

## Towards Smart Nation Singapore – Developments in 2017 (Part 3 of 3)



Autonomous scheduled buses and autonomous on-demand shuttles will serve commuters in Punggol, Tengah and the Jurong Innovation District (JID) in Singapore from 2022.

This is the third instalment of our overview of initiatives towards Smart Nation Singapore from 2017.

(Part 1 and Part 2)

### Land Transport Authority

The Land Transport Authority (LTA) is a statutory board under the Ministry of Transport, which spearheads land transport developments in Singapore. It is the agency responsible for planning, designing, building and maintaining Singapore's land transport infrastructure and systems.

Smart Urban Mobility solutions constitute one of the Strategic Smart Nation Projects. The Ministry of Transport (MOT) and LTA announced in November that autonomous scheduled buses and autonomous on-demand shuttles will serve commuters in Punggol, Tengah and the Jurong Innovation District (JID) in Singapore from 2022.

MOT and LTA also launched a Request for Information (RFI) to seek inputs from the industry and research institutions on the key requirements and enablers needed for the successful pilot deployment of AVs.

Singapore's first autonomous vehicle (AV) test centre was opened at JID, Singapore's largest living lab. The CETRAN AV Test Centre has been jointly developed by LTA, Nanyang Technological University (NTU) and JTC Corporation. ST Kinetics and NTU ERI@N have plans to commence their autonomous bus trials at the CETRAN AV Test Centre next year.



Above photo: Autonomous shuttle at the new CETRAN AV Test Centre/ Credit: LTA (from LTA's Facebook page)

In August, LTA announced that Singapore aims to achieve fully cashless public transport system by 2020. LTA and TransitLink are expanding cashless payment options for stored-value card transactions. Since January this year, the option of topping up stored-value cards using personal bank cards, as well as mobile payment platforms like Apple Pay and Android Pay, has been added to all General Ticketing Machines (GTMs) at all train stations.

Since March 2017, LTA has been piloting Account-Based Ticketing (ABT) in collaboration with Mastercard. Commuters holding Singapore-issued Mastercard contactless credit or debit cards will enjoy the convenience of a “tap and go” fare payment experience by simply tapping their Mastercard contactless credit or debit card on the bus or MRT fare readers.

In October LTA revealed plans to extend this ABT pilot with Mastercard beyond the original duration of six months. Visa and NETS will also come on board the ABT pilot from June 2018. Details are expected to be announced in due course.

#### Monetary Authority of Singapore

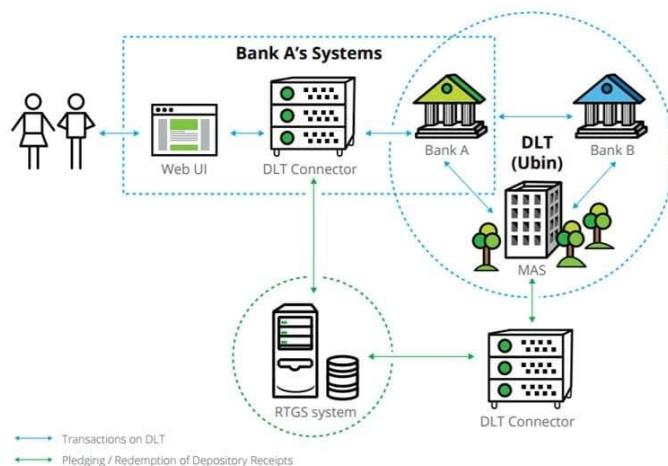
The Monetary Authority of Singapore (MAS) is Singapore’s central bank and financial regulatory authority.

Speaking at the Singapore FinTech Festival in November, Mr. Ravi Menon, Managing Director of MAS, outlined six strategies Singapore is following to foster a thriving FinTech hub.

He said that the Singapore FinTech Journey 2.0 is about building a diverse ecosystem where established financial institutions and FinTech start-ups compete as well as collaborate, open architecture (encouraging financial institutions to develop and share their APIs openly), forging international links, developing a strong pipeline of talent and research capabilities, regulations which promote FinTech innovation, while ensuring that the system remains stable, and last but not least, cybersecurity.

These priorities were also captured in the industry transformation map (ITM) for financial services released in October. It takes into consideration the technological disruption in the production, delivery and consumption of financial services and aims to achieve growth in financial sector real value-added of 4.3% and productivity of 2.4% annually. The ITM also aims to create 3,000 net jobs in financial services, and an additional 1,000 net jobs in the FinTech sector annually.

In terms of driving innovation, the industry consortium led by the Monetary Authority of Singapore (MAS) and the Association of Banks in Singapore (ABS) completed phase 2 of Project Ubin during 2017, developing three software prototypes on Distributed Ledger Technology (DLT or blockchain) platforms, which are amongst the first in the world to implement decentralised netting of payments in a manner that preserves transactional privacy.



