Next Generation Network (*NGN*) - The future of telecommunication

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Customers now demand EoIP (*Everything over IP*), which requires NGN with ability to serve new multimedia services on any device. The NGN architecture with its separation of access, control and service layers, lends itself to the re-definition of the telecom landscape. New licensing should reflect technology-independent service provision or service-agnostic multiple technology service delivery. Packet networks also need new charging regimes with the 'death of distance', where interconnect charging agreements are no longer distance-based, but depend on quality and capacity.

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Mr Gupta was awarded the Minister of Railways award for the outstanding performance during 1995-96. He is the founder President of ACTO, an Industry body of carriers and members of National ICT Committees. He is a Fellow and Chartered Engineer of Institution of Electronics and Telecom Engineers, India and member of National Council. He is also a Life Member of Institution of Railway Signal and Telecom Engineers & Vice-President and Trustee of PTC India Foundation. He was elected as Vice President of ISP association of India and Advisor to OSP Association of India. He was elected as the Jt. Secretary of APT-ITU Foundation of India. Mr Gupta has founded the NGN Forum in India and serves as its Director General. He is a member of India IPv6 Task Force committee for IPv6 implementation and a Nominee Director of IT-ITES SSC of National Skill Development Corporation. He is also a member of National Broadband Plan (NBP) advisory body. He has been awarded the Bharat Excellence Award and Jewel of India Medal by the Friendship Forum of India during 2009-10 and included in the International Dictionary of Professionals by ABI, USA. Recently, he published a book entitled Everything Over IP that covers almost all about NGN and Broadband.

Introduction

In the current state of economic meltdown and cut-throat competition, Telecom operators need ways of providing multiple services over their networks to demanding customers. They need to address falling average revenues per user (*ARPU*) as additional growth of voice services is gained via penetrating lower and lower income levels. Offering the same customer base, multiple services requires establishing multiple networks, which is very inefficient, and therefore a converged Next Generation Networks (*NGNs*) is needed, which is entirely based on Internet Protocol (*IP*). This could be done without dumping the investments in existing legacy networks, which are still delivering the goods, however inefficiently. The

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layered architecture of NGN is ideally suited for technology-agnostic based services, thus encouraging the competition as well as enabling the optimum utilisation of telecom infrastructure.

What is Next Generation Networks (*NGN*)?

ITU defined NGN in 2004 as: "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 generalised mobility which will allow consistent and ubiquitous provision of services to users."

The NGN is based on packetisation technology with a separation of infrastructure, service control and service provision functions. As the inflexible circuit-switched connection-oriented TDM technology is phased out, the IP-based NGN is taking charge. In NGN domain, the main network elements are: Softswitch, IMS (*IP Multimedia Subsystem*), media gateways, application servers, routers and broadband access nodes.

The schematic diagram depicting the Layered Architecture of NGN distributing various network elements is shown in Figure 1. As shown, the NGN layered architecture consists of transport, service control and application layers, distributing intelligence at every layer. The underlying packet transport and media infrastructure is in the Transport layer interworks with circuit-switched (*PSTN*) networks through media gateways, so that existing networks can continue to support subscribers. The service control layer, consisting of softswitches, media gateway controllers and IMS (*IP Multimedia Subsystem*), performs the functions of control, authentication, accounting, QoS, security and network management. The application layer makes use of capabilities provided by the other layers to deliver multimedia applications based on open service architecture and published APIs.

The NGN architecture defines open standards to support the interaction between service provision and underlying infrastructure, so that operational licence holders can accommodate different content/ application providers and niche service providers can serve their customers with innovative multimedia services.

NGN is required to cater to many different end-user devices. These devices could be computer, laptop, fixed-line telephone, mobile handset or TV, or any device that is at present in the imagination of the designers. These handsets deliver not only voice and data but also video, mobile TV, mobile e-mail and all other converged 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 fundamental change from VoIP to EoIP - Everything-over- Internet-Protocol.

PSTN migration to NGN

The evolution of PSTN to NGN would be dictated by customers and services. Instead of merely replacing voice services by a broadband version of them, it promises new services to end-users. NGN must build on the strength of both telephony and Internet service models. Access modernisation is key in this evolution but state-of-the-art PSTN solutions of today can evolve and stay part of the future NGN, to preserve investments. Access, for instance, could be through high-speed broadband provided through ADSL, VDSL, LTE, FTTH or all of them. Carrier Ethernet and IP-MPLS (*Multi-Protocol Label Switching*) have become the preferred transport modes. NGN facilitates service-oriented architecture that enables new developments to be integrated without massive additional investments. .

