



Telecom Regulatory Authority of India



**Recommendations
on
Proliferation of Broadband
Through Public Wi-Fi Networks**

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Chapter I

Introduction

- 1.0 “Broadband” is currently defined as “ *a data connection that is able to support interactive services including Internet access and has the capability of the minimum download speed of 512 kbps to an individual subscriber from the point of presence (POP) of the service provider intending to provide Broadband service.*” It therefore refers to a data connection capable of delivering high-speed Internet access services. The importance and utility of broadband and internet services has been brought to the forefront with Hon’ble Prime Minister’s announcement of the “Digital India” vision. Of the three main vision areas of the Digital India, viz. digital infrastructure being provided as a utility to citizens, software and services being available on demand to citizens, and digital empowerment of citizens – the first vision area, of delivering infrastructure as a utility is the most crucial element.
- 1.1 Like electricity, a century ago, broadband has over a period of time, become a critical platform for economic growth, job creation, global competitiveness and improved way of life. It is helping emergence of new industries while unlocking vast new possibilities for existing ones. It has brought a paradigm shift in the way we impart education to children (and other students), deliver health care, manage energy, evolve public safety, engage Government and access, organize and disseminate knowledge. In this regard, the World Bank’s World Development Report recently observed that on an average a 10% increase in internet penetration, is likely to lead to a 1.4% growth in the GDP of an economy. Given the size and scale of the Indian economy, the “digital dividend” that can be achieved through increased broadband proliferation in India is likely to be significantly greater than that in other countries.

1.2 However, despite significant progress in the space of mobile telephony and mobile broadband, delivering broadband (BB) to the last mile remains a challenge. While considerable progress has been made in terms of deploying BharatNet, there are other potential methods for rapidly delivering broadband. In particular, interoperable and scalable Wireless Local Area Networks (WLANs) show the promise of rapidly delivering affordable broadband services at relatively low costs. The term Wi-Fi (an acronym for Wireless Fidelity) is commonly used to refer to the array of technical standards (802.11 standards and various amendments to it) developed by the Institute of Electrical and Electronics Engineers' (IEEE) that can be used to create WLANs. Strictly speaking, Wi-Fi is a certification provided by the Wireless Broadband Alliance (WBA), which owns and controls the "Wi-Fi Certified" logo that can be applied to products that satisfy certain interoperability criteria. The certification is centered on the following tenets:

- a.** *Interoperability* is the primary target of certification. Rigorous test cases are used to ensure that products from different equipment vendors are interoperable in a wide variety of configurations.
- b.** *Backward Compatibility* has to be preserved to allow for new equipment to work with existing gear. Backward compatibility protects investments in legacy Wi-Fi products and enables users to gradually upgrade and expand their networks.

1.3 WLANs created using the Wi-Fi standard can be used to connect personal computers, mobile phones, tablets and other appliances to a local network, which in turn provides connectivity to the Internet. These WLANs can be operated for private use, such as in the home, or to create short-range, public networks, known as "hotspots", which can be found in public places like airport lounges, coffee

shops or neighbourhoods.¹

- 1.4 The Authority noted that India significantly lags behind other countries in terms of providing access to Broadband Internet, especially to people in rural areas. Since there is a significant section of the population still to be connected, there is a need to take some measures so as to provide broadband services to the unconnected. This calls for introduction of new set of small players in the Wi-Fi service provisioning space, who will be able to extend their resources through a process of incentivisation.
- 1.5 Accordingly, in order to have detailed deliberations on the matter, the Authority on 13th July 2016, released a Consultation Paper on “Proliferation of Broadband through Public Wi-Fi Networks”. The Consultation Paper sought to explore the regulatory and commercial constraints that potentially hinder the growth of scalable and ubiquitous Wi-Fi in the country. This included a review of any potential licensing restrictions, measures required to facilitate interoperability between Wi-Fi networks, de-licensing of additional bandwidths for the purpose of expediting the deployment of public Wi-Fi, and several demand-side issues such as roaming capabilities, authentication and payment processes, that potentially hinder the uptake of public Wi-Fi.
- 1.6 During the course of the consultation, the Authority in partnership with International Institute of Information Technology (IIIT), Bangalore conducted a workshop on public Wi-Fi networks on 28th September, 2016. The purpose of this workshop was to explore various models of public Wi-Fi that could address the resource gap in terms of delivering public Wi-Fi in remote areas. The workshop

¹ International Telecommunication Union, Global Market Trends, available at <https://www.itu.int/osg/spu/spunews/2003/oct-dec/wi-fi.html>

was attended by service providers, payment solution firms and startups, Wi-Fi solution providers, Wi-Fi/ mobile device makers, academia, system integrators, Network Equipment Manufacturers, Software Vendors, and Government officials. Experts from different areas and industry segments presented their viewpoints and shared experiences. Based on the discussions held at the workshop in relation to exploring viable models for deploying interoperable and scalable public Wi-Fi networks. The Authority also released a Consultation Note on “Model for Nationwide Interoperable and Scalable Public Wi-Fi Networks”. The Consultation Note attempted to (a) explore the roles of different stakeholders in the Public Wi-Fi network value chain and build an ecosystem for promoting scalable and sustainable partnerships for large scale nation wide deployment; and (b) explore viable models that could be adopted towards rapidly deploying affordable and interoperable public Wi-Fi networks.

