AUTONOMOUS VEHICLE SIMULATION

AVxcelerate

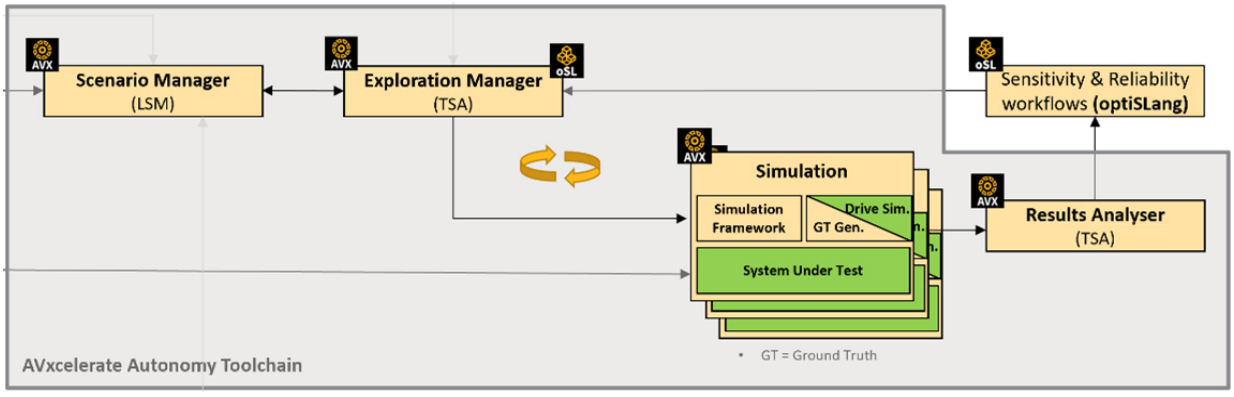
Autonomy Overview

Ansys AVxcelerate Autonomy™ software combines a set of applications that helps develop, test and validate advanced driver-assistance systems (ADAS) and autonomous driving (AD) software stack safety in real-world conditions. This toolchain is highly customizable and scalable. It has been designed to assess the safety performance of vehicles with a high level of autonomy.

The **Scenario Manager** application in AVxcelerate Autonomy software enables the import of previously defined logical scenarios using OpenDRIVE 1.x and OpenSCENARIO 1.x standards, as well as parameter variation distribution according to the function operational design domain. Key performance indicators are associated with each scenario.

The **Explore** application generates concrete scenarios based on selected variation methods and sampling. Large-scale jobs are launched using the **Simulation** application and executed on cloud infrastructure using modern docker architecture.

Campaigns that could result into 10+ million samples can be easily investigated, thanks to AVxcelerate Autonomy's **Analysis** application. It reports KPI and displays customizable graphs, which enables you to zoom in on highest probability of failure distribution.



Ansys AVxcelerate Autonomy software simulation workflow

/ Scenario Manager

- **Logical Scenario Definition**
  - Import/define logical scenarios as OpenSCENARIO data
  - Define hierarchical structures
- **Parameter Space Definition**
  - REST API to access scenario and parameter catalog
  - Import parameter constraint and distributions
- **Key Performance Indicator (KPI)**
  - KPI definition
  - Fail criteria thresholds definition
- **Fault Injection**
  - Define/select error source and parameterization
  - List system version error handling capability

/ Explore

- **Concrete Scenario Configuration**
  - Exploration job definition, including scenario and system configuration
  - System version/simulator configuration
  - Customization entry points for script execution (e.g., pre-/post-simulation)
- **Parameter Variation and Sampling**
  - Define parameter ranges and sampling algorithm
  - Import parameter distributions
- **Analysis Configuration**
  - Define sensitivity and reliability analysis

/ Simulation

- **Concrete Scenario Generation**
  - Build scenario file variation and metadata
- **Iterative reliability analysis**
  - Dynamic concrete scenario generation for reliability analysis
- **Simulation Framework**
  - Abstraction layer to interface third-party modules (including SuT)
  - Customization by pre- and post-simulation hooks
  - Abstract customer-specific bus communication
  - Live monitoring
  - Module/activity management
- **World Simulator Connectors**
  - Reference ground truth generation based on ASAM OpenDRIVE 1.x, OpenSCENARIO 1.x, and Open Simulation Interface 3.x
- **KPI Evaluators**
  - Reference KPI implementations, e.g., TTC, ...
  - Plugin for KPI target (black box) execution

/ Analyze

- **Design of Experiment Analysis**
  - Efficient parameter space analysis
  - Scalable up to millions of design points per test case

AVxcelerate Autonomy software is provided with REST API for all its components so it can connect to enterprise applications such as ALM, requirements database, and more.

AVxcelerate Autonomy software can be deployed either on an on-premises cluster or on cloud using docker and Kubernetes technology.

Ansys AVxcelerate Autonomy	Preppost	Solve
Scenario Manager		
Logical Scenario Definition	●(1)	
Parameter Space Definition	●(1)	
Key Performance Indicator (KPI)	●(1)	
Fault Injection	●(1)	
Explore		
Concrete Scenario Configuration	●(1)	
Parameter Variation & Sampling	●(1)	
Analysis Configuration	●(1)	
Simulation		
Concrete Scenario Generation		●(2)
Iterative Reliability Analysis		●(3)
Simulation Framework		●(2)
World Simulator Connectors		●(2)
KPI Evaluators		●(2)
Analyze		
Design of Experiment Analysis	●(1)	

(1) One license per user
(2) One license per concurrent scenario execution
(3) Require an Ansys optiSLang Premium license concurrent per analysis

/ Ansys Autonomous Vehicle Simulation product line

- AVxcelerate Headlamp
- AVxcelerate Sensors

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