

Response to

**Consultation Paper on Proliferation of Broadband
Through Public Wi-Fi Networks**

Contributed by

Dr. V. Sridhar, Professor, IIT-Bangalore (vsridhar@iiitb.ac.in)

Dr. Rohit Prasad, Professor, MDI, Gurgaon

24 August 2016

Q1. Are there any regulatory issues, licensing restrictions or other factors that are hampering the growth of public Wi-Fi services in the country?

1. Though unrestricted Internet Telephony was allowed for Unified Access Service Providers way back in 2007, it has not been actively promoted by the incumbent mobile operators due to their overlapping business interests in protecting SMS and TDM voice revenue.
2. As is pointed out in the recent TRAI consultation paper on “Internet Telephony (VoIP), the ISPs can provide unrestricted Internet Telephony only after getting Unified License with Access Services registration. The minimal area in which UL with Access Service authorization can provide service is a telecom service area. On the other hand, category C ISPs can provide service in Secondary Switching Area level. Since ISP can be a non-facility based service and not directly linked to Access Service, relaxation of the condition on unrestricted Internet Telephony to be provided by ISPs will provide an incentive for ISPs to set up Wi-Fi networks. Moreover, the entry fee for Access Service authorization is higher than that for ISP authorization. Hence the move might encourage smaller ISPs to provide access through public Wi-Fi networks.
3. There are Wi-Fi access providers coming up in India, much like tower companies. These firms provide Wi-Fi access at wholesale or retail level, provide managed services and may even be OTTs providing applications/ content over Wi-Fi networks. They basically can cover all the 3 layers as given in the consultation paper. Do these providers require license? If so, which license type - Infrastructure Provider (IP)-1, IP-2, UL-ISP, or UL-Access Service? It is ambiguous.

Q2. 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?

Once the optic fibre is provided till the panchayat level, the last mile can be provided using a Wi-Fi network, provided that the licensing requirements for ‘rural ISPs’ are kept at a minimum level and they are given free backhaul on the optic fibre.

Q3. What measures are required to encourage interoperability between the Wi-Fi networks of different service providers, both within the country and internationally?

A framework for roaming between the Wi-Fi networks of different operators needs to be created. The framework should cover both commercial and technical aspects.

Q4. What measures are required to encourage interoperability between cellular and Wi-Fi networks?

1. Seamless Wi-Fi connectivity from cellular macro networks through SIM based authentication has been in use as most of the U.S. and European operators have adopted it for their International roaming programs. However, this requires Wi-Fi access point to be connected to the IMS of the mobile operator for authentication. Hence “equal access” to all PoIs of the operators is required for Wi-Fi networks to provide seamless

authentication. This shall be mandated through specific clauses in the UL-Access Service.

2. Firms such as Qualcomm have been promoting the 4G Long Term Evolution (LTE) - Unlicensed that operates in the 5 GHz unlicensed band for seamless connectivity between macro and micro networks. The corresponding spectrum band shall be made available for deployment and seamless switch over.

Q5. 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.

1. Realizing the above economic value of unlicensed spectrum, the U.S. Federal Communications Commission last year made available another 100 MHz of spectrum in the 5.150 to 5.250 GHz band more usable for unlicensed technologies, doubling the amount available in the 5 GHz band and enabling Gigabit speeds through the 802.11ac Wi-Fi standard. In India, outdoor use of this band is permitted but not license exempt (NFAP, IND 68). In tune with the developments in the U.S. and elsewhere, the GoI, on its part should release 5.150 - 5.250 GHz for unlicensed use.
2. With advancement in technology and increase in functionality of devices, new bands have been released by FCC for unlicensed use at 902-928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz. By 2008, 955 MHz were allocated to unlicensed uses below 6 GHz. Alliances such as [LoRa™](#) have been developing technologies in the 902-928 MHz ISM band for IoT use. The lower 900 MHz band is perfectly suitable for IoT long haul communication. We suggest that GoI should actively consider release the following frequencies for unlicensed usage in tune with global practice:
 - a. 916-928 MHz;
 - b. 1880-1930 MHz;
 - c. 863-868 MHz.
3. Moreover, in India, 585-698 MHz is marked for digital broadcasting (NFAP IND 37) and 698 - 806 MHz for IMT and broadband wireless access (NFAP IND 38). Since the government has finalized on the release of IMT Band 28 (APT band: 703-748/ 758-803 MHz) for licensed use, 698-703 and 803-806 MHz can be potentially released for unlicensed use. Further, since only one national broadcaster is using the upper VHF band of 585-698, it is also potentially possible to release some frequencies in this band for unlicensed usage, since this band is mainly reserved for White space technologies and is not harmonized much globally for licensed use.

