

# “NEC the WISE” for City Transportation

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## Abstract

City transportation plays a significant part to the society in driving urban mobility and productivity that realize smart cities vision. The program by “NEC the WISE” for transportation assists cities such as Singapore in achieving smooth and convenient travels for commuters. The objective is to build smarter management and optimization systems for trains, buses, taxis as well as smarter traffic management system to ensure that commuters get from one place to another in the fastest and most convenient way. This can be achieved using AI to perform performance monitoring, demand management, schedule optimization and social media analytics.



artificial intelligence, intelligent transport system, Traffic Management, advanced public transportation system

## 1. Introduction

NEC is charting a smart cities roadmap, enabled mainly by artificial intelligence (AI) and advanced ICT technologies. This program focuses on the ability to leverage on new brain-inspired technology trends to provide people and enterprises with a truly connected nation with trusted collaboration and timely information available to create a different level of comfortable lifestyle for everyone – enterprises, the man on the street and giving government agencies a level of situation awareness that will help them monitor and react to crisis quickly.

## 2. Aim of the Vision: People-centred Land Transport System

City transportation plays significant part to the society in driving urban mobility and productivity that realize smart cities vision. Large populated cities continuously invest and develop roads and rails network to accommodate ever-growing numbers of commuters, vehicles and alleviate traffic congestion. Intelligent Traffic Management of the roads and rail is introduced to make more efficient movements across potentially congested areas

that could cause accidents and large traffic jams. Yet, urban transportation systems are still far from ideal given continuously high dependency on private rather than public transportation. In order to convince the citizens that public transport rather than private vehicles is the future of a modern metropolis, improving speed, convenience, and accessibility across various modes of transit is essential. This means the authorities should ensure all the different systems are interconnected and form a unified system to better compete with private transport experience – lowering cost to user, bringing easy transitions across various modes of transport, with a smooth and seamless journey from beginning to end.

As such, conventional transportation planning and management is no longer adequate to make public transport systems smarter and responsive. Instead, transportation planning authorities and decision-makers has to consider a wider range of options and impacts. They need better information and tools to align policy, plan, operate, and coordinate a range of services and combinations of transport modes available that will improve mobility. They also need to be better at turning data into useful, reliable, accessible and easy-to-under-

stand information. New data sources from social media, sensors and video cameras could open new opportunities to improve the transportation experience. They are at the heart of mobility transformation by:

- Optimising connections between modes for faster travel times
- Minimising the cost of operation and increasing convenience based on data analytics of actual travel behaviour
- Delivering better information services for respondents driven by real-time data - for any journey, time of day, or mode of transport
- Producing connected systems that are ready for the transport users of the future

Clearly, such integrated approach could offer service providers new capabilities to optimise convenience, frequency, speed and cost in developing sustainable, environment-friendly, cost-efficient transportation ecosystems of the future.

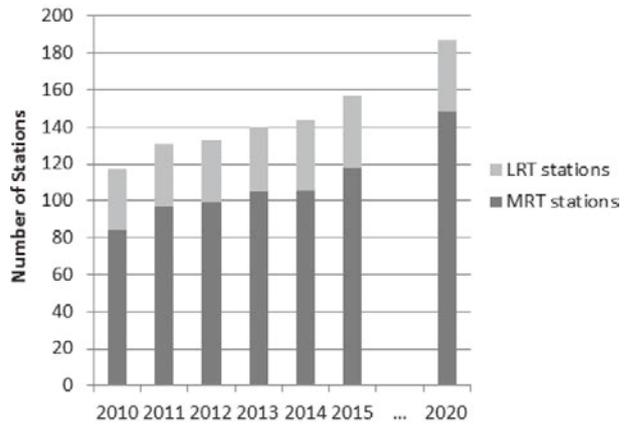
As one of the most densely populated countries in the world with growing transport demand and the constraints of physical space, the Singapore Government has set to make public transport a choice mode for people living and working in Singapore and work towards the vision of “people-centred land transport system”, focused on enhancing travel experience. For example, the Singapore Government intends to have six in every 10 households to be able to walk to a nearby train station within 10 minutes. In the next 5 years, the Government intends to add in more than 20 stations to the whole rail network (see Fig. 1).

