

**Uninor Response**  
**to**  
**Consultation paper on Migration to IP based Networks**  
(CP 8 of 2014)

**Preamble**

TRAI in its consultation paper has highlighted that the migration to IP based networks and interconnection regime will bring enormous benefits to the telecom service providers such as converge network infrastructures, increase efficiency and scalability, provide huge bandwidth, consolidate terminating traffic and reduce long-distance charges. The benefits of migration to an IP based network are well known and there is no doubt that IP based networks are the future. However, migration to IP based network requires extensive changes in the network and service provisioning and mandating migration to IP based network requires immediate network changes in the existing TDM networks by deploying network elements - Media Gateways, signaling gateways/soft switch leading to unwanted financial stress on already debt laden telecom sector.

Before discussing the modalities of the functioning of an IP based network, it is pertinent that adequate study/research is undertaken to ensure that migration to an IP network will be economically viable. In-depth analysis of the cost of migration as well as the cost of doing business using an IP based network needs to be conducted. Moreover, impact of migration to an IP based network on national security needs to be studied. Questions such as how to identify a user using an IP network and how to prevent misuse of the network need to be answered before migration is considered.

In the current competitive scenario, the Indian Mobile market which is highly competitive having 8-10 TSPs in each service area is operating on the lowest tariffs. The telecom service providers are doing adequate investments ensuring regular up gradation of their networks to provide good quality of service at affordable rates to their customers. The majority of the telecom service providers have started implementing IP based core transport networks for carrying voice and data traffic to meet the communication requirements of their customers in a most efficient manner. These changes are driven by prevailing market forces and competition.

In view of above background, we would like to submit the following:

- 1) IP Interconnection should not be made mandatory for telecom service providers (TSPs) and left to the market forces. We recommend that TSPs should be encouraged to implement IP based networks in view of technological advances taking place and considering the fact that data demand is growing exponentially.
- 2) The current minute based Interconnection usage charges regime should be continued.

- 3) There is no need of Interconnect exchange. In case, if IP based interconnection become mandated, peer to peer connectivity will suffice.
- 4) The transition from TDM to IP should be done only after ascertaining the availability of adequate infrastructure, regulations or standards in place. The adequate study/research is undertaken to ensure that migration to an IP network will be economically viable.

It is suggested that before making any regulation on this subject, TRAI should seek views from TEC on this subject especially on issues related with sharing of IP based core & access network elements, Security, ENUM, Emergency number dialing etc.

### **Uninor Response to the issues under consideration**

**Question 1:** 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.

#### **Response:**

It is still pre-mature to mandate IP interconnection due to large quantum of legacy equipment in the network across the telecom networks. Although there are several benefits of IP interconnection, however conversion from TDM networks to IP networks requires additional cost implications to telecom service providers. Considering this fact, we recommend to the Authority that there is no need to mandate IP interconnection and same should be driven by the market ecosystem and advantage of implementation of the IP based networks. As highlighted by TRAI in its consultation paper that different operators in India are at various stages of migration to IP based networks thus we are of the view that at this stage both TDM & IP interconnection needs to co-exist and choice & time of migration to IP based network should be left to the operators.

It is suggested that the Telecom Engineering Centre (TEC) be entrusted to carry out a viability study in the Indian Network scenario considering all aspects including but not limited to security, Call Data Recording, emergency number routing, QoS, governance of such interconnect, timing to introduce, etc. Further steps to be considered based on the recommendations of TEC. In the meanwhile service providers should be encouraged to internally move in for all-IP interconnections within its elements so that the network becomes ready for the quick transformation.

#### **International Practices:**

- a) In Bangladesh, the regulatory commission has no plan to go for mandatory IP based interconnection in near future.
- b) Saudi Arabia regulator has proposed that IP interconnection should be commercially driven.

- c) In 2013, FCC reports that it is extremely challenging to regulate Interconnection in the internet age (<http://www.bna.com/fcc-struggles-regulate-n17179877146/>). In-fact, FCC section 251 (1) guide is encouraging providers to “negotiate in good faith,” and section 251(a)(2) authorizes the state utility commissions to mediate contract disputes, if necessary.
- d) In 2012, French Telecom regulator ARCEP, in its IP interconnection study, indicates that ARCEP does not intend to regulate this market today. The situation in data conveyance and interconnection markets today does not appear to warrant the introduction of ex ante regulation at this stage.
- e) In Malaysia and Singapore, all IP interconnections are commercially driven / negotiated.

