



# 17<sup>th</sup> Asia Pacific Forum on Intelligent Transport Systems

Brisbane Convention & Exhibition Centre  
Queensland, Australia | 12-15 April 2021



## Singapore: Moving towards a Sustainable and Smart City



Saurav Bhattacharyya  
President



#ITSAP2021



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**Established on 26 August, 2001**

*Bringing together the professional interests of those in public and private organizations, practitioners, academics and researchers related to ITS, and create opportunities for networking and interaction*



**ITS** Singapore



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CUBIC™



Institute for Infocomm Research



MITSUBISHI HEAVY INDUSTRIES ASIA PACIFIC PTE. LTD.



School of Electrical & Electronic Engineering



SINGAPORE INSTITUTE OF TECHNOLOGY



Business Services



the mind of movement



ST Electronics

A company of ST Engineering



URBAN REDEVELOPMENT AUTHORITY

To make Singapore a great city to live, work and play





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# Objectives

1

- To promote & support the development of the ITS Industry in the interests of Singapore

2

- To represent Singapore and support the activities and interests of the ITS Asia Pacific and ITS World Congress entities

3

- To champion, promote & protect the interests of companies, business organisations, educational and research institutions, firms, partnerships & other entities legally organised for ITS business in Singapore

4

- To act as the advisory, consultative & coordinating body for the ITS Industry

5

- To promote, organise, manage & stage seminars, conferences, exhibitions & other events relevant to the ITS Industry



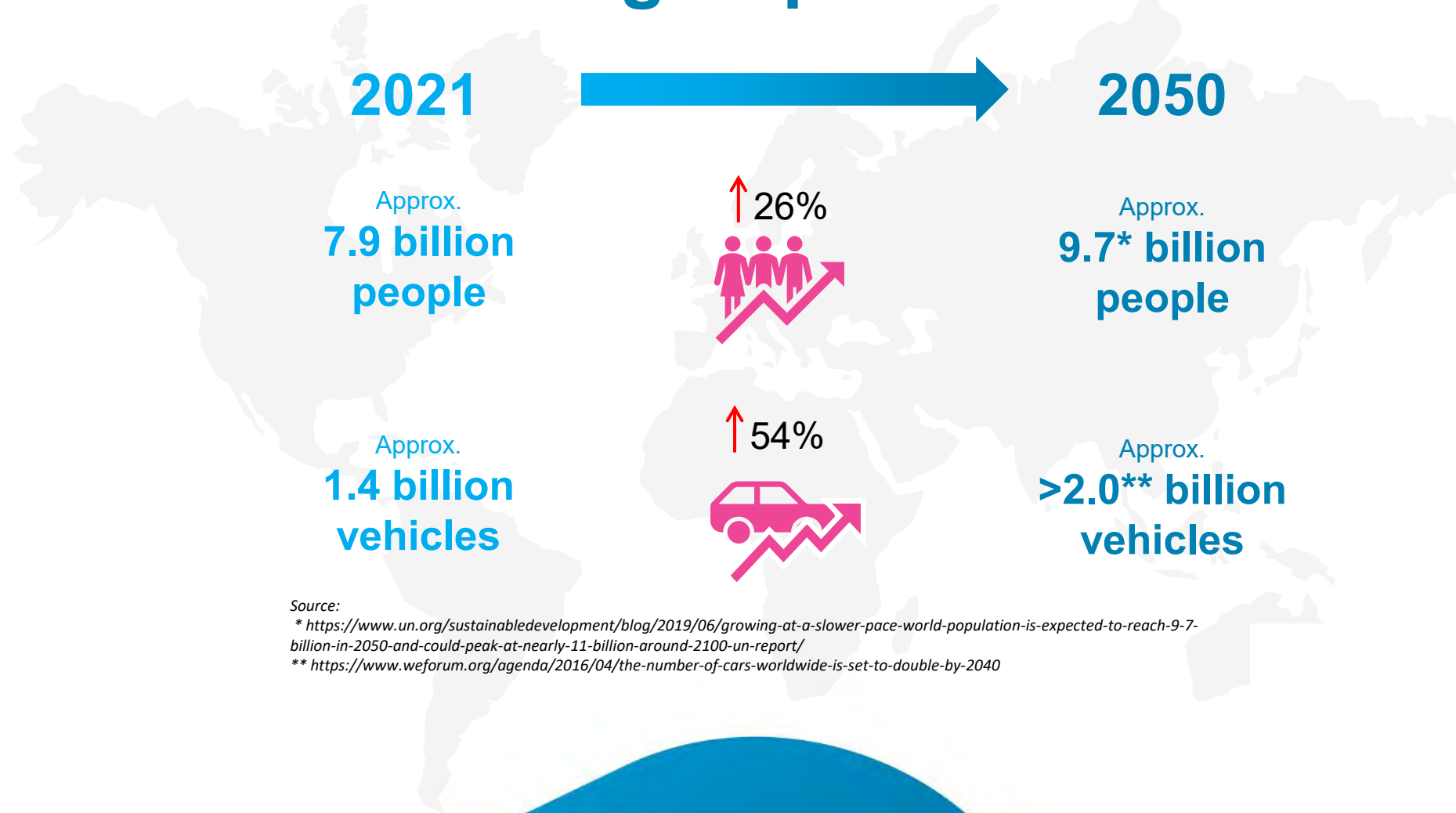
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# Increasing Population Trend



Source:

\* <https://www.un.org/sustainabledevelopment/blog/2019/06/growing-at-a-slower-pace-world-population-is-expected-to-reach-9-7-billion-in-2050-and-could-peak-at-nearly-11-billion-around-2100-un-report/>

