AGENDA

- Connectivity Landscape

- IMconnected

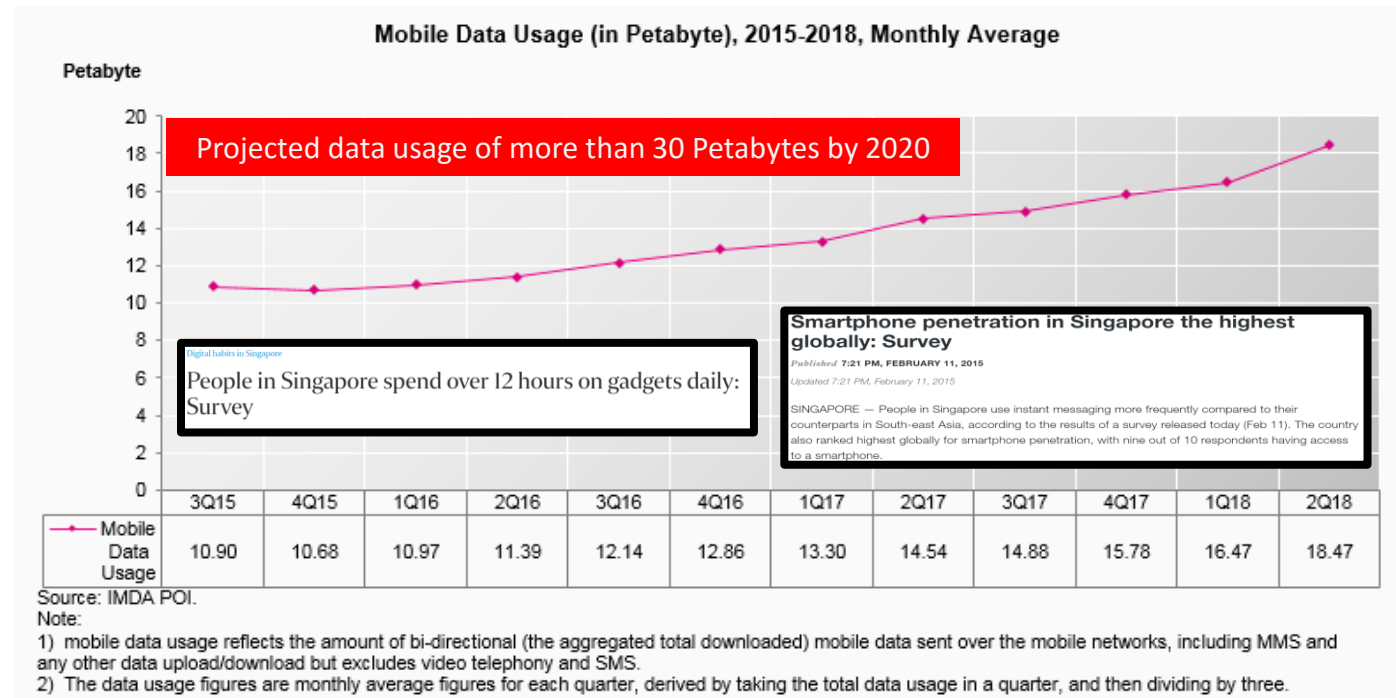- Harnessing the Power of Big Data Analytics

- Conclusion

CONNECTIVITY LANDSCAPE

INCREASING CONNECTIVITY ON MOBILE

Growing importance of mobile broadband connectivity towards
Digital Economy & Smart Nation Initiatives

- Market Demands for higher quality, content and speed

- Quality of Content
- Development of new applications

Mobile Data Usage (in Petabyte), 2015-2018, Monthly Average

Petabyte

Projected data usage of more than 30 Petabytes by 2020

Digital habits in Singapore
People in Singapore spend over 12 hours on gadgets daily: Survey

Smartphone penetration in Singapore the highest globally: Survey
Published 7:21 PM, FEBRUARY 11, 2015
Updated 7:21 PM, February 11, 2015

SINGAPORE — People in Singapore use instant messaging more frequently compared to their counterparts in South-east Asia, according to the results of a survey released today (Feb 11). The country also ranked highest globally for smartphone penetration, with nine out of 10 respondents having access to a smartphone.

