Mr. Arvind Kumar

Advisor (NSL)

Telecom Regulatory Authority of India

Mahanagar Doorsanchar Bhavan

Jawahar Lal Nehru Marg

New Delhi 110 002

Dear Sir,

Please find enclosed a copy of our submission in response to the Consultation Paper Number 05/2015 on '**Implementation Model for BharatNet'**.

We are of the opinion that this project meant to usher in a network revolution was started from the wrong end of the stick. A project of such importance for the development of connectivity to the entire strata of society has languished. A project which was to usher in an unprecedented development has yet to take off in reality. A project supposed to usher in the commoditisation of connectivity continues to be a paper tiger. For starters, the one-size fits all approach towards the adoption of fibre technology as the sole means towards creating the multi-purpose infrastructure that extends up to places of varying nature and terrains such as urban, rural, hilly and other remote areas stretching across the length and breadth of the country is completely flawed and misplaced. We strongly believe that the principle to be adopted must be "Applying Technology to reach out to the Masses. " We believe that this was a result of a recommendation of Dr. Raghavan outlined in this piece (Annexure 1)

Impediments, be it regulatory or policy, are reduced with respect to application of technology must be taken care of. By application of technology, we mean no restrictions in using a technology which is the means to provide access via backhaul/national/international connectivity to provide connectivity on the principle of Just in Time. The best available technology which could be deployed

to provide just-in-time service to the remotest of areas by the use of satellite or other means needs to be looked at. Creating points of presence (PoP) is essential, whatever be the medium – satellite, wi-fi, MWA, fibre, etc. This needs a mindset change from the policy makers, who better understand connectivity. We must be receptive to new innovations and allow an ecosystem that leads to new technologies being built.

The right of way (RoW), land for towers, space for BTSs (Electronics), availability of prime power etc and issues over municipal roads/State highways, national highways must be settled through an overarching policy directive that shall address concerns of any State Government and ensure that RoW and all other facilitation can be provided as and when needed. There can be an online digital mechanism created for a party seeking such RoW access and various other requirements.

We do not believe that the PPP model is best suited for the project as well, given the use of the Government money in private hands can lead to a case of misguided motives. The ideal model is one that has been seen in the case of DMRC or the Bangalore Airport (BIAL) as these were agencies that were empowered to execute the project without their hands being tied. We must therefore, look to study the DMRC model to examine the powers and accountability that was vested in them. Therefore, following such a model wouldn't be a bad idea towards driving the implementation of this project. Create an empowered entity that is truly empowered, accountable and auditable; and which is committed to deliver in a set time frame. The reason, why this project has not taken off, and might not as well, is for the lack of an empowered organisation. Why hasn't the stated principle of Minimum Government and maximum Governance been applied here?

We have also enclosed a copy of our earlier response on the TRAI Paper relating to 'Delivering Broadband Quickly' (Annexure 2) to re-emphasize our position on related issues.

We hope that our inputs are useful to the Authority to formulate their position on the BharatNet Implementation.

Best regards,

B.K. Syngal

Senior Principal

Implementation Model for Bharat Net

Introduction

The National Optical Fiber Network (NOFN) project was approved by the Union Cabinet on December 25, 2011. The project was expected to be completed in two years. However, very little progress in project implementation has take place.

The Government's vision of Digital India to transform India into a connected knowledge economy through high speed broadband infrastructure with a slew of digital services riding on the information super-highway is critically dependent on the timely completion of NOFN or BharatNet as it has been rechristened.

However, this project meant to usher in a network revolution was started from the wrong end of the stick. A project of such importance for the development of connectivity to the entire strata of society has languished. A project which was to usher in an unprecedented development has yet to take off in reality. A project supposed to usher in the commoditisation of connectivity continues to be a paper tiger. For starters, the one-size fits all approach towards the adoption of fibre technology as the sole means towards creating the multi-purpose infrastructure that extends up to places of varying nature such as urban, rural, hilly and other remote areas stretching across the length and breadth of the country is completely flawed and misplaced.

Now that we have devoted our attention to debate on the institutional frameworks that would take the responsibility of implementing this large scale project, we are neglecting the critical issue of the choice of technology.

Impediments, be it regulatory or policy, are reduced with respect to application of technology must be taken care of. By application of technology, we mean no restrictions in using a technology which is the means to provide access via backhaul/national/international

connectivity to provide connectivity on the principle of Just in Time. These have spelled out, in some detail, by the Authority in the Consultation Paper as well.