\*\* <https://www.weforum.org/agenda/2016/04/the-number-of-cars-worldwide-is-set-to-double-by-2040>

**Rail length: ~200km**  
6 Mass Rapid Transit Lines

**Bus fleet: ~5,800 buses**  
Over ~370 routes



**ASIA**

**Singapore**



**5.69\* Million**  
Resident Population

**7,866\* persons/ km<sup>2</sup>**  
Population density

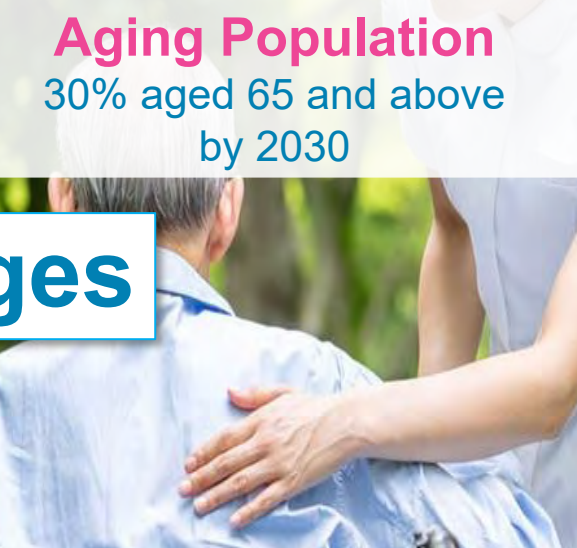


**954,000\*\***  
Vehicles

**12% of land**  
Road network



Source:  
\* SingStat as of June 2020  
\*\* Data.gov.sg as of Feb 2020



**Increasing Travel Demand**  
Population increase, intensive development and change in lifestyle

**Land Constraints**  
>12% of total land used for road and land transport infrastructure

**Aging Population**  
30% aged 65 and above by 2030

# Singapore's Key Mobility Challenges



**Manpower & Digital Competencies**  
Shortage of labour in specific industry and relevant digital knowledge



LAND  
TRANSPORT  
MASTER  
PLAN



20-Minute Towns  
and a 45-Minute City



Transport  
for All



Healthy Lives,  
Safer Journeys

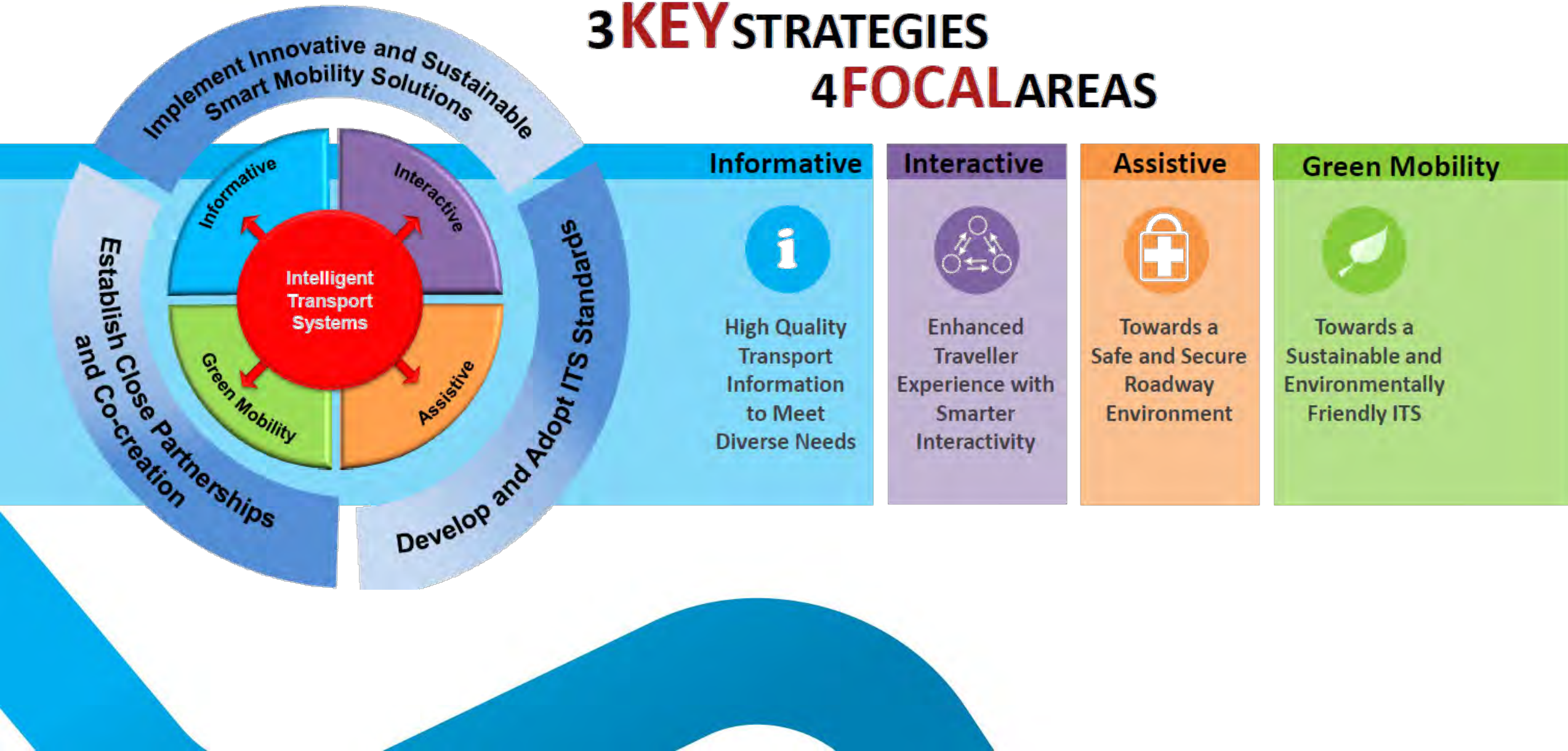




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# Smart Mobility 2030

## 3 **KEY** STRATEGIES 4 **FOCAL** AREAS





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# Key Public Transport Modes Today



