Tech Mahindra

Tech Mahindra's Response

To

TRAI's Consultation Paper on

Proliferation of Broadband

Through

Public Wi-Fi Network

Confidentiality Clause

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1. Introduction

Access to internet and high speed data connectivity is becoming a necessity in India which is the world's most rapidly growing economy. Today, a whole **lot of consumer services are driven via mobile apps** across multiple segments - Education, Healthcare, E-commerce and Entertainment. Governments are driving services through mobile – KYC verifications, payments, authentication, e-governance etc.

The Indian government recently announced the Digital India initiative that aims to **transform India into digitally empowered society and knowledge economy**. The target is to provide **internet connection to every citizen in next 3-5 years**. The national broadband plan indicates connecting lakhs of towns and villages spending billions of dollars for creating the infrastructure. The minister of IT and communications recently announced "India is set for a "digital revolution" as it implements an $18 billion program to expand high-speed Internet access and offer government services online."

Availability of right and adequate telecommunication infrastructure will be the key to the success of this program. Multiple wireless and wireline technologies will come into play. Past few years trend indicates that the **ratio of wireless subscribers to wireline subscribers has become 4:1** and the divide continues to grow.

The exponential growth seen in wireless subscribers' means more infrastructures will have to be created for wireless technologies on the access side. **Backhaul will have to be enriched** by laying more fiber or adopting to new wireless transmission technologies. For providing broadband wireless access to end users, a myriad of competing technologies exist. Each technology has its limits in terms of bandwidth, reliability, cost or coverage. Optical fiber offers almost limitless bandwidth capabilities, has excellent reliability but has high deployment timelines due to ROW issues. Wireless broadband technologies today are available in very attractive form factors that can be rapidly deployed. However, getting the right location to deploy and choice of spectrum (licensed/unlicensed), needs to be taken into consideration.

2. Response to TRAI's Consultation paper

In TRAI's paper titled *Consultation Paper on Proliferation of Broadband Through Public Wi-Fi Networks*, dated 13 July 2016, some of the key questions asked were:

Q.1 Are there any regulatory issues, licensing restrictions or other factors that are hampering the growth of public Wi-Fi services in the country?

Q.2 What regulatory/licensing or policy measures are required to encourage the deployment of commercial models for ubiquitous city-wide Wi-Fi networks as well as expansion of Wi-Fi networks in remote or rural areas?

Q.5 Apart from frequency bands already recommended by TRAI to DoT, are there additional bands which need to be de-licensed in order to expedite the penetration of broadband using Wi-Fi technology? Please provide international examples, if any, in support of your answer.

These questions can be addressed through consideration of causes of low Wi-Fi build out, potential solutions, and effects of wider build out. The current number of commercial Wi-Fi hotspots in India is estimated to be 0.2 per 10,000 inhabitants.

