Rambøll IMI comments
National broadband strategy

**Intended for TRAI by
Rambøll IMIsoft Pvt Ltd.**

**Ramboll IMIsoft Private Limited.
Plot 32,Near Jubilee Hills Road No.36,
Kavuri Hills, Guttala Begumpet,
Hyderabad-500033, India.**

CONTENTS

1. COMMENTS BY RAMBØLL IMI FOR CONSULTATION PAPER ON NATIONAL BROAD-BAND STRATEGY

1.1 INTRODUCTION

Rambøll IMI has studied the Consultation Paper on National Broadband Plan with great interest. The broadband access penetration and broadband service availability will be of significant importance for the continuing growth and prosperity of the Indian society. The consultation paper is addressing many important issues and challenges related to the development of a broadband society.

Considering the concluded 3G and BWA auctions and the expected 4G auction, there are interesting years ahead where cost effective technologies will make broadband even more attractive and valuable. But as addressed at several places in the consultation paper, core network and backhaul capacity and availability are major obstacles. Various options for public financing and solutions to the core network challenge have been discussed. It is important that any authority intervention in this market is long term, predictable and do not obstruct competition. Even the discussion of possible future authority intervention may affect the motivation for making long term private investments in this area, so it is important that any discussion of this kind is concluded within short time.

The consultation paper is addressing many of the important drivers and enablers for increased broadband penetration. From an authority perspective it may also be reason to focus more on how the authorities by regulation and by being a significant user of broadband services may enable and drive broadband penetration. From a regulatory perspective it may be effective to observe the broadband ecosystem as 3 interdependent domains: services, networks and infrastructure. This is useful in a situation where there is no longer a one to one relation. Traditionally, cable TV had its own infrastructure, network and service platform. Likewise, telephony had its own infrastructure, network and service system. We are now facing another multiservice reality where all kinds of services (TV, telephony, internet etc) may be on the same network. There may even be several competing service providers on the same network. There may also be several network technologies and network operators on the same infrastructure. This segmentation of domains is potentially very powerful in order to ensure competition, low cost and maximum range of service options. But in order to release this potential it is necessary that all

multiservice networks are treated equally and that certain networks by regulation not are restricted to offer only certain services.

One of the bottlenecks for broadband availability is within the infrastructure domain, including elements like fiber cable infrastructure, telecom tower space etc. If it is considered that this is the main bottleneck, authority efforts to improve the situation by co-funding or investments should focus specifically on the infrastructure domain. Interventions by authorities always have a multitude of effects; some of these may be unexpected and unwanted. And this is a good reason to focus the efforts specifically on the bottleneck domain.

Following the line of multiservice and segmentation of domains, it may be considered by the authorities to develop / maintain regulation which enables effective competition on all domains. There is a risk that dominant network operators will obstruct competing service providers on their network. The same applies between infrastructure owners and network operators. By effective regulation it is possible to ensure higher volumes of specialized investments making it possible to focus on certain domains and utilize resources from other companies to provide an end to end solution.

1.2 COMPANY BACKGROUND

Rambøll IMIsoft Pvt Ltd is part of Rambøll Telecom. Rambøll Telecom is the world's largest group in design & consultancy services of Telecom Passive infrastructure. Rambøll, as a committed facilitator for telecom world class knowledge-base has ensured the expertise spreads far beyond the confines of traditional boundaries. Rambøll IMIsoft Pvt Ltd provides specialized engineering services including software products for tower design, project management of tower construction, design and detail engineering consultancy and quality audit services covering the entire life cycle of tower construction. With 1050 employees and 19 offices spread across India, our customers include many of the country's major telecom and power transmission companies. We have 20 years of consulting experience in tower engineering and our company is well placed in terms of understanding and know-how of telecom towers. We have undertaken audit and due-diligence of 100000 telecom towers in India. Also, we are maintaining an exhaustive record of the towers in our database.