The Singapore’s Ministry of Transport (MOT) aims to

adopt a 3-pronged approach in the coming 10-15 years.

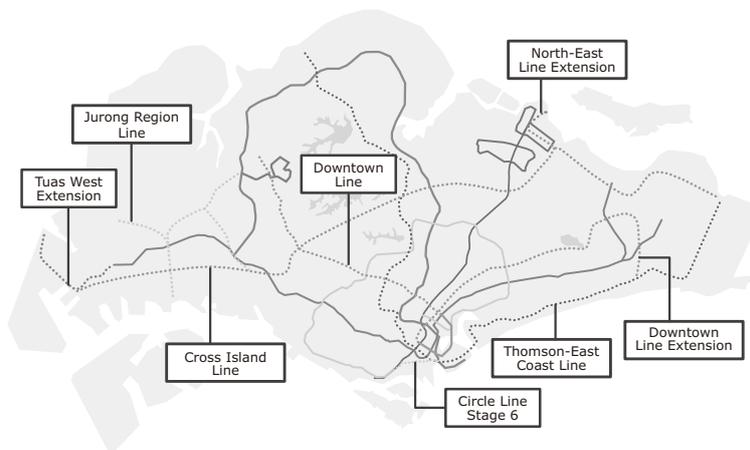
First, it is beefing up public transport options. The bus industry will be gradually restructured to increase competition and boost standards, while the existing fleet is being increased by about a third. Meanwhile, the rail network will be doubled to 360 km by 2030 (See Fig. 2). This means eight in ten households will live within a 10-minute walk of a train station. Public Transport Operators will further add on the reality of easy bike rentals at each of these train stations to homes. The aim is to have 75 per cent of trips made by public transport by 2030, and 85 per cent by 2050.

Second, the MOT is also starting to provide alternative modes of transport - for instance, under the National



\* This figure is created based on the “Fact Sheet - Public Transport Improvements and Future Plans- (2015.8)” released by Singapore Ministry of Transport.

Fig. 1 Government’s plan to add stations.



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Fig. 2 MRT Lines by 2030 covering 360 km of rail network.

Cycling Plan, 700km of cycling paths will be built by 2030, up from about 350km now. Bicycles and mobility devices such as e-scooters will soon be allowed on foot-paths and shared paths as well, in a move to promote more convenient and quicker connectivity to public transport modes, as well as to reduce traffic congestions on the roads.

Finally, the Government is trying to curb the growth of private cars and trying to encourage and initiate more car sharing schemes.

Yet, the MOT has said, "There is room for further improvement, and we will continue to invest more resources, introduce new technologies, adopt innovative maintenance approaches, and upgrade equipment, to keep up the momentum of improvements of the last five years."

### 3. NEC's Solution for People-centred Land Transport System

NEC has promoted the development of AI-related technology for nearly half a century in the domains of visualization, analysis, and control and guidance to contribute to the realization of a safe, secure, efficient, and equal society. Known as "NEC the WISE", this portfolio of AI technologies represents NEC strong determination to harness the wisdom of humans and AI working together to resolve the increasingly complex and intertwined issues society is facing today. Many of its AI technologies, including speech recognition, image and video recognition, language and semantic understanding, machine learning, prediction and detection, and optimal planning and control, are either "unprecedented or ranked No. 1 in the world". Going forward, NEC will make it possible to provide people with suggestions for complex problems without a clear single answer, including transportation sector.

The program by NEC the WISE for transportation aims to assist cities such as Singapore in achieving smooth and convenient travels for commuters. The objective is to build smarter management and optimization systems for trains, buses, taxis as well as smarter traffic management system to ensure that commuters get from one place to another in the fastest and most convenient way. The larger intent is to encourage as many private car owners to take public transport, yet ensuring comfort and without compromising on time of travel. The program by NEC the WISE for transportation will focus on data acquisition of commuters across different train and bus routes, as well as large transit points for commuters such as Train-Train interchanges, Train-Bus interchanges and Bus-Bus interchanges.

