TRAI Consultation Paper (8/2014)
Migration to IP based Networks
30th June, 2014

Chapter 5: Issues for consultation

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.

Comments

Ericsson recommends IP inter-connection should be driven by market ecosystem. In our view, the IP-fication is not about *translation* of traffic/signalling at POI from non-IP to IP format. This is more about progressive evolution of networks to unified IP control plane & service layer with horizontal layered NGN architecture. The IP-fication of POI may not be a good starting point.

Roughly 40% of the CS networks of major telecom operators include conventional MSCs. First of all, there is a need to revamp the CS Core to MSC-Soft Switch & M-MGW architecture completely. Operators will transform these MSCs as per their Operational plans and business justification. The timeline for CS-Core augmentation to Soft Switch and M-MGW architecture may be fixed based on operators' feedback.

Once that is achieved, robust IP interconnections framework will become necessary with the uptake of Voice over LTE (VoLTE), which is a SIP-based IP voice service. GSMA is already working towards defining PRDs for IP interconnections and roaming agreements keeping this in view.

The exact time frame of mandating IP interconnections will depend on operator plans for complete migration of CS Core to distributed (Soft Switch & M-MGW architecture, if they wish so) and; LTE & VoLTE uptake in India. Even operators who have already launched VoLTE (e.g. Korean operators launched VoLTE in 2012) are still establishing interconnects on TDM (ISUP).

In our view, **IP interconnection should not be mandated, whereas** IP transformation of networks should proceed in the following manner –

> A.   Replacement of traditional MSCs with MSS architecture and M-MGW deployment in remaining part of TDM network.
> B.   IP-fication of Core with IMS control plane
> C.   Then we should move to IP-fication of POIs.
> D.   IP-fication of Metro and Access (in case of fixed-line networks).

These activities can be operationalized in parallel also depending on the life cycle stage of various operators.

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.

Comments

We suggest that operators, who have augmented their CS-Core on distributed MSS Soft-Switch architecture with M-MGWs deployed, should be given a choice whether to go for IP interconnections or to go for it after IP-based architecture (IMS) is implemented. There is a natural case for VoIP service providers to interconnect through IP based POI. While rest other TDM operators should be allowed to continue with TDM based POIs till there is a business viability to migrate to IP interconnection. Therefore, till such time, there will be coexistence of TDM and IP based interconnections in networks.

Both interconnects should be allowed as all operators will not move to Soft-Switch/M-MGW and IP voice (VoLTE/IMS) at the same time.

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

Comments

Covered in points 1) & 2).

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.

Comments

In continuity to previous comments, there will be a progressive uptake of IP based interconnection. We are of the view in Phase I, till CS-Core is fully augmented to Mobile Soft-Switch and M-MGW architecture, the scenario would demand peer-to-peer based IP interconnection between operators depending on their mutual business interest and understanding.

In Phase II, when Core network is transformed with IP-based architecture with unified control plane, Interconnect Exchange based interconnection would justify its case.

Later on, with growth in IP-based peering and VoLTE networks, IP peering via IP Exchange is expected to become the norm. The IP Exchange would be a single point for IP peering for both voice and signaling.

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.

Comments

We would suggest that IP Exchange should be implemented in distributed architecture due to the following reasons –

1. Lower latency and high traffic requirements for applications
2. Capacity inefficiency due to back & forth traversing of traffic.
3. Best practices requirements for BCP & DR frameworks.

In line with above metrics, IP Exchange may be kept at Circle level or Regional level with necessary redundancy.

Apart from technical drivers for the placement of IP Exchange, business needs will also drive the number and placement of IP Exchange.

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.

Comments

TRAI should stipulate essential QoS requirements and should leave this to market, business, and network requirements. The ecosystem will grow in response to traffic and QoS requirements. We don't suggest this to be a regulation area.

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.

