Indicator X: Fixed (Wired) Broadband Quality of Service Experienced by the User

Definition:
Quality of Service Experience (QoSE) is a term used to differentiate between the QoS of a network and the QoS received at the end user's computer. There are many parameters that define QoSE;

Indicator Xa: Download speed
The speed at which a user can receive information from a server.
Unit of measurement: kbps (kilobits per second)

Indicator Xb: Upload speed
The speed at which the user can send information to a server.
Unit of measurement: kbps (kilobits per second)

Indicator Xc: Latency / Round Trip Time (RTT)
The time taken for a packet to traverse the network, reach the destination server and back.
Unit of measurement: ms (milliseconds)

Indicator Xd: Jitter
The variation of end-to-end delay from one packet to the next within the same packet stream.
Unit of measurement: ms (milliseconds)

Indicator Xe: Packet Loss
The number of packets that does not reach the destination.
Unit of measurement: Percentage

Clarifications and Scope:
This group of indicators will contain the results of software based tests conducted by the National Regulatory Authority (NRA) of each country for selected broadband packages. Although network equipment placed at test sites produces more accurate results, software options are a more cost-effective and practical option. The scope diagnostics is for multiple technologies such as ADSL, Fibre and mobile broadband. The more complex issues associated with mobile broadband is acknowledged.

Method of Collection:

1. Select a broadband service provider: The largest service provider
   [Ideal: Test all service providers]

2. Select a broadband plan: For the service provider(s) selected above, select at least one plan within the following advertised speed range:

   Note: Ranges to be defined by the ITU based on availability at country-level; examples are given below.
   a. Up to 1 Mbps
   b. 2 Mbps – 4 Mbps
   c. 5 Mbps – 10 Mbps
   d. Above 10 Mbps
   [Ideal: Test all plans offered by the service provider(s) selected above]

3. Set a downloadable file in the following domains:
   a. Local - a server within the service provider's network
   b. National – a server located in one of the country's main service provider's network,

other than the service provider being tested

    c. International - a server located at the first U.S. Point-of-Presence (for all countries apart from the USA) and a server located at the first Point-of-Presence in Great Britain (for the USA)

4. Notes on data collection for specific parameters:

   a. Download: The file size must be set and selected based on the advertised speed of the plan being tested from each domain as follows:

   Note: To be defined by the ITU. Examples are given below.

- 10 MB for broadband connections up to 10 Mbps
- 35 MB for broadband connections above 10 Mbps

   b. Latency, Jitter and Packet Loss – Calculated based on the average result of 10 ping tests.

5. Due to differences in network performance based on peak/off-peak and weekdays/weekends, it is recommended that the diagnostics are carried out:

    a. During multiple times of the day (to account for peak and off-peak times; proposed times: 08:00, 11:00, 15:00, 18:00, 20:00, 23:00)
    b. During multiple days of the week (to account for changes in data traffic during week days and weekends; at least 2 week days and 1 weekend)
    c. In multiple domains (please see point 3 above)
    d. In multiple locations within the country (to account for service areas of varying levels of congestion). If it is possible to conduct these diagnostics in only area, then it is suggested that a major urban agglomeration is selected.
    e. Once in six months, in the least
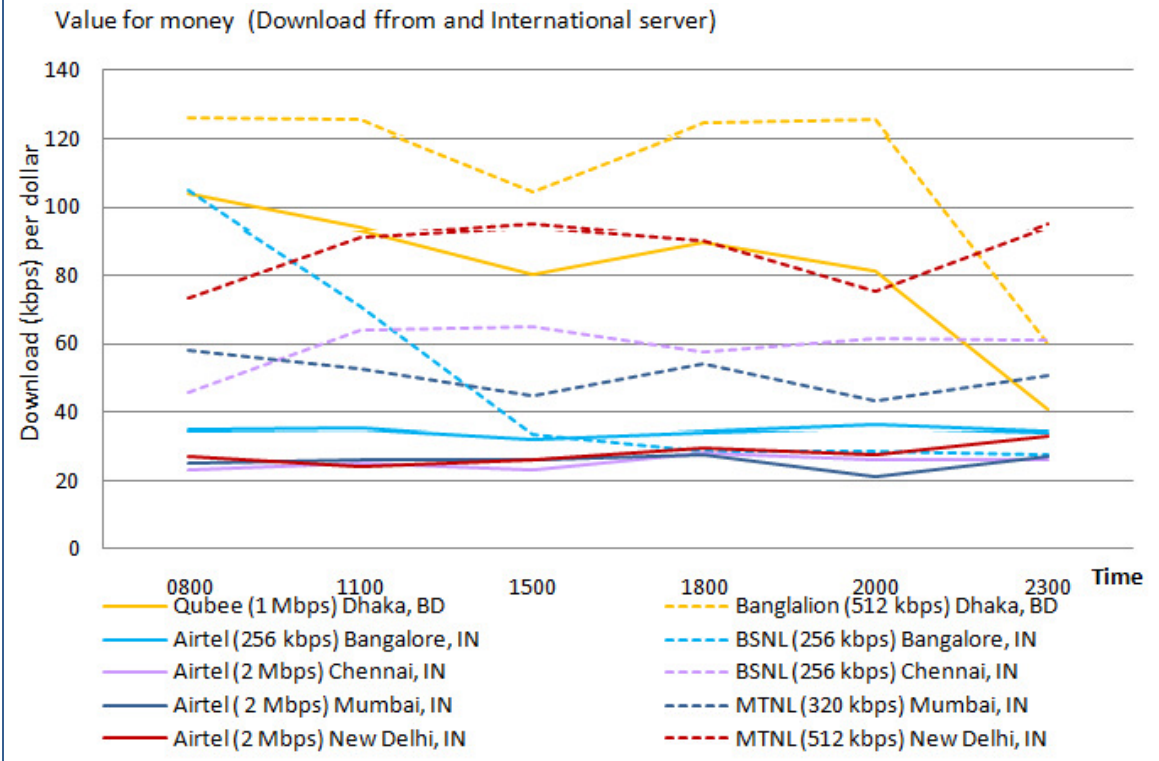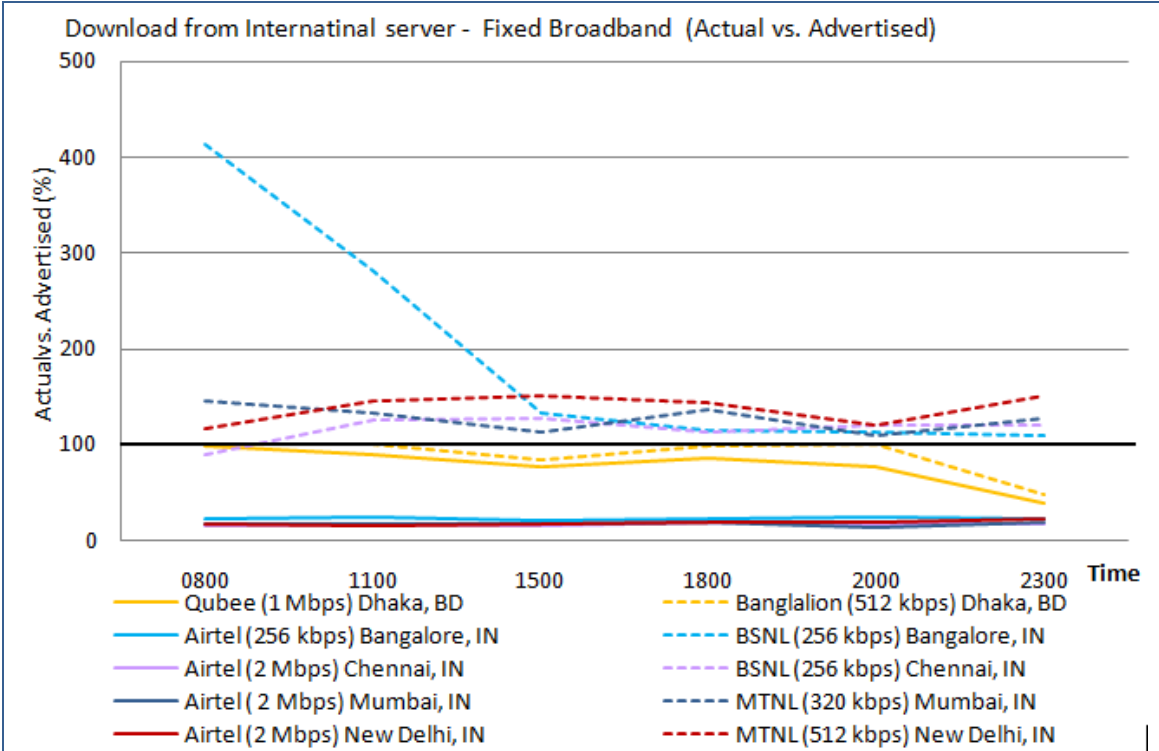
Relationship with other Indicators:
If the same operators and plans are selected as Indicator 50 (Fixed (wired)-broadband speed) and Indicator 51 (Fixed (wired)-broadband monthly subscription charge), combining results from this indicator (Download speed, Indicator Xa) will result in interesting data representation such as, Advertised vs. Actual Speeds and Value for Money (please see examples from LIRNE*asia* below)

Methodological Issues:
QoSE can vary tremendously based on location (distance from exchange, a known location where service providers have optimized network performance for), time of day, contention ratios, physical medium used in the core and access networks, to name a few. The proposed methodology cannot account for all potential network issues; however, by collecting vast amounts of data it is assumed that such anomalies are normalized to a great extent. Countries / NRAs are encouraged to conduct suggested diagnostics in as many locations (ideally based on a representative sample), for as many plans from as many service providers as possible so as to increase levels of comparability.