We should not be hung up about one form of technology or licensing. The use of any existing technology (copper, fibre, microwave, wifi, etc) or any other new emerging technology must be encouraged as long as it goes about establishing points of presence (PoP). For example, PoP created by use of satellite in remote area can lead to broadband services being delivered there at a village or gram Panchayats (GP) level by the use of many of the wireless technologies as above. A proper and complete mapping out of the resources to expedite the implementation is of utmost importance. The Government shouldn't indulge in a process akin to reverse engineering. It looks unlikely that existing resources have been mapped out properly in a co-ordinated manner and grids created of the nearest point of presence (PoP) from the cluster/village/gram panchayat (GP). There should be a study carried out to match the need and timing of technologies. In order to progressively provide the right kind of technology, if things need to be reconfigured, so it should be.

The best available technology which could be deployed to provide just-in-time service to the remotest of areas by the use of satellite or other means needs to be looked. Creating points of presence (PoP) is essential, whatever be the medium – satellite, wi-fi, MWA, fibre, etc. And, this needs a mindset change from the policy makers, who better understand connectivity. We must be receptive to new innovations and allow an ecosystem that leads to new technologies being built. Leaving out such kind of technologies from this broadband project was a mistake.

However, to keep pace with broadband objectives of the country and implement such ambitious projects in a timely manner, participation of private parties along with government agencies could help the country achieve its objective in a more efficient manner.

Example: Markets like France, Portugal and Singapore are very good examples of government supported fibre roll outs but led by private industry. The government has allowed multiple operators to deploy fibre with little support allowing free market forces to drive fibre deployments. This model also results in extensive fibre access across the country.

We have also noted that there has been lots of criticism levelled against the PSUs inability to deliver broadband services effectively. But has the Government tried to address the constraints

faced by these PSUs? These PSUs do not enjoy operational autonomy with the bureaucrats controlling the running of these enterprises coupled with the Minister's hand hanging over them. If these institutions are not empowered in the manner they should be, why attribute fault to the PSUs? If the adequate quality of life cannot be provided in the PSU ecosystem, there is no point faulting the PSUs in its inability to deliver broadband services effectively? Should the Government really expect results from PSUs, they have to be restructured and Governed by respective Boards; Minimum Government maximum Governance.

There is also a model referred to in the Consultation Paper with respect to a State Government led enterprise. Such a model is a non starter given the amount of co-ordination that would need to be driven and the 'islands' that would be created.

The right of way (RoW) issues, land for towers, space for BTSs (Electronics), availability of prime power etc and issues over municipal roads/State highways must be settled through an overarching policy directive that shall address concerns of any State Government and ensure that RoW can be provided as and when needed. There can be an online digital mechanism created for a party seeking such RoW access and various other requirements. There should also be a proviso in place to mandate that any destruction of land or property caused by a party seeking to put in this RoW shall be reinstated by the party seeking such RoW and not the State. Especially, given that the State is not levying any fees or charges for the RoW.

We do not believe that the PPP model is best suited for the project as well given the use of the Government money in private hands can lead to a case of misguided motives. The ideal model is one that has been seen in the case of DMRC or the Bangalore Airport (BIAL) as these were agencies that were empowered to execute the project without their hands being tied. We must therefore, look to study the DMRC model to examine the powers and accountability that was vested to it. Therefore cloning such a model wouldn't be a bad idea towards driving the implementation of this project.

Create an empowered entity that is truly empowered, accountable and auditable; and which is committed to deliver in a set time frame. The reason, why this project has not taken off, and

might not as well, is for the lack of an empowered organisation. Why hasn't the stated principle of Minimum Government and maximum Governance been applied here?

Issues for Consultation

Q1: The "Report of the Committee on NOFN" has recommended three models and risks/advantages associated with these models. In your opinion what are the other challenges with these models?

Q2: Do you think that these three models along with implementation strategy as indicated in the report would be able to deliver the project within the costs and time-line as envisaged in the report? If not, please elucidate.

<Combined Answer for 1, 2>

Now that we have devoted our attention to debate on the institutional frameworks that would take the responsibility of implementing this large scale project, we are neglecting the critical issue of the choice of technology.

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Q8: What terms and conditions should be imposed on the executing agency so that it provides bandwidth/fibre in fair, transparent and non-discriminatory manner?

Q9: What flexibility should be given to the agency in terms of selection of route of laying optical fibre, construction, topology and deployment of technology?

<Combined Answer for 8&9>

We should not be hung up about one form of technology or licensing. The use of any existing technology (copper, fibre, microwave, wifi, etc) or any other new emerging technology must be encouraged as long as it goes about establishing points of presence (PoP). For example, PoP created by use of satellite in remote area can lead to broadband services being delivered there at a village or gram Panchayats (GP) level by the use of many of the wireless technologies as above. A proper and complete mapping out of the resources to expedite the implementation is of utmost importance. The Government shouldn't indulge in a process akin to reverse engineering. It looks unlikely that existing resources have been mapped out properly in a co-ordinated manner and grids created of the nearest point of presence (PoP) from the cluster/village/gram panchayat (GP). There should be a study carried out to match the need and timing of technologies. In order to progressively provide the right kind of technology, if things need to be reconfigured, so it should be.

