



Technische Hochschule
Ingolstadt

CARISSMA Institute of Automated Driving

Design of a Mixed Reality Test Environment to Validate Autonomous Vehicles

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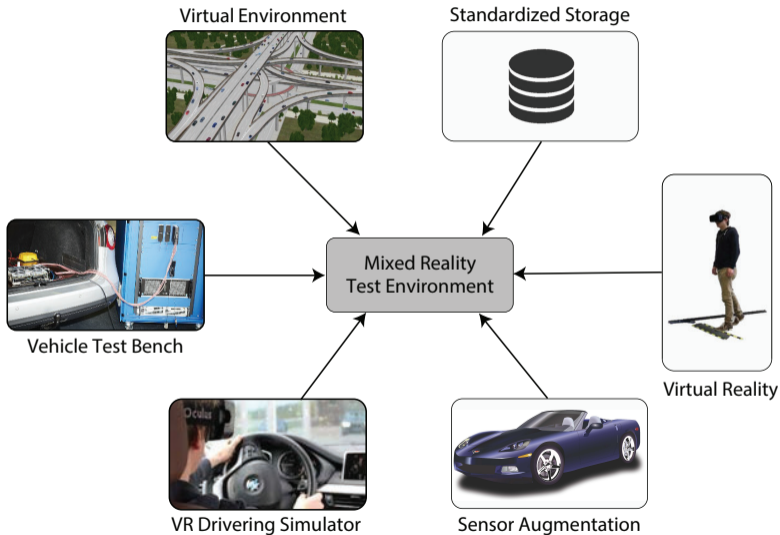


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Motivation



- Extention of classic XiL test setups
- Seamless transition between virtual and real parts
- Physical separation of individual participants
- Standardized interfaces
- Simple connection of individual parts

- Design of a system architecture
 - Run time exchange of moving objects and traffic lights
 - Static environment only at startup
- Identification and evaluation of exchange formats
- Possibilities for connecting components such as
 - Simulation Systems
 - Experimental Vehicles
 - HiL-Systems
 - Prototype Models

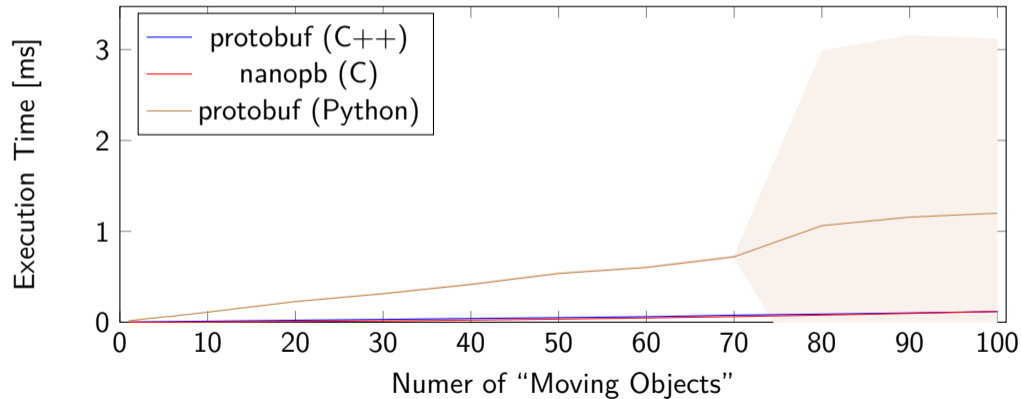
Open Simulation Interface

- ASAM OSI standard (according to PEGASUS)
- automotive context
- programming language independent through IDL compiler

