
REGULATION ON QUALITY OF SERVICE FOR VOIP BASED INTERNATIONAL LONG DISTANCE SERVICE, 2002

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In exercise of the powers conferred upon it under sub-clause (b) (v) of sub-sec. (1) of Sec. 11 of TRAI (Amendment) Act, 2000 in regard to laying down the standards of quality of service to be provided by the service providers, the Telecom Regulatory Authority of India hereby makes the following Regulation :

1. Short title, extent and commencement :-

(i) The title of this regulation shall be Regulation on Quality of Service for VOIP based International Long Distance Service, 2002'

(ii) This regulation shall be applicable to all the International long Distance Service Providers using VOIP based networks.

(iii) This regulation shall come into effect from the date of its notification in the Official Gazette.

2. Definitions :-

In this Regulation, unless the context otherwise requires:

(i) "Act" means the Telecom Regulatory Authority of India Act, 1997 , as amended by, TRAI (Amendment) Act, 2000 and as amended from time to time.

(ii) "Authority means the Telecom Regulatory Authority of India.

(iii) "MOS" means Mean Opinion Score, a subjective measure of

speech quality as defined in ITU-T Recommendation P.800, 'Methods for Subjective Determination of Transmission Quality, August 1996'

(iv) "Regulation" means the regulation on Quality of Service for VOIP based International Long Distance Services notified by the Authority under the 'Act'.

(v) "R-Value" is the objective measure of speech quality denoted as the resultant value of the Transmission Rating Factor' as defined in ITU-T Recommendations G.107, 'E-Model, Computation Model for Use in Transmission Planning, August 2001' and G-108, 'Application of the E-Model, A Planning Guide, September, 1999'.

(vi) "Service Provider" in the context of this regulation means a legal entity holding an ILD licence.

(vii) "Quality of Service (QoS)" means the indicator of performance of a network and of the degree to which the network conforms to the stipulated norms.

(viii) "Voice over Internet Protocol (VOIP)" means a technology that enables the carriage of real time voice traffic over a packet network by using Internet Protocol (IP).

(ix) Acronyms and Abbreviations

3. Objective of laying down Quality of Service Benchmarks

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The objective of laying down Quality of Service benchmarks is to :

(i) Ensure customer satisfaction by laying down standards of network performance, which the service provider is required to achieve by proper engineering of his network.

(ii) Measure the Quality of Service from time to time and to compare that with the specified norms so as to monitor the level of performance, provided by various service providers' networks.

(iii) Protect the interests of subscribers of the ILD services in regard to Quality of Service, particularly a minimum level of voice quality, which he expects, when he marks an ISD call and pays for it.

4. Quality of Service Benchmarks for ILD networks engineered by employing VoIP technology :-

4.1 Determination of QoS:

4.1.1. End-to-End QoS Parameters The ILD segment of the network will be engineered to meet the following end-to-end service quality parameters:

4.1.1.1. Toll Quality Networks:

MOS greater than 4 or R-value of 80 or higher

One-way end-to-end delay less than 150 ms

Packet loss not to exceed 0.1%

Jitter should not exceed 5 ms

Transparency to DTMF tones

Services covered in addition of voice to include: G3 Fax; voice-band modem @14.4 kbps or higher

4.1.1.2. Below Toll quality Networks :

MOS 3 or R-value of 70 or higher

One-way end-to-end delay 400ms

Packet loss not to exceed 2%

Jitter not to exceed 10 ms

4.1.2. VoIP ILD Equipment Performance : From the end-to-end performance parameters specified above, the contribution of the ILD segment of the end to end connection in regard to parameters specified in prepara shall be as indicated below :

4.1.2.1. Toll quality :

MOS 4 or R-value of 80 or higher

One-way IPTD (IP Packet Transfer Delay) 50 ms

Transparency to DTMF tones

Services covered in addition of voice to include: G3

Fax; voice-hand modem @ 14.4 khps or higher. 4.1.2.2. Below Toll quality :

