Response to the 'CONSULTATION PAPER ON BANDWIDTH REQUIRED FOR ISPS FOR BETTER CONNECTIVITY AND IMPROVED QUALITY OF SERVICE dated January 15, 2009'

LIRNE*asia* and the TeNet group of IIT Madras thank Telecommunication Regulatory Authority of India (TRAI) for the opportunity to present this response. We have been involved in conducting broadband quality testing in India, Bangladesh and Sri Lanka since January 2008 using a methodology designed for local conditions. The recommendations are largely based on the outcome of this work.

For convenience the points are addressed in the same order they appear in the paper.

1.0 Contention Ratios:

1.1 Broadband: We recommend maintaining ratios between 1:20 and 1:50, following standard practice in the UK, for both business and residential customers. We do not specify a figure for leased lines as it is more a unique agreement between the operator and user.

Justification/explanation:

The ideal contention ratio depends on many factors, such as the most commonly used applications, the daily average volumes of downloaded content, the number of links further shared at the customer premises, etc.. Hence specifying an exact figure is not as straightforward as it may appear.

We note the following:

i. Most business connections are shared. This is not the case with most residential links. Therefore, it makes sense to use a lower ratio for business links. However, this does not justify a difference as big as 1:20 versus 1:50.

ii. An exception to (i) may be justified if the volumes of data downloaded by residential users are higher on average. Then the demand can be on par or higher in the residential sector. As capped packages with lower charges are the most popular, we do not believe India has reached this stage. Such a trend is not shown in our Quality of Service Experience (QoSE) test results of two widely used broadband packages in India in February and October 2008.

iii. Contention ratio of 1:50 is meaningful only when considering large subscriber base. For smaller subscriber base (say few hundreds) this contention ratio will degrade the Quality of Service Experience by the subscriber. Hence we suggest to specify the contention ratio along with the minimum subscriber base.

iv. Contention ratio is defined assuming non-blocking in the internal network of ISP. In Tier-2 cities and rural, backhaul that connects the access device to the aggregation network can be the source of congestion. This factor needs to be considered when defining the contention ratio for Tier-2 cities and rural.

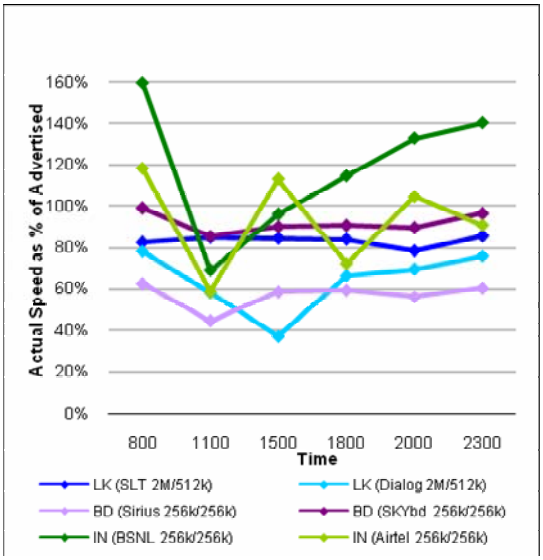
v. One possible approach may be to introduce multi tier packages. The operators can charge higher for users under 1:20. Then those are less quality conscious can settle for the other package, which also consider the factors mentioned above. However, the users should know the difference and what it means.

1.2 Dial-Up and High Bandwidth services: We have no comments as these are outside the scope of our present research.

2.0 Impact of defining contention ratios:

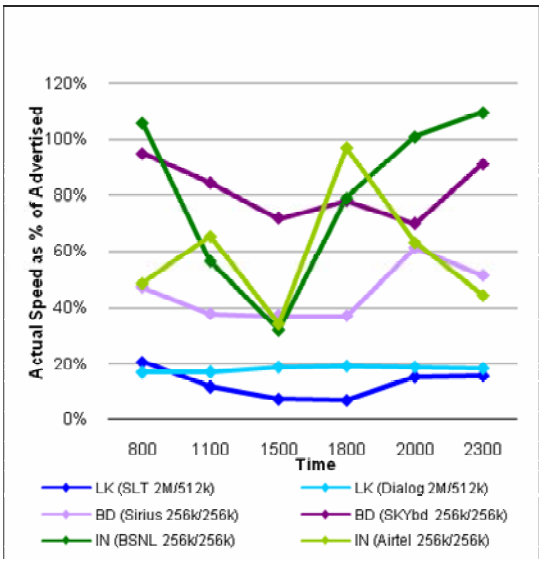
Our test results have shown gaps between the advertised and actual (delivered) speeds of most packages. In the test results of October 2008, the two Indian operators (BSNL and AirTel – tested in Chennai) performed better than most of their counterparts in Dhaka and Colombo (Figures 1 & 2). However, there is no cause for complacency as the BSNL 256k/256k package at business peak (around 11.00 am) and the AirTel 256k/256k package at both business and residential (after 8.00 pm) peaks showed sharp deteriorations in quality. These drops are significant particularly when accessing international sites (in this case tested with yahoo.com)

Figure 1: Throughputs of selected broadband packages in India, Bangladesh and Sri Lanka (Download from ISP)



Source: LIRNEasia test results, Oct 2008

Figure 2: Throughputs of selected broadband packages in India, Bangladesh and Sri Lanka (Download from yahoo.com)



Source: LIRNEasia test results, Oct 2008

Imposing contention ratios and monitoring the total available bandwidth at the gateway will certainly improve the situation but that would not be adequate, since the service provider groom and aggregate different package's traffic before sending it to the gateway Hence, It is a necessary but not sufficient condition.

