



Intel Corporation appreciates the opportunity to respond to the recent Telecom Regulatory Authority of India (TRAI) Consultation Paper on National Broadband Plan seeking suggestions/comments on issues around Broadband penetration in India. At the outset, we wish to compliment TRAI for coming out with a well thought out, well researched and an exhaustive consultation paper.

Intel Corporation is the world's largest semiconductor manufacturer and a leader in technical innovation. Intel is also a leading manufacturer of communications and networking chips and equipment. Continuing our long history of technological innovation. Intel is currently pursuing the latest technological advances by working with more than 100 standards and industry groups worldwide.

Intel believes that widespread deployment of broadband services can bring tremendous benefits to society. Therefore, we are working on initiatives worldwide. For example, the Intel World Ahead Program is committed to developing sustainable technology for the next billion users in emerging countries around the world. The pillars of this program are as follows: greater accessibility to PCs, increased connectivity, quality education, and localized content and services.

Intel also has a longstanding interest in promoting public policies that foster broadband deployment. Intel strongly supports technology neutral policies regarding the allocation of spectrum. We believe that a "technology neutral" approach to spectrum management is one of the best methods to foster technology growth and geographical coverage of broadband and addressing the social and economic digital divide. We also believe the best way to reduce barriers to innovation, investment and competition is for regulators to give licensees more flexibility to use the technology of their choice (aka technology neutrality) and provide the service they think will best serve their consumers (aka regulatory or service flexibility). Indian consumers and society will be better served by allowing carriers more technology and service choice.

We realize that if we are to be successful in increasing the BB penetration in the country where there is lack of awareness of how BB can open the doors to a very wide world, we have to focus not just on the right policy environment but also put tremendous focus on fostering public benefit beyond what is currently being addressed by the government and service providers under various schemes and programs.

We urge the usage of Universal Service Funds to be deployed judiciously and expeditiously for ushering in the benefits of high speed broadband wireless



access and voice to the rural masses. There are enough studies which correlates a nation's GDP with its teledensity and broadband penetration. While we are the fastest growing telecom market in the world adding tens of millions of mobile subscribers' month over month, the picture is abysmally low on the broadband front. It is time for the regulator and the government to encourage low cost spectrum in 2.3 GHz, 2.5 GHz and 700 MHz band for service providers to deploy BWA, provide additional spectrum in these bands for BWA, take steps to boost the overall BWA eco-system so that people at large, in our hinterland have access to high speed internet, updated information and best global practices.

We must also take a cue from some developed nations who have been comparatively quite successful on Broadband front. The French government was the first in the world to actually invest over \$3,000 per household for "computer-phones" for access to even private services like laundry, groceries, etc. Singapore saw telephony as the recipe for respite from traffic by encouraging people to talk. Now broadband has had the whole world excited far more. President Barack Obama's focus is to use broadband to correct delivery of education with a stimulus of \$7.2 billion to be disbursed by September. Prime Minister Gordon Brown thinks broadband is the only way to keep Britain competitive and wants taxpayers' money to spur the country's slow roll out with healthcare as priority. The Australian government has just concluded a \$31 billion public-private-partnership for ushering in a nation-wide network. Even countries like Jordan, Bahrain and UAE want broadband to be the backbone of their initiatives for quality education.

With above statements, we would request, encourage and appreciate if Authority recommends some forward looking policy measures that foster increasing Broadband penetration and proliferation across India, under the National broadband Plan.

Meanwhile, we are enclosing a white paper around "Optimizing benefits of National Broadband ICT Plan – Policy Objectives for Success" for your kind consideration. This paper has been arrived at after an exhaustive research and aptly fits for a developing nation like ours.





I hope you find merit in our comments and would give due consideration to them while making recommendations to the Government.

Further, we have given below our specific comments against various questions under "Chapter Five: Summary of Issues for Consultation" for your kind consideration.

We are available for discussions in taking some of these recommendations forward.

Thank you,

Sincerely

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CHAPTER 5: Summary of Issues for Consultation

CHAPTER 2: Broadband – Demand & Supply

5.1 What should be done to increase broadband demand? (Reference Para 2.23)

- Increase Awareness around the benefits, applications, limitless possibilities, knowledge and ease of use of Broadband
- Involve NGOs (Non Government Organizations) who have reach to the masses in the hinterland
- Availability of local content and tailor made applications
- Digital infrastructure Creation at the State and Central level
 - To be given top priority by Planning Commission and the Prime Minister's Office
- Lower costs of devices and services by reducing taxes, duties and other levy on them.
- Engagement, Cooperation and Collaboration amongst the various stakeholders within the Eco-System viz. Government, Regulator, Industry and the common man.
- Forward looking Policies and Regulatory mechanism.
 - Adopt supportive regulations that foster competition and market-based investment
- Higher connection speeds (low connection speeds create frustration, and the inability to utilize the internet effectively)
- Lower cost for high quality BB connectivity (achieved though reduced taxes and targeted subsidies, as well as encouraging new entrants and technologies via a technology neutral approach)
- Introduction of 4G broadband wireless access technologies such as WiMAX and LTE
- High quality and high speed internet centers, for example using schools, libraries, Post Offices, hospitals, nationalized banks, CSCs and other public centers
- Digital literacy training