Rambøll IMIsoft is a global provider of engineering and consultancy services covering the following service areas:
- Buildings & Design
- Infrastructure & Transport
- Energy & Climate
- Environment & Nature
- Industry & Oil / Gas

- IT & Telecom
- Management & Society

Rambøll Group is a holistic company and actively supporting UN Global Compact maintaining the highest standards with respect to Professional Services as well as Corporate Social Responsibility.

2. SPECIFIC COMMENTS TO THE CONSULTATION PAPER ON NATIONAL BROADBAND STRATEGY

2.1 Demand Factors:

(1)What should be done to increase Broadband demand?

It is crucial for users to be aware of the benefits that broadband can provide. Both government and private sector can play an active role in marketing the benefits of broadband. Successful approaches may include insuring that broadband is available in schools & colleges, enabling con-

sumers to share broadband connections and permitting bundling of broadband with other services. Government promotion campaigns and co-branding can also encourage take-up.

In Urban areas people are willing to spend more for better connectivity. Good quality and connectivity are major aspects. Hence by providing good quality services the demand for broadband can be further increased.

(2) What according to you will improve the perceived utility of broadband among the masses?

Users must be convinced of the advantages to be gained by adopting key broadband technologies and integrating them into their daily lives. Applications that have been mashed in to successful broadband economies include IP telephony, video chat, and audio over broadband and online gaming. Business and government cultures can also embrace and encourage ideas such as teleworking and online transactions.

Application of broadband such as healthcare, telemedicine, & video on demand can improve the perceived utility among masses. For rural areas e-governance, e-democracy would be more required in their local language.

Should target local content and customized internet service

(3) What measures should be taken to enhance the availability of useful applications for broadband?

Access to broadband user devices such as computers, terminals and mobile smart-phones is required as a fundamental enabler of broadband penetration. In a low income market as India it is required to think in innovative terms in order to make these user devices affordable.

(4) How can broadband be made more consumers friendly especially to those having limited knowledge of English and computer?

Applications and content are the drivers for broadband penetration. The actual user value of broadband lies in the content and applications. Content and applications of local reference and local language generally have a broader appeal than foreign applications and content.

2.2 Supply factors

(1) Do you agree with projected broadband growth pattern and futuristic bandwidth requirements?

Considering the volume of the Indian market it is important to enable scalability and flexibility by applying a decentralized network architecture and service system architecture. The contention ratio of 1:50 is low compared to standard dimensioning practice in other developed markets, so the forecasted core bandwidth requirement is also low. The solution is to avoid this level of traffic aggregation by applying a decentralized architecture.

(2) 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?

It is important to be realistic in terms of short term user bandwidth targets. Due to the size of the total rural Indian market, bandwidth effective applications of great value may be developed and provided at a lower cost and most importantly within a shorter time span.
The access network should be developed in two phases:
   a) Fast basic service based on technologies which supports low deployment cost and short deployment time. This will mainly be wireless access technologies
   b) Full service based on more fixed access technologies.

Telecom infrastructure is generally deployed and scaled for the current demand. The future broadband demand will most likely require a reengineering of the network architecture and infrastructure. Some of the current assets may be reused, but the challenge is not only related to capacity and scalability. Modern broadband services come with high requirements to network quality in terms of bit error rate, delay and jitter. Broadband users will also require high resiliency end to end, and this will require a rethinking of the infrastructure and network solutions. In order to enable a competitive market for broadband it is necessary to separate the infrastructure domain, the network domain and the service domain. This will have technical implications, but also regulatory implications.

Internet connectivity in India is provided through the National Internet Exchange of India (NIXI).
Four NIXI nodes were originally setup at NOIDA (North India), Mumbai (formerly Bombay), Chennai (formerly Madras), and Kolkata for international connection and connectivity to domestic ISPs also. Presently the domestic ISPs have to pay transit fee for the sharing of Network . It is suggested that the domestic ISPs could peer among themselves and route domestic traffic within the country. Peering is an arrangement between two service providers to exchange traffic between their customers. In most cases peering arrangements do not involve either of the service providers paying any money to the other. For peering, service providers

need to physically interconnect their networks so that they can directly exchange traffic between their customers. In this way the ISPs avoid paying a transit fee to a third carrier (generally a higher tier ISP) who would have otherwise provided such connectivity. Thus existing infrastructure is optimally utilised

2.3 National broadband network

2.3.1 Access Network

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

UMTS, LTE and WIMAX technologies seems to be the most promising wireless access technologies at this point of time. These technologies are being developed to accommodate the quality of service(QOS) and rate requirements set by forthcoming applications like Wireless broadband access, video chat and other streaming services for "any time-anywhere" mobility.

