



# Automated Driving: Simulation and validation



TASS International is established from five independent automotive TNO subsidiaries.

The supplementary business propositions of these five independent companies result in a complete offering of safe, green and smart mobility solutions. TASS International supports the transport industry to develop safer, greener and more intelligent vehicles by providing innovative software products, state-of-the-art testing facilities and cost-effective engineering solutions.

TASS International offers reliable virtual models, simulation software, engineering services and testing facilities that support the development of automated systems to OEM vehicle manufacturers, 1st tier suppliers and governmental organisations worldwide.

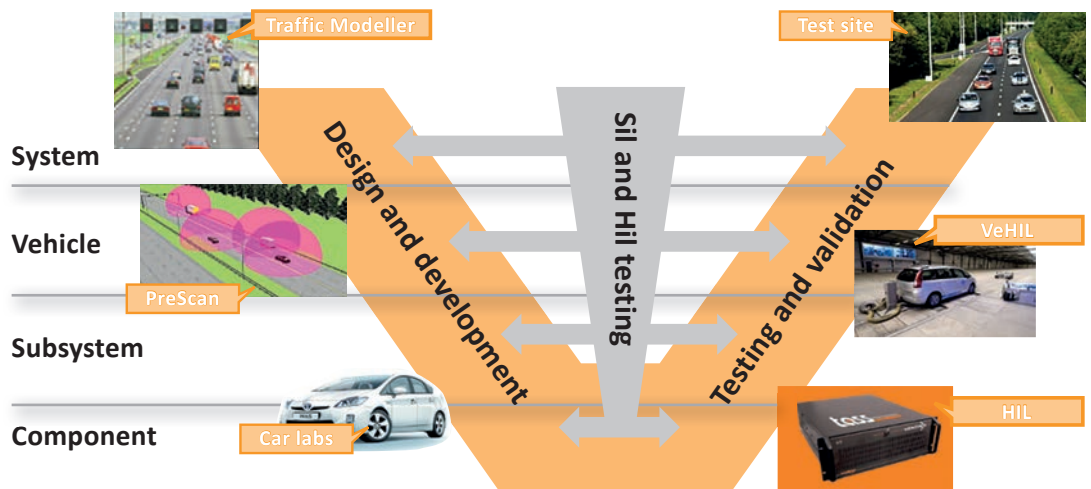
TASS International employs over 200 people worldwide and has a global presence with offices and facilities in 13 countries. It is our vision to create future virtual labs that support our customers to develop faster, easier and cheaper so they are able to increase the release time and speed to market.



## Solutions for:

- Accurate vehicle location
- Environmental perception
- Vehicle tactical & operational control algorithms
- Human machine interface
- V2X communications

The complexity in cooperative and automated vehicles increases exponentially compared to traditional vehicles. An integrated tool suite supporting the full development V-cycle is crucial to enable cost and time efficient development processes. For the development phase, we offer a state of the art simulation platform for active safety and automated systems. Ranging in scale from complete traffic networks, down to component level simulation tools. For testing, **hardware in the loop** testing is necessary for sensor and communication systems, while a dedicated test environment for rapid, safe, and reproducible testing of cooperative and automated vehicles is required to test complete systems. Finally, for validation and performance testing, **a test site for urban, interurban and highway is available.**

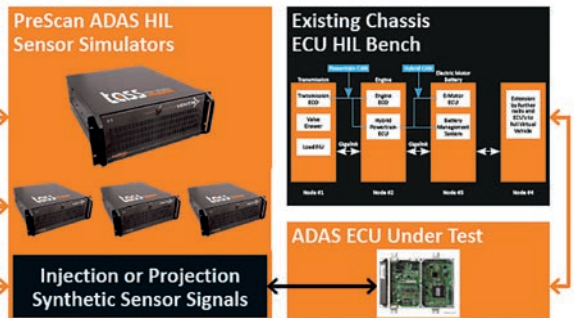


# Tool suite for Automated Driving

**PreScan** is a dedicated simulation platform for designing advanced driver assistance systems (ADAS) and automated driving. It enables manufacturers to evaluate their intelligent safety system designs in a wide range of virtual traffic and road environments. With PreScan, advanced vehicle sensors, controls and warnings can be designed that go well beyond existing standards of safety. PreScan includes functionality such as **automatic traffic generator**, **GIDAS importer**, **IBEO scanner importer** to speedup the automated driving virtual scenario generation.



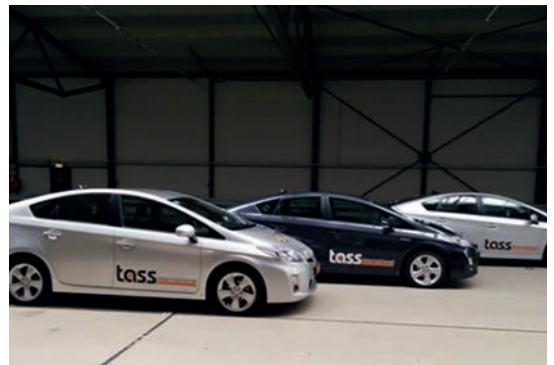
Laboratory testing by means of **Hardware In the Loop (HIL)** simulation is common practice for development and evaluation ECU systems. PreScan allows for physics-based calculation of synthetic sensor readings. The sensor signals are sent to the ECU to evaluate the prototype or production algorithms. The signals can be projected, for **Driver in the Loop** or **camera HIL**, or **injected** in the ECU. To support HIL testing for positioning and timing, ground truth data and low level GPS and vehicle data has been recorded in many realistic scenarios that can be replayed in a HIL setup to test and optimize positioning algorithms.



The **Vehicle Hardware-In-the-Loop (VeHIL)** laboratory can be seen as the missing link in the design and development of intelligent vehicle systems. It can handle any combination of system hardware and simulation modules to create a combined real and virtual system or traffic environment. The test vehicle is placed on a roller bench. Other road users are represented by wheeled mobile robots (MB) resembling real passenger cars for radar, LIDAR and vision systems. By connecting both roller bench and MBs, VeHIL offers quality, detail and effective testing for numerous intelligent ADA-solutions.



For testing and validation, TASS International provides a fleet of test vehicles and four **CarLabs**. The standard equipment includes a Denso front radar, 360 degree view using Continental radar, 360 degree view using six Ibeo laser scanners, Mobileye camera, GPS, dGPS system from OXTS, ITS G5 communication unit, and a fail-safe CAN gateway (read & write). A real-time embedded application platform can be used for rapid prototyping and testing new applications. These CarLabs can be used to test new applications and subcomponents. It is also possible to add additional sensors and to test them.



For testing and validating cooperative and automated systems, observation systems are required that can determine the details of the systems under test, but also of the surrounding traffic. To this end, a **test site** has been developed on the urban, interurban, and highway N270/A270 between Helmond and Eindhoven, The Netherlands. Over 50 cameras provide trajectories of all vehicles with a resolution better than 1 meter. Real-time information is available from four intersections on the test site. The full test site is covered with ITS G5 communication units.