- Promoting high speed internet kiosks and cyber cafes in general

Some other key measures that could help increase broadband demand in India could be:

- Encourage Investment in essential infrastructure and the latest innovative technology
- Release spectrum suitable for sustained broadband deployment
- Encourage competition
- Form mutually beneficial public/private partnerships
- Assign abundant technology and service neutral spectrum for wireless broadband technologies such as WiMAX. Additionally a minimum of 30 MHz or more per operator is needed to enable and ensure lower costs, as well as potential impacts to service quality.
- Reduce the cost of computer ownership by providing targeted subsidies and minimizing or eliminating import duties on devices used to access the internet.
- Provide training programs to enable more citizens to access the internet.
- Establish computer ownership and training programs in every School, College, and University (Public and Private)

Reference for importance of ICT training (while US example, we believe it scales)

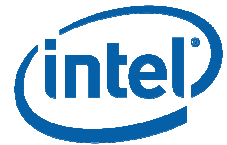
http://www.pewtrusts.org/uploadedFiles/wwwpewtrustsorg/Reports/Economic_Competitiveness/broadband_report.pdf

US broadband plan

<http://www.broadband.gov/>

5.2 What, according to you, will improve the perceived utility of broadband among the masses? (Reference Para 2.23)

- Awareness and training on use of internet/BB and other ICT tools
- Making internet education mandatory for all schools, colleges, universities, government establishments and their employees.
- Creating benchmark and performance metrics for each government department, ministry, states around ICT adoption and e-readiness.
- Digital literacy training



- Adoption of globally accepted metrics for ICT/broadband advancement (this can provide an even measure of how global economies are performing, and allow for competitive comparison and advancement).
- Periodic tracking and reporting on progress relative to the globally accepted metrics

5.3 What measures should be taken to enhance the availability of useful applications for broadband? (Reference Para 2.23)

- Awareness and training on use of internet/BB and other ICT tools right at the schools level.
- Encourage application development in local content and languages by giving tax sops etc.
- Provide education programs to outline the myriad of beneficial applications that broadband can fulfill (we can provide some examples in future)
- Provide tax advantages and subsidies, as well as other incentives to promote the new uses of broadband
- Assign more sub 3GHz spectrum in a technology and service neutral manner for broadband wireless access

5.4 How can broadband be made more consumer friendly especially to those having limited knowledge of English and computer? (Reference Para 2.23)

- Awareness and training on use of internet/BB and other ICT tools right at the schools level.
- Encourage application development in local content and languages by giving tax sops etc.
- Provide education programs to outline the myriad of beneficial applications that broadband can fulfill (we can provide some examples in future)
- Carrying out advertisement campaigns on regional and national TV channels and local and national print media print media



5.5 Do you agree with projected broadband growth pattern and futuristic bandwidth requirements? (Reference Para 2.35)

- We agree in concept that the future bandwidth requirements will be large to support the needs of Indian citizens, and encourage the planning projections to ensure that the needs are met not only for today, but also for the future..

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? (Reference Para 2.35)

- We agree that the existing infrastructure requires improvement to support the current and future broadband demand, and both wireless and wire line networks play an important role in the overall effort to promote optimum BB connectivity. First and foremost, policies and programs must be established to promote a competitive broadband environment. More spectrum should be released in a technology and service neutral manner, to support new wireless network technologies and services. Subsidies and tax incentives can be provided, in a competitively neutral manner, to encourage connectivity to the under served, and vulnerable populations.,

CHAPTER 3: National Broadband Network

5.7 What network topology do you perceive to support high speed broadband using evolving wireless technologies? (Reference Para 3.22)

- 4G broadband wireless technologies such as WiMAX and LTE will play a critical role in the next 5 years to provide broadband penetration in the next 5 years and beyond.