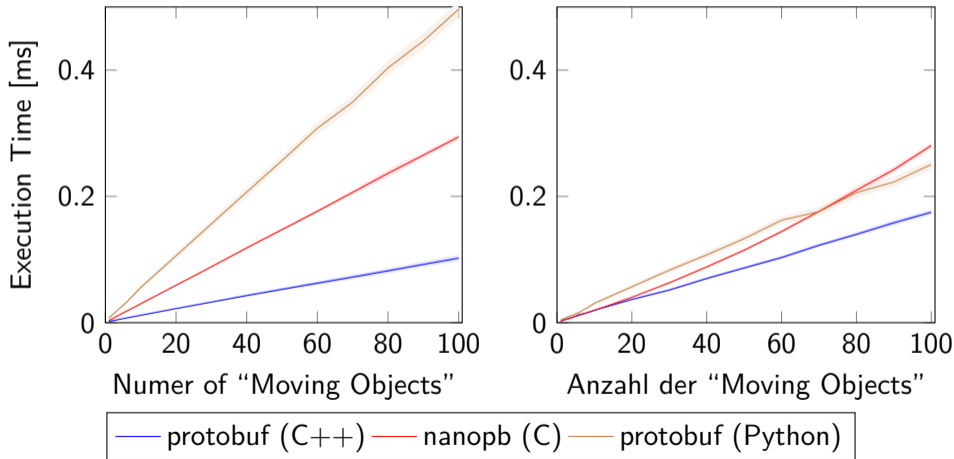
Selection of the protobuf implementations

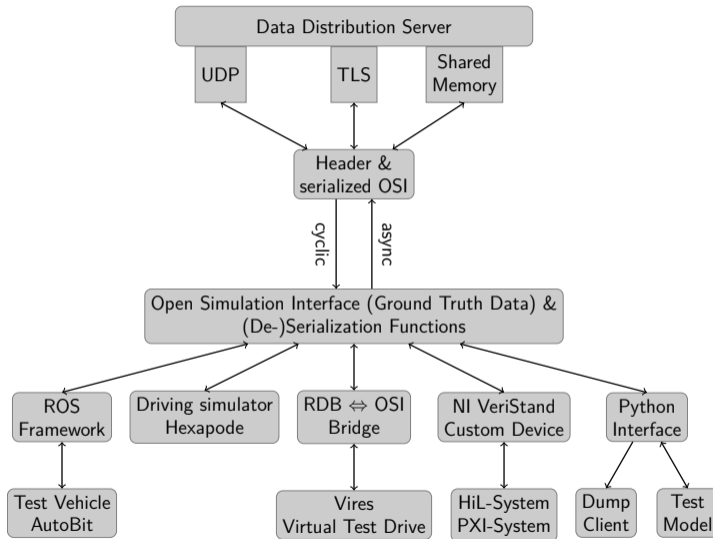
- main components in compilable language
- prototype also in interpretable language
- Official implementation of Google (C++ and Python)
- Lightweight third party implementation (nanopb in C)