Comments

For data applications, the existing usage minutes based interconnection charges would not be sustainable for data traffic, the way data traffic is increasing in the networks.

Interconnection charges for data should be based on parameters like - interface speed, usage volume and QoS requirements etc., akin to global practices in other markets.

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.

Comments

We would recommend option (d) The charging principle should be based on a combination of a) (a) Interface speed, (b) Usage volume based (c) QoS based.

Details as above in Q7.

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.

Comments

The charging principle should be based on a combination of (a) Interface speed, (b) Usage volume based (c) QoS based etc.

Details as above in Q7.

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?

Comments

The existing usage minutes based interconnection charges would not be sustainable for data traffic given the way data traffic is increasing in the networks. This should be based on interface speed, usage volume and QoS requirements etc.

Details as above in Q7.

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.

Comments

Flexibility should be there to accommodate different charging mechanisms like volume based, event based, time based, subscription based etc., and also subscribed QoS levels for various services & applications.

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.

Comments

QoS may be reviewed in view of IP based network services as and when IP/NGN transformation is achieved.

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.

Comments

QoS may be reviewed in view of IP based network services as and when IP/NGN transformation is achieved. As already stated before, IP transformation of networks should proceed in the following manner –

A. Replacement of traditional MSCs with MSS architecture and M-MGW deployment in remaining part of TDM network.
B. IP-fication of Core with IMS
C. Then we should move to IP-fication of POIs.
D. IP-fication of Metro and Access (in case of fixed-line networks)

In line with above, post completion of Phase B), ITU-T specified QoS benchmarks in ITU-T Y.1541 for various IP based services and applications may be adopted for QoS regulations. The details are provided below –

Network performance parameter	Nature of network performance objective
IPTD	Upper bound on the mean IPTD
IPDV	Upper bound on the $1 - 10^{-3}$ quantile of IPTD minus the minimum IPTD
IPLR	Upper bound on the packet loss probability
IPER	Upper bound

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?

Comments:

Post migration to IP/NGN architecture, Ericsson would recommend imposing the QoS in light manner for in Phase I (may be 2 years) and after 2 years QoS can be linked to mandatory compliance. The initial 2 years' period would help the operators to make the networks ready to meet the required QoS framework. We feel the following advantages by implementing the QoS in IP based Network:

1. Definitely end user will get benefitted
2. Bring more transparency to choose the Operator
3. Also helps the Operator to differentiate their services and increase their market share

ITU-T has specified QoS benchmarks for various services and applications which may be included in the new regulation.

The details are provided below –

Network performance parameter	QoS Classes							
	Class 0	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6	Class 7
IPTD (ms)	100	400	100	400	1000	U	100	400
IPDV (ms)	50	50	U	U	U	U	50	50
IPLR	1×10^{-3}	1×10^{-3}	1×10^{-3}	1×10^{-3}	1×10^{-3}	U	1×10^{-5}	1×10^{-5}
IPER	1×10^{-4}	1×10^{-4}	1×10^{-4}	1×10^{-4}	1×10^{-4}	U	1×10^{-6}	1×10^{-6}

ITU-T Y.1541 Benchmarks

Segment-wise targets for Access, National Long Distance, and International segments can be set as per allocation approach mentioned in the ITU-T.

For access part in LTE mobile network, the 3GPPP has recommended benchmarks for LTE as follows.

Network performance parameter	QoS Classes							
	Class 0	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6	Class 7
	Synchronization	IMS Signaling	Real Time Gamming, Conversational Voice	Voice • Video (Live Streaming) •Interactive Gaming	Video buffering stream/ Non-Conversational Video (Buffered Streaming)	www, e-mail, chat, FTP, P2P file sharing FTP, P2P file sharing	Video (Buffered Streaming) TCP-based (for example, www, e-mail, chat, FTP, P2P file sharing, progressive video, etc).	
IPTD (ms)	100	100	50	100	300	300	300	300
IPDV (ms)	10	10	10	20	30	30	30	30
IPLR	1×10^{-6}	1×10^{-6}	1×10^{-3}	1×10^{-3}	1×10^{-6}	1×10^{-6}	1×10^{-6}	1×10^{-5}
IPER	1×10^{-7}	1×10^{-7}	1×10^{-4}	1×10^{-4}	1×10^{-7}	1×10^{-7}	1×10^{-7}	1×10^{-6}

