

# SELF-DRIVING VEHICLE INITIATIVES IN SINGAPORE

**4 April 2017**

# Key Drivers of Urban Mobility

## Increased Travel Demand

- Planning parameters for resident population is 6.5-6.9 million by 2030

## Competing Land Uses

- >12% of land is used for road infrastructure (compared to housing at 14%) today, not feasible for land-take of road infrastructure to continue expanding

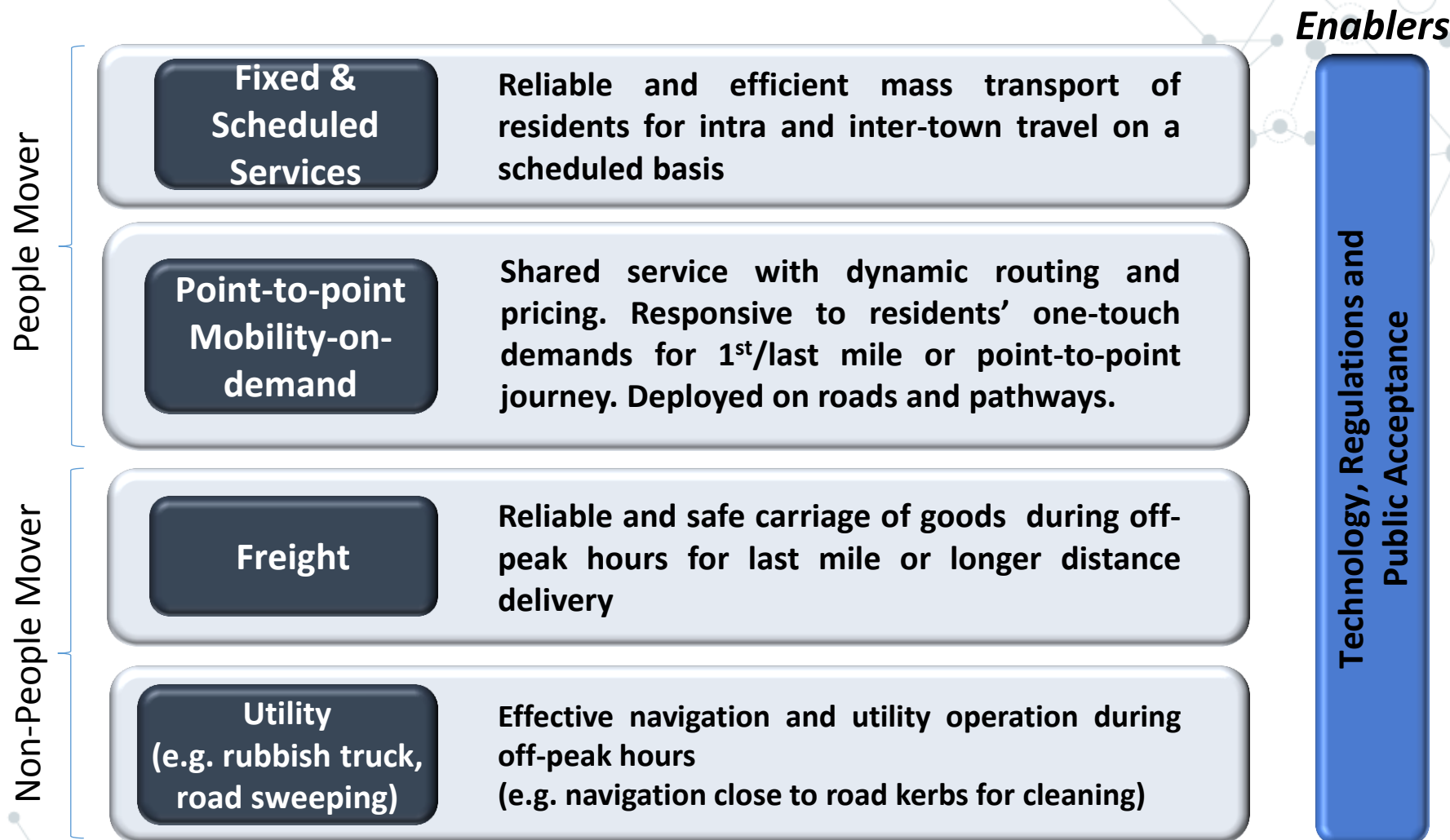
## More Diverse Transport Needs and Wants