- 1.7 A total of 60 comments and 7 counter-comments were received in response to the Consultation Paper as of the closing date for the consultation (7th September 2016), and a total of 39 comments were received in response to the Consultation Note. Open House Discussion was held in New Delhi on 9th January 2017, and was attended by most of the stakeholders who had participated in the consultation process. After considering the comments of the stakeholders and its own analysis, the Authority has finalized these recommendations.

Chapter - II

Issues in Proliferation of Public Wi-Fi Hotspots

A. *Active Infrastructure Sharing*

- 2.0 In the Consultation Paper the Authority noted that due to network and cost limitations, most Internet service providers are not in a position to provide uninterrupted Wi-Fi coverage to their users across various geographic locations, thereby posing a significant challenge in the widespread adoption of Wi-Fi services. This calls for adoption of new mechanisms that can provide for ubiquitous Wi-Fi services, by service providers. Further, sharing of Wi-Fi infrastructure can facilitate offloading of traffic on to Wi-Fi networks thereby easing network congestion on mobile networks in high density public footfall areas.
- 2.1 Ideally this can be facilitated through bilateral agreements between service providers towards sharing public Wi-Fi infrastructure on a rental/ revenue sharing basis. This would be somewhat akin to roaming arrangements in cellular services. It would also help in resolving interference issues which can come up due to access points of different service providers installed in the same location using the same unlicensed ISM band. The Authority therefore sought stakeholder comments towards a proposal for a 'neutral Wi-Fi network' wherein subscribers of all ISPs can access high speed broadband connection through Wi-Fi without duplicating the infrastructure. The neutral network can allocate separate SSID to each operator. ISPs can get into agreements with one another for facilitating roaming of a Wi-Fi subscriber of one network on other networks. In this regard the Authority also invited comments on

setting up a central authentication, authorization and accounting (AAA) hub, along the lines of the Wireless Roaming Intermediary Exchange (WRIX) standards developed by the Wireless Broadband Association (WBA) and the GSM Association (GSMA).

2.2 On this issue, most stakeholders suggested against setting up a central AAA hub. The primary concern voiced by stakeholders was that setting up a central AAA hub would lead to the creation of a “super entity” which would have a monopoly with regard to AAA services. Moreover, stakeholders felt that creation of such a central AAA hub would create additional layers (central registry, registration application provider) through regulatory intervention, leading to complexities in the ecosystem.

2.3 With regard to enabling neutral Wi-Fi networks through bilateral arrangements, most stakeholders highlighted the present restrictions in active infrastructure sharing. While most stakeholders appreciated the Department of Telecom’s decision to allow sharing of active infrastructure, they highlighted that there was no express provision allowing sharing of active infrastructure in the context of public Wi-Fi hotspots. The present license conditions allow sharing of active infrastructure and roaming only under the Unified License, Cellular Mobile Telephone Service License, and the UASL agreements. Similar arrangements between ISPs have not happened for need of a license amendment. Moreover, even under the recently amended Unified License Agreement, the Department has allowed for sharing of active infrastructure only with regard to antennae, feeder cable, Node B, Radio Access Network and transmission systems. It therefore indicates the Department’s intent to allow sharing of active infrastructure only in the access network.

2.4 In light of the above, the Authority feels the need for an amendment to

the ISP licenses, and an express clarification with regard to sharing of active Wi-Fi infrastructure, i.e. access point and backhaul infrastructure.

2.5 **Accordingly, the Authority recommends that**

The Department of Telecommunication (DoT) may amend the terms of the ISP license to allow for sharing of active infrastructure, in line with the Unified License (UL). Further, the Authority recommends that a clarification be provided in respect of all license categories, that sharing of infrastructure related to Wi-Fi equipment such as Wi-Fi router, Access point, and backhaul is also allowed.

B. *Limitations on Spectrum Availability*

2.6 The use of unlicensed spectrum has been one of the key enabling factors in the growth and widespread adoption of the Wi-Fi standard. Accordingly, in an effort to provide maximum flexibility for innovation and lower entry costs for ubiquitous wireless devices including those that utilize the Wi-Fi standards, many countries have set aside certain bands (such as the 2.4 GHz and 5 GHz bands) exclusively for unlicensed users. However, apart from the unlicensed frequencies typically utilised under the Wi-Fi standard, there are several other frequency bands which can be utilized for wireless provision of Internet access.

2.7 Further, in addition to the need for designating additional bands for wireless devices, there is also a growing need to expand backhaul capacity by utilising other bands of spectrum that remain largely unused. Accordingly, most countries are evaluating the possibility of utilising V-band (57 - 64 GHz) , E-band (71-76 / 81-86 GHz) for this purpose.

