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20th July 2010

Telecom Regulatory Authority of India (TRAI)
Doorsanchar Bhawan
Jawahar Lal Nehru Marg
New Delhi – 110 002

Kind Attention   **Advisor (CN)**
Subject   **Consultation Paper No. 09/10 on National Broadband Plan**
                Dated 10th June 2010

Dear Sir,

We applaud the Authority's thought leadership in recognizing the need for a holistic National Broadband Plan and undertaking the ensuing consultation process and we are grateful for the opportunity to respond to the same.

Broadband Ecosystem essentially comprises of Infrastructure, Access Devices & content and need enabling environment to foster growth and must be seen as a core infrastructure for inclusive growth and sustainable development. Focus needs to be on **pervasive, productive and protected broadband.**

The Authority had published a report on its decade long existence in 2007 where technology neutral policy & regulation was depicted as the core pivot responsible for unprecedented growth of telecom in the country. This must be sustained as the country looks at broadband.

Technology neutral policy & light-touch regulation that foster innovation and rules to promote and sustain a healthy & competitive online space are the key to realize full potential of broadband. Cloud represents the new paradigm of computing and India has an opportunity to become the data centre hub if we can get a pragmatic Data Centre framework spanning infrastructure (bandwidth, power supply) and rules & regulations especially around security & privacy.

In terms of efficiency, besides looking at the potential of virtualization within data centres, cloud enables reliable and inexpensive remote mirroring that can come in handy for the purpose of Business Continuity Process & Disaster Recovery. For example, an SDC in one state can have its mirror in an SDC of another state (that is also in a different seismic zone) and with a resilient broadband infrastructure, this can still be accessible and useful.

Importance of extending high speed broadband access and investment in the computers and deployment of relevant content at every anchor institution (every educational

institute, healthcare centre, railway station, post office and ग्राम पंचायत) cannot be overemphasized. The needy anchor institutions should be provided viability gap funding from Universal Service Obligation Fund on priority and these high speed termination points can be further leveraged for further distribution by way of other last mile solutions - both wired & wireless. Such investments provide manifold returns compared to the investments especially since these places offer congregation of a large number of users.
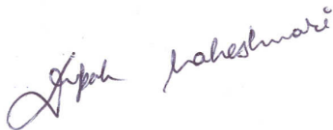
Fiscal incentives, proliferation of CPEs amongst the masses, availability of locally relevant content, trust & confidence in the broadband ecosystem and enhanced ICT literacy would play a pivotal role in spurring broadband growth. Endeavours such as 'Secure Your PC' portal (http://cert-in.org.in/securepc/index.html) under the aegis of CERT-IN can play a crucial role in enhancing user education, awareness and empowerment.

Similarly, cognitive radios that utilize small slivers of unused spectrum at any given location and/or time (*White Spaces*) and operate at extremely low power, offer opportunity for affordable last mile access as we look at a **combination of licensed & unlicensed spectrum**. Since the consultation paper itself is largely focused on optical fiber, annexure – D includes specific suggestions on **review & revision of spectrum management** though we are aware of the recent auctions of the spectrum for Broadband Wireless Access and have already responded to the Authority on 4G pre-consultation.

Considering the critical nature of the broadband ecosystem and the increasing reliance & relevance of day-to-day life of more & more people on this, it is of utmost importance to ensure that the critical information infrastructure is protected and also that the users & the CPE remain safe & secure. Specifically, the proposed National Broadband Plan must not only look at the central government but also at the state / UT governments for identifying respective roles & responsibilities and enablement.

We are enclosing a comprehensive note on broadband before responding to specific queries and hope that the Authority would find the same cogent, relevant & useful. However, in case there are any queries please feel free to contact us.

Thanking you,
For **Microsoft Corporation (India) Pvt. Ltd.**

(Deepak Maheshwari)
Director – Corporate Affairs

Annexures:
    A. **Backgrounder on Broadband in India**
    B. **Responses to Specific Questions Raised in the Consultation Paper**
    C. **Key Public Policy Objectives**
    D. **Review & Revision of Spectrum Management**
    E. **Usage enablement in the area of taxation**

Backgrounder on Broadband in India

1. **India & ICT: Socio-Economic Context & Impact**

Before one delves into various issues related to the broadband – most of these already mentioned in the consultation paper, it would be useful to capture the import and trend in the Information & Communication Technology (ICT) domain, especially in the Indian context and to juxtapose the relevance of broadband access therein.

While India's Gross Domestic Product (GDP) has grown manifold since 1991 when the liberalization began, perhaps even more profound change has happened in the GDP mix if one examines the contribution of different sectors, viz. Agricultural, Manufacturing and Services.

Ours is now a service economy to the extent that the service sector accounting for two-third of India's GDP and while both agriculture and manufacturing have also grown significantly, contribution of manufacturing is around 18% and agriculture stands even lower around 14%. Considering current GDP mix and in keeping with the trends, to grow at 10% on a sustained basis we need agriculture to grow @ 4% per annum, manufacturing to grow at 12% per annum and services to grow @ 10.5% per annum.

Though agriculture accounts for 58% of employment, it is obvious that with more infusion of technology in the farm sector, dependence on agriculture sector to provide jobs needs to come down and there is an urgent need to create more jobs in manufacturing and services sectors. Both manufacturing & services need more skilled people and that too, with specific skill-sets and hence, it is imperative that skill development needs to be a national priority.