- Rapidly ageing population – number of seniors aged 65 years and above will almost triple from 365,000 in 2010 to over 900,000 in 2030
- More travel options to match variety of lifestyle wants and needs

## Increasing Manpower Constraints

- More than 1/3 of labour force aged at least 50 in 2014, compared to 1/5 in 2004
- Labour force growth expected to slow significantly

# Vision of SDV deployment in Singapore





# Concept of a Future Town Centre with Self-Driving Vehicles (Day Time)





# Concept of a Future Town Centre with Self-Driving Vehicles (Night Time)



# Committee on Autonomous Road Transport for Singapore (CARTS)

## Committee on Autonomous Road Transport for Singapore (CARTS)

Chaired by PS/MOT

Comprising public & private sector members

**WG1 on  
Visioning SDV  
Deployment  
in SG**

**WG2 on  
Regulations  
&  
Implementation**

**WG3 on  
Industry  
Development**

### Govt Agencies



CENTRE FOR STRATEGIC FUTURES  
Strategy Group, Prime Minister's Office

**NATIONAL  
RESEARCH  
FOUNDATION**

### Private Organisations

**TOYOTA**



**ST Kinetics**  
A company of ST Engineering



**THE  
BEHAVIOURAL  
INSIGHTS TEAM.**



Singapore-MIT Alliance for Research and Technology

**CARLO  
RATTI  
ASSOCIATI**





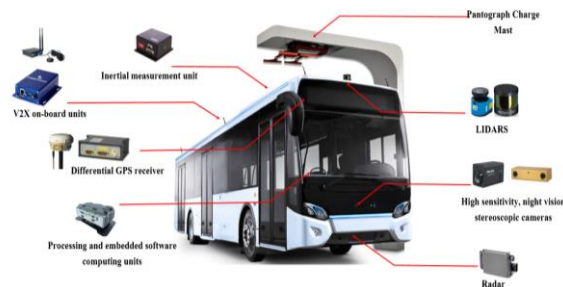
# Current SDV Developments



## Self-driving Vehicle Trials @ NTU-CleanTech Park



## Self-driving Bus Trials

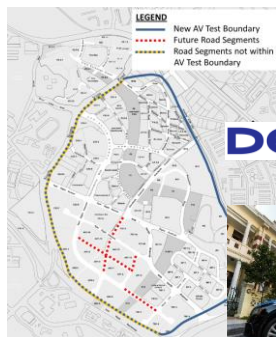


## Self-driving Shuttle @ Gardens by the Bay

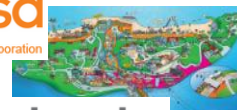


## Point-to-Point Mobility on-Demand Services

## Self-driving Vehicle Mobility-on-Demand Trials @ one-north



## Self-driving Shuttle @ Sentosa



- Trials on roads, mixed-use traffic
- Fleet management system
- Public acceptance
- Partnership between MOT-SDC-STE

# Current SDV Developments



## Freight

### Self-driving Truck Platooning for Port Operations



- Partnership between MOT and PSA
- Self-driving truck platooning concept of 1 human-driven truck with 3 driverless follower trucks
- Trial in enclosed port area and open roads on West Coast Highway



## Utility



Road Sweeping



Waste Hauling

- Common mobility platform, multiple use cases
- Functional autonomy, road sweeping and refuse collection etc.
- Specialized self driving capabilities, eg. kerb following and obstacle avoidance etc.
- Trials on road, light mix-use traffic