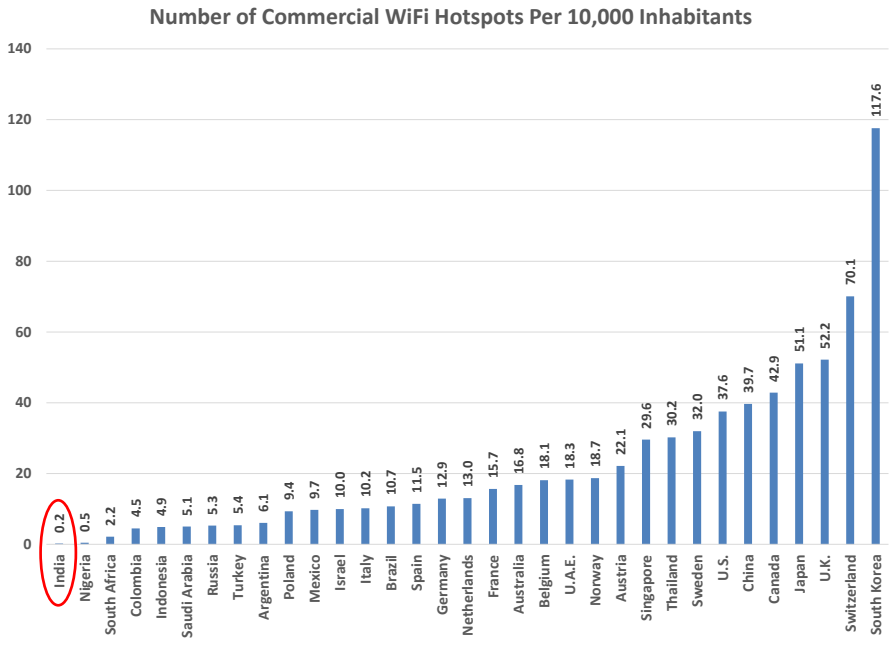

Figure 1. *Number of commercial hotspots per 10,000 inhabitants*

Low Wi-Fi Build out Causes

In October 2011, the *Broadband Commission for Sustainable* Development, setup by the ITU and UNESCO, defined broadband targets for 2015, amongst which were connecting 40% of homes in developing countries to broadband, and making broadband affordable such that its cost would be less than 5% of average household income. As per statistics from TRAI, a sample of which is given in Table 1 below, broadband data penetration rates in India are low. Wireline penetration is low likely because of poor availability and affordability. Note that the fixed wireless subscribers, which includes Wi-Fi, are less than 0.2% of households.

Type of Broadband	Subscribers (millions)	% of Population	% of Households
Mobile Wireless	142	10.8%	
Wireline	17.16	1.3%	6.4%
Fixed Wireless (WiFi, VSAT, PTP, etc.)	0.54	0.04%	0.2%

Table 1. *India broadband penetration rates, May 2016 [1]*

In addition, the current definition of broadband in India, >= 512 kbps download speed, is much lower than most countries. Comparatively, in the U.S., broadband is defined as >= 25 Mbps. It should be noted that the OECD uses a threshold of 256 kbps for broadband, although individual countries may have higher targets, and achieved rates are significantly higher.

Besides subscription, broadband access speed is another important factor. According to *Akamai's State of the Internet Report, Q1 2016* [5], India's average Internet connection speed, including wireline and wireless, is 3.5 Mbps, with a global ranking of 114; average mobile wireless speed came in at 3.2 Mbps. To note, India ranks 7th in the worlds in terms of overall GDP, although 122nd in terms of GDP per capita according to the IMF.

A key vision of the *Digital India* initiative is to make digital infrastructure a core utility for citizens. Hence, broadband access underpins *Digital India*. In general, lack of broadband availability can occur due to a myriad of reasons, key ones being regulatory, and a lack of infrastructure. These issues can result in investment hesitation.

In its paper, TRAI has already listed some key reasons for poor Wi-Fi build out, including regulatory reasons such as a restriction of use of 5.8 GHz spectrum for outdoor unlicensed use, lack of a viable business model, and deployment logistics challenges.

From the broadband penetration statistics above, another obvious fact is the poor state of wireline broadband penetration, which stands at 6.4% of households, far short of the 40% target from the Broadband Commission. A very large percentage of these subscribers are DSL, with a small percentage of Cable subscribers; FTTH is estimated to be very low.

The low density of built and available fiber-to-the-premises not only hampers consumer availability, but also hampers wider build out of Wi-Fi, and in the future will hamper rollout of small cells, for example. With Wi-Fi peak data rates starting at 54 Mbps, increasing to 450 Mbps to 1.3 Gbps, and advancing to 7+ Gbps with 802.11ad, a fast backhaul is needed to make Wi-Fi usable.

Key Regulatory Factors That Can Increase Wi-Fi Build out

Since fiber rollout is a costly process and has a long time-to-market, one emerging solution is getting equivalent throughput using a wireless system, typically at high frequency bands with wide channel bandwidths. Hence, one solution to this issue is making the 60 GHz band license-free, including for outdoor use, with wide channel bandwidths conforming to ITU definitions. ITU-R currently defines four 2.16 GHz channels in the band between 57 and 66 GHz.

Several countries already have already made the regulatory changes to allow the 60 GHz band for unlicensed outdoor use, including the U.S. and the U.K.; other countries include Australia, Singapore, S. Korea, and China. Because of propagation characteristics at this band, it is important to allow sufficient power for outdoor use; for example, the U.S. allows a peak EIRP of 85 dBm [9].

With laying of fiber being expensive, recouping costs in India would be challenging. With affordability being another challenge, a less-expensive and faster-rollout solution with high capacity makes perfect sense. No doubt, fiber rollouts need to continue, but enabling alternatives is a must, and this requires making the 60 GHz band unlicensed not just for indoor use but also for outdoor use as PTP or PMP, with channelization conforming to ITU recommendations.

