

Press release

**Smart Nation:
Singapore to benefit from IRT SystemX and its partners for modelling, numerical simulation
and validation for the operational safety of autonomous vehicles**

ASV (Automated Driving Simulation & Validation) is the first project launched by the Institute for Technological Research (IRT) SystemX in Singapore. Led in close coordination with Nanyang Technological University, Singapore (NTU Singapore), it is part of the work of the CETRAN Centre of Excellence, dedicated to the research, testing and certification of autonomous vehicles, benefiting from a 1.8-hectare test circuit. The digital simulation platform that will be developed by SystemX as part of this project will contribute to test and validate the operational safety of autonomous vehicles of all industrialists who wish to establish themselves in Singapore and more widely in the world.

Singapore, 20 September 2018 – [SystemX](#), unique IRT dedicated to digital systems engineering of the future, launches its first research project in Singapore for a period of 48 months in collaboration with [Nanyang Technological University, Singapore](#) (NTU Singapore), one of the world's leading research-intensive universities. This partnership follows the signing of an MoU (Memorandum of Understanding) between the two parties in March 2017. The ASV project (Automated Driving Simulation & Validation) focuses on the development of a digital simulation platform for testing and validating the operational safety of autonomous vehicles (AVs) in urban and peri-urban areas. It brings together the expertise of Renault, SNCF, Systra and OKTAL-AVSimulation and is one of the strategic axes of the CETRAN test centre* ([Centre of Excellence for Testing & Research of AVs at NTU](#)) that was launched in January 2017 at NTU Singapore. Under the leadership of NTU researchers, the centre provides a controlled environment for the testing of AVs, including developing international test standards and certification for such vehicles.

Singapore is an island of 720km², with a population of 8,000 inhabitants / km² and a very dense road network. Following the development of megacities and the aging of the population, the authority in charge of the management of the road infrastructure (the LTA - Land Transport Authority) launched in 2014 the strategic plan "Smart Mobility 2030" to:

- Facilitate transportation planning and management by implementing smart mobility solutions, innovative and sustainable, leveraging on Big Data analytics.
- Ensure interoperability of systems and the establishment of public and private partnerships through the development and adoption of ITS (Intelligent Transport Systems).

It is in this context that IRT SystemX, which opened in September 2017 a first international representative office in Singapore, contributes its expertise in the field of digital systems simulation. The objective is to complete the physical tests carried out on the CETRAN circuit for the validation of the safety of autonomous vehicles of level 4 by numerical tests. These will make it possible to study different situations and operational contexts (traffic, weather, etc.).

The ASV project in a few words

- **Program:** Autonomous Transport
- **Start date:** January 2018
- **Duration:** 48 months
- **Total effort:** 4 FTE

Industrial partners: Renault, SNCF, Systra
OKTAL/AVSimulation,

Academic partners: NTU Singapore (Nanyang Technological University, Singapore)

Project's objectives:

- Develop and validate a simulation platform for testing and validating the operational safety of the autonomous vehicle.
- Validate simulation models by physical tests on the CETRAN circuit, under different climatic conditions.

Challenges:

- Explore the test cases corresponding to a given operational area.
- Determine what needs to be tested physically and what needs to be done by simulation.
- Validate the models of perception and decision of the autonomous vehicle.

Among the main challenges of the ASV project:

- Define the situations to be studied by numerical simulation.
- Develop the simulation technology base and models for the validation of the autonomous vehicle in urban and peri-urban territory, in classic and disturbed conditions.
- Explore the possible scenarios games.
- Validate the simulation models via an experimental platform.
- Experiment and validate the simulation platform through different use cases (eg intersections, roundabouts, valet parking etc).
- Build data sets that consider weather conditions (tropical rain, humidity etc) to improve sensors.

"Digital simulation can reduce the cost of physical testing and address a much broader combination of situations than in real, without being constrained by the likelihood of events occurring, such as weather events. SystemX is recognized for its expertise in this field, particularly for the results of its [Simulation of Autonomous Vehicle Safety \(SVA\)](#), and is very excited to be at the heart of the CETRAN pilot program on this issue, a program that benefits from the contribution of the City-State of Singapore in terms of co-financing and access to experimental sites and associated data. For SystemX and its partners, it will be an opportunity to study new cases of urban experimentation and to validate the models of simulation, perception and decision established by physical tests", explains Abdelkrim Doufene, Coordination Manager of the Autonomous Transport Program of IRT SystemX.

"The Singapore City-State's 8 to 10 year ambition is to offer a unique centre that will certify the reliability, performance and operational safety of the autonomous vehicles that manufacturers will launch on the market. Many manufacturers are already showing interest in testing their vehicles on the digital simulation platform that we will develop as part of the ASV project. Indeed, the issue of standardization and certification of autonomous vehicles is a real international issue, which goes beyond the borders of Singapore", adds François-Xavier Lannuzel, Head of the SystemX Representative Office in Singapore.

Professor Subodh Mhaisalkar, NTU Associate Vice President for Strategy & Partnerships and Executive Director for the Energy Research Institute @ NTU (ERI@N), said, "Autonomous vehicles (AVs) are the future of public transportation which not only serves as an effective first-last mile solution for commuters, but will also present new possibilities with the car-sharing economy and multimodal transportation solutions. This partnership with SystemX will leverage NTU's research excellence in sustainability and transportation technologies, to jointly develop a digital simulation platform that will enhance the safety of AVs, and contribute to the overall research efforts at CETRAN."

About IRT SystemX

Based on the Paris-Saclay plateau, the IRT SystemX is positioned as an accelerator of digital transformation. Focusing on the digital engineering of the systems of the future, its research projects cover the scientific and technological issues of the transport and mobility industries, energy, digital security and communications. They respond to the challenges faced by manufacturers in the design, modelling, simulation and experimentation phases of future products and services, integrating more and more digital technologies.

The evolution of technologies and the need for their integration imply indeed the need to take into account the new "Digitalization" paradigm by a "systems" or even "systems of systems" approach. IRT's 2016-2020 roadmap revolves around four programs: the agile industry, autonomous transportation, smart territories and the internet of trust. Today, SystemX has 31 projects launched (of which 20 are ongoing), involving 83 industrial partners and 24 academic laboratories, and 265 employees, including 130 own resources.

About Nanyang Technological University, Singapore

A research-intensive public university, Nanyang Technological University, Singapore (NTU Singapore) has 33,000 undergraduate and postgraduate students in the Engineering, Business, Science, Humanities, Arts, & Social Sciences, and Graduate colleges. It also has a medical school, the Lee Kong Chian School of Medicine, set up jointly with Imperial College London.

NTU is also home to world-class autonomous institutes – the National Institute of Education, S Rajaratnam School of International Studies, Earth Observatory of Singapore, and Singapore Centre for Environmental Life Sciences Engineering – and various leading



research centres such as the Nanyang Environment & Water Research Institute (NEWRI) and Energy Research Institute @ NTU (ERI@N).

Ranked 12th in the world, NTU has been placed the world's top young university for the past five years. The University's main campus is frequently listed among the Top 15 most beautiful university campuses in the world and it has 57 Green Mark-certified (equivalent to LEED-certified) building projects comprising more than 230 buildings, of which 95% are certified Green Mark Platinum. Apart from its main campus, NTU also has a campus in Singapore's healthcare district.

For more information, visit www.ntu.edu.sg

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