

F.No TTL/TRAI Corres/CP/2014/T10

Dated 19<sup>th</sup> August 2014

**The Secretary,**  
**Telecom Regulatory Authority of India,**  
Mahanagar Door Sanchar Bhawan,  
Jawahar Lal Nehru Marg, Old Minto Road,  
New Delhi – 110 002

**Kind Attention: Mr. A. Robert. J. Ravi**  
**Advisor (CA & QoS)**

**Subject: Consultation Paper on IP based Networks**

Dear Sir,

This is in reference to the Consultation Paper dated 30<sup>th</sup> June 2014 on the above mentioned subject.

Tata Teleservices's point-wise response to the Consultation Paper is as follows:

**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.**

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**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.**

**TTL**

- It may not be mandated by TRAI but facilitated by TRAI on different issues. It should be a progressive natural evolution to IP as per flexibility of the operators (who may be in different stages of IP usage status). It would involve massive , yet progressive up gradation of transmission network as well as Switches.
- It may also be mentioned that the migration procedure for operators running circuit switched networks requires a gradual elimination /swapping of switching equipment and at the same time replacement with new packet switched equipment (there is no up-gradation of the individual asset) , which is equivalent of implementing a new switching network.
- Also, evolutions process related to catering to growing broadband internet access demand, an end to end IP service would be required for providing better service and of high bandwidth would. This would mean upgrading of the access network infrastructure

as well. This usually would require replacing of portions of copper cable and/or microwave systems in the access backhaul network with optic fibre (for both fixed and mobile networks).

- In any case, the service provider has flexibility to choose any digital technology for the access network including the use of packet switches as per the license. The operators based on their business plans and strategies are evolving from current technologies to the next generation technologies and networks. No doubt that the Equipment being offered today by Vendors are IP based and the existing TDM assets will reach end of service life leaving little choice with the operators but to migrate to IP progressively.
- Both TDM and IP interconnection should be allowed to co-exist since the licenses are technology neutral and already provide enough flexibility to operators to deploy technology of their choice (including NGN).
- The existing regulation i.e. 'Reference Interconnection Offer dated 12th July 2002' addresses the requirements of IP interconnection and from that perspective need not to be revisited as a holistic exercise to the extent appropriate but it cannot be left un-discussed to cover some the provisions of Interoperability Standards
- Further, Interconnection of the networks is very important and it has to be provided in a non-discriminatory manner for the entire system of telecommunication to function. Service providers agree for interconnection after finalizing commercial and technical arrangements mutually. In the present market scenario, interconnections is not mandated and therefore IP interconnection also need not be mandated and left to the mutual agreement of interconnecting parties.

**Q3. In case IP interconnection is mandated in India, whether the enforcement of inter-connection agreements should rely on**  
**(i) Bilateral agreements and dispute resolution; or**  
**(ii) Mandatory reference off**

**TTL:**

- Interconnect between TDM and IP network should be based on Bilateral agreements and dispute resolution.
- Yet, at this Juncture; we may have to keep it as a matter of study both the cases to see which is best suited to INDIA. However since we are in favor of operators talking to each other we have suggested the OPTION 1 which is bilateral.
- In summary, the Interconnect between TDM and IP network should be based on bilateral agreement between two operators i.e. no need to have mandatory RIO but should accordingly enable it as a helping guideline for operators.

**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.**

**&**

**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.**

**TTL:**

- The interconnection between the licensed operators in India is already working well, with most of the operators are connected to each other.
- Network structure prevailing in India is Peer – Peer and thus it is suggested that we continue the same even for IP based interconnection.
- In view of the above, there does not appear to be any need to have a common point (IP exchange) of interconnection and the established peer to peer arrangement should continue. The common interconnection in the form of internet exchange will restrict competition and will encourage monopoly, since this will act as a major toll.
- However, in case of both the environments are considered by any merit carrying of traffic through Interconnect Exchange the same needs to be extensively reviewed based on some of the pros and cons given below:

a) Possible Interconnection advantages

Scalability, Operational efficiency as it may require monitoring of only one link with Interconnect for bandwidth utilization.

b) Interconnection Disadvantage:

- The Interconnect location becomes a single point of failure.
- Even with multiple locations in a circle, one should consider the possibilities of terror attacks, natural calamities etc.
- It would also require Interconnect Exchange should be placed in each Licensed Service area or Hub location with a Redundancy for Operational efficiency
- Centralized exchange may pose a lot of issues.
- For example: The regional players will have to carry traffic up to central location, outage of that system because of any technical snag or any geographical /natural calamity leading to a complete/partial outage of the network , severely impacting the services running .

- Even maintaining the exchange, hardware/ software upgrades may pose a challenge, therefore this option may need to go ultimately for decentralized model as compared to centralized.

