Combining Tools and Standards to Create Synthetic Scenes

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Introduction

Capturing and labeling real world data is time consuming and expensive. Synthetic data can support the process of training, testing and understanding ML algorithms, especially by varying the scenes and isolating sensor effects. Still, combining different tools and models to reduce the gap between real and synthetic data is challenging. It may include a traffic simulation, driving dynamics, sensor models, renderers and various 3D models with realistic animations and material descriptions.

Goals

- Create a toolchain structure, which unites model, material and map databases with scenario generation and runtime tools.
- Build a framework that connects these tools and databases through standards like OpenDRIVE, OpenSCENARIO and OSI.

Figure 2: Scenario creation from scratch

Challenges & Methods: Scene Creation

Depending on the task and existing database, a synthetic scene can be created using real world measurements (digital twin) or from scratch. This applies to the static environment (map/mesh creation from point cloud) as well as the dynamic scene composition (label extraction). The two different methods:
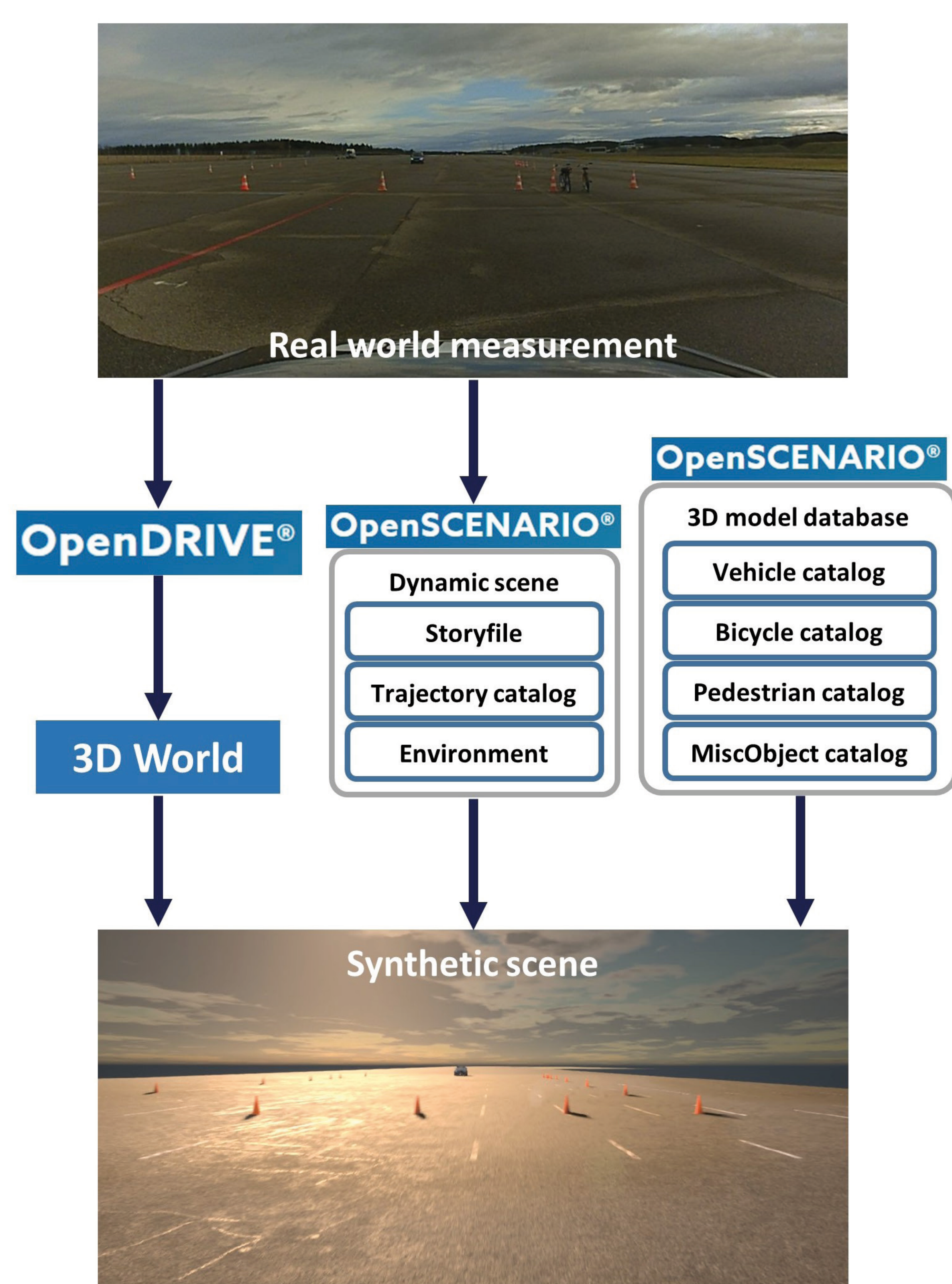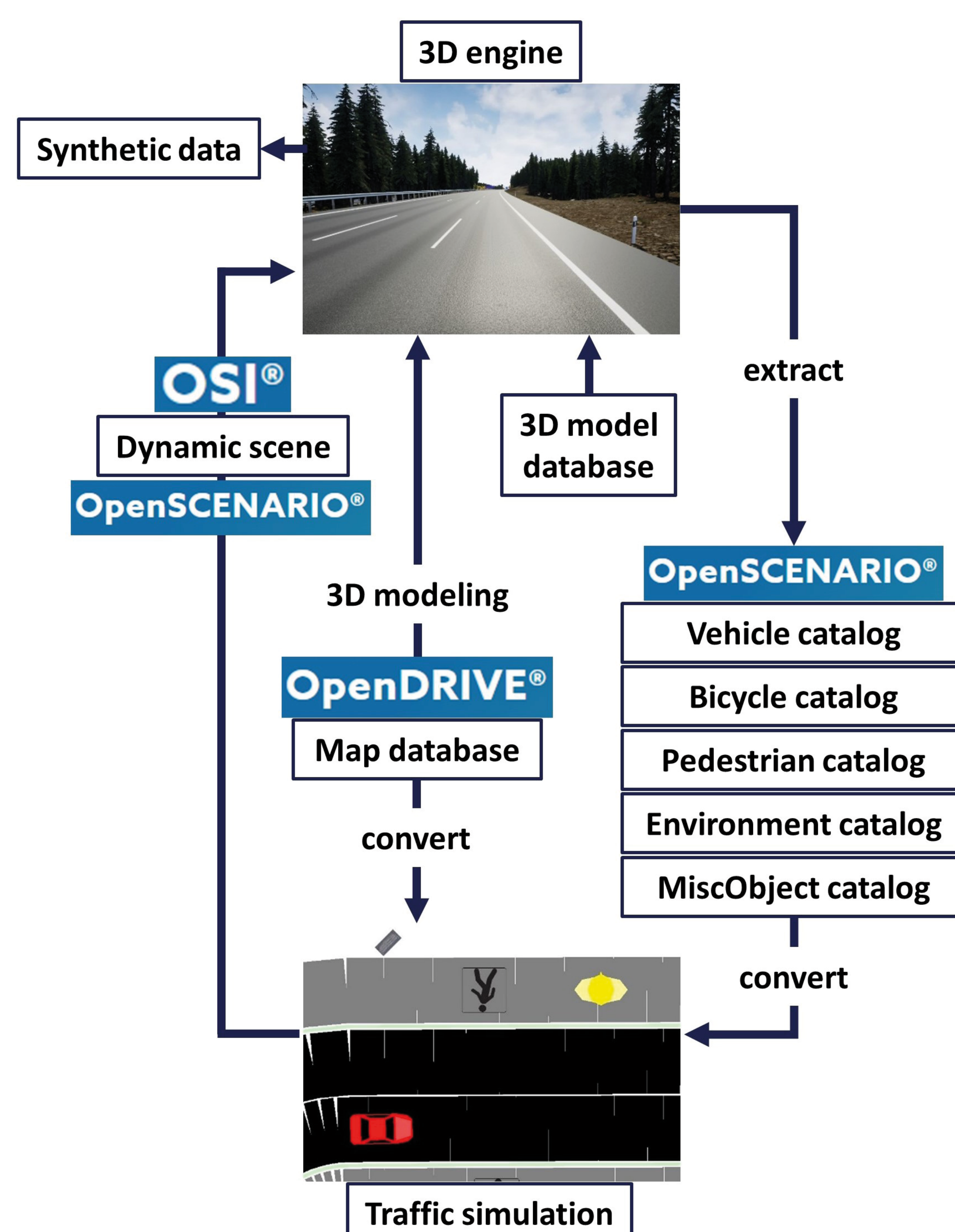