**MRT**

199 km



**LRT**

29 km



**Bus**

>5600 Buses  
>310 Routes



**Taxi/Private  
Hire Cars**

>20,000 Taxis  
>45,000 PHCs



**3.5 million**

MRT/LRT trips



**4.3 million**

Bus trips



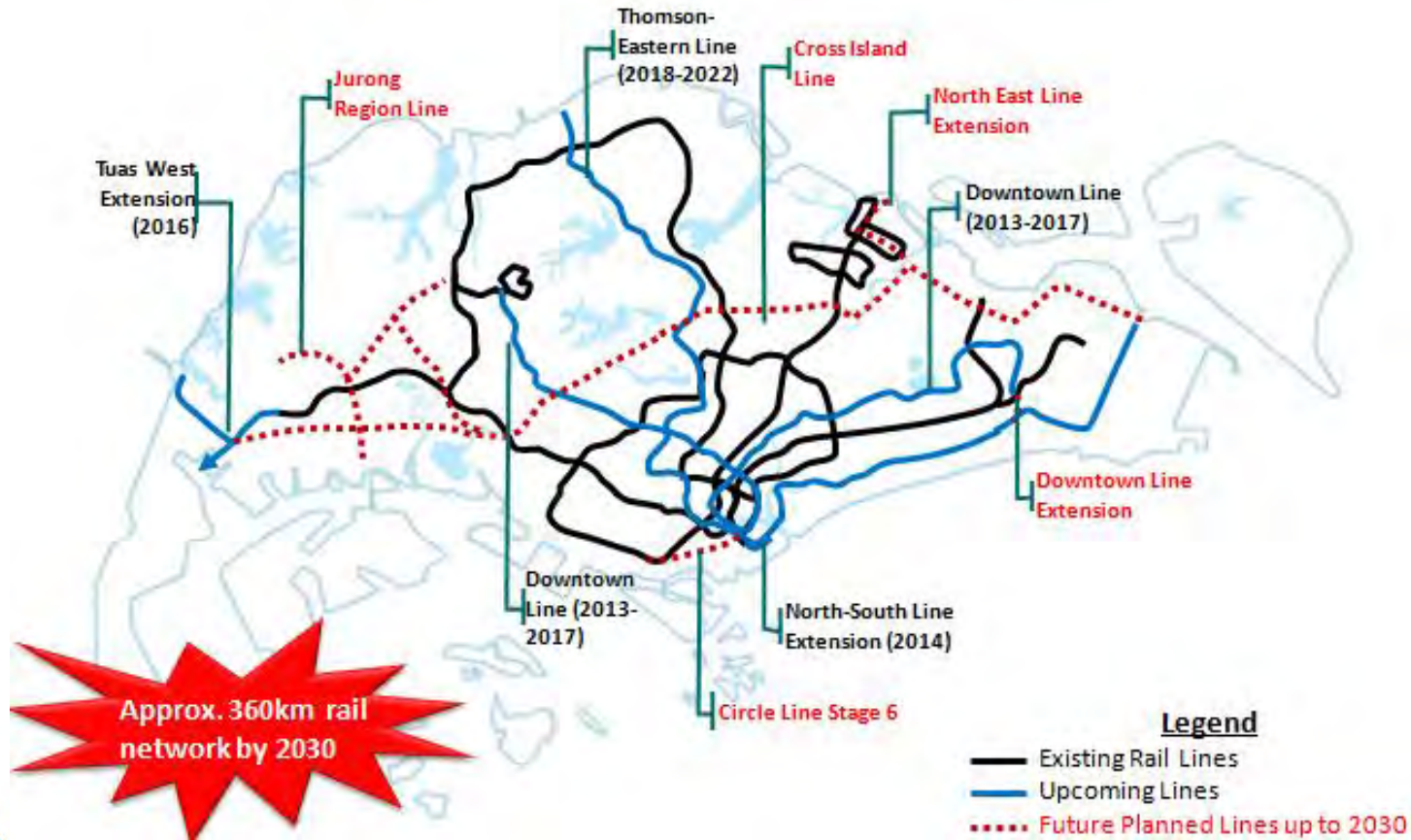
**1.1 million**

Taxi & PHC trips



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# Enhancing Transport Accessibility and Connectivity



## Doubling the Rail Network & Enhancing the Bus Services



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# Enhancing Transport Accessibility and Connectivity



**Developing More Integrated Transport Hub**



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# Offering Multiple Transport Modes

Mobility on Demand using private hired vehicles



Crowdsource Shuttle Service (non-fixed route)



Electric car sharing



Electric Bus



Shared Dockless Bikes



City Direct Bus (fixed route)



Electric Taxi Trial



Personal Mobility Devices





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# Leveraging on Artificial Intelligence (AI) in Land Transport

## Land Transport Data

- Traffic Conditions
- Private Vehicles
- Bus
- Rail
- Commuters' Farecard
- Video, WiFi, People Counting etc.