All the same, non-agricultural sectors already account for about 50% of the economic activities in rural India. There is also a definite trend toward increasing urbanization and while we need to upgrade & improve urban infrastructure, the speed of forced urban migration can be mitigated partially if there are opportunities of learning & earning within the rural areas, albeit in newer areas.

In terms of demographics, our population continues to grow and we do have the largest population of young people and there is obviously an opportunity to look at the population as an asset rather than as a liability. Overall, **Indian economy is service-centric though as a society we may still be agrarian and have a large pool of young people most of whom would need employment outside the agricultural sector and would need suitable skills and opportunities.**

It is also useful to see how the Information Technology (IT) & telecom sectors themselves have grown in the past two decades. In 1989, Indian IT sector had crossed a collective turnover of Rs. 1000 crores and the (fixed) telephone (the only telecom service with maximum spread) was largely limited to the urban areas and even there, amongst the rich & influential.

The world now looks at India as the place for talent, entrepreneurship and innovation across all cutting-edge areas of specialization and especially in the field of IT. Similarly, in the telecom sector we have the world's second largest base of (mobile) phone connections and are all set to cross 1 billion connections within the next 3-4 years.

Though the ICT infrastructure in rural areas needs massive up gradation and improvement, this can ameliorate the pressure on urbanization to some extent by generating learning & livelihood opportunities within rural areas and overcome the challenges of other physical infrastructure.

In the **e-Readiness Index Report 2008** published by the Department of Information Technology, % share of computer-related services and communication services sector in overall GDP is tabulated as below:

	(at constant 1999-2000 prices)								
	1999-2000	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008
Computer-related Services	1.0%	1.4%	1.6%	1.8%	2.1%	2.4%	2.7%	3.0%	3.3%
Communication	1.6%	1.9%	2.2%	2.6%	3.1%	3.6%	4.2%	4.9%	5.7%
Total Share of Computer-related Services and Communication	2.6%	3.3%	3.8%	4.4%	5.2%	6.1%	6.9%	7.9%	8.9%

Note: Total may not match due to rounding off
Source: CSO [Central Statistical Organisation]

Though this tabulation presumably covers contribution of ICT from services' perspective only and if one were to add the contribution of the telecom & IT hardware, the contribution is likely to be even higher. In fact, certain other reports peg the collective contribution of the ICT sector to the GDP as 10% + for FY 2007-08 and 11% + for FY 2008-09.

Hence, it is clear that from being a fringe contributor to the GDP, the **ICT sector has become so important and integral to the Indian economy that it may well account for almost 15-16% of the national GDP by FY 2014-15 and become the largest contributor therein.**

Input-Output Multiplier for ICT has been around 2.5% and the Use of IT within India has a history of more than 4 decades and the Indian telecom companies have acquired control over significant share of the international bandwidth market within the first decade of the new millennium, especially in some of the busiest routes. By and large, the Indian IT story has been mostly about providing services to overseas clients, while the telecom companies had been expanding the services within Indiha. However, in the past couple of years things have begun to change inasmuch that domestic demand & opportunity of

IT has gained a critical mass and the telecom companies have begun expanding outside India in a big way. IT services (including Business Process Outsourcing) just cannot run without advanced telecommunication services and likewise, the telecom services cannot run without advanced IT systems.

This interdependence and symbiotic relationship of IT & telecom is not just limited within the (vertical) ICT sector but more importantly, it opens up opportunities for horizontal diffusion across other sectors and practically, can bring about significant improvements in every other domain of human endeavour. This impact is visible by no other way than by way of the potential of the Internet and study after study – including the latest World Bank study cited in the consultation paper establishes the potential of the Broadband Internet and the fact that the impact is more pronounced in developing countries than the developed countries, just cannot, and ought not to be, ignored.

Within the Indian context, according to the e-Readiness Index Reports prepared by Department of Information Technology (Ministry of Communications & IT, Government of India) and National Centre for Advanced Economic Research (NCAER) the input-output multiplier of It sector has been more than 2 for all these years and according to NASSCOM, this sector has been responsible for the lion's share in generation of all new incremental job opportunities in urban India.

All the same, despite significant improvement in the ICT infrastructure expansion (geographic, technological options and capacity), overall reduction in prices and last but not the least, the usage of the ICT services & applications our ranking in most international ICT indices continues to be quite low (usually in the bottom quarter) even though year on year absolute scores have been usually showing a positive trend; And, in some cases, our ranks have even slipped down further.

For example, ITU's publication 'Measuring the Information Society 2010' mentions that India's ICT Development Index (IDI) score did improve from 1.62 in 2007 to 1.75 in 2008 thereby recording almost 8% gain within a year, the overall rank amongst 159 countries slipped from 116 in 2007 to 117 in 2008.

What it implies is that while overall we have a positive movement; several other countries (including several developing countries) are moving faster. Again, in some particular sub-sectors (such as mobile) we may have made tremendous progress, there are other areas where we continue to lag (e.g. PC penetration) and in some areas we are actually losing ground (e.g. the number of fixed line telephones continue to recede month on month) thereby creating an imbalance that would not be sustainable for long and the sooner we correct the better it would bode for us.

2. Evolution of Internet & Broadband in India

While it is well-known that Internet access to the public began by the incumbent International Long Distance Operator Videsh Sanchar Nigam Limited (now renamed as 'Tata Communications Limited') w.e.f. 15th August 1995, Internet access were already being provided by Education & Research Network (ERNET) and Software Technology Park of India (STPI) – both autonomous societies under the then Department of Electronics (now called 'Department of Information Technology'), albeit limited to the respective communities that they were serving.

