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Fixed Mobile Convergence

Introduction

Did you know - you will soon be able to take inbound cell phone calls on your land line or even on your SIP phone as you walk into the office (without a call-forward)? In-fact, you could seamlessly pass your call from a CDMA network on to a public Wi-Fi zone as you walk through the mall and remain connected to the call (but not be charged for the unlicensed spectrum you used along the way). Those are some of the benefits of the new convergence era that is dawning upon us.

con·ver·gence (kn-vûrjns): n. The Webster's defines 'Convergence' as 'The process of coming together or the state of having come together toward a common point'. Convergence has appeared as a buzz word several times in the past and each time it has brought with it the promise of a better world: voice and data, email and voice or simply circuit and packet networks. In its latest avatar, Convergence has returned with a bigger promise than before but with significant credibility to match. The market developments in access and core networks together with massive innovation in the device end are generating enough interest in every player no matter his position in the value chain. This paper looks at the Fixed Mobile Convergence (FMC) in the wake of current trends and indicates the huge new opportunities thrown up.

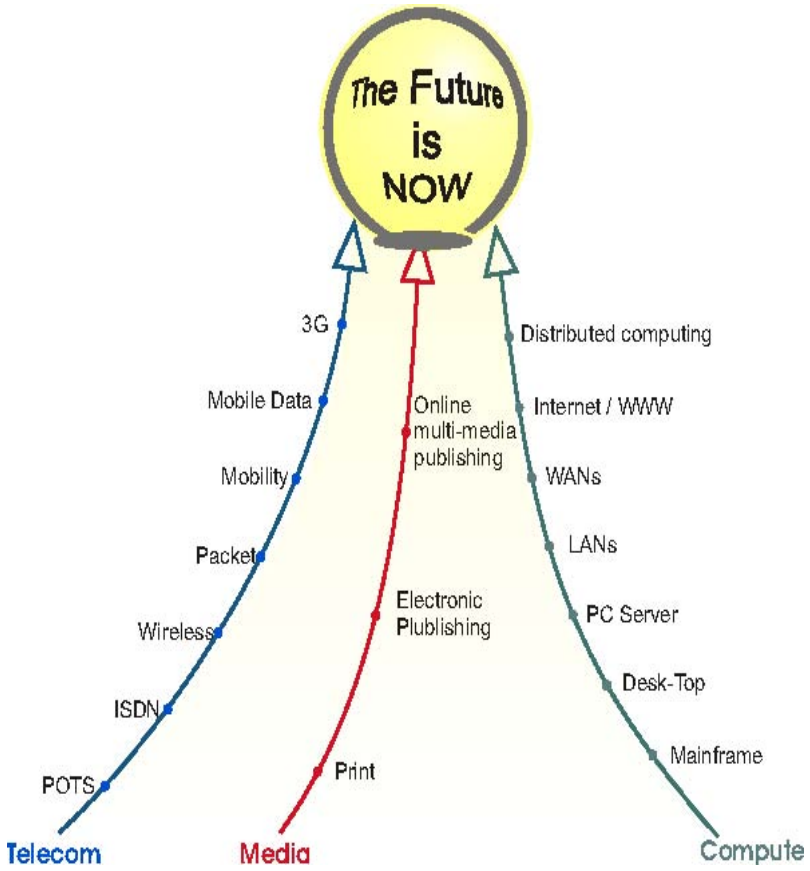
Market Reality:

Historically, in the media, compute and telecom industries, every complex function reached a point where factors such as advances in Silicon / electronics, market demand-supply equations & scale economies, drove it to a point of commoditization. Standards play a key role along this trend as they help bring in commoditization which is characterized by large scale deployments (in a relatively short period of time), significant drop in pricing and lack of personalization or differentiation. The following graphic depicts (at a high level) trends in the media, telecom and compute industries as they quickly evolved and are today converging into the ultimate goal of 'any-media any-time any-where'.

