

Use case overview



Figure 1. Overview of Use Case 4.1

UC4.1 addresses automated reverse parking of a truck with a semitrailer at a logistics hub, as a sub-case of automated truck operation in confined areas.

Objectives

The objective is to demonstrate how the SUNRISE SAF is applied for safety assurance of a reverse backing function focusing on its performance within defined operational conditions and adherence to safety requirements.

SAF blocks demonstrated

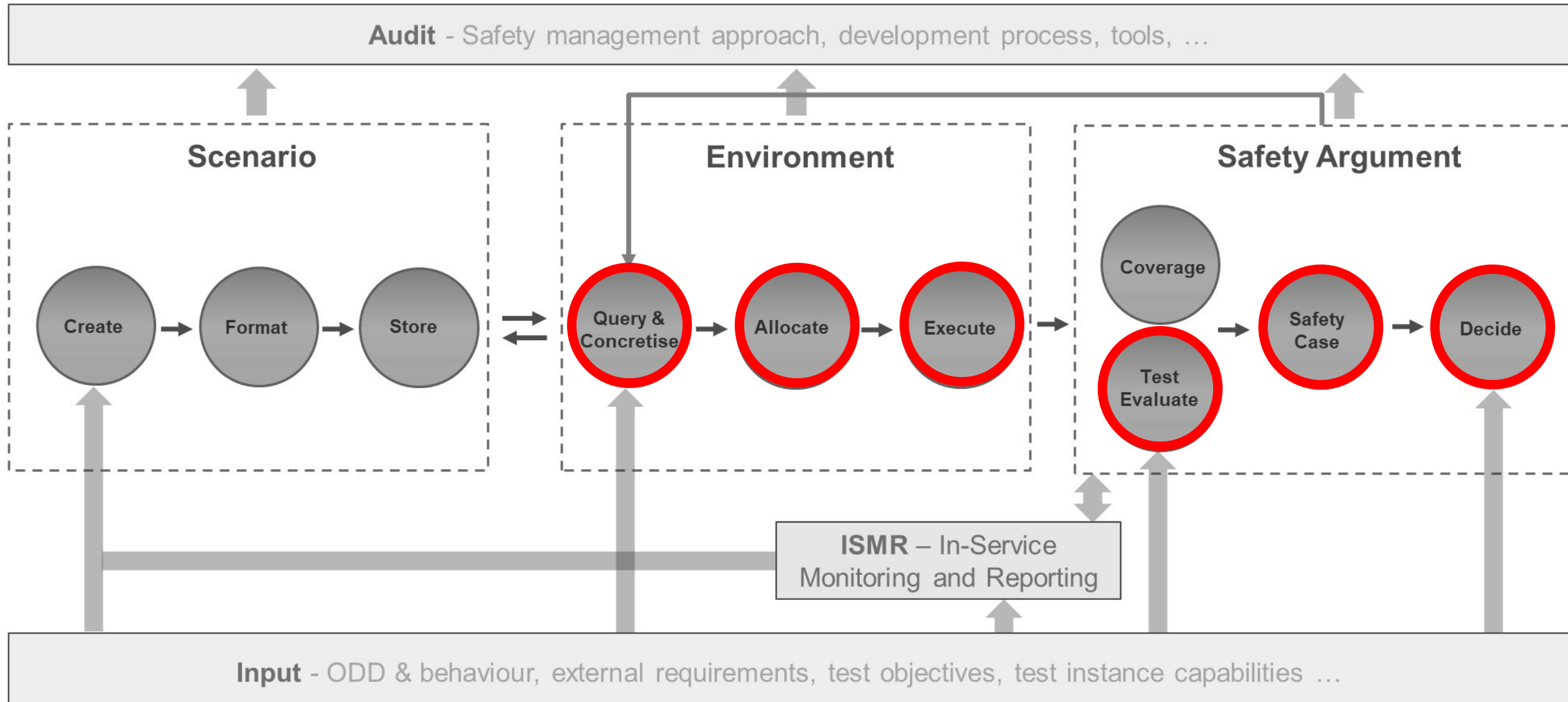


Figure 2. Overview of demonstrated SAF blocks

Test case setup