TRAI should be commended for recognizing most of this, since they have already recommended that the V Band (57-64 GHz) should be delicensed for indoor and outdoor based access applications like Wi-Fi hotspots etc. Unlicensed outdoor use of this band for backhaul must also be included, with defined power limits, as several other countries already have. Other considerations should be license-exempt use in the 64-71 GHz, and inclusion and expansion of 5 GHz band for Wi-Fi use.

As per current TRAI guidelines, 60GHz falls under ‘light touch regulation’, wherein the allotment will be done in multiples of 50MHz and more than one channel can be allotted and allowed for aggregation. However, wireless backhaul links using new technology are envisaged to deliver data throughput at gigabit speeds, demanding higher channel bandwidths. At least 2.16 GHz, single IEE 802.11ad frequency channel will be needed (FCC's Part 15 rules). This channelization (2.16 GHz wide, 4 channels on 58.32 GHz, 60.48 GHz, 62.64 GHz and 64.80 GHz) was approved by ITU-R WP 5A for global standardization in November 2011.

Other challenges in carrying out city-wide ubiquitous deployment are:

1. Availability of infrastructure: Street furniture like light poles and traffic poles are best suited locations for deploying Access Points (AP). However, they need to be of standards that can

accommodate the weight of APs, Antennae, Solar panels, Cabinets for Data switches / Routers and battery backup systems. Majority of the street furniture today is not suitable to carry this load. Replacing existing 'Light Poles' with stronger 'Telecom Poles' is needed. Few infrastructure provider companies have come up with customized Telecom poles that can cater to this need. Regulation to adopt to these new poles need to be passed across municipal corporations.

2. Availability of Power: The proposed Telecom poles would have a combination of equipment like street lamp, CCTV Camera, Wi-Fi AP, Data equipment and battery back-up. All this combined will demand a power in the range of approximately 150W-200W. The street furniture need to be equipped to share and meter the extra power requirement. Guidelines related to participation of power companies in expanding broadband network need to be released at central level for inclusive growth.

3. Availability of Backhaul: The latest Wi-Fi standards are capable of delivering data speeds in excess of 300Mbps. The new WiGig standard promises to deliver 1Gbps. This needs to be supported with equal and higher speed back haul links. Fiber is the most preferred option. However, reaching out to every node with fiber will be a challenge in most of the city areas due to right of way issues. The cost of such a deployment will also be high making the business case unviable. An alternate method is to deploy wireless point to point link between nodes. Technological advancement in silicon and radio technology has made it possible to design equipment in high frequency bands which are smaller, cheaper and lighter.

Benefits of Greater Wi-Fi Build out

In general, benefits of a greater Wi-Fi build out, which represents wider broadband availability, can be classified into economic and social categories. As per TRAI, the cost per MB for a Wi-Fi network is around INR 0.06 per MB, significantly lower than that of mobile wireless data; a Wi-Fi network typically has a much lower opex. Fast-to-market backhaul solutions, such as through de-licensing 60 GHz will speed-up Wi-Fi rollout, making faster cost-effective broadband data accessible to the masses. Examples of expected benefits include the following, and include economic as well as social benefits:

- Job creation
- Effect on related industries
- Innovation
- Work-from-home enablement
- Traffic reduction
- Environmental effects
- Information access for the poor (e-Government, telemedicine, etc.)
- Quality-of-life improvement

On the economic front, rollout of telecom infrastructure, not only Wi-Fi, but also backhaul networks, will spur additional jobs. This investment will directly create jobs not only in telecom, but also have spillover effects in other industries such as IT. For example, a wider work-from-home industry will require application development; wider availability of broadband will lead to more innovation and even more applications, thus energizing whole industries.

An example of social improvement is that faster affordable broadband access will enable work-from-home for a segment of the population. This will help cut down long commutes. This factor and others can thus have environmental impact, such as a reduction in traffic, noise, and pollution, and thus increasing the quality-of-life. Everything is moving to the Internet, including e-commerce, education, portions of healthcare, e-Government, entertainment, etc. For the poor, better Internet access can also mean being better-informed, and can enable more efficient service delivery to them. No doubt, there are hurdles as well; illiteracy can prevent effective use of the Internet.

