

# Services in NGN-Future Telecom Network

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## ABSTRACT

Telecommunication Next Generation Network (NGN) is a converged network of new generation to provide the multitude of services over a single network infrastructure, rather than providing multiple services over separate and overlaid networks. Instead of using separate networks in NGN we are going to use single network which is packet based and survives on IP backbone. NGN is the future of telecommunication industry where all the services would be carried over IP. It is the unification of data, telephone, and mobile network including their services into one network concept. Telecommunication industry is rapidly growing towards NGN with its already existing services and with provisions for new services. In this paper we are going to study the various services in NGN provided by its core network, access network and also by the various NGN elements.

**Keywords**— Next Generation Network (NGN), Quality of Service (QoS), Services.

## 1. INTRODUCTION

Telecom traffic with growing technology is increasing day-by-day for that our conventional system is not enough to provide or not capable to provide increasing demand of establishment of new users and services. At present, we are using three networks for voice, video and data. Because of technological progress and increasing demand of services, there is a need of converged network i.e. NGN. NGN is the network that will unify legacy networks with their services and with improved Quality of Service (QoS). Service creation depends on the user demand, network, service functions and its properties. So while creating such an advanced network which supports all the services over one network we have to take in mind its

architecture which supports and manages different services with different elements in its layered architecture. Building of NGN architecture as a layer modeled structure gives opportunities to new network services to be deployed easily in it. For a service, conventional network has the vertically separated network and NGN has the horizontally layered network. And again the access, transport, control and service functions are separated into individual network layers. These layers can be managed by different service providers. And so NGN is the best solution for developing and propagating new services to the users.

## 2. NGN OVERVIEW

Since NGN is nothing but the modified telecom network whose base is the conventional systems used in telecom, so before getting acquainted to NGN let's first have a quick glance over the conventional system and then move towards NGN.

## 2.1. Conventional System

Currently we are using three different networks for three types of services. These are as follows:

### 2.1.1. Public Switched Telephone Network (PSTN):

It is mainly designed for the voice connectivity over the wired connection. It uses analog circuit switching technique.

### 2.1.2. Public Land Mobile Network (PLMN):

It is designed to give wireless connectivity to users for voice. Use of this network is more as it has some advanced features as compared to PSTN.

### 2.1.3. Public Switched Data Network (PSDN):

The popular use of this network is Internet. In this information is forwarded to the end user by assembly of routers.

## 2.2. Drawbacks of Conventional Systems

- Traditional networks are slow to develop new technologies.
- These networks are not compatible for IP platform so security is less.
- There are no convergence features.
- It requires high CAPEX & OPEX due to maintenance of different networks for different services.
- There are Large Power and Cooling requirements.

## 2.3. Next Generation Network (NGN)

It is convergence of above systems to give the one united system which is capable to handle the all services.

The definition of NGN as per ITU is "A Next Generation Network (NGN) is a packet-based network able to provide Telecommunication Services to users and able to make use of multiple broadband, QoS- enabled transport technologies and in which service-related functions are independent of the 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 of services to users."

As per definition, in NGN, control functions, applications/services, etc are separate; transport of voice and signaling is across a common packet-switched network dedicated to multi-service transport and advanced services are triggered from call/session control servers and implemented on separate application servers which can be remote from the other elements. NGN is capable of supporting wide range bandwidth and high QoS. It also supports the wide range of services, applications and also provides multiple broadband services to the users. This network supports the legacy network via open interface and the legacy network can be accessed by different service providers. Hence NGN is the best solution for future telecommunication networks.

## 2.4. NGN Architecture

The crucial feature of NGN architecture is the separation of the main functional units into three layers as shown in figure 1:

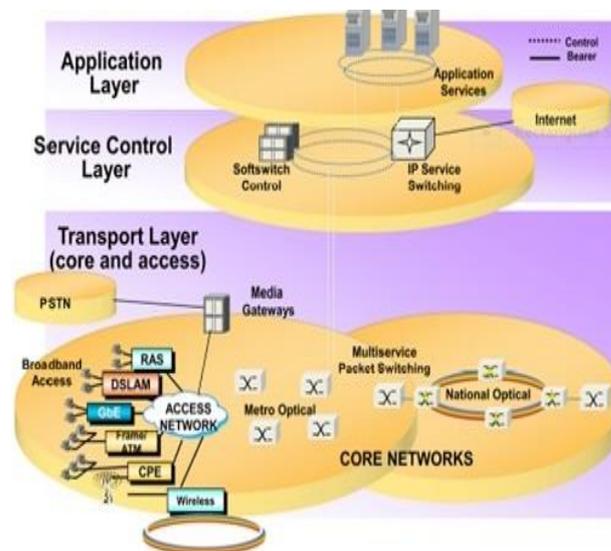


Figure-1: Layered architecture of NGN

### 2.4.1. Transport Layer:

Transport functions provide connectivity for all physically separated functions within NGN. It is IP based layer and combination of core and access layer. It basically works within the Multi Protocol Label Switching (MPLS) cloud and consists of various routers and performs the main functionality of transporting data between the nodes of network. Transport layer interworks with the circuit switched network (PSTN)

through media gateways so that the old network can also co-exist during the migration of networks.

### 2.4.2. Service Control Layer:

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.

### 2.4.3. Application Layer:

It provides the enhanced and multimedia services to end subscribers. Any service can be introduced with the help of server (e.g. prepaid, announced and service servers) at any time without any modifications in the control, transport or access networks.

## 3. SERVICES PROVIDED BY NGN CORE NETWORK

The NGN services can be categorized into three wider areas on the basis of function, properties, use and scope etc. which are stated as follows:

- Communication Services (voice call, VPN etc.)
- Information Services (content services)
- Transaction Services (e-commerce etc.)

A brief description of various services provided by NGN is presented below:

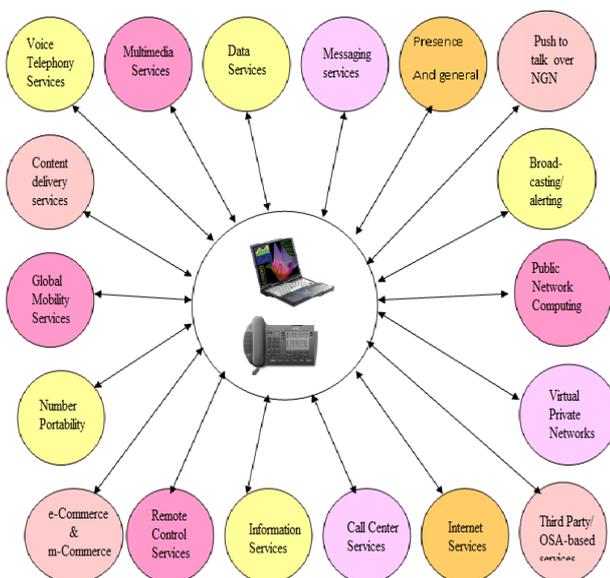


Figure-2 Services of NGN

### 3.1. Voice Telephony Services

NGN supports all existing PSTN/PSDN/PLMN voice telephony services like Call Forwarding, Call Waiting, 3-Way Calling, Calling number and name Identification Presentation, Centrex services, various IN services and other value added services.

### 3.2. Multimedia Services

These services provide the facility of interaction to the group of community or group of users using voice, video, picture and data. Video conferencing, multimedia value added services, collaborative computing, mobile TV, electronic white boarding, video mail etc. comes under the multimedia services. In multimedia call there is electronic whiteboard application where both parties can meet by virtual meeting.

### 3.3. Data Services

Data services establish real-time connectivity between endpoints along with various data related value-added features (e.g., bandwidth-on-demand, connection reliability/resilient, Switched Virtual Connections (SVCs), bandwidth management and call admission control). Data services include file transfer, World Wide Web services, applications sharing interactivity etc.

### 3.4. Messaging Services

NGN give messaging services for fixed and mobile networks by real and non-real messaging. Some messaging services are designed as 'real time' and others are 'non-real time' (mailbox) service where the messages are stored and delivered at a later time.

#### 3.4.1. Unified messaging:

Unified Messaging facilitate voice mail, email, fax mail service etc. through common interfaces to the user. User can access these services through any network (wire-line, wireless network).

#### 3.4.2. Instant messaging:

Instant messaging (IM) is a form of real-time communication which happens between two or more people based on typed text and it is supported across fixed and mobile networks. Low

latency, mobility, message filtering, security and group management are key features.

