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WITHOUT PREJUDICE
By HAND/E-mail

To
Telecom Regulatory Authority of India,
Mahanagar Doorsanchar Bhawan,
Jawaharlal Nehru Marg,
NEW DELHI # 110002

Kind Attention : Shri Arvind Kumar, Advisor (Broadband & Policy Analysis)

Subject : Comments on Consultation Paper on Proliferation of Broadband through Public Wi-Fi Networks.

Dear Sir,

We write to you, in response to the Consultation Paper No.14/2016 Dated 13th July, 2016 on “**Proliferation of Broadband through Public Wi-Fi Networks**”. We have examined in detail the Consultation Paper (CP) and would like to congratulate Telecom Regulatory Authority of India (TRAI) for publishing such a comprehensive Consultation Paper which will have positive impact on the industry.

As a matter of back ground, Ortel Communications Ltd, is pioneer in providing convergence communication services in the country. It has always been Company’s vision to provide Cable TV, Data services and Internet Telephony on a single cable to the households. The Company has laid its own network with reverse path compatibility to provide triple play services. Ortel provides connection to customers directly and has control over the last mile.

We understand that, the primary purpose for which Telecom Regulatory Authority of India (TRAI) has floated this Consultation Paper is to examine the need of encouraging public Wi-Fi networks in the country from public policy point of view & discuss the issues in its proliferation and find out solutions.

Our response to all the issues raised in the CP is given in Annexure – I.

Thanking you,

Yours faithfully,
For **ORTEL Communications Limited,**

Sd/-

Col. M. M. PATTNAIK
Chief Technology Officer

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

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

Ans I: The Wi-Fi technology is typically deployed within unlicensed spectrum over 2.4 and 5 GHz frequency bands. Based on the recommendation of TRAI in 2004 and 2007, only frequency band from 2.4GHz to 2.4835 GHz and 5.825 GHz to 5.875GHz have been earmarked as unlicensed band for the purpose of Wi-Fi. However, the other frequencies as recommended by TRAI are yet to be delicensed. These frequencies are 5.150GHz to 5.350GHz and 5.725 GHz to 5.825GHz. In order to give more impetus to the subscribers requirement and to use broadband through Wi-Fi architecture it is necessary that these frequencies are delicensed. In addition to this Ortel would recommend for the intervention of Regulatory in the following aspects :-

- a. **Equipment Interoperability** Presently interoperability is not possible due to the different chipset, OFDM algorithm and different spectrum algorithm to maintain better communication in noise free environment. There should be a common specification to be drawn so that at least the CPE and Access Points can work with other manufacturers controller and vice versa.
- b. **Controller Equipment** Different manufacturers use different algorithm in the controller equipment and hence presently it is not possible to have one common software for all types of manufacturers equipment to work together and to access seamlessly by the subscriber. Therefore presently it would require to draw a seamless specification to make all manufacturers equipment to work together.
- c. **Access Point(AP)** In order to optimise the spectrum uses by all APs, a common specification to be drawn for the size, modulation profile, MIMO technology, 802.11 standard so as to accommodate ac,a,n and all other related standards.
- d. **Security Standard** One of the vulnerable aspect in wireless is security. Since the signal is open to all, there must be stringent security standard be laid by the regulatory to make the APs and CPE work together without jeopardizing the security. In addition to this all service providers are to adopt the security standard on the software to be used for login to the network and the restriction laid by DOT on the software uses.
- e. **Power Output of APs** More specific standard be ;laid on the power output with the modulation and multiplexing used.

The AP network and wireless data communication technology play a very significant role for seamless and easy penetration of broadband and its roll out.

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?