Without regular monitoring, a mandated contention ratio will not yield the anticipated results. Having no access to the operator's network, information on contention ratios will not be available to broadband users. Hence it is essential that they are educated on the promise – in terms they can easily understand and measure (e.g., minimum anticipated speeds). Operators should be encouraged to use easily understandable and verifiable terms in their advertising.

3.0 Other recommendations:

i. **Broadband quality should be seen holistically and should not be confined to download/upload speeds as normally specified by the operators:** Apart from the throughput parameters, delay and loss parameters too are critical depending upon the nature of the application (Table 1). Any meaningful approach should aim to improve all dimensions– and not just the throughput.

Table 1: Relevance of quality parameters

	Throughput		Delay		Loss
Service	Download	Upload	RTT	Jitter	
Browse (text)	↑	-	↑	-	-
Browse (media)	⬆	-	↑	↑	↑
Download file	⬆	-	-	-	-
Transactions	-	-	↑	↑	-
Streaming media	↑	-	↑	↑	↑
VOIP	↑	↑	⬆	⬆	⬆
Games	↑	↑	⬆	↑	↑

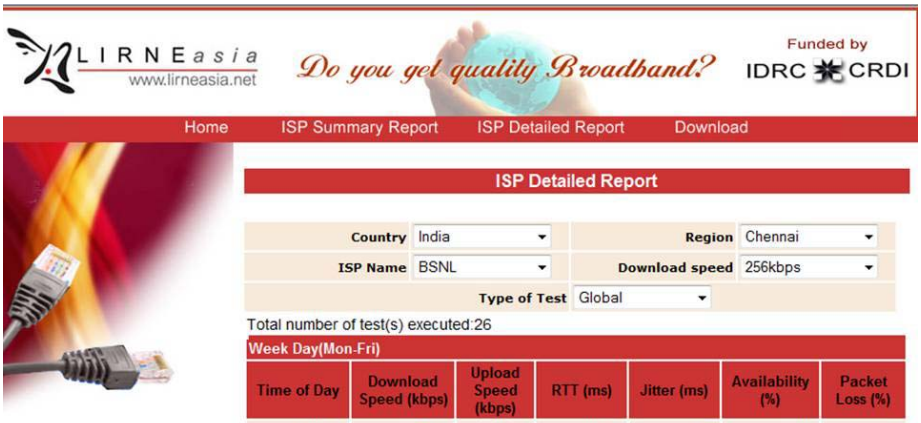
⬆ highly relevant ↑ very relevant ↑ relevant - not relevant

ii. **User education/empowering should be promoted:** The Regulator's intervention in ensuring broadband quality is commendable. However, that would not be complete unless supplemented by a parallel approach at the user end.

LIRNE*asia* and the TeNet Group have jointly developed AT-Tester, an open source based software application any user can download from the site www.broadbandasia.info to test the broadband link. The results are uploaded to generate an overall package/operator performance profile. This exercise ensures that a user is empowered with knowledge of the comparative performance of widely available broadband packages in the market.

We also plan to build that capability for wide participation by users in providing broadband performance information to our database, so that we draw the complete picture, how each operator and package performs, (a) at different time of the day; (b) on different dates (week days vs. weekends) and (c) on different regions/areas .

Figure 3: Sample test report from broadbandasis.info (BSNL 256/256 kbps link tested in Chennai)



ISP Detailed Report

Country	India	Region	Chennai
ISP Name	BSNL	Download speed	256kbps
Type of Test	Global		

Total number of test(s) executed:26

Week Day(Mon-Fri)

Time of Day	Download Speed (kbps)	Upload Speed (kbps)	RTT (ms)	Jitter (ms)	Availability (%)	Packet Loss (%)
8:00 AM	271.08	108.49	296.25	1.35	100	0
11:00 AM	210.2	72.12	329.6	10.78	100	0
3:00 PM	82.33	60.5	336.5	6.15	90	10
6:00 PM	202.6	99.25	325.25	16.8	100	0
8:00 PM	258.63	101.85	313.5	8.63	95	5
11:00 PM	280.64	108.29	298.5	5.85	100	0

