Consultation Paper No. 2001/3

-
-

TELECOM REGULATORY AUTHORITY OF INDIA
NEW DELHI.

CONSULTATION PAPER ON " QOS OF DIALUP ACCESS NETWORK FOR INTERNET'

DATED OCTOBER 8, 2001

TELECOM REGULATORY AUTHORITY OF INDIA
A-2/14, Safdarjang Enclave
New Delhi-110029
E-mail : trai@del2.vsnl.net.in
Fax : 6103294

Preface

Internet is a network of networks encompassing the globe by providing seamless interconnectivity between diverse data networks. It has blurred the geographical boundaries between countries and is seen as contributing to the economic growth of the countries by providing numerous applications for the benefit of the users. The first Internet service in India was started on 15th August 1995 by VSNL Private participation started in November 1998, subsequent to the decision of the government to open up Internet to private participation. Currently there are three categories of ISPs viz. A, B & C catering to more than 3 millions of Internet Subscribers.

TRAI had conducted an on-line customer survey on the problems faced by Internet users in India. Poor quality of dialup access was one of the major problems raised by the respondents in the survey. The major problems encountered by the users include delay in access, slow response unstable connection, and occasional non-availability of the internet accounts due to capacity constraints.

By and large, Internet has been unregulated throughout the world and the quality of service parameters are still being developed even at the standard setting bodies such as ITU and IETF. Till now, except IDA Singapore, no other regulator is known to have fixed the quality norms for Internet dialup service. However, in an attempt to address the quality issues in the overall interest of growth of Internet Services and customer satisfaction, TRAI has initiated the first step towards streamlining the quality norms so that accountability of ISPs and BSOs, towards the users can be established under regulatory supervision.

In accordance with the established practice of public consultations, TRAI is issuing a Consultation Paper elaborating the issues and underlying concepts and shall hold consultations with the stake holders such as BSOs,

ISPs, Consumer Organizations, consumers and the general public, in order to get feedback with the objective of framing realistic benchmarks for the quality of service parameters.

This paper has been posted on the website of the TRAI **(www.trai.gov.in)** and those wishing to respond to the issues raised herein or on any other issue relating to quality standards for internet services in India may respond by e-mail or ordinary mail/fax at the address given below.

I hope this Consultation Paper would generate useful inputs from all stakeholders. I request that written comments on this Consultation Paper may please be furnished to Secretary, TRAI by the 30th October 2001. For any further clarification of the matter Advisor (CN), TRAI may be contacted at Phone Nos. 6167914 **(E-mail: trai09@bol.net in)** or Deputy Advisor(CN) at 6167024 (E-mail –**trai13@bol.net.in)** and Fax No. 6103294.

(M. S. VERMA)
CHAIRPERSON

New Delhi

October 8, 2001

CONTENTS

Page No.

1. NTRODUCTION **5**

2. ISSUES RELATING TO QUALITY OF SERVICE (QOS) ON DIAL UP ACCESS THROUGH PSTN **7**

3. DIAL-UP ACCESS PORTS POOL **8**

4. PROBLEMS RELATING TO REMOTE ACCESS SERVER (RAS)

5. QoS DEFINITIONS **11**

6. INTERNATIONAL EXPERIENCES **13**

7. BENCH MARKING FOR QOS PARAMETERS FOR DIAL UP ACCESS **14**

8. POINTS TO BE DISCUSSED IN THE PUBLIC CONSULTATION PROCESS **15**

QOS OF DIAL UP ACCESS NETWORK FOR INTERNET

1. INTRODUCTION:

Internet is a network of networks encompassing the globe by providing seamless interconnectivity between data networks. Internet has blurred the geographical boundaries between countries and is seen as contributing to the economic growth of countries by providing various types of applications for the benefit of users. The first Internet service in India was started by VSNL from 15th August 1995 and subsequently the Government decided to open up the Internet to private participation. The private participation started in November 1998. ISP licenses were issued providing for unlimited competition in all the three categories at service areas such as `A', `B' and `C'.

The ISP licence condition 7.6 of Schedule `C' states that the `Quality of Service' is not being defined for the time being. However it may be defined at a later date based on the experience gained and inputs from "Internet Engineering Task Force (IETF)".