5.8 What actions are required to ensure optimal utilization of existing copper network used to provide wireline telephone connections? (Reference Para 3.22)

- No Comments



5.9 Do you see prominent role for fibre based technologies in access network in providing high speed broadband in next 5 years? What should be done to encourage such optical fibre to facilitate high speed broadband penetration? (Reference Para 3.22)

- Perhaps eventually, but the high cost of this exercise at this time may impede the success, especially in remote areas. A possible better approach is to leverage wireless technologies for access where the cost of fiber would be prohibitive. (for example a combination of both fiber and wireless technologies; fiber as a backbone and to anchor institutions first, and access from high speed wireless technologies, such as WiMAX,. Eventually the fiber connections can be expanded, where cost effective and desired, to provide higher speed access directly to individuals.

5.10 What changes do you perceive in existing licensing and regulatory framework to encourage Cable TV operators to upgrade their networks to provide broadband? (Reference Para 3.22)

- No specific comments. However, the Authority may take a note of some recently released Industry reports and papers around Broadband in India and the suggestions around using Cable TV networks for providing BB.

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? (Reference Para 3.39)

- In the short term, it is likely much more cost effective to provide high speed wireless connectivity to villages, for example using 4G technologies such as WiMAX. .

5.12 If so, is there a need to create national optical fibre network extending upto villages? (Reference Para 3.39)

- Eventually there will likely be a need, however as previously stated, in the short term, it would be in many cases more cost effective to provide access and backhaul to villages using wireless technologies.



5.13 In order to create National optical fibre core network extending upto villages, do you think a specialized agency can leverage on various government schemes as discussed in para B? (Reference Para 3.39)

- Yes, we think it is advisable and a highly appreciate step. At the same time, It would be beneficial to do a dedicated study, plan, and timeline to implement the stages of promoting this connectivity.

5.14 Among the various options discussed in Para 3.35 to 3.37, what framework do you suggest for National Fibre Agency for creating optical fibre network extending upto village level and why? (Reference Para 3.39)

- While determining the best option to promote optimum connectivity to Indian citizens, including those who reside in villages, care should be taken to ensure a technology and competitively neutral process is established. The most cost effective and optimum solution will likely be a mix of technologies and incorporate both wireless and wire line solutions. As previously mentioned, one recipe could first focus on high speed fiber in urban areas and to anchor institutions, 4g wireless to the villages, and provide training to the remote areas and villages on the benefits of and how to use BB and ICT.

5.15 What precautions should be taken while planning and executing such optical fibre network extending upto villages so that such networks can be used as national resource in future? What is suitable time frame to rollout such project? (Reference Para 3.39)

- No Comment.

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? (Reference Para 4.18)



- First, it is insightful of the TRAI to recognize that broadband definitions are not static, and are required to improve over time. In context, fixed broadband technologies such as fiber can generally provide higher throughput than wireless technologies can today, and ergo it is logical to differentiate between fixed and mobile broadband. In any event, we recommend that India ensure that most citizens are able to get at least 1-2 Mbps initially, at high quality and affordable rates, and as expeditiously as possible.

5.17 Is present broadband definition too conservative to support bandwidth intensive applications? If so, what should be the minimum speed of broadband connection? (Reference Para 4.18)

- Yes, in its present form, it is way too conservative. Yes, we recommend for an emerging economy like India, depending on local circumstances, we should ensure that most citizens are able to get at least 1-2 Mbps initially, at high quality and affordable rates, and as expeditiously as possible.

5.18 What specific steps do you feel will ease grant of speedy ROW permission and ensure availability of ROW at affordable cost? (Reference Para 4.30)

- No Comments

5.19 Does the broadband sector lack competition? If so, how can competition be enhanced in broadband sector? (Reference Para 4.42)

- While it is difficult to comment specifically on competition in the Indian market, in order to enhance competition generally, technology and competitive neutral policies should be established. More spectrum should be released in a technology and service neutral manner to promote broadband wireless access. Additionally, policies and practices should be established to encourage competition for access to the international cable gateways.

5.20 Do you think high broadband usage charge is hindrance in growth of broadband? If yes, what steps do you suggest to make it more affordable? (Reference Para 4.42)

- Yes, they are a hindrance.



- In addition to creating policies and practices to enable a more technology neutral, competitive environment, incentives can be provided, in the form of targeted subsidies and tax incentives, Additionally, digital literacy training can be established to explain the benefits of broadband to Indian and global citizens..

5.21 Do you think simple and flat monthly broadband tariff plans will enhance broadband acceptability and usage? (Reference Para 4.42)

- No Comment

5.22 Should broadband tariff be regulated in view of low competition in this sector as present? (Reference Para 4.42)

- No, in general the government should focus on promoting policies that encourage competition and investment in the broadband marketplace. This will do the most to encourage lower costs. In the event where competition will not exist for some time, for example in areas where it is not cost effective, targeted subsidies and tax incentives can be provided to promote lower costs to consumers.
- As an example, incentives out of the USOF could be provided to Service providers, in a technology and competitively neutral manner, for providing low cost BB to the students and government employees, NGOs, schools, hospitals, other educational institutions.