	3Q15	4Q15	1Q16	2Q16	3Q16	4Q16	1Q17	2Q17	3Q17	4Q17	1Q18	2Q18
Mobile Data Usage	10.90	10.68	10.97	11.39	12.14	12.86	13.30	14.54	14.88	15.78	16.47	18.47

Source: IMDA POI.
Note:
1) mobile data usage reflects the amount of bi-directional (the aggregated total downloaded) mobile data sent over the mobile networks, including MMS and any other data upload/download but excludes video telephony and SMS.
2) The data usage figures are monthly average figures for each quarter, derived by taking the total data usage in a quarter, and then dividing by three.

SINGAPORE'S MOBILE CONNECTIVITY LANDSCAPE

- Four Mobile Network Operators
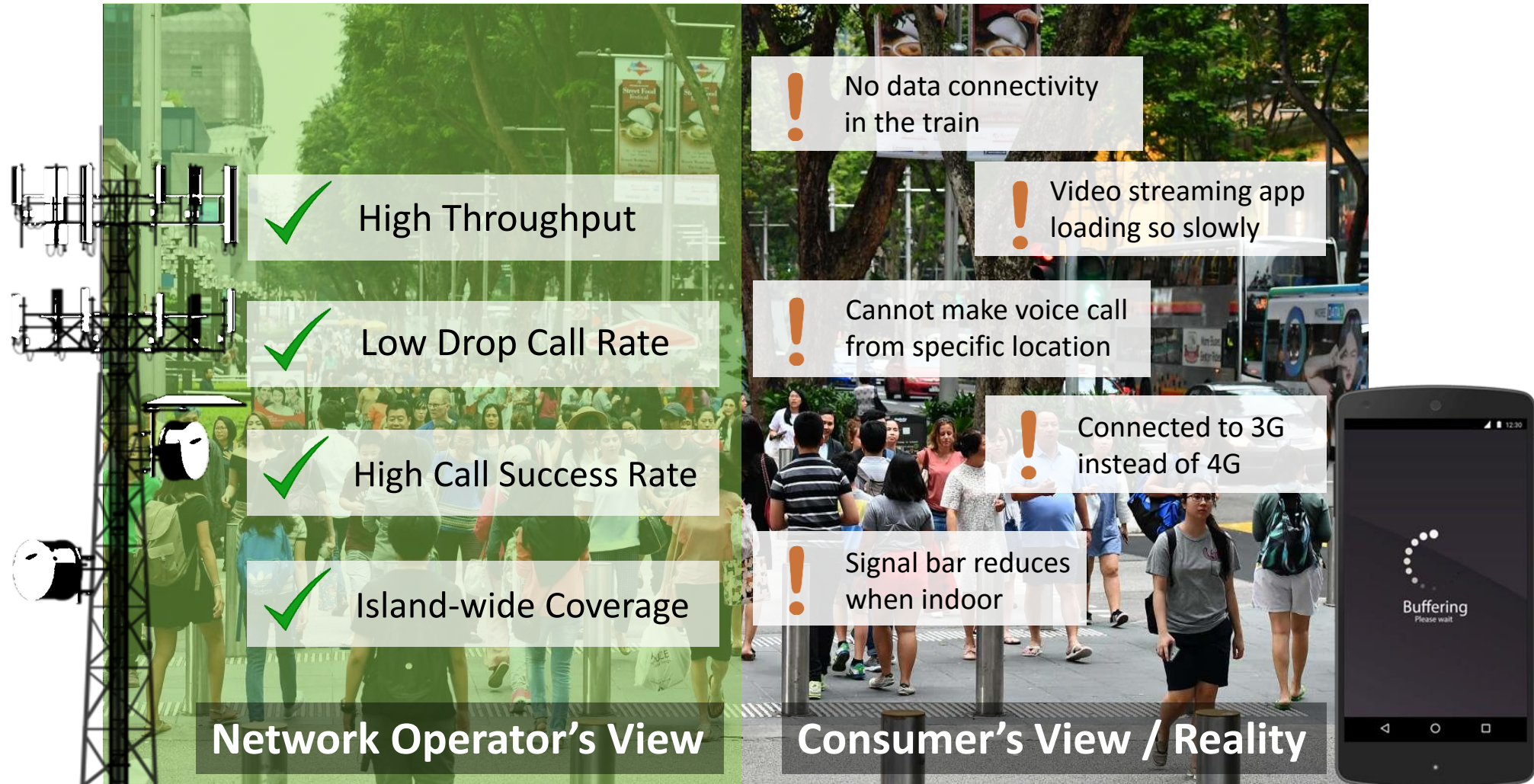
- Network Capacity

