

**Q1. Is there a need to mandate IP interconnection? If so, what should be the time frame for implementation of the same? Please comment with justifications.**

Reply: As it is mentioned in the consultation paper, the different operators in India are at various stages of migration to IP based networks. There is a requirement to establish IP interconnection. However, being legacy network operators, it will take time to migrate all existing TDM network to IP based network. Therefore, there is no need to mandate the IP interconnection in short term, as this mandate will force to legacy operators to make additional investment immediately to comply with this arrangement which may not be fair enough. The mandatory IP- interconnection would force, even to two such operators who would both prefer the interconnection to be TDM based.

The sufficient time of 4-5 years to mandate the IP interconnection should be given to the operator so that they will make all readiness at their end.

**Q2. Whether both TDM and IP interconnection should be allowed to coexist? If so, whether the existing regulation i.e. 'Reference Interconnection Offer dated 12th July 2002' addresses the requirements of IP interconnection also? Please comment with justifications.**

Reply: As the different operators in India are at various stages of migration to IP based networks. And with increase in deployment of IP based elements in the network, the need of an IP interconnection framework is being arisen. In view of this and reason mentioned at reply of Q1, both TDM and IP interconnection may be allowed to coexist and the IP interconnection should be left at the choice of the operators only initially.

'Reference Interconnection Offer dated 12th July 2002' meets the requirement for TDM and same may be considered as basic guidelines for IP interconnect. Further operators may be allowed to inter bilateral agreement as per their requirement.

**Q3. In case IP interconnection is mandated in India, whether the enforcement of interconnection agreements should rely on**

- (i) Bilateral agreements and dispute resolution; or**
- (ii) Mandatory reference offer**

Reply: If IP interconnection becomes mandatory then enforcement of interconnection agreements should based on bilateral agreement and dispute resolution.

**Q4. In an IP based network scenario, which mode of interconnection is preferable to carry traffic: - peer-to-peer, Interconnect Exchange or combination of both? Please comment with justifications.**

Reply: In case of Interconnect Exchange (IPX), there is need to create IPX at different locations in order to meet the requirement of interconnect. Moreover, it may not wise to create the IPX at many locations as this may lead to a parallel infrastructure for interconnect only.

As peer-to-peer interconnect mode is an agreement of interconnect between two operators as per their requirement. Therefore, the choice of mode of interconnection between Peer-to-peer or Interconnect Exchange should be left to operator.

**Q5. In case an Interconnect Exchange is required, should such Exchange be placed within each licensed service area or a single Interconnect Exchange will be adequate for the entire country? Please comment with justifications.**

Reply: In case of Interconnect Exchange (IPX), there is need to create IPX at least on zonal basis. Moreover, a single IPX will not be adequate due to following reasons-

- There may be limitations in capacity of the network elements, for a country of the size of India.
- Each operators need to carry their traffic to a single location from Pan India for exchange of their traffic.
- The traffic is transmitted back and forth for no reason for the source & destination of same location.
- There may be compromise of services for Pan India due to any non-availability/redundancy issues in the network at IPX.

**Q6. Whether any regulatory intervention is required to mandate the locations and structure of points of interconnection (POI) for IP based network architecture? Please comment with justifications.**

Reply: There should not be any regulatory intervention to mandate the locations and structure of points of interconnection (POI) for IP based network architecture. The agreement of interconnect should be considered as mutual agreement between two operators as per their requirement. Therefore, the choice of location (POI) and capacity should be left to operator.

**Q.7 What are your views on the migration from the existing interconnection regime-measured in terms of minutes of traffic to an IP interconnection regime replaced by measures of communication capacity? Please comment with justifications.**

Reply: There should be Capacity based interconnection charging (CBC) along with the charging on service usage based also (i.e. esp internet data should not be part of this CBC meant for telecom). E.g. There should be a separate SIP – trunking link for the voice.

Therefore, the capacity here referred should exclusive meant for telecom data only and this is similar to POI connectivity. In addition to this, the services usage charging should be determined for the usage of the service.

**Q.8 In an IP interconnection between networks, comment on the type of charging principles that should be in place-**

- (a) Capacity based in terms of Mbps.**
- (b) Volume based in terms of Mbps.**
- (c) QoS based.**
- (d) a combination of the above three.**

Reply: The IP network in India is still not so mature especially for the telecom operations i.e. voice. There are many issues in IP network like QoS, monitoring of traffic etc. Initially, along with the charging on service usage based also (i.e. esp Internet data should not be part of this CBC meant for telecom).

However, once the IP network became mature enough in India to address the issues then this may be revisited and combination of CBC, Volume based and QoS based may be decided after discussion with all the concerned.

**Q9. What should be the criteria to estimate the traffic minutes in IP environment if interconnection charges continue to be minute based? Please provide justification in support of your answer.**

Reply: The duration & volume of traffic for different services can be considered for IP environment in place of the usage of service minutes only.

**Q10. In addition to the above, any other modifications or components of IUC which are required to be reviewed in the IP based network scenario? Please provide all relevant details?**

Reply: Usage counts in addition to duration in minutes also to be part of IUC.

