

HOW SINGTEL DERIVED THE 3G and 4G TYPICAL DOWNLOAD SPEEDS FOR MOBILE DATA ACCESS

3G Typical Download Speed

Measurements are carried out using Cat 6 device configured to 3G network running Ookla Speedtest application for measuring download throughput speed of file size 100MB.

Theoretical Speed	Typical Download Speed Range (Stationary)	Typical Download Speed Range (Mobility)
21Mbps	0.8Mbps – 10Mbps	0.8Mbps – 5Mbps

The Ookla Speedtest application tests are carried out using local server (Singtel) in Singapore and international server (AIS, Bangkok) in Thailand. The throughput is based on the average transfer rate captured by the Ookla Speedtest application.

The typical throughput speed ranges are computed based on 80% of the data points (80% is derived from trimming off the top and bottom 10%) to better indicate the speed range of a customer's experience at 80% of the time over a 24-hour period.

There are a total of 300 data points collected for each test category i.e.

- Stationary: 2 time periods i.e. off peak hours (8am – 6pm) & peak hours (6pm – 10pm)
 - Peak hours 100 data points from Singtel server
 - Off Peak hours 80 data points from Singtel server & 20 data points from AIS, Bangkok server)
- Mobility: during office hours (8am – 6pm)
 - 100 data points from Singtel server

The tests are conducted between Oct to Dec 2015. The above measurements are carried out and updated on quarterly basis.

1) Stationary Tests

For off-peak Stationary tests, the tests are carried out at various 3G hotspots in Singapore, namely:

North: Bishan Junction 8, Causeway Point

South: Raffles City Shopping Centre, Bugis Junction and Wisma Atria

East: Tampines Mall and Changi Airport Terminal 2

West: Lot One, West Mall and West Gate

For peak hours Stationary tests, the tests carried out at ten (10) heavy user traffic locations (e.g. shopping malls) and outdoor areas (e.g. vicinity of MRT stations) with high mobile data usage.

North: North Point Extension Bldg, Ang Mo Kio Blk 512, Yio Chu Kang Squash Centre

South: RedHill Blk 78 and Singapore Conference Hall

East: 30 Mydin, Geylang Exchange and Blk 173 Toa Payoh Lor 1

West: Blk 210 Jurong East St 21 and Blk 135 Jurong East St 13

2) Mobility Tests

In addition, SingTel also conducts mobility tests along major routes in the following HDB estates:

- Clementi
- Tanglin
- Pasir Ris
- Yishun

It is important to note that the typical download speeds may vary between users and are subject to devices used, hardware and software limitations, network coverage/ user traffic, distance between users and base stations, nature of built-up areas, source of websites as well as other environmental factors (e.g. interference from neighboring devices/equipment).

4G (300Mbps) Typical Download Speed

Measurements are carried out using Cat 6 device with CA features configured to LTE network running Ookla Speedtest application for measuring download throughput speed of file size 100MB.

Theoretical Speed	Typical Download Speed Range (Stationary)	Typical Download Speed Range (Mobility)
300Mbps	20Mbps - 140Mbps	20Mbps - 100Mbps

The Ookla Speedtest application tests are carried out using local server (Singtel) in Singapore and international server (AIS, Bangkok) in Thailand. The throughput is based on the average transfer rate captured by the Ookla Speedtest application.

The typical throughput speed ranges are computed based on 80% of the data points (80% is derived from trimming off the top and bottom 10%) to better indicate the speed range of a customer's experience at 80% of the time over a 24-hour period.

There are a total of 300 data points collected for each test category i.e.

- Stationary: 2 time periods i.e. off peak hours (8am – 6pm) & peak hours (6pm – 10pm)
 - Peak hours 100 data points from Singtel server
 - Off Peak hours 80 data points from Singtel server & 20 data points from AIS, Bangkok server)
- Mobility: during office hours (8am – 6pm)
 - 100 data points from Singtel server

The tests are conducted between Oct to Dec 2015. The above measurements are carried out and updated on quarterly basis.

1) Stationary Tests

For off-peak Stationary tests, the tests carried out at various 4G hotspots in Singapore, namely:

North: Bishan Junction 8, Causeway Point

South: Raffles City Shopping Centre, Bugis Junction and Wisma Atria

East: Tampines Mall and Changi Airport Terminal 2

West: Lot One, West Mall and West Gate

For peak hours Stationary tests, the tests carried out at ten (10) heavy user traffic locations (e.g. shopping malls) and outdoor areas (e.g. vicinity of MRT stations) with high mobile data usage.

North: North Point Extension Bldg, Ang Mo Kio Blk 512, Yio Chu Kang Squash Centre

South: RedHill Blk 78 and Singapore Conference Hall

East: 30 Mydin, Geylang Exchange and Blk 173 Toa Payoh Lor 1

West: Blk 210 Jurong East St 21 and Blk 135 Jurong East St 13

2) Mobility Tests

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It is important to note that the typical download speeds may vary between users and are subject to devices used, hardware and software limitations, network coverage/ user traffic, distance between users and base stations, nature of built-up areas, source of websites as well as other environmental factors (e.g. interference from neighbouring devices/equipment).