In January 1998, the government had announced the Internet policy thereby opening the sector to participation by private sector but in February 1998, the Authority had stayed the same and though the stay was subsequently vacated by the Delhi High Court, the revised Internet policy was announced in November 1998. There were indeed various revisions in the policy, the most important one was in terms of the scope of services – the policy announced in January 1998 had enlisted a few particular services and for any other service, prior government approval was to be sought, the **November 1998 policy allowed all types of Internet services with the sole exception of 'telephony on the Internet'**. This was a clear manifestation of the appreciation and realization by one and all that Internet is not just an innovative platform by itself but more importantly, it is a platform for innovation at large.

(Restricted) Internet telephony was allowed (IP-PSTN interconnection within India was not allowed) w.e.f. 1st April 2002 and is being offered and used since. Subsequently, 'unrestricted' Internet telephony was finally allowed w.e.f. 1st January 2006 but unfortunately, India remains the only country where unrestricted Internet telephony is legally permitted but not yet legally available! Hence, Indian people are deprived of deriving benefits of the unified & presence-based communication using Internet Protocol (IP), signifying a glaring market failure and a fit case for regulatory intervention.

Meanwhile, following a public consultation the Authority made a comprehensive set of recommendations in April 2004 which became the basis of the Broadband Policy announced on 14th October 2004. Besides scoping the possible and positive impact of the broadband, the recommendations included ways & means to spur competition in the 'last mile' as well as various fiscal incentives. Though the Broadband Policy did mention in its closing paragraph that the fiscal incentives shall be taken up with the Ministry of Finance, none of those seem to have been implemented and it is not surprising at all that we are way behind the targets stipulated in the Broadband Policy 2004. It is also a matter of record that the Authority has since reiterated several of its recommendations as well as made fresh ones to give an impetus to the broadband in the country, but little has changed in terms of the policy though the broadband availability, accessibility and usage have been on the rise and currently, almost 60% of all Internet connections in the country qualify as 'broadband'.

The instant consultation process undertaken by the Authority proffers us a great opportunity to take a fresh look at ways & means to aggressively grow the broadband ecosystem in the country and see what measures – including but not limited to the fiscal incentives, are needed.

3. Cloud Computing & Implications for National Broadband Plan

Like any other technological domain, the computing has also been undergoing various changes over the decades; The mainframes gave way to the emergence of Personal Computers (PCs); Then came the client-server architecture and was quickly followed by the emergence of the Internet & the web.

Right now, the computing is undergoing perhaps its most significant transition, viz. 'cloud computing'.

While there are various ways to define what cloud computing means, reputed analyst firm **Forrester** defines it as *"A standardized IT capability, such as software, app[lication] platform, or infrastructure, delivered via Internet technologies in a pay-per-use and self-service way."* Another analyst firm **Gartner** defines it as *"a style of computing where massively scalable and elastic IT-related capabilities are provided 'as a service' using Internet technologies to multiple external customers."*

Cloud computing, therefore, implies provision of ICT resources as a service, in a dynamic and scalable manner over a network.

There are 5 essential characteristics of the Cloud - On-demand self-service, Broad network access, Resource pooling, Rapid elasticity and Measured service.

Whether it is e-governance, e-education, e-healthcare or for that matter entertainment or any other plausible use of broadband, the cloud paradigm is forcing a rethink from the erstwhile *'best-effort'* model to the evolution of *'assured service levels'* and becoming increasingly mission-critical to all types of content, application and services as well as for the infrastructure.

Besides ensuring quick and efficient rollout of new services and the flexibility of scales, cloud computing also offers useful elasticity for certain workloads that have predictable peaking (such as examination results and election results) and still ensure that by pooling a lot of elasticity available in the system, even non-predictable peaks can be managed much better (for example, the load on responding agencies in case of disasters).

With the enormous growth in the IT and IT enabled services market where India has become the pre-eminent off-shore provider and the need for massive ICT adoption within the country, the cloud paradigm can enhance our international competitiveness as well as set ourselves on a path to leapfrog several technological generations and realize the benefits of scale & efficiency brought about by the cloud.

However, to realize such benefits we need to ensure that the cloud infrastructure as well as the network is world-class in terms of uptime, availability, quality of services (latency & jitter, etc.) and flexibility while also assuring highest level of security, privacy and reliability. These are, therefore, paramount considerations in terms of the National Broadband Plan.

Though India retains the competitive edge in the area of IT & IT enabled services, the gap is narrowing as several other countries (such as Philippines, Vietnam & Ireland) are fast catching up and hence, India needs to look at new area of sustained competitiveness. Cloud computing perforce needs investment in data centers and it would be useful for India to look at proactively developing a framework for attracting investment in world-class large scale data centers. Data centers need physical resources like space, reliable and affordable electricity supply, high bandwidth within and outside the country but also need talented manpower and rules & regulations that do not put onerous burden on the data center operators. It is worth taking note of the fact that even small countries like Singapore and Mauritius are attracting investments in such endeavors in their quest to become the de facto hub of data centers in their respective neighborhoods.