Figure 2 shows a plot of the year-on-year GDP growth plotted against the year-on-year broadband penetration growth. The data is for 2010 or later, and was plotted for several years for each country. From the data at the top right of the chart, it looks like a high growth rate of broadband penetration corresponds with a relatively high GDP growth rate. There are several studies that

show a positive correlation between the two factors, although there are some that show that this is not always the case; some show that the correlation is positive if only the right ecosystem exists to unleash the power of broadband access.

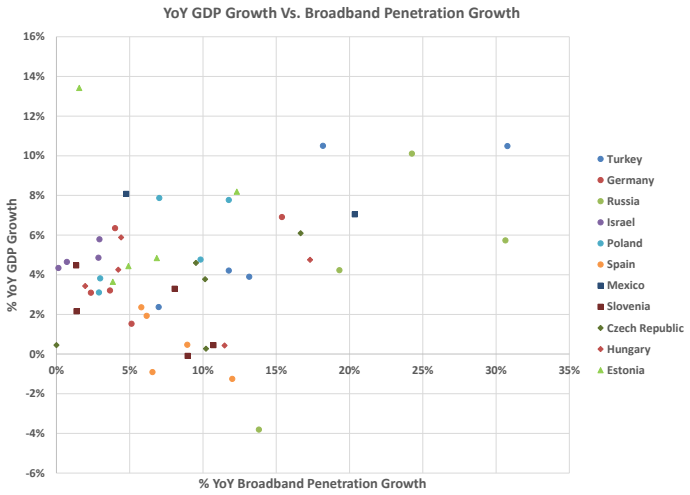

Figure 2. *Year-on-year broadband penetration growth vs. GDP growth (baksed on [2])*

Building a ubiquitous Wi-Fi network will be highly beneficial for the safety and security of the society, which has become a major concern. Connected devices will help the society during

1. Natural calamity or
2. During an attack by anti-social elements or
3. Tracking miscreants
4. Broadcasting “Real Time Critical Alerts”

Wi-Fi AP’s today are equipped to provide basic information like the number of subscribers connected, their physical location (may be the orientation & distance from AP), Data usage, etc. This captured information can be available on the fly to the Safety and Security Agencies so that,

- The data captured by the AP’s can be used to evacuate people from the enforced situations like, Flood, Fire, or when taken as hostages in planned attacks or
- Have a count of the number of people in the affected area when there is an planned or unplanned attack or
- To trace the movement of the suspects or

- To Broadcast the Critical alerts to all the subscribers in specific area (Location based) The critical alerts can be, traffic related or Environmental or calamities or accidents etc., or
- To pass on the information to the rescue agencies etc.,

3. Summary

A rapid increase in rollout of Wi-Fi access points requires better wireline backhaul availability, which can be achieved faster and at lower expense by making the 60 GHz band license-free for outdoor use. 60 GHz can be used to rollout fiber-equivalent throughput using a wireless network; wireless networks can be deployed much faster than fiber networks. Wi-Fi has a much lower cost structure, and thus will spur availability of broadband data at a lower cost structure. Mobile wireless standards already include future interoperability with Wi-Fi networks, so that will be an additional benefit.

A high-capacity wireless backhaul network will have impact on additional areas. Rollout of 4G is dependent on better access to faster backhaul networks; mobile wireless networks are already capacity-constrained, and likely limit data speeds to end-users. Easier deployment of small cells also requires easy access to high-capacity backhaul. Although initial 5G deployments will likely be fixed wireless, mobile 5G will not be far behind, and will also need and benefit from fast backhaul. IoT, smart cities, and autonomous vehicles are also all dependent on availability of broadband.

Widespread Wi-Fi deployments, in turn, will have significant socio-economic impacts, including reduction in commuting, traffic, pollution, noise, increases in jobs as well as efficiency, and a general improvement in quality-of-life. It will also increase opportunities for the poor, bringing them into the e-economy.

Taking cue from some effective Business Models

Germany Energy sector: In Germany, small private solar farms are able to feed energy back into grid and make money. Similarly, private hot spots can provide extra capacity to Telcos and other operators.

Uber cabs: Cab services earlier were poor. With the Uber model where ‘anyone can become a cab driver’, has dramatically improved the cab service and has lowered prices as well. A similar model can be created for Wi-Fi services, wherein anyone who owns a Wi-Fi infrastructure can act as a retail internet service provider thereby increasing reach, business and revenue opportunity for all.

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