**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 Justification**

**TTL:**

- Procedure may be based upon current practice in terms of security, availability, connectivity and infrastructure and not Location.
- However, the regulator could facilitate by laying down as suggestive guidelines of the interconnect POI as reference document for all the TSPs. The implementation of the same should be left on the operators based on the economic feasibility and benefits.
- As peer to peer arrangement aids creation of robust and redundant networks as multiple routing options are available thus the point of interconnection (POI) should be as dictated by the respective network architecture and governed by the Interconnect Agreements between the Service Providers as is being done currently on peer to peer basis.
- One of the issues raised in the consultation paper is about issue of transit where one network agrees to offer traffic to the other. There may be difficulties in transiting through the designated public operator.
- Present licence does not allow transit of other operator's traffic.
- However, if at all transit is done within the network of an operator then there should not be any charge w.r.t the same. To exemplify, Private operators are constrained by BSNL to handover their traffic to BSNL at Level II TAX and pay the transit charge of Rs 0.15/min for carriage of calls to SDCA. This could be revisited and not be charged.
- In other case where the designated public operator is not able to provide interconnection at SDCA to the NLD operator, they should allow the traffic to be handed over at the LDCA and the transit from LDCA to SDCA should not be charged.
- The analogy that there should not be any transit or carriage charge at the termination end must be considered.

**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.**

**&**

**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.**

**&**

**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.**

**&**

**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?**

**TTL:**

As it won't be feasible or financially viable for all operators migrate to IP based infrastructure at the same pace, the time based billing cannot be done away with mostly. IP interconnection charging needs to be considered based on some of the points mentioned below:

- If the IP Network infrastructure has capability to identify the type of traffic that flows between routers, to granular levels taking in to account the type of traffic – OTT, Voice etc. Each category of traffic can be quantified; it can consider using communication capacities which are differentiated on the basis of type of payload.
- But, the bandwidth pipes being huge, it may be a challenge to identify the payload at the ingress to the network and charging differentially.
- The charging should be based on option (b) Volume based in terms of Mbps. However in future a combination of three can also be reviewed at later date based on applications supported.
- In case of IP interconnect only, the existing charging mechanism holds good, however in data this would be defined in MB or GB based on data, Internet usage.

- Another parallel subject of study is BAK 'Bill and Keep' (BAK) for termination charges as one of the way forward in the co-existence of TDM and IP based interconnect.
- In BAK charging methodology, traffic originating operator does not pay to the recipient operator for termination of traffic. Bill and Keep may solve the problem of determining cost of termination for each technology and hence reduces the complexities involved.
- An interconnection product charged on BAK principle result in no regulatory intervention, no consultancy fees, no monopoly problem and no arbitrage and is considered as the most popular IUC regime.
- However, this charging mechanism could be reviewed at a later stage and over a period of time based on technological advancements on IP Network.

**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**

**TTL:**

We do not envisage any interconnection requirement for application and content service providers.

The telecom licenses are granted under Indian Telegraph Act 1885, to provide, establish, maintain and work telegraph. Since, Content and application Providers neither provide nor establish/maintain work telegraph, they cannot be a licensed operator in the telecom market and are not allowed to have direct interconnection with TSPs.

Moreover content providers being un-licensed players, have no obligations to provide any LI facility, QoS and emergency calling.

In case content and application service providers are desirous of gaining access to the end consumer, they are free to do so after acquiring an access license or alternatively they can continue to access the end customer through the network of an access provider after signing standard commercial agreements.

The charging mechanism should be left to the commercial negotiations and mutual agreement between the various stakeholders viz TSPs and application and content providers. Interfering into the commercial negotiations would destroy the free play of market forces. The commercial arrangements of TSPs and application and content providers are guided by the demand, acceptability of the product, technical arrangements on the network and other support services like billing arrangements, marketing agreement etc

**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**

**&**

**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.**

**TTL:**

- There is no need for it to be reviewed immediately but only over period of time based on technological advancements on IP Network.
- May come in future and should be dealt with at a appropriate time frame.
- In today's ultra-competitive Telecom Service scenario, TSPs are regularly monitoring their networks to provide good quality of service to the customers. With to the emergence of Mobile Number Portability, TSPs are under pressure to maintain their QoS standards to sustain in the market. QoS are driven by market forces and there should not be any forced approach for adoption of QoS benchmarks. If operators don't keep a self-check and measure their own performance, they can't maintain high service quality or address performance and quality issues as and when they arise. As a regular practice, Operators at their end do independent monitoring of the networks and other customer service aspects so that they can become more competitive by addressing customer satisfaction, capacity, service and quality issues.

In view of that we believe that QoS is driven by market forces rather than by Regulatory intervention and Service provider are meticulously adhering to the reporting requirement of TRAI.

