ITS Development in Singapore

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Singapore Road Transport

3,500 km
Road Network

5 km/square km
Road Density

1 car / 10 persons
Car Ownership

960,000
Total Vehicles Population
575,000 private cars
Tackling The Challenges

• Adopt a holistic and integrated approach
• Deploy innovative technologies and advance traffic management tools to complement policies & regulations
• Close collaborations between government agencies, industries and academic institutions
Integrated ITS Approach

1. Intelligent sensors and equipments
- Surveillance Cameras
- Traffic Light Controls & Green Man
- Webcams
- Parking Guidance Info
- Expressway Monitoring & Advisory System
- Vehicle probe data

2. Integrated Traffic Monitoring and Control
- ITS CENTRE
  Intelligent Transport Systems Centre
  One Central ITS Platform
- Incident Management
- Tunnel Monitoring & Control
- Emergency Response
- Data Analysis & Traffic Advisory
- Unified Equipment Maintenance

3. Optimizing Traffic Operations
Integrated Public Transport Approach

1. Bus IoT Sensor

- Ruggedized SIM on ALL buses

2. Data Analytics

**Before**
- Public Bus Operators: Data collection *by the minute*
- Data transmission: 1 min interval
- Missing data

**After**
- LTA: Data collection *by the seconds*
- Data transmission: every 20 sec, 98% accuracy

- Bus loading heat-map
- Bus loading analysis
- Bus loading & headway analysis
- Bus trip load monitoring

3. Real-Time Transport Information

- Bus Arrival Panel
- Radio broadcast of live traffic news
- Smartphone traffic apps
- Live traffic on social media

Seamless Travel with Contactless Card

**Before**
- Data transmission: 1 min interval
- Missing data

**After**
- Data transmission: every 20 sec, 98% accuracy

Increased Data Quality

Seamless Travel with Contactless Card

Common Fleet Management System
Reliable Real-Time Transport Information

- Smartphone traffic apps
- Live traffic on social media
- Radio broadcast of live traffic news
- On-site traffic advisory and parking info

Real-time info on the move – anytime, anywhere

Comprehensive and Integrated transport Info

Reliable, relevant and intuitive information
Reliable Bus Services & Timely Bus Arrivals

- **Reducing** Headways
- **Schedule** Adherence
- **Improved** Navigation
- **Real-time** Tracking
- **Greater Operational Efficiency**
- **Unified System**

- **Reduced** Waiting Time
- **Accuracy of 95%** up to 4 stops away
- Powered by **5,000 IoT Sensors** across Bus Fleet
- **Innovation and Co-creation** with public via DataMall
- **API downloads per month** > **600M** from DataMall

Common Fleet Management System

Bus Arrival Information
Seamless Travel With Contactless Card

100,000 Pilot Users

No need to top up separate fare card

Commuters can track their journey and fare payment history via the Web Portal or Mobile Services app
Traffic Light Control Systems –
Green LInk DEtermining (GLIDE) System
& Green-Man Plus (GM+)

Detection of vehicles

Detection of pedestrians
*Elderly and Mobility Challenged group of users can be detected through the use of dedicated cards

Regional Computer

Centralised Management System

Local Controller

Countdown timer for pedestrians

Traffic light signals
Expressway Monitoring & Advisory System

- **Replacement** of existing Variable Message Signs (VMS) to full-colour matrix
- Richer **graphics** to display incident info and traffic advisory messages
- **Colours** to indicate travel time information
- **Simple** and **intuitive** messages/graphics for quicker response and decision-making
- **More cameras** for detection and monitoring
Vehicle Probes Data – TrafficScan

- Taxis equipped with Global Navigation Satellite System (GNSS) provide real-time information on their locations and speeds as they ply along roads.
- Fused with other sensor source speed data to translate to real-time travel information on roads to motorists.
Current ITS in Summary

- 500 signalised crossings with Green Man Plus
- 77 ERP Gantries
- 1,600 Electronic Parking Systems
- 114,000 Island-wide Lampposts with sensors
- 2,200 Sets of Adaptive Traffic Signals
- 1,600 Detection Cameras with image processing technology
- 16 million Public Transport Transactions daily for Data Analytics
- 23 million Page-views monthly for MyTransport.SG
- 88 Radar-based traffic data collection systems
- 176 MRT Stations Wifi@MRT
- Data Transmitters on 5000 Buses
- 28,000 Taxis for Data Collection
Next Generation Electronic Road Pricing

Global Navigation Satellite Systems (GNSS)

Greater Flexibility
Managing traffic congestion with point charging and distance-based charging on congested roads

Driving Conveniences
Providing real-time advisories on prevailing traffic conditions to improve driving experiences

Value-Added Services
Facilitating payment for roadside parking, toll payments (at Checkpoints) and travel-related fees

On-Board Unit
- Congestion Charging
- Parking Information
- Incidents & Road Works
- School Zone

4G and FM-RDS communication

DSRC 5.9 GHz (V2I communication)
Self-Driving Vehicles

**Self-Driving Bus**
- Improve productivity, safety and reliability of bus services
- Overcome shortage of bus drivers

**Self-Driving On-Demand Mobility**
- First-mile Last-mile connections to public transport
- Automated Responsiveness to meet demand

**Self-Driving Truck Platoon**
- Each driver can command more trucks and carry more containers
- Encouraging more trucking activities to be carried out at off-peak hours.

**Self-Driving Utility vehicle**
- Cleaning up our environment is a manpower-intensive job
- Self-move at a slow speed to clean up our environment at night.
One-north public route for AV testing
- 4 AVs granted approval

Surveillance Cameras
- CCTV placed at strategic and critical locations
- Real-time streaming of video feeds
- Video recording
- Enable remote monitoring

Dedicated Short Range Communications (DSRC) beacons
- Position augmentation
- V2I information dissemination

AV Performance Evaluation System
- AV Monitoring and Evaluation
- Manage V2I information dissemination
Centre Of Excellence for Testing & Research of AVs-NTU (CETRAN)

- A dedicated **enclosed test circuit** in CleanTech Park is currently being developed to support all the AV testing and certification activities.
- The area can also be used to test other new ITS technologies and sensors.
Electric Vehicle (EV) Initiatives

- **Electric Car Sharing**
- **Electric Bus Trial**
- **Electric Taxi Trial**

A fleet of 1,000 shared electric vehicles

2,000 charging points (Up to 400 for public use)
Smart Street Lighting
Leveraging on Smart Street Lighting Field Area Network Comms

FIELD DEVICES

- Low power/low bandwidth sensor network
- Island-wide network coverage with street lighting infrastructure
- Potential use case for similar type smart sensors from other agencies (temp, water level, noise etc)
- Opportunity to use existing & new AG box for the backhaul

Authorised Management Workstation

RCMS Central Management System
@ ITS Centre
(Interface to i-transport & UMH)
We look forward to welcoming you to
Singapore