A high-level view of Project Ubin's architecture between different banking systems and users. The blockchain based system is linked to the conventional payment system. Fund transfers in the MEPS+ become value transfers in the Ethereum blockchain. (Source: The future is here Project Ubin: SGD on Distributed Ledger, page 18)

In November, the source-codes for the prototypes was released for public access under Apache License Version 2.0. Central banks, financial institutions, as well as academic and research institutions can now tap on the open source-codes to facilitate their experiments, research and innovation.

The first startup graduated out of MAS' FinTech Regulatory Sandbox in 2017. Thirty applications have been received.

In line with the e-payments strategic smart nation project, MAS has also worked with the industry to lay the infrastructure that will support an interoperable e-payment system. FAST was launched in 2014, followed by PayNow in July this year. FAST is Singapore's 24x7 real-time inter-bank retail payment system. PayNow is built upon FAST. It links bank accounts to mobile phone numbers or personal ID numbers, and enables people to make inter-bank transfers into and out of their bank accounts using just the mobile phone number or personal ID number.

An industry taskforce was formed, co-led by MAS and IMDA to develop a common QR code for Singapore ("SGQR"). The Payments endorsed the specification for SGQR in November, which can accept electronic payments by both domestic and international payment schemes, e-wallets, and banks.

The Payments Council itself was formed in August this year with 20 leaders from banks, payment service providers, businesses, and trade associations to encourage collaboration within the payments industry and promote interoperability among e-payments solutions.

MAS continued to enter into FinTech Co-operation agreements with financial regulators in other jurisdictions, reaching a total of sixteen agreements by the end of 2017. As part of the agreement with the Hong Kong Monetary Authority (HKMA), MAS and HKMA have committed to work on a strategic project on trade finance cross-border infrastructure, based on distributed ledger technology, as their first collaborative initiative.

MAS is working closely with local and foreign banks to explore a Banking KYC Shared-Services Utility that will streamline end-to-end KYC, improving the quality of risk management while reducing cost and time taken. This will play an important role in anti-money laundering / countering the financing of terrorism (AML/ CFT) efforts.

On the cybersecurity front, in October, MAS announced the establishment of a Cyber Security Advisory Panel (CSAP), comprising cyber security thought leaders from around the world. MAS also appointed its first Chief Cyber Security Officer in October. MAS is also partnering with the Association of Banks in

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Singapore to review its Technology Risk Management Guidelines and to establish guidelines for ‘red-teaming’ (a covert penetration test conducted on a financial institution’s live environment). FS-ISAC (Financial Services Information Sharing and Analysis Centre), a global intelligence gathering and sharing initiative for the financial sector with over 7000 members worldwide, has launched its regional centre in Singapore.

Ministry of Home Affairs (MHA)

MHA is leveraging Science & Technology to keep Singapore safe and deal with threats effectively by developing better detection and situational awareness, improved analytical ability and stronger operational capabilities.

For instance, an Automated Biometric and Behavioural Screening Suite (ABBSS) has been deployed at Woodlands Checkpoint, a land border crossing between Singapore and Malaysia. ABBSS encompasses a state-of-the-art video analytics system, which can perform real-time facial recognition, cross-referencing that against a large database. It can search recorded footages based on multiple parameters such as colour, size, shape, number plate, speed and direction of a moving object.

This is a network of labs across Singapore’s checkpoints which play a critical role in dealing with drugs and terrorism. These labs provide the capability to quickly and accurately detect an entire spectrum of Chemical, Biological, Radiological, Nuclear and Explosive (CBRNE) threats, and conduct speedy accurate investigations based on advanced forensic methods.

MHA is also utilising technology such as virtual reality and learning-on-the-go through smart phones and tablets for enhanced training of the Home Team (The seven Departments and two Statutory Boards under the Ministry of Home Affairs are collectively called the Home Team).

National Environment Agency

The National Environment Agency (NEA) is the leading public organisation responsible for improving and sustaining a clean and green environment in Singapore.

The Environmental Services Industry Transformation Map (ES ITM) was launched in December, unveiling the strategies and initiatives to ensure a vibrant, sustainable and professional industry that will provide services and solutions to help achieve a Zero Waste vision and a clean and liveable Singapore.

NEA will be engaging with its partners to identify key challenges and capability development opportunities in preparation for subsequent grant calls for technology solutions. To encourage greater use of technology and automation to increase the overall productivity, funding schemes that facilitate the development and deployment of innovative and smart technologies are available.

NEA has also been organising regular thematic and broad-based technology connect sessions, and it will continue to engage the industry to prototype, pilot and profile environmental services solutions through the INCUBATE initiative (INnovating and CUrating Better Automation and Technologies for Environmental Services).