Example:
Analysis resulting in combining actual download speeds (Indicator Xa) with Indicator 50 and 52

Download from Internatinal server - Fixed Broadband (Actual vs. Advertised)

Legend:
- Qubee (1 Mbps) Dhaka, BD
- Banglalion (512 kbps) Dhaka, BD
- Airtel (256 kbps) Bangalore, IN
- BSNL (256 kbps) Bangalore, IN
- Airtel (2 Mbps) Chennai, IN
- BSNL (256 kbps) Chennai, IN
- Airtel (2 Mbps) Mumbai, IN
- MTNL (320 kbps) Mumbai, IN
- Airtel (2 Mbps) New Delhi, IN
- MTNL (512 kbps) New Delhi, IN

Value for money (Download ffrom and International server)

Legend:
- Qubee (1 Mbps) Dhaka, BD
- Banglalion (512 kbps) Dhaka, BD
- Airtel (256 kbps) Bangalore, IN
- BSNL (256 kbps) Bangalore, IN
- Airtel (2 Mbps) Chennai, IN
- BSNL (256 kbps) Chennai, IN
- Airtel (2 Mbps) Mumbai, IN
- MTNL (320 kbps) Mumbai, IN
- Airtel (2 Mbps) New Delhi, IN
- MTNL (512 kbps) New Delhi, IN

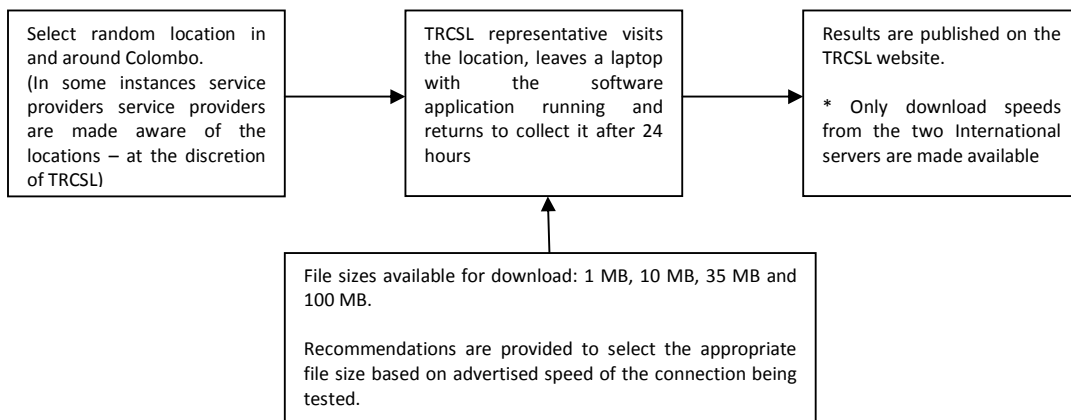Source: http://lirneasia.net/projects/ict-indicators/

Implementation of software based download speed measuring facility by an NRA
The Telecommunication Regulatory Commission of Sri Lanka (TRCSL) introduced an on-line,

