Next Generation Networks for India

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Abstract

Implementation of NGN networks in India will go a long way in convergence of the IT, telecom and broadcasting industry. This will lead to the growth of value added services (VAS) for end users, but will pose serious challenges to the regulatory bodies. In this paper we propose a framework to test the readiness of NGN adoption and illustrate the NGN eco-system. Next we explore the viable business model for NGN adoption in India. We then propose that road map by which the rural health care delivery system in India could benefit from NGN networks.

Keywords: NGN, broadband, business models, public garden, gated garden, walled garden, two sided platform, regulation, national rural health care

1.0 Introduction

The Telecom Regulatory Authority of India (TRAI) has recommended to the Department of Telecom (DOT) that they launch Next Generation Network (NGN) [15]. Currently there are 10 million broadband users in India of which 86% have xDSL broadband [16]. TRAI recommends that the access networks in India need to be shifted to passive optical networks (PON) based FTTx technology [1, 6, 8, 9], to support high bandwidth applications [15].

PON networks use only one fibre to connect to multiple people. The splitting may happen at (i) home, (ii) street cabinet, and (iii) local exchange. This technology is cheaper than the point to point FTTx technology. At the central switch level the PON technology require more intelligence and encryption to ensure that proper aggregation and splitting of customer data stream. PON technology standards have undergone subsequent up gradation in terms of reach and upstream/downstream speeds. The various PON standards in use are APON/BPON, GPON and EPON respectively. PON technology is much superior to the xDSL technology which still relies on copper for the last mile local loop connectivity. The upload and download speeds for xDSL based broadband depends on the distance of the end user from the central office [8].

A 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 and in which service-related functions are independent from underlying transport-
related technologies [5]. The NGN platform will enable the telecom providers to provide a new range of services and create opportunities for revenue enhancement [15]. Figure 1 and 1A respectively illustrates the shift from two networks to a single IP based network for transmission of voice and data traffic respectively. This will help in reduction of costs and also enhance the quality of experience for the end users.

Figure 1: Two separate networks for voice and data transmission

Figure 1A: One single network for voice and data transmission

NGN core networks are based on (i) IP and, (ii) and packet switched technology. In NGN networks the transport and the application layer independent of each other as exhibited in Figure
2. This will help service providers to bundle multiple applications (voice, data and video) to the customers [8]. This will help in reducing cost due to the benefit of economies of scale.

<table>
<thead>
<tr>
<th>Application</th>
<th>Service Layer (voice, data, video)</th>
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<tbody>
<tr>
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<td>Presentation</td>
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**Figure 2: Schematic representation of NGN network**

In this paper we propose a framework to test the readiness of NGN adoption and illustrate the NGN eco-system. Next we explore the viable business model for NGN adoption in India. We then propose that road map by which the rural health care delivery system in India could benefit from NGN networks.

This paper contains seven sections. In Section 2, we discuss the convergence issues to be promoted by NGN. Section 3 details the framework to be used for testing the readiness of a country to adopt to NGN, based on technological, social and economic parameters. In Section 4 we propose the ecosystem to be in play in case of NGN industry. Section 5 we explore the possible business models suitable for NGN implementation in India. In Section 6 we propose a social business initiative, i.e., delivery of national healthcare system India using NGN. Section 7 has the concluding remarks.

**2.0 Convergence**

Currently the telecom market in India works in “vertical silos” as exhibited in Figure 3. Different services such as voice telephony (wireless and fixed Line), TV (cable TV (CATV) and terrestrial) and data (wired and wireless) are provided to end users over separate networks.
In India each of these players has different business models and also has to various regulatory authorities and rules to comply with. This puts customers as a disadvantage as they have to purchase of the item separately. NGN would facilitate converged triple/quadruple play service access seamlessly across different networks and multiple platforms. NGN would promote the growth of Web 2.0 and Web 3.0 applications [8].

Figure 4 illustrates the expected implications of convergence that NGN would bring to the Indian telecom market namely, (i) Network convergence: fixed-mobile and ‘3-screen’ convergence (mobile, TV and computer), (ii) Service convergence: Growth of smart handsets, that will allow access to web-based value added services (VAS)/ applications. (iii) Industry/market convergence: IT, Telecom and Media industries convergence, (iv) Legislative, institutional and regulatory convergence –broadcasting and telecom regulation to address content and services. (v) Device convergence: microprocessor, screen, storage, input device and network connection to facilitate multiple communication functions and applications, (vi) Converged user experience: enriched quality of experience (QoE) for end-users [8].
We recommend the following would be required to ensure convergence, (a) technology agnostic regulation need to be developed; (b) each NGN service providers would need only an UASL, and (c) mandatory interconnection between service providers.