In the telecom domain, commoditization in some areas has already occurred to a certain extent.. IP in the Transport layer, has become the default protocol of choice in most telecom networks. A large variety of IP access technologies have become prevalent, and bandwidth commoditization has set-in. In the Call / Session control layer, the distributed call model created a commoditization of call control function with proliferation of soft-switches, MGC, MSC servers, SIP proxy servers in both wire-line and wireless networks.

Interesting part of commoditization is that it invariably causes lateral shifts in certain network functions that may get integrated (in-skin) into other functionality. While it is not clear whether commoditization causes

convergence or not, convergence always creates new nodal functions in the emerging network, for example: inter-working functions, session border controllers, application gateways.



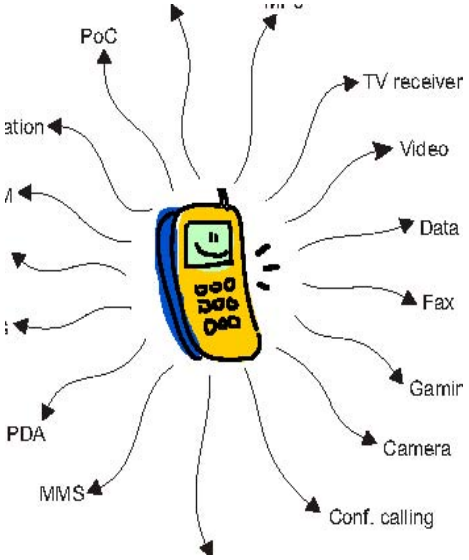
In the Applications domain, there is a very large global community of application developers coming from the IT world who have created a suite of several hundred applications which could be extended into the telecom world. The OSA / Parlay models were initiated with the objective of bringing this available repertoire of applications into the marketplace.

Convergence

Convergence is noticeably happening already at every segment along the end-to-end service delivery chain of the telecom network. Some of the key trends happening now:

Device: The legacy POTS phone was a dedicated device for a dedicated network: meant to carry voice only. Today's end-user device (mobile handheld) is a virtual 'do-all' including voice, text messaging, data, fax, email, video, multi-media gaming, photo imaging and interactive gaming with a remote users in dissimilar networks.

Access Network: The access network is continuously evolving from pure wire-line network for voice to broadband data with penetration increasing in emerging economies (Broadband speeds of 256kbps at $15 monthly rentals for the wired home are common). Wireless access speeds have shot up from



9.kbps GSM data speeds to 64kbps and above on EDGE / 2.5G interfaces. New radio technologies specified by 3GPP: W CDMA and TD CDMA are promising 14.4Mbps theoretical rate (for HSDPA and EDCH of 5.76Mbps) in Release 6. These speeds over a multi function handheld device were unimaginable just a couple of years ago. Broadband over Copper terminating into Wi-Fi hubs - feeding multiple IP devices, is a common facility today in most SOHOs and residential areas. CDMA access networks in developing economies offer faster data speeds than POTS lines and excellent voice quality to match. Access space offers a plethora of choices with DSL, Coax, wide area Ethernet, Wi-Fi & Wi Max. In many cases, user traffic is actually riding more than one network seamlessly with no indications of slack speeds or disconnects. Convergence in Access segment is well on its way.

Services Convergence: Services Convergence is not entirely new. The ability to have service or application portability across networks (wire-line and wireless) has only compounded now as network operators manage a broad service suite across multiple networks. For example, both wire-line as well as

wireless subscribers are demanding Ring Back Tone and Messaging services (fixed line SMS is the next hot thing in some Asian countries) thereby requiring service providers to look for ways to have application portability or use signaling infrastructure that enables it. Presence, Location and Conferencing features are beginning to cross borders as customers in VoIP as well as mobile networks are demanding access to the entire suite. Service providers have to battle network technology obsolescence in fleeting time windows plus rapidly changing customer 'mood swings' while maintaining profitable business operations.