(2)What actions are required to ensure optimal utilization of existing copper network used to provide wire line telephone connections?

It might be worthwhile to use the existing copper network as a combination of alternatives such as cable, fiber, wireless, in particular in combinations (fiber to the curb + wireless) to provide last mile broadband connectivity. These alternatives also have their own set of problems. For example, cable (CATV) in India is chaotic, disorganized and employs primitive technology. But its reach is vast. There are 78 million cable TV homes in India. If telecom companies tie up with Multi Systems Operators (MSOs) / last-mile cable operators and make proper investments, there is a huge opportunity to roll out cheap broadband services in the country. With wireless technologies such as WiMAX there is always the problem of spectrum allocation, even though it must be noted that wireless has the potential of connecting rural and geographically dispersed areas. In rural areas where incomes are traditionally low, the affordability of broadband (even if it is available) is a problem.

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

Optical fiber in access network may provide user bandwidth in the range of Gbps. Many developed markets have an increasing penetration of fiber to the home. But the cost of invest-

ment is very high and the time to deploy is generally long. Fiber to the home may support the full range of advanced services now as well as in the future. Regulatory limitations related to ROW should be improved in order to enable fiber access where the market can support the cost of this technology. "There is a need to create optical fiber access network in all major cities and metros to provide high speed broadband". High speed broadband may be provided by several wireless technologies at a much lower cost and within a shorter deployment time. It is however necessary that fiber backhaul is required in order to deliver high speed wireless broadband access. So in Phase one, fiber backhaul should be provided with relatively high geographic density of 4-6 points per sqkm depending on the population density. At the backhaul end points, base stations for wireless access technologies may be provided. These locations should also be prepared for future upgrade to fiber based access technologies.

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

Cable TV service providers are currently in a position where they need to redesign their network to support digital broadcast, in this context it is effective if the regulatory position of these service providers are clarified in respect of their opportunities in the broadband access market. In many cases the upgrade of cable TV networks will be a competitive way to provide high quality broadband services.

2.4 Core Network: National Optical Fiber Network – Connectivity to Rural Area.

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

Non-availability of fiber is certainly a bottle neck for effective backhaul connectivity in rural India. But this does not necessarily require that fiber should be laid to every single village.

(2)If so, is there a need to create national optical fiber network extending upto villages?

For rural areas there are some wireless point to point transmission technologies which may support the broadband capacity demand for a few years. This is not to say that fiber backhaul is not required. It is definitely required, but not necessarily to every single village. By

using wireless point to point backhaul transmission technologies to aggregate the wireless access networks throughout a few villages, it is possible to provide a higher broadband penetration in phase 1 at a lower cost.

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

Also on the core infrastructure it is necessary to have separate infrastructure domain and network domain to build the best possible foundation for competition. The core infrastructure should further be segmented into a national core and a state / regional core in order to provide scalability and avoid unnecessary traffic in the national core. This segmentation could also be a good foundation for a phased deployment and cooperation with several infrastructure partners in different regions.

(4) Among the various options discussed in Para 3.35 to 3.37, what framework do you suggest for National Fiber Agency for creating optical fiber network extending upto village level and why?