- 2.8 Recognizing the need for widespread Broadband deployment, the Authority had in its earlier Recommendations on “Broadband India: Recommendations on Accelerating Growth of Internet and Broadband Penetration” of 29th April 2004, recommended for de-licensing of certain frequency bands. The Authority recommended that, *“The 2.4 – 2.48 GHz band should be de-licensed for low-power outdoor usage, and on the basis of non-interference, non-protection and non-exclusiveness. This de-licensing should be technology-neutral. Similarly, de-licensing should also be done for the 5.725 – 5.85 GHz band to facilitate deployment of Wireless Access technologies for Broadband. Additionally, the 5.15 – 5.35 GHz band should be vacated expeditiously and delicensed to further facilitate the objectives.”*
- 2.9 Following these recommendations, certain frequency bands were de-licensed between the years 2004 and 2007.
- 2.10 Since then the Authority has, from time to time, gave several recommendations in relation to the spectrum allocation policy. These include the Authority’s recommendations on “Allocation and Pricing of Microwave Access (MWA) and Microwave Backbone (MWB) RF carriers” dated 29 August 2014, wherein the Authority recommended that, *“in order to increase broadband penetration in India, the usage of high capacity backhaul E-band (71-76 / 81-86 GHz) and V-band (57-64 GHz) may be explored for allocation to the telecom service providers.”* The Authority further recommended that (a) Channel bandwidth for E-band (71-76 GHz and 81-86 GHz) should be 250 MHz with a guard band of 125 MHz at the top and bottom of each 5 GHz band and more than one channel can be allowed and allocated for aggregation. (b) Channel bandwidth for V-band (57-64 GHz) should be 50 MHz with a 100 MHz guard band at the beginning of the band and more than one

channel can be allowed and allocated for aggregation.²

2.11 More recently, the Authority in its recommendations dated 17th April 2015 on “Delivering Broadband Quickly: What do we need to do?”, recommended that *“the de-licensing of the 5.725 - 5.825 GHz band for outdoor usage needs to be carried out in the next 6 months. DoT must release larger quantities of unlicensed spectrum (as has been done in many parts of the world) for better quality of service and reducing the strain on existing networks.”*³

2.12 In the context of the Authority’s earlier recommendations, and the growing need for additional spectrum suitable to be deployed in the context of Wi-Fi networks, the Consultation Paper sought stakeholders’ comments on whether in addition to the frequency bands already recommended by the Authority to DoT, other bands needed to be de-licensed in order to expedite the penetration of broadband using Wi-Fi technology.

2.13 Some stakeholders have recommended against further de-licensing until optimal utilization of existing unlicensed spectrum is achieved. They have emphasized that access spectrum is not an immediate bottleneck for the spread of Wi-Fi services, and hence additional spectrum need not be de-licensed. On the other hand, some stakeholders have emphasized that refraining from de-licensing commercially significant frequency bands that have been completely de-licensed (indoor and outdoor) in other jurisdictions, could constrain the device ecosystem and modes of Wi-Fi service delivery

² TRAI’s Recommendations on “Allocation and Pricing of Microwave Access (MWA) and Microwave Backbone (MWB) RF carriers” dated 29th August 2014

³ TRAI’s Recommendations on “Delivering Broadband Quickly: What do we need to do?” dated 17 April 2015

available in India. Accordingly, they have submitted that spectrum bands such as 2.483-2.5 GHz, 2.7-2.9 GHz, 5.725 - 5.825 GHz, E-Band, V-Band, TV White Space (470-698 MHz), etc. should be delicensed, subject to spectrum usage rules that ensure efficient use of the spectrum bands.

2.14 The Authority notes that while there is merit in considering de-licensing of additional spectrum subject to reasonable spectrum usage restrictions, further recommendations on particular spectrum bands can only be made after detailed internal analysis, consultations and coordination amongst Governmental agencies towards harmonizing spectrum allocation policies.

2.15 Nonetheless, in the short term, de-licensing certain additional spectrum bands could catalyze the market for public Wi-Fi services, and enable delivery of Wi-Fi services to the last mile, including in remote and far flung areas.

2.17 **Accordingly, the Authority recommends that**

The DoT may re-visit the TRAI's earlier recommendations and consider de-licensing spectrum in the 5.725 - 5.825 GHz spectrum band for outdoor usage, and expedite decision on allocating E-band (71-76 GHz and 81-86 GHz) and V-band (57-64 GHz) to service providers.

