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Question 1.

TRAI has suggested two options:

1) Obligatory IP interconnection when one of the parties demands IP interconnection
2) Mandatory shift to IP interconnection for all at a future date

Before evaluating these options it is imperative to ask the following questions:

1) Need for intervention: Whether the market can find the optimal form of interconnection on its own or whether external intervention by the regulator/state is required?
2) If intervention is required, whether these two options are an exhaustive list of all possible forms of interventions? Also, which of these interventions is the most optimal intervention?

In the present consultation paper, TRAI suggests that need for external intervention exists because IP interconnection is more efficient than TDM interconnection. However, this argument does not establish the existence of a market failure that requires external intervention. If IP interconnection is more efficient than TDM interconnection, why wouldn't the market itself adopt IP interconnection in the long run without external intervention? Interconnection should be mandatory because of network effects, but type of interconnection should be left to the market.

However, if the need for intervention is presumed to exist, then there is a need to evaluate the different options for intervention. In the present case, TRAI has suggested only two options for intervention. It is submitted that there exist other options as well. The two options suggested by TRAI are of the form of "technology regulation instrument", a type of "command and control instrument" wherein the licensees are forcefully mandated to adopt the technology (IP interconnection).

Other options such as "economic instruments" also exist. In this, the regulator/state may provide an economic *incentive* for IP interconnection or an economic *disincentive* for TDM interconnection. For example, the state may mandate a proportional reduction in Green Telecom targets for every subsequent IP interconnection. Or the state may levy an extra USO charge for every subsequent TDM interconnection. Such economic incentives/disincentives can also drive the market towards adopting IP interconnection.

Alternatively, the regulator may also adopt performance regulation instruments. For example, the state may mandate performance targets that every licensee needs to have atleast 30% of all points of interconnection converted to IP

interconnection by year 2017, and 80% converted to IP interconnection by year 2020.

However, if one were to restrict the analysis to the two instruments/options suggested by TRAI, then the first option would be preferable over the second option. In the first option, it is obligatory to provide IP interconnection if one of the interconnecting TSPs demands IP interconnection. This would not force IP interconnection between two TSPs that find TDM interconnection more efficient. The rationale for the second option is that it would avoid parallel TDM and IP interconnections. It is submitted that parallel existence of TDM interconnections and IP interconnections, in itself, is not inefficient or bad. In fact, parallel TDM and IP interconnections may be more efficient than forceful IP interconnections between two TSPs that find TDM interconnection more efficient. Therefore, the suggested rationale is not an argument in favour of the second option. Accordingly, the first option is strongly suggested.

Questions 2 & 3.

TRAI definitely needs to mandate a RIO. The RIO has two benefits:

1) RIO drastically reduces the transaction costs (search costs, information costs, negotiation, contracting costs) of interconnection.
2) RIO reduces the market power in the hand of the incumbent to exploit the newer operators.

There are no negatives of enforcing a RIO as long as it only specifies the minimum contractual obligations; and can be modified if both parties find it convenient.

The current RIO does not sufficiently address the needs of IP interconnection. It needs to be modified to introduce the modalities of IP interconnection. Importantly, it needs to be updated with respect to the charging and billing mechanisms. It also needs to be updated with respect to the kind of IP based equipment that must be made available for bilateral interconnection and for exchange based interconnection.

Questions 4 & 5.

The mode of interconnection should not be mandated by the regulator. It should be the economic decision of the TSP. The model followed by National Internet Exchange of India (NIXI) should be adopted. In this, the state facilitated the setting up of an interconnection exchange but made it *voluntary* for the ISPs to participate. Similarly, TRAI should actively facilitate the setting up of interconnection exchanges, but should make participation in such exchanges voluntary. The exchange should be financed on membership fees as presently done by NIXI.

Exchanges should be set up in all circles as majority of the voice traffic will be intra-circle. However, participation in such intra-circle exchanges should be voluntary.

TRAI should additionally consider allowing Content Delivery Networks (CDNs) to participate in such exchanges, as allowed by most international exchanges, to increase speed of transfer and to reduce redundancy in routing.