3G	4G
42 Mbps	> 450 Mbps

- Quality of Service for nationwide coverage

	Outdoor	Indoor	Tunnel
3G	99%	85%	95%
4G	99%	85% (from 2019)	99%

PERCEPTION OF CONSUMERS

Network Operator's View

- ✓ High Throughput
- ✓ Low Drop Call Rate
- ✓ High Call Success Rate
- ✓ Island-wide Coverage

Consumer's View / Reality

- ! No data connectivity in the train
- ! Video streaming app loading so slowly
- ! Cannot make voice call from specific location
- ! Connected to 3G instead of 4G
- ! Signal bar reduces when indoor

MEASURING CONSUMERS' MOBILE EXPERIENCE

Data & Voice

Network Coverage

Stationary & On-the-move

Indoor & Outdoor

Access Technology

Common Devices

Everyone, Everything, Everywhere, All the time Networks are used

KEY FEATURES OF IMCONNECTED

- Island-wide roving sensors

- "Light-weight" Solution
   (Does not drain resources)

- Anonymous & non-intrusive
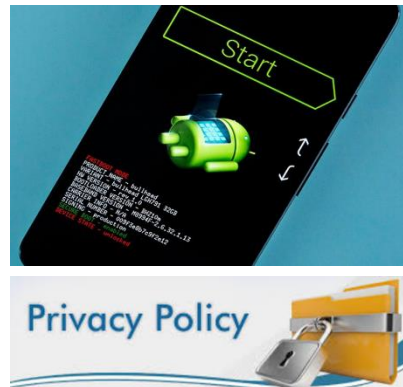
- Subjective feedback
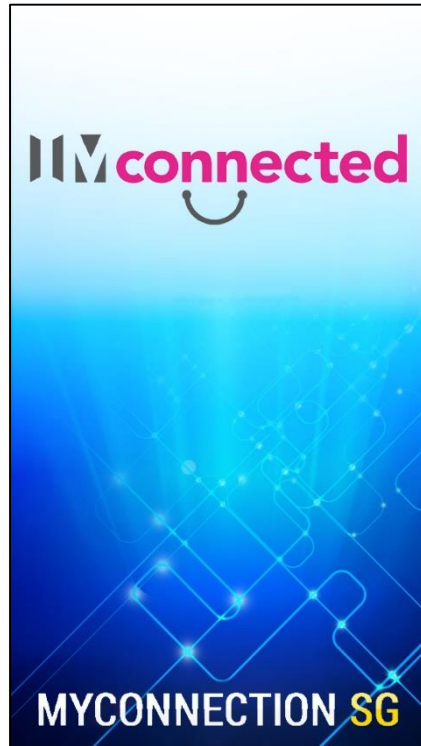
UNDERSTANDING CONSUMERS' EXPERIENCE