C. *Issues with the Unified License – Virtual Network Operator (UL-VNO) License*

2.18 Section 4 of the Indian Telegraph Act, 1885 sets forth a licensing requirement for the establishment, maintenance and working of telegraphs within India. Accordingly, up till recently, only licensed service providers, i.e. Telecom Service Providers (TSPs) and Internet

Service Providers (ISPs; Category A, B or C) with Unified Access Service Licenses (UASL), were permitted to provide Internet services. This requirement prevented small entities and individuals from being able to provide for hotspots/ community Wi-Fi, etc. Recognizing this, the Authority in its recommendations on “Introducing Virtual Network Operators in Telecom Sector” dated 1st May 2015, recommended issuance of Virtual Network Operator (VNO) licenses. In its recommendations, the Authority observed, *“There can be several organizations that want to make their controlling areas/premises Wi-Fi enabled. For example, cities like Delhi are aiming to become a fully Wi-Fi enabled city to provide broadband services to its citizens so that various e-Governance services are available on their mobile devices. Similarly, the Indian Railways is aiming to make railway stations Wi-Fi enabled for the benefits of its passengers. In the present setup they need to rely exclusively on existing NSOs for provisioning of such services in the controlling area/boundaries. If they are allowed to become VNOs within their boundaries, they can provide such services according to the needs of the customers and can design innovative tariff plans to suit customers’ needs.”*

2.19 The UL VNO licensing regime was approved by the DoT in March, 2016. Shortly thereafter, the Department issued guidelines for the issuance of UL VNO licenses. As a result, under the present framework, an entity wishing to provide internet services can either obtain Unified License with ISP - Category-C Authorization (which is most relevant for small businesses) with a minimum entry fee of INR 20,000, or a Unified License (VNO) License with ISP Category-C authorization with a minimum entry fee of INR 10,000. There are no restrictions upon the number of VNO licensees that can be parented to any one NSO. Likewise, there are no restrictions upon the number of NSOs with which a VNO licensee may tie up *for all services other than access services and services that need numbering and unique*

identity of customers.

2.20 During the course of consultation, most stakeholders intending to provide Internet Services raised concerns with regard to the Clause (1)(xxii), which places restriction on a VNO having more than one parenting with NSOs for a service needing *numbering and unique identity of customers.*

2.21 The Authority has reviewed the concerned clause under the UL VNO Guidelines Clause (1)(xxii) of the Guidelines provide that, “VNOs will be allowed to have agreements with more than one NSO for all services other than access services and such services that which need numbering and unique identity of customers.” While the stakeholders argued that this clause restricts a UL VNO from becoming an agent for multiple service providers, and restricts it from multi-homing by purchasing bandwidth from multiple ISPs, the Authority observes that the clause generally allows VNOs to have agreements with one or more NSOs, *except where* the agreements are for the purposes of access services and such services that need numbering and unique identity of customers. Internet access services do not typically require assignment of unique identity to customers, nor do they involve adherence to any uniform numbering system. Accordingly, the restriction under Clause (1)(xxii) of the UL VNO Guidelines should not ideally apply to UL VNO licensees entering into agreements with ISPs. However, in the absence of an explicit clarification from the Department, most stakeholders might interpret the restriction as applicable to Internet access services as well.

2.22 **Accordingly, the Authority recommends that**

Subject to the DoT’s agreement with the Authority’s interpretation, the DoT issue a clarification in respect of Clause

(1)(xxii) of the UL VNO Guidelines, specifically clarifying that there is no exclusivity requirement upon UL VNO licensees for internet services i.e. a UL VNO can parent to multiple NSO for providing internet service.

D. Authentication & payments:

2.23 The authentication process for connecting with a public Wi-Fi is cumbersome and inflexible. It requires mechanisms such as OTP that necessitates the requirement of mobiles with appropriate Subscriber Identity Modules (SIMs). Similarly, current payment models also pose certain issues. Available modes of payment cater only to a very small section of population who has access to electronic modes of payment. Physical vouchers also suffer from logistic problems and associated distribution costs. One possible way to create a unified authentication and payment infrastructure is to leverage national open Application Program Interfaces (APIs) implemented for Aadhaar, eKYC (e-Know Your Customer), and Unified Payment Interface (UPI). This has also been supported by a number of stakeholders. While these suggestions will contribute to making the payment process more frictionless, the Authority recognizes that in the absence of interoperability for payment and authentication, the customers may still be deterred from utilizing Wi-Fi services.

2.24 **Accordingly, the Authority recommends that**

Existing requirement of authentication through OTP for each instance of access may be done away with. Authentication through eKYC, eCAF and other electronic modes be allowed for the purposes of KYC obligations. In consultation with the security agencies, DOT may consider authentication by MAC ID of the device or through a mobile APP which stores eKYC data of the

subscriber and automatically authenticate the subscriber.

E. Right of Way Issues

2.25 During the course of consultations, one of the most consistent issues highlighted by stakeholders was the issue of obtaining Right of Way (RoW). Amongst other concerns stakeholders highlighted the issues of acquisition of sites, requirement for multiple documents and No Objection Certificate (NoC), and the lack of a single window clearance mechanism. While these concerns have often been highlighted as key impediments to developing broadband infrastructure in the country, the Authority notes that the RoW issues highlighted by stakeholders have since been addressed by the Department with the issuance of the Right of Way Rules, 2016.