Data from Sensors

## AI Engine

- Predictive Analytics
- Data/Video Analysis
- Machine Learning

Provide Insights

## Applications

- Predictive Equipment Maintenance
- Smart Traffic Control
- Crowd Analysis
- Anomaly Detections

Enhanced Operations & New Capabilities



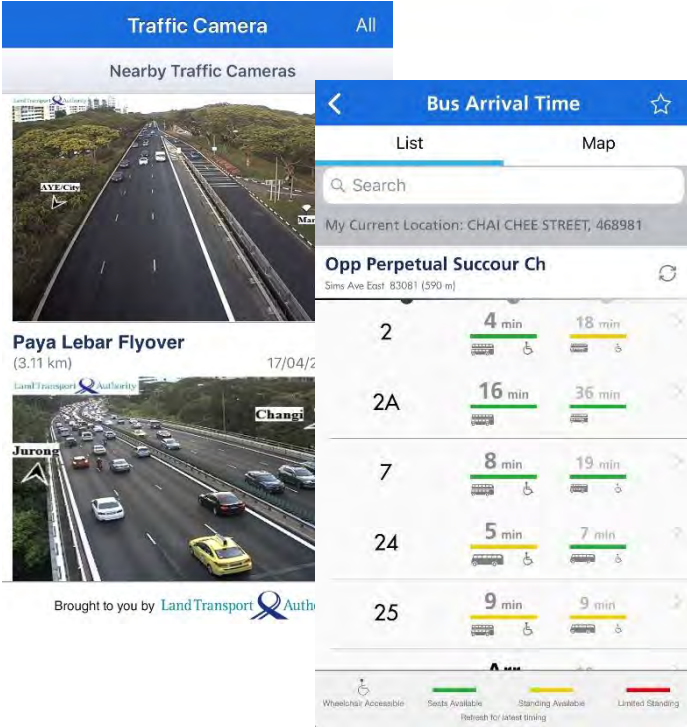
## Outcomes

- Enhanced Reliability
- Enhanced Land Transport Operations
- Enhanced Safety and Security



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# Providing Timely, Reliable & Relevant Information



Smartphone traffic apps



Live traffic updates on social media



Live traffic broadcast on radios



On-site traffic advisory

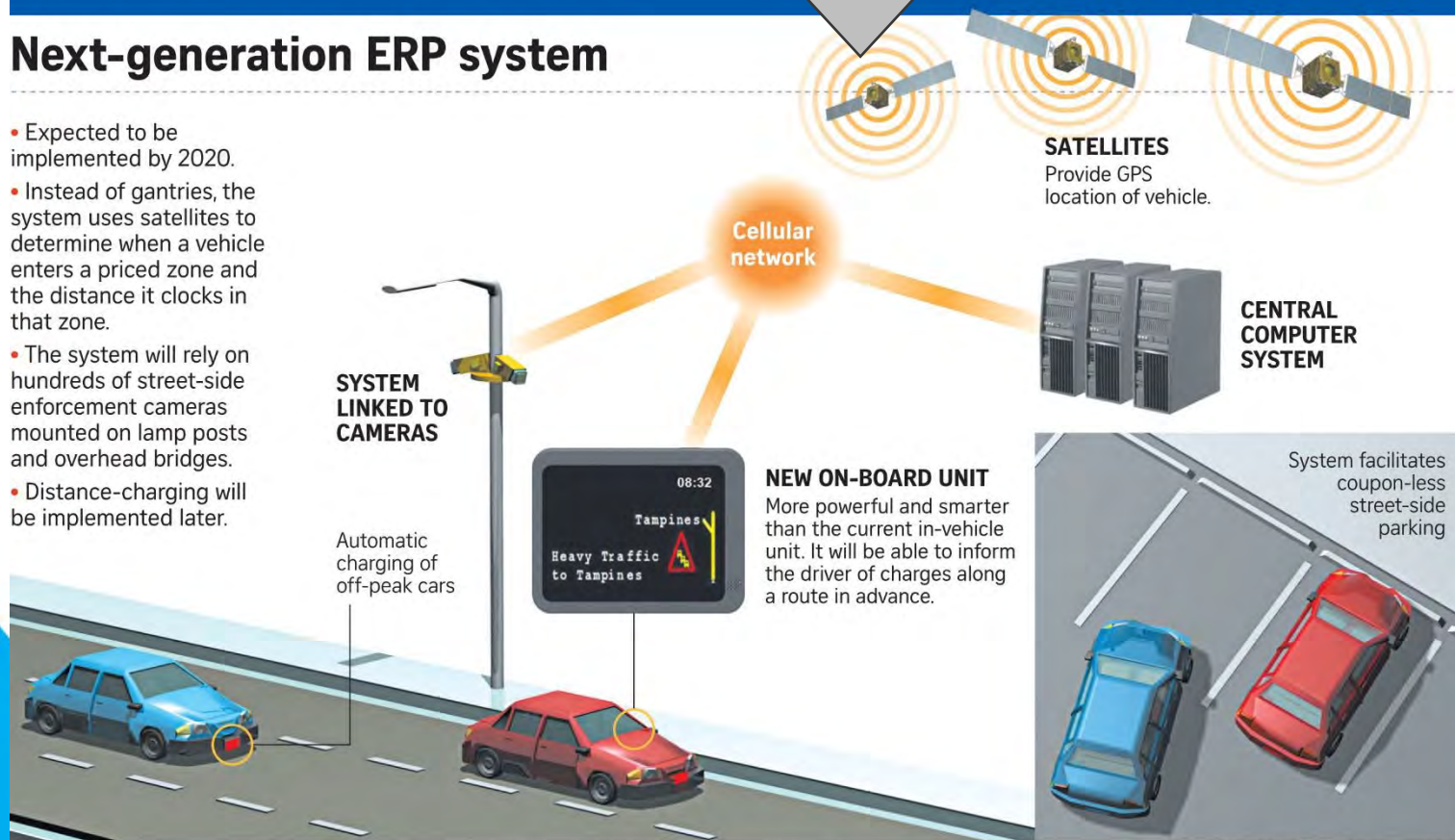
- Real-time info on the move – anytime, anywhere
- Comprehensive and easy to understand Info
- Accurate, reliable and relevant





## Next-generation ERP system

- Expected to be implemented by 2020.
- Instead of gantries, the system uses satellites to determine when a vehicle enters a priced zone and the distance it clocks in that zone.
- The system will rely on hundreds of street-side enforcement cameras mounted on lamp posts and overhead bridges.
- Distance-charging will be implemented later.