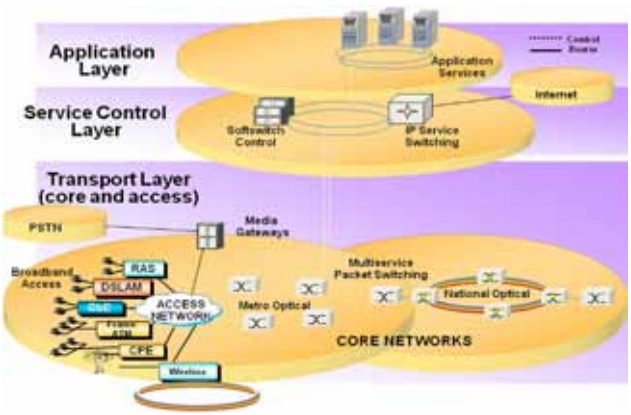

Figure 1

The All IP - NGN Ecosystems

Next Generation Services - Converged (voice, data, video, mobile)
Next Generation Access - high-speed (Broadband) IP-based connectivity (ADSL, VDSL, LTE, Cable, FTTH)
Next Generation Wireless Access - 3G+/4G, Advanced WLAN
Next Generation Transport - Carrier Ethernet, IP-MPLS,
Next Generation Architecture - Service oriented, layered
Next Generation Internet Protocol - IPv6
Next Generation Interconnect - Capacity and Quality based charging
Next Generation Licensing - Unified and Class Licensing
Next Generation Regulation - Converged (Single Regulator for ICE)

Advantages of NGN

For service providers, the NGN features provide many compelling advantages. The integrated packet-based technology reduces Capex and Opex. Transmission costs are lower, there is greater power saving, less space requirement and less O&M costs while there is also ability to offer wider range of services at faster speed. Instead of maintaining different networks for different services, only a single network needs be managed.

Subscribers will benefit when call charges are reduced. They could choose multiple service providers to get maximum advantage of competitive offers or take advantage of single billing for all services of voice, data, video and mobile. In addition, customers can control their own application layer and obtain On-Demand services.

Fixed mobile convergence (*FMC*)

NGNs enable fixed-mobile convergence that benefits users but also conserves scarce licensed radio spectrum. For example, a mobile call can be delivered on fixed phone or terminated through a fixed broadband network on a mobile phone. Where many networks face spectrum shortage, this could reduce spectrum consumption. Studies show that 70 per cent of mobile calls are received when the user is at a fixed

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location or near a Hot Spot. In the context of declining fixed-line usage and saturation in mobile ownership, there could be more harmonious division of work between the two, benefiting the entire system. As broadband becomes ubiquitous and the mobile handset is turned into a multi-purpose, multi-band, palm-held computer, the advantages of increased use of FMC could be easily foreseen.

NGN deployment

Many operators are now convinced that NGN is the future goal and are evolving towards it. Obviously, existing PSTN cannot be scrapped overnight but migration has to be initiated, and 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, and now moving beyond NGN through superfast broadband powered by FTTH.

Operators in many countries like UK, Japan, Korea, Malaysia, Italy, Singapore, Vietnam and China have decided to migrate to NGN. The incumbent operators there are replacing their existing networks by IP-based infrastructure in a time-bound manner. This is mainly motivated by the need to face competitors and new entrants and provide new value-added services, cut down on Opex and make the network future-proof.

Regulatory challenges in transition toward NGN

As NGN capabilities blur the differences between various types of services, traditional boundaries between local access and long distance operators are vanishing. Regulators faced with the impact of ongoing technological advancements on the telecom environment, are forced to re-look at service-based licensing and geographical area-based regulatory regime, including reformed numbering systems. They have to determine who a telecom operator is and who a value-added service provider is, when operators are also becoming value-added service providers and niche service providers can connect via larger networks. Such a scenario necessitates considering a technology-neutral and service-agnostic unified licensing for operations and services, and 'class licensing' for Value-added Services. In addition, there is a need for another category which would be authorised to create and provide underlying infrastructure for service providers.

There is also the need for interconnect charging to be based on capacity and quality, instead of the existing systems which have been designed to deal with distance and duration (Minutes and Miles). Where telecom technologies are causing what is termed 'death of distance' - pricing based on distance becomes out of date. For instance, a rupee a minute charge is now valid for long distance calls whether the call is from Delhi to Chandigarh (250 km) or from Kashmir to Kanyakumari (3000 km).

Opportunity for non-facility based service providers (MVNOs, resellers)

The layered architecture of NGN provides a great opportunity for the regulators to facilitate Resellers and MVNOs who will operate at service layer. They will make use of the underlying transport and control infrastructure created by main operators who wish to act as wholesalers/carriers. This will optimise utilisation of the infrastructure and enable the competition to enter the market faster in a cost-effective manner. The NTP-2011 draft in India has envisioned this concept already in the form of Network Service Operator (*NSO*) and Service Delivery Operator (*SDO*).

Way forward

The many challenges, technical as well as business hurdles, are to be faced and sorted out through consultations among all stakeholders in coopetition mode, as there is no option but to migrate to NGN - for survival as well as for overall societal welfare. As they say - "Packetise or Perish". ●