In light of above, we are of the view that the transition from TDM to IP networks should be left solely to the telecom service providers based on their network planning, techno-commercial considerations and future scope to migrate to IP based networks.

**Question 2:** 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.

Response:

Yes, TDM and IP interconnection should be allowed to co-exist.

- a) There will be a phase when both TDM and IP interconnection has to co-exist, but this should not pose challenge, as for some period of time until capacity is built up and stability is established the two shall co-exist. The IP based network architectures (e.g. ETSI-TISPAN, IMS, 3GPP Rel x etc.) provide breakout functions to interconnect with the legacy TDM networks. There are provisions of MGCF (Media Gateway Control Function) to have Interconnection with the TDM Networks.
- b) We, therefore feel that there is no need of any timeframe to be mandated for the migration to the IP network and hence the operators can plan their migration on the basis of their techno-economic considerations. TSPs should be given the choice as to when and how they wish to upgrade their networks to IP based.
- c) While RIO dated 12th July 2002 will suffice for the physical interconnection, however, quality requirements may require modifications considering the IP interconnection.

**Question 3:** 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

Response:

In case, If IP interconnection is being mandated, the enforcement of interconnection agreements should be made basis mandatory RIO.

**Question 4:** 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.

Response:

We think there will be a progressive uptake of IP based interconnection. We are of the view that in Phase I, till CS-Core is augmented to Mobile Soft-Switch and Media Gateway architecture, the scenario would demand peer-to-peer based IP interconnection between operators depending on their mutual business interest and understanding taking advantage of already built media. In Phase II, when Core network is transformed with IP-based architecture with unified control plane, Interconnect Exchange based interconnection would justify its case for combination of peer-to-peer and Interconnect Exchange architecture. Later on, with growth in IP-based peering and VoLTE networks, IP peering via IP Exchange is expected to become the norm. The IP Interconnection exchange would be a single point for IP peering for both voice and signalling. A third party Interconnect Exchange however may not bring in operational efficiency since there will be a cost outflow to the Interconnect service provider

In view of above and considering the present interconnection arrangements which are working well, introduction of interconnect exchange will be an additional cost implication on telecom operators. Thus at this stage because of well spread networks in India we do not consider it technically & commercially a viable option to have an interconnected exchange. We also recommend peer to peer IP based interconnection in a progressive manner driven basis market forces as an option in future for telecom service providers.

**Question 5:** 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.

Response:

As mentioned in response to Q4, there is no need to mandate Interconnect exchange as there is no business case in the present context.

However, in case, if Interconnect Exchange is required at a future stage, it is suggested that such exchange should be placed within each licensed service area due to following benefits:

- Majority of voice traffic is local thereby single exchange within the licensed service area will save bandwidth.
- Lower latency requirements for applications
- Capacity inefficiency due to back & forth traversing of traffic
- Best practices requirements for BCP (Business Continuity Process) & DR (Disaster Recovery) frameworks.

The fate of NLD service providers and their migration path should be considered.

**Question 6:** 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.

Response:

Regulatory intervention will be necessary to mandate the location and structure of points of interconnection (PoI) for IP interconnection. The location should be restricted to one (1) per service area. This is imperative to safe guard the interest of growing telecom service providers.

It is recommended such gateway be established one per license area. This suggestion is more specifically applicable to BSNL since in the current practice there are multiple interconnections in the TDM mode (L1 and L2 interconnection for landline). With other Cellular players interconnection is confined to GMSC and this could replace into a single point of interconnection per LSA.

**Question 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.

Response:

- a) We are of the view that the current interconnection regime measured in terms of the minutes of traffic should continue considering the fact that presently majority of mobile and fixed line networks are TDM based where costing is done basis of minutes exchanged in the network.
- b) We are of the view that there is need to differentiate between Internet connectivity and PSTN/PLMN connectivity based on TDM and IP networks for which the wholesale interconnect charges are prescribed under the IUC and SMS regulation.
- c) We believe that the current issue raised by TRAI is limited to PSTN/PLMN connectivity based on TDM and IP networks and not internet connectivity for which such charges are under forbearance.

