Next Generation Networks (NGN)-Future of Telecommunication

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ABSTRACT—Next Generation Networks (NGN) have a major impact on existing communications technology whereby Telecom Operators can provide multiple services over their networks to improve their revenues. NGN allows the convergence of multiple applications to run on the same network; consisting of voice, data and video and other new media applications. In this paper,the author has discussed the importance of NGN and its architecture.

KEYWORDS- Next Generation Network, ARPU, TDM, IMS, FMC.

I. INTRODUCTION

In the current scenario of economic meltdown and cut- throat competition Telecom Operators are in need of ways of providing multiple services over their networks to demanding customers to address the problem of falling average revenues (ARPU) as the voice services penetrates to lower and lower income levels. To establish multiple networks to serve the same customer base for multiple services does not make a business case as it is very inefficient. Could there be a single network that could serve ever widening range of services? The answer is the Next Generation Networks which is a converged network, all based on Internet Protocol (IP). In this article it is discussed what these networks are and how these could be established to provide both Mobile and Fixed voice as well as Broadband and Video Services and how this could be done without dumping investments in the existing legacy networks which are still delivering the goods, though inefficiently. In addition, the layered architecture of the NGN is ideally suited for Non-Facility based service provision, thus encouraging the competition as well as enabling the optimum utilization of telecom infrastructure of Facility based operators [1].

II. LITERATURE REVIEW

Next Generation Networks (NGN) are the systems based on emerging Packetization technology of IP which leads to convergence of networks, services and markets and enhancing efficiency and flexibilityand follow the layered approach for separation of Infrastructure, Service Control and Service Provision functions. NGNs offer service providers and operators a converged, efficient and flexible IP-based platform which can evolve in a modular and flexible manner to create, deploy and manage innovative unified application services. As Time-division multiplexing (TDM) technology, which is Circuit Switched (Connection-Oriented) and hence inefficient and inflexible is being phased out, the IP-based NGN is taking charge. In NGN domain various network elements will be: Softswitch, IMS (IP Multimedia Subsystem), Media Gateways, Service Control servers, Application servers, Routers, Packet Transmission links and Broadband Access. These network elements largely based on IP are fitted in a layered architecture as shown in figure 1.

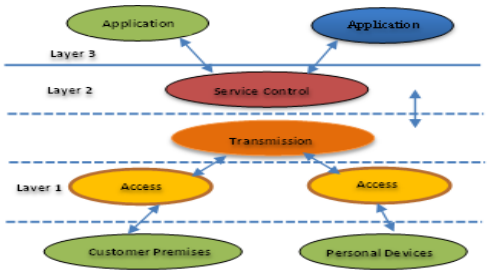

Figure 1 Layered Architecture of NGN

The schematic diagram depicting the Layered Architecture of NGN distributing various network elements is shown in Figure 2 below;

