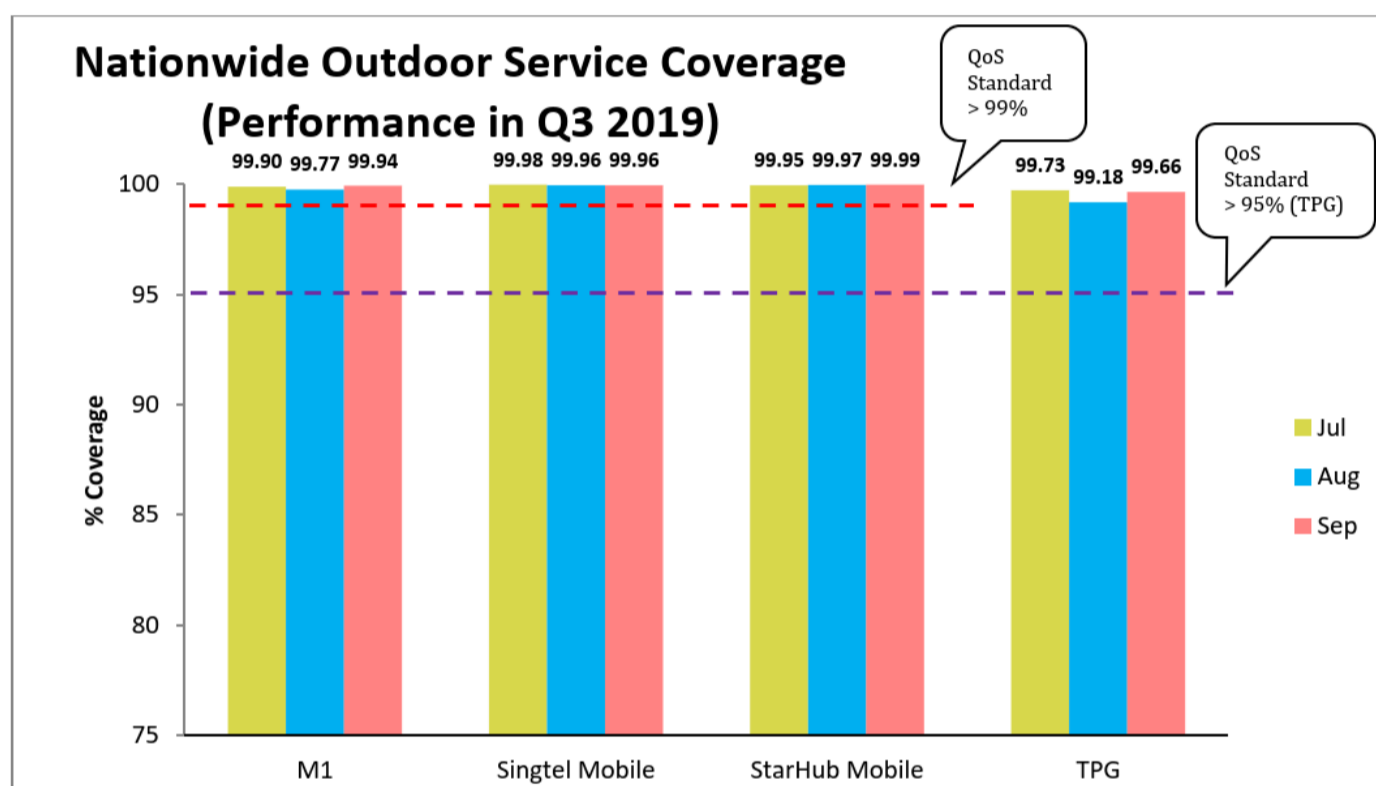


Quality of Service Performance Results for July – September 2019

Nationwide Outdoor Service Coverage

This indicator measures the Nationwide Outdoor Service Coverage for the 4G cellular mobile networks. Service coverage is determined by signal strength. The availability of service coverage is the ability of a cellular network to achieve the minimum signal strength of at least -109dBm. Under IMDA's 4G Service QoS framework, mobile operators are required to achieve Nationwide Outdoor Service Coverage of > 99%*. In order to better measure the end users' experience**, IMDA uses mobile phones to collect the signal strength data points.