F. Import duty on Wi-Fi equipment

2.26 A few other issues, such as suggestions to reduce the import duty on WLAN equipment, may also be explored in coordination with the Ministry of Commerce. The Authority notes that at present the basic duty applicable on Access Point equipment is 10% on Cost, Insurance and Freight (CIF) Value. Additionally Countervailing Duty of 12.5% and Special Countervailing Duty of 4% are also applicable on imports.

2.27 Accordingly, the Authority recommends that

The import duty applicable upon Wi-Fi access point equipment be revisited in coordination with the Ministry of Commerce. This will reduce cost of providing Wi-Fi service in the country leading to proliferation of broadband services.

Chapter – III

Need for Creating Public Data Offices (PDOs)

- 3.0 As highlighted in the consultation paper issued by the Authority in July 2016, India lags significantly behind other countries in terms of providing access to Broadband Internet, especially to people in rural areas. Since there is a significant section of the population still to be connected, measures taken to enable larger service providers to provide public Wi-Fi, as discussed in the previous chapter, will not suffice. The existing service providers may not have the reach and the incentive to deliver public Wi-Fi in remote areas. Due to these reasons, steps need to be taken to ensure that in addition to existing service providers, small providers can also enter the public Wi-Fi ecosystem and have the capability and incentives to provide public Wi-Fi on a small scale.
- 3.1 During the discussions held in Bengaluru, it emerged that unbundling various part of the Wi-Fi service provisioning so that each component can be delivered by a separate entity, can give a push to installation of public Wi-Fi by small entrepreneurs. Specifically, a model was proposed where Wi-Fi venues would be provided by local shop owners and neutral third party providers will provide the Wi-Fi equipment and associated software etc. It was suggested that these third party providers would take care of the authentication and payment process.
- 3.2 After detailed deliberation, the Authority noted that a model akin to the cyber cafe and Public Calling Office (PCO), could be one of the ways to scale up public Wi-Fi hotspots in the country. Under the existing regulatory regime, cyber cafes are exempted from any licensing requirements. They are, however, required to register with a

registration agency, and provide details of the establishment, including, address, and types of services being provided by the establishment. Upon registration, a cyber cafe is required to adhere to the Information Technology (Guidelines for Cyber Cafe) Rules, 2011 (Cyber Cafe Rules).

A. PDOs: An upgrade on the Cyber Cafe and PCO model

3.3 Cyber cafes played a massive role in facilitating the use of Internet in the country, by addressing the issue of access. This was more so in the case of rural areas where mobile Internet penetration levels remained low. After an initial spurt of growth in the number of cyber cafes and users alike, the growth pattern eventually started to decline with the number of cyber cafes reducing year on year. This reduction in growth can partially be attributed to the increased use of mobile Internet in both urban and rural areas.

3.4 However, the failure of the cyber cafe model cannot be fully attributed to increased use of mobile Internet. The Cyber Cafe Rules have often been criticized as hindrance and have stifled the growth of the market. The Cyber Cafe Rules imposed a number of granular requirements, which could not be reasonably met by all establishments. While cyber cafes in the urban areas had the resources to meet these stringent requirements, many cyber cafes in the rural areas had to shut down simply because they could not afford the compliance cost that came with the introduction the abovementioned guidelines.

3.5 Some of the major issues with the Cyber Cafe Rules include prescriptive obligations relating to user registration and authentication processes, the need to maintain logs for a certain period, and physical layout and computer resource requirements. The need to maintain user records for a period of one year is not quite

practical for all such setups. On the user side, the necessity to provide identification every time such user had to access a cyber cafe and the fact that a minor or person without a photo ID could not enter the cyber cafe without an adult stifled the demand for such services over time.

3.6 In order to replicate a similar model for public Wi-Fi, and also address the problems faced by cyber cafes, the Authority has considered a model wherein an aggregator (may be termed as Public Data Office Aggregator) can provide last mile Wi-Fi services and small entrepreneurs would set up Public Data Offices (PDOs). This aggregator will work through PDOs to supply public Wi-Fi services, while the PDOs will provide the venue for the public Wi-Fi deployment. The Public Data Office Aggregator (PDOA) may multi-home Internet bandwidth from multiple ISPs and sell them to customers at a retail level. Service providers may charge differential “commercial’ tariffs from PDOAs

3.7 Further, similar to the cyber cafe model, PDOAs (not PDOs) may be mandated to get registration with a relevant registration agency (as prescribed by the DoT) and allowed to setup Wi-Fi hotspots. Registration requirements for Hotspot Providers could have built-in obligations to ensure that e-KYC, authentication and record-keeping requirements are fulfilled. These obligations will take care of the security requirements, as highlighted by some stakeholders. The PDOAs would be required to maintain a list, with details as may be specified by the DoT, of all the PDOs being serviced by the PDOAs registered with it.