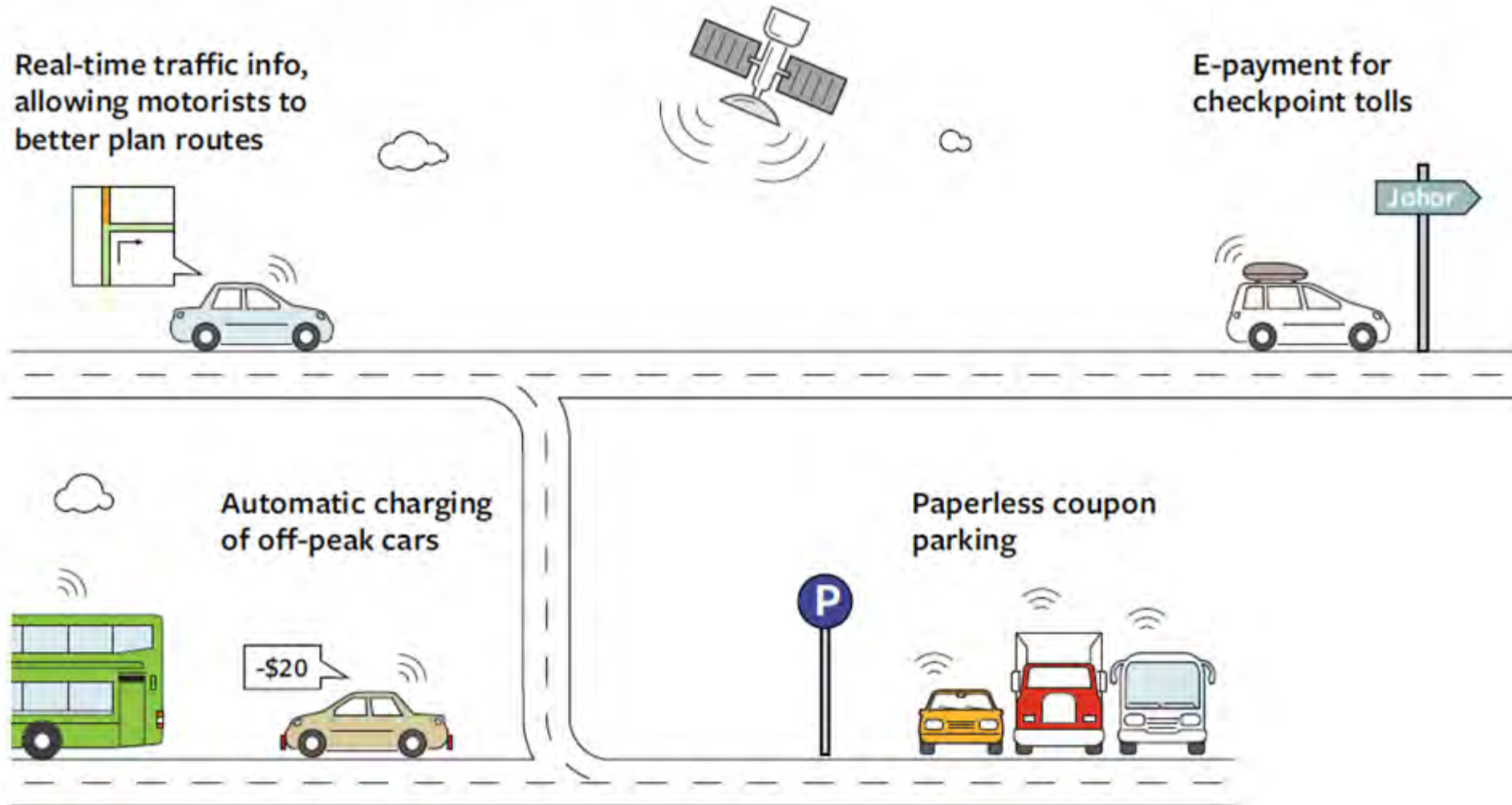




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# Optimising Road Networks & Enhancing Road Experiences

