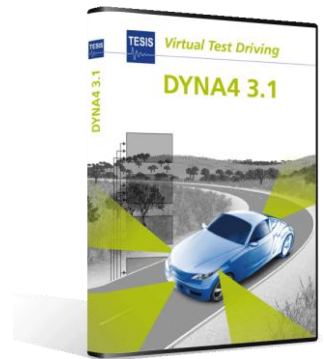


Quick Overview

- **Multi-ego setups with several vehicles under test** for function development of connected vehicles and cooperative driving functions
- **SUMO traffic** integrated in DYNA4
- **Fisheye cameras** with configurable distortion and arbitrary angles of view
- **Enhanced 3D visualization** with 4K resolution, Oculus Rift support and many new objects, increased performance and flexibility
- Function development in **ROS2 and ADTF** connected to DYNA4
- Functions for **NOx calculation** and optimization of exhaust strategy
- Improved **ease of use in GUIs and example projects**
- **Updated platform support** for CANoe, Matlab, dSpace and National Instruments



Multi-ego setups with several vehicles under test

- Development of connected, cooperative vehicle functions, e.g. platooning
- Integrate your functions in **multiple active ego vehicles**
- Usage of multiple DYNA4 vehicle models with flexible and easily configurable interfaces
- All ego vehicles with precise vehicle dynamics, even truck-trailer combinations
- Surrounding traffic with deterministic or stochastic behavior

Watch video: [Multiple Vehicles under Test in a platooning setup](#)



Five semi-trailer trucks under test in a platooning setup



Each truck with precise vehicle dynamics simulation

SUMO traffic integrated in DYNA4

- Integration of stochastic traffic from SUMO providing interaction with vehicles, pedestrians and traffic lights
- SUMO is a free open-source traffic simulator by DLR
- GUI based configuration in DYNA4
- Combination of deterministic DYNA4 scenarios with stochastic SUMO traffic
- Virtual test driving natively on OpenDRIVE road
- Great 3D visualization of the entire scenario in DYNA4

Details and videos: www.tesis.de/sumo



Vehicle under test (red) in urban environment* with SUMO surrounding vehicles, pedestrians, traffic lights

* Wangen village: 3D graphics by TrianGraphics

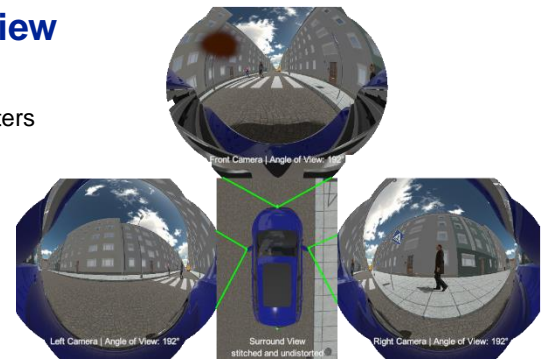


Rural environment: Vehicle under test (red) with SUMO traffic (white)

Fisheye cameras with arbitrary angles of view

- Support of cameras with angles of view up to 360°
- Parametrization of distortion with OpenCV or Scaramuzza parameters
- Support for dirt on lens
- Display of sensor images on separate screens for image injection
- Example: development of image stitching and rectification algorithms for surround view
- Usage from MiL (algorithm development) to HiL (image injection on ECU)

Watch video: Virtual test driving with four ultra wide angle cameras
 Technical details: www.tesis.de/sensorsimulation



Three 192° fisheye cameras, top camera with dirt

Enhanced 3D visualization

- Support of high fidelity 4K resolution, e.g. for driving simulators
- Support of Oculus Rift VR headset
- Many new objects, e.g. roadworks elements, new vehicles, elements used in OpenDRIVE roads etc.
- Easy integration of new objects, e.g. from Unity asset store or as fbx



Image copyright by Facebook Technologies, LLC
 Oculus Rift supported



Integration of Unity Assets, e.g. Windridge environment



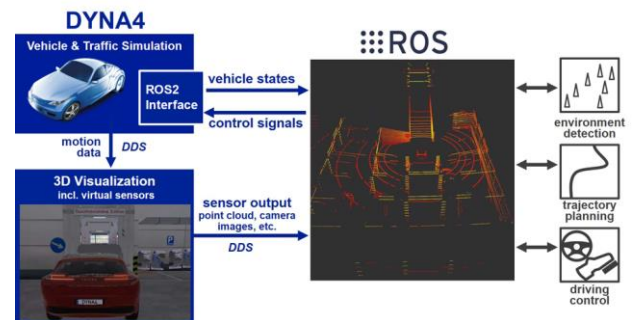
Many new objects, e.g. lighted road elements

ROS2 and ADTF connection to DYNA4

- Closed-loop simulation for function development of ADAS/AD functions
- Function developers retain their preferred toolset while benefiting from DYNA4's high-fidelity driving dynamics, GPU sensor models and 3D visualization
- Co-simulation with DYNA4 via dedicated ROS2 interface
- Usage of ROS1 via ROS bridge
- Export DYNA4 models as ADTF filter for Windows and Linux, headless operation without DYNA4 GUI

Learn more: www.tesis.de/ros

Watch video: [ADAS development with DYNA4 and ROS](#)



Co-simulation with ROS via DDS and ROS2 interface

DYNA4 Engine

- Functions for NOx calculation and optimization of exhaust strategy in test bench operation / HiL systems
 - Consideration of fuel enrichment for targeted exhaust gas temperature control
 - Increased precision of heat transport calculation in exhaust gas system and temperature behavior in SCR-Cat
 - NOx as a function of peak pressure and combustion curve; routines to validate dependencies
 - NOx concentration depending on operating point based on evaluation of measured characteristic maps
- Enhanced supercharger model for increased stability in idle control

Model improvements

- Efficient online collision detection and ground truth calculation for TTC (time to collision)
- Improved actuation of acceleration and brake pedal for driving cycles
- New Through-the-Road hybrid Model Configuration
- New improved differential model including optional clutches and elastic shafts
- Tire test rig with improved TYDEX file support. Analysis for FTire, MF-Tire and TM-Easy
- MF-Tire 6.2 integration: Improved stability at low speeds and standstill

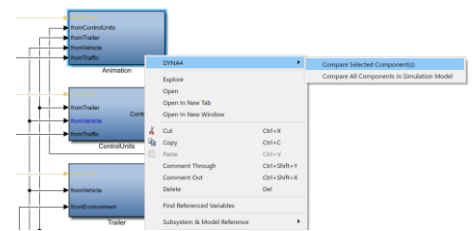


Collision detection, e.g. in NCAP scenarios

Improved ease of use

- Improved model handling: Easy Simulink Model Component comparison and data assignment via context menu
- New example projects for a quick and easy start in DYNA4
 - GPU sensor demo
 - Vehicle cutting-out for ACC tests
 - German OpenDRIVE A9 motorway by 3D Mapping
 - Roadworks example project

Watch video: [Virtual test driving on OpenDRIVE A9 motorway](#)



Components comparison via context-menu

Updated hardware and software compatibility

- Matlab up to R2019a
- dSpace up to R2018-B
- Vector CANoe up to 12.0
- NI VeriStand up to 2018
- ADTF 2.x Windows and Linux
- ROS2 Simulink library

Many more on demand

Overview: <https://www.thesis.de/compatibility>



Interested in virtual test driving with DYNA4?

DYNA4 is highly modular, flexible and is easily tailored to your needs.

Find out more about the applications and features:

<https://www.thesis.de/dyna4>

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