3GPP Benchmarks

The above benchmarks are applicable to IP based LTE network between eNode to EPC. Specific to LTE networks, we recommend adopting 3GPP benchmarks, because most of the operators would be tracking 3GPP QoS parameters to maintain Radio Network KPIs.

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.

Comments

The monitoring mechanism can use both Active as well as Passive measurement methodologies. However, practically the granularity of QoS monitoring can be Service-class wise not individual user based. The testing can be done by third party or taken up by TRAI itself.
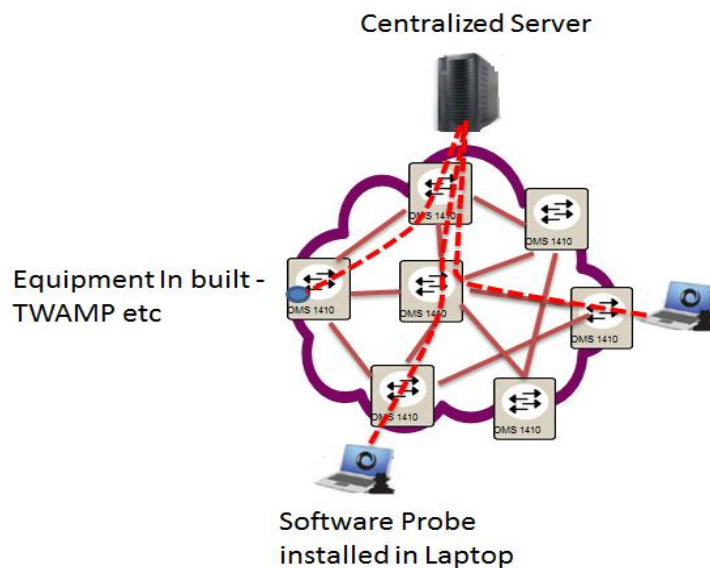
Figure-1

The testing can be done through a software probe embedded in to a centralized machine or through an equipment in-built Two-Way Active Measurement Protocol (TWAMP) mechanism.

With setup proposed in Figure-1 there will be Server at central locations and can send the packet with different Class-marking into the network, S/W Probe agents in PC or Equipment inbuilt tool will receive the packet send by the server and reply back to the servers. Based on the packet flows between the Server & Software probes Network Performance can be evaluated. Recommended to cover at least 10 to 15% of the nodes in a month and perform the testing in the Network Busy Hour (NBH). Operator can view the monthly Network Performance Parameters from the Centralized Server.

With evolution of cloud technology, a single server can also be used for all the operators. If all the Nodes have inbuilt feature, operator intervention will not be required, and TRAI can have testing setup through cloud and all the operators' network performance can be assessed.

Justification: Proposed solution is based on the Software Probes and Node in-built features so operators don't need to invest much capex to monitor the QoS. Also this is easy to conduct the test because test can be performed remotely.

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.

Comments

Sharing should be allowed for both core and access networks.

- Challenges: QoS, Charging, Security,
- Opportunities: Cost saving, Time to Market, ease of entry and exit

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

Comments

Suitable mapping mechanism of E.164 to SIP URI or IP needs to be developed.

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.

Comments

ENUM needs to be considered.

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?

Comments

Public Infrastructure ENUM, through DNS based mapping of E.164 number to ENUM URI & IP address.

Q20. 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.

Comments

Yes. Emergency number is an essential service irrespective of TDM or IP architecture.

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

Comments

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. 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.

———————