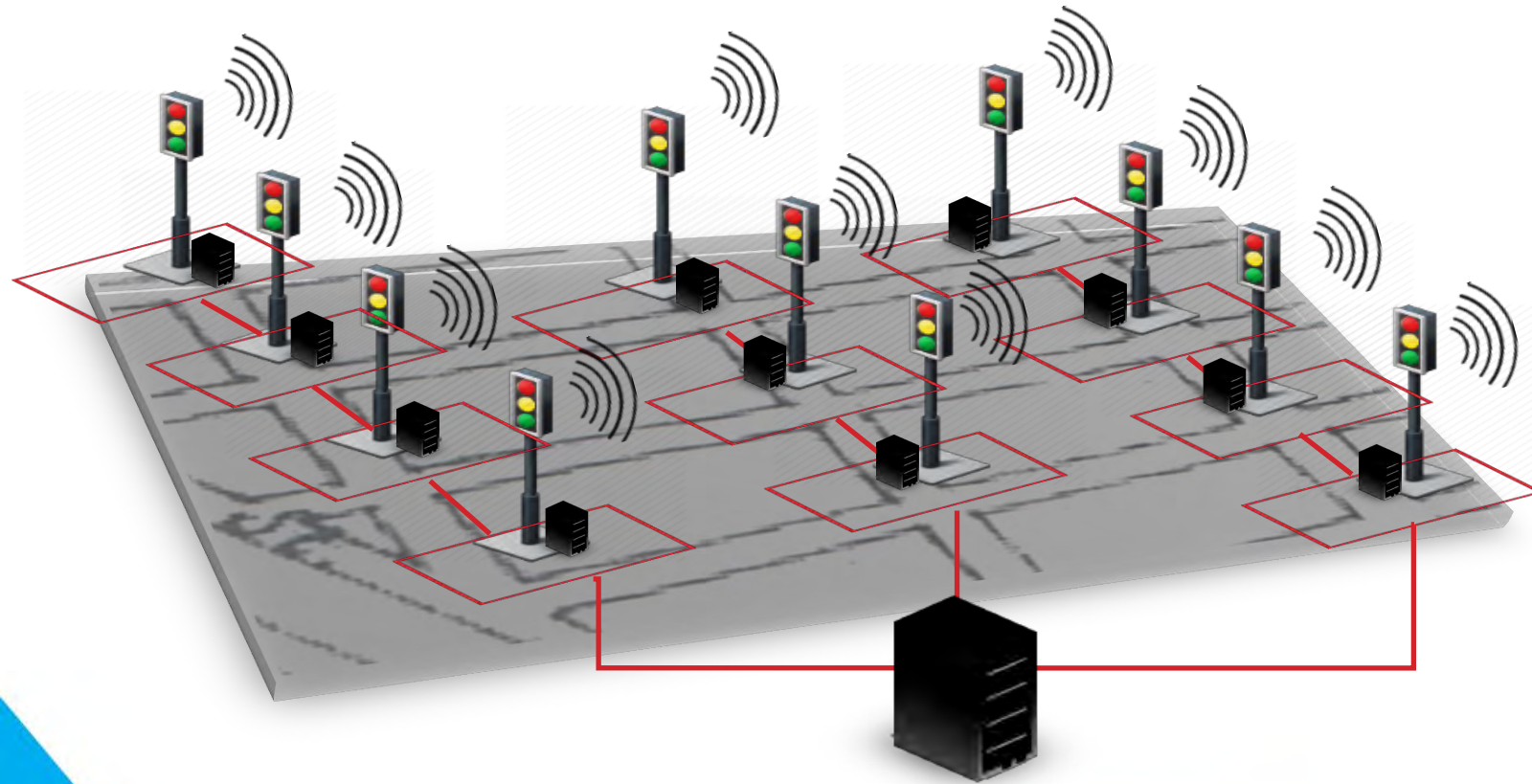
Services enabled by next-gen ERP:





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# Enhancing Intelligence of Traffic Light Control System



- Harness **richer real-time data** from vehicles and ground sensors
- Detect, coordinate and optimise traffic flow more **pro-actively** and **efficiently**.
- **Supports new mobility concepts** such as V2X capabilities, self-driving vehicles, truck platooning, vehicle priority



# Embracing Innovations in Autonomous Mobility

## Self-Driving Bus



Photo by: NTU

- Improve productivity, safety and reliability of bus services
- Overcome shortage of bus drivers

## Self-Driving On-Demand Mobility



Photo by: Aptiv

- First-mile Last-mile connections to public transport to increase accessibility
- Supports mobility for elderly and mobility challenged users

## Self-Driving Truck Platoon



Photo by: SAE Off-Highway Engineering Online

- Encourage more trucking activities to be carried out at off-peak hours
- Supports logistic industry and enhance fleet management