#### **3.4.3. Chat:**

This facilitates the real time communication between the two end users who has logged in on their account on the internet.

#### **3.4.4 MMS and SMS:**

This facilitates near real time communication by sending and receiving multimedia messages or text messages. For example, video greetings can be sent using MMS.

### **3.5. Virtual Private Network**

Voice VPNs improve the multiple location networking capabilities of businesses by combining their existing private networks to work together for efficient working and combining with subsets of PSTN, thus providing subscribers with uniform dialing capabilities. Data VPNs provide added security, internet access facility and networking features that allow customers to use a shared IP network as a VPN.

### **3.6. Push to talk over NGN**

'Push' operation refers to service initiated data transmissions to members of a particular group. Push-to-Talk, also referred to as PoC (Push-to-Talk over Cellular). It is built around VoIP (Voice over IP) technology. It is a wireless service that turns mobile phones into long-range walkie-talkies by connecting to other phones without dialing i.e. one can simply push a button and talk to members of a group. The conversation will be one-way-at-a-time instead of a two-way conversational mode. It is used for short-duration and high-urgency voice communications and keeps an 'always-on' connection between groups of frequently called mobile subscribers like family, colleagues, business associates, friends etc. All members of the group can hear the speech from remaining group members and the listeners do not have to press any button to hear the speech from others as it is 'always on'.

### **3.7. Global Mobility Services**

In NGN environment phone and other devices user can travel from place to place. Global Mobility Service provides global roaming and other location based services for all types of wireless and wire line users. Mobility can be for terminals, users and services.

### **3.8. Content Delivery Services**

The content based services like music and video on demand, radio streaming, gaming, financial information distribution, professional and medical image distribution, electronic publishing etc. can be offered to customers using NGN.

### **3.9. Number Portability**

Number Portability provides the end subscribers to retain their existing directory numbers while moving from one physical location to another or from one service provider to another.

### **3.10. Broadcasting Services**

These services involve transmission of data to many users simultaneously, allowing efficient use of bandwidth for radio broadcast and TV broadcast. For example, IPTV (Internet Protocol Television) is used for delivering digital television services over the Internet Protocol (IP) using wire line as well as wireless broadband connections. The end user terminals can be a PDA, Laptop, mobile handset, TV etc.

### **3.11. E-commerce and M-commerce**

These services allow consumers to purchase goods and services electronically over the internet. These services include processing the transactions, verifying payment information, providing security and possibly trading (i.e. matching buyers and sellers who negotiate "trades" for goods or services), home banking, home shopping, Business-to-business applications (e.g. supply-chain management and knowledge management applications) etc.

### **3.12. Emergency Telecommunication Services**

Emergency services can be provided between citizen to authority, authority to authority and authority to citizen. Typical emergency services are Police assistance, medical assistance, disaster relief operations, lawful intercept services etc.

### **3.13. Third Party Services**

NGN provides open API interface for third party or person to develop personalized services: Third party/OSA-based services are applications developed and provided by vendors

outside the service provider's domain using IT technology and tools. Parlay is an open standard API designed to facilitate easier access to core network capabilities from outside of the network. Such API allows the existence of new business models.

### **3.14. Remote Control/Tele-action Services**

These services can be used for home applications control, telemetry, electronic voting, alarms etc. With the advent of in-home networking and intelligent appliances, these services could control and monitor home security systems, home energy systems, home entertainment systems and other home appliances.

### **3.15. Information Services**

This service is also called as voice portal service. These services contain news, sports scores, weather, stock quotes, advertisement, directory enquiry service, cinema tickets, motorway traffic status and information to consumers based on pre-specified criteria or on personal preferences.

### **3.16. Call Center Services**

A user can make a call to a call center agent by clicking on a Web page or CPE. The call is routed to an appropriate agent, who could be situated anywhere, even at home (i.e. virtual call centers). Voice calls and e-mail messages are queued uniformly for the agents. Agents would have electronic access to customer, catalog, stock, and ordering information, which could be communicated back and forth between the customer and the agent.

## **4. SERVICES PROVIDED BY SOFT SWITCH**

A Soft switch (software switch) is a device independent software platform designed to facilitate telecommunication services in an IP network. So, there is large number of services provided by soft switch and some of which are described as follows:

### **4.1. Abbreviation Dialing**

Abbreviated dialing includes the use of a short telephone numbers to reach public services.

