

## Response to TRAI's Consultation Paper on National Broadband Plan (10<sup>th</sup> June 2010)

### CHAPTER 2: Broadband – Demand & Supply

5.1 What should be done to increase broadband demand?

#### Response

Qualcomm agrees with the Authority that there is an immediate need to improve broadband penetration amongst masses. To ensure increased demand and equally matching supply of internet/broadband for masses, following is our view point--

- (a) **The CPE/user device**: The CPE/user devices should be affordable to the masses. It will not be practically/ financially possible for every household to own a device with form factor of a PC/Laptop, whereas percentage of households owning a device with form factor of a smartphone, providing same broadband/Internet accessing power will be certainly much higher. These devices will be cheaper as they will ride the same growth cycle as that of mobile phones. The Internet penetration can be increased considerably with handheld devices having user-friendly graphical icon based interfaces with touch screen type solutions, unlike PC/Laptops which require atleast basic IT knowledge to handle them.
- (b) **Services** : It is envisaged that there are three types of broadband/data services which will be used by the masses in different ratio as under-
  - (i) Basic and Internet service – Various applications based on Internet will be the most popular amongst masses and these applications run effectively with a moderate 256 Kbps connectivity. These will include emailing, social networking, accessing information etc.
  - (ii) Government driven services – Services like e-Governance, e-Healthcare, e-Learning services, which will be popular nodal services, especially in rural areas. It is expected that these nodes will be 'Gram Panchayats' (one per village), and may require higher connectivity speeds. These can be connected over high speed 3G and BWA systems. Though the users will be many, but the controllers/operators (preferably IT qualified) of these nodes will be limited and under direct control of 'Gram Panchayats'.
  - (iii) Bandwidth intensive applications – Applications like video on demand, mobile TV, etc. though, will be popular, but will need more capacities and network resources thereby increasing service costs for mass based usage, (due to resources constrains like spectrum and backhaul).
- (c) **Spectrum**: Spectrum is crucial for ensuring faster and wider broadband/internet penetration. As it is well known that the lower frequencies have much better propagation characteristics, use of these frequency bands (e.g. 850 MHz band) for broadband penetration is essential.

- (d) **Infrastructure:** The country already has a very large mobile wireless infrastructure in place with basic voice and data services being provided in most competitive way. If this asset is utilized to its potential, the demand of broadband/Internet services can be increased manifold for the masses. The next generation technologies like 3G and BWA which will be used for providing seamless broadband and internet connectivity to the mass are essentially incremental upgrade of the existing infrastructure already deployed by the service providers. Hence, integration of services and sharing of network should be encouraged for enabling better business case and cost effectiveness to the end consumers.

5.2 What, according to you, will improve the perceived utility of broadband among the masses?

**Response**

It is good to compare broadband penetration of India with some of the most developed nations. However, it should be kept in mind that there are certain peculiarities of our own country and to achieve broadband penetration and its acceptance amongst masses, simple, integrated and affordable solutions are the ones which will make it a success story. The existing wireline based broadband has not found enough penetration and laying of fiber to address the desired broadband penetration level by 2014 will be a big challenge. Presently, it is important that everyone gets access to broadband/internet since its penetration has high impact on national economic growth. The main usage of broadband/internet services will be towards social connectivity and obtaining information which can help them in earning their livelihood. Following will improve the perception of masses towards utility of broadband-

- a) Availability of internet connectivity to the user at the place of their interest, e.g. a farmer would like to avoid travelling tens of kilometers to Panchayat office, with a high speed connectivity, just to find out about prices of seeds. On the other hand he would prefer spending reasonable prices (comparatively cheaper than purchasing PC) for owning a simple handheld device providing him same information, may be at moderate speeds.
- b) Availability of low cost devices. PCs/Laptops, despite subsidies may be expensive. Their maintenance, protection against viruses, associated costs of various essential software, costs of upgrades, power supply support, etc. are issues which will only impede in government achieving its vision of broadband penetration.
- c) Mobile devices are much more affordable and sufficient to access most applications and they will certainly meet the basic necessity of masses for accessing internet/data, at a time and place where they need it most. It is a known fact that literacy level of most of the rural areas is far below the desired level. Uneducated and under educated users, especially in the rural areas may find PCs/laptops daunting to use. Simple handheld devices just requiring clicking of icons, may enjoy broader usage. This concept has been adopted very successfully by villages of coastal area of Tamil Nadu, where Qualcomm, along with MS Swaminathan Research Foundation, has initiated a project "Fisher Friend". Under this project the fisherman use simplest of icon based handheld devices, which provide them the information of fish catchment areas, government/market rates, weather and sea conditions, etc., besides using them for basic voice communication.
- d) An all-in-one integrated system having voice/data alongwith mobility will certainly be the first choice of users (both urban and rural), besides providing a business case for the network operators/service providers.