TRAI had conducted a customer survey on problems faced by Internet users in June 2000. The survey was based on the response received from users to a questionnaire. Subjective views were obtained from Internet subscribers on

problems faced in getting connected to Internet node and in downloading information from various sites etc. Replies were received from 468 Internet users across the country. It was seen that poor Quality of dial up access was one of the major problems faced by the customers. Users encounter problems relating to access through the dial up connection provided by the BSOs including MTNL/BSNL through their local network (PSTN). The problems faced include delay in access, slow response and unstable connection besides those about occasional non-availability of Internet accounts due to capacity constraints. Such complaints can arise due to congestion in the international or the national access segment, inadequate dial up ports or deficiencies in point of presence (POP) equipment configuration and lack of synchronization in the local switches which are connected to the POP. In addition, other complaints may include such as repeat attempts required to connect to the Remote Access Server (RAS), no reply condition, all circuits on the circuit group on 172XXX level being busy, causing annoyance to the subscribers. This survey along with ISP performance monitoring reports, submitted by all the ISPs on a quarterly basis, provided the required inputs to initiate an exercise to fix norms for Quality of Service for Dial Up Access to the ISP node.

2. ISSUES RELATING TO QUALITY OF SERVICE (QOS) ON DIAL UP ACCESS THROUGH THE PSTN:

For accessing Internet through Dial-up, two options are available to the customers viz. (i) PSTN Dial-up; and (ii) ISDN Dial-up. The end user's system is connected to an ISP node through a switched circuit completed by the dialling action of the modem. The end user may have a simple PC with a modem or a Local Area Network (LAN) connected to the ISDN through an ISDN enabled `Router'. The schematic diagram for Dial up Access on PSTN network is shown below:

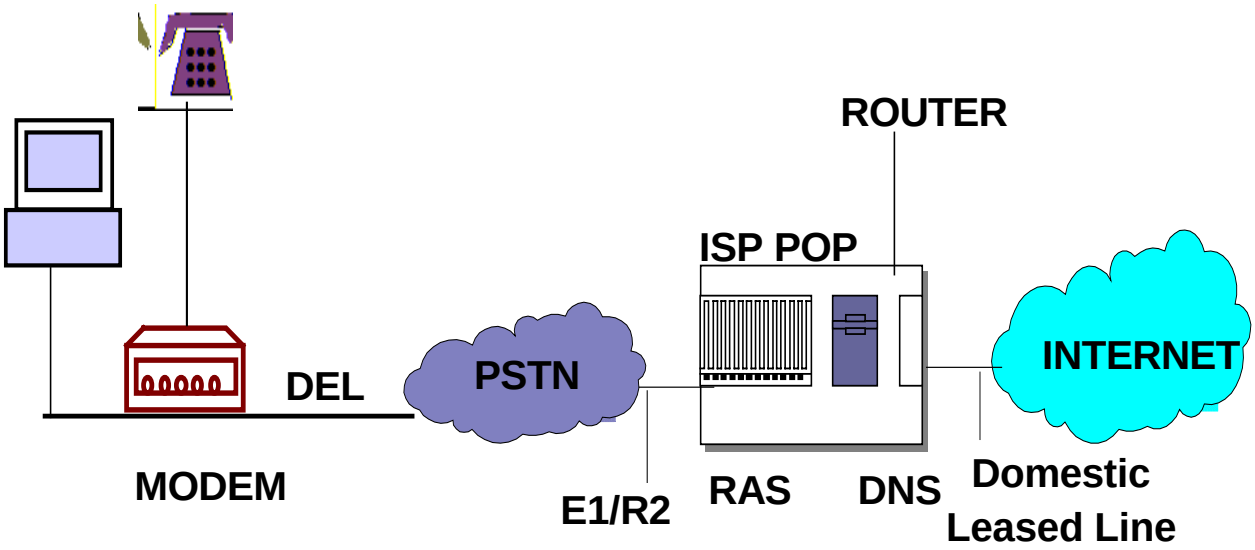

Fig.1 Typical Dialup Access Through the PSTN

3. DIAL-UP ACCESS PORTS POOL:

As shown in the above diagram, the subscriber accesses the ISP Node (POP) by dialling through his modem which is connected through a DEL (Direct Exchange Line). The PSTN cloud for a local telephone system consists of local exchanges interconnected through higher-level tandem's as shown in Figure.2. Generally, the Remote Access servers are connected to the outlets of Tandem exchanges by E1 links on code 172xxx. The Internet Service Provider leases E1 junctions from the BSOs (including MTNL/BSNL) to connect his node to the tandem exchange/local exchange. Congestion in the PSTN cloud shown in Figure 1 can happen in the Local Exchange (LE), or on the Junction between Local Exchange & Tandem Exchange and on the E1 links connecting the Tandem exchange to the ISP POP. In addition, there can be failure in the handshaking process of two modems (subscriber and ISP end), in case of different speed settings of the two modems and other incompatibilities. Even after handshaking is complete between the two modems, the Server (RAS) may not respond and the attempt to access the Internet could be frustrated, leading to repeat attempts, which may further worsen the problem of congestion in the PSTN cloud.