Crowdsourcing

Network Experience

Network Performance on customer's device

+ Experience (Survey)
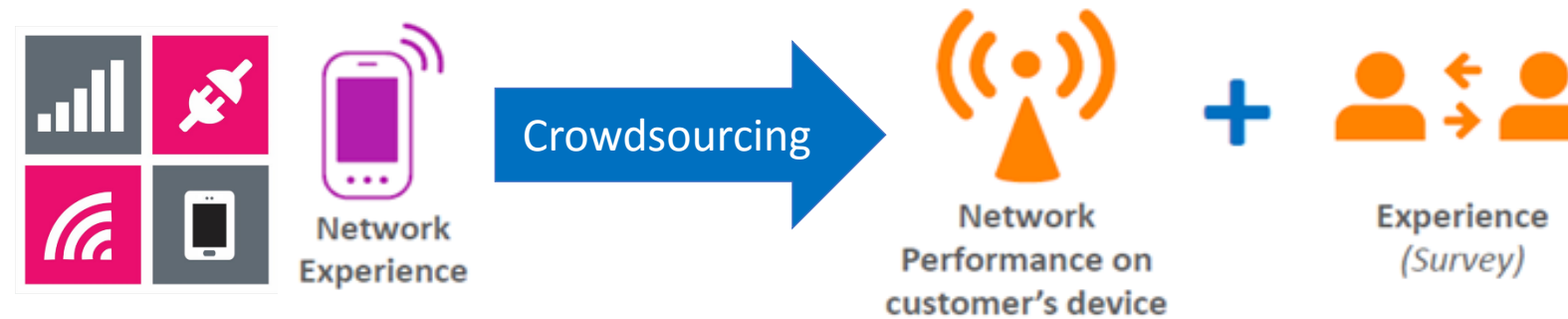
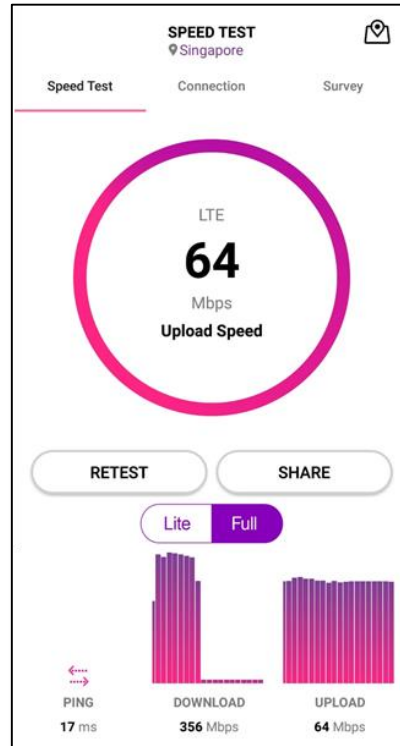| Data Performance	Voice Performance	Device Identifiers
1. Session throughput 2. Latency 3. Packet loss per session 4. Data volume utilised	1. Experienced network coverage	1. Manufacturer and model 2. Operating System 3. Location Information