**Question 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.

Response:

We are of the view that this issue is premature at this stage and at present, the minute based charging should continue. Since end customers are being charged for voice usage on per min basis (*except in few tariff plans, it is per second basis*) hence same yardstick to be continued at the wholesale level.

**Question 9:** 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.

Response:

- The practice of charging on the basis of Minutes of Usage is already in place in the case of 2G/3G Network, whereas in the case of 4G Network, this is feasible as CDRs are generated in the packet core node (whether it is generated through CS fallback or through VoLTE).
- The interconnection usage charges for voice are computed and billed using the voice CDRs generated by the switches irrespective of technology of interconnection e.g. TDM or IP.
- Further, the widely commercially available platforms of MSS/MGW and SBCs for routing etc. of the IP voice traffic (which would be deployed for the interconnection) are capable of generating the minute based CDRs which are used for interconnect billing.

In view of above, we believe that the IUC settlement on minutes of usage basis does not pose any challenge in IP networks.

**Question 10:** 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?

Response:

We are of the view that existing interconnection arrangements both in terms of trunk grouping and IUC should be continued. Further, the concept of seeker and provider should be abandoned in IP context.

**Question 11:** 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.

Response:

As submitted in response to Q1 & Q2, there is no need to mandate IP interconnection and both IP & TDM based networks will coexist. Moreover, the interconnection arrangements are between licensed operators.

In view of same, we suggest that the interconnection and charging mechanism between Application & Content service providers and Telecom service providers should be driven by market forces as being done in the current scenario.

**Question 12:** 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.

Response:

Existing regulatory framework may not suffice IP based network service. While media availability (this too becomes irrelevant in mesh connectivity) could be the only parameter which could be common to the two types of interconnection, guaranteed throughput, jitter and latency are few important parameters which needs to be defined for the IP based network. QoS in IP based interconnectivity shall be governed by the ITU-T QoS specs Y.1541 and complimented by the 3GPP standards.

We would suggest that the regulatory body to define India specific Quality parameters to be adhered by all TSPs.

**Question 13:** 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.

Response:

The existing QoS parameters from an interconnect point view has been in conformance to a TDM based network which will have to be realigned for an IP based network. We recommend definition shall be aligned to the ITU-TY.1541 recommendations for Packet Transfer Delay; Packet Delay Variations, Packet Loss Ratio and Packer Error Ratio.

Definition shall be classified into (A) Traffic influencing parameters – Latency, Jitter, Loss (B) Management of Finite Resources – Rate control, Queuing and scheduling, Congestion Management, Admission Control, Routing Control traffic protection (C)

## Service Level Agreement (SLA) – per-flow, aggregated

	Fixed Line	Wireless
Key Standards	ITU-T	3GPP
Performance Parameters	Y.1540	TS 22.105
QoS Classes	Y.1541	TS 23.107

ITU-T Y.1540 IP Availability Performance Parameters  
 ITU-T Y.1541 Network Performance Objectives for IP-Based Services  
 3GPP TS 22.105 Services and Service Capabilities  
 3GPP TS 23.107 QoS Concept and Architecture

Other related standards:  
 ITU-T Y.1221 Traffic Control and Congestion  
 ITU-R M.1079 Performance and QoS Requirements for IMT-2000  
 3GPP TS 23.207 End to End QoS Concept and Architecture  
 3GPP TS 29.207 Policy Control over Gs interface

We would also like to mention that with regards to customer centric parameters, the existing QoS parameters are already in place and working well. The same would also serve the purpose for IP based networks.

In view of above, it is imperative for TRAI to define the QoS parameters to be met by each network and same should be defined in accordance with the internationally laid down standards (e.g. ITU-T Y.1541). ITU-T Y.1541 is also highlighted by the TRAI in its Consultation Paper.

**Question 14:** 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?

**Question 15:** 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.

### Response to Q14 & Q15:

It is suggested that QoS defined for IP based networks should be monitored and duly reported periodically for the purpose of ensuring effective implementation.

In the existing TDM networks, there are challenges when it comes to port augmentation in order to meet the QoS norms. The periodic monitoring by regulatory body is essential to avoid such issues.