SIP: A Key Convergence Enabler

SIP, an Application layer peer-to-peer multi-media communications protocol designed to enable converged communications is capable of placing control over distributed network entities. The power of SIP comes from its openness (entirely based on or leveraging standards such as HTTP, MIME, RTP, RSVP, SOAP, VoXML, SMTP, UDP/TCP, DHCP and a host of others) rendering it to naturally align in an IP centric network. This has become an impressive credential as the core of the emerging wireless network is 100% IP based, making SIP the natural candidate of choice. SIP deployments originally started off in the VoIP world for international arbitrage but gained significant presence in the enterprise market very quickly. This coupled with a virtual monopoly on the soft phones (except for some proprietary p-to-p clients) and IM client space (including MSN Messenger) has given SIP a broad installed base in a very short time. SIP protocol was originally defined by IETF and then adopted by 3GPP and 3GPP2. SIP is likely to become the primary driver of the newly converging areas of the wireless, wire-line worlds.

IMS (IP Multimedia Core Network Subsystem), is an umbrella framework for providing enhanced IP based services developed by 3GPP body. The Release 5 and Release 6 specifications detail a framework for an IP /SIP based network services architecture for wire-line, wireless and cable networks.

Key highlights of the IMS approach are:

- Ability to deliver person to person real time IP multi-media communication services irrespective of location

- Provide the complete range of communication services with open, secure access to a multitude of 3rd party services with ability to enhance the session quality at will (for example, click to start video call from a text session)

IMS promises to deliver several advantages: **Mobility management** (the network tracks users presence, availability & best possible session depending on profile and other parameters), **Service Quality** (several new specifications have been defined to ensure packet loss and echo are avoided to ensure highest possible real time mobile IP call quality). **Service Control** (on powering on a user profile download, determines available range of services, but at anytime through one touch menus the user should be able to update or override the profile enhancing the communications experience) also most importantly **Standard Interfaces** (service creation, access and delivery have been defined to a large extent by standard interfaces

that are showing an encouraging level of acceptance).

IMS supports SIP clients and can be connected to any compliant SIP device: mobile terminals, wire-line PCs or WLAN devices. SIP based session management and IMS allow peer-to-peer IP sessions to be established, taking full advantage of ubiquitous IP networks in enterprises and broadband equipped homes.

Fixed Mobile Convergence

FMC solutions are promising to deliver the long awaited hand off of calls and or calling features between wire-line and wireless networks (Wi-Fi). At this stage of the market, several approaches to solutions are evident and various business models are emerging. From the UMA (Unlicensed Mobile Access) approach (broadband wireless both public & private), to cellular calls inter-working, will all happen via UMA Controllers that enable call hand offs on dual mode handhelds. This approach is more cellular-operator-centric and the UNC is actually paired with a MSC in the cellular network.

Wire-line focused FMC solutions take a different approach by enabling the wire-line carrier to maintain control of the call when the call roams to the Wi-Fi network. The approach allows an easy transparency with the feature rich (mostly SIP based) IP-PBX in the enterprise. This SIP approach has benefits since SIP has already entered the emerging wireless network (via 3GPP) and is inherently compatible with the IMS architecture (3GPP2 release 5 and 6). The promise of this approach may perhaps enable wire-line operators to make a successful bid at recapturing lost wireless minutes, provided they have the right alliances and technology solutions in place. The FMC server solution promises to deliver a single-phone, single-number, single-voice mail and a common unified bill for all data & voice calls with seamless roaming between Wi-Fi networks.

FMC is likely to bring to reality the following scenarios hitherto considered impossible.

- A cell phone user can start receiving calls on his SIP home phone when he enters his home, saving spectrum and charges for the 'home roaming usage'. This kind of hand-off is both extremely non-intrusive and cost beneficial.

- Enterprise subscribers roam their mobile number into a business environment via one to many SIP devices. This may be offered by a service bureau as a managed service.

- Enterprise subscribers get to roam their mobile numbers in an enterprise network (LAN or Wi-Fi network) via one to several SIP devices. This further establishes that none of the existing infrastructure will be rendered a waste.