Q6. Are there any challenges being faced in the login/authentication procedure for access to Wi-Fi hotspots? In what ways can the process be simplified to provide frictionless access to public Wi-Fi hotspots, for domestic users as well as foreign tourists?

1. Login/ authentication procedures are cumbersome. One Time Password (OTPs) are used for authentication to Public Wi-Fi access points. Though proven to be successful, it is not user friendly. The only purpose for the use of OTP in Public Wi-Fi is to assess the

extent of usage and thus limit of usage (e.g. by MB or time). The authorization can also be done through a payment gateway using credit card/ debit card/ UPI ID in future. Hence the possibility of monetization along with authentication.

2. There are also disruptions on authentication promoted by start-ups such as Wi-Fi Master Key, the app that enables one to connect to share Wi-Fi hotspots by crowdsourcing login credentials. The credentials have been shared by the Wi-Fi access point owner and it resides in the app cloud to be retrieved on the go by any user who wants to use the Internet through such shared access points. Though security ramifications of such methods need to be explored, a modified form of it can be used in public Wi-Fi networks.

Q7. Are there any challenges being faced in making payments for access to Wi-Fi hotspots? Please elaborate and suggest a payment arrangement which will offer frictionless and secured payment for the access of Wi-Fi services.

1. The typical Wi-Fi Access Points (APs) do not have any processing capability. It may be possible to convert the Wi-Fi access points to a Point of Sale terminal (without the expensive video display) so that all authentication and payment can be done through the Wi-Fi access points.
2. However, it is important that the Wi-Fi Aps share the payment information of the user so that the user can seamlessly roam across Wi-Fi APs; the account reconciliation across providers of these Wi-Fi APs can happen at the back end.

Q8. Is there a need to adopt a hub-based model along the lines suggested by the WBA, where a central third party AAA (Authentication, Authorization and Accounting) hub will facilitate interconnection, authentication and payments? Who should own and control the hub? Should the hub operator be subject to any regulations to ensure service standards, data protection, etc?

1. This method resembles control and coordination which are much against the federated nature of the Internet and to a large extent Wi-Fi movement. This puts in one more layer in the value chain and hence reduces the surplus received at the ends of the value chain.
2. An alternative is to propose the use of UPI APIs by Wi-Fi access providers to provide both authentication and payment.

Q9. Is there a need for ISPs/ the proposed hub operator to adopt the Unified Payment Interface (UPI) or other similar payment platforms for easy subscription of Wi-Fi access? Who should own and control such payment platforms? Please give full details in support of your answer.

1. UPI as a method for use in payment platforms is preferred as it would provide a standard interface for all types of payment transactions. However, the payment platforms themselves can be federated and distributed, with no single firm having to control the same.

Q12. What measures are required to promote hosting of data of community interest at local level to reduce cost of data to the consumers?

1. The Wi-network provider can use personalized advertisement as one of the possible methods for monetization and cross subsidize the data cost to consumers. However this needs a debate as to whether it falls under Net Neutrality rules or not.

Q13. Any other issue related to the matter of Consultation.