The best available technology which could be deployed to provide just-in-time service to the remotest of areas by the use of satellite or other means needs to be looked. Creating points of presence (PoP) is essential, whatever be the medium – satellite, wi-fi, MWA, fibre, etc. And, this needs a mindset change from the policy makers. This needs a mindset change from the policy makers, who better understand connectivity. We must be receptive to new innovations and allow an ecosystem that leads to new technologies being built. Leaving out such kind of technologies from this broadband project was a mistake.

Q.12 What should be the tenure/period after which the ownership of the project should be transferred to the Government?

A 10 to 15 year recovery period should be put in place for transfer of ownership towards the project.

Q 13 Do you think that some measures are to be put in place in case the executing agency earns windfall profits? How should windfall profits be defined?

There should be an upfront declaration requirement upon reaching a certain threshold of windfall profit levels. A payback mechanism to the Government should be put in place upon

hitting such windfall levels. It is for the government to decide the level of windfall profits and announce that upfront. Taxing or claiming windfall profits is nothing new. The principle is applied in entire developed world. Therefore, let a definition be made right in the beginning in order to avoid time wasting legal bouts.

Q.14 Whether there is a need to mandate the number of fibres to be offered as a dark fibre to other operators to ensure more than one operator is available for providing bandwidth at GP level?

While laying the fibre, the digging and cost of pipes are a common denominator. After that the capacity of fibre is in core sizing of 12/24/48/96. The sizing, while must be done bearing in mind the cost-benefit analysis, and keeping provision for one or two extra pipes for private operators for contingency sakes. A cost plus methodology may be used to determine how a 20-25% RoI may be arrived at.

Q15: What measures are required so that broadband services remain affordable to the public at large?

Need and timing should be essential considerations as it is in allowing businesses to grow and make it self-sustaining or self-funding. If one is short sighted on one form of technology in itself, it doesn't meet the overall infrastructure for this large scale national project.

Q16: What safeguards are to be incorporated in the agreement entered between Government and executing agencies if RoW is not being granted to the executing agency in time?

The right of way (RoW) issues, land for towers, space for BTSs (Electronics), availability of prime power etc and issues over municipal roads/State highways must be settled through an overarching policy directive that shall address concerns of any State Government and ensure that RoW can be provided as and when needed. There can be an online digital mechanism created for a party seeking such RoW access and various other requirements. There should also be a proviso in place to mandate that any destruction of land or property caused by a party

seeking to put in this RoW shall be reinstated by the party seeking such RoW and not the State. Especially, given that the State is not levying any fees or charges for the RoW.

THE HINDU

» TODAY'S PAPER » OPINION

January 11, 2006

Gigabits and Gandhi a realistic model

S.V. Raghavan

Fibre optic cables may hold the key to a rural revolution. They can create a multi-purpose infrastructure for the villages of India.

WHAT CAN advanced technology do for rural India? Can rural folk be provided the same technology that works in urban areas? Can they afford it and learn to use it? These are common questions. Now let us see whether we can find credible answers and pragmatic solutions that make economic sense.

Two important properties make Information and Communication Te ology (ICT) interesting for human welfare and development. These are "annihilation of distance" and "death of time." With ICT one can ntaneously be everywhere. For a village it means the entire world will be at its doorstep. ICT bestows upon humanity the ability to def tance and time. How can it be used for human development?

Human development is quantified in the annual World Human Devel ent Report of the United Nations as progress in health and education. A healthy nation means more productive labour and an educated nat means more creative labour.

ICT has many facets. The most visible part is the bandwidth used fo nmunication. Modern technology delivers gigabits through a fibre optic medium and several megabits through the wireless medium. A bination of the two technologies along with specialised devices often called routers and switches (equivalent to post offices and beat const s) can enable flow of gigabits of information from one village to another. What does it mean to villages? The villagers can have acces igh quality medical help, quality education, and relevant information pertaining to crops, fertilizers, entertainment, and access to the Inte as is enjoyed by their urban counterparts.

Cooperative effort

How can we make this happen? This is where Gandhi and his econon ought play a crucial role. The entire exercise has to be seen as a cooperative effort of the people, by the people, and for the people. Th dian administrative system divides the nation into States, districts, blocks, and villages. A typical district has 20 blocks and about 400 vi s with a population of 40 lakh. The physical size of a village can be set at about 10 km in diameter. There are four-five hamlets in each villa ith an average population of 2000 spread across 500 families. The average fibre optic cable length required per village will be about 15 Each village will require a few modern telephones, videophone equipment along with active networking components such as routers switches. Each village will require a standard wireless technology that can transfer at 54 megabits per second in order to reach each ha t in a concentrated manner.