3.8 During the consultation process, some of the stakeholders opined that to provide impetus to Wi-Fi provision by small entrepreneurs it was essential that resale of data, which is presently not permitted, be

allowed. The Authority is well aware of the fact that introduction of PDO along with an aggregator (PDOA) would entail resale of data services as is already allowed in case of cyber café model. Further, the Authority is of the view that this is the best way to achieve proliferation of Wi-Fi systems in the country. Such a model would address the shortcomings of the cyber cafe model that have been mentioned earlier, and additionally address several unique concerns associated with public Wi-Fi such as authentication, payments and authorization.

- 3.9 As mentioned previously, PDOs will be venue owners. These may not own or deploy any infrastructure and may not have the means or resources to actually implement a seamless interoperable system on their own. This is where, the role of a PDOA comes in. This PDOA will be registered with the DoT and there should be no limit on the number of PDOs (venues) that such a PDOA can register.

B. Role of the PDOA

- 3.10 A PDOA will be an aggregator which will ensure that subscribers have a seamless experience when it comes to authentication and payments. Such PDOA will be responsible for maintaining electronic (authentication and payment) records of all users that end up using the Wi-Fi service provided by a PDO linked with such PDOA. PDOA may set up and invest in their own authentication and payment systems or even outsource these functions to a third party. Such a third party service provider may provide services to more than one PDOA and in the long run, a system of seamless roaming from one PDOA to another can be established.

- 3.11 When registering a user (Authentication and Payments) for the first

time, a user may be asked for his or her consent on whether such information can be shared with other PDOA. The PDOA must ensure the privacy and secrecy of information shared with it by its subscribers. This is important in order to achieve a seamless interoperable system in the long run. As a user moves from one PDOA to the other, he should be able to use the Wi-Fi provided by the PDO of the new PDOA without having to go through the registration/authentication process once again. Similarly, payment information setup with the first PDOA should be sufficient to make payment to the second PDOA. The terms of settlement among themselves can be determined by the respective PDOAs.

3.12 As highlighted above, the introduction of PDO and PDOA is expected to address the issues of awareness and affordability on the demand side. As the number of PDOs in the country increases, their greater visibility will make the people aware of their advantages thereby enhancing the demand for public Wi-Fi. Further, the PDOs will ensure that users can buy the data amount based on their needs. The availability of data services for small token values will stimulate the demand for public Wi-Fi services.

3.13 In the long run, as the market begins to develop, innovation in technology will make public Wi-Fi services more seamless from both demand and supply perspective. This model will facilitate Wi-Fi systems which will address the issues of authentication and payments interoperability highlighted previously. Introduction of PDO/PDOA is also expected to have a positive impact on the economy of the country which has been highlighted in the following section.

C. *Economic Benefits of PDOs*

3.14 PDOs are expected to have similar effects on the economy as PCOs did when they first came up almost twenty five years ago. With tele-density in the country hovering at less than 5 at the turn of the century, a number of people were dependent on PCOs to make telephone calls. There was an initial spurt in growth of these services as the demand for it far outnumbered its supply. It played a substantial role in providing tele-services especially to the rural areas and villages of the country. Entry of PDOs into the ecosystem can similarly lead to a number of economic benefits, as highlighted below:

a. Increased penetration - PDOAs will allow smaller players to provide Wi-Fi services without having to incur heavy costs. This will lead to an exponential increase in the number of PDOs in the country. With increasing reach in urban and especially rural areas, more and more people will be able to access Wi-Fi networks. Increased penetration will steadily address the problem of awareness that has been highlighted earlier as a demand side issue. Any home user can also be converted into the PDO through logical partitions by the PDOA in which one part of bandwidth may be allocated to the home user for its own use and other part can be used as public Wi-Fi Hotspot. This can make ubiquitous presence of public Wi-Fi in the area.

b. Increased employment - Introduction of PDOA for public Wi-Fi provision can develop Wi-Fi hotspots like a small scale industry and just as in the case of PCOs, shop owners and micro-entrepreneurs will be able to start this business. Setting up of a PDO will require a small infrastructure cost and it can be run along with other businesses. For example, small retail outlets like tea-shop owners can set up their own PDOs which can operate alongside their main businesses. The PDO will generally be required to install an access point and ensure availability of

electricity for the access point. In some models, in places where electricity is available, only a small box is to be hoisted in the shop. This arrangement will encourage village level entrepreneurship and provide strong employment opportunities, especially in rural areas.

c. Leveraging BharatNet infrastructure - The Government has already commenced laying of fibre for rural connectivity under the BharatNet, to create a high speed digital highway to connect all 2.5 lakh Gram Panchayats of the country. The next logical step would be for Panchayats and local entrepreneurs to utilise this connectivity to create Wi-Fi networks offering e-learning, e-governance, e-banking, e-health and other online services to the community. PDOs can help achieve this step by facilitating last mile connectivity. There is a strong case for better utilization of the capacity provided by the existing infrastructure through public Wi-Fi.