Broadband connectivity may have public value exceeding the initial commercial value of the services and this may be argument for allocating public financing to the deployment of broadband. In case of public financing, the government should focus on ensuring that the value created within the financing is optimized. Obviously the technical assets of the infrastructure deployed within the project are an important part of the value. But another important value is related to how the financing impacts the business models and competition within the industry. When the government allocates financing to infrastructure projects, the government may enforce effective requirements on segmentation and competition. This is related to the separation of service domain, network domain and infrastructure domain. It is important for a competitive broadband market that several network operators have fair and equal access to the same infrastructure, and likewise that several service providers have fair and equal access to the same networks. This will ensure a broad selection of opportunities and competitive prices in the market. Planning, deployment, operation & management of core infrastructure and networks should be tendered to private companies. It should be considered if the government funding should focus on the infrastructure domain and leave the network domain to the private companies.

(5) What precautions should be taken while planning and executing such optical fiber network extending up to villages so that such networks can be used as national resource in future? What is suitable time frame to rollout such project?

The planning should be managed in a bottom up approach. First the expected broadband traffic for every single village is forecasted. Secondly, the backhaul options are mapped (fiber, point to point radio link, leased line). In phase 1, fiber connectivity is deployed to facilities of public interest and central rural locations where several villages can be aggregated via point to point radio link backhaul. Fiber connectivity should be deployed to such an extent that all villages in the broadband plan may be connected to the fiber point of presence with a single point to point radio link hop.

2.5 Regulatory Challenges and Future Approach

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

It is recommended to use a downlink capacity per user of 2 Mbps as the overall definition of broadband. This may be used for both mobile and fixed technologies.

In addition to this, the authorities should define a set of Key Performance Indicators related to perceived user value and set thresholds for basic, medium and high broadband quality in order to monitor more effectively the overall value of the broadband market.

2.5.1 Right of Way (ROW) Issues

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

In order to ensure coordination with other local planning and requirements it is likely that the ROW administration must be managed by local authorities. But it should be managed transparently and under national framework, rules and regulations. Preferably all telecommunication, broadband and cable TV infrastructure and networks should be considered as basic utility like electricity. As a minimum, the core infrastructure should be considered basic utility. All infrastructures and networks should be treated equally and fair independent of technology and owner.
Also the laying of optic fibre cable should be planned along with GAIL and other gas distribution companies so that when the gas pipe lines are laid the optic fibre cable is laid along with them so that number of clearances required is reduced. This would also cause fewer disturbances to the public in general.

2.5.2 Affordability of broadband

(1) Does the broadband sector lack competition? If so, how can competition be enhanced in broadband sector?

The market situation may indicate that there are obstructions with startup service providers that cannot fight effectively. With a national core infrastructure / network it might be possible for startup companies to provide services in limited regions. Interconnect arrangements should be assessed to ensure fair pricing and that the dominating players are not abusing their market position.

(2) 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?

Affordability is a general challenge in India, and in some cases business models and technologies which are proven to be successful in other markets will fail in India. So cost per user is a major focus. A major cost of broadband access is the user equipment and network equipment. Shared access may be one way of introducing broadband to the market, using technologies like WiFi to share access locally.

(3) Do you think simple and flat monthly broadband tariff plans will enhance broadband acceptability and usage?

Flat rate seems to be one important enabler for wider acceptance of broadband. Volume based billing is very hard to comprehend, as the general population has no relation to the volume units involved. So a flat rate model is more predictable and safe. The experience from other markets is that flat rate is the enabler of growing broadband penetration as well as the introduction of advanced value added services.

(5) What should be the basis for calculation of tariff for broadband, if it is to be regulated?

Regulation of user tariffs as such will not increase the motivation for offering services and making investments. Regulation of fair interconnect charges could be effective in order to ensure that dominant players are not abusing their market position. This will motivate new investors and service providers. Regulation on user tariffs ensuring transparency and comparability may improve competition. Any regulation should be long term and predictable in order to motivate private investments in the broadband market.

(6) How can utilization of International Internet bandwidth be made more efficient in present situation?

It is expected that when broadband penetration is increasing, there will be an interesting market for national / local content, services and applications. In other markets it seems like national / local content is generally preferred. There are a few exceptions related to social networking services, where the physical architecture of the service platform causes a lot of

international traffic even when most of the interaction is between people within the same country / region. It is expected that when broadband penetration grows, the local traffic will grow more than the international traffic. Many developing countries have very expensive arrangements for international data traffic. There are ongoing international efforts in the direction of fairer pricing.