4. Key Public Policy Objectives

During her **address of the Hon'ble President on 4th June 2009 to the Parliamentary**, she outlined the broad agenda of the government to stay focused on inclusive growth & sustainable development, ensuring national security and public safety, diffusion of technology (digital and other types) across all strata and regions & leveraging the same for addressing societal challenges and declared the upcoming decade as the innovation decade while also reminding the members of the parliament that they had *"the mandate and the opportunity to translate the hopes and aspirations of the people of India into change in the everyday lives of the people."*

These sentiments are reverberating elsewhere as well, for example, in the following excerpts from the **2009 World Economic Forum Annual Meeting Report** as well:

"With coordinated, conscientious leadership, new technologies will not only continue to fuel growth but if harnessed, such advancements will also enable a digital revolution that can uplift parts of the world hitherto not reached by the agricultural and industrial revolutions. Achieving this kind of inclusive growth requires new mindsets."

While in a broad sense, the public policy objective should be 'अंत्योदय' as articulated by Mahatma Gandhi, it is clear that the **National Broadband Plan should be specifically focused towards making broadband pervasive, productive and protected.** *Annexure – B* goes in some detail about various public policy dimensions & objectives.

5. Policy Landscape for Broadband

Licensing for Internet access is administered by the Department of Telecommunications.

All the same, policy matters relating to Internet, promotion of Internet, assistance in the promotion of E-Governance, E-Infrastructure, E-Medicine, E-Commerce & Information Technology-based education, etc. and Initiative on bridging the Digital Divide are covered within the functions of Department of IT as per the Allocation of Business Rules. Besides being the nodal agency for implementation of a comprehensive and ambitious National e-Governance Plan, Department of IT has established National Internet eXchange of India (NIXI) to provide easy interconnections within India for Internet as a public-private partnership. NIXI also runs the country code top level domain registry for India (ccTLD for '.IN' domain) on behalf of the government of India.

Governments of the states and the union territories also have their respective departments of IT/ICT or such like. Most of the citizen services are also provided by the state / UT government and hence, it is important to look at the role of governments at states / UT level and sensitize them to the urgent need of supporting the broadband ecosystem. Besides, there are other important areas such as Right of Way, etc. where they can smoothen the process significantly and thereby attract investments and encourage entrepreneurship & foster innovation.

Considering broadband is a core infrastructure, the proposed National Broadband Plan must identify distinct roles & responsibilities at the central government as well as those at the state / UT governments. An empowered body needs to look at its coordinated implementation and take corrective actions, as needed.

6. Broadband Ecosystem

Broadband ecosystem comprises of Infrastructure, Customer Premise Equipment (CPE or the Access Device) and the Content (including Applications & Services) as very succinctly presented by way of the Figure 4.12 in the Consultation Paper. Hence, it is important to look at ways & means to create equitable growth opportunities for all these towards a symbiotic, interdependent and virtuous cycle of innovation, adoption and usage.

It is pertinent in particular to consider the peculiar role of the CPE and that of the Content in the context of broadband that is different from the traditional voice telephony. Voice telephony is about infrastructure and access devices wherein the content is generated & consumed *impromptu* by the users during the course of the call itself. However, in case of broadband, the content, applications and services play a key role – whether these are provided by the service provider, by third parties or for that matter, user-generated and whether it is generated / consumed synchronously or asynchronously.

The implication is that not only we need backbone & access infrastructure with high bandwidth, low latency & jitter but also the CPEs need be advanced & smart enough to enable the users generate / consume such content. Hence, it is imperative that infrastructure, access devices and the content – all be given due attention while developing the National Broadband Plan.

7. Factual Analysis

Performance Indicator Reports released by the Authority for the past few quarters, the monthly press releases in terms of subscription numbers, the instant consultation paper and several show that:

a. **The total base of Internet subscriptions in the country stands at around 16 million – including almost 9.5 million broadband connections.**

b. **For the past few quarters, the net growth in number of Internet connections is almost same as the net growth in number of broadband connections though it does not automatically imply that all the new Internet connections are in the broadband category.**

c. **About 1.7 million Internet subscriptions are presumably on broadband platform (e.g. cable, DSL etc.) but are being used at speeds below 256 kbps; this could be because higher (broadband) speeds are not available or too costly or even, both.**

d. **Remaining 5 million Internet subscriptions are presumably on dial-up; there is CPE and they appreciate the value of Internet access but have not yet migrated to broadband connection. Again, this could be either because broadband access is not even available or too costly or even, both.**

e. **Though there seems to be market concentration when seen at national level, there could still be a long tail of niche operators who focus on particular users segments and/or geographical areas but more granular and continuously**

updated data needs to be available in the public domain for further analysis in this regard. All the same, it is likely that there are many areas where no broadband access exists and in some cases, where no form of Internet access exists and in several more, the competition is even lesser than what the national level figures indicate.

f. Hence, besides looking ways & means to increase broadband access to new locations, new subscribers and with new CPEs, *there is an urgent need to focus at migrating at least 80% of the non-broadband customers (4 million) to broadband access by enhancing awareness latest by 2011*, increased availability and affordability even as some subscriptions may continue to be on dial-up for specific reasons in the foreseeable future.

g. However, much of the attention should be on the future – proliferation of more CPEs, deployment of new infrastructure, development of relevant content, new connections, new users and new business models!

8. High Speed Broadband Connections on Priority to Anchor Institutions

In a country like ours, broadband access to every household and the ability of every citizen to utilize the same would take a long time to realize. However, in an institutional setting, numerous concurrent devices can share the same connection and when there is a possibility of sharing the same device (usually, in short duration sessions) the number of users supported becomes significantly higher.

