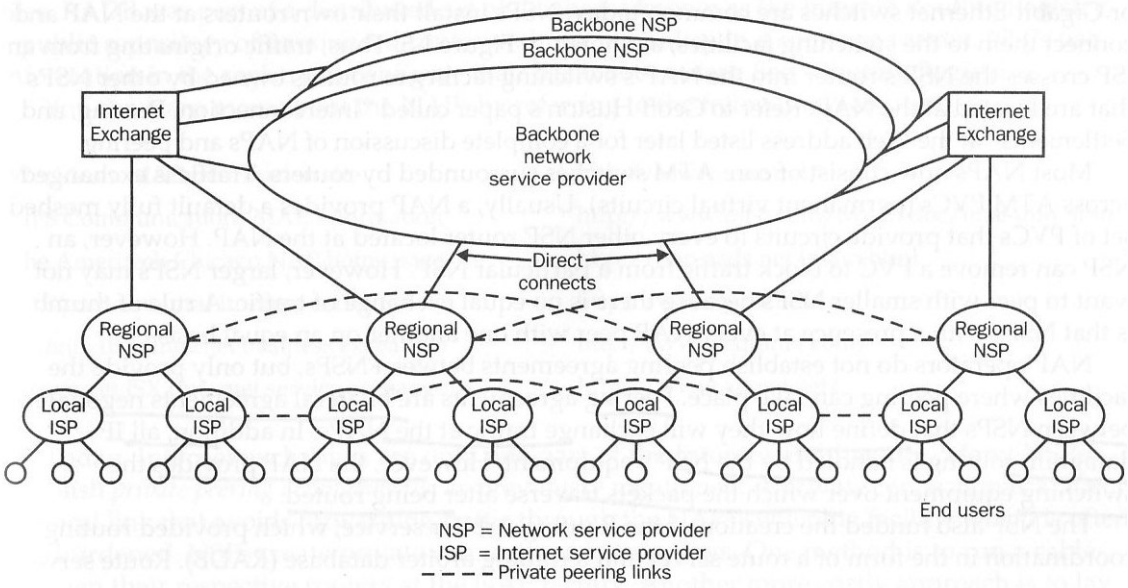
General comments on Issues brought out for Consultation in Authority's Consultation Paper on 'Telecommunications Infrastructure', by RRN Prasad Former Member TRAI/Telecom Commission.

A. Internet Exchange Point

1. With the imminent introduction of IP based 3G networks in the country, there will be a surge in real time IP traffic. Since a large volume of VOIP calls as well as video calls are likely to be carried on the public internet, there is a strong justification for introducing a hierarchy in the public internet, so that the number of hops involved in the transport of such calls is dramatically reduced. Both voice and video traffic is highly sensitive to latency and jitter, which can affect the QOS of these services very adversely. Therefore, there is an urgent need to set up more internet exchanges so as to introduce a hierarchy based routing of internet calls, somewhat similar to what is applicable to voice calls in the classical PSTN network.

2. For example, our country's National Long Distance (NLI) network has two levels, i.e., level I and level II. The country is divided into 324 switching areas out of these 24 have level trunk automatic exchanges located at state capitals servicing a primary switching area, which is roughly coterminous with the state boundary. Below these level I exchanges, there are 300 level II Trunk Automatic Exchanges (TAXs), located in Secondary in Switching Areas (SSAs) whose boundaries are roughly co-terminus with that of the revenue district. There is yet another level of switching called tertiary switch, which serves a local area or a tehsil through a tandem exchange. The telecom calls follow a strict routing discipline of first trying a high usage route, which are direct routes between two destinations, having a large community of interest, generating traffic in erlangs in excess of a threshold typically 30 erlangs. These high usage routes short circuit the hierarchy. In case all circuits on high usage routes are busy, the call overflows through the hierarchy, i.e., through the next higher level of switching of the area. This routing discipline which connects thousands of destinations within the country by a combination of mesh and star architecture provides an optimal solution with least cost routing, thus saving on both transmission bandwidth cost and switching costs.

3. There is a strong case for the internet which does not follow any hierarchy to adopt to some extent the routing and hierarchical topology of the public switched telephone networks which has evolved over last 100 years, and is based on a number of scholastic mathematical models to justify its architecture. The Internet which has evolved from its predecessor research network called the NSFNET (National Science Foundation network), had a hierarchy consisting of local service providers connected to the next level called regional service providers, who in turn were connected to the national service provider. Even after commercialization of the NSFNET, there are local ISPs, regional NSPs which in turn are connected through national backbones provided by backbone network providers as shown in the following diagram. It will be seen that there is a hierarchy in the internet in USA.



