

Quality of Experience (“QoE”) Monitoring Framework for Retail Mobile Broadband Service

This is applicable to Mobile Network Operators (“MNOs”) providing mobile broadband services to end-users.

| Performance Indicators (For Monitoring) ¹ | | Source |
|--|---------------------------------------|---|
| (1) | Latency ¹ (for round-trip) | IMDA’s measurement application (i.e. IMconnected) |
| (2) | Download Throughput ² | |

¹ To monitor latency, IMDA’s measurement application collects information during each data session. Latency is given by the round trip time taken for test packets to travel between the volunteers’ devices and IMDA’s local test server. Measurements are collected throughout the reporting period. The average latency will be calculated. The measurement, in “x ms”, represents the average latency experienced by end-users during the reporting period.

² Throughput refers to the amount of data that is successfully transferred from one point of the mobile broadband network to another over a specified period of time. To monitor throughput, IMDA’s measurement application collects information on data downloads during each data session. The throughput is calculated and recorded for each data session. Measurements are collected throughout the reporting period. Data points that fall in the 10th percentile, 50th percentile and 90th percentile will be calculated. The measurement, in “x Mbps”, “y Mbps” and “z Mbps”, represents the 10th percentile, 50th percentile and 90th percentile of the throughput value experienced by end-users during the reporting period. Peak speeds will also be reported as the median of all daily maximum speeds during the reporting period.

IMDA crowdsources the mobile data QoE of end-users, such as throughput and latency, from volunteers who have installed IMDA’s measurement application (i.e., IMconnected) and monitors these indicators. The IMconnected application collects data performance based on users’ traffic. When the application is installed, it will run in the background of the mobile phone and collect data passively when the end-user surfs the Internet, including but not limited to web browsing and video and audio streaming. Data is also collected when end-users actively perform speed tests using IMconnected. The application does not collect any end-user content or any information that can be used to identify the user. IMDA will differentiate the mobile data performance by mobile broadband network (such as 3G and 4G), where such information may be subject to IMDA’s publication bi-annually or such other frequency as determined by IMDA.

IMDA will continue to improve the measurement methodology to enhance the quality of information collected to better capture the mobile data quality as experienced by end-users.