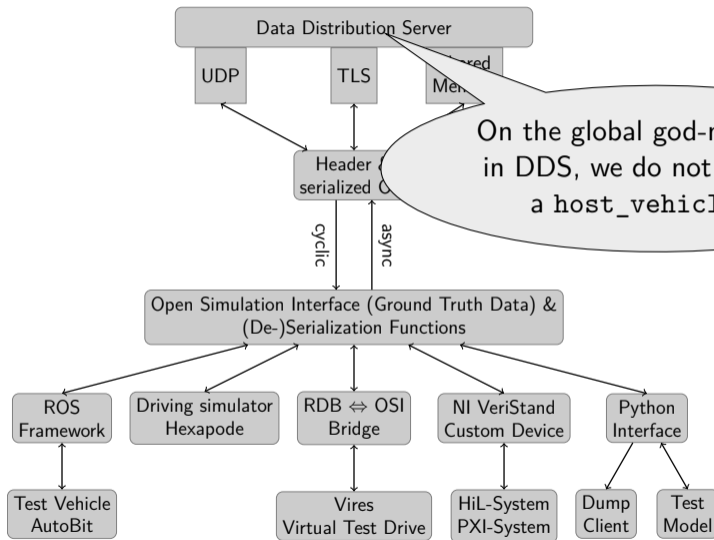
Creation of OSI protobuf Structures



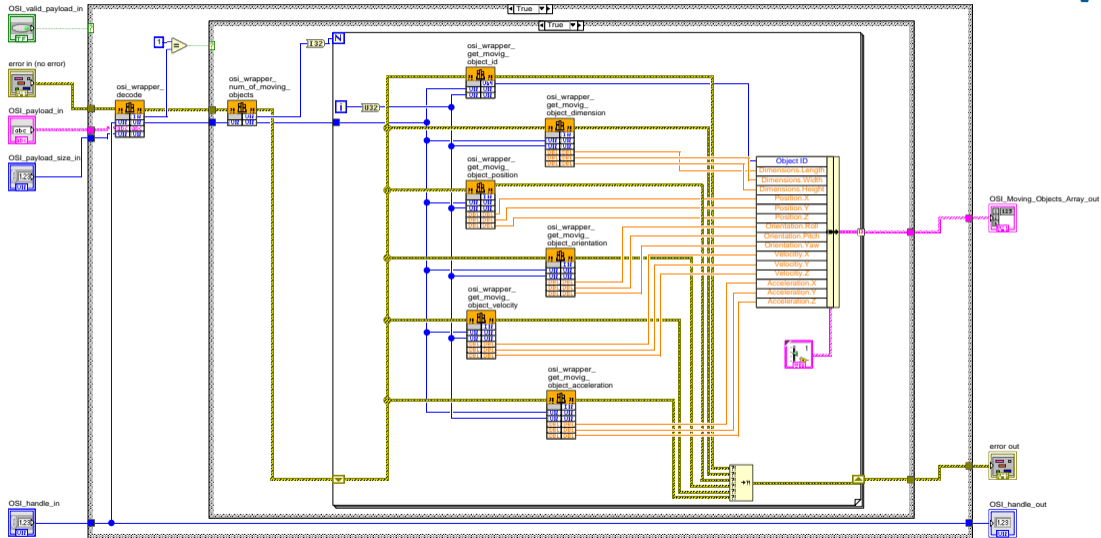
Serialisation and deserialisation of OSI protobuf Structures



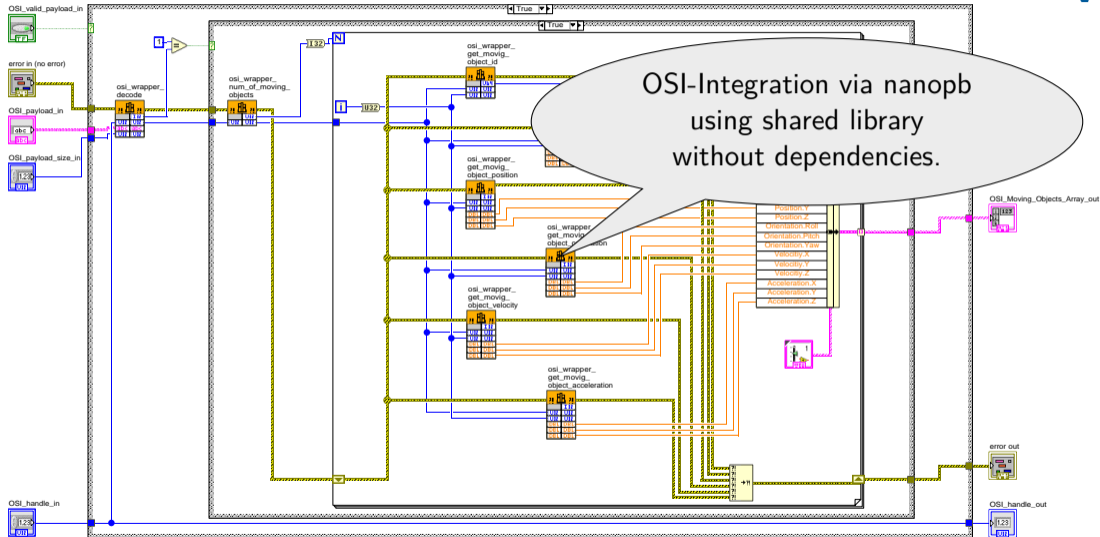




HiL-Integration in NI LabVIEW and Phar Lap ETS



HiL-Integration in NI LabVIEW and Phar Lap ETS



- protobuf and OSI for soft real time for < 100 objects usable
- Exchange of moving objects and traffic lights using
 - Data Distribution Server (DDS)
 - HiL system,
 - main simulation,
 - simple vehicle modelbased on Open Simulation Interface (OSI) possible
- Possibilities to integrate additional test components

- Integration of
 - test vehicles with sensor augmentation,
 - test persons
 - etc.
- Comparison of physical test drives and mixed reality tests



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Initial Publication:

Aufbau einer Mixed-Reality-Versuchsumgebung zur Absicherung autonomer Systeme

Echtzeit 2019 – “Autonome Systeme – 50 Jahre PEARL”

https://doi.org/10.1007/978-3-658-27808-3_5