MOS 3 or R-value equal or greater than 70

One-way IPTD (IP Packet Transfer Delay) 150 ms

4.2 Test and Measurement Setup. The measurement set up and

methodology is described in the following paragraph. Apropos the reference network configuration described in Figure-4.1, the measurements required at the maximum traffic handling capacity over various interface spans and the expected results are indicated in Table 4.2. The network configuration should be similar to the actual network deployed by the ILDO in terms of the number of nodes and transmissions links. Figure 4.2 depicts the test setup along with the measurements to be made. The national PSTN sections can be realized by using real telephone switches deployed in the network of BSO and NLDO. For International section, the two mated setup's offered by the ILDO can be connected via looped back transmission links over the actual physical facility whether fiber or satellite - or via simulated delay links. In the case of end-to-end measurements, the test equipment is to be connected to reference points X1 and X4 while in the case of VoIP section; measurements could be with reference points X2 and X3 (see figure 4.2). In both the cases, the International transmission link has to be looped back. Two-stage testing is prescribed - lab tests and pre-commissioning (in situ) tests. All the measurements as given in the following Table shall be conducted in each testing state. In the first stage, i.e. lab testing state, the tests and measurements shall be conducted only on the VoIP set up offered by the ILDO in the lab or at ILDO's actual VoIP installation but the equipment shall not be connected to the PSTN/ISDN/PLMN. In contrast, pre-commissioning test shall be conducted in situ over the VoIP section as well as the entire International connection in the actual inter-connection scenario. It may be noted that the second stage of testing may not be taken up if the equipment does not pass the lab tests and measurements.

Span	Description	Parameter	Value For Toll Quality Service	Value for Below Toll Quality Service	Method.
1	2	3	4	5	6
X2-X2	ILD segment employing VOIP techniques (excluding transmission delay)	Packet Delay Jitter Packet Loss R-Value R-Value	$\leq 50\text{ms}$ $\leq 5\text{ ms}$ $\leq 0.1\%$ 80 4	$\leq 150\text{ms}$ $\leq 10\text{ ms}$ $\leq 2\%$ 70 3	Individual parameters measured by using IP analyzer plus the Aggregate measure (MOS or R-value)
X1-X4	End to End	Delav R-	< 150 ms	< 400 ms	Aggregate measure

Parameter	End-to-End	Category	End-to-End	End-to-End	Aggregate measure (MOS or R-value)
	International Connection of which ILD segment is a subset	Value MOS Jitter Packet Loss CCS 7 Signalling Delay	80 4 □ 5 μσ □ 0.1% Ασ περ Θ.709.	70 3 □ 10 μσ □ 2% Σαμε ασ φορ Τολλ θυαλιτψ.	CCS7 Signalling Analyzer

The terminating PSTN and VoIP Sections in another country are outside the purview of our national administration and as such have to be simulated. For the complete end to end international connection and the ILD segment, commercially available voice quality monitoring tools are recommended for dynamic measurement of the R-value or MOS at the end of each call. PSTN/ISDN/PLMN call samples are automatically collected by these tools and the R-value or MOS are computed in each case. It would be necessary to make sure that during these measurements, the VoIP equipment is loaded up to its rated BHCA with the help of a telephony traffic simulator. In the case of end-to-end tests, the actual interconnection path offered by the service provider should be used and measurements made during the peak and off-peak hours. In addition to the above, for Toll Quality service end to end through tests are to be conducted by making International telephone calls, sending fax messages, sending DTMF tones to an IVR system and by sending data via voice band modems over the complete end to end International connection described above. The end-to-end CCS7 signalling delays can be measured using a CCS7 protocol monitor and noting the message time stamp at the first and the last PSTN/ISDN/PLMN node. The values should be within the values mandated in Q. 767 and Q.709 and calls should be successful. The individual parameter measurements on the VoIP section should be made with a suitable Internet Protocol analyzer. The traffic up to the maximum traffic handling capacity of the VoIP equipment can be generated with a telephony traffic simulator. The call Completion Rate (CCR) should be as mandated under Clause 4(i)(7) of Section IV of the TRAI Regulation on Quality of Service of Basic and Cellular Mobile Telephone Services, (2 of 2000) dated 5th July 2000, as modified from time to time. The packet size and the payload-to-header ratio should be varied by employing various speech codecs offered by the Implementation Under Test (IUT) in the gateway.

4.3. Testing Agency. The testing agency shall be the Telecommunication Engineering Centre of Ministry of Communication.

5. Review :-

(i) The QOS parameters given in Section IV maybe reviewed by the Authority from time to time.

(ii) The Authority, on reference from any affected party, and for good and sufficient reasons, may review and modify this Regulation.

6. Over-riding effect :-

Wherever higher quality parameter has been stipulated as a

condition of license, the QOS as required by the license will override the parameters given herein.

7. Interpretation :-

In case of disputes regarding interpretation of any of the provisions of this Regulation, the provisions of this Regulation, the decision of the Authority shall be final and binding. □