5.23 What should be the basis for calculation of tariff for broadband, if it is to be regulated? (Reference Para 4.42)

- No Comment

5.24 How can utilization of International Internet bandwidth be made more efficient in present situation? (Reference Para 4.42)

- No Comment

5.25 How can use of domestic and international internet bandwidth be segregated? Will it have direct impact on broadband affordability? If so, quantify the likely impact. (Reference Para 4.42)



- No Comment

5.26 What steps should be taken to bring down the cost of international internet bandwidth in India?(Reference Para 4.48)

As previously mentioned, introducing liberalizing access to the international gateway will help to reduce costs.

5.27 How can competition be enhanced in the International bandwidth sector? (Reference Para 4.48)

While the process depends on national circumstances, one general method is to ensure fair and equal access to the international bandwidth.

We refer to the Singapore efforts of liberalization of the international cable access as a possible example.

http://www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR08/discussion_papers/IntlSharing_Singapore_web1.pdf

5.28 QoS of broadband, availability of bandwidth, adherence to given contention ratio, affordability, availability and spread are some intricately linked parameters. In your opinion what should be done to ensure good quality broadband to subscribers? (Reference Para 4.59)

- Voluntary QOS metrics should be developed in partnership with industry. Additionally, introduction of more competition into the marketplace will help to promote higher quality connectivity. As an example, we refer to the recent discussions in the United States by the FCC for the national broadband plan, which includes discussions on QOS metrics.

5.29 Do you think that bad quality of broadband connection is impacting the performance of bandwidth hungry applications and hence crippling the broadband growth? If so, please suggest remedial actions. (Reference Para 4.59)

No specific comments here.



5.30 Is there a need to define new/redefine existing quality of service parameters considering future bandwidth hungry applications, time sensitivity of applications and user expectation? What should be such parameters including their suggestive value and should such parameters be mandated? (Reference Para 4.59)

- Please see previous answer; the government should consult with industry to establish voluntary, up to date QOS metrics for broadband access.

5.31 What measures do you propose to make Customer Premises Equipment affordable for common masses? Elaborate your reply giving various options. (Reference Para 4.64)

- Establish easy accessibility and affordability to internet devices like PC, laptops, netbooks, mobile internet devices and other BB enabled devices. This can be enabled by eliminating or minimizing tax on internet access devices, such as computers, netbooks, mobile internet devices, etc. Reducing the taxes and duties on these devices to 'Zero' will help affordability and hasten the pace of BB penetration and proliferation.
- Provide targeted subsidies, preferably from general tax revenue, to underserved and unserved populations for internet access devices.

5.32 What measures are required to encourage development of content in Indian vernacular languages? (Reference Para 4.68)

- Increase Awareness around the benefits, applications, limitless possibilities, knowledge and ease of use of Broadband
- Involve NGOs (Non Government Organizations) who have reach to the masses in the hinterland
- Incentives to the local entrepreneurs for making available the local and tailor made applications to suit local needs of the region
- Digital infrastructure Creation at the State and Central level



5.33 Do you perceive need for any regulatory or licensing change to boost broadband penetration? (Reference Para 4.71)

- One major issue is the lack of adequate spectrum for broadband wireless technologies and applications. New 4G wireless technologies such as WiMAX and LTE have great promise to promote broadband growth and competition in the Indian marketplace, provided adequate spectrum is made available. In case of WiMAX, abundant spectrum should be made available, allowing the operator to obtain a minimum of 30 MHz or more to allow for a successful, competitive, and robust business model.

5.34 Are there any specific competition and market related issues that are hindering growth of broadband? (Reference Para 4.71)

- Same comment as in 5.33 above.

5.35 What other fiscal/non-fiscal measures should be considered to boost broadband penetration? (Reference Para 4.71)

- Some other specific measures which would lead to increased BB penetration and proliferation, thereby increasing the demand for BB, would include the following:
 - USF subsidies for broadband support to unserved and underserved areas.
 - Additional targeted subsidies for computers and computer training
 - Minimal or no tax on internet access devices
 - Support for ICT in Education – Schools, Colleges and Universities
 - ICT for non ICT sectors
 - A certain fixed % of all budgets (Centre + State) earmarked towards Broadband penetration and proliferation
 - More support and traction to states deploying Broadband across its length and breadth, promoting local content and encouraging its eco-system proliferation
 - Innovation, Engagement, Collaboration and Coordination amongst various stake holders within the eco-system (including the government), aimed towards Broadband growth.