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

Yes, there are various factors hampering the growth of Wi-Fi services in the country. For example, there is not enough clarity on whether Wi-Fi hotspots can be operated in ways similar to Cyber Café where the café owner can charge for internet usage. Today, only ISPs may be able to operate in payment mode. If small entrepreneurs are explicitly allowed to sell data plans within their physical premises, then they can set up smaller Wi-Fi hotspots and earn livelihood while it contributes towards the growth of public Wi-Fi services in the country. Needless to mention that such Wi-Fi hotspots must comply to standards set by the regulator.

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?

There are three key ways in which proliferation of Wi-Fi networks can be increased:

1. Allowing seamless log in process into Wi-Fi networks by one time phone +SMS based authentication – similar to mobile Apps like Uber and WhatsApp. Most cloud based AAA can carry out MAC id based authentications for subsequent logins and hence making it a seamless process from second login onwards.
2. Allowing small entrepreneurs to manage shop level networks as long as they comply with basic KYC requirements for end users which can be enabled through captive portal based routers.
3. Creating up mechanism of inter-operability amongst different operators similar to roaming mechanism amongst telecom players.

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

The interoperability can be introduced by either mandating or incentivising the players. For example – Banking ATM networks. Clear guidelines on pricing amongst various parties and asking networks to publish open APIs can boost such efforts.

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

While technically, interoperability is feasible, KYC related and other regulatory norms are hindrance today. These can be relaxed which allows for seamless shift from cellular to Wi-Fi networks.

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.

At this point of time, there are enough low hanging fruits which can be harvested to expedite the penetration. We do not have any specific recommendation related to de-licensing of additional bands.

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?

Domestic users: One time phone based (OTP authentication) should be done. Post this the user should be allowed to create a username password combination which can be used in future for network access. This will allow seamless entry in case the user chooses for remembering username password

option. Alternatively, MAC id based authentication can be allowed post one time OTP authentication. In this case, the user will get seamless entry without need for any intervention. This can be path breaking for seamless shift between cellular and Wi-Fi networks.

Foreign tourists can be allowed one time registrations using their passport/ other national ID. This shall entail a registration form with such details, uploading image of their document and credit card details. Such registrations would be temporary and for limited and shorter time periods only.

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.

Yes. Since the consumption of Wi-Fi is for limited time period at a particular point of time, users are not willing to buy data packs. However, users may be interested in buying a *'pass'* which can be used repeatedly over time at the network till the time purchased data has been consumed. The pass may have time validity like a month or a quarter but not lesser than this.

Second issue is how to create the payment process without giving internet access. Most payment gateways talk to various bank platforms and hence would require internet access. This limits users who do not have any data connectivity through cellular network and want to use Wi-Fi as the only channel to use data. This problem can be solved in two ways – allowing access for a small time to users for the purpose of payment only or creating a dedicated payment channel for Wi-Fi networks which is whitelisted at all networks.

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?

No, a central third party AAA will become a hurdle for creativity and product innovation. The future of networking infrastructure is by creating Software Defined Networks. This means that more and more user policies and product features will be deployed on Cloud. In fact, a lot of product innovation across the world has happened due to cloud computing and constraining it may not be desirable.

A central AAA can become inflexible and would not be able to move at the same pace at which the Wi-Fi network companies may want to operate.

AAA should not be seen as a clearing mechanism but a key component of product innovation. Today also, many AAA are able to communicate with Property Management Systems in case of hotels using standard APIs. Similarly, different AAA across network providers can interact with each other and serve the same purpose as a centralised AAA. This will balance product innovation and scalability.

Rather, the mechanism must have a federated authentication and device management services, but, with some interoperability standards among them without having any central switch/platform. The technical feasibility of such solution is very high.

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.

We are against a central hub since it will slow down the much needed innovation required to grow Wi-Fi networks in the country. Having said that there can still be central clearing mechanism with a footprint of data left in each account of each user. Each time user connects with any of the network,

his account details are imprinted in the central server. Networks may have different rates which can be highlighted before the consumption.

The other and better way would be to operate like roaming feature at telecoms where the user buys pass from a particular network but is allowed roaming at other networks. The re-conciliation of payments can happen at the backend between the operators. In such cases, APIs between operators would pass on only data as the entry and not the amount left. (*Please see a proposed architecture at the end of this document*).

Alternatively, the prices can be regulated at the same rate across networks. However, this brings practical issues for far off places where the cost of providing services may be high. It also kills the creativity in terms of product pricing and features.

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?

Yes, a federal structure with a backend central server can solve this problem. An entity can become a distributor of service for larger players (like pre-paid voucher distributors). Each network registers its own customers, but the customers can roam on other networks also. The back end server has the data footprint of each use so that every time a user enters different network, the new network knows how much data is shared. (*Please see a proposed architecture at the end of this document*).

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?

India is left behind in setting up hotspots in the country. It is, therefore, important to allow innovation so that we gain the lost ground. Hence the reselling of data should be allowed not only by commercial establishments but also by individuals at homes. So if an individual wants to share his broadband with his neighbour, he should be allowed to charge. This can work in in ways similar to car-pooling.

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

This, at most, is a temporary solution. Over time, the cost of data transmission would go down and hence creating local servers may neither be cost effective nor customer centric. Customers would like to all kind of access instead of being limited by data storage at local servers. Globally local level servers have been able to meet limited needs. These can be used for some specific content consumption needs like public utilities, awareness and education.

Q13. Any other issue related to the matter of Consultation

To enable inter-operability amongst various Wi-Fi hotspot providers, regulator will need to define the following:

- Standardize authentication process (e.g. – each user needs to identified uniquely. Some WiFi operators authenticate using user id/password while some leverage Phone Number/SMS. We recommend Phone number and MAC Id to be the unique key for each individual)

- Measurement unit of data (There is ambiguity in terms of how data should be measured. E.g. – Does 1 MB mean 1000 KB or 1024 KB? Though the difference looks small, it is amplified when the data units become larger)
- How to account for any data overheads? (E.g. – AAA solution will consume some bandwidth and needs to be judiciously allocated across users)
- What should be the rate (unit cost) at which Wi-Fi hotspot operators exchange data with each other?
- Effective mechanism for end of day cash settlement amongst various players

A sample architecture is provided below which can deliver inter-operability amongst operators without limiting innovation and ability of small entrepreneurs to create more value for the end consumer. This is based on the principle of a federated centralised structure which allows for a standardised and uniform way of data accounting on a single platform while having flexibility on payment options across network providers.

Proposed Backend Architecture