1. The prevailing view amongst policymakers is that the vast majority of economic value is derived from licensed spectrum. The value of unlicensed spectrum, for instance spectrum in the 2.4 GHz and 5 GHz bands being used for Wi-Fi, has always been undervalued. There are many studies that have illustrated the economic value of unlicensed spectrum using data from the United States under different scenarios including cellular-Wi-Fi offloading, Wi-Fi Internet Service provisioning, Wi-Fi in communication intensive locations such as hospitals and malls, community Wi-Fi in public places, and finally residential Wi-Fi. As per the recent work of Katz (2014), the sum of consumer and producer surplus of the technologies operating in unlicensed spectrum bands in the United States amounts to a total annual economic value of \$222 billion in 2013, and contributed \$ 6.7 billion to the nation's GDP. It is also estimated that by 2017, at least, \$547.22 billion in economic value and \$49.78 billion in contribution to the GDP, will be contributed by unlicensed spectrum and associated technologies.
2. **Wi-Fi in residences:** Of the about 90 million worldwide hot spots as measured by iPass, 80 million are residential ones. However, residential Wi-Fi is poor in India due to pathetic land line broadband penetration at 6 per 100 households which is required to back haul Wi-Fi hotspots at home. Despite the poor penetration, a study by the authors indicate that users switch their data access to residential Wi-Fi as best as they can, due to (i) lower landline broadband tariff and (ii) improve quality of experience. While most of the landline broadband providers offer bundled Wi-Fi access points, they are not actively promoting it as a better alternative to mobile broadband due possibly to avoid cannibalization of their mobile data revenue. The ability of ISPs and private telcos to access optic fibre to home through the unbundling of the local loop, currently in the possession of the government operator, will unlock value in this market.

We postulate that in countries such as India, wherein the average licensed spectrum assigned to operators is a low of about 2 X 13 MHz per service area; at a very high price of \$1-\$2/MHz/Population (in metros and category A service areas), Wi-Fi and associated technologies operating in unlicensed band will generate more economic value than in other markets in the following scenarios.

3. **Wi-Fi in Enterprises:** On the other hand, enterprises of today are moving from single channel (e.g. in-store or online) to omni-channel (i.e. online-offline) sales and marketing, especially in retail businesses. By using the power of Wi-Fi, retail stores can provide store branding, product promotion, loyalty programmes, cross and up selling of merchandise and much more to the customers who walk in to their stores, clutching their Smartphones. The communication also can be personalized with minimal effort.

Continuous customer feedback collection, which is one of the major pain points for retail businesses, can be elicited using simple forms or chats over Wi-Fi. A wealth of information thus collected can be used to improve merchandise stocking, innovate on pricing policies, and improve customer experience. Though retail industry tried a variation of this using Blue Tooth technology, due to its intrusive nature and complexity of set up, it is not really catching on. It is time for the brick-and-mortar companies to latch on to this simple but powerful technology to outwit their e-commerce counterparts.

Though one can argue that such omni-channel experience can be provided through a mobile App of the store, the app space is getting cluttered. The number of mobile Apps in Google Play Store is more than 1.6 Million. With constraints in memory and storage space in mobile devices, the stickiness of apps is very poor especially in India. Wi-Fi provides a great opportunity for business to connect with the proximal customers, without the need for developing a mobile app and inducing its adoption which in itself is a difficult task.

References

Mishra, R., Sridhar, V. (26 May 2016). Business value of Wi-Fi. Financial Express.

Sridhar, V., and Prasad, R. (December 2015). A techno-economic study of Wi-Fi adoption in India. Second Regional International Telecommunications Society Conference, New Delhi, 13-15, December 2015.

Sridhar, V., Prasad, R., (August 2015). A techno-economic study of non-exclusive sharing of radio spectrum for mobile services and associated policy implications. X Annual International Conference on Public Policy and Management. Indian Institute of Management Bangalore, 3-5 August 2015.

Mani, S. and Sridhar, V. (19 December 2015). Diffusion of Broadband Internet in India: Trends, Determinants and Challenges, Economic & Political Weekly, L(50), 54-62.