3.0 Our framework to test NGN readiness

In this paper we propose a NGN readiness framework based on the following drivers namely, (i) Economic (ii) Technological and (iii) Social. We would compare India and the other developed countries such England, France, Poland and Germany that have already successfully implemented NGN [6, 8, 9]. The economic factors used in our study are (a) Dipping top lines: erosion of fixed line ARPU for almost operators (BSNL, MNTL, Airtel, etc), saturation of ARPU and high churn rate for mobile service providers, and intention to increase foothold into various market segments (voice, data, multimedia), (b) Competition: entry of specialist players in the national long distance (NLD) and international long distance (ILD) markets, and players providing bundled triple play services, (c) Investment strategy: “ladder of investment” strategy for operators to start in densely populated area and move into less populated area subsequently. Technological drivers to be used are, (a) Obsolescence: of the existing multiple legacy network infrastructure, (b) Costs: Low transmission and operation cost to be incurred as traffic would flow over optical fibre, and routing, and switching to be centralized; VOIP would reduce costs for voice calls too, (c) Services: IP network would allow easy triple and quadruple play, (d)
**Benefits:** convergence of customer premise equipment (CPE). Social drivers would include, (i) *High bandwidth Services:* HDTV, VOIP, IM, VC, P2P, etc. (ii) *User defined services:* personalized on demand multimedia and mobility, user created content, (iii) *Integrated Value added services (IVAS):* secure access to centralized resources and intelligence for businesses [8,9]. Figure 5 illustrates the NGN adoption readiness framework.

![NGN adoption readiness framework](image)

**Figure 5:** NGN adoption readiness framework

### 4.0 NGN eco system

Figure 6 illustrates our proposed NGN ecosystem, comprising of (a) suppliers (device, component, testing & monitoring units), (b) carriers (infrastructure, core network), (c) content /value added service (VAS) providers, (d) service providers (SP) and (e) end users. We overlay the value chain model [14] on the NGN network diagram (last mile, peering, backbone and first mile).
NGN platform will help provide end users services such as, digital terrestrial TV, IPTV, HDTV and video on demand (VOD). The rich content can be provided on video, TV, computer and also smart phones. Disruptive applications such as Slingbox4 will provide on Demand TV to their end users. Content will be the main driver for the growth and adoption of NGN. The role of content creators (providers) and content aggregators (distributors) will be of prime importance in creating the content. The content provider in turn has to play adequate business logic in selecting the right the market mix in which these services will be rolled out. Providing bundled services to the end users will be an appropriate technique to garner market share. End users would benefit from the cross subsidies being provided during creation of the bundle. NGN will also help promote personalized content for end users.
Using Porter’s five forces model we note that the threat of new entrants in the NGN eco system will be equally high at the first mile, backbone, peering and last mile. This is so, as the CAPEX required to enter as a content provider, component supplier, device manufacturer or equipment testing agent. Component supplier, device manufacturer and equipment testing for measuring NGN performance has to support voice, data and video. A new service provider (peering level) will have to buy spectrum at market rate. This along with license fees will need a high fixed investment. Also at each step in the NGN eco systems, there is a need for skilled personnel for daily operational activity. NGN will promote the bargaining power of the buyers/end users. NGN enabled convergence of voice, data and video will enable end users to choose from a large pool of bundling of services offered by providers. The switching cost for the end users will also be low. Similarly, since multiple suppliers such as Cisco, Alcatel, Nokia, Lucent etc are providing components and devices the bargaining power of the suppliers will be low. At the last mile, there are multiple access networks such as cable TV (CATV), power line have on NGN and existing xDSL players which pose a competitive threat to the NGN technology. Pure play service providers will face a threat from MVNOs. The NGN convergence will enable MVNOs to set up operations easily, as the service layer is independent of the transport layer. In the India scenario too, we recommend that MVNO’s should be encouraged to allow growth of NGN.

It follows for the NGN eco system that the main source of competitive advantage for a NGN provider is its relationship with the content provider (CP), comprising of content owner, retailers and consumers, located in the first mile [2]. So, a proper balance needs to be maintained between competition and collaboration across the value chain.