Ans 2: Though one should use liberal method in providing the license to anyone who wants to deploy Wi-Fi, but while issuing the license the following aspects to be kept in mind so that country's security is not at stake :

- a. **Espionage and Terrorism Activities** Continuous monitoring of the traffic to avoid any such of jeopardizing activities. Customers detail and his each and every minute of activities in using the internet bandwidth.
- b. **Maintenance of Customer Usage Data** Each service provider should maintain the IP usage database for future query as per laid down procedure.
- c. **Infrastructure Sharing** Building separate network by licensees in the same geographical area duplicates investment in the same asset, thereby making a national loss. Therefore infrastructure sharing is paramount importance similar to TSP tower sharing.
- d. **Restrictions in Issuing Licenses** Ortel is of the opinion that the Wi-Fi should be allowed to be deployed by only TSPs / ISPs to ensure cyber security.
- e. **Commercial Viability** Public Wi-Fi internet services may have to be offered free of cost in future due to which, the commercial viability will not be a reality in the near future for the service provider. Hence the license should be restricted to TSPs and ISPs.

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

Ans 3: As discussed above in Question No I, interoperability between different manufacturers equipment, would enable for the subscriber to access seamlessly in any network with common user id and password. The following are recommended for interoperability :

- a. **Chipset Manufacturer** Different manufacturer should be asked to develop versatile chipset, which can be changed to adapt different manufacturer algorithm to work together.
- b. **OFDM Algorithm** Different algorithm and multiplexing technologies were used to adopt spectrum efficient and cheap technology. The original 802.11 standard supported 1 or 2 Mbps transmission in the 2.4 GHz band using either frequency hopping spread spectrum (FHSS) or direct sequence spread spectrum (DSSS). It was followed by the adoption of the IEEE 802.11b standard, which operates on 2.4 GHz using DSSS and then the IEEE 802.11a standard, which operates on the 5GHz band and offers data speeds of up to 54 Mbps using an orthogonal frequency division multiplexing (OFDM) encoding scheme. These standards were however not inter-operable with each other. The adoption of 801.11ac and 802.11n technology have enhanced the bandwidth, data rate as high as 3Gbps using MIMO with 8 channels. OFDM technology is used to immune from interference and noise suppression. However, it is not feasible for interoperability.

Due to technology limitation, interoperability may not be possible at equipment level. This would be possible at software level. Software sits on top of the equipment and make the subscriber to work seamless.

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

Ans 4: Achieving interoperability between wireless LANs and cellular networks is a very challenging task. Here we briefly discuss some of the major issues involved in achieving interoperability.

a. When to Switch?

The manner in which a mobile device dynamically switches between the multiple network interfaces available to it greatly influences the performance and resource consumption of the system. User Profile based switching is as a possible solution. This would involve, a mobile station (MS) often finds itself in the coverage of multiple networks at the same time for example, that of a cellular network and that of a Wi-Fi hotspot. The MS can choose to connect to any of the available networks. The behavior of the MS is driven by its resource requirements and user interests. For example, an MS engaged in a multimedia transmission will have different requirements from one which is just downloading email from a server. We associate each MS with a user profile that reflects its requirements. This user profile in turn determines how the MS chooses the cellular BS or Wi-Fi AP it connects to. The following are three basic user profiles a mobile station may possess.

- (i) **Bandwidth Conscious User Profile:** The MSs with a Bandwidth Conscious user profile will choose to connect to the BS or Wi-Fi AP which offers the maximum bandwidth.
- (ii) **Cost Conscious User Profile** An MS with a Cost Conscious user profile always chooses to connect to the network with the lowest transmission cost per byte.
- (iii) **Glitch Conscious User Profile:** A Glitch Conscious MS has glitch free connectivity as its priority. We define a glitch as an interruption in the transmission or connectivity which occurs when an MS moves from one network to another. Thus an MS with this user profile tries to minimize the number of hand-offs it undergoes between different networks to achieve the smoothest possible transmission. This is done by remaining connected with the cellular network, which has a larger coverage area, at all possible times. An MS engaged in a voice call may use this profile.

b. Smooth Handoffs

Maintaining existing network connections while switching between different network interfaces is a difficult task. Smooth handoffs involve issues of diverse addressing schemes, different packet formats and sizes, and packet sequencing across multiple networks.