All these are available commercially off-the-shelf from across the wo No development time is required. The cost would work out to Rs.500 crore a district - which translates to Rs.1,250 per capita investment.

The technology is such that fibre is useful for 20 years. The rest of th chnology is useful for five years based on a very conservative estimate. The ratio of investment between 20-year use and five-yea e is about 3:2; that is Rs.300 crore for fibre and Rs.200 crore for equipment, including end-user equipment. One can therefore amorti e Rs.300 crore over a 20-year period and Rs.200 crore over a five-year period. The per capita per annum turns out to be Rs.137.50 or re 37 paise per person a day. This is an amount that can be handled as a *hundi* collection using micro transactions in the modern e-comm world by a progressive bank. It is feasible and makes economic sense. At the end, every Indian village gets a gigabit delivered on fib

Fibre technology has something very interesting for economists. The cept of marginal cost deals with increased production with incremental investment, once the basic system is in place. In fibre te ology, a mere two per cent incremental investment creates more than 100 per cent production capacity. This is mainly because when the fi is laid, it has 6/12/24/48 cores inside and only one pair is put to use. The rest can be lit as and when necessary to increase bandwidth or carrying capacity. That is the incremental cost. India has fantastic facilities to produce fibre optic cables in bundles up to 96 cores and beyond.

Besides, they can be packaged for use indoors, outdoors, overhead, underground, under water, under sea, and to operate under very hostile conditions. What we discussed so far creates a fantastic multi-purpose infrastructure for the villages of India.

The natural question that arises is: if it is so simple, why has it not been done so far? The answer is simple. Fibre optic technology research and development requires such a sophisticated and expensive environment, the simplicity of use in the field is easily missed. Perhaps, the fear of "large scale obsolescence of earlier models of infrastructure creation" prevents one from venturing into this extremely powerful yet simple infrastructure. To practise what is said here requires a paradigm shift in thinking - in terms of technology, economics, investment, and welfare measures.

(The writer is Professor of Computer Sciences, IIT-Madras.)

FROM AROUND THE WEB

Delivering Broadband Quickly: What do we need to do?

Introduction

There is no doubt that the proliferation of access to information, knowledge, public records, etc. is a must to provide transparency. Our view is that proliferation of internet is something which is kind of given, and the penetration of internet is something which must increase manifold and at a faster rate in order to meet the key objectives of transparency and dissemination of knowledge at a pace not seen hitherto.

Augmenting "broadband highways"

We understand that "broadband highways" are a priority for the new Government, as has been highlighted in the recent launch of the 'Digital India' initiative as well. The Digital India project aims to ensure nationwide digital transformation through application of ICT in various sectors of the economy, empowerment of people and delivery of all government services electronically to the citizens and businesses through re-engineered processes, integrated and interoperable systems and multiple delivery channels. This can only be achieved, when, impediments, be it regulatory or policy, are reduced with respect to application of technology. By application of technology, we mean no restrictions in using a technology which is the means to provide access via backhaul/national/international connectivity. These have spelled out, in some detail, by the Authority in the Consultation Paper as well.

Improving existing infrastructure

The Government must promote initiatives to help better use existing telecom infrastructure and allow the private sector to further participate in the creation of additional infrastructure. India's telecom policy should allow participation of all stakeholders - whether ISPs, Web based service providers, utility companies, broadcasters or any other stakeholders - to acquire and sell telecom infrastructure rather than restrict it to licensed operators. India should develop a policy

framework to maximize the infrastructure already in place, encouraging usage of underutilized networks on a non-discriminatory basis.

Release of Spectrum

What we see hindering application of technology is the inter-departmental feud on the release of spectrum which is currently held by Defence, Space, etc. This has led to hoarding of spectrum with the various agencies protecting their turf. This issue needs to be taken up at a national level as this internecine approach needs to be resolved and entities not using the spectrum must be forced to release spectrum. **The Government must look to put in place a re-farming policy**. The Government must start looking at newer bands in 400MHz, 700 MHz and 3.3 to 3.8 GHz which the EU has recently decided to release for terrestrial uses.

Issues relating to Right of Way (RoW)

The right of way (RoW) issues over municipal roads/State highways, national highways must be settled through an overarching policy directive that shall address concerns of any State Government and ensure that RoW can be provided as and when needed. There can be an online digital mechanism created for a party seeking such RoW access. There should also be a proviso in place to mandate that any destruction of land or property caused by a party seeking to put in this RoW shall be reinstated by the party seeking such RoW and not the State. Especially, given that the State is not levying any fees or charges for the RoW.

Developing the broadband ecosystem

Our application, awareness and literacy are essential for augmenting broadband penetration. But we should not use this as lack of awareness or literacy as an excuse for not changing the status quo. We must provide the populace the possibility of getting connected; create the environment that enables them to get connected, and incentive to get them to learn to be able to use that connectivity. We should not quibble over this like 'a chicken-egg situation' in terms of the literacy vs. demand creation dichotomy.