Anchor institutions such as educational institutes, healthcare centers, healthcare centres, railway stations, post offices and ग्राम पंचायत support a large number of people and ought to be leveraged for extending broadband access to those where availability, affordability and usability is a challenge.

Hence, extending high speed broadband access to the anchor institutions assumes priority and we should target providing at least 100 Mbps / 1 Gbps connection to all such anchor institutions by 2014 leveraging the optical fiber (or, any other technology) though the first objective must be to extend whatever maximum bandwidth (but no lesser than 2 Mbps) can be provisioned using other technologies such as DSL, cable or wireless, etc. so that 100% coverage is achieved latest by 2011.

9. Relevance of Computers as CPE / Access Device

Mobile telephone may be the first device for a lot of users to have their first experience of Internet; the role of other CPEs and especially that of PC ought not to be overlooked. It is well known that India is adding more number of new mobile phone connections than any other country and that China's mobile phone connections now exceed 1 billion.
However, we must also take note of the fact that **despite the huge number of mobile phones in 2011, China is likely to equal the US market (so far the largest market in the world) in terms of number of PCs bought (projected as 60 million for both the countries) and thereafter, lead as the world's leading PC market for the foreseeable future. As a contrast, the total installed base of PCs currently in India is less than 40 million!**

It would also not be out of place to mention that even the ITU and other agencies (such as World Economic Forum, Economist Intelligence Unit, UNCTAD, etc.) tracking ICT-related development do factor in computer penetration & broadband connections as well as mobile connections & mobile Internet connections besides other relevant parameters (such as fixed lines, international bandwidth, ICT literacy, etc.).

It should be clear that it is not about either PCs or mobile phones; rather, it is about co-existence of both and offering the choice to the citizens in terms of when and how they use one or more type of CPE. As Indian market matures in terms of better network coverage, increasing incomes spurred by economic growth and availability of more diverse content (local relevance & local language), we are likely to see accelerated growth of PCs in India as well, especially amongst the households, SOHOs and MSMEs.

10. **Definitions & Measurements**

Though the consultation paper does refer to the ITU report "The ICT Development Measurement Index 2009" ITU has since released its latest report in the series titled "Measuring the Information Society 2010" to determine the ICT Development Index wherein the term 'subscription' is being increasingly used instead of 'subscriber'. ITU and the other agencies also track user numbers. In fact, ITU encourages, asks and urges the national authorities and regulators to undertake regular user surveys in addition to collation of data from the service providers.

In a country like India where shared usage (whether in an institutional setting like school/office or public access kiosk such as cyber café / common service center) outside the household is more a norm than an exception, it becomes all the more **important to track different parameters such as number of subscribers, number of subscriptions, number of users and number of beneficiaries.**

It is also desirable that the spreadsheets of continuously updated and historical data at granular level be placed in the public domain by all the public authorities that collect such data for wider dissemination and usage.

Responses to Questions Raised in The Consultation Paper

Chapter 2: Broadband – Demand & Supply

Questions # 5.1 – 5.3

The policy should focus on expanding the broadband infrastructure, enable the users acquire and use the devices and foster an environment that channelizes entrepreneurial energy & vigor for innovative content development & usage. Endeavors to increase awareness and inculcation of world-class ICT skills would go a long way in spurring the demand.

A sample of specific initiatives that can act as demand drivers in case of a business dealing with tax authorities has been depicted in Annexure – E. Similar scenarios may be created for other areas of government interactions with citizens and organizations.

Questions # 5.4

It is true that most of the current broadband usage in India is in English but the fact is that several initiatives have been taken to simplify usage of Indian languages. For example, Microsoft's Indic Language Input Tool can be downloaded free of cost from http://specials.msn.co.in/ilit/ that utilizes the power of transliteration though there is also facility to type using other input methods such as soft keyboards.

उदाहरण के तौर पर, यह वाक्य इसी टूल के माध्यम से टाइप किया गया है |

Questions # 5.5 – 5.6

The illustration in the consultation paper does detail certain assumptions but the broadband can grow in many different ways and the results may vary accordingly. However, it is a fact that the current infrastructure is woefully short in terms of the emerging needs.

To model the emerging trends, it would be useful to consider 3 different growth scenarios at moderate, medium and hyper growth rates for the next decade considering the ensuing development of devices, content and the networking technologies juxtaposed with the imminent economic growth and the changing lifestyles & aspirations of India's population.

Thereafter, one needs to decide which are the core elements where the costs are not significantly different and the gestation period is highest in terms of deployment and other aspects where deployment costs increase more linearly. Depending on the viability gap funding needed to support specific components, the support from the Universal Service Obligation Fund and other sources should

be leveraged in targeted manner. At the cost of repetition, the support must be available for not just the infrastructure but also for the CPE and the content.

Chapter 3: National Broadband Network

Questions # 5.7- 5.15

National Internet Backbone (NIB) is actually not a new idea *per se*; More than a decade back, NIB was indeed conceived, albeit the coverage was not planned up to the village level and the bandwidth projections were definitely conservative. Despite some delays, NIB was implemented but its usage has since been largely confined to within the incumbent's network rather than being available & accessible as the National Internet Backbone.

Besides, there are other IP backbones in the country – again, built using the public monies. Hence, it would be useful to assimilate all such backbone assets into a special purpose vehicle (SPV) and then only see what additional investments are needed and where.

Another important area for achieving greater efficiencies is that rather than creating separate physical networks across the country for specific sectors, it would be better to provide last mile connectivity to such nodes from the common national backbone. Thereafter, a secure virtual private network can be created across different nodes as needed and yet broadband access to the Internet can also be provided through the same 'last mile' link(s).