c. Billing and Revenue Sharing

The presence of multiple service providers makes billing and revenue sharing very challenging tasks. It is essential that the schemes are so designed that the commercial viability of all service providers is guaranteed.

d. Security and Authentication

A mobile device can connect to multiple networks at the same time. Authentication of the users and security of data transmitted across diverse networks is to be carried out as per weighted average and best network selection.

e. Load Balancing

Load balancing between different network architectures requires new metrics to ascertain the load and novel schemes to shift a section of users to a different network, whenever needed.

f. **Implementation**

Implementation of interoperability requires changes in both the network protocols as well as in the protocol stacks of the mobile devices. Maintaining compatibility with the existing systems and protocols while incorporating interoperability is very important.

In view of the above it would be possible to work in interoperability environment between the cellular network and Wi-Fi network either nationally or internationally.

The BSs are placed such that the entire terrain is covered, while the Wi-Fi APs are assumed to be randomly distributed throughout the metropolitan area. The Wi-Fi hotspots are considered as multi-hop relaying environments similar to the Multi-hop Cellular Networks. The Wi-Fi AP acts as the coordinator for enabling routing and reserving bandwidth for MSs in the hotspot. Wi-Fi APs with multi-hop relaying is an attractive option in WLANs as it can extend the coverage of a high bandwidth AP to a much larger area. As is evident from the system architecture, each MS has the option of operating either under the control of the BS or under the control of the Wi-Fi AP.

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.

Ans 5: Yes, USA have gone in for more spectrum in the frequency band of 5 GHz to 6 GHz with channel spacing of 160MHz. This change is mainly to cover wider data rate as high as 3Gbps in the 802.11ac.

More precisely, Wi-Fi's 5GHz band currently stretches from 5.150 to 5.825, with a gap in the middle. The FCC plan would add two new bands, ultimately giving Wi-Fi a contiguous block from 5.150 to 5.925. This will be particularly useful to devices using 802.11ac as opposed to the last-generation 802.11n standard. 802.11ac can use channels of up to 160MHz wide, and having a larger contiguous band as proposed by the FCC would allow more and wider channels and thus more capacity.

Hence, in India we also should look to work in 802.11ac in the entire spectrum of 5GHz to 6GHz.

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?

Ans6: There are many methods available in the market for authentication and logging in to the network. However, most of them are standalone method. Mostly used methods are Log2 Space and Inventum method using AAA authentication. The salient aspects on logging in and authentication process used by Ortel is as under :

a. **To Accommodate Centralized Database** Ortel uses its network as a converged network with last mile concept. It has a centralized customer database. One unique number is provided to one customer for his various services opted by him. A common billing system is used for all types of services provided in the network. Thus the software used for Wi-Fi should be able to use the same customer database, billing system and provisioning system. Keeping this in view, Ortel uses Inventum AAA authentication using Unified Gateway. The user login and authentication is managed through unified gateway system.

- b. **Log in and authentication** Customers who are already using fixed line DOCSIS 3.0 broadband, can also use the facility of Wi-Fi by using the same user name and password. This facility is applicable in all the six states where Ortel is operating.
- c. **OTP Facility** New customers who are not the user of Ortel, is provided with the OTP facility by registering their mobile number in the Wi-Fi network. These customers subsequently be converted Ortel customers if they desire. The OTP facility is also used to provide free internet to customers for 30 minutes.
- d. **Coupon System** Foreign or other customers who are willing to use the Wi-Fi facility they can buy coupon from the nearest counter and use the authentication facility enumerated in the coupon.
- e. **Payment Gateway** Unified Gateway has the facility to integrate the payment gateway used by Ortel for its Digital TV and Broadband customers. It is the same gateway which has been integrated in the unified gateway. This payment gateway also would help foreigners to use the Ortel Wi-Fi network.

Ortel has not tried seamless access in different service provider Wi-Fi network. This is yet to be implemented.

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.

Ans 7: Ortel has not faced any challenges in integrating payment gateway and coupon method as enumerated above. Both these methods are providing frictionless and secured payment for the access of Wi-Fi

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?