installation-free download speed measuring facility in 2011. The tool measures end-to-end Internet download speeds from servers situated in Germany and the USA, since the majority of outbound data traffic routes to servers in either Europe or in the USA.
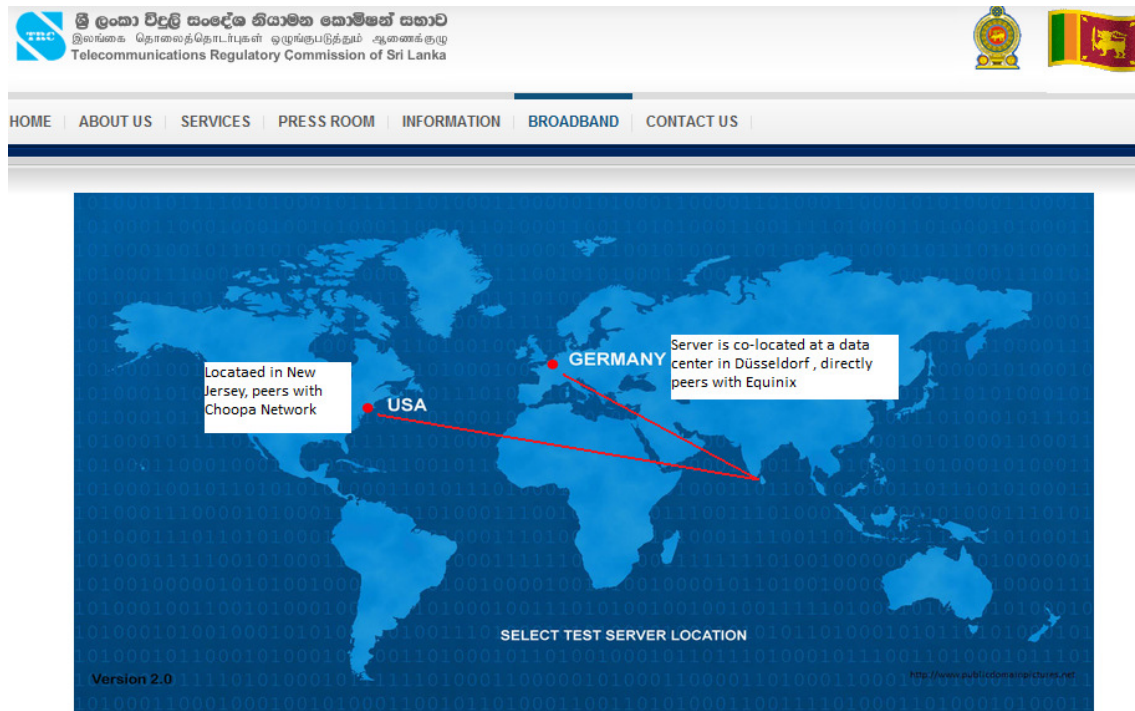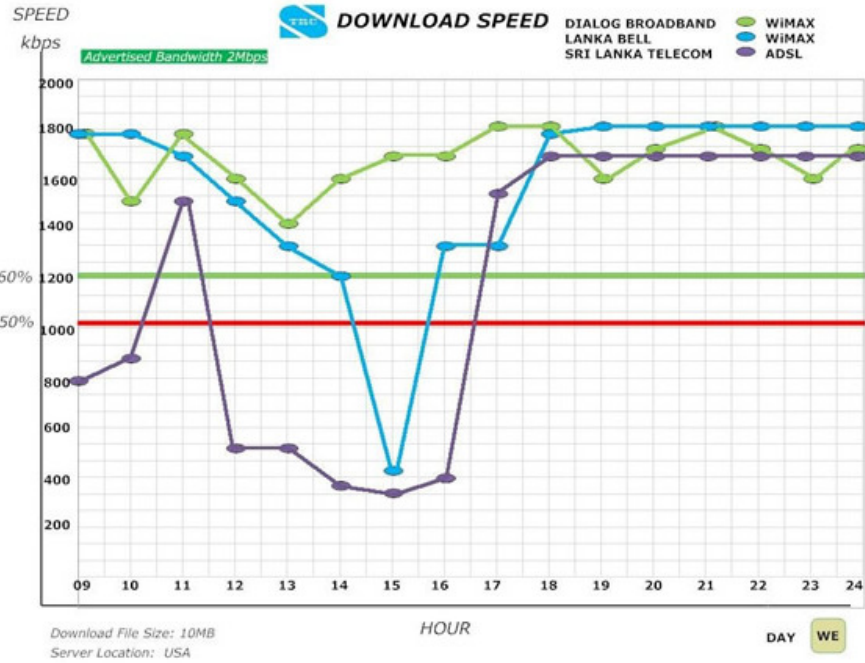

- These servers have been selected based on locations that have the presence of Tier-1 networks to ensure that the system provides best possible congestion free, reliable network path

- TRCSL's modus operandi:

| Select random location in and around Colombo. (In some instances service providers service providers are made aware of the locations – at the discretion of TRCSL) | → | TRCSL representative visits the location, leaves a laptop with the software application running and returns to collect it after 24 hours | → | Results are published on the TRCSL website. * Only download speeds from the two International servers are made available |

File sizes available for download: 1 MB, 10 MB, 35 MB and 100 MB.

Recommendations are provided to select the appropriate file size based on advertised speed of the connection being tested.

- Round Trip Time (RTT) and Download speeds from local servers are measured by the regulator. However, this feature is not available to the public and is not shared with the monthly reports.
- Sample results from August 2012; 2 Mbps, All operators, Random locations, downloading a 10 MB file from the server in the USA

Source: http://www.trc.gov.lk/broadband/broadband-initiative.html