4. In view of the above, immediate steps are required to be taken to upgrade the seven NIXIs by installing suitable switching facilities capable of connecting access links which will carry broadband traffic with real time service capability. In addition to the seven locations, another seventeen locations where primary switching centres of PSTNs are located, should also be designated as Level I national internet exchange locations. Immediate steps should be taken to install internet exchanges with switches, routers servers etc. to provide facilities similar to what is available in the Network Access Points (or NAPs) in the US, which are at the highest levels in the internet hierarchy of USA. Below the NAPs even in US, we have Regional NSPs (Network Service Provide) and below the Regional NSPs, we have the local ISP (Internet Service Provider).

5. To start with in India, we need only two levels, Level I and Level II. ISP licenses will have to be modified on the lines of the PSTN licenses so that they are mandated to connect their load to the internet exchange within their switching area. The government should form a high level working group consisting of members from TRAI, TEC, ISPAI, AUSPI, COAI and other stakeholders as well as from IITs, IT industry etc. so that the details of setting up of a national internet topology, consisting of two levels of NIXIs and their interconnection, to follow a routing discipline and the needed routing protocols are worked out.

B. In-Building Solutions / Distributed Antenna Systems

1. Sharing of telecom towers should be encouraged to drastically reduce the number of such towers in the country. Even some financial incentives can be given to the operators who utilize the passive infrastructure of IP1 to install their base stations. By 2015, almost a million base stations will be required to cater for one billion plus subscriber base. Recently Mr Milind Deora, Lok Sabha MP, has brought out into public domain an important health relating to electromagnetic radiation from base stations. Although non-ionized radiations from microwave emitted by telecom base stations have been

considered safe due to their extremely low power density that does not cause any thermal effect on human cells as long as the exposure are within the limits prescribed by the International Commission for Non-Ionising Radiation Protection (ICNIRP) in its guidelines, based on studies conducted in 1990s. However it should be noted that ICNIRP guidelines are based on short term immediate health effects, such as stimulation of peripheral nerves and muscles and harm caused by tissue temperature that is mostly thermal effects. Subsequent to the publication of ICNIRP guidelines a number of studies have brought out the inadequacies of the existing guidelines. The bio-initiative report 2009 in which a number of adverse biological effects of electromagnetic radiation at very low levels have been highlighted.

2. A number of countries, including European Union, have decided to adopt a precautionary approach and have fixed much lower limits than the ICNIRP guidelines. Since the effect of exposure from multiple base stations have not yet been studied, there is a strong case for our country to adopt such an approach, particularly in view of the 3G and broadband access systems which will be inducted in our network in large numbers in the near future. Taking note of these inputs and their own studies in the Indian context, a Inter-Ministerial Group set up by government has also recommended reduction of radiation from telecom towers to one tenth of the present level.

3. With one millions base stations by 2015, the country will have an enormous electromagnetic smog, particularly in urban areas. Some policy & regulatory measures can mitigate the problem to some extent. One is to prescribe the maximum emitted power for various systems in the license and to actually measure the same for compliance, during acceptance testing. Another could be mandating indoor coverage for all commercial & office buildings, particularly for third generation systems. It is estimated that 80% of the 3G multimedia (data/video) traffic will originate or terminate indoor, in big urban centres like malls, schools, offices and other public places. To provide in-building coverage, outdoor base stations have to dramatically increase their power level, i.e., radiation contributing to the electromagnetic smog. In case dedicated indoors cells are provided, their radiation level will come down considerably. Studies have indicated up to 400% increase in system capacity by deployment of indoor, Pico/microcells and outdoor macrocells, which will make the environment safer, due to reduction in electromagnetic radiation levels. All measures should be taken to encourage deployment of innovative technologies, such as distributed antenna system, which cannot only reduce number of towers, but also reduce the level of electromagnetic radiation in the atmosphere. Last but not the least is to give financial incentive to operators who deploy lower power density systems which are environment friendly, and provide green solutions, such as reduction in revenue share percentage.

C. Mobile Virtual Network Operators (MVNOs)

1. In a real world, calling an entity ‘virtual’ is a bit confusing and should be avoided. It may be difficult to precisely define a Virtual Operator. In absence of a precise definition, the MVNOs can enter the telecom market by proxy. It will also lead to spectrum trading about which a policy decision should be taken.