Creating points of presence (PoP) is essential, whatever be the medium – satellite, wi-fi, MWA, fibre, etc. And, this needs a mindset change from the policy makers. We must be receptive to new innovations and allow an ecosystem that leads to new technologies being built.

Ability of PSUs to deliver

We have also noted that there has been lots of criticism levelled against the PSUs inability to deliver broadband services effectively. But has the Government tried to address the constraints faced by these PSUs? These PSUs do not enjoy operational autonomy with the bureaucrats controlling the running of these enterprises coupled with the Minister's hand hanging over them. If these institutions are not empowered in the manner they should be, why attribute fault to the PSUs? If the adequate quality of life cannot be provided in the PSU ecosystem, there is no point faulting the PSUs in its inability to deliver broadband services effectively? Should the Government really expect results from PSUs, they have to be restructured and Governed by respective Boards; Minimum Government maximum Governance.

Encourage participation of all parties in development of ICT sector

Historically, in order to deploy telecommunications infrastructure (fibre, towers, cable landing stations etc.), an operator has to become licensed. This licensing regime puts a number of restrictions on what firms can do, placing many constraints under their respective licenses. This can be overcome by etching away the blurring lines between those who create and infrastructure and those who provide services which would require licenses under the Indian Telegraph Act. Today, even to create infrastructure, there is very little leeway available under the present licensing regime. One has to have a license.

Such licensing limitations include restricting the sale of dark fibre, and limiting the set-up of cable landing stations to purely for the purpose of transiting international traffic via India (without touching India networks/users). These limitations constrain other providers of web-enabled services from expanding their services in the country due to service providers imposing charges on transmission/IP capacity on retail and enterprise pricing basis.

By creating barriers to entry, these limitations lead to inefficiently high costs for IP transmission capacity, which in turn constrains Internet applications and services innovation. Due to these costs exceeding market based rates, web enabled services and ICT applications in general are constrained from being able to expand in India. In particular, the inability of companies to buy and use dark fibre without becoming licensed telecommunications operator hampers competition in the market.

The Government should look at innovative ways wherein a pure play infrastructure provider is not subjected to conditions which are applicable to the normal licensed players.

Despite a number of service providers rolling out their fibre network across India, the price of bandwidth within India still remains very high - nearly three times that of developed markets. As the mandate to sell capacities/bandwidth within India remains privy to specific licensed operators vis-a-vis all infrastructure owners, the market remains relatively less competitive keeping the prices high which inhibits the growth of internet and other broadband based services.

India's telecom policy should allow participation of all stakeholders - whether ISPs, Web based service providers, utility companies, broadcasters or any other stakeholders - to acquire and sell telecom infrastructure rather than restrict it to licensed operators

Interconnection charges at submarine cable landing stations

The monopolistic practices of the entities with access to submarine cables have been a deterrent in the availability of international connectivity. Submarine cables are the primary source of connectivity for Indian networks to get connected to other networks that make up the global Internet. It is important that these cables must be accessible to all service providers and ISPs on reasonable and fair prices for all parties. This remains a bottleneck facility for the development of internet growth in India as well as establishing India as hub for ICT in the region.

Interconnection charges whether for domestic/international traffic, SMS termination or international capacity landing at submarine cable landing stations of India, have always been an issue of debate and litigation in India. Despite positive efforts by the TRAI on regulating such charges, such interconnection charges remain complex and stagnate the potential for economic growth. Access charges, such as the Access Facilitation Fee, on international capacity landing charges levied by incumbent operators remain very high. TRAI's recent actions at the end of 2012 in seeking to reduce interconnection charges for landing stations are positive, and the Government should take steps to implement them as best possible so that the benefits are available to the ICT sector as a whole and Indian users.

Example: (1) After South Africa liberalized its telecom policy in 2005 including open access to undersea cables & landing stations, three new cables got built within 5 years and bandwidth prices fell tenfold.

Where India decides to require 'bottleneck facilities' be opened up to third party providers, quick enforcement is fundamentally necessary.

Broadly, we submit before the Authority that the basic impediments which must be addressed to deliver broadband quickly is- (a.) free up spectrum held by entities such as Defence, Space, Broadcast and Police. (b.) allocation of spectrum must take place in a transparent manner and there should be a spectrum refarming policy put in place (c.) Regulatory impediments such as RoW must be taken of care through overarching policy directives, (d) A re-farming policy wherein proceeds from auction must be allocated to ministries hoarding spectrum to encourage them to use either better spectrum efficient technologies or move to newer bands of spectrum, (e) restructuring of PSUs, because they are the ones who would deliver infrastructure, (f) a licensing regime which encourages application of technology to reach out to the masses; and finally (f) licensing regime to remove ambiguities between infrastructure providers and those providing licensed activities.