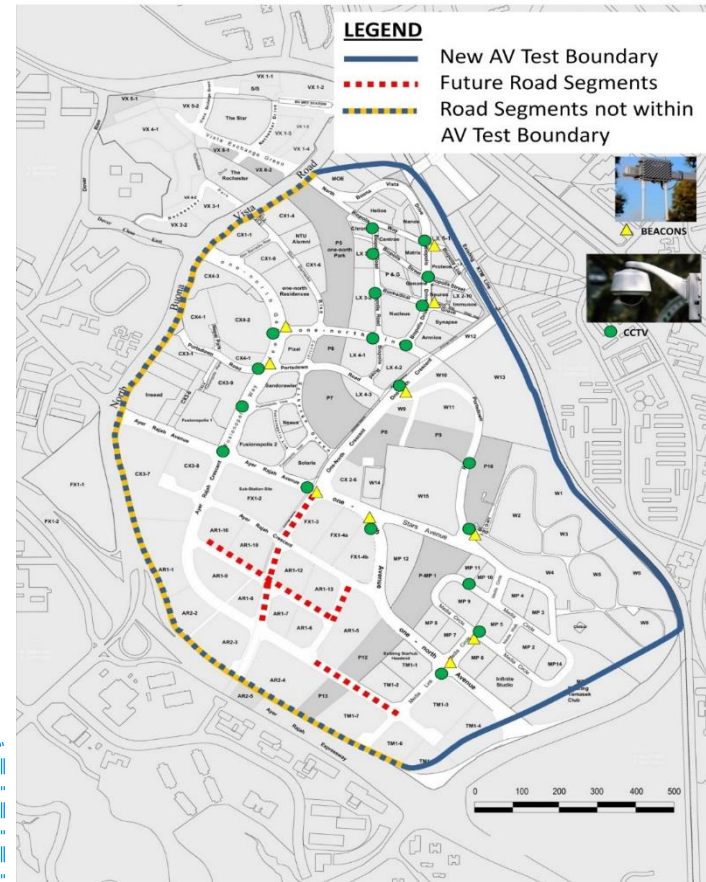
# SDV Test-Bed @ one-north

The test-bed serves as a proof-of-concept for SDV testing, paving the way for future test-sites and deployment of SDVs.

LTA and industrial land planner (JTC Corporation) have drawn up a specific set of requirements which interested applicants are required to adhere to when conducting on-road testing at one-north.



4 participants have been granted approval to conduct AV test-beds in one-north



<http://www.lta.gov.sg/content/ltaweb/en/roads-and-motoring/managing-traffic-and-congestion/intelligent-transport-systems/savi.html>

# Centre of Excellence of Testing & Research of AVs-NTU (CETRAN)

On 1 August 2016, CETRAN was launched to:

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

NTU is appointed by LTA to host CETRAN.

The test circuit, jointly developed by JTC and LTA is located at CleanTech Park and will also support these SDV testing and certification activities.



## Vision:

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

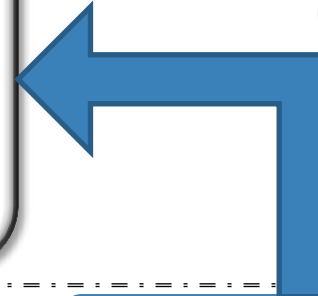


## CETRAN Partners:



# Overview of CETRAN Focus Areas

**CETRAN**



Functional Safety

Testing and performance  
evaluation

V2X

Test Circuit Facility

Cyber Security

Technology Roadmapping/  
Standards Development (tbc)

Outreach Programme



In development with CETRAN Partners:



CREATE



TNO

With engagement of AV Trial Participants:



DELPHI





# Legislative Amendments

- To provide Minister for Transport with the power to make subsidiary legislations to regulate the use of AVs
- Powers in the Road Traffic Act (RTA) include the ability to exempt or modify existing provisions
  - Changes, if required, can be made quickly to adapt the regulations in response to rapid development of AV technology

# International collaboration opportunities

- Technology developers
  - Test your SDVs in Singapore
  - Participate in our trials, based on what a urban city such as Singapore requires
- Research institutions, testing houses
  - Partner Singapore / CETRAN in developing test scenarios, testing standards
- National Authorities
  - Share experiences and insights gained from trials in your countries
  - Update one another on our rules and regulations, come together to establish commonly agreed standards

# Collaborations with the European Commission (EC)

- Signed EC-MOT MOU on ITS Collaboration on 13 Feb 2012
- Hosted visit by Mr Henrik Hololei, Director-General of DG MOVE to Singapore on 28 Oct 2016
- Regular video conference between Singapore and EC-DG-MOVE for projects update and sharing
  - Autonomous and Connected Vehicles
  - V2X Standards
  - Cyber-security
  - Traffic Management





# Active Participation and Sharing at ITS World Congresses and International Forums



Japan



# Close Collaborations within the Asia Pacific Region



# Collaboration with Contra Costa Transportation Authority (USA) and GoMentum Station

Land Transport Authority

CONTRA COSTA  
transportation  
authority

GOMENTUM  
STATION



Randy Iwasaki @riwasaki2 - Apr 19

The beginning of a great partnership! @gomentum & @LTAsg sign a collaborative agreement to advance autonomous tech.





People and Technology in Motion

21 - 25 October 2019

**Thank You!!**

*See you at 26<sup>th</sup> ITS World Congress 2019*