Comments by LIRNEasia on the Consultation paper on Data Speed Under Wireless Broadband Plans (Consultation Paper No. 6 /2017)

Submitted to the Telecom Regulatory Authority of India on the 29th June 2017.

LIRNEasia appreciates the opportunity to offer comments on the data speed under wireless broadband plans, and trusts that its research based comments will contribute to the transparency of broadband service delivery in India. We have limited our comments to **Q1, Q4, Q5, Q6, Q7, Q10** as these are the areas where we have conducted the most research.

LIRNEasia is a regional information and communication technology (ICT) policy and regulation think tank active across the Asia Pacific. It has commented on numerous TRAI consultations and its Chair, Rohan Samarajiva, PhD, is a regular participant in telecom policy and regulatory events in New Delhi. Annex 1 contains the organizational profile.

Q1: Is the information on wireless broadband speeds currently being made available to consumers transparent enough for making informed choices?

There is some ambiguity on what information is provided to the consumer. According to paragraph 2.3 from the consultation paper (see reference below), the app MySpeed is one tool that provides insights for informed decisions. The website http://www.myspeed.trai.gov.in/ provides consumers the ability to select a city and view the coverage, download and upload speeds by "top 3 operators" or all operators. However, the methodology is unknown and therefore an assessment cannot be made on the accuracy of app (in comparison to the many other apps that exist). Of the information that is displayed;

- the box titled 'experience' is misleading and can be confusing. In some cases it indicates the sample size is insufficient and in other instances says "good" or "excellent"; but again, the premise is unknown.
- in terms of 'coverage' that is displayed, for lay consumers signal strength in dB without any corresponding translation is likely to cause confusion or be of no real value.
- on the map, in locations where coverage data is available there are no corresponding data on download and upload speeds (for the same locations). The reason is unknown and it is not intuitive, unless the app picks up certain data points and transmits it to TRAI without the user's knowledge.

Download speed is often the foremost characteristic cited when illustrating the quality of broadband services. Speed is vital, but it is not the only thing that matters. Different types of applications demand different performance measures in order to function within acceptable standards (Zuhyle & Mirandilla-Santos, 2015)[1]. Although it seems latency, or round trip time (RTT) is collected via MySpeed it is not displayed is another important aspect of QoS that is not made visible to consumers. Figure 1 below illustrates the value in other lesser-cited parameters that do affect the user's experience of the Internet. The consultation focuses on download speed

[1] Zuhyle S., and Mirandilla-Santos M.G. (2015). Measuring Broadband Performance: Lessons Learnt, Challenges Faced

only (for reasons unknown), however, we firmly believe that other parameters, latency at minimum ought to be considered.

Service	**Speed**		**Delay**		**Packet Loss (%)**
	Download (Kbps)	Upload (Kbps)	RTT (ms)	Jitter (ms)	
Browse (Text)	++	-	++	-	-
Browse (Media)	+++	-	++	+	+
Download file	+++	-	-	-	-
Transactions	-	-	++	+	-
Streaming Media	+++	-	++	++	++
VOIP	+	+	+++	+++	+++
Games	+	+	+++	++	++

Note: +++ Highly relevant; ++ Very relevant; + Relevant; - Irrelevant

Figure 1: Relevance of metrics to various Internet services (Gonsalves, T. A. & Bharadwaj, A., 2009)

Referred paragraph from the consultation:

> 2.3 Service providers and their associations thereafter made a representation to the Authority citing various constraints. Various rounds of discussion were held with the service providers and alternative implementation methods suggested. These suggestions were also not acceptable to the service providers. Thereafter, as a via media it was decided that as an alternative the service providers would jointly develop an app which would capture the speed obtained by the subscribers. However, the development of app was delayed by the 10 service providers. Meanwhile the Authority developed 'TRAI Myspeed' app and launched it on 5th July, 2016. The app allows subscribers to check the actual speed of their data connection and also report it to the TRAI server based on a crowd-sourcing model.

General note on method: Given inherent qualities of the mobile network and users, network performance can widely vary. Multiple factors such as load on BTS, distance from BTS, air interface, signal propagation etc. affect the outcome. Ideally, results will cover as many geographic locations as possible and will be carried out multiple times a day on weekdays and weekends to iron out anomalies that may skew the results. However, this is highly resource intensive exercise and is impossible in a **crowd-sourced approach**. The benefit of the crowd-

sourced approach that TRAI has adopted is the sheer volume of data points that typically will be received. With large volumes of data it can be assumed that anomalies will be normalized.

There is mention of parameters collected by Mobile Network Operators (MNOs). However, there is no mention of the results being published for public consumption (see paragraph 2.9 below followed by the table). Therefore, it is assumed that the only information available to the public is currently via the MySpeed.