5.3 What measures should be taken to enhance the availability of useful applications for broadband?

**Response**

There is a need to identify a business model through which various applications are made available at very low costs and with no hidden conditions which force the users to opt for pirated versions. Creation of application stores by the service/VAS providers, from where applications can be downloaded, with no or minimum costs will help accessibility and adoptability of broadband. Also having an integrated network, providing single point window for all kinds of applications and government driven information base, will ensure mass broadband penetration. Other important step would be developing contents in local languages.

5.4 How can broadband be made more consumer friendly especially to those having limited knowledge of English and computer?

**Response**

Typically to operate a PC/laptop, a user must have some basic knowledge of IT. On the other hand a mobile device with simple widget/icon based interface will have mass appeal, as it would provide similar internet accessibility with no requirement of IT/English literacy. With high penetration level of existing wireless mobile services, it is clear that it is not necessary for any individual to be literate to handle these simple mobile devices. Mobile banking, is another such example.

5.5 Do you agree with projected broadband growth pattern and futuristic bandwidth requirements?

**Response**

Broadband growth pattern and futuristic bandwidth requirements go hand in hand with the success of drivers for the growth. It is simply not sufficient to envision a high speed bandwidth access; user demand based on increasingly more complex services shall drive the projections. To that end, it is important to envision what services mix could be successfully introduced to a base of 400 million users. Initially providing information (news papers), access to communication (letters replaced by email), photo exchange may be the popular applications which can be provided with existing bandwidth of 256 Kbps.

As the user base picks up on these kinds of applications and makes them popular, overall upgradation of networks will be required. This will include higher backhaul speeds, increased number of application servers, closer to users to avoid network latency, increased number of NIXI NoCs, and increased capacity of international bandwidth and gateways.

5.6 Do you agree that existing telecom infrastructure is inadequate to support broadband demand? If so what actions has to be taken to create an infrastructure capable to support futuristic broadband?

**Response**

The existing telecom infrastructure is capable of providing connectivity to mobile users to masses across the country. It has already crossed a landmark figure of 500 million mobile subscribers. In their present state all these networks are capable of delivering atleast moderate data/internet speeds, which are need of the hour, for accessing internet based applications. While it is necessary to identify the network components which require an urgent capacity upgrade to meet the national broadband penetration goal, a forward going policy on spectrum and infrastructure sharing will help in achieving a cost effective and efficient broadband/internet delivery system.

- (a) **Core Network** - Yes, we agree that the existing infrastructure of core network is inadequate to meet the envisaged broadband needs in 2014 (upto 6000 Gbps). Following is recommended for core network elements-
- (i) Firstly, there is a necessity to improve and upgrade the existing backhaul/core networks to meet the desired capacities by laying of OFC backbone network.
  - (ii) There are limited Submarine cable landing stations in India and are “choke points”. Besides improving their existing capacity of handling data, number of these landing stations should also be increased to improve international connectivity.
  - (iii) National Internet Exchange of India (NIXI)-Another important limiting network component of Internet connectivity in India is the NIXI. Currently, there are seven NOCs at Delhi, Mumbai, Chennai, Kolkata, Bangalore, Hyderabad and Ahmadabad. With very limited NOCs, NIXI will not be able to meet the envisaged traffic demands of 2014.
- (b) **Access Network** – An overlay of mobile broadband networks over fiber will be an ideal situation for ensuring extensive availability of broadband to its users. Planning access/last mile connectivity on fiber/copper will be difficult in rural/remote India as firstly, it will not be cost effective and secondly, the future infrastructure developments like roads, canals etc., in these areas will be a severe threat to fiber cables. Hence to ensure broadband connectivity, **the access/last mile connectivity should essentially be an overlay of wireless based broadband on fiber.** Various wireless technologies like EVDO Revision A, WCDMA, HSPA, HSPA Evolved, LTE, etc., are already providing the tremendous power of broadband services to its users.
- (c) **Servers** - In India, the co-location prices do not provide enough incentive for content providers to move content from US, Europe and other regional countries to India. Therefore, there is a need to create multiple domain servers to improve availability and accessibility. Number of servers housing applications based on regional needs should also be increased to reduce latency.

