Automotive Simulation & Integration Platform

Overview

For the automotive domain, TechSAT offers an integrated development platform that consists of ADS2 and a number of third-party tools. The solution can be used in all development phases (MiL, SiL, PiL, HiL and ViL) of modern automotive vehicles and their highly automated driving functions.

TechSAT's ADS2 Simulation, Integration, Test, and Validation Platform has been developed for aircraft validation and verification and is in use for decades. For ADAS (Advanced Driver Assistance Systems) and AD (Autonomous Driving), it provides the integration of MATLAB/Simulink/Simscape models, FMI/FMU, SCADE, AUTOSAR, virtual environment simulation (e.g. Vires VTD), ADTF (Automotive Data and Time-Triggered Framework) filter graphs, test environments (e.g. Piketec TPT), and others.

Use Cases

- Virtual automated test environments for driver assistance systems for autonomous driving (e.g. Car Park Pilot, Traffic Jam Pilot, Highway Pilot, etc.)
- Fleet test of real vehicles in a synchronous realtime environment
- Model-based requirements validation
- Hardware/software integration and verification during equipment/system level integration and verification
- Multi-function integration, verification, and validation during vehicle level integration and verification

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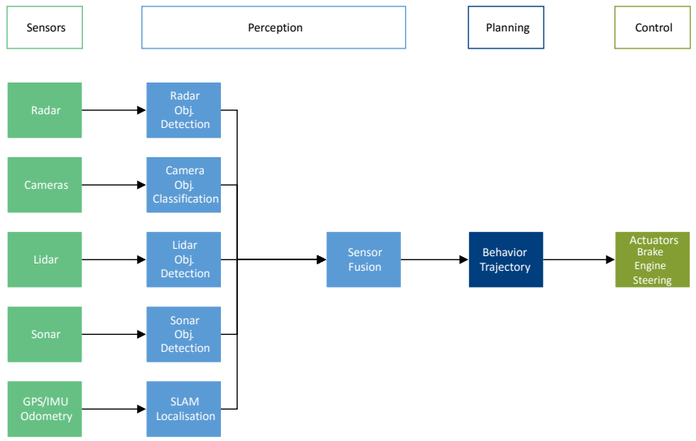
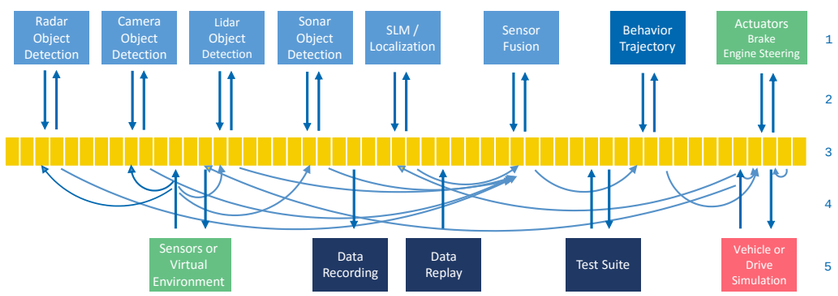
Autonomous Vehicle Components Architecture



TechSAT ADS2 ADAS/AD Platform



1 Exchangeable Model Frameworks: MATLAB, FMI, AUTOSAR, RTE, ADTF, and others

2 Each component provides its own variables

3 ADS2 Distributed CVT for deterministic, consistent, and realtime scheduled data exchange

4 Variables mapping between components; Fault Insertion provided

5 Exchangeable real hardware OR simulations

Core Functions & Features

VIRES Virtual Test Drive (VTD)

- Read/write access to both RDB and SCP messages in ADS2
- Prebuilt ADTF gateways to replace SCP/ RDB Sender and Receiver filters for the VTD Toolbox developed for environmental conditions according to RTCA DO-160
- ADS2 acting as external sync source for VTD, providing complete control over flow of time during scenario execution
- Control of scenarios and VTD states from ADS2 via SCP

ADTF Gateway

- Gateway filters acting as a bridge between the ADS2 system and ADTF filter graphs
- Automatic generation of gateways based on header files and/or DDL description files
- Prebuilt ADTF service to synchronize time between ADS2 and multiple ADTF instances
- Complete control over the ADTF states or single filter states from ADS2 via prebuilt ADTF control service
- Read/write access to all data in ADS2
- Recording, replay, and on-the-fly error injection all supported by ADS2
- Trigger pins to synchronize execution of any parts of a filter graph via ADS2

NVIDIA Drive PX-2

- ADS2 runs natively on the NVIDIA Drive PX-2 target platform
- Software components (including, for instance, MATLAB models) can be executed on the Drive PX-2 while still having access to the full spectrum of ADS2 functionality

Piketec TPT

- Signal and message configuration
  - directly from ADS2 ADTF gateway configuration files or
  - from specific Microsoft Excel/CSV configuration file
- Import of message definitions from ADTF description files or from C header files
- Generation of TPT types in a TPT project file to update existing TPT tests or start from scratch
- Support of cycle rates down to 1 millisecond
- Support of up to 64000 signals

AUTOSAR

- Import of AUTOSAR System configurations (.arxml files)
- Generation of complete AUTOSAR RTE code (C files) for integration and execution on the Techsat ADS2 Platform together with user SWCs code (objects)
- Use of real application code (objects) of user SWCs within ADS2 simulation environment
- AUTOSAR OS scheduling equal to that used in user application
- Generation of ADS2 input files and ADS2 simulation environment needed to run system simulation on the ADS2 Platform
- Generation of Visual C++ Framework needed to generate Windows applications to be run on the ADS2 Platform
- High automation level

Benefits

- Frame-based approach and realtime monitoring allowing for complete determinism of repeated test executions
- Support of automotive busses
- Simple API to integrate new interfaces and frameworks
- Seamless operation of ADS2 on Windows, Linux, and NVIDIA Drive PX/2 or AGX
- Integration of leading industry solutions into a common platform
- Reproducible test runs across all test stages (e.g. MiL, SiL, PiL, HiL, and ViL)
- Very fast development cycle thanks to high reconfiguration flexibility
- Runtime control and monitoring
- Platform for cyber-physical systems

From Avionics to Automotive

With 30+ years of experience, TechSAT is recognized worldwide for its expertise in designing and developing turnkey solutions for the integration, verification and validation of safety-critical aircraft systems, including related consulting and services. TechSAT has been a major supplier to most of the large aerospace programs of the last two decades, including Airbus A340, A380, A350, A400M, Boeing 777, B787, C919, MA700 T50, KF-X, Eurofighter Typhoon, and Tiger.