## Self-Driving Utility vehicle



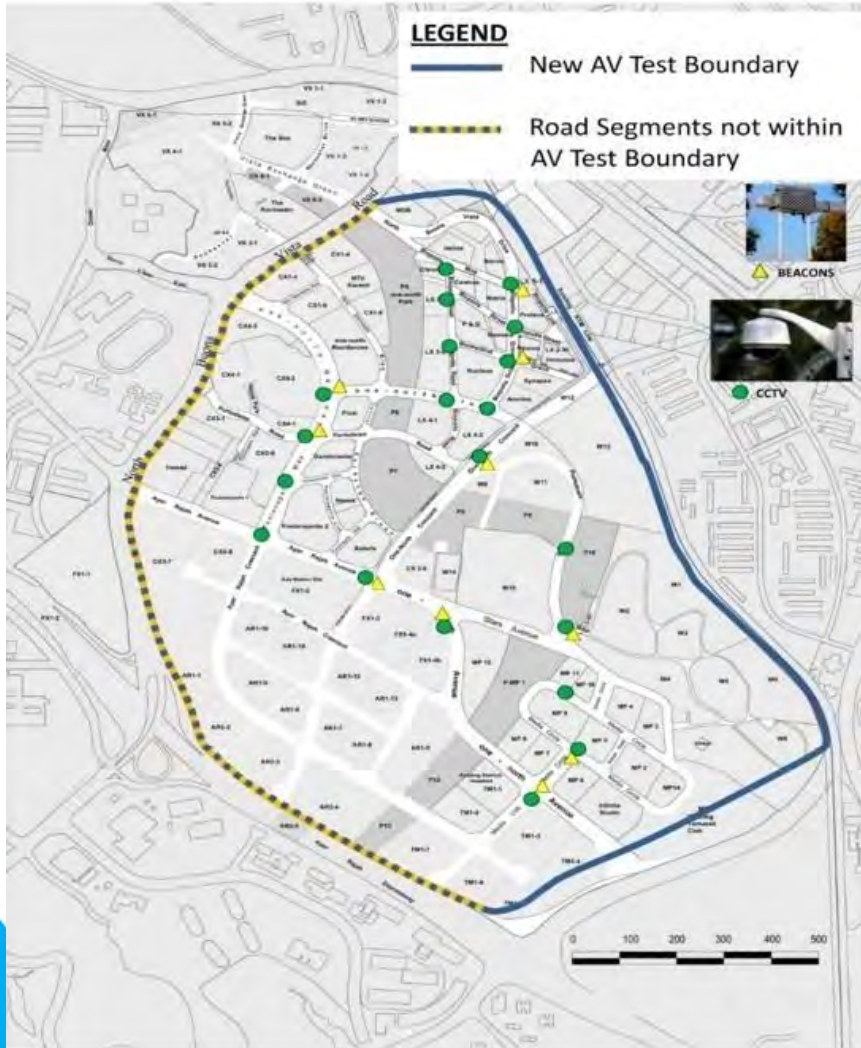
Photo by: The Livingstone Weekly

- Reduce manpower for road cleaning jobs
- Improve productivity

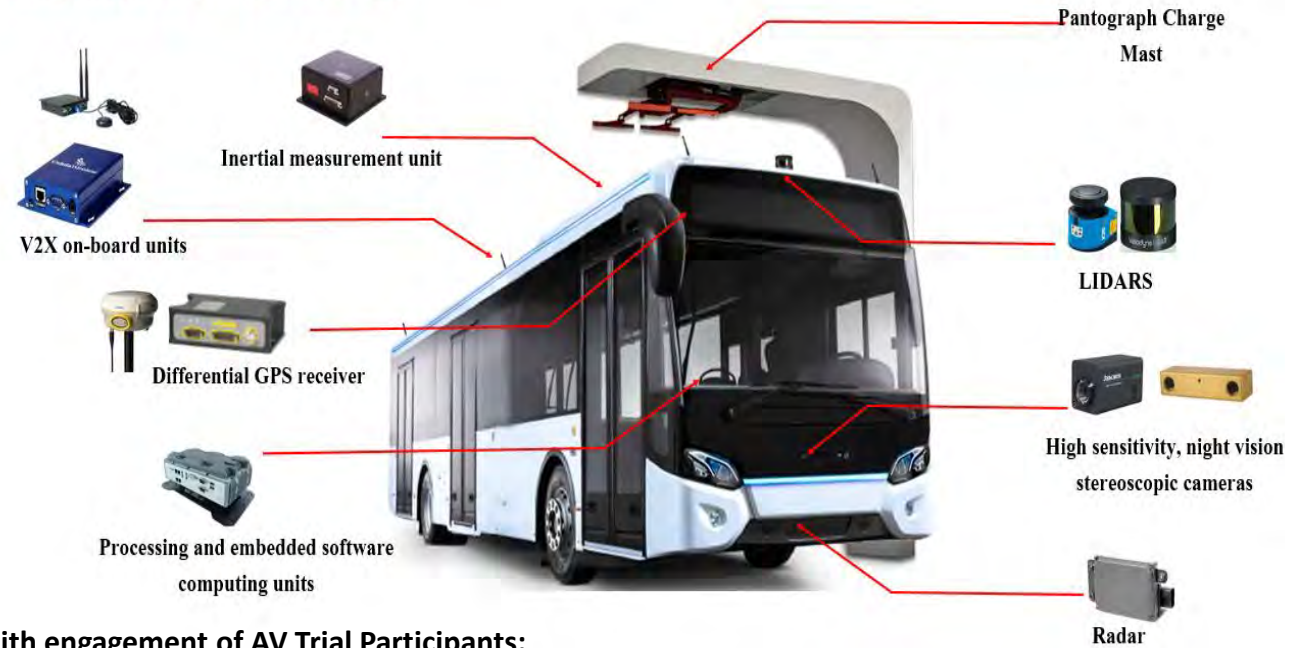


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# SELF-DRIVING VEHICLES



## Components of AV Robotics Kit



## With engagement of AV Trial Participants:





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# LAUNCH OF CETRAN

## Centre of Excellence for Testing & Research of Autonomous Vehicles NTU



On 1 August 2016, CETRAN was launched to:

- build up technical capabilities and knowledge in the testing and certification of AV capabilities,
- to facilitate the drafting of regulations to allow eventual deployment of AVs on public roads

### NTU is appointed by LTA to host CETRAN

The test circuit, jointly developed by JTC and LTA is to support these AV testing and certification activities.

#### Vision:

To position Singapore as a renowned AV Knowledge and Research Centre to catalyse the testing and certification of AV Technology for urban cities



#### CETRAN Partners:



# Call for Collaboration for the Pilot Deployment of Autonomous Buses and Shuttles in Singapore

07 Jan 2019 | Urban Solutions & Sustainability

<https://www.edb.gov.sg/en/news-and-events/news/call-for-collaboration-on-pilot-deployment-of-autonomous-buses-and-shuttles.html>

Through the Call for Collaboration, Land Transport Authority and Economic Development Board are keen to partner companies/consortiums with the requisite capabilities to:

- establish AV research and development, product development, and commercial capabilities in Singapore; and
- pilot the deployment of AVs for public transport