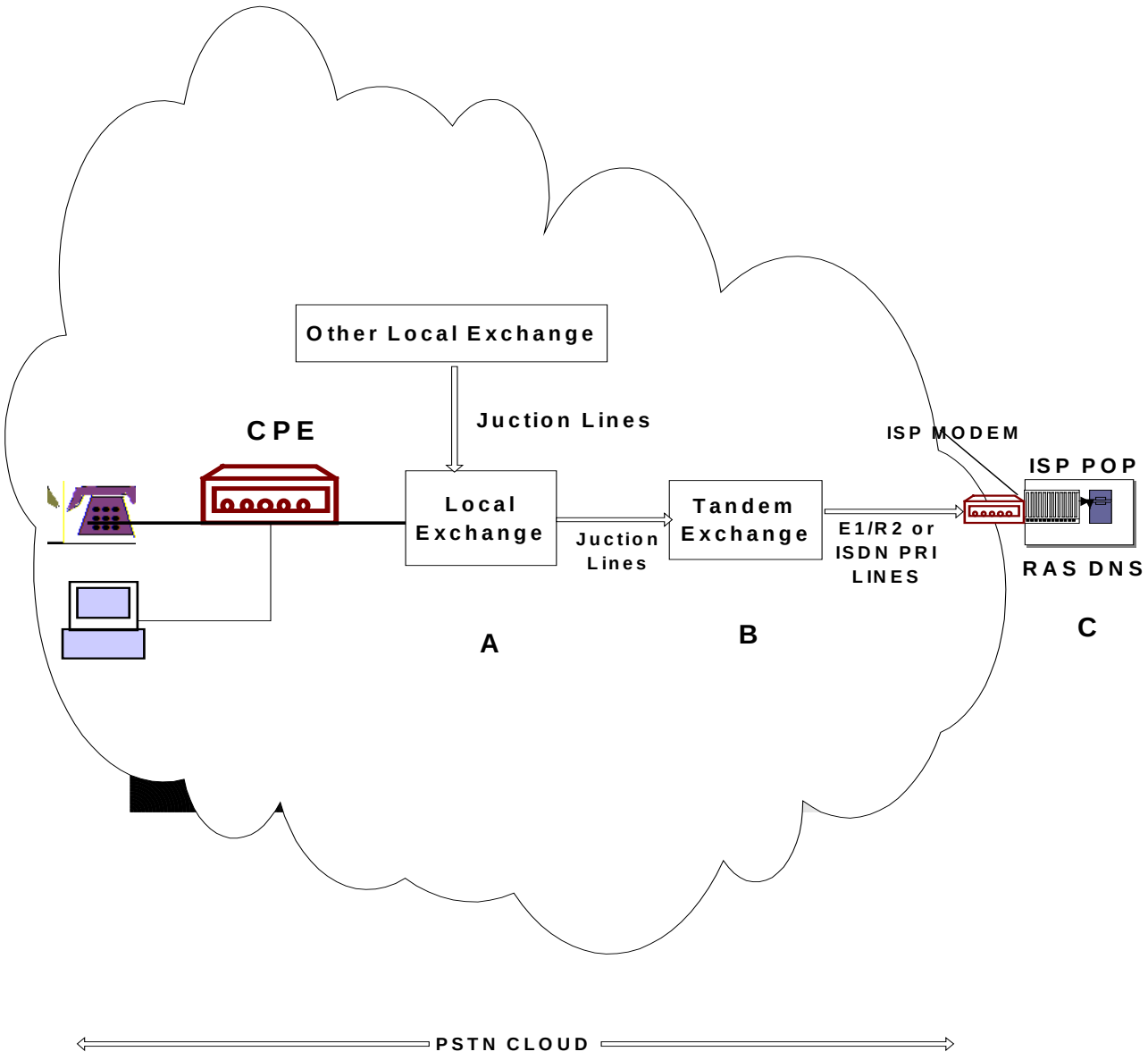

Figure-2

Generally, a pool of access ports, which are modems connected to a Server called RAS is provided as a pool of resources for the entire population of dial up subscribers. One of these ports is used by a dial up subscriber in case he

seizes a circuit at the outlet of the Tandem Exchange, which is part of the E1 link connecting the tandem exchange to the ISP POP as shown in figure 2 above. The dial up call seizes one of the time slots or PCM circuit to get connected to a modem mounted in the RAS. The call is answered by the modem and handshaking takes place based on the protocols (V series) of the two modems, one part of CPE and the other mounted on the RAS of the ISP. Since the resources in the PSTN cloud are engineered based on well known dimensioning rules such as Erlang's formula, the number of E1 time slots could be dimensioned to ensure a `Grade Of Service' on the link between the TANDEM EXCHANGE and the ISP node i.e. RAS which is a circuit group on level 172xxx. At present, a thumb rule approach is adopted by the service providers. For example, an ISP may be using a port ratio of 1:20, which means on an average for each group of 20 subscribers one outlet on the PCM link is provided, irrespective of traffic originated by each of them. This thumb rule approach may mean either over or under provisioning of resources of the E1 link and/or RAS. Further, congestion management may pose a problem.

The issues for discussion in this connection are:

(i) (i) Since the link between Tandem exchange and the RAS is junction group of PSTN, it appears logical to adopt an engineering approach instead of a rule of thumb approach. Is there a valid reason for not adopting the Erlang's formula to engineer the PSTN link connecting the tandem exchange to the RAS?

(ii) (ii) Whether it is possible to measure the offered traffic on level 172xxx and Grade Of Service on the junction group connecting the Tandem or Local Exchange with the ISP Node by suitable Man Machine command in the SPC exchanges of the BSO, to enable proper measurement of “Grade Of Service” on the link connecting the Tandem Exchange and the RAS.

4. PROBLEMS RELATING TO REMOTE ACCESS SERVER (RAS):

When a PSTN subscriber dials the 172xxx code and accesses the RAS, the server of the ISP, the response from the RAS server could be either to “reject *access”* or to “accept *access*”.

The access is rejected because the handshake of the two modems due to total incompatibility. Access may be slow when the modems of CPE and the RAS has some incompatibility and results in delay due to delay in handshaking of the two modems.

The issues for discussion in the context of this type of failures are the following: -

(i) (i) It is understood that different modem speeds at both ends can cause delays and failure in accessing the ISP node. What can be the remedy for this?

(ii) (ii) How is it possible to identify and isolate the problems relating to failure of handshaking and take corrective action?

(iii) (iii) Incompatibility between the client software at Customers Premises Equipment and the Server Software can result in failure to access the ISP node. What can be the remedy for this?

5. QoS DEFINITIONS:

ITU-T E800/3312 defines various parameters with respect to QOS on telecom networks as indicated below::

5.1 Service Accessibility Performance:[XS1]

"The ability of a service to be obtained, within specified tolerances and other given conditions, when requested by the user. This takes into account the transmission tolerance and the combined aspects of propagation performance, trafficability performance and availability performance of the related systems".[XS2]

5.2 Time To Access/ Mean Access Delay

"The *expectation* of the *time duration* between the first *call attempt* made by a *user* of a telecommunication network to reach another *user* or a *service* and the *instant of time* the *user* reaches the wanted other *user* or *service*, within specified tolerances and under given operational conditions".[XS3]

5.3 Reliability Performance

"The ability of an *item* to perform a *required function* under given conditions for a given *time interval*. It is generally assumed that the *item* is in a state to perform this *required function* at the beginning of the *time interval*. The term reliability is used as a measure of reliability performance".[XS4]

5.4 Mean Time Between Failures (MTBF)[XS5]

"The *expectation* of the *time between failures"*.