Notwithstanding the above, if the Authority feels that there is need to have QoS parameters for wired IP based interface then to start with, some of the parameters as suggested in the VOIP regulations of 2002 for Toll Quality networks may be applicable as follows:

- $MOS \geq 4$  or R-value of 80 or higher
- One-way end-to-end delay  $\leq 150$  ms
- Packet loss not to exceed 0.1%
- Jitter should not exceed 5 ms

The current QoS under ILL & VoIP based ILD contain the QoS that are sufficient unless a New Service is brought up. Same can be revisited from time to time at a later stage and changed as per requirement. Please refer to existing QoS mentioned below.

QoS for VOIP based International Long distance Services					
Span	Description	Parameter	Value for QoS parameters when international satellite link is not involved	Value for QoS parameters when international satellite link is involved	Method
X2 - X3	ILD segment employing VOIP techniques* (excluding transmission delay)	Packet Delay	< 50 ms	< 50 ms	Individual parameters measured by using IP analyzer plus the aggregate measure (MOS or RValue)
		Jitter	< 5 ms	< 5 ms	
		Packet Loss	< 0.1%	< 0.1%	
		R-value	> 80	> 80	
X1 - X4	End to End International Connection of which ILD segment is a subset	Delay	< 150 ms	< 400 ms	Aggregate measure (MOS or Rvalue)
		R-value	> 80	> 70	
		MOS	> 4	> 3.5	
		Jitter	< 5 ms	< 5 ms	
		Packet Loss	< 0.1%	< 0.1%	
		CCS7 Signaling Delay	As per Q.709	As per Q.709	CCS7 Signalling Analyzer

2	<b>Leased Line Access</b>	
	Latency	<ul style="list-style-type: none"> <li>· Not to exceed 300 msec on Optical Fibre Communication (OFC) links between India and farthest node abroad.</li> <li>· Not to exceed 800 msec on satellite links between India and farthest node abroad.</li> </ul>
	Packet Loss	1.00%
	Availability	99.50%

Thus Immediate review is not required for existing QoS keeping in view of migration of network to IP but suggested to have a periodic review on the targets / KPI'S / methods of computation.

**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?**

**TTL:**

This needs to be reviewed over period of time based on technological advancements as well new products on IP Network.

**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.**



**TTL:**

Current Practice can be continued for monitoring the parameters for end to end QoS in IP based network environment. The KPI's and targets can vary from service to service, need to be revisited and tweaked time to time. Monthly values should be the reporting requirement.

**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?**

**TTL:**

- Sharing of IP based Core and access network can be allowed as this will improve the efficiency, cost of delivery of services and management. But there would be need to lay down advisory guide lines in terms of Security, QoS on Network availability and customer service.
- Sharing of IP based Core and access networks should ultimately be allowed as this will improve network efficiency cost of delivery of services and management. Regulatory intervention is not required and it would be desirable to leave the same to the market forces.
- Network sharing can provide better economics and will act as a mean to close the mobile broadband coverage gap. In the broader scheme, permission to share would ultimately become an imperative to ensure rapid growth of broadband and also to ensure competition to flourish.

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

**TTL:**

- There may not be many issues as long as migration of networks to IP is limited to Interconnection.
- There will be challenges of numbering in an increasingly IP world which includes not only the porting of numbers but also the effective administration and conservation of numbers

**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.**

**TTL:**

This is implemented and is operating successfully in most of the developed countries.

**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?**

**TTL:**

- Public/Carrier ENUM concept can be deployed and controlled by the trusted third party, the way MNP has been deployed.
- Advantages and disadvantages of Public/Carrier ENUM and IP addressing mapping with E.164 number need closer examination and further discussion. An expert committee needs to be formed, having representation from TSPs & Associations, TEC etc. to discuss the entire issue concerning numbering, e-num, migration, translation etc.

**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.**

**TTL:**

- There is a need to take forward the issue access emergency numbers using telephone over IP.
- There are however many issues involved and have to be discussed for end to end possibilities and Road Blocks of technology. Implementation of ENUM may be kept in mind for the same however.

**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**

**TTL:**

- This needs to be discussed as separate subject. : Would and how VoIP provider should be able to route the Emergency Call to the designated emergency centre.
- The identification of the subscriber though could be done in a similar way as for ordinary POTS-subscriber where the telephone number (E.164 and/or URI) is used as identifier.
- In case of Voice based on fixed network or IP telephone the E.164 Number is mapped to a SIP URI and based on the E.164 number/URI mapping the Caller location information can be delivered.

- The location of a subscriber can be perhaps be provided by the VOIP provider based on a look-up data base via interface.
- However internet telephony Calling may have issues which needs to be looked into and requires more study.
- The IP Transmission network may have to examine for its limitation.
- Also in case of International roaming emergency services and location may not be guaranteed.
- It requires a detailed discussion on feasibility and work flow.

We sincerely hope that our views expressed will be given due cognizance.

Thanking you,

Yours sincerely,

**Satya Yadav**  
**Addl. Vice President – Corporate Regulatory Affairs**  
**Tata Teleservices Limited**  
**And**  
**Authorized Signatory**  
**Tata Teleservices (Maharashtra) Limited**