3.15 The benefits from setting up of PDOs are expected to contribute immensely to the growth of broadband in the economy. Besides the macro economic benefits that have been highlighted above, some of the other user side issues that PDOs can help address are in the following sections.

D. Addressing demand-side issues through the PDO model

3.16 Apart from the licensing issues highlighted earlier, there are some demand side impediments in public Wi-Fi uptake.

3.17 *Affordability of broadband Internet:* Willingness to pay and affordability is another problem that continues to affect the growth of this market.

A trend among consumers is to use the public Wi-Fi for as long as it is free but stop the use once the free usage period ends. This has been observed based on surveys conducted at the Mumbai airport (Ozone-GVK) as well as another study carried out on the Ghats of Varanasi (BSNL). Consumers have also raised the issue of unutilized balances and remaining time of validity on their Wi-Fi purchases. Consumers were of the view that there will be more demand of Wi-Fi if unutilized amount can be used at some other locations. In this regard, the Authority notes that during the course of consultations, it was apprised of certain existing models which have managed to stimulate demand for paid public Wi-Fi by offering “sachet” sized access plans of low denominations ranging from INR 2 to INR 20. However, the success of such models are predicated upon appropriate changes being effected in the regulatory and licensing regime. Accordingly, the PDO model is expected to provide the required impetus towards stimulating demand for public Wi-Fi.

3.18 Authentication & payments: As explained earlier, the authentication process for connecting with a public Wi-Fi is still cumbersome and inflexible. It requires mechanisms such as OTP that necessitates the requirement of mobiles with appropriate Subscriber Identity Modules (SIMs). The Authority recognizes that in the absence of interoperability for the payment and authentication, the customers may still be deterred from utilizing Wi-Fi services. The PDO model will encourage PDOAs to engage with third party service providers to address this issue, by ensuring seamless interoperability in both authentication and payments. A “one time” (single click) authentication process based on device characteristics such as MAC ID would also dispense away with the need of OTP everytime.

3.19 Awareness of broadband services: Currently, customers including users of mobile broadband services in the country are unaware of

existing public Wi-Fi services. Moreover, there is a lack of awareness amongst consumers in relation to the manner of accessing and utilizing public Wi-Fi networks. This lack of awareness about broadband and public Wi-Fi services among consumers could in part be attributed to the low levels of broadband and public Wi-Fi penetration in India. As broadband proliferates in the country, this issue will steadily be addressed, with consumers being able to evaluate the potential advantages that come with using Wi-Fi networks. It is expected that with the facilitative environment being offered under the PDO model, the rate of proliferation of public Wi-Fi would be accelerated, leading to greater awareness amongst consumers.

3.20 *Storing community interest data locally:* PDOA may also like to store data locally with can be accessed by the people at very negligible price without paying Internet charges.

3.21 In order to ensure that Wi-Fi hotspot scale at a rapid space throughout the country, it needs to be ensured that this process of registration of PDOA with DoT is electronic, seamless and hassle free. Also, it is important to note here that any framework adopted should provide venue providers (e.g. retail outlets like shops, malls, educational centers, etc.) with the flexibility to enter into tripartite agreements with Internet Service provider/Telecom service provider and PDOA, to resell Internet services without being subject to any licensing requirements.

3.22 As the entities registered as PDOA need not pay any fees on a revenue share basis, recognition may be given to a separate “commercial” category of tariffs that may be charged by the bandwidth providers for Internet access services provided to commercial

customers such as PDO/PDOA. This would balance the incentives between service providers and hotspot providers in the provision of Internet access services through public Wi-Fi networks.

3.23 It is pertinent to note here that in one of the submissions received by the Authority, a data reselling model has been described wherein Wi-Fi networks are being deployed at the venue of micro-businesses in “sachet-size” packages such as 100 MB, 500 MB, etc., thereby enabling demand stimulation and allowing price sensitive customers to pay smaller amounts as per their requirements. The Authority observes that the PDO framework suggested above, would be crucial in enabling such service delivery models.

3.24 **Therefore, the Authority recommends that**

- a) **A new framework should be put in place for setting up of Public Data Offices (PDOs). Under this framework, PDOs in agreement with Public Data Office Aggregators (PDOAs), should be allowed to provide public Wi-Fi services. This will not only increase number of public hotspots but also make Internet service more affordable in the country.**

- b) **PDOAs may be allowed to provide public Wi-Fi services without obtaining any specific license for the purpose. However, they would be subject to specific registration requirements (prescribed by the DoT) which will include obligations to ensure that e-KYC, authentication and record-keeping requirements (for customers, devices and PDOs enlisted with the PDOAs) are fulfilled by the PDOAs. This will encourage village level entrepreneurship and provide strong employment opportunities, especially in rural areas.**

