Next Generation Networks: A Continuous Approach Towards Goal

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Abstract

The next generation networks (NGN) are packet-based networks able to converge the existing communication services. The packet-based network is proposed to design with architectural changes for using multicast technology and it will have almost no limitations. The next generation networks also called future generation networks is ongoing process and the development of this technological advancement will be continue from generation to generation. The continuous demand of convergence of networks and migration from conventional networks to next generation networks, it is challenging to fulfill the demand within a specific period of time. The convenient allocation of next generation services to the users, the continuous technological improvement is necessary. This paper has written to show the actual overview and continuous approach towards next generation networks.

Keywords: NGN, OPEX, IP-based networks, IMS, PSTN, PLMN, Migration process, Fourth generation (4G) networks.

1. INTRODUCTION

The next generation networks (NGN) are the future networks defined by International Telecommunication Union (ITU) as packet-based networks, with the service layer separated by the transport layer, which transforms them into a platform of converged infrastructure for a range of previously distinct networks and related services. Technological innovation, stimulated through digitalization, has been a major factor in driving change in the communications market [1]. This innovation is reducing costs and enhancing the capability of networks to support new services and applications. A key innovation which is expected to bring further significant changes in the communications market is the transformation from circuit-based public switched telecommunication networks to packet-based networks using the Internet Protocol, so-called next generation networks (NGN). NGN is expected to completely reshape the present structure of communication systems and access to the Internet. The present structure of vertically independent, although interconnected, networks may be transformed into a horizontal structure of networks based on Internet Protocol. Investment requirements for NGN are high and, as for any investment, there are risks. Policies need to ensure that risks and uncertain returns are compensated while ensuring competition since, without competition, the benefits of high-speed broadband and NGN will not be realized. The developments in new communication structures and the impetus they are expected to give to the present process of convergence in networks, services and terminals are expected to lead also to new policy challenges. In particular, convergence and the development of the NGN may require a review of a number of elements of the present structure of economic regulation of communication markets, in order to ensure that regulation allows the potential benefits of these technologies to rapidly diffuse in economies and societies. Convergence, by changing service boundaries, service characteristics and stimulating the offer of new services, may require that new markets are regulated differently than existing ones. Due to the complicated nature of this issue the number of approaches nearly equals the number of operators, at least from a technical point of view [2]. However, there are aspects and keywords most agree upon - for example the use of IP Multimedia Subsystem (IMS) as the basis for future multimedia services.

The NGN concept is a theme which is establishing from initial level and the important matter is all telecommunication and internet service providers are finding and trying to solve their problems by using concepts .The packet –based networks are going popular day by day because of high speed and multicast and multimedia facilities. The intention of this research is to show the overview of whole contribution of

NGN in current situation and its future. The main objectives of this paper to show the actual progress towards NGN from its initial stage to ongoing final stage.

2. ARCHITECTURAL FRAMEWORK OF NGN

The next generation networks (NGN) architecture is different than conventional circuit-switched networks. The layered architecture consists of five layers. The five function layers are [3] : (1) Application Layer that supports SIP protocol; (2) Network Control Layer that aims at overcoming the bottleneck problems at edge nodes or servers for end-to-end admission control; (3) Adaptation Layer that supports different network configurations and network mobility; (4) Network Transmission Layer that provides end-to-end QoS control for real-time communications through integrating Differentiated Service (DiffServ) and Multi-Protocol Label Switching (MPLS) and (5) Management Layer that provides Web-based GUI browser for data presentation, monitoring, modification and decision making in NGN.

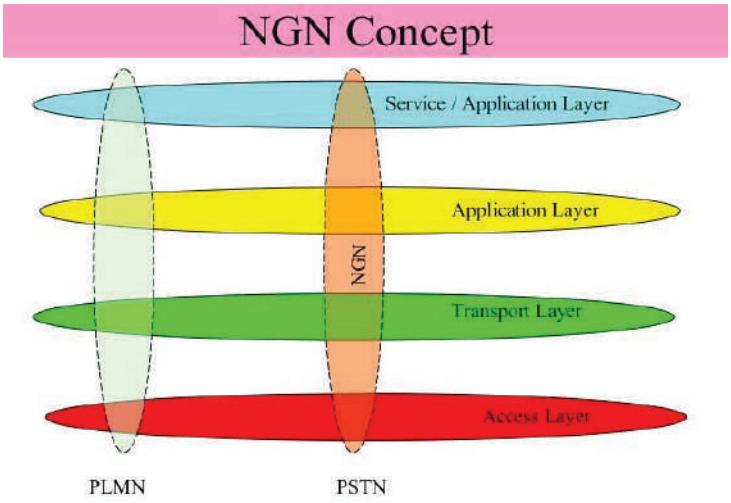

Figure 1. NGN layers concept

The public-switched telephone network (PSTN) and Public land mobile networks(PLMN) are merged to create the NGN layers as shown in figure 1.