Question 6

Redundancy of points of interconnection is needed to deal with localized requirements and to deal with network outages. As UAS/UL licenses are circle specific, the point of interconnections should also be according to the circles. There should be at least one POI per circle. Therefore, TRAI should mandate a minimum number per circle and let the TSPs decide the actual number as per needs. Additionally, all TSPs do not have presence in all circles or only in 1 circle and therefore POIs need to be circle-wise.

Questions 7, 8, 9 & 10

In an all IP environment, there should be no difference between different services. Additionally, all principles of ***network neutrality*** should be followed. Alternatively put, all services should be treated alike. **Therefore a QoS based system of charging should be strictly prohibited**.

Further, capacity based charging should also be strictly prohibited. This is because the upstream end user is already charged according to capacity in many cases. By introducing capacity based charging at a downstream level, the TSPs may impose constraints on the end user for many routes without his knowledge.

Only volume based charging should be permitted.

Migration of access networks to IP based systems also puts the current mechanism of "calling party pays" into question, as the receiving party will also be paying for data consumption for receiving calls. Accordingly, the notion of termination charges should also be discontinued. The current system of IUC cannot apply to a data environment.

Question 11

Two important principles are suggested:

1) Charging of content providers should not violate any aspect of *network neutrality*
2) Content providers should not be licensed as it would stifle innovation: Additionally, mandatory licensing of content providers is not possible over

the internet. Further, the state does not have the mandate to do so under the Telegraph Act.

However, CDNs should be allowed to voluntarily interconnect at Internet Exchanges if they take an Application Service Provider (ASP) license. Such ASPs interconnecting to interconnect exchanges should be charged on the basis of volume like any other TSP. As iterated before, in interest of network neutrality, QoS based charging should not be allowed for ASPs.

Questions 12, 13, 14 & 15

Y1541 is flawed for the reason that it gives lowest priority to applications of default IP networks. Looking ahead, there is going to be no inherent difference between a Skype call and a VoIP call. Looking ahead, there is going to be no inherent difference between broadcasting services and traditional video streaming services. Therefore, Y1541 creates an artificial distinction in the face of convergence and gives the TSP power to discriminate. The TSP may use this distinction to charge services like YouTube and Skype to use the low jitter mechanism. However, the use of classes may be permissible in the case of emergency services.

Further, if the regulator permits the implementation of Y1541, the regulator should also stipulate that if the application demands a QoS class, then the TSP should be obliged to provide that QoS class. Any discriminatory power in the hands of the TSP should apply to a class of applications and not a specific application. Principles of network neutrality are the epitome of the internet and TSPs should not be allowed to violate them on a discriminatory basis. Accordingly, QoS parameters should equally apply for all services.

Network-centric parameters and Customer-centric parameters as identified by TRAI appear to be complete. Both types of parameters should be regularly published by TRAI on its website on a quarterly basis as per current practice.

Question 16

Active sharing should be allowed. Infrastructure sharing will allow the infrastructure owners to make efficient use of excess capacity; significantly reduce capex/opex; and reduce time for completing rollout obligations.

Concerns exist with respect to possible anti-competitive practices. For example, it is possible that Airtel, Vodafone and IDEA deny sharing opportunities to other TSPs and use it as a mechanism to deny other TSPs to lower their capex. Therefore, they may exploit their market power in the infrastructure sharing market to exploit the retail market.

However, this concern is not specific to the IP environment as it equally exists for the TDM environment.

Further, if TSPs are allowed to share both network and core, then it may be misused as an excuse to launch MVNOs. Therefore, the regulations should stipulate what percentage of total CAPEX may be shared by a TSP.

Questions 17, 18 & 19

Does the regulator intend to allow calls to and fro between PSTN and OTT VoIP providers? Allocation of ENUM makes sense only in the condition that such calls are being allowed. However, this may have considerable security and interception implications and should therefore be avoided.

ENUM numbering may also be provided for OTT to OTT calls as well. However, in this case since PSTN is being kept inaccessible from OTT VoIP, therefore the OTTs should be required to keep a separate numbering scheme – distinct from the PSTN E.164 numbering scheme.

Questions 20 & 21

Priority routing should be allowed for emergency calls.

Location should be allowed to be shared using GPS for such calls. Most future handsets are expected to have this feature.