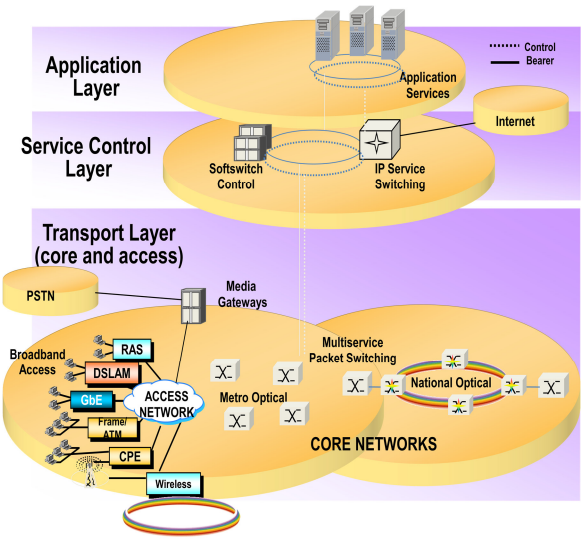

Figure 2 NGN layered architecture

NGN is a layered architecture consisting of Transport, Service Control and Application layers distributing intelligence at every layer. The underlying packet transport and media infrastructure are grouped under Transport layer which also inter-works with circuit- switched (PSTN) network through Media Gateways so that existing networks can co-exist and need not be scrapped. The Service Control layer consisting of Softswitches, Media Gateway Controllers and IMS perform the functions of control, authentication, accounting, maintaining QOS, security and network management. The Application layer makes use of the capabilities provided by other functional layers to provide multi-media services and applications based on Open Architecture of APIs[2][3]. As per ITU, "Next Generation Network (NGN) is a packet-based network able to provide services including, Telecommunication Services and Able to make use of multiple Broadband, QoS-enabled transport technologies in which service-related functions are independent from underlying transport-related technologies; It offers unrestricted access by users to different service providers. It supports generalized mobility which will allow Consistent and ubiquitous provision services to users."

What are these networks designed to do? From co-existing with PSTN, to be agnostic to access technology, they support quad-play, namely voice, data, video and mobile services including meeting the quality of service requirements. The architecture is based on open standards for the networks to be versatile with separation between service provision and underlying infrastructure so that operational license holders have flexibility andcould accommodate different content/application providers and niche service providers to serve the customers with innovative and multi-media services.

The emerging communication scenario is such that there is convergence of services and of access and transport supporting for all types of end user devices. NGN has not only to take care of every existing and new multimedia service but also cater to different end- user devices. These devices could be computer, laptop, fixed line telephone or mobile handset or TV or maybe some other device that is at present in the womb of the future. Such networks are obviously going to be the networks of the future as the handset delivers not only voice and data but also video, mobile TV, mobile e-mail and all other unified services. In effect NGNs are capable of providing any service from any infrastructure, irrespective of whether the service is in telecom, Internet or broadcasting, anywhere to anywhere from any device to any device. This is the big story in communication now, a change from VOIP to EOIP or Everything over- Internet Protocol;

Emerging NGN Applications- EOIP		
Voice over IP	Unified Messaging	BB - High Speed Internet
Primary line	Content Delivery	PC to Phone
Second line	Games	Phone to PC
IP Centrex usage	Downloads (MP3)	IP VPN (data)
Voice VPN	Gambling	BW on-demand
IP Centrex	Video on demand	QOS on demand

Video Conferencing	TV on demand	Quad play
HDTV	Cinema of the future	Instant messaging presence management
Multimedia Conferencing IPTV	Long distance bypass Tele Presence (TP)	MMS on fixed network Location Based Services (LBS) FMC (Fixed Mobile Con.)
Distance learning	IP offload	3G & beyond applications

Table 1: Emerging NGN Applications- EOIP

PSTN migration to NGN

The evolution of the PSTN to NGN would be determined by customers and services. Instead of merely providing broadband, it promises new services to end-users. NGN must build on the strength of both the telephony and the Internet service models. Access modernization is key in this evolution but state of the art PSTN solutions of today can evolve and stay part of the future NGN system to preserve investments. Access for instance could be through high speed broadband provided through ADSL, VDSL, and WI-Max, FTTH or PLC or all of them. Carrier Ethernet and IP-MPLS have become preferred transport modes. NGN demands service oriented, layered architecture where transport, control and application are separate and interconnected designed to take on new developments without massive additional investments. In the mobile area the operators have to provide now for a 3G plus Access and Internet Service Providers migrate to Next Generation Internet (IPv6). This calls for the new eco-system to facilitate the Next Generation Networks and services. Layman's point of view of an all IP-NGN Ecosystem is depicted in Table 2.

Next Generation Services – Converged (quad-play, voice, data, video, mobile)
Next Generation Access – High speed (Broadband)
IP based connectivity (ADSL, VDSL, Wi-Max, Cable TV, FTTH, PLC)
Next Generation Transport – Carrier Ethernet, IP-MPLS
Next Generation Architecture – Service oriented, Layered (Transport, control, application)
Next Generation Mobile – 3G+
Next Generation Internet – IPv6
Next Generation Interconnect – Capacity and Quality based
Next Generation Licensing – Unified and Class Licensing

Table 2: Next Generation Networks and services.