- Mobile subscribers can continue enjoying all enhanced services available on their home PLMN networks in any roaming network they are visiting and on their landline networks as well.

- Mobile subscribers can seamlessly roam between locations with calls transparently following them irrespective of whether they are in a cable zone or a public Wi-Fi hot spot.

Quality of communications experience will be unimaginably higher since the limitation will be more on the device rather than on the network or access to profile information. Moving forward, a call made to a VoIP phone will be connected to the called party's cell phone if he is outside the IP zone roaming in a mobile network. Subscribers will only need to carry one unique phone number as the network will intelligently route the call to the most optimal device.

Signaling in the FMC space:

SS7 as the default signaling protocol in the large legacy network infrastructure for voice continues to play a critical role. SS7 based transactions continue to identify, authenticate, register the subscriber & validate the cell phone device used in a cellular network. In the FMC space particularly, SS7 will continue contributing in the seamless delivery of the following services: Emergency 911 calling, Supplementary Services, CLASS services (such as Call-Block, Call-Completion on Busy Subscriber), LIDB, LNP, WNP & the entire suite of IN offerings. With the merging of Internet and telecom services, SS7 further enables the Internet call waiting, Click-to-Dial applications, location based games and Hot Spot billing (although some of these services may move to pure IP billing for end-to- end pure IP sessions).

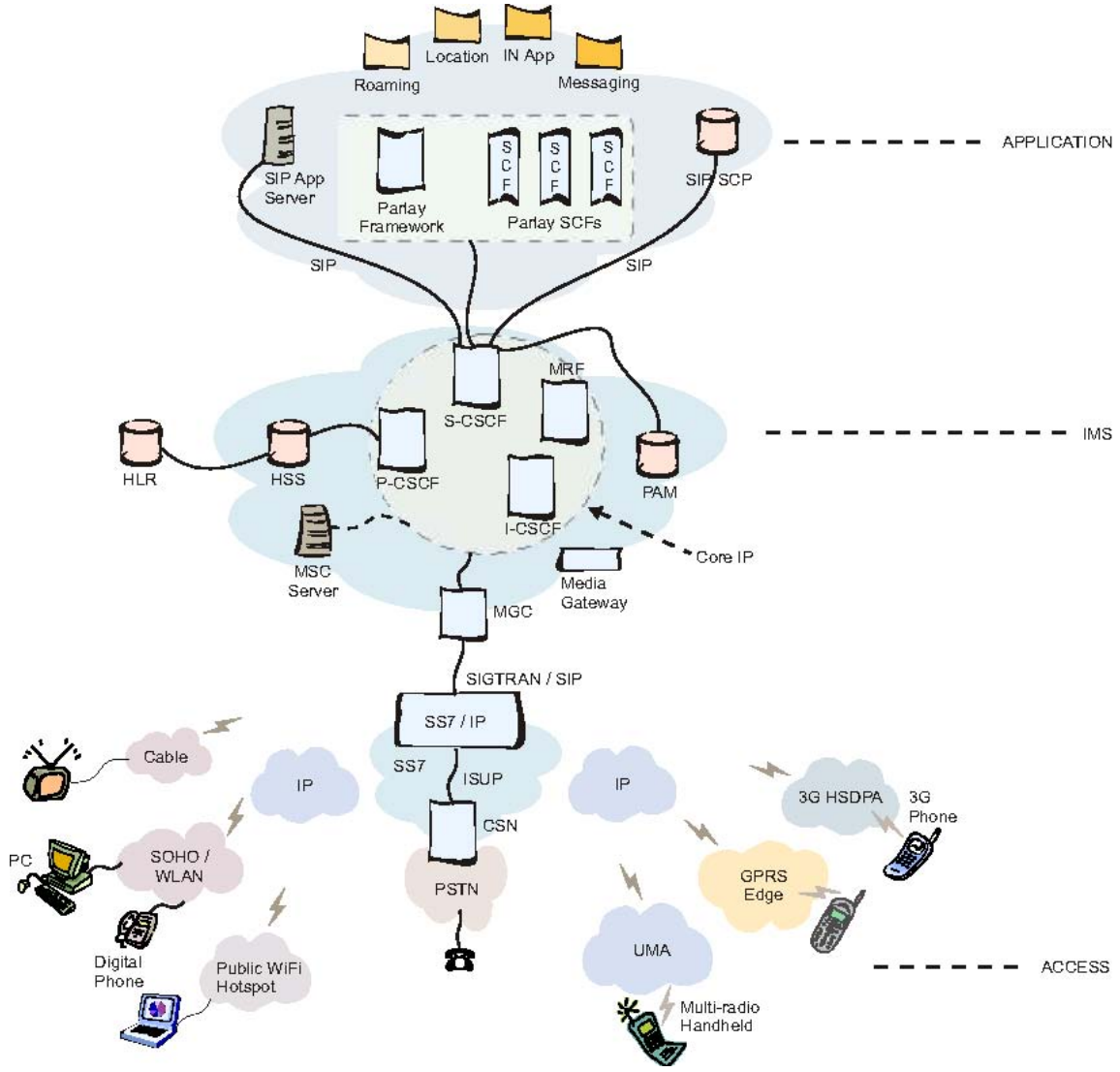
In the 2.5G networks, SS7 is used to provide authentication, mobility management, call control and messaging services. MAP is used widely in the GSM network to provide automatic roaming, authentication, inter-system hand off & SMS services.