NEA has developed a S\$10.8 million Environmental Robotics Programme, with support from the National Robotics R&D Programme. The agency is also going to start a new Closing the Waste Loop (CTWL) research funding initiative to boost Singapore’s R&D capabilities in developing solutions to extract value and resources from key waste and residue streams including plastics, food, electrical and electronic products, and incineration ash.

National Research Foundation

The National Research Foundation (NRF) is a department within the Prime Minister’s Office and it sets the national direction for research and development (R&D) by developing policies, plans and strategies for research, innovation and enterprise. It also funds strategic initiatives and builds up R&D capabilities by nurturing research talent.

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The RIE (Research, Innovation and Enterprise) 2020 plan was launched last year, with the government planning to invest SG\$19 billion over 5 years. In September this year, the progress was reviewed and announcements made regarding the future in the four technology domains of the Plan- Advanced Manufacturing & Engineering (AME), Health & Biomedical Sciences (HBMS), Services & Digital Economy (SDE) and Urban Solutions & Sustainability (USS).

The government seeks to drive innovation, knowledge transfer and adoption of advanced manufacturing technologies, such as the industrial internet of things, robotics/automation and additive manufacturing, through public-private partnership platforms. Comprising Tech Labs (or Model Factories), Tech Access and Tech Depot, these platforms will allow companies to co-develop, experience, and deploy advanced manufacturing technologies while minimising potential disruptions to their operations.

In the HBMS area, the focus is on diabetes, which affects 400,000 Singapore residents and could affect one in three Singaporeans over their lifetimes. The strategies include use of digital tools, such as HealthHub and Diabetes Pal and creation of a consolidated National Diabetes Database (NDD).

In the USS domain, the Singapore government has embarked on efforts to begin Research & Development (R&D) on Grid 2.0. Grid 2.0 refers to the next-generation grid system that will transform how energy is managed by consolidating gas, solar and thermal energy into a single intelligent network that is more efficient, sustainable and resilient. This builds on Singapore's past investments in smart meters, grid storage, solar photovoltaics, as well as various energy efficiency and demand management solutions.

In May, NRF set up a Singapore Data Science Consortium (SDSC), in collaboration with the National University Singapore (NUS), the Nanyang Technological University (NTU), the Singapore Management University (SMU) and the Agency for Science, Technology and Research (A\*STAR).

NRF has also launched a national programme in Artificial Intelligence (AI) to develop Singapore's AI capabilities. Called AI.SG, this initiative is driven by a government-wide partnership comprising NRF, the Smart Nation and Digital Government Office (SNDGO), EDB, IMDA, SGInnovate, and the Integrated Health Information Systems (IHIS). NRF will invest up to \$150 million over five years in AI.SG.

#### SkillsFuture Singapore/ Workforce Singapore

SkillsFuture Singapore (SSG) is a statutory board under the Ministry of Education (MOE), which aims to facilitate continuous education and training, upgrading skills to keep up with the fast pace of technological advancements and increasing competition.

Workforce Singapore (WSG) is a statutory board under the Ministry of Manpower (MOM), which oversees the transformation of the local workforce and industry to meet ongoing economic challenges.

Both these agencies run multiple initiatives to equip Singaporeans with the right sets of skills to participate in the economy of the future and at the same time, building a strong talent pipeline to meet Singapore's needs, as it strives to benefit from the technological revolution. The ITM launches are usually accompanied by training and education programmes from SSG and WSG.

For instance, WSG runs Professional Conversion Programmes (PCPs), which are career conversion programmes targeted at Professionals, Managers, Executives and Technicians (PMETs), including mid-career switchers, to undergo skills conversion and move into new occupations or sectors that have good prospects and opportunities for progression.

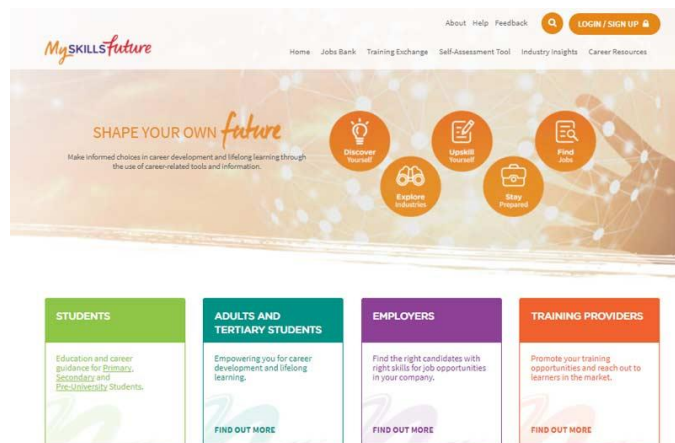
In October, SSG launched a new SkillsFuture Series of training programmes in eight priority and emerging skills areas: Data analytics, finance, tech-enabled services, digital media, cybersecurity, entrepreneurship, advanced manufacturing and urban solutions.