**Question 16:** 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.



Response:

This shall be permitted and encouraged, so as to reduce interconnect cost and investment on redundant hardware. This approach may technically be feasible, however, its implementation shall be permitted once TEC confirms its suitability from a security angle. Access sharing is feasible right away, the provision of active infrastructure sharing in Unified License should be operationalized.

**Question 17:** Do you see any issues concerning the national numbering plan with regard to the migration towards IP based networks?

**Question 18:** 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.

**Question 19:** 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?

Response to Q17, Q18 & Q19:

- ENUM is a protocol for mapping a telephone number to a Uniform Resource Identifier (URI) which can be used to contact a resource associated with that number. The protocol itself is defined in RFC 3761: The E.164 to URI DDDS Application (ENUM) which obsoletes RFC 2916. The Internet Architecture Board (IAB) and ITU-T Study Group 2 are discussing collaboration on the operational, administration and delegation issues related to deployment of ENUM protocol-based services. The ITU-T has defined Interim procedures for Geographic Country Codes and Interim procedures for shared Country Codes for Networks and Groups of Countries. In view of above explanation, ENUM based protocol is recommended since this has the approval of the ITU-T and will be a de-facto international standard.
- Public ENUM is recommended in view of its adaptation in a larger number of countries worldwide for inter-relationship between number and IP addressing.
- Suitable mapping mechanism of E.164 to SIP URI or IP needs to be developed. In Norway, the regulator has issued some of the fixed telephony numbers to be used for VoIP services. The Operators use ENUM protocol in their internal networks for the IP addresses of their VoIP services and convert this to E164 ordinary fixed line numbers in the VoIP number range towards other operators.

**Question 20:** Is there a need to mandate Emergency number dialing facilities to access emergency numbers using telephone over IP based networks platform? Please give your suggestions with justifications.

Response:

- a) This is a critical and mandatory feature. Therefore, we suggest that the Emergency number dialing from IP telephony subscribers should be mandated, however, methodologies of such implementation be left to service providers.
- b) Access to emergency services and authentication of calling and called party identification are mandatory in the current licenses and IP technology when used by existing licensees in its network can not absolve it from the mandatory obligation.
- c) Any interconnected telephony including VOIP is required to provide emergency services.
- d) Further, any specific problem arising for providing emergency number dialing in case of IP based networks can be referred to TEC for solution.
- e) *Implementation experience from Norwegian Market:* In Norway, geo coordinates are being used for transferring mobile emergency numbers to the correct Emergency Response Center (ERC). For VoIP calls, all calls are routed to the ERC that is correct with respect to the VoIP subscribers home address. There is a separate non-profit company owned by 6 of the telecom companies that have made a common solution for number portability (fixed and mobile). The company has also developed a solution for transferring the relevant information (name, address etc.) from the telecom operators to a centralized database or per inquiry to the ERC to facilitate emergency number dialing. Earlier only Telenor, had a system to transfer information about the caller to the ERCs. The information was transferred with the actual call. With the new solution all telecom operators/providers can issue ERCs with information. If the caller is a mobile number, the ERC can request positioning information of the caller. Today a VoIP callers physical home address is transferred (VoIP has a fixed telephony number in Norway). The information is tagged so that the ERC becomes aware of this.

**Question 21:** 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.

Response:

In this regard, the Authority may consider the following submissions:

- a) The Emergency number facility should be available to all telecom subscribers irrespective of the network platforms and technology adopted.
- b) It is suggest that that we should continue with the existing TDM interconnection methodology until a solution is worked out in an IP based network. Currently all emergency numbers are routed through the L1 TAX of BSNL. This connectivity could be retained free of charge.

- c) For Fixed Users, Caller location will be based on the landline number address from Operator's database on query basis by PSAP or possibilities around push mechanism need to be explored.
- d) The location in case of mobile user will be as it is done now through location based system (SMLC/GMLC system). Priority routing / QoS can be assigned to specific Emergency numbers based on the Destination IP address or SIP URI.
- e) Unlike the conventional TDM networks, IP based interconnectivity can pose security risks / issues similar to traditional IP networks (denial of service, virus outbreak, attempts to hack etc.). These Security risks/issues and security controls for their mitigation are not covered in the paper and should be referred to TEC for detailed consultation.

\*\*\*\*\*