Figure 1: Scenario creation from measurements

Challenges & Methods: Runtime Framework

Next to the creation of synthetic scenarios, we also built a framework, which connects different tools together via a middleware and standardized interfaces. It uses an internal database and is structured as follows:
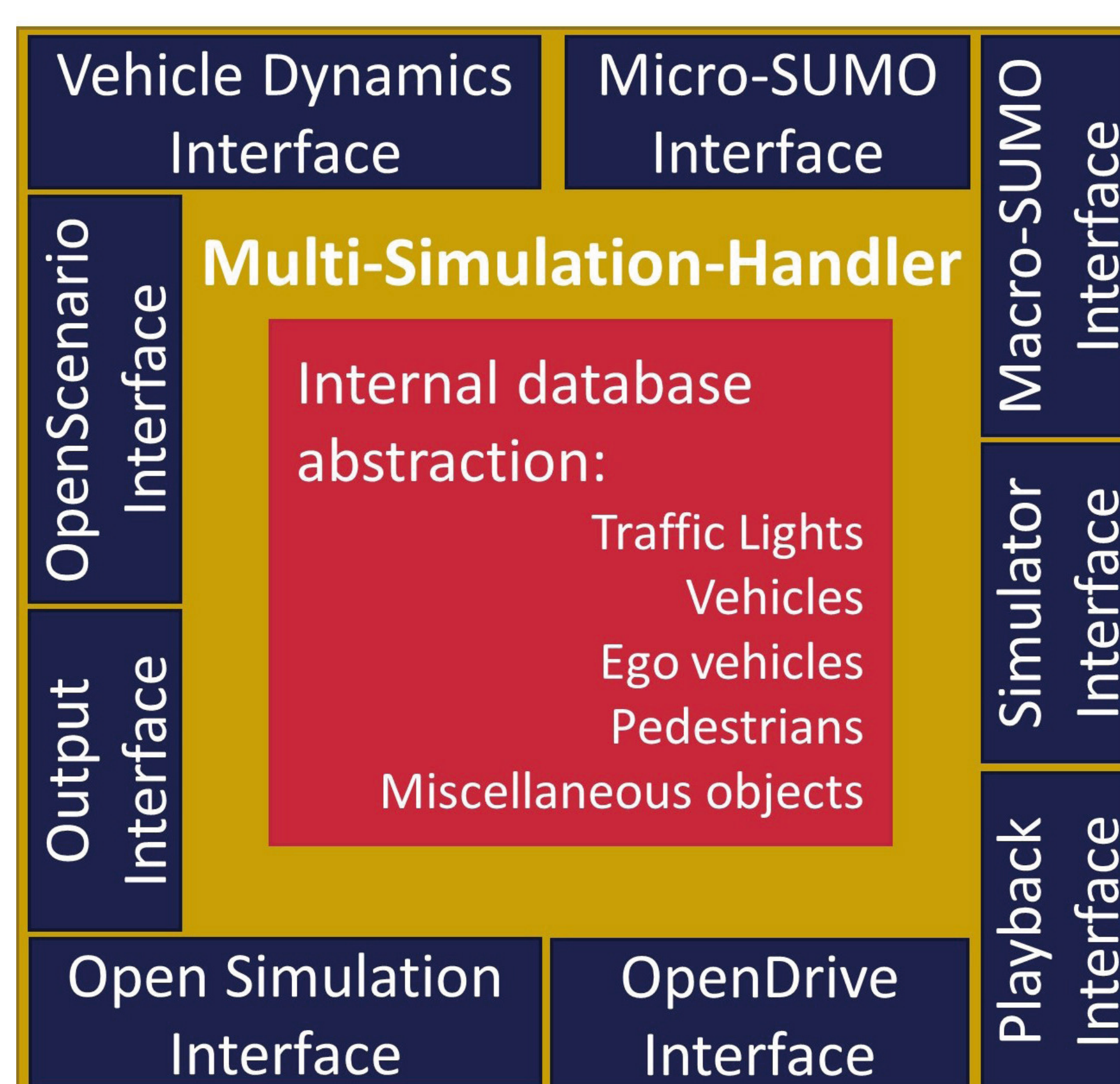

Figure 3: Runtime environment

Summary and Outlook

We designed a toolchain structure, which decouples the scene creation from the rendering engine. The dynamic scene can then be processed via OpenSCENARIO or OSI. Transferring the model, map, mesh and material database is still challenging and part of future work. Connecting sensor models to the framework via OSI is also on our agenda.