> 2.9 'The Standards of Quality of Service for Wireless Data Services Regulations, 2012 (26 of 2012)6 dated 4th December, 2012 prescribes that every CMTS provider or UAS provider must meet the following QoS benchmarks for the wireless data services in respect of each specified parameter, namely:

Name of Parameter	Benchmarks	Average over a period
Service activation/ provisioning	Within 4 hrs with 95% success rate	One Month
Successful data transmission download attempts	>80%	One Month
Successful data transmission upload attempts	>75%	One Month
Minimum download speed	To be measured for each plan by the service provider and reported to TRAI	One Month
Average throughput for packet data	>75% of the subscribed speed	One Month
Latency	Data < 250ms	One Month
PDP context activation success rate	>= 95%	One Month
Drop rate	<=5%	One Month

Q4: Is there a need to include/delete any of the QoS parameters and/or revise any of the benchmarks currently stipulated in the Regulations?

Related to paragraph 2.9 referred to above;

- Given that these measures are taken and reported by the MNOs it is important to note the point in the network that the measurements are taken from. It is fair to assume that within the network domain of the MNO the results will be far superior to what the user receives
- "successful data transmission download attempts", "successful data transmission upload attempts" and "drop rate" can be replaced with network availability where,

Network Availability = [(Total Operational minutes - Total minutes of service downtime) / Total operational minutes] x 100%

- Download speed measures shouldn't differ from plan to plan unless there are plans that have varying advertised speeds / are limited by technology (2G, 3G, 4G / LTE).

Streamlining and grouping the service offers accordingly can reduce the burden of measurement of "each plan"

- Given that throughput is a collective term to mean download and upload speeds there is discrepancy in the measures "Minimum download speed" and "Average throughput for packet data"
- Latency at < 250 ms should be specific for content access via an international server. If the distinction of accessing the local domain vs. the international domain is to be made the appropriate latency benchmark within the local domain as per Singapore's Infocom Media Development Authority is < 50 ms.

Q5: Should disclosure of average network performance over a period of time or at peak times including through broadband facts/labels be made mandatory?

The question is unclear. The average download and upload speeds are currently reported on MySpeed (http://www.myspeed.trai.gov.in/). It will be valuable if the results, similar to what is currently displayed in the 'monthly trend' graph, are displayed on an hourly average (or in 2-3 hour blocks). This will inherently include the peak periods.

Q6: Should standard application/ websites be identified for mandating comparable disclosures about network speeds?

There are many websites and apps that offer network speed tests. However, the underlying methodology, including that of TRAI's MySpeed, can cause consumers to receive varied results. It will be helpful if TRAI assesses some of these tools and makes suggestions on its uses, if desired, based on the assessment of the methodology (in order for it to be comparable).

Q7: What are the products/technologies that can be used to measure actual end-user experience on mobile broadband networks? At what level should the measurements take place (e.g., on the 26 device, network node)?

As mentioned in Q6, there are many tools that are used to measure end-user experience. As part of LIRNEasia's ongoing work we created a simple list with the attributes that were of concern to our own research. This is being shared as a sample only with TRAI (see Figure 2 below).

As for the level in which the measurement should take place, if the intent is to measure the end-user experience then ideally the measurements need to be at the end-user level. There are concerns such as the user device that can pose limitations and have an effect on the broadband QoS experience, the air interface, and signal propagation in highly urban settings (basements, high rise buildings) etc. However, the value in the crowd-sourced approach is that large number of data points is obtained and any irregularities will be resolved.

	MLab's NDT	**Ookla's Speed Test**	**Net Radar**
Allows Active and / or Passive tests?	Active	Active	Active
Single threaded / Multi threaded	Single	Multi	Single

Parameters:			
Throughput	Transfers as much as possible within 10 seconds	Two fastest results are removed. Thereafter 1/4th (approx. 22%) of the slowest are removed. Rest is averaged. (Used to be: 30% of lowest and 10% of highest results dismissed)	Transfer for 10s, average of the last 5s (once the stream is stabilized)
Latency / RTT	Measured during the throughput test Avg. RTT = Sum RTT / Count RTT	Lowest result is displayed from multiple tests	Avg. RTT
Network Availability	-	-	Yes
Packet loss	Number of lost segments / Total number of segments sent out	via a PingTest (a separate line quality test)	No, but can be inferred with alternative measures that are captured
Capability to measure Fixed BB and / or Mobile BB	Both	Both	Mobile BB
Mobile app platform	Android	iOS & Android	iOS & Android
Code	Open source	Proprietary	Open source
Ability to identify user's location	Lat / long coordinates (accuracy is questionable, but can be fixed)	Based on IP look up	Based on GPS
Is automated testing possible?	No	No	Yes (but the OS may restrict this feature)
Comments	Multiple server locations (not as widely covered as Ookla), possible to customize the app to give users the option of selecting servers	Has many server instances across a lot of networks, closest is selected by default so likely to provide the optimal which is not representative of the full path / end user performance. The user has to manually change the server.	3 Measurement points: Europe, North America, Asia The system finds the closest measurement point. Also collects: - Manufacturer, model, operating system and version - Network and subscriber operator - Base station - Mobile technology, such as UMTS, HSPA, LTE, WLAN, etc. - IP address and transport ports, both public and private - Timestamp