Issues for Consultation

Q1: What immediate measures are required to promote wireline technologies in access networks? What is the cost per line for various wireline technologies and how can this cost be minimised? Please reply separately for each technology.

When it comes to wireline technology, whatever be the medium (copper, fibre, coaxial), it may be noted that the digging costs are relatively the same. The primary cost lies in the laying of the cables. Given this, there should not be any manipulation in terms of messing around with the charging on this. The pipes should provide multiple ducts for laying down copper, coaxial or fibre. When such a digging is carried out, it may be provided that a certain number of pipes (say 12-24) are laid down to ensure that any future usage needs are also taken care of. All Highway authorities, regardless of state or centre must be directed to bury pipes while building roads or undertaking widening or repairs of roads.

All attempts must be made to free up the copper pairs of MTNL and BSNL as well as any excess fibre they might possess.

Various telecom operators and government agencies have developed long-haul fiber networks, telecom towers, and local access/metro networks for their captive use or to resale to third parties. Though, some infrastructure sharing by way of sharing telecom towers exist in India however much of this infrastructure remains underutilized, hindering the ability of technology companies to bring the vast array of benefits broadband Internet could provide to more people.

Example: - DFA (Dark Fiber Africa), a non-operator or service provider built significant part of passive fiber network across major routes in South Africa and commercially leased it among various telecom operators enabling network redundancy, lower unit costs for operators and enabling healthy competition for bandwidth/IP services in the market.

India should develop a policy framework to maximise the infrastructure already in place, encouraging usage of underutilized networks on a non-discriminatory basis.

The government would also benefit from consulting with stakeholders on how telecommunications operators could help improve the market for consumers by allowing them to let other service providers share access to their telecom infrastructure. TRAI has in the past considered efforts in this direction, and a fresh consultation on possible policy proposals would be timely.

Q2: What are the impediments to the deployment of wireless technologies in the access network? How can these deployments be made faster? Please reply separately for each technology

The major impediment is inadequacy of spectrum; this issue has to be tackled as priority. What we see hindering application of technology is the inter-departmental feud on the release of spectrum which is currently held by Defence, Space, etc. This has led to hoarding of spectrum with the various agencies protecting their turf. This issue needs to be taken up at a national level as this internecine approach needs to be resolved and entities not using the spectrum must be forced to release spectrum. The Government must look to put in place a refarming policy. The Government must incentivise the freeing up of spectrum in the frequency bands held by entities such as defence, space, etc. by charging those entities who wish to acquire spectrum in these bands on account of the higher efficiency these bands may offer.

Q3: The recommendations of the Authority on Microwave backhaul have been recently released. Are there any other issues which need to be addressed to ensure availability of sufficient Microwave backhaul capacity for the growth of broadband in the country?

Many countries, including (the U.S., Europe and several others) have already formalized the rules and licensing infrastructure (databases etc.) for higher frequency bands of 60 & 80 GHz. We believe that the regulator must undertake a separate study to see which are the fresh bands that may be examined.

Q4: The pricing of Domestic Leased Circuits (DLC) have been reviewed in July 2014. Apart from pricing, are there any other issues which can improve availability of DLC?

The pricing is not the only issue, it is the availability as well in all segment like access, backhaul etc. The aspect of last mile connectivity needs to be examined carefully. This is evident from the complete stagnation seen in the wire-line infrastructure ecosystem. Investments are needed to overcome the shortage, in addition to release of capacities from PSUs. .

Q5: What are the specific reasons that ISPs are proactively not connecting with NIXI? What measures are required so that all ISPs are connected to the NIXI?

There are commercial considerations for ISPs not looking to connect with NIXI. NIXI does not have the technical wherewithal in terms of the necessary nodes and capacities for the ISPs to be encouraged or incentivized in partnering with them.

To keep pace with Internet growth in India and to develop a strong IP network in India, various Internet Exchange Points (IXPs) should be created across India as carrier neutral points of interconnection - allowing all ISPs and telecom Service Providers to be able to interconnect. This would be in sync with the recent thrust on "Make in India", a government initiative to foster innovation and investment within the country. This will help break down barriers to flow of information among networks in a cost efficient manner, helping increase the proliferation and use of the Internet. This will also enable smaller ISPs to access other IP networks in the country at reasonable costs, enabling them to pass the benefits to end users and help grow broadband access in the country.

Example: In Kenya, establishment of the Kenya Internet Exchange Point (KIXP) localized few Gbit/s of peak traffic, dramatically reducing latency (from 200-600ms to 2-10ms on average), while allowing ISPs to save almost $1.5 million per year on international connectivity. The IXP also helped increasing mobile data revenues by an estimated $6 million for operators having generated at least an additional traffic of 100Mbit/s per year; helps the localization of content in the country which is critical to raising government tax revenues, and increasingly acts as a regional hub for traffic from neighboring countries.