To summarize, Qualcomm believes that the National Broadband Plan should fundamentally be based on the point that mobile broadband/internet services delivered by technology neutral 3G and BWA networks is, and will continue to be, essential for the delivery of high speed ubiquitous broadband throughout the country. As a result, the National Plan should define “broadband” to include wireless mobile networks using EV-DO, WCDMA/HSPA, LTE and WiMAX.

### **CHAPTER 3: National Broadband Network**

5.7 What network topology do you perceive to support high speed broadband using evolving wireless technologies?

#### **Response**

There is a need to have a national plan of network topology so as to have an integrated network wherein all resources are pooled in for best utilization. As mentioned earlier, this will involve a robust and high capacity core network based on fiber, well located servers, probably in request broker architecture mode, overlay of wireless technologies and fiber for backhaul networks and finally, the most important, wireless based access network for connecting to masses. From existing mobile networks to the new generation wireless broadband technologies like LTE, supporting peak data rates higher than 100 Mbps with 20 MHz carrier, the mobile based access networks provide tremendous power for broadband and internet penetration. This network topology provides the fastest and assured way for implementing the broadband penetration to the level as desired by the Hon'ble President of India.

Furthermore, in urban and dense urban areas, heterogeneous networks where the macro wireless network is complemented with pico and femto cells to provide high speed mobile broadband access to all users in densely populated areas (e.g., offices and apartment complexes) is a futuristic wireless network topology for India. The idea here is that femto and pico base stations automatically adjust their radio characteristics so that they do not interfere with the macro base stations. Heterogeneous network topology brings the wireless network very close to the end users.

Where wireline/fiber backhaul may not be available, the network topology would include relays or repeaters to extend the range of wireless networks and to bring the network closer to the end user.

Also provisioning of lower frequency spectrum by the government for deploying access networks for broadband is important as these lower frequencies have propagation characteristics which make them most suitable for covering rural and remote areas.

5.11 Is non-availability of optical fibre from districts/cities to villages one of the bottlenecks for effective backhaul connectivity and impacts roll out of broadband services in rural areas?

**Response**

Yes, non-availability of optical fiber from districts/cities to villages is the bottleneck for effective backhaul connectivity. However, these rural areas can be provided broadband connectivity using microwave links/wireless solutions. It may be noted that deployment and maintenance of such wireless solutions for rural/remote areas is faster and cheaper as compared to rolling out of fiber based network.

5.12 If so, is there a need to create national optical fibre network extending upto villages?

**Response**

Yes, in long term, there is a need to create a national optical fiber network for core and backhaul networks. These fibers should be planned to provide the high capacity backhaul connectivity to all BTSs. For greater accessibility and penetration, it is important to have an overlay of wireless broadband for Access component of the network.

**CHAPTER 4: Regulatory Challenges and Future Approach**

5.16 Is there a need to define fixed and mobile broadband separately? If yes, what should be important considerations for finalizing new definitions?

**Response**

A separate definition for fixed and mobile broadband is not recommended. However, it is more important to define the backhaul and core network capacities which ultimately will drive the broadband. As far as access network is concerned, with a robust backhaul connecting BTS of existing mobile networks, mobile data services are sufficient to meet the goals and deadlines of broadband penetration amongst masses. Therefore, there is no need to have separate definitions for fixed and mobile broadband. However, the definition of broadband should exclusively include various ITU recognized technologies including 3G and BWA wireless technologies. Like US National Broadband Plan, our National Broadband Plan should also include 3G mobile broadband networks, their evolution paths and BWA networks within the definition of “Broadband”.

Worldwide, approximately 1.02 billion people use a 3G device. By 2014, the number of 3G subscribers is projected to reach approximately 2.8 billion, and at that time, most 3G subscribers will be using an EV-DO or HSPA-based device. This strong demand creates an ever-expanding market for 3G-based devices, including 3G feature phones, smartphones, PDAs, tablets and consumer electronics devices. These devices include more than 779 EV-DO-based devices (227 of which incorporate EV-DO Revision A) and more than 2,349 HSDPA-based devices (609 of which incorporate HSUPA). The sheer number and wide variety of these devices is increasing every day. With existence of such a device ecosystem, economies of scale are available thus reducing the prices of these devices which are far lower when compared to PCs/laptops. Further subsidy based schemes for these devices from government will surely ensure mass adoption of these devices for broadband connection.

5.17 Is present broadband definition too conservative to support bandwidth intensive applications? If so, what should be the minimum speed of broadband connection?