While optical fiber is known to enable maximum bandwidth amongst all technologies available today, in keeping with the technology neutral policy the proposed augmentation should also be kept open so that the most apt technology available and feasible under the particular circumstances is deployed. Leveraging of other government schemes would be a value-add but it must be ensured that the payouts under such schemes are linked to real outcomes.

In order to ensure that national assets remain neutral and accessible to one and all without any discrimination, the SPV must be independent and confined in the creation of infrastructure only but kept away from active provisioning of the services to avoid the highly likely scenario of vertical price squeeze.

Continuous fall in the number of fixed line telephones for the past few years must be a cause of national worry and the operators can look at models such as 'only DSL' (DSL connection without any telephone number) that have been quite successful in many parts of the world. Though the bandwidth deterioration with increasing length of the copper pair is a reality, by deploying newer versions of DSL such as VDSL2 (ITU-T G.993.2, one can get as high bandwidth as 52 Mbps downstream and 16 Mbps upstream.

As for cable networks, the key challenge is in the uplink from the CPE and if there is deployment of hybrid set top boxes where downlink can happen through cable and the uplink can happen through Wi-Fi or White-Fi.

However, it must be realized that even if there is optical fiber reaching into every household, there would be still need to have numerous choice by way of wireless in the last mile since the device and/or the user could be in motion as very well brought out by the Authority.

Chapter 4: Regulatory Challenges and Future Approach

Questions # 5.16 – 5.17

Innovations such as evolution of three dimensional and high definition video as well as the peer to peer networks where numerous computers and/or users interact as a community, are driving up the demand for bandwidth even further. These have specific, immediate and relevant applications in areas such as education & skill development and healthcare, etc. Similarly, large-scale deployment of sensor networks (such as that for soil and climate monitoring) and grid computing also drive up the need for bandwidth.

Definition of broadband should be considered from end-user scenario and considering use of video as well as potential for one more add-on device in the vicinity sharing the same connection, the benchmark should be revised to at least 2 Mbps downlink and at least 1 Mbps uplink and these should be annually reviewed. However, for the reasons detailed in the backgrounder about the crucial role of anchor institutions, the benchmark for them needs to be significantly different and at least 100 Mbps to justify special targeted funding.

The phrase "always on" can be replaced by "instantly accessible". This will help in saving electricity, greater efficiency in spectrum usage (where applicable) and last but not the least, mitigate the security challenges especially when the users may not be proactively monitoring or using but the device could still be 'on' and 'connetced'!

Any upward revision in the benchmark may result into a temporary phase when the broadband base becomes very small compared to the current figures but one need not shy away from such decisions. Fact is that once there is a new benchmark, the customers would demand that and service providers would provide that, even if after some delay.

For example, before the Broadband Policy 2004 defined the 256 kbps benchmark, any connection of any speed (even 64 kbps that was just marginally faster than 56 kbps possible on dial-up) on cable, radio or DSL was called broadband but most service providers and the customers moved up to the new benchmark of 256 kbps and some went even beyond it. The key is to keep the benchmark as a stretch goal and keep reviewing & revising the same regularly.

Question 5.18

Since most of the 'Right of Way' (RoW) issues are at state level, promotion of broadband must become part of the state government's own plans as well and they should see long-term value in what they are investing in, incentivizing or enabling. Hence, state-level analysis would be useful.

Questions # 5.19

Level of competition does seem to be less in the broadband provision and this may be truer for remote and rural areas where usually, it would be just one provider, if at all. However, granular data (perhaps at the PIN code level) may be necessary to understand the nuances in different areas.

Questions # 5.20 – 5.23

The Authority has the power to specify standard tariff packages and while choice must be left to the subscribers, couple of flat rate tariffs for different 'last mile' technologies may be mandated as standard tariff packages that *MUST* be offered by the respective service providers even as they should be free to offer other tariff packages as well.

Questions # 5.24 - 5.27

International & domestic bandwidth costs are key input costs for broadband access and since it has been several years since the Authority had reviewed and revised tariffs for these, it is high time that the Authority does undertake the same.

Efficient interconnection is paramount to the success of broadband and hence, the only requirement for connecting to NIXI (National Internet eXchange of India) should be the technical one; it implies that any entity having its own Autonomous System Number (ASN) should be able to connect to NIXI just like one such non-licensee entity that has been connected to NIXI all along.

Questions # 5.28 - 5.30

Quality of Service (QoS) is important to broadband just like any other service but due to different usage scenarios where different parameters matter more, it is difficult to specify one-size-fits-all type of QoS parameters. For example, in case of e-mail slightly longer delay (latency) may be tolerable but not the loss of a single bit of data. However, in case of Internet telephony, latency needs to be low and jitter in particular – low & consistent though slight loss of packets may be tolerable. Hence, the Authority should rather define various parameters from the users' perspective in simple language, create awareness about what those mean and how those are measured and their respective importance in different usage scenarios. Beyond that, the service providers should be asked to transparently communicate about the same to the subscribers and the former be held accountable to deliver the same.