Advantages of NGN

NGN makes use of the best of both the worlds (flexibility, efficiency & Innovativeness of IP and QOS, Security, Reliability, Customer-friendly features of proven PSTN).
For service providers these provide many advantages. The integrated and efficient packet based technology reduces capex. Transmission costs are lower, greater power saving, less space requirement and less O&M costs while there is also the ability to offer a wider range of services at faster speed. Yet another advantage is personal service customization and management. Instead of maintaining different networks for different services, the single network alone needs be managed.Subscribers also benefit as call charges are reduced, they could choose multiple service providers to get maximum advantage of competitive offers and take advantage of single billing for all services of voice, data, video and mobile.

Fixed Mobile Convergence (FMC)

A major development due to the versatility of NGNs is that it is now possible to have a fixed-mobile convergence for the benefit of the users and also to conserve the precious licensed spectrum. That is, as per the convenience of the user, a mobile call can be delivered on fixed phone or can be terminated through a fixed broadband network on mobile phones. In a situation where many networks face spectrum shortage that affects quality of service, the need for spectrum for the mobile user could be reduced. Studies show that 70 per cent of the time a mobile calling user is in a fixed location or near a Hot Spot. In the context of decline in fixed line usage

and saturation in mobile, there could be more harmonious division of time between the two benefiting the entire system. As broadband becomes ubiquitous and cost effective and mobile handset is turned into a multi-purpose, multi-band palm-held computer, the advantages of increased use of FMC could be easily seen [4].

NGN Deployment Scenario

Several operators are now realizing NGN as the future and are evolving towards it. Obviously existing PSTN cannot be scrapped overnight but the migration has to be initiated the sooner the better. BT in the UK is one such operator. Key milestones towards NGN migration in what is termed as 21CN began with the initiation of transition in 2005, completing the transformation into NGN by 2011.Many countries like UK, Japan, Korea, Malaysia, Italy, Singapore, Vietnam and China have decided to migrate to NGN. The incumbent operators there are going for NGN and replacing their existing networks to IP -based in a time bound manner. This is being done to beat to competitors and new entrants on the technology front and being able to provide new value added services, cut down on apex as well as to make the network future-proof.

III. REGULATORY CHALLENGES

NGN capabilities are blurring the differences between multiple services and traditional boundaries between local access and long distance operators are vanishing. Regulators are now faced with ongoing technological developments causing drastic impact on the telecom scenario forcing a re-look at the service based licensing and geographical area based regulatory regime including numbering systems. They have to determine who exclusively telecom operator is and who value added service provider is when operators are also becoming value added service providers and niche operators are connecting to larger networks. Such a scenario compels a unified licensing of operations and services and also the Class licensing for Value Added Services. Another challenging development is the need for new interconnect products based on capacity and quality were so far these products have been designed to deal with distance and duration (Minutes and Miles). In a situation where telecom technologies are causing what one author has termed “death of distance” pricing based on distance becomes out date. For instance, a rupee a minute charge now prevails across the country for long distance calls whether the call is from Delhi to Lucknow or from Jorhat to Rajkot. Additionally operators and regulators have to deal with providing access to emergency services and security monitoring under all circumstances in the IP domain.

Way Forward

All the above challenges and also the technical as well as business oriented hurdles are to be faced and sorted out through consultations among all stakeholders, as there is no option then to migrate to NGN for survival as well as for customers' welfare, as they say “ **Packetize or Perish**”.

IV. REFERENCES

[1] ITU-T Recommendation Y.2001 (12/2004) - General overview of the NGN Telecom Regulatory Authority of India, Consultation Paper on Issues Pertaining to Next Generation Networks (NGN), 12 January 2006,

[2] Consultation Paper No: 2/2006, at http://www.trai.gov.in/trai/upload/ConsultationPapers/3/cpaper12jan06.pdf

[3] Cisco. 2002. How does network convergence support a business strategy? Retrieved December 2, 2008, fromhttp://www.cisco.com/global/EMEA/sitewide_assets/pdfs/tdm/iptel/how_does_network_convergence_support_a_business_strategy.pdf

[4] Crimi, J. C. , 2005. Next Generation Network (NGN) Services. Retrieved December 2, 2008, http://www.mobilein.com/NGN_Svcs_WP.pdf