5.5 Mean Time To Restoration (MTTR); Mean Time To Recovery; Mean Time To Repair [XS6]

"The expectation of the time to restoration".

6. International Experience:

Inforcomm Development Agency (IDA) Singapore regulates the QOS of ISP service providers requiring them to submit quarterly reports of their service quality. Surveys are also conducted to monitor customers satisfaction and to get customer feed back to improve the service, from time to time. Based on these surveys IDA interacts with ISPs to diagnose the problem and to take corrective action.

IDA has specified the following benchmarks for Quality of Service for Internet Access:

Table-1

INTERNET ACCESS SERVICES	VALUE
Network availability	Over 99.5%
System accessibility: • Dial-up access • Leased-line access	 Over 95% Over 99%
Service Activation Time from date of receipt of application: • Dial-up access • Leased-line access	 3 working days or less 7 working days for less

7. Bench Marking for QOS Parameters for Dial Up Access:

Based on the discussions in the previous sections the Authority proposes to benchmark parameters relating to Accessibility, Reliability, Provision of service and Service operatability. It is proposed to specify targets for short-term and long-term, as the desired QOS is to be achieved gradually, in phases. These are indicated in the table below for soliciting the views of the stakeholders:

Table-2

	Domain/Service Indicators of PSTN dial up	**Short term** (To be achieved within 6 months)	**Long term** (To be achieved within 12months)	**Remarks**
A	**Service Activation Time** (from date of receipt of application along with requisite payment)	3 working days	2 working days	
B	**Service Accessibility**			
	I) Time to access (connection set up time including handshaking)	40 sec	25 sec	
	II) Number of dial attempts required			
	a) First attempt	70%	80%	
	b) Second attempt	80%	90%	
	c) Third attempt	95%	99%	
	III) ISP related Faults per 100 subscriber per month	5	3	
	IV) Server Outage/Month	1 hr	30 min	
	V) Grade of Service between PSTN node and ISP node	0.01 (1 in 100)	0.002 (1 in 500)	

8. POINTS TO BE DISCUSSED IN THE PUBLIC CONSULTATION PROCESS:

1. TRAI has issued QOS regulations in respect of availability and reliability in the case of basic/mobile services. Would it be desirable to issue, right at this stage, regulations for the Internet also as far as these relate to dialup access, reliability and availability of PSTN link as well as the ISP node ? Can such regulations be expected to improve the quality of dialup access, reliability and availability of Internet service and contribute to the growth of Internet service in the country ?
2. Since the link between tandem exchange and the Remote Access Servers (RAS) of the Internet Service Provider (ISP) is just like an interexchange junction, will it not be more logical to apply the same rules of dimensioning as applicable to similar junctions in the PSTN cloud? Such an approach instead of a rule of thumb approach will perhaps enable the link between PSTN & the ISP node to be properly engineered to provide a grade of service of say 1 in 100 and to avoid congestion. Please comment.
3. From the inputs received from various stakeholders and our own analysis, it would appear that incompatibility between modem at the customers premises and its corresponding modem at the ISP node causes a large number of failures on dial up Internet Access. What corrective actions should be taken to resolve this problem of incompatibility between CPE & Front End Equipment of ISP node?

4. Apart form the problems of incompatibility between the CPE and front end equipment , whether any problem in the back end equipment of ISP node, such as Servers/Routers, can also cause problems of unstable connection and slow response? Please comment.

5. Lack of synchronization in the Public Switched Telephone Network (PSTN) employing digital switching and transmission network elements can also contribute to unstable dial up connections. How far lack of synchronization in the PSTN cloud contributes to unstable dial- up connections? Please comment.

6. Some benchmarks have been proposed in tables 1 & 2 relating to Internet service provision and dial-up access. Do we need to modify these benchmarks to suit the Indian environment?