**Response**

It may be noted that Internet/broadband network essentially works on IP/packet based system. Therefore, defining the speeds of access network will not be of help towards implementing of National Broadband plan. **Speed** alone cannot improve Quality of Experience (QoE). The data rates, by themselves, only deal with one aspect of user experience. Another important factor in any broadband network (including mobile networks) is **Latency**. Low latency is also critically important to user experience, especially for applications such as web browsing or others which involve a high degree of interactivity. **Rate** and **latency** are effectively a unified concept in broadband networks. Therefore, whether the network appears slow while web browsing because the underlying data rate is slow or because of latency issue is irrelevant to a broadband user and QoE of the end user will be low. Driving network upgrades to achieve the fastest possible data rates in mobile broadband networks is a worthwhile goal, but increases in data rates alone, especially those which might only occur in a small percentage of a given network’s coverage and/or traffic, do not dramatically improve user experience unless latency is also improved. Improving of latency will require improved backhaul/core network infrastructure, availability of applications, sufficient number of application servers and high international bandwidth connectivity.

Therefore, the present definition is **not conservative** and needs no change. Focus should be towards improvement of backhaul infrastructure and not access network. Once the improvements

on backhaul start taking place, the quality of access network delivery will automatically improve. Merely creating bandwidth will not suffice; there is a need to upgrade the backhaul connectivity. In present scenario, mobile wireless systems are the most appropriate for achieving the desired broadband penetration.

Going further, a robust spectrum policy will be one of the key factors towards improvement of economic environment of the country. The growth in wireless communications—and mobile broadband in particular—has been a key contributor in the economic growth and will continue to be so in the future. Convergence of technologies—Internet and mobile communications—has ensured that mobile broadband is the best opportunity for the government to adopt for deep penetration of broadband in the country. There is a need to identify and make sufficient spectrum of lower frequency bands available for mobile broadband for more flexibility, increased reach, capacity and cost-effective solutions. Therefore, making sufficient spectrum available in a transparent way and having a comprehensive spectrum policy is need of the hour.

5.22 Should broadband tariff be regulated in view of low competition in this sector as present?

**Response**

No, tariffs should not be regulated and should be left to market forces to decide as had been in the case of mobile telephony.

5.31 What measures do you propose to make Customer Premises Equipment affordable for common masses? Elaborate your reply giving various options.

**Response**

Firstly it is important to identify the right user device which can be considered as an aid in increasing the broadband/internet penetration amongst masses. Low price devices which can be afforded by masses will be the ones which will break the barrier and will help in adoption of broadband by the masses. Most of the existing handheld wireless mobile devices, such as feature phones, smartphones, PDAs, tablets, etc. qualify in this category. Importantly, users using these devices do not require any kind of IT or English qualification to handle them.

Secondly, a PC/laptop as broadband user device for masses will be an overkill. The extremely high processing/computing capacities of these devices is of use basically in metros/cities/education institutions and scientific labs. Whereas an “Aam Aadmi” would prefer a cost effective device with decent computing power with which he could meet his basic Internet/data requirements. Also, the cost factor involved with PC/laptops viz-a-viz smartphones is many times higher. Therefore, incase it is decided to utilize the USO/ other government fund as schemes towards subsidy for broadband mobile devices, providing subsidy to these handheld smartphones/feature phones can help in covering a larger user base as compared to having subsidies for PC/laptops which, comparatively with much higher prices, would be having low acceptability by masses hence resulting in very low broadband penetration.

There are some innovations by means of which, a computing device with enough computing power can be made available at very low prices (sub Rs. 10K level). Qualcomm has formally

announced the introduction of such a low cost PC alternative by the name of “Kayak”. These Kayak-based devices use mobile broadband technology to fill the niche between desktop computers, which typically require wireline or cable connections for internet access that is often unavailable in rural areas, and internet-capable mobile broadband-enabled smartphones. Kayak-based devices include embedded mobile broadband capability, a full featured Web 2.0 browser, and web access via the browser for other broadband applications. In addition, Kayak supports both television sets and computer monitors for displays and/or built-in displays. Kayak-based devices are compatible with a standard keyboard and a mouse for input and will include a music player and/or 3D gaming console functionality. Kayak consists of a reference design and recommended software specifications that device manufacturers are using to bring to market a variety of innovative wireless devices. The Kayak enables the user to access the internet by using a standardized web browser running at desktop resolutions and mobile broadband networks which employ 3G wireless broadband technology, either EV-DO Revision A or HSPA. Thus, Kayak-based devices use built-in cellular connectivity and an inherently low-cost platform based on high-volume wireless chipsets. Kayak-based devices enable affordable mobile broadband Internet access. More details are available at following URL- [www.qualcomm.com/news/releases/2008/081112\\_qct\\_kayak.html](http://www.qualcomm.com/news/releases/2008/081112_qct_kayak.html).