Questions # 5.32

भारतीय भाषाओं के लिए उपलब्ध टूल्स और सेवाओं से स्मबद्ध डेटाबेस होने से काफ़ी सहूलियत होगी और नयी सेवाओं के विकास और उनके उपयोग में तेज़ी आएगी |

Questions # 5.33 - 5.34

As per the prevailing methodology for computing the payable license fee by way of adjusted gross revenue includes revenues directly attributable to such business activities that do not require a telecom service license. Hence, most service providers shy away from offering any CPE and/or other value added service(s) since they are likely to be uncompetitive with the non-licensee vendors who may offer the same CPE and/or service(s) without having to pay any license fee(s). Hence, it would be extremely useful to revise the AGR computation such that the license fee incidence is limited to the revenues attributable to services for which a telecom service license is a pre-requisite and in particular, do not include revenue from sale of CPE and/or offering value added services that are beyond the purview of any telecom service that attracts AGR-based license fee.

Such a move would enable offering of bundled CPE, access and the content where the respective service provider would have an incentive to ensure that everything works properly and the customers also get single-point support.

Questions # 5.31

CPE cost needs to come down and this can happen in 3 distinct ways – firstly, by way of reducing taxes & levies, secondly, by allowing 100% depreciation and lastly, by providing tax rebates for acquisition of the access device / CPE.

Questions # 5.35

The Authority must revisit its recommendations on fiscal incentives that were made in April 2004 but have not yet been implemented. Fiscal incentives should cover tax rebate to the end user for CPE and the usage charges and attract investment in crucial infrastructure such as data centers.

Key Public Policy Objectives for National Broadband Plan

The country today faces a number of unprecedented challenges: improving healthcare and education, skill development, massive urbanization, challenges to national security, energy challenge & mitigate the challenges of climate change, while also ensuring continued growth.

Innovations in broadband ecosystem spanning content, smart & intelligent devices and resilient & secure infrastructure can help meet these challenges while also making government services more accessible, transparent and responsive to citizens' needs.

It is increasingly clear that the Internet is an ecosystem. Like ecosystems in the natural world, the online ecosystem includes many participants—consumers, content creators, online publishers, advertisers, network operators and service providers—whose activities and fortunes are deeply intertwined. Given the Internet's important and growing role in all sectors of the economy and society, government must ensure that the online ecosystem evolves in ways that promote sustainable competition, innovation and consumer choice.

Information & Communication Technology (ICT) - with cloud computing & broadband as the most obvious & relevant facets, is increasingly being seen as integral to solving such challenges. To tap the full potential of broadband, the government and the private sector must collaborate on a range of policy issues as described below:

A. Address Societal Challenges

Improve education. Governments and the private sector have an important role to play in improving teaching & learning experience. Cloud computing can be especially helpful in expanding and access to quality education in remote and underserved communities.

Skill Development. ICT skills as well as use of ICT in skill development at large are important opportunities for our young population.

Improve healthcare. Advances in "health IT" including cloud-based services can expand and improve healthcare while reducing costs and giving people more control over their health records & data. Government policies can ensure adequate protection of consumer privacy and promote efficiency and better outcomes.

Address energy and environmental challenges. Government can accelerate progress toward a zero-carbon economy by funding research into renewable energy, providing incentives for private sector investment, and promoting accurate measurement and reporting of energy use.

Make government more transparent and effective. ICT can facilitate greater citizen participation in government, improve access to government services, and reduce costs and the cloud computing can aid in faster rollout of e-governance services.

B. Accelerate the Economic Growth

Invest in technology. The ICT sector is an important contributor to economic growth and government support for policies that promote investment in the sector will encourage the creation of entrepreneurship and employment.

Ensure choice in procurement. Government investment in ICT infrastructure for healthcare, education, and energy can provide further boost to the economic growth. Objective and merit-based technology neutral procurement frameworks can help ensure the widest possible choice among ICT products and services.

Promote a responsible move to the cloud. Cloud computing offers tremendous opportunities as well as new challenges and responsibilities. Government policies can encourage user confidence in the areas of privacy, security, and consumer safety, as well as attract private investment in this growth area.

Strong IPR Regime. Government can help foster innovation and economic opportunity by ensuring IPR incentives for innovation, and by enforcing existing IPR laws and updating them as needed to encourage and adapt to new and beneficial uses of ICT.

C. Promoting a Healthy Online Ecosystem

Encourage online competition. To allow consumers to enjoy the benefits of vibrant online competition, governments can adopt policies that ensure competitive markets for all important online sectors, including advertising and search.

Support user choice and interoperability. Government policies can promote user choice by supporting industry-led efforts to advance interoperability among products from different vendors and ensure that users have access to and control of their data across various online products and cloud services.

Promote privacy and uniform laws. Government should consider robust privacy protections for consumers, promote cross-border data flow that is crucial to innovation, and work with other governments to ensure uniformity of laws across jurisdictions and avoid conflicting rules on data storage and access.

Promote a trusted, safe, and secure Internet. Because so much of our critical infrastructure is online, governments have a compelling interest in securing ICT systems and strengthening enforcement of laws against cybercrime.

Increase access for people with disabilities. To empower people with disabilities and the elderly, governments can encourage market-driven assistive technology innovations and interoperability among products, software, and services.

Review & Revision of Spectrum Management

Even if the fibre network reaches every household in the country, every government office and business premises as well as in every school, healthcare centre and other anchor institutions, there will always be scenarios, especially in the 'last mile' where wireless would still be useful and relevant. Hence, there is a need for a fresh look at spectrum management in particular, for broadband access and while the Authority has already undertaken several initiatives in this regard, we would like the Authority to consider the following points:

1. It is obvious that licensed spectrum usage has tremendous value by providing protection to such usages from harmful interference and thereby attracting investments but only a finite number of such licenses can be granted in any particular band and while there may be competition across different vendors of equipment or services often there is little differentiation in terms of underlying technologies for the end-users.