6-monthly Publication since July 15

3G 4G

Wireless @SG

Cellular

Wi-Fi

SG:D EMPOWERING POSSIBILITIES

IIM INFOCOMM MEDIA DEVELOPMENT AUTHORITY
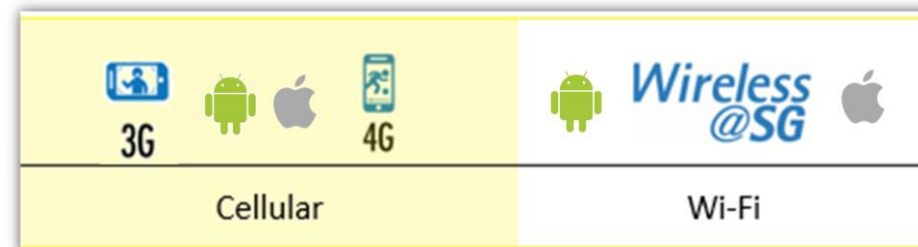
USER INTERFACE

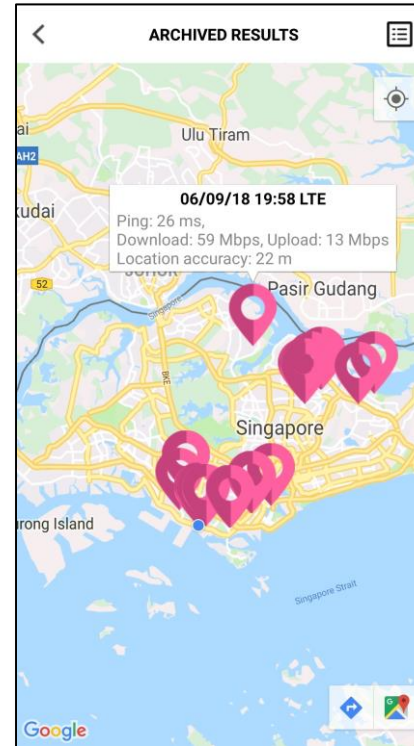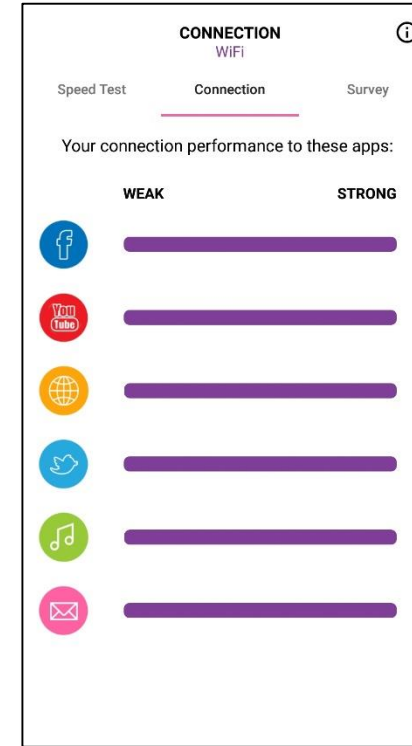| Splash Screen	Speed Test	Mapped Results	Connection	Survey
IMconnected relies *heavily* on passive data collection in the background	Data streams with a maximum capped data size for testing the speed to emulate the user's experience	Speed test results were archived on the mobile phone locally and displayed on a map	Connection performance to popular websites and applications	Users' experience review

HOW IT WORKS

Sessions
Data1 – 10 Mbps, Location A
Data2 – 8 Mbps, Location B
Voice 1 – successful, Location B
-          -   -
-          -   -
Data3 – 2 Mbps, Location A
Data4 – No Signal, Location C

IMDA Server

IMDA Server

Data A   Data B   Data C

MAC

Download IMconnected, run the App once and leave it in the background

App makes voice and data observations, including areas of no signal.

Information cached on phone is sent to IMDA server at regular intervals

Mobile Analytics Centre processes data and analyses information

1

2

3

4

HARNESSING THE POWER OF BIG DATA ANALYTICS

SG:D
EMPOWERING POSSIBILITIES

INFOCOMM
MEDIA
DEVELOPMENT
AUTHORITY

OUTDOOR MOBILE COVERAGE HEAT MAP
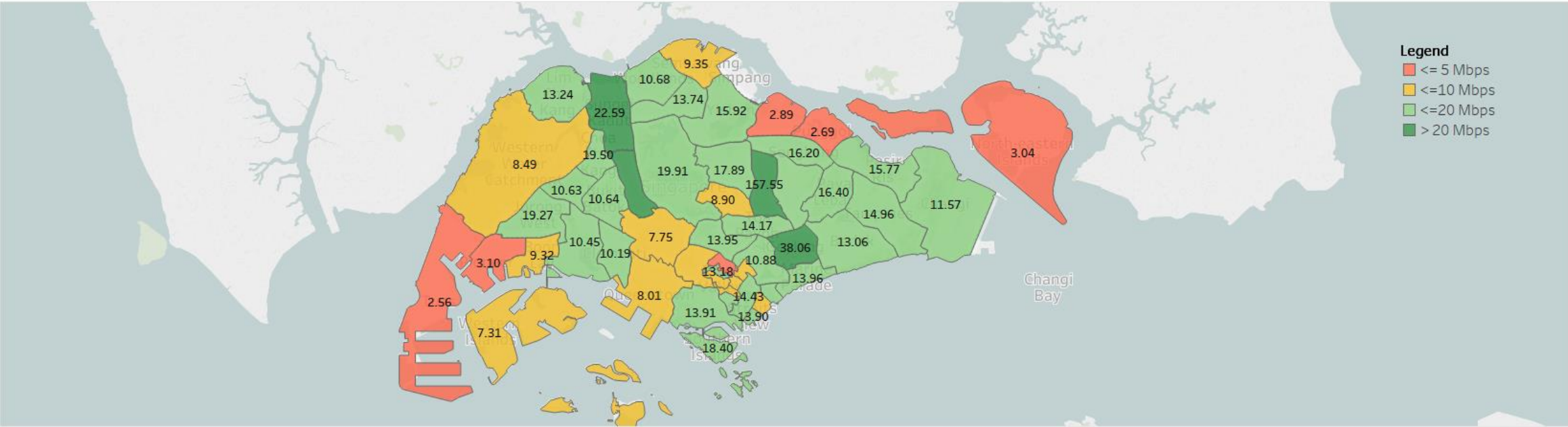
CONCLUSION