5.0 NGN business model

We critically evaluate the various business models implemented globally for NGN implementation and propose a hybrid market driven structure for the Indian context. NTT Docomo used the gated garden model for i-mode implementation [2]. The content is provided through a consortium of content retailers; and NTT Docomo takes care of the transmission, QoS and billing. France and British Telecom used the walled garden model for their DTTV and VOD bundled services to the end user [8]. They had a revenue sharing model with the CP. They took care of the end to end QoS. In the public garden model there is multiple CPs from whom the users buy content [2]. The SP only facilitates the transmission but does not guarantee QoS. Joost,
and Babblegum used *advertisements* as a source of revenue [8]. In European NGN market had followed a *two sided platform pricing model*, where the consumer had been subsidized by the CP and SP to generate more demand in the future[3,4,7,10, 11,12,13].

We propose that in India Universal Service Obligation Fund (USOF) [17] should provide support to players interested in rolling out NGN. Initially players may follow a *two sided platform pricing model* to encourage consumers to join NGN. There after the *gated garden model* would be an ideal solution. The traffic and QoS needs to be measured to ensure proper billing of services. TRAI has to ensure fair pricing policy is being followed by each provider even when bundling services together.

### 6.0 NGN and rural health care delivery in India: A social business initiative

In India the rural health care delivery system comprises of Sub-centre (SC), primary health centre (PHC) and community health centre (CHC). SC is located in remote villages and is funded by the Central government. There are about 146,036 SCs in India. Each SC is manned by an Auxiliary Nurse Midwife (ANM) and one Male Multi Purpose Worker (MPW). They provide basic treatment to the villages located within a radius of 21 sq km. PHC, which is financed by the respective States, is located at the block level and is a referral for six SCs. A PHC provides curative, preventive and family welfare services to the villagers. PHC’s are manned by a medical officer and 14 paramedics. It also has available capacity of 4 to 6 indoor beds. There are about 23,458 PHC’s in India. CHC’s are located at districts and form the tertiary unit. Each CHC serves as the referral unit for four PHCs located within 722 sq. Km. CHC’s have 4 medical specialists supported by 21 paramedical staff. It has a capacity of 30 in-door beds with OT, X-Ray, labor room and laboratory facilities. There are 4,276 CHC’s today in the country. Figure 7 illustrates the National Rural Health Care delivery system of India.
World Health Organization (WHO) states that globally there is a shortage of 4.3 Million medical staff. In India the budget for health care is around 3% of the GDP on health care. Yet there is a shortfall, of 20,486 SCs, 4,477 PHCs and 2,337 CHCs. At all levels of the rural health care infrastructure there exists shortage of posts and also vacancies in the sanctioned strength of the medical workers in India.

Currently 86% of broadband connectivity in India is provided over copper loops using xDSL technology. With the auction of spectrum for 3G and broadband wireless access (BWA), the last mile access could be effectively negotiated hostile terrains. We propose that with the roll out of NGN, the ANM/MHW/mobile units can transmit, at a rate of 100 Mbps, the patient data (i.e., blood pressure, body temperature and pulmonary function information) from remote SC to PHC. They can then follow it up by making voice over IP (VOIP) based calls on mobile phones to seek advice from medical workers at PHC’s. This will enhance productivity for the villagers as they would spend lesser hours in commuting to PHC’s or CHC’s. The PHCs in turn can be connected

**Figure 7:** National Rural Health Care delivery system in India
to the CHCs using fiber optics backhaul. This will enable doctors at a PHC to video conference with a specialist at a CHC. The CHC in turn can be connected to the super specialty hospitals, at the state capitals, by IP based network. Digital reports (such as X-ray’s, ECG) of critical cases can easily be transferred online from the CHC to the super specialty facilities. Thus, NGN will help bring a patient located at a distant remote village to a close proximity of a doctor. Such Social businesses [18, 19] initiatives will be effectively implemented with the help NGN.

7.0 Conclusion
NGN implementation in India is the need of the hour. This will help in convergence of the vertical silos in which the Telecom industry operates today in India. This will also provide a significant benefit to the end users as they will have the option to choose for a plethora of services to choose from. MVNOs will be able to enter the capital intensive market very easily. This will pose a challenge to the existing incumbent players. Regulations will also need to be looked into in ensure arbitrage and wrong means are not followed by the players in the market. USO funding should initially be provided by the Government of India to help in roll out of the NGN project. Besides, social business initiatives such as creation of an effective national rural health care delivery system can be effectively be rolled out using NGN in India.

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