References:	https://github.com/ndt-project/ndt/wiki/NDTTestMethodology#Bottleneck_Link_Detection https://github.com/ndt-project/ndt/wiki/NDTDataFormat http://www.measurementlab.net/ http://spectrum.library.concordia.ca/980168/5/Item_1_-_Data_Description.pdf	https://support.speedtest.net/hc/en-us/articles/203845400-How-does-the-test-itself-work-How-is-the-result-calculated-	https://www.netradar.org/en/help

Figure 2: Comparison of Measurement Lab, Ookla and Net Radar

Q10: Any other issue related to the matter of Consultation.

On services being sold based on underlying technology.

Given that both 3G and 4G networks are packet based networks that follow the Internet Protocol, we fail to understand the repeated distinction on QoS and data limits by technology. When a consumer is within range and has a device capable of 4G, if signal strength is adequate the consumer will receive services via the 4G network. However, when signal strength of the 4G network drops then services are seamless handed over to a lower technology (3G and then 2G). The cell handover mechanism of the mobile network that does not cause disruption of service particularly between 3G and 4G networks (based on capability and signal strength) is meant to be seamless. The logic behind defining services based on access technology is unknown and is not addressed in the consultation document. Further, from a consumer's point of view it appears confusing. The paragraphs referred to by the consultation document are given below;

> 2.6 On 31st October 2016 TRAI issued its revised directions on delivering broadband speeds in a transparent manner and provide adequate information to broadband consumers. The directions are applicable to both wireline and wireless broadband services although there are certain key differences in the obligations imposed on both sets of providers. In case of wireless broadband services, the operator is required to disclose the data usage limit with specified primary technology (3G/4G) and the speed offered after that limit on its website and in all advertisements.
>
> 1.11 The coexistence of competing mobile telecommunications standards can also contribute to technological complexity and consumer confusion.5 At present, service providers are selling SIM cards in the name of the underlying technology i.e. 2G/3G/4G. However, no speed whatsoever is being guaranteed by the service providers and not all consumers are aware of the difference between them.

Annex 1: Organization Profile

LIRNEasia is a regional information and communication technology (ICT) policy and regulation think tank active across the Asia Pacific. Its mission is "Catalyzing policy change through research to improve people's lives in the emerging Asia Pacific by facilitating their use of hard and soft infrastructures through the use of knowledge, information and technology". The core focus is on conducting in-depth research and analysis of key policy issues. We have a strong record of accomplishment in conducting policy relevant and successful training programs for a range of stakeholders in several countries.

In 2007, LIRNEasia in collaboration with IIT Madras designed a subscriber oriented diagnostic methodology (the 'AsokaTissa' methodology[2]) to test the quality of service experience (QoSE) of the end user[3]. In order to normalize anomalies in the network, the methodology suggests the tests are carried out at six time slots per day (08:00, 11:00, 15:00, 18:00, 20:00, 23:00) on multiple days covering both weekdays and weekends. The parameters measured are download and upload speeds (Kbps), latency or Round Trip Time (RTT, ms), jitter (ms), packet loss (%) and network availability (%). In the initial stages diagnostics were run only in Sri Lanka and India but since 2010 the test base has increased to eleven cities in seven countries[4] in South and Southeast Asia. More recently our focus has been in Myanmar using tools such as the Measurement Lab's Network Diagnostic Tool (NDT) and NetRadar from the Aalto University School of Electrical Engineering that are better geared towards measurements of the mobile network.

In partnership with the Ford Foundation, LIRNEasia has been working on a project on 'Facilitating and enriching policy discourse on improving broadband access by the poor' since 2012. The objective of the study is to inform and engage decision makers and stakeholders in India (among others) about good practices on licensing policy, spectrum management, as well as other regulatory aspects affecting broadband access by the poor.

LIRNEasia has a network of researchers spread across South and Southeast Asia. We are also formally connected to research networks in Africa (Research ICT Africa) and Latin America (DIRSI), and as such have the ability to provide geographically comprehensive research coverage on ICT and telecom policies. More information on the organization including fully downloadable annual reports is available at http://lirneasia.net/about/.

For further information please contact Ms. Shazna Zuhyle (shazna@lirneasia.net / +94779417189).

[2] http://www.lirneasia.net/wp-content/uploads/2008/03/broadband-quality-test-plan1.pdf
[3] Past reports are available http://lirneasia.net/projects/2008-2010/indicators-continued/benchmarks/
[4] Colombo - Sri Lanka; Chennai, Mumbai, Bangalore, New Delhi - India; Dhaka - Bangladesh; Thimphu - Bhutan; Chiang Mai, Bangkok - Thailand; Jakarta - Indonesia; Manilla – Philippines.