- c) Authentication through eKYC, eCAF and other electronic modes be allowed for the purposes of KYC obligations cast upon PDOAs. This would enable PDOAs to obtain eKYC information and automatically authenticate the user device based on parameters such as the device's MAC ID or through a mobile APP, which will store data required for authentication of the subscriber. This will further improve user experience.**
- d) PDOAs be allowed to enter into agreements with third party application/ service providers for the purposes of managing authentication and payment processes. Appropriate guidelines may be issued to ensure that customer consent is obtained, and other issues surrounding privacy and protection of sensitive personal information are addressed. This will encourage innovation in authentication and payment processes resulting in ease in access of the Wi-Fi services.**

Chapter - IV

Summary of Recommendations

- 1. The Department of Telecommunication (DoT) may amend the terms of the ISP license to allow for sharing of active infrastructure, in line with the Unified License (UL). Further, the Authority recommends that a clarification be provided in respect of all license categories, that sharing of infrastructure related to Wi-Fi equipment such as Wi-Fi router, Access point, and backhaul is also allowed. (Para 2.5)**

- 2. The DoT may re-visit the TRAI's earlier recommendations and consider de-licensing spectrum in the 5.725 - 5.825 GHz spectrum band for outdoor usage, and expedite decision on allocating E-band (71-76 GHz and 81-86 GHz) and V-band (57-64 GHz) to service providers. (Para 2.17)**

- 3. Subject to the DoT's agreement with the Authority's interpretation, the DoT issue a clarification in respect of Clause (1)(xxii) of the UL VNO Guidelines, specifically clarifying that there is no exclusivity requirement upon UL VNO licensees for Internet services i.e. a UL VNO can parent to multiple NSO for providing Internet service. (Para 2.22)**

- 4. Existing requirement of authentication through OTP for each instance of access may be done away with. Authentication through eKYC, eCAF and other electronic modes be allowed for the purposes of KYC obligations. In consultation with the security agencies, DoT may consider authentication by MAC**

ID of the device or through a mobile APP which stores eKYC data of the subscriber and automatically authenticate the subscriber. (Para 2.24)

- 5. The import duty applicable upon Wi-Fi access point equipment be revisited in coordination with the Ministry of Commerce. This will reduce cost of providing Wi-Fi service in the country leading to proliferation of broadband services. (Para 2.27)**
- 6. A new framework should be put in place for setting up of Public Data Offices (PDOs). Under this framework, PDOs in agreement with Public Data Office Aggregators (PDOAs), should be allowed to provide public Wi-Fi services. This will not only increase number of public hotspots but also make Internet service more affordable in the country. (Para 3.24 (a))**
- 7. PDOAs may be allowed to provide public Wi-Fi services without obtaining any specific license for the purpose. However, they would be subject to specific registration requirements (prescribed by the DoT) which will include obligations to ensure that e-KYC, authentication and record-keeping requirements (for customers, devices and PDOs enlisted with the PDOAs) are fulfilled by the PDOAs. This will encourage village level entrepreneurship and provide strong employment opportunities, especially in rural areas. (Para 3.24 (b))**
- 8. Authentication through eKYC, eCAF and other electronic modes be allowed for the purposes of KYC obligations cast upon PDOAs. This would enable PDOAs to obtain eKYC information and automatically authenticate the user device based on parameters such as the device's MAC ID or through a mobile APP, which will store data required for authentication**

**of the subscriber. This will further improve user experience.
(Para 3.24 (c))**

- 9. PDOAs be allowed to enter into agreements with third party application/ service providers for the purposes of managing authentication and payment processes. Appropriate guidelines may be issued to ensure that customer consent is obtained, and other issues surrounding privacy and protection of sensitive personal information are addressed. This will encourage innovation in authentication and payment processes resulting in ease in access of the Wi-Fi services.
(Para 3.24 (d))**

List of Acronyms

S. No.	Acronym	Description
1.	AAA	Authentication, Authorization and Accounting
2.	BB	Broadband
3.	CIF	Cost, Insurance and Freight
4.	eCAF	Electronic Customer Application Form
5.	eKYC	e-Know Your Customer
6.	GDP	Gross Domestic Product
7.	GSMA	GSM Association
8.	IEEE	Institute of Electrical and Electronics Engineers
9.	IIT	International Institute of Information Technology
10.	ISP	Internet Service Provider
11.	MAC ID	Media Access Control ID
12.	MWA	Microwave Access
13.	MWB	Microwave Backbone
14.	NOC	No Objection Certificate
15.	NSO	Network Service Operator
16.	OTP	One Time Password
17.	POP	Point of Presence
18.	PCO	Public Calling Office
19.	PDO	Public Data Office
20.	PDOA	Public Data Office Aggregator
21.	RoW	Right of Way
22.	SIM	Subscriber Identity Module
23.	SSID	Service Set Identifier
24.	TSP	Telecom Service Provider

25.	UASL	Unified Access Service License
26.	UL	Unified License
27.	UPI	Unified Payment Interface
28.	VNO	Virtual Network Operator
29.	WBA	Wireless Broadband Alliance
30.	WLAN	Wireless Local Area Network
31.	Wi-Fi	Wireless Fidelity
32.	WRIX	Wireless Roaming Intermediary Exchange