**Q11. Do you envisage any interconnection requirement for application & content service providers? If so, what should be the charging mechanism? Please provide all relevant details justifying your comments.**

Reply: No, it should be left on licensed Telecom Operators and application provider to decide the interconnect methodology.

**Q12. Whether the existing regulatory framework for measuring and reporting quality of service parameters as defined for PSTN/PLMN/Internet may continue to apply for IP based network services? Please comment with justifications.**

Reply: Yes, the existing regulatory framework for measuring and reporting quality of service parameters as defined for PSTN/PLMN/Internet may continue to apply for IP based network services because the end to end QoS in IP based network environment is complex due to different types of users and real-time multimedia service applications with different bearer requirements on a wide variety of infrastructures. More over there are many different standards defined for different set of requirement.

**Q13. In the context of IP based network Migration, if the parameters in the existing QoS regulation are required to be reviewed immediately then please provide specific inputs as to what changes, if any, are required in the existing QoS regulations issued by the Authority. Please comment with justification.**

**Q14. In case new QoS framework is desirable for IP based network, do you believe that the QoS be mandatory for all IP based network services. If yes, what should be QoS parameter and their benchmarks?**

Reply wrt Q13 & Q14:

The following network performance parameter of IP based network for assessment of the QoS may be considered in addition to existing QoS parameters defined for Broadband & wirelines-

- Bandwidth: the maximum number of bits that a transmission path can carry.
- Latency: Voice and video are delay-sensitive applications while most data applications are not. The permissible delay may be considered as 50 ms – 100ms.
- Queuing delay: The time that a packet waits before being transmitted. Both the average delay and variability of delay (jitter) matter, since the two together establish a confidence interval for the time within which a packet

can be expected to arrive at its destination. The jitter can be around 20 -50 ms.

- Packet loss: IP packet loss ratio (IPLR) is the ratio of total lost IP packet outcomes to the total transmitted IP packets in a population of interest. Loss is typically a function of availability. This packet loss may be allowed to 1%. The reference points for measuring the above parameter need to be defined appropriately. However, these parameters need to be reviewed after 4-5 years.

**Q15. What should be the mechanism for monitoring the parameters for end to end QoS in IP based network environment? What should be the reporting requirement in this regard? Please comment with justification.**

Reply: In the beginning, there is no need to setup any mechanism for monitoring of these parameter till the network mature properly for all IP services. The value of these parameter may be taken from the respective operators for the reporting purpose.

**Q16. Should sharing of the IP based core and Access network element by different telecom service providers be allowed in IP based network scenario? What are the challenges, opportunities and problems of such sharing? Please comment with justifications.**

Reply: No, there may be following challenges-

- Traffic monitoring for security agency for different type of services
- End to end QoS measurement
- Resource reservation and Allocation etc

However, this need to be reviewed after 4-5 years.

**Q17. Do you see any issues concerning the national numbering plan with regard to the migration towards IP based networks?**

Reply: No, we do not see any issues concerning to the national numbering plan with regard to the migration towards IP based networks at present.

**Q18. Do you believe that ENUM has to be considered when devising the regulatory policy for IP based networks as it will provide essential translation between legacy E.164 numbers and IP/SIP (Session Initiation Protocol) addresses.**

Reply: Yes, ENUM is very much required as ENUM transforms the telephone number—the most basic and commonly-used communications address (i.e. E.164 number) —into a universal identifier (i.e. Uniform Resource Identifiers (URIs)) that can be used across many different devices and applications (voice, fax, mobile, email, text messaging, location-based services and the Internet). ENUM is an important for silent migration from TDM to IP network. It helps to facilitate such services as VOIP & allows network elements to find services on the internet using only a telephone number. ENUM also help in decision making in the routing of calls as it translate the called party number to URI domain name and then URI domain name to IP address.

**Q19. Which type of the ENUM concept should be implemented in India? What should be the mechanism for inter-relationship between number and IP addressing, and how it will be managed?**

Reply: Each operator should have their own ENUM server for mapping their E.164 numbering scheme to URI. This ENUM concept is similar to the “Private

Infrastructure ENUM” type mentioned in the consultation paper. There is a relation between E.164 numbering scheme and SIP URI in the ENUM server. Further, there is relation between domain name to IP address in DNS. Moreover, the DNS functionality required for NGN can work in same infrastructure of ENUM.

**Q20. Is there a need to mandate Emergency number dialling facilities to access emergency numbers using telephone over IP based networks platform? Please give your suggestions with justifications.**

Reply: Yes, there is a need to mandate Emergency number dialling facilities to access emergency numbers using telephone over IP based networks platform because it is requirement of common public /society who require services irrespective of backend technology.

**Q21. How will the issues, of Caller location delivery and priority routing of calls to the emergency centre in IP based networks environment, be handled? Please comment with justifications.**

Reply: Yes, it is difficult to know the caller’s current location with sufficient certainty in case of nomadicity is allowed which is one of the feature of VOIP. However, it should be explored by technology providers that caller’s location shall be identified based on the location of first Network Access Equipment towards caller (e.g. say LMG/DSLAM/OLT/SBC etc.) through which caller is making the call. In this respect, P-Access-Network-Info header can be used for locate the subscriber based on the first Network Access Equipment towards caller.