3. MIGRATION TO NGN

Migration is also called transformation from one network to another. The reasons of migration is depends on the technological advancements, new features, comparison with the existing systems ,marketing strategies, advantages of new systems and technologies and the user-friendly instruments. The legacy networks capabilities are not increasing with demands that's why the migration from legacy to NGN is accelerating. The migration from legacy networks to NGN is increasing from year to year. The whole migration process involves several steps . These steps are depends on the types of users and their services. The process given below.

3.1 Migration process

Possible sequence of migration steps is as follows [4] :

1. Introduce a core network capable of supporting quality of services for each future class of traffic it will carry. Packet voice is one such class.
2. Introduce media gateways to support interworking with legacy switched circuit networks (including the operator's own network until migration is complete).
3. Introduce access gateways to receive the analogue copper loops. Voice digitization, encoding and packetisation take place in the access gateway.

4. Introduce IMS call/session signalling. The access gateways must generate IMS messages in response to loop signalling on the subscriber line side.
5. Introduce a new OSA/Parlay service platform. Develop services identical to those already supported on the IN platform.
6. Subscribers on analogue loops can then be transferred to the NGN. IMS call/session control takes over and bearer traffic moves to the multiservice network.
7. Intelligent phones can be offered via an integrated access device (IAD) at the customer premises and multiservice IP edge node (IPEN). IMS signalling now involves the terminal.

3.2 Migration preparation and plans

Migration from conventional circuit-switched networks to NGN needs some preparation and plans [5] . These are:
(1) Network migration plan
(2) Data migration planning
(3) Phases implementation plans
(4) Cutover process plans
(5)Tests, acceptances, and operation plans.

4. CURRENT MIGRATION OVERVIEW

The current migration process is moving speedily from last few years. Migration speed towards NGN at a medium pace in four consecutive years with feasible rates in the region indicated in Figure (2) according to the initial maturity of network and services combined with the economic affordability. Migration of data services starts one year after voice services due to the need of the end to end deployment for high speed and quality grade data flows. It should be emphasized that a quicker speed is difficult to implement for a new technology (first time) and a lower speed will imply a longer period of both technologies working in parallel that do not facilitate savings in OPEX. Those migration rates apply both to the existing services carried by the traditional technology as well as for the new services demand.
The migration from PSTN to mobile networks is increasing from last few years. The latest generations of mobile networks such as fourth generation (4G) providing some extra features including high data rates with multimedia and multicasting facilities. The migration rates from last few years are given below with a chart. The green line shows data migration rate, the red line shows voice migration rate and the blue line shows the year progression. The X-axis represents the migration rate and the Y-axis represents last 11 years.
The voice migration started early than data migration rates as shows in figure 2 [6]. Both migration rates are increased linearly from last eleven years. The result shows that the migration from conventional networks to IP-based networks are growing continuously.

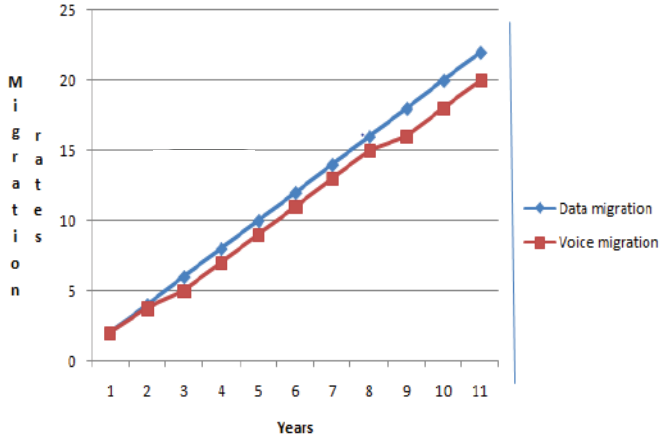

Figure 2. Voice and data migration rates of last 11 years

Another figure shown below, which represents the yearly progress of migration from year to year. The amount of fixed to mobile telephone subscriptions are shown in figure 3.The X-axis represents the amount of subscription and Y-axis represents the years. The blue portion shows the amount of subscriptions.

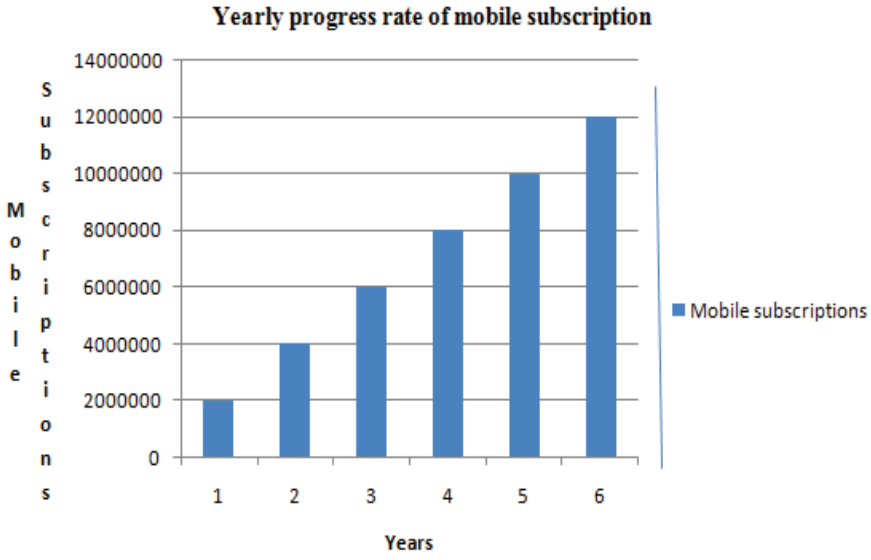

Figure 3. Yearly progress rate of migration to NGN

It is estimated that the migration from TDM to IP would be completed in in approximately 2030. It is easy to understand the maintaining a network part with utilization rate of 1% isn't economically viable. That is why the telecom operators must participate actively in order to speed up the network migration. The legacy networks users are decreasing rapidly but will not vanish within few years. It will continue and after estimated period (2013) the IP-based users will dominate almost all over the world. So

5. COMPARISON OF PSTN AND CELL-PHONE USERS IN BANGLADESH

Source: Bangladesh Telecommunications Company Limited (BTCL)

Year	Cell phone users (millions)	PSTN users (millions)
2017	135.98	N/A
2016	131.376	N/A
2015	126.866	0.8095
2014	116.553	1.00
2013	105.051	1.20

Table 1. Users comparison table of Cell phone and PSTN in Bangladesh

The Table 1. shows that the statistical overview of PSTN and Cell phone users of last five years. Its shows that the cell phone users are increasing while the PSTN users are decreasing dramatically. This alarming result telling the current operators to rearrange the network infrastructure and to build –up their networks suitable for next generation networks(NGN).Although the PSTN is low cost than NGN , in broad sense it is desirable to go to NGN because after certain period of time , it will possible for operators to reduce the cost of NGN when all of the ingredients of NGN will successfully installed.

5.1 Fourth generation (4g) feasibility and penetration

Almost hundred countries in the world has been covered by fourth generation(4G) networks. It is called long term evolution(LTE) .The 4G is fully IP-based networks and it is called next generation networks. The fastest IP-based networks are spreading worldwide very firstly. Since the IP-based networks are covering the world firstly ,it can easily guess that the IP-based networks will be the next generation networks (NGN). Bangladesh telecom operators are taking initiative to implement and upgrade their

networks into 4G . The deployment of 4G networks needs infrastructure development. They have already bought the spectrum for 4G and some operators are under trial for deployment of 4G networks.

6. DISCUSSION AND CONCLUSION

The next generation networks (NGN) is a dream to everyone. The current operator in telecom and internet sectors in worldwide are working for best user-friendly features of NGN. This is a challenge for every operators to reach the destination within specific time. The worldwide internet and IP-based users are growing immediately, that's why the operator should take the challenges and overcome the current problem to deployment the 4G and upgraded generations such as fifth generation (5G) and others. The paper has written for ultimate future of current and next generations mobile networks and possible problems for deployment of next generation networks. The future of mobile and broadband networks will be more challenging than current times because the technological development is developing rapidly. To overcome these new generation challenges the operators and the organizations related with these sectors must have to upgrade. The current migration from conventional PSTN and other TDM-based technologies to NGN will be continue up 2030. After this time period , it seems that the world will be the world of next generation networks (NGN).

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