There are many more examples of Internet Exchange Points established across the world which have contributed significantly to development of internet & business in their country such as IXPN (Internet Exchange Point of Nigeria), LINX (London Internet Exchange), JINX (Johannesburg Internet Exchange) etc.

The Government must encourage the setting up of IXPs and provide support to help these IXPs proliferate across India.

Q6: Would the hosting of content within the country help in reduction of the cost of broadband to a subscriber? If yes, what measures are required to encourage content service providers to host content in the data centre situated within India?

We do not see merit in making the hosting of content within the country mandatory. There are cost and quality concerns which have resulted in the content providers not putting in data centres in India, in the first place. We believe that the infrastructural bottlenecks that dissuade content providers from putting in the data centres must first be resolved, and then we can perhaps seek to encourage the setting up of the data centres in India, given our national policy imperative of 'Make in India'.

Q7: Are PSUs ideal choices for implementing the National Optical Fibre Network (NOFN) project?

We have also noted that there has been lots of criticism levelled against the PSUs inability to deliver broadband services effectively. But has the Government tried to address the constraints faced by these PSUs? These PSUs do not enjoy operational autonomy with the bureaucrats controlling the running of these enterprises coupled with the Minister's hand hanging over them. If these institutions are not empowered in the manner they should be, why attribute fault to the PSUs? If the adequate quality of life cannot be provided in the PSU ecosystem, there is no point faulting the PSUs in its inability to deliver broadband services effectively? The Government has to empower them to deliver or else do not expect much.

Q8: Should awarding of EPC turnkey contracts to private sector parties through International Competitive Bidding (ICB) be considered for the NOFN project?

We believe that private sector parties along with the PSUs must be encouraged in the awarding of EPC turnkey projects through international competitive bidding. However, the Government must maintain oversight on the bidding process. We believe that a project which is of national importance must be awarded to a competent outfit and in a most transparent manner.

Q9: Are there any ways in which infrastructure development costs can be reduced? Is it possible to piggyback on the existing private sector access networks so as to minimize costs in reaching remote rural locations?

Q10: What can the private sector do to reduce delivery costs? Please provide specific examples.

<Combined Answer for 9 & 10>

We should not be hung up about one form of technology or licensing. The use of any existing technology (copper, fibre, microwave, wifi, etc) or any other new emerging technology must be encouraged as long as it goes about establishing points of presence (PoP). For example, PoP created by use of satellite in remote area can lead to broadband services being delivered there at a village or gram Panchayats (GP) level by the use of many of the wireless technologies as above. .

Government initiatives such as NOFN (National Optical Fibre Network), NKN (National Knowledge Network) are progressing well in connecting thousands of villages/Institutions using USOF (Universal Service Obligation Fund). However, to keep pace with broadband objectives of the country and implement such ambitious projects in a timely manner, participation of private parties along with government agencies could help the country achieve its objective in a more efficient manner.

Example: Markets like France, Portugal and Singapore are very good examples of government supported fibre roll outs but led by private industry. The government has allowed multiple

operators to deploy fibre with little support allowing free market forces to drive fibre deployments. This model also results in extensive fibre access across the country.

Q11: What are the major issues in obtaining right of way for laying optical fibre? What are the applicable charges/ constraints imposed by various bodies who grant permission of right of way? In your opinion what is the feasible solution?

The right of way (RoW) issues over municipal roads/State highways, national highways must be settled through an overarching policy directive that shall address concerns of any State Government and ensure that RoW can be provided as and when needed. There can be an online digital mechanism created for a party seeking such RoW access. There should also be a proviso in place to mandate that any destruction of land or property caused by a party seeking to put in this RoW shall be reinstated by the party seeking such RoW and not the State. Especially, given that the State is not levying any fees or charges for the RoW.

Q12: Should the Government consider framing guidelines to mandate compulsory deployment of duct space for fibre/ telecommunications cables and space for telecommunication towers in all major physical infrastructure construction projects such as building or upgrading highways, inner-city metros, railways or sewer networks?

The pipes should provide multiple ducts for laying down copper, coaxial or fibre. When such a digging is carried out, it may be provided that a certain number of pipes (say 12-24) are laid down to ensure that any future usage needs are also taken care of. All Highway authorities, regardless of state or centre must be directed to bury pipes while building roads or undertaking widening or repairs of roads.

Various telecom operators and government agencies have developed long-haul fiber networks, telecom towers, and local access/metro networks for their captive use or to resale to third parties. Though, some infrastructure sharing by way of sharing telecom towers exist in India however much of this infrastructure remains underutilized, hindering the ability of technology companies to bring the vast array of benefits broadband Internet could provide to more people.