2. In this context, it will be interesting to note in this context that in many countries such as UK, there is a clear distinction between Network Operators and Service Providers. When the UK mobile market was opened up about two decades back, the growth of the mobile services were rather slow and only two mobile operators namely Cellnet and Vodafone entered the market. To spur the growth of mobile services presently called as Value Added Services (VAS), the UK government had created an additional tier of competition in the market structure by creating another category of Service Providers who were really providing Value Added Services to the customers. In fact initially there was a prohibition of direct sales by Cellnet and Vodafone to the consumers and they were required to provide services only through so-called Service Providers where in fact airtime resellers. These resellers, i.e., retailers of services providing a powerful Sales & Marketing force injecting entrepreneur skills to the market which was lacking with the network operators who behave like traditional public telecom operators without having innovative and marketing skills. In no time, there were about 40 (forty) approved Service Providers in the UK who contribute greatly to the subsequent high growth rate of UK cellular market in 1990s.

3. This model of having a clear differentiation between pure network operators and service providers has been following by a large number of European countries. The European Regulators, i.e., European Commission, has fully supported this distinction. It has also been adopted by some Asian countries such as Singapore, where there is a distinction between the so called Facility Based Operators (FBOs) and non-Facility Based operators or Service Providers. The former are the whole-sellers of airtime and the latter are the retailers who sell airtime to the customers and provide a number of innovative services to them.

4. Such a policy initiative is quite relevant in the context of Third Generation (3G) mobile services which provide a very rich value chain by a packet switch technology providing direct mobile access to the internet. 3G networks like the Universal Mobile Public Telecommunications System (UMPTS) are basically data communication networks which are designed to provide to a large number of Content and Application services. Building of value chain in Broadband wireless services such as UMPTS and providing competition in all the segments of value chain will also be in accordance with the Broad Band policy initiatives of the government. In a number of countries the regulatory authorities rightly view 3G Broad Band wireless technology capable of bringing wider benefits to the community and economy by stimulating the structures capable of providing Content & Application services.

5. The convergence bill which is still pending clearance by the parliament also takes a view of separately licensing Content & Application services. Therefore, this is right time to take necessary policy decision to segment the Mobile Telecom sector into separate compartments such as Network Services and or Pure Network operations and Value Added Services (VAS), which should include particularly Application services and Content Services.

D. Miscellaneous issues relating to Infrastructure (Chapter 5)

I. National Broadband Plan

1. The authority has recommended utilization of USO Fund to lay optical fibre from block head quarters (BHQ) to villages so as to fulfil the backhaul bandwidth requirement for provision of broadband in rural areas. The plan is too rigid as it presupposes that in every scenario only an optical fibre is required in the last mile of the access network, that too, in a rural area. In majority of the cases, provision of optical fibre which has theoretically terabit capacities will be an absolute overkill and will lead to unnecessary expenditure. In most of the planning scenarios, microwave technologies including WiFi can provide good backhaul for broadband connectivity to villages, being an optimal solution. Since congestion is a major problem in the core of the public internet, merely providing a very thick digital pipe in the access network will not solve the problem. The throughput the subscriber gets will be decided by the weakest link in the chain, which could be either in the first mile or middle mile, rarely in the last mile. Let the type of backbone be decided by the planning engineer, with the help of planning tools and the traffic data of a particular block.

II Rural Telephony

a. According to the latest reports, major rural operators such as RCom and Bharti are seeking exit from rural telephony scheme floated by USO Administrator. They have approached the government seeking to prematurely exit from the rural telephony scheme under the USO subsidy without fulfilling the commitment they had made by winning bids in 2007 to provide telecom services in villages. It is learnt that the DOT is contemplating to ban the non-performing service providers from participating in the next round of bidding to be launched soon. The main reason for non-performance by GSM / CDMA operators is the non-viability of deploying of such urban systems in purely rural areas, which require extensive tower and power supply infrastructure, including diesel run engine alternator sets.

b. We should draw a lesson from 1990s when large capacity Digital Switching Systems (DSS) imported from MNCs, failed in rural areas. Rural Automatic Exchanges (RAXs) developed by C-DOT and manufactured by a number of indigenous entrepreneurs, was equal to the task and functioned without air-conditioning in villages. The RAXs brought the telecom revolution to rural areas.

c. In view of the above, in the next phase, the USO Administrator should adopt a new approach and promote systems designed in the country, employing microcells with a smaller antenna which can be mounted on rural house tops, requiring less power, preferably from solar energy systems. These rural systems should have their own low capacity BSC/MSC located in each rural SDCA. The backhaul being microwave links instead of costly optical fibre. To accelerate creation of rural infrastructure, a new category of operators called ‘rural operators’, be permitted to engineer their low cost networks employing microcellular systems.

d. Such operators should be given the following incentives under the USO scheme to speed up the spread of telecom infrastructure in rural and remote areas.

   i. No revenue share from telecom income generated from rural operators.
   ii. No spectrum charges for rural telecom
   iii. No ROW charges in rural areas
   iv. USO support for Rural Telecom Entrepreneurship Development.
   v. USO funding for Rural ICT Application Development.

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