(7) 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.

In developed markets, the service provider pays for incoming traffic and gets paid for outgoing traffic at the exchange. As the market develops, the amount of outgoing traffic will generally increase more than the incoming traffic. When the broadband penetration increases, there will be more local traffic, which will also shift the balance between international and national traffic.

Segregation may have negative impact on effective traffic routing and network architecture. Due to the size and volume of the Indian market it is very important that regulations do not enforce bottlenecks or too hierarchical network architecture.

2.5.3 Higher international bandwidth prices

(1) What steps should be taken to bring down the cost of international internet bandwidth in India?

We can showcase the volume of Indian market and try and get discounts for the high volumes of usage from International internet bandwidth.

(2) How can competition be enhanced in the International bandwidth sector?

By laying our own fiber network we can increase the competition in the International bandwidth sector, and make us ready for the future as bandwidth is likely to become a scarce resource in the future with huge volumes of data flowing across the continents.

2.5.4 Quality of service for broadband

(1) 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?

In order to gain wide market acceptance, the customers must get what they pay for. In network planning, operation and optimization many factors are only known with a limited statistical probability. Traffic growth, traffic movements, new services and applications, net-

work failure, power failure, lack of hardware for upgrade / swap may affect quality of service severely and they are all hard to predict with high certainty.

One way to ensure good QoS is to require that service providers should define all essential QoS related parameters as a Key Performance indicator defined by the authority. This specification of the service should be referred in customer contracts. The service providers should be required to monitor these KPI's and compensates customers if they are not providing a compliant service. This will lift QoS from the technical department to the corporate level, as it has direct impact on business performance.

Poor QoS is definitely capable of reducing the demand for broadband connections. It is directly affecting the user perceived value, and thereby the willingness to pay for the service.

(2) 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.

Yes, bad quality of broadband connection is impacting the performance of bandwidth hungry applications. The need for high capacity communication is growing with great momentum. These applications are mostly concentrated on multimedia including video and audio. Every individual having broadband is promised with minimum download speed of 256kbps by the service provider but due to bad quality of broadband connection customer feel annoyed.

The bad quality of broadband can be attributed to various factors such as operational problems, network design problems, and customer related issues. Need to pin point at every process to enhance the quality

(3) 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?

The QoS parameters to be committed, monitored, published and reported should be reconsidered annually in order to reflect the changes in services, applications and user requirements. The parameters should cover the full service delivery end to end and be generally applicable to user perceived value and technology neutral.

2.5.5 Broadband growth

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

The cost of user end equipment (CPE, terminal, router) is very dependent on access network technology. It should be one of the main concerns when evaluating access network technologies. Cost of user end equipment is often ignored in these evaluations as they are often covered by the customer. But in the overall picture the total cost for broadband access is the important cost benchmark.

Volume, standardization and long term predictable market conditions generally drives prices down.

Thin clients / NetApps are attractive in terms of user equipment cost, but generally require very high network and service platform quality. It is important to consider these factors combined in order to evaluate the advantages of thin clients.

2.5.6 Content

(1) What measures are required to encourage development of content in Indian vernacular languages?

Local authorities and media companies could be encouraged to provide local content services. From national authorities it should be ensured that there are no regulatory obstructions prohibiting the availability of media content over broadband.

"MINDING THE HEALTH OF CELL SITE FROM CONCEPTION TO MAINTAINENCE"

Disclaimer:

1. This pre-consultation document is submitted in public interest. It is a compilation of expert inputs and data collected from various sources including internal departments of Rambøll IMIsoft Pvt Ltd.

2. Also, some information has been sourced from newspapers, trade journals, white papers, news portals, industry portals and news published on World Wide Web.

3. Neither the company nor any of its employees makes any warranty, expresses or implies any views, including the data presented, or assumes any legal liability or responsibility for accuracy, completeness, or usefulness of any information.