There are 3 key areas that the program by NEC the WISE for transportation is currently working on:

#### (1) Performance Monitoring and Demand Management

On-time performance provides a measure of service quality. Through a very precise data acquisition technology, NEC's Data Analytics platform is also able to continually match train and bus loads for public transport authorities and operators much more accurately. The platform will be able to predict potentially large fluctuation from a daily and even hourly commuter numbers to give advance information to the operators to act on an increase or reduction in train cars or buses appropriately without compromising service excellence.

#### (2) Schedule Optimization

This feature is designed to help increase service efficiency and resource allocation to meet relevant work rules, ridership demands. NEC's Data Analytics platform will be able to optimize bus schedules, taking into consideration current and future commuter numbers, and enabling transport operators to manage their bus captains. What is more critical is that should there be an unexpected event such as a bus breakdown, the platform will look to suggest alternative options to bring the overall schedule back to normalization, aided by a user-friendly and interactive user interface and visualization.

#### (3) Social Media Analytics

Despite the best planning and foresight, organisations may still find themselves in a crisis from time

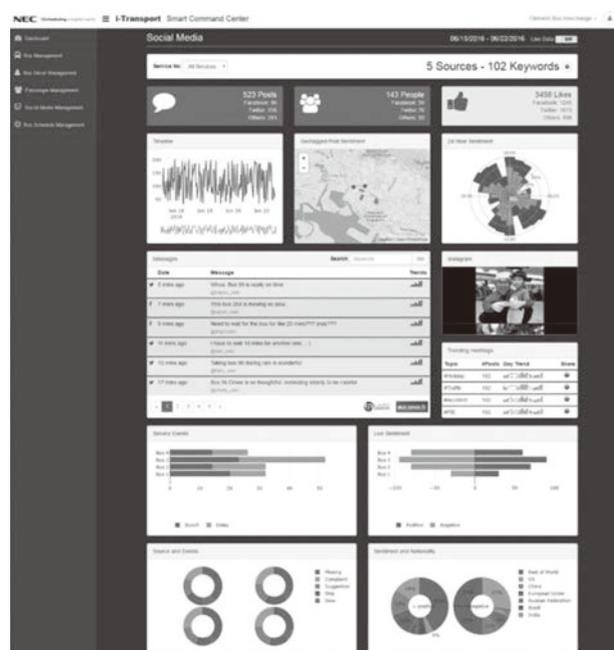


Fig. 3 NEC Data Analytics Platform for Social Media.

to time. Often, before the organisation knows about the incident, media (e.g. traditional and social media) are already reporting and sharing the news. In order to respond meaningfully, an organisation requires timely and real information.

NEC's Data Analytics Platform recognized the potential of using social media analytics as human sensors. It has developed a world leading RTE technology to identify, analyse and find transport related risk events from Social Media Content, such as disruption of service, long passenger wait time and alert them in real time (**Fig. 3**). With feeds from twitters and other social media websites, it has also the ability to classify, identify and alert on potentially large drop in service levels as polled by the commuters and to verify it with the actual situation on the ground.

#### 4. Conclusion

The program by "NEC the WISE" for transportation provides public transport authorities and operators with a comprehensive set of AI services that will help operators in providing people-centred land transport system, resulting in smooth and convenient transport service for commuters, and with the larger intent to attract private car owners to use more public transport than personal driving that would lead towards a "car-lite" city.

NEC Laboratories in Japan, Europe, America, China and Singapore are working together to build the program by "NEC the WISE" that will consist of multiple AI analytics co-related together in our indigenous NEC Data Analytics platform, with intuitive visualisation for government users, enterprise users and citizens to realize the experience of living in a smart city with NEC's innovations.

#### Authors' Profiles

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December 2016

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