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

3G Typical Download Speed

Measurements are carried out using Cat 16 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. 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 12-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 – 12pm, 2pm – 6pm) & peak hours (12pm – 2pm)
    - Peak hours 100 data points from Singtel server
    - Off Peak hours 100 data points from Singtel server
- Mobility: during office hours (8am – 6pm)
    - 100 data points from Singtel server

The tests are conducted between January to March 2018. 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: Blk 705 AMK Ave 8.
South: People Park Food Centre and Pek Kio Food Centre
East: Blk 85 Bedok, 51 Old Airport Rd Market, Blk 538 Bedok Food Centre and Sims Vista.
West: Jurong East Street 24 Food Centre, Blk 353 Clementi Food Centre, and Yuhua Place
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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: Opp Khatib MRT, Woodlands Bus interchange, Bishan Junction 8 and AMKHub.
South: Youth Park, Albert Food Centre and Blk 29 Bendemeer Road.
East: Blk 4A Eunos Cres and Haig Road Food Centre.
West: West Gate.

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

- Queenstown
- Tampines
- Jurong
- Woodlands

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 16 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. 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 12-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 -- 12pm, 2pm -- 6pm) & peak hours (12pm – 6pm)
    - Peak hours 100 data points from Singtel server
    - Off Peak hours 100 data points from Singtel server)
- Mobility: during office hours (8am – 6pm)
    - 100 data points from Singtel server

The tests are conducted between January to March 2018. 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: Blk 705 AMK Ave 8.
South: People Park Food Centre and Pek Kio Food Centre
East: Blk 85 Bedok, 51 Old Airport Rd Market, Blk 538 Bedok Food Centre and Sims Vista.
West: Jurong East Street 24 Food Centre, Blk 353 Clementi Food Centre, and Yuhua Place

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: Opp Khatib MRT, Woodlands Bus interchange, Bishan Junction 8 and AMKHub.
South: Youth Park, Albert Food Centre and Blk 29 Bendemeer Road.
East: Blk 4A Eunos Cres and Haig Road Food Centre.
West: West Gate.

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

- Queenstown
- Tampines
- Jurong
- Woodlands

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+ (Up to 500Mbps) Typical Download Speed

Measurements are carried out using Cat 16 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)
Up to 500Mbps	32Mbps - 227Mbps	32Mbps - 200Mbps

The Ookla Speedtest application tests are carried out using local server (Singtel) in Singapore. 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 12-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 -- 12pm, 2pm -- 6pm) & peak hours (12pm – 6pm)
    - Peak hours 100 data points from Singtel server
    - Off Peak hours 100 data points from Singtel server)
- Mobility: during office hours (8am – 6pm)
    - 100 data points from Singtel server

The tests are conducted between January to March 2018. 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: Blk 705 AMK Ave 8.
South: People Park Food Centre and Pek Kio Food Centre
East: Blk 85 Bedok, 51 Old Airport Rd Market, Blk 538 Bedok Food Centre and Sims Vista.
West: Jurong East Street 24 Food Centre, Blk 353 Clementi Food Centre, and Yuhua Place.

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: Opp Khatib MR, Woodlands Bus interchange, Bishan Junction 8 and AMKHub.
South: Youth Park, Albert Food Centre and Blk 29 Bendemeer Road.
East: Blk 4A Eunos Cres and Haig Road Food Centre.
West: West Gate.

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

- Queenstown
- Tampines
- Jurong
- Woodlands

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).