5G promises to deliver higher speed, density and availability at ultra low latency

<table>
<thead>
<tr>
<th>Latency</th>
<th>Speed</th>
<th>Connections</th>
<th>Mobility</th>
<th>Network Architecture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Few ms</td>
<td>10 Gbps per Connection</td>
<td>1mil Connections per km²</td>
<td>500 km/h High speed railway</td>
<td>Slicing Ability required</td>
</tr>
</tbody>
</table>

- **Virtualised Network**
  - 10x
  - 10x
  - 100x
  - 1.5x

- **4G**
  - 30-50ms
  - 100Mbps-1Gbps
  - 10k
  - 350km/h
  - Inflexible
Ericsson Mobility Report: 5G insights by 2023

Over 1 billion
5G subscriptions for eMBB

15%
5G mobile subscriptions in APAC

20%
mobile traffic via 5G networks

More than 20% of world’s population covered by 5G
Global survey conducted by Ericsson in January 2018 across 10 industries

- 3/4 expect their industry and own company to leverage 5G to improve offerings and cost
- 73% have a strategy to leverage first mover advantages.
- 70% expect their first 5G use case to be in production by 2021
- 5 5G capabilities carrying tied to premium values across industries
- >50% Expect to be in trials for their first use case in 2019

— 10 industries covered: Energy & Utilities, Manufacturing, Public Safety, Healthcare, Public transport, Media, automotive, financial services, retail, agriculture
5G standards will be progressively introduced to achieve full 5G capability by 2020/2021

- Enhanced Mobile Broadband
- Ultra Low Latency
- Ultra Reliable
- Massive Connectivity
- Network Slicing
A number of use cases will require a combination of 5G uLLC, mMTC and eMBB through network slicing to realise its potential

**eMBB**
*(Enhanced Mobile Broadband) 2019+

- 4K Video beamer
- High resolution video streaming
- VR remote education/training
- AR/VR immersive games
- Work & game while traveling
- Augmented dashboard

**mMTC**
*(Massive machine-type comms) 2020+

- Logistics
- Maintenance optimization
- Toll collection
- Connected home
- Traffic steering & management
- Waste mgmt.
- Tracking / inventory systems
- Smart clothes

**uRLLC**
*(Ultra-Reliable Low Latency) 2021+

- Real-time remote control
- Factory automation
- Assisted driving
- Remote Surgery
- Smart grids
- Reliable emergency communications
- Self driving

**Performance Metrics**

**eMBB**
- **Peak throughput**: 1-10 Gbps
- **Average throughput**: 50-100 Mbps
- **Latency**: 50-100 ms
- **Mobility**: 3-120 kmph
- **Subs Density**: 200 – 150000/km2

**mMTC**
- **Coverage**: < 1 Mbps
- **Latency**: 10 ms
- **Mobility**: Up to 1 Million
- **Subs Density**: Up to 1 Million/km2

**uRLLC**
- **Coverage**: 160 dB
- **Reliability**: 99.999%
- **Latency**: 1 ms
- **Mobility**: Static - 200 kmph
- **Subs Density**: 10 -1000/km2
Singtel and Ericsson announced the launch of 5G Centre of Excellence Program in 2017

- Develop 5G technical competence for engineers in Singtel
- Provide 5G showcase to create awareness for consumers and enterprises
- Enterprise engagement and 5G trials with strategic corporate customers
- Engage research and tertiary institutions on potential collaboration opportunities
5G Use cases for Enterprise & Consumer segments

**Enterprise**
- 3D AR calling for remote assistance
- Workplace collaboration
- Drones for security monitoring, surveillance and logistics
- Ultra reliable connected factories

**Consumer**
- New learning experience anywhere
- Real-time 3D Mapping for AV
- Real-time Cloud Gaming
- Low latency interactivity on any surface

**5G**
- Ultra High Speed
- Network Slicing
- Low Latency
- Massive Connectivity
In Summary

✓ 5G promises to deliver higher speed, density and availability at ultra low latency

✓ It is gaining momentum in the industry and it is use case driven

✓ Virtualised, programmable core network is an integral part of 5G and it is ultimately based on open source technologies. Thus accelerating the digital transformation for telcos
Disclaimer: This material that follows is a presentation of general background information about Singtel’s activities current at the date of the presentation. The information contained in this document is intended only for use during the presentation and should not be disseminated or distributed to parties outside the presentation. It is information given in summary form and does not purport to be complete. It is not to be relied upon as advice to investors or potential investors and does not take into account the investment objectives, financial situation or needs of any particular investor. This material should be considered with professional advice when deciding if an investment is appropriate.