*For TPG, the Nation-wide Outdoor Service Coverage standard of > 95% and > 99% takes effect from 1 January 2019 and 1 January 2020 respectively.

**Based on IMDA's coverage performance surveys which included nationwide outdoor drive test and areas such as housing estates/town centres, outdoor recreational areas and above ground MRT tracks.

Note: End users' individual experience may differ due to different models of handset used, handset settings, number of users in the vicinity, etc.

In-building Service Coverage

This indicator measures in-building service coverage for the 4G cellular network. Under IMDA's 4G QoS framework, mobile operators are required to achieve a service coverage of > 85% per building. Service coverage is measured at randomly selected buildings and at publicly accessible areas within the tested buildings as a proxy for the coverage in the entire building to avoid disturbing residents in their units. For buildings that have failed IMDA's compliance standard, mobile operators will have a period of four months to improve the coverage within the buildings. IMDA will audit the buildings again after the four-month period.

The In-building Service Coverage standard took effect for the following three mobile operators on 1 January 2019.

IMDA's Performance Survey Period: Q3 2019

M1	Singtel Mobile	StarHub Mobile
No of buildings passed/ No of buildings tested Compliance standard > 85% per building		
60/60	60/60	60/60

Note: The same sixty buildings were tested across the three mobile operators. The performance of each of the mobile operator varies for each of the building tested. End users' individual experience may differ due to different models of handset used, handset settings, number of users in the vicinity, etc.

The In-building Service Coverage standard takes effect from 1 January 2020 for TPG.

Tunnel Service Coverage

This indicator measures the service coverage for the 4G cellular mobile network within road and MRT tunnels. Tunnel service coverage measures the percentage of data points collected in a tunnel from a 4G cellular mobile network that achieve a minimum signal strength of at least -109dBm. The tunnel areas surveyed by IMDA include all road and MRT tunnels in Singapore. Under IMDA's 4G Service QoS framework, mobile operators are required to achieve a service coverage of > 99% for all road and MRT tunnels. In order to better reflect end users' experience, IMDA uses mobile phones to collect the signal strength data points.

IMDA's Performance Survey Period: Q3 2019

M1	Singtel Mobile	StarHub Mobile
Compliance standard: > 99% for all road and MRT tunnels		
Central Expressway (Road Tunnel)		
Pass	Pass	Pass
Kallang-Paya Lebar Expressway (Road Tunnel)*		
Fail	Fail	Fail
Fort Canning Tunnel (Road Tunnel)		
Pass	Pass	Pass
Woodsville Tunnel (Road Tunnel)		
Pass	Pass	Pass
Marina Coastal Expressway (Road Tunnel)		
Pass	Pass	Pass

M1	Singtel Mobile	StarHub Mobile
North South Line (MRT Tunnel)		
Pass	Pass	Pass
East West Line (MRT Tunnel)		
Pass	Pass	Pass
Changi Airport Line (MRT Tunnel)		
Pass	Pass	Pass
Circle Line (MRT Tunnel)		
Pass	Pass	Pass
North East Line (MRT Tunnel)		
Pass	Pass	Pass
Downtown Line (MRT Tunnel)		
Pass	Pass	Pass

Note: End users' individual experience may differ due to different models of handset used, handset settings, number of users in the vicinity, etc. The tunnel service coverage results are based on IMDA's coverage performance surveys.

*M1, Singtel Mobile and StarHub Mobile had failed to meet the 4G QoS standard of > 99% for the Kallang-Paya Lebar Expressway due to upgrading and replacement of the equipment providing tunnel coverage. IMDA expects the mobile operators to work closely with the relevant parties to complete the enhancement works as soon as possible.

The Tunnel Service Coverage standard takes effect from 1 January 2020 for road tunnels, and 1 January 2022 for MRT tunnels for TPG.