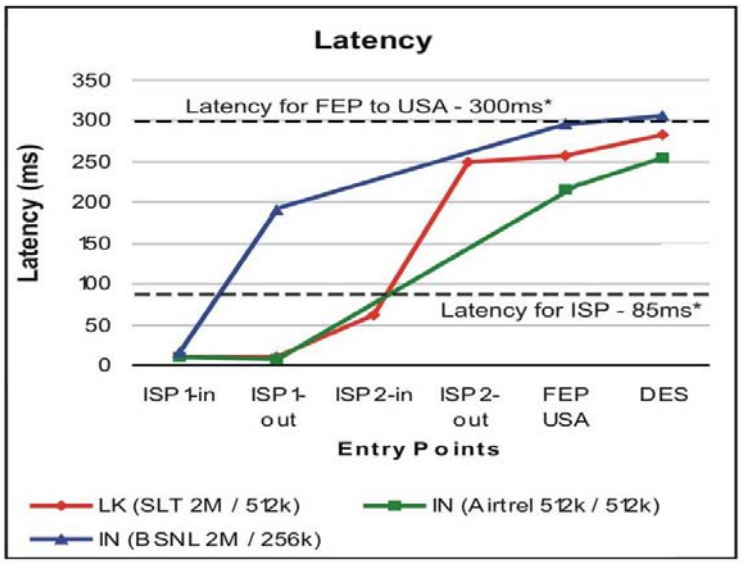
iii. **Advertising standards for the operators should be defined:** Misleading advertising of broadband speeds has caused confusion. Heavy competition increases the likelihood of misleading advertising. We have also noted a practice among mobile broadband suppliers to advertise base-station speeds rather than what the user may actually experience. Inaccurate advertising prevents users from choosing the best package for his/her needs. Regulator intervention in specifying advertising standards can address the issue to a large extent. We hope TRAI will take its pioneering initiative forward on this line.

iv. **International Bandwidth should be an important consideration:** For a user, end-to-end is what matters and not just the last mile. However, it would not be fair to expect the operator to be responsible for the part of the link that falls within the Internet cloud at international level. A reasonable limit would be to the first entry points to key international gateways[1], as the local operator pays for international bandwidth up to this point and controls the dimensioning.

Our research has shown that most of the time the latency occurs in the international segment and not within the local segment (Figure 4).

[1] Sometime back, this could have been taken as the first entry point to USA, but we understand now it is more distributed.

Figure 4: Latency of three selected broadband packages in India and Sri Lanka benchmarked against Singapore Regulator requirements



(ISP 1 – Out = Exit from local ISP; FEP=First entry point to USA; Des = Destination)

Source: LIRNEasia test results, February 2008

v. **The quality measurements should be technology-neutral and speed-neutral:** By specifying an absolute set of quality standards the users will be clear about what they receive. We recommend not maintaining a separate set of standard for satellite transmission. Our research has shown with adequate bandwidth operators depend on satellite links too can meet the TRAI specified limit for Round Trip Time (RTT) for international access.

About LIRNEasia www.lirneasia.net

LIRNE*asia* is a regional think tank involved in Information and Communication Technology (ICT) policy and regulation research and capacity-building across the Asia Pacific. LIRNE*asia* 's program of actionable research seeks to identify the institutional constraints to effective use of ICTs to improve the lives of the people of the Asia Pacific, not simply in abstract terms but in country context, and to work collaboratively with multiple stakeholders to catalyze the changes conducive to greater participation by users and suppliers. LIRNE*asia* 's overall mission of capacity building seeks to contribute to building capacity for evidence-based intervention in the public-policy process by persons attuned to the specific national contexts within which policies are made and implemented.

Its mission is : *To improve the lives of the people of the emerging Asia-Pacific by facilitating their use of ICTs and related infrastructures; by catalyzing the reform of laws, policies and regulations to enable those uses through the conduct of policy-relevant research, training and advocacy with emphasis on building in-situ expertise.*

Currently, the majority of LIRNE*asia* 's programs are funded by the International Development Research Centre of Canada (IDRC). LIRNE*asia* 's work has also been funded by *info* Dev, a World Bank unit that has partnered with LIRNE.NET since 2001 in the World Dialogue on Regulation for Network Economies.

About TeNet Group, IIT Madras http://www.tenet.res.in

Established a decade ago, the TeNeT Group is today a coalition of 14 faculty from the Electrical Engineering and Computer Science & Engineering Departments of IIT-Madras who work together towards a few common goals in research and product development. The focus is to address pressing needs of India and other developing countries by market-driven product development, strengthening of Indian telecom/networking industry, technical training and education, and driving telecom/IT policy.

Its vision is *"World-class Technology at an Affordable Price".* At different times, this vision translates to various tangible goals. For some years, it was to enable 100 million telephone and Internet connections in India. As this goal is a reality, it now has other missions.

These include:

- enabling 50 million broadband connections in the next five years
- doubling the rural GDP of India
- turning India into a telecom Design House for the world
- enabling one or two billion-dollar product companies in India
- driving the next generation of international wireless standards specifically for India
- high quality distance education with an emphasis on rural areas.

The TeNeT Group has about two hundred full-time researchers, engineers and other technical staff, and project students working in over 10 dedicated labs. Currently, the Group works in diverse areas including Wireless Communications, Computer Networking, Fibre Optics, Digital Systems Architecture, Network Management Systems, Integrated Voice/Video/Data Communications, Indic Computing and applications for rural development.