The Base Station system Application Part (BSSAP), an Application Part API, defines the messaging interface between a GSM Base Station and a Mobile service Switching Center. This interface uses the services provided by both connectionless and connection-oriented Signaling Connection Control Part (SCCP) for its transport layer. CAMEL Application Part (CAP), enables Intelligent Network services and provides service mobility as the user moves between different serving networks (fixed and mobile). CAMEL GSM phase 2+ connects the home and visited mobile networks to various Intelligent Network (IN) platforms used throughout national networks providing features such as Pre-Paid Calling, personal Numbering and more complex location dependent services. INAP and AIN are used for service logic access to the legacy applications and SIGTRAN for transporting traditional signaling information to the IP network.

SIP signaling is the primary method for user registration and session control in the IMS network. The CSCF (Call Session Control Function) consists of four sub elements that handle all of the signaling associated with call set up / teardown. This also houses SIP Registrar and Stateful SIP Proxy and performs basic SIP message exchange. The Home Subscriber Server (HSS) is the 3G IMS equivalent to the HLR, providing AAA functions and maintaining subscriber profile and service related data including user identities, registration information, access parameters, and service triggering information in a central location. The HSS also provides subscriber location functions and device-type being used plus Authentication.

The CSCF uses Diameter protocols to perform user authorization and retrieve subscriber service profiles from the HSS. Application servers use Diameter to retrieve and update subscriber information and service profiles. Applications invoke SIP-based Media Server resources to offer services such as ad hoc conferencing, audio or video streaming, media conversion (e.g. text-to-speech, automatic speech recognition), and basic audio announcements. The Media Gateway Control Function controls the media conversion (circuit to packet) for calls that originate or terminate in the switched circuit network and require

access to IMS services



Concluding Thoughts:

Fundamental business changes are evident in the communications landscape globally: p2p technology has become a rage and pc telephony virtually threatens to take voice calling almost to any desktop in the world costing next to nothing. Will the world's carriers be reduced to bit-pipes faithfully delivering voice minutes to the desktop for a pittance? Will Wi-Fi quietly steal the thunder by creating metro wi-fi versions and inter-linking these islands via ubiquitous 2G and 2.5G networks seamlessly? If wireless carriers are going to carry airwaves to the enterprise and handoff to enterprise Wi-Fi networks (read unlicensed spectrum) where will the next big revenue come from? The battle between technology and economics is always interesting and as long as the consumer wins, there is really little to complain. Watch this space as we bring you more new thoughts from this exciting world.

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