### **4.2. Absent Subscriber Service**

This feature makes possible for a subscriber who cannot answer the calls because he/she is absent, to divert these calls to an announcement.

### **4.3. Charge Accounting**

This service provides information about costs of a call and takes the charges from end user account.

### **4.4. Anonymous Call Rejection**

The Anonymous Call Rejection service enables a user to reject calls from anonymous parties. By activating this service, callers without available caller identification get informed that the user is not accepting calls at that time.

### **4.5. Auto Call Back**

When the calling person is engaged, calling party can register for Auto Call back by inserting a specified button or key on the calling instrument. It is not possible to place an automatic call back if the called number is diverted to voicemail. As soon as the called party hangs up, a call will set up automatically from caller to the called party. This feature saves time and network resources to keep trying the same number over again and again.

### **4.6. Automatic Hold/Retrieve**

The Automatic Hold/Retrieve service provides an alternate method to hold and retrieve calls for System users. Specifically, this service can be setup where calls are held without having to use feature access codes. This service is especially useful to attendants handling large volume of incoming calls by allowing them to hold calls by simply transferring them to dedicated parking stations.

### **4.7. Call Forwarding Busy**

Call Forwarding Busy enables a user to redirect calls to another destination when an incoming call encounters a busy condition. The user can activate and deactivate the service. If activated, a user must specify the forwarding number.

### **4.8. Call Forwarding on not reachable**

Call forwarding on not reachable enables the user to redirect calls to another destination (Phone number, voice mail) when

an incoming call encounters a not reachable condition. The user can activate and deactivate this service through an activation/deactivation procedure. The caller status can become unreachable in case of power failure or LAN cable disconnection.

#### **4.9. Call Forwarding Selective**

Call Forwarding Selective enables a user to define criteria that causes certain incoming calls to be redirected to another destination. The user controls the service via an interface, which provides the ability to set the forwarding destination address and the criteria sets for determining which calls require forwarding.

#### **4.10. Call Intercept**

Call Intercept records the call contents and identity and gives several options for handling the call.

#### **4.11. Call Return**

Call Return enables a user to call the last party that called, whether or not the call was answered. To call back the last party that called, the user dials the call recall star code. The system stores the number of the last party to call, and connects the user to that party.

#### **4.12. Call Waiting**

Call Waiting enables a user to answer a call while already engaged in another call. When a second call is received while a user is engaged in a call, the user is informed via a call waiting tone. To answer the waiting call, the user depresses the flash hook. The user connects with the waiting party and holds the original party. By depressing the flash hook, the user reconnects to the original party and holds the waiting party. The feature completes when any party hangs up. Users can activate/deactivate the Call Waiting service for all incoming calls via their web interface. The users also have the option of cancelling their Call Waiting on a per-call basis by dialing a star code before making the call, or after a switch-hook flash during the call. Once the call is over, Calling Waiting is restored.

#### **4.13. Carrier Pre-Selection**

Carrier Pre-Selection (CPS) is a mechanism that allows end-users to select, in advance, alternative Service Providers to carry their calls without having to dial a prefix or install any special equipment at their premises.

#### **4.15. Closed User Group**

A Closed User Group is a logical group within the operator's network. Users belonging to a 'Closed User Group' are permitted to communicate with each other but not with users outside the group. A user Data Terminal Equipment (DTE) may belong to more than one closed user group.

#### **4.16. Dial Up Call**

It is used for connecting a network connection, e.g. Internet, which requires a telephone number to be dialed.

#### **4.17. Direct Inward/Outward Dialing**

This feature is applicable for Centrex or PABX users. Users can be assigned a directory number that can be used to place/receive calls directly from/to their phone, without forcing access via a central number. Incoming and outgoing calls can be placed/received via the phone or the Call Manager (except an initial incoming call, for which the phone must be taken off hook).

#### **4.18. Fax Call**

Point-to-point FAX and Multi-point FAX services are supported.

#### **4.19. Incoming Calls Only**

This facility restricts the user to receive incoming calls only.

#### **4.20. Outgoing call only**

This facility restricts the user to make outgoing call only.

