Dear TRAI Team,

At the outset, let me complement you all for the thought leadership in extending WiFi as a "employment / small business" opportunity, more so for the rural areas.

My observations to "Issues for Consultation" are followed by generic comments/clarifications. Will appreciate if someone can respond back, especially about reference / source of Table 2.3.

Q1. - Q4

No comments

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.

Free spectrum (TV White-Space) in unlicensed band can be a big enabler for rural deployments - especially if line of sight communications to the Hot-Spot can be done, along with solar power etc.

If mobile devices can support such bands (omni-directional) - that may accelerate the adoption, but cause additional noise and interference, thus degrading deployment quality.

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?

For bottom of the pyramid, current deployment options are too costly. If open source implementations that are certified for field use as made available, it will open up the eco-system. Lots of employment opportunities can be created with service models catered to bottom of pyramid. Crudely speaking, as an analogy, it can be the difference between car servicing and bike servicing (and by that virtue car ownership vs. bike ownership).

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.

Despite increase in ATM and similar features, rural people are unsure of electronic payments. Further it's a security risk is the ecosystem is not fully audited.

It will be good to have options of pay by cash - similar to recharge vouchers. Instead of physical recharge, electronic recharge can be done by the agents, with a small commission.

Optional: To encourage pre-paid aspects, users can be incentivized to sign up for higher plan with an option to get a refund on unused portions (after deduction of processing fees etc.).

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?

Hub model operated by third party will need to be cost optimum for the amounts involved. While economy of scale may drive it down for urban setups, it may not be effective in rural setup.

If there are options for users to get a refund after deduction of processing fees etc. or to carry over a part of unused service to next month, it will be a good option.

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.

It should be an independent party under regulations - similar to number portability. It is important

that the processing charge for UPI is kept very low (below 1%). Probably more than one organization can be allowed in this space to encourage competition. PayTM, MobiQwik et. al. already have such platforms and may be willing to do it for free (with ability to cross-sell / advertisements ..).

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. But with some concerns which are an evolution of how present cyber-cafes work.
- the audit/compliance on operational aspects can be a big issue.
- hackers and people with burner phones can cause additional security issues in such scenario.
- police and law/order can control large ISPs. How do we control many small ISPs on the grid? Even if backbone is disconnected, they may have enough local communication.

Self-certification is an option, but will the operators be aware of all the security implications? E.g. even today the Cyber-Cafe do not keep adequate track of their users.

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?

To the extent possible we should open up the Cyber-Cafe and similar centers to move into this space. Too much regulation will discourage adoption.
Instead they should be provided with tools and policy guidelines. Further independent third party can be created to audit and certify / rate them (similar to emission checks in metros). The auditors can be trained in institutes like ITI or Polytechnic.

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 will be an application / use-case specific solution. Similar to content distribution network, a paradigm can be proposed to host "femto app server" or "femto portals" or "femto bots". A "**femto data center**" at each gram panchayat using modular platform can be a huge enabler. Redundant setup with fault tolerance and efficient power usage will be mandatory. Hardware should not require air conditioning.
Existing hardware can be adapted for such needs. E.g. in next 12 -24 months USB-3 power cell phones (or net-books or projects like Google- ATAP's Ara) with USB-3 based storage arrays can be used.
Target for Femto / Nano data center may be to have 2-10 TB redundant storage and 16-64 core compute at 2 GHz per core or similar at a cost of below Rs. 40,000/-. Virtualization, LXC / Docker etc. can be used to isolate the different femto-apps.
In some cases femto-apps may just be a gateway to internet based apps. In other cases they may only be serving local community - e.g. milk collection service; tractor booking service etc. Operational expense for femto-data center should be recovered from the owners / users of these femto apps.

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

Distributed vs. Centralized ownership of Hot Spots:

While lot of large enterprises (Facebook / Google / Reliance and others) are willing to offer services

almost for free, we need to look at alternate options such that dependencies on large enterprises do not make them monopolies.

On the contrary side, network security and policies around security are growing cause of concern today. Further law enforcement people want the ability to *control* and *track* flow of data. This has a tendency to push for large enterprise focused solutions which concentrates the employment, revenue and control to a small set of organizations.

It is important to understand that even with centralized approach, a rogue entity will figure out alternate means (tor / vpn / hacking ..) to defeat the systems. Further a compromise on large system during cyber-war will have much more impact than a compromise on some of the distributed systems.

As a frame-work, TRAI should encourage distributed modular deployments such that the operational costs are low. Tools, policies and training can be given to provide an environment where small organizations make money and provide employment to local youth rather than to people sitting in remote data centers. Given the economy of scale and the cost points that will exist in next year or so, next two three years offer the right opportunity to develop and deploy nano-data centers.

Review comments that you may include – goes beyond the questions posed.
General Comment 1: Kindly ensure that the goal of "There could be small entrepreneurs or even a very small entity which would like to participate in common and shared Wi-Fi network for larger public use. [sec. 1.9]" does not get reduced in scope.

General Comment 2: The CP has two goals which are a bit divergent. Rural penetration and use cases for bottom of the pyramid vs. mobile urban users like tourists who have much higher aspirations. Trying a single solution for both may be a mistake. This is on account of operational expenses associated with remote rural areas where skilled manpower may not be affordable.

Section 2.2 - We should mandate only 8 - 10 years of backward compatibility. Longer periods can be optional.

Section 2.13 - While for initial capex, research and experimentation mesh topologies are great, please keep in mind that at present, the operational costs for such systems are very high (if decent quality is desired - e.g. real time communication).

Table 2.3 - what is the source for this list?
Many new use cases can be enabled, some of which need not be revenue based, but focus on societal impact - e.g.

- Why should photo's of bad roads be uploaded to PMO for local roads - why not enable it at gram panchayat / mandal / block level.
- Minutes of decisions at local community can be stored and shared to bring further transparency and accountability.
- Panchayat level quick survey / voting ….

Section 2.22 - Costing is for enterprise grade. Kindly add a note that deployments for rural / small enterprises may be at a drastically lower cost.

Section 3.24 - "Reselling" data services should be opened up, especially for small and medium enterprises. Remember that even if we block them from making a monetary transaction, through advertisements etc. they can still make money. So why not allow it more transparently.

Section 3.24 - Centralized implementation may have operational cost related issues. While it looks like a good choice, "centralized implementation" should NOT be mandatory.

Section 3.25 - Other than Make-in-India efforts on hardware, projects like DD-WRT or OpenWRT can be adapted for off the shelf consumer access points (in range of Rs 1000 or lower). In fact CyanogenMod or similar distribution can be adapted to provide affordable 3G/4G to wifi hotspot functionality by recycling old mobile devices at lower cost points.

--
Warm Regards
Abhishek Thakur, CSIS Dept., BITS Pilani, Hyd campus