Example: - DFA (Dark Fiber Africa), a non-operator or service provider built significant part of passive fiber network across major routes in South Africa and commercially leased it among various telecom operators enabling network redundancy, lower unit costs for operators and enabling healthy competition for bandwidth/IP services in the market.

India should develop a policy framework to maximize the infrastructure already in place, encouraging usage of underutilized networks on a non-discriminatory basis.

Q13: What are the impediments to the provision of Broadband by Cable operators? Please suggest measures (including policy changes) to be taken for promoting broadband through the cable network.

We do not see much economic viability for the use of fibre or cable that is managed by cable operators for the provision of broadband as it is use more specific for the TV signals. At present, the penetration of broadband or data over cable TV is small. We therefore it is best to leave it to the market forces and the various operators in how they wish to utilize this medium for providing broadband.

Any regulatory/licensing policy in this regard may prove to be an unwarranted barrier and the Government should not channel much of its energies on focussing in this domain.

Q14: What measures are required to reduce the cost and create a proper ecosystem for deployment of FTTH in the access network?

We should first look to map out points where FTTH (fibre hub) can be created. The hub may be created for establishing PoP which may then be distributed by other means to the homes and end users. For example, at the point of the fibre hub connect, delivery to consumers in condos and high rise buildings or shopping areas, offices, etc. may be provided through coaxial ,copper, wireless, or P2P, etc.

Q15: Are there any regulatory issues in providing internet facility through Wi-Fi Hotspots? What are the reasons that installation of Wi-Fi hotspots has not picked up in the country? What type of business model needs to be adopted to create more Wi-Fi hotspots?

Q16: What are other spectrum bands which can be unlicensed for usage of Wi-Fi technology or any other technology for provision of broadband?

<Combined Answer for 15, 16>

The deployment of wifi networks and other innovative access solutions across Indian towns and rural centres must be a policy priority. It should be ensured that the regulatory environment is reviewed in order to make public wifi networks and new access technologies (such as shared/dynamic spectrum and TV white spaces) possible in India. At present, this falls within the realm of unlicensed activity leading to some areas where a user has to pay as well as some areas where a user doesn't have to pay. There must be a uniform tariff regime which must be brought about in this regard.

Q17: How much spectrum will be required in the immediate future and in the long term to meet the target of broadband penetration? What initiatives are required to make available the required spectrum?

Q18: Are there any other spectrum bands apart from the ones mentioned in Chapter-2 to be identified for provision of wireless broadband services?

Q19: What are the measures required to encourage Government agencies to surrender spectrum occupied by them in IMT bands?

<Combined Answer for 17, 18, 19>

What we see hindering application of technology is the inter-departmental feud on the release of spectrum which is currently held by Defence, Space, etc. This has led to hoarding of spectrum with the various agencies protecting their turf. This issue needs to be taken up at a national level as this internecine approach needs to be resolved and entities not using the spectrum must be forced to release spectrum. The Government must look to put in place a re-

farming policy. The Government must incentivize the freeing up of spectrum in the frequency bands held by entities such as defence, space, etc. by charging those entities who wish to acquire spectrum in these bands on account of the higher efficiency these bands may offer. The Government must also look at newer bands like for eg, EU has opened up the 3.3-3.8 GHz for terrestrial usage.

Q20: What should be the time frame for auctioning the spectrum in 700 MHz band?

The Government must look to auction the spectrum in 700 MHz band as quickly as possible. They should also look at bands like 400 to 450 MHz.

Q21: Do you agree with the demand side issues discussed in Chapter 5 and Chapter 6? How these issues can be addressed? Please also indicate any other demand side issues which are not covered in the CP.

Our application, awareness and literacy are essential for augmenting broadband penetration. But we should not use this as lack of awareness or literacy as an excuse for not changing the status quo. We must provide the populace the possibility of getting connected; create the environment that enables them to get connected, and incentive to get them to learn to be able to use that connectivity. We should not quibble over this like 'a chicken-egg situation' in terms of the literacy vs. demand creation dichotomy.

Q22: Please give your comments on any related matter, not covered above.

A wide range of laws can impact the ability to innovate on the Internet, including data privacy and security regulations, intellectual property regulations, and other forms of liability for online content. India should ensure that its legal framework is flexible, predictable, and fair, such that new innovations can grow and thrive. In particular, India should reform its existing statute regarding intermediary liability, ensuring that third parties are not held unfairly responsible for users' misconduct online. Please also see our comments in the preamble.
Example: FCC's initiatives to liberalize and promote Internet & allied online businesses in USA over the last many years have resulted in Internet based industry being a major economic thrust for the country. It has helped creating a large number of employment and very significant revenues for the country.