Quality of Service Monitoring Framework for 4G Retail Mobile Broadband Service

This is applicable to Mobile Network Operators ("MNOs") providing mobile broadband services to consumer subscribers. For the avoidance of doubt, MNOs refer to the operators who are deploying their own mobile network.

		Performance Indicators (For Monitoring)	Source
(1)		**Network Availlability**[1]	
(2)		**Local Bandwidth Utilisation**	
(a)		Segment 1[2]	
(b)		Segment 2[3]	
(3)		**Data Success Rate**[4]	
(a)		Average monthly data success rate across the entire month[5]	**Submissions by MNOs**
(b)		Average monthly data success rate during the busy hour[6]	
(c)		Average monthly data success rate during hour with the worst performance[7]	
(4)		**Data Drop Rate**[8]	
(a)		Average monthly data drop rate across the entire month[9]	
(b)		Average monthly data drop rate during the busy hour[10]	
(c)		Average monthly data drop rate during hour with the worst performance[11]	

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[1] To measure Network Availability, the data to be reported by MNOs is based on actual "live" traffic performance extracted from the MNOs' 4G mobile broadband network. The MNOs are required to report the total downtime of the mobile broadband network, including but not limited to the antennas, base stations, elements in the packet switched core network, multiplexers, routers and connection to an Internet Exchange and Internet backbone over a month. All scheduled downtime for the purposes of maintenance and upgrading of the mobile broadband network will be excluded from the calculation. The reported downtime should include any non-scheduled downtime caused by upstream service providers. Network availability should be reported as a percentage of the total operational time in a given month and computed as follows:

$$\text{Network availability} = \frac{Total\ operational\ minutes - Total\ minutes\ of\ service\ downtime}{Total\ operational\ minutes} \times 100\%$$

[2] The MNOs are required to measure the hourly average bandwidth utilisation of Segment 1 (refer to Diagram for 4G Mobile Broadband Network Topology) during one busy hour per working day. IMDA may require the MNOs to review and change the busy hour from time to time.

[3] The MNOs are required to report the aggregated link utilisation in Segment 2 (refer to Diagram for 4G Mobile Broadband Network Topology) during the measured busy hour.

[4] Data success rate measures the percentage of successful data attempts, such as but not limited to upload and download call establishments.

[5] Average monthly data success rate across the entire month will be computed as follows:

$$\frac{\textit{Total number of successful 4G data session established on the radio network for the entire month}}{\textit{Total number of 4G data session establishment attempts for the entire month}} \text{ x 100\%}$$

[6] Average monthly data success rate during the busy hour will be computed as follows:

$$\frac{\textit{Total number of successful 4G data session established on the radio network during daily network busy hour for the entire month}}{\textit{Total number of 4G data session establishment attempts during daily network busy hour for the entire month}} \text{ x 100\%}$$

[7] If the busy hour is not the hour with the worst performance, the performance for both during busy hour and the hour with worst performance should be reported. Average monthly success rate during hour with the worst performance will be computed as follows:

$$\frac{\textit{Total number of successful 4G data session established on the radio network during hour with worst performance for the entire month}}{\textit{Total number of 4G data session establishment attempts during hour with worst performance for the entire month}} \text{ x 100\%}$$

[8] Data drop rate measures the inability of the 4G network to maintain a connection. It may happen because of radio link failures, uplink or downlink interference, bad coverage, unsuccessful handovers or any other reason.

[9] Average monthly data drop rate across the entire month will be computed as follows:

$$\frac{\textit{Total number of abnormal 4G data session disconnections registered by the radio network for the entire month}}{\textit{Total number of successful 4G data session connections for the entire month}} \text{ x 100\%}$$

[10] Average monthly data drop rate during the busy hour will be computed as follows:

$$\frac{\textit{Total number of abnormal 4G data session disconnections registered by the radio network during daily network busy hour for the entire month}}{\textit{Total number of successful 4G data session connections during daily network busy hour for the entire month}} \text{ x 100\%}$$

[11] If the busy hour is not the hour with the worst performance, the performance for both during busy hour and the hour with worst performance should be reported. Average monthly data drop rate during hour with the worst performance will be computed as follows:

$$\frac{\textit{Total number of abnormal 4G data session disconnections registered by the radio network during hour with worst performance for the entire month}}{\textit{Total number of successful 4G data session connections during hour with worst performance for the entire month}} \text{ x 100\%}$$

4G Mobile Broadband Network Topology (Diagram)

4G LTE

LTE — Long Term Evolution (4G)

PGW — PDN Gateway

SGW — Serving Gateway

eNodeB

Pipe
to Central Office
(may be shared betw.
Services)

Segment 1

SGW

Gi interface

PGW

Segment 2

Internet
(fixed network)

Overseas Point
of Presence