FOREFRONT IN A **DATA-DRIVEN** SOCIETY

```
         ┌──────────┐
         │  Gather  │
         │   Data   │
         └──────────┘
┌────────┐  ╭──────╮  ┌──────────┐
│ Enact  │  │ Data │  │ Interpret│
│ Change │  │Driven│  │   Data   │
└────────┘  │ Loop │  └──────────┘
         ╰──────╯
         ┌──────────┐
         │  Action  │
         │   Plan   │
         └──────────┘
```
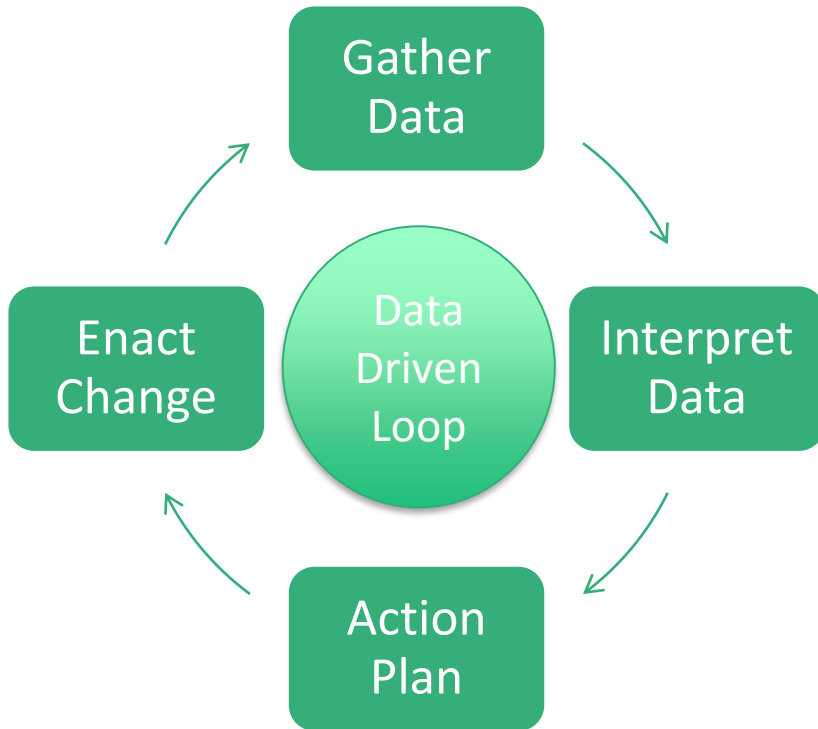
**Flow of Data Driven
Management Decision**

- **Revolutionise** the new era of data collection and sampling

- **Challenge** several conventional norms

- **Feedback** loop on ground sentiments

- **Increasing relevance** with introduction of 5G

- **Basis** for formulation of policies and decision-making

THANK YOU

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IMconnected

SG:D
EMPOWERING POSSIBILITIES

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INFOCOMM
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