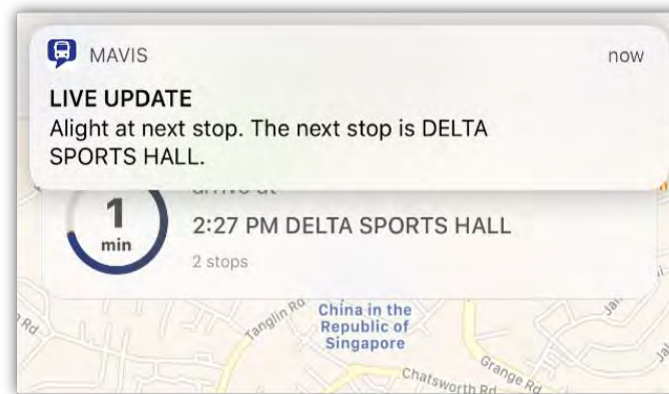
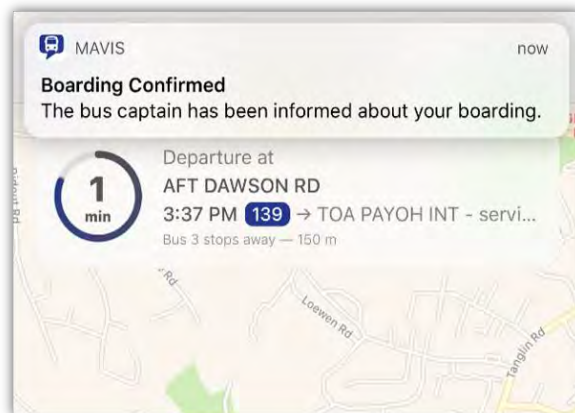


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# Supporting Inclusivity and Enhancing Safety - Assistive Passenger Information System

Technology trial of **MAVIS** - **M**obility **A**ssistance for the **V**isually-**I**mpaired & **S**electd users:

- **Provide real-time bus information and alerts**, in-journey updates and notification of arrival at alighting bus-stop to mobility challenged commuters
- **Alert bus captains** of special needs commuters who will be boarding / alighting
- **Trigger external audio announcement** from the bus to the visually impaired commuters







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# Supporting Inclusivity and Enhancing Safety

## Green-Man Plus

- Extend crossing time for elderly and mobility challenged users at pedestrian crossing



## Silver Zone

- Provide senior-friendly, barrier-free road safety features for elderly

## School Zone

- Flashing warning lights during school starting and dismissal hours to alert motorists to reduce speed to 40km/hr





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# Innovative Use of Drones

For bridge inspection



For tunnel inspections





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# Public Transport during COVID-19



Public Transport is a Critical Public Utility



Measures put in place to curb virus spread & protect commuters and Public Transport workers



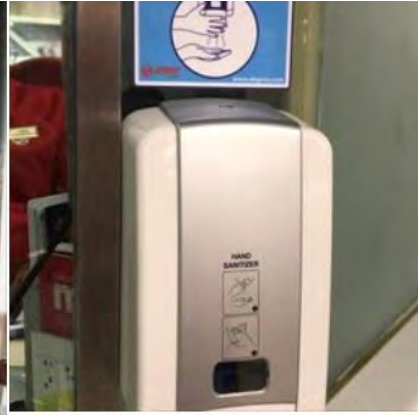
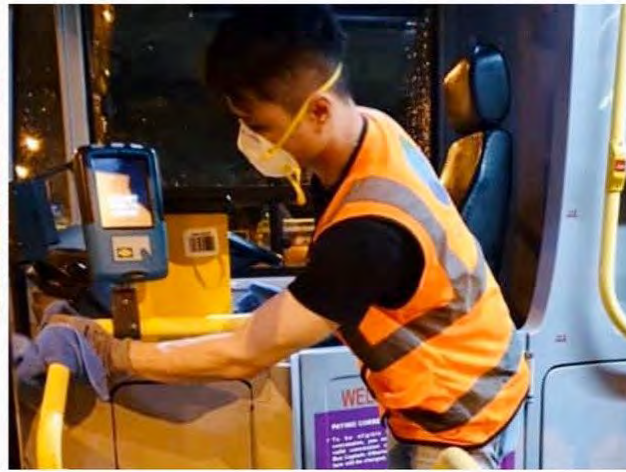
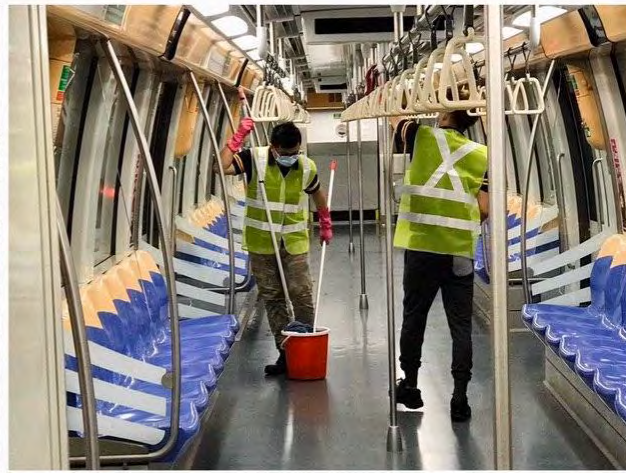
Public Transport to continue to operate normally for essential workers and industries



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# Ensuring Cleanliness

Hand Sanitizers in MRT Stations



New Cleaning Methods



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# Transport Ambassador Scheme



Employing taxi drivers and cabin crew affected by COVID-19 situation



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# The Road Ahead



Improve reliability of  
public transport  
systems

Find prospects to  
enhance quality of  
service



# In Summary...



Adopt a long-term holistic and integrated transport master plan and strategies

Effective use of technologies and data to support regulations and policies

Embrace innovative mobility solutions and new business models

## ... To achieve a Sustainable Smart City





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# Thank you



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