDMA	Wideband Code Division Multiple Access
WiFi	Wireless Fidelity
WLAN	Wireless LAN

7 References

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