SSG is also working with the Institutes of Higher Learning (IHLs) and employers to launch seven new Earn and Learn Programmes (ELPs) to meet new manpower needs especially in emerging sectors.

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Above image: Screenshot from MySkillsFuture.sg portal

The MySkillsFuture portal (MySkillsFuture.sg) was launched a short while ago, as a one-stop portal for all Singaporeans, offering resources for students in schools, tertiary students and people in the workforce, to make informed learning and career plans. Each individual will have a personalised account for their learning and career plans, which can follow them through life.

#### Personal Data Protection Commission

The Personal Data Protection Commission (PDPC), under the Ministry of Communications and Information (MCI) is responsible for administering and enforcing the Personal Data Protection Act 2012 (PDPA).

Data lies at the heart of the ICT-enabled revolution which is affecting all aspects of society and individual lives. Having a trusted and progressive personal data protection framework is integral to Singapore's digital economy and Smart Nation plans.

PDPC embarked on a series of new initiatives in July, including a public consultation on PDPC's review of the Personal Data Protection Act (PDPA) and publication of a new Guide to help organisations adopt best practices when sharing data.

Plans to introduce a Data Protection Trustmark certification scheme by end 2018 and Singapore's Notice of Intent to participate in the APEC Cross-Border Privacy Rules System and the APEC Privacy Recognition for Processors System (APEC CBPR and PRP) were also announced.

Mr. Yeong Zee Kin, Deputy Commissioner of PDPC, said in a speech on September 29, is in the process of finalising guides to assist companies to put in place Data Protection Management Programmes and to help businesses conduct Data Protection Impact Assessments.

PDPC also plans to launch a Data Protection Trust Mark certification scheme by the end of 2018.

#### SGInnovate

SGInnovate was launched in November 2016 as a private limited company wholly owned by the Singapore Government, to support and develop the deep tech startup ecosystem in Singapore.

By the end of 2017, SGInnovate will have completed equity investments in 15 deep tech startups, played a part in generating 400 potential-customer leads for early-stage companies and built a network of more than 1,000 technical individuals interested in joining early-stage tech companies.

SGInnovate announced its 'Deep Tech Nexus' Strategy in December as a direct result of experiences and insights gained in its first year of operation. The Deep Tech Nexus represents SGInnovate's commitment to add tangible value to the Singapore deep tech startup ecosystem in two key areas –

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Human Capital and Investment Capital. Three technology areas have been selected for focus during 2018: Artificial Intelligence, Blockchain and MedTech.



Above photo (From left to right): Yeo Hwee Lee, Director, Software & Solution Services, IBM Software Group, IBM Asia Pacific; Wendy Wong, Senior VP, Corporate Governance & Communications Office, GIC; Sam Witteveen, Founder, Red Dragon AI; Steve Leonard, Founding CEO, SGInnovate; Yap Jia Qing, Founder, Nurture.ai; Aziza Sheerin, Regional Director, General Assembly (GA); Scott Jones, MD, Six Kins; Tan Tin Wee, CEO, NSCC/ Credit: SGInnovate

On December 14, SGInnovate announced that it has appointed 17 co-investors under the Startup SG Equity scheme. The co-investors would collectively be identifying and co-investing with SGInnovate in early-stage deep tech startups in areas prioritised in Singapore's Research, Innovation and Enterprise 2020 Plan or RIE2020, such as Artificial Intelligence and Blockchain.

Singapore Land Authority

The Singapore Land Authority (SLA) is a statutory board under the Ministry of Law, which optimises Singapore's limited land resources for economic and social development.

SLA launched a mobile version of OneMap, an integrated map system, launched on the desktop seven years ago in 2010. New features in this app include Map Styles, Driving and Journey Planner and BusRouteExplorer among others.

OneMap is an integrated map system for government agencies to deliver location-based services and information, such as community services (child care, community clubs, eldercare, disability services etc.), education, environment, safety and security, government institutions (fire stations, libraries, police force establishments etc.), attractions, sports and transportation.

Though commercial map applications are available, OneMap provides an extraordinarily high level of detail unavailable on any other platform, tailored to meet the local requirements of residents or visitors in Singapore.

Part 1 - Agency for Science, Technology and Research; Building and Construction Authority; Economic Development Board; Civil Aviation Authority of Singapore and Changi Airport Group; Cyber Security Agency

Part 2 - Government Technology Agency; Housing & Development Board; Integrated Health Information Systems; Infocomm Media Development Authority; Intellectual Property Office of Singapore; International Enterprise Singapore