2. An equally important and admittedly lesser known fact is that unlicensed technologies have been playing and continue to play a very important role in fostering development of innovative technologies and applications and that too, often at a much rapid stride than those that need licensed spectrum. For example, in the past 25 years just 83.5 MHz of spectrum in the 2.4-2.4835 GHz has seen enormous innovation across wi-fi, Bluetooth, ZigBee, Microwave Ovens, cordless phones, car remote controls and this is not an exhaustive list and keeps growing.

3. It is a fact that all frequency bands are not equal and some are obviously more preferable than others. Having seen what is possible in the 2.4 GHz but also in several other bands (such as 5 GHz) as well, it is easy to imagine possibilities if similar type of de-licensing happens in lower frequency bands especially with respect to the much better propagation characteristics.

4. Considering the challenges of extending broadband access to 600,000+ villages of the country and even in the urban and semi-urban areas with limited fixed line and fibre network, it is imperative that we aggressively look for making frequency bands available in the sub-1 GHz band, both for licensed an de-licensed usage.

5. A concerted effort towards achieving world-wide harmonization of bands and regulatory frameworks around unlicensed spectrum usage is self-serving and in the national interest for the following reasons:
     i. It enables broadband access to be cost-effective and ubiquitous because it enables business models that are usable for both urban and rural connectivity
     ii. It enables fair and sustained competition
     iii. It enables innovation, and
     iv. It creates a national economic ecosystem that is equal or greater than that created through licensed operation

6. There must be a clear roadmap for spectrum re-farming and harmonization so that developers and service providers can prepare accordingly.

7. Worldwide, spectrum authorities have been looking at White Spaces as a way of spurring innovation and enhancing public welfare specifically by looking at ways and means to offer unused or vacated spectrum by terrestrial television broadcast and other usages that have shifted to terrestrial digital broadcasting and/or satellite broadcasting.

8. Another change underway is the emergence of cognitive radios and adaptive approaches such that radios can shift dynamically to bands that are lesser in use, can dynamically suppress part of the carrier/sub-carrier where other signals exist and even for that, potentially have real-time access to databases that guide the radios which bands to avoid at a particular location and at a particular time and such like.

9. It is a matter of fact that several of the technological innovations – including OFDMA (the very core of IMT-Advanced) actually first developed in the context of de-licensed usage and later were adopted within the licensed technologies. The reason is that with the non-exclusive, non-interference and non-protection rules that govern the unlicensed usage along with the limitations on the radiated power, the radios need to be much more agile, adaptive and sensitive to function!

10. Last but not the least, it is clear that the traditional spectrum partitioning needs to give way to much more adaptive, cognitive approaches where intelligent hardware/software systems can exploit unused spectrum in particular regions. This will foster far more innovation than the current approaches and enable bring more and more people to reap benefits of broadband access.

Taxation – Some Suggestions for Greater Facilitation Between Government & Business

A. **Indirect Taxes**

1. **Central Excise & Service Tax**
   (Automation of Central Excise & Service Tax- ACES project)

a. Online scrutiny and replies by assesses have begun but need to be made mandatory.

b. Refund Claims, Intimations, Permissions are online but need to be made mandatory.

c. Responding to the summons through in person appearances is the most common form of trouble for taxpayers. Hence, notice for investigations, summons and for furnishing additional information should be sent to the assesses through e-mail and it should suffice for the company officials to respond in such matters by e-mail and/or through secure online forms, Only if the reply is not satisfactory and when physical documents have to be necessarily tendered for examination and/or cross-verification, should the company officials be summoned for in-person appearance.

2. **Import / Export Customs processes :**
   (Indian Customs EDI System-ICES version 2 and Risk Management System –RMS)

a. Filing of Bill of Entry and all supporting documents including invoice, bill of lading etc. Scanned copies of documents should be accepted and so should electronic invoices.

b. Claim for refund of duty along with supporting documents should be accepted online.

c. Queries (for cases under scrutiny) by tax officials and Customs officers should be communicated online and online replies to the same should be accepted.

3. **Value Added Tax (VAT)**

   Some states have electronic filing and e-payment facilities and have made it mandatory for certain classes of dealers. This needs to be more widespread both across other states and also the mandate be extended to other categories of dealers.

4. **Goods & Service Tax (GST)**

   Introduction of GST presents a great opportunity for not only streamlining the processes but also leverage IT for better, faster & more efficient tax realizations. Mandating online filing, scrutiny, audit & investigation (to the extent possible) should be implemented for State Goods & services Tax (SGST), Central Goods & Services Tax (SGST) and Inter-State GST besides proactively enabling online payment & refund.

5. Real-time Credits

Last but not the least, for all the indirect taxes where **credits** are due, the same **must be available on real-time basis** rather than the **prevailing approach of pay now, claim later**. In fact, this itself can be a positive incentive for motivating the taxpayers move online ASAP especially considering that all the indirect taxes allow for certain credits to be availed in many cases, assesses keep waiting for years to receive the refunds (e.g. in case of Special Additional Duty on imports) and thereby often resort to pass on such temporary tax outgo to the end-customer.

B. Direct Taxes

1. Online filing, scrutiny, audit & investigation (to the extent possible) should be mandated (at least) for the body corporates.

2. Online status of income tax return audit, and refund claim should be available.