Ans 8: Yes, there is a need to adopt hub-based model along the lines suggested by the WBA. The salient points are as under:

- a. This concept is more suitable for very large Wi-Fi network in which large number of APs are deployed for accommodating 1 million customers.
- b. By signing a unilateral interconnect agreement with a Wi-Fi roaming hub, a service provider may enable its users to access multiple approved public Wi-Fi hotspots. This approach is beneficial to Wi-Fi service providers as an alternative to signing multiple bilateral agreements (the method traditionally used for cellular services). AT&T, BT, China Mobile, Deutsche Telekom and others have developed or are currently developing Wi-Fi roaming hubs, many of which run on platforms from the likes of BSG Wireless, Syniverse or Accuris Networks.
- c. Hubs need to be capable of supporting different types of traffic and devices.

- d. Users expect a consistent Quality of Experience (QoE) when using VoWi-Fi, irrespective of their location. Providing a good voice QoE is especially important when supporting high-value customers.
- e. However, not all Wi-Fi roaming hubs are capable of delivering and managing inter-carrier SIP signaling, which is used to provide a consistent QoE for VoWi-Fi.
- f. When seeking a Wi-Fi roaming hub partner, a Wi-Fi hotspot service provider should evaluate whether the platform used by the hub provider can distinguish VoWi-Fi traffic.
- g. There are also challenges involved in providing a wide range of services from a single platform. In most cases roaming hub providers use multiple platforms to support cellular (2G/3G/LTE) and Wi-Fi roaming traffic. In order to maximise their revenue and minimise apex, therefore, they are likely to be interested in an approach that only requires a single platform to support cellular and Wi-Fi traffic, and is capable of authenticating Wi-Fi only devices, promoting Pass point, etc. However, it does not appear straightforward to develop such a platform. For example, BT in UK first announced its plans to support cellular and Wi-Fi data on a single platform in mid-2014, but has not yet completed the project. It is our understanding that BT's platform will be able to distinguish VoWi-Fi and apply security policies to web traffic, which should be attractive to Wi-Fi network operators.

Ortel is of the opinion that, HUB concept can be implemented subject to large volume deployment and need to work seamless between different service provider.

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.

Ans 9: As mentioned above, any of the three companies, BSG Wireless, Syniverse or Accuris Networks would be willing to implement single point payment collection method to maximise the revenue. However, integrating 3g/4g/LTE with Wi-Fi is a challenge, and hence most of Hub provider only would like to provide the payment integration for Wi-Fi only.

Q10. Is it feasible to have an architecture wherein a common grid can be created through which any small entity can become a data service provider and able to share its available data to any consumer or user?

Ans 10: As mentioned above at Ans 8 to Question No 8, yes the Hub concept is most suitable to work in a common grid, where a seamless integration is done at all service provider level. Any small entity can be part to the grid and share the network for its customers.

Q11. What regulatory/licensing measures are required to develop such architecture? Is this a right time to allow such reselling of data to ensure affordable data tariff to public, ensure ubiquitous presence of Wi-Fi Network and allow innovation in the market?

Ans II : While developing such architecture, following regulatory and licensing measures are required:-

- a. Reselling of data by small operators may jeopardize the security of the nation. Since this would work either in NAT or SNAT principle to keep a track of security is most difficult.
- b. Only TSPs and ISPs should be allowed to lay Wi-Fi network so that he is answerable for all regulatory requirement.

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

Ans I2: Data center hosting is primarily done through a cloud or managed data center service provider. The data and applications are migrated from the existing data center to the hosted data Center. The service provider is responsible for providing power and the basic operational environment to the data Centre facility. For each data center hosting client, the service provider can allocate entirely separate data center resources or use a shared infrastructure. The client can access the data center and all resources from the Internet or through a secure network connection.

Ortel is of opinion that data center hosting be given to only TSPs and ISPs who can well manage the data center and give facility to client to manage their data center.

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

AnsI3: NA