#### **4.21. Priority Lines**

This feature allows some lines in the exchange to be marked as priority lines. These lines get preference while originating calls, in case of abnormal conditions like switch overload or network congestion. This feature can be useful for individuals or services more responsible for the maintenance of law and order and security of the citizens, under emergency conditions.

#### 4.22. Selective Call Services

This service allows the end-user to give special treatment to calls originating from a pre-defined list of subscriber numbers. The result of this treatment can be either differentiated ringing (for different members of a family) or rejection of non-expected calls.

#### 4.23. Voice Mailbox Service

This service implements all functionality needed to the end user to complete call answer service. Not answered incoming calls are redirected to a voice mailbox, where the caller may leave a message.

### 5. SERVICES PROVIDED BY APPLICATION LAYER

The Application layer makes use of the capabilities provided by other functional layers to provide multimedia services and applications based on Open Architecture. Some of these applications are described below:

#### 5.1. Application Sharing

Application Sharing is an element of remote access that enables two or more users to access a shared application or document from their respective computers simultaneously in real time. Mostly the shared applications run on a host computer and remote access to the shared content is provided to other users by the host user.

#### 5.2. Call Notification

Call Notification enables a user to define criteria that causes certain incoming calls to trigger an e-mail notification. If an incoming call meets user specified criteria, an e-mail (or short message to a cell phone) is sent to the notified address informing the user of the details of the incoming call attempt. The user controls the service via a web interface, which provides the ability to set the notify e-mail address and to set the criteria for determining which call triggered a notification. A criteria set is based on incoming calling line identity, time of day and day of week. Multiple criteria sets can be defined.

#### 5.3. E-learning

Electronic learning refers to computer-enhanced learning through which we can access the study material from the Internet. It consists of links to selected and reviewed articles, white papers, research reports, conferences, journal articles, workshops, seminars etc. Today by using smart phones, tablets and laptop E-learning has become very easy. For example, NPTEL provides E-learning service through online Web and video courses in Engineering and Science.

#### 5.4. Electronic Publishing

This service provides news, financial matters, travel information, movie trailers, sales, promotion etc. on user terminal.

#### 5.5. Multimedia Conference

It is the multi-party interaction with each other using voice, picture, video and data file.

#### 5.6. Radio Streaming/Music on Demand (MoD)

Radio streaming is audio transmission over a data network to deliver audio on demand or an audio broadcast. Unlike sound files (WAV, MP3, etc.) that are played after they are downloaded, but in MoD we request for the music to play online without downloading. We get the music after few seconds of requesting. Music-on-Demand enables individuals to select audios from a central server for listening music on computer or any other audio device.

#### 5.7. Video streaming/Video on Demand

Video streaming is a video transmission over data network to deliver video-on-demand or a video broadcast service. Unlike movie files (MPG, AVI, etc.) that are played after they are downloaded, streaming video is played within a few seconds of requesting it, and the data is not stored permanently in the video play device. Video-on-Demand enables individuals to select videos from a central server for viewing on a television or computer screen.

#### 5.8. Web Browsing

Web browser is a software application used to locate and display Web pages. The two most popular browsers are Netscape Navigator and Microsoft Internet Explorer. They can display graphics as well as text. In addition, most modern

browsers can present multimedia information, including sound and video. Subscribers can control their subscribed services through Web Portal. Click-to-dial, Call Answer, Call hold/Retrieve, Call Release services can be invoked via the web portal.

## 6. CONCLUSIONS

An NGN deployment provides good revenue and new services from voice, data and video integration but NGN development is not easy. NGN deployment is done step-by-step i.e. in phases with service integration with provision to new services. By growing technology service providers recognized the value of new services and started giving new services with QoS with the development of NGN. We have seen so many services of the telecommunication which are necessary in new networks. NGN architecture is packet based and its transport is IP based so it offers high service security and QoS. Services get accessed by the end user with no inference by other users. There is end to end IP connectivity between the service and service user. NGN is service oriented network which will enhance the telecomm sector with services explained above. Excellent service assurance for traditional and new emerging services is the key to satisfy existing and new customers. These services are going to make users life easy and fast. The users will access many services with one IP address with unite bill of all services. For future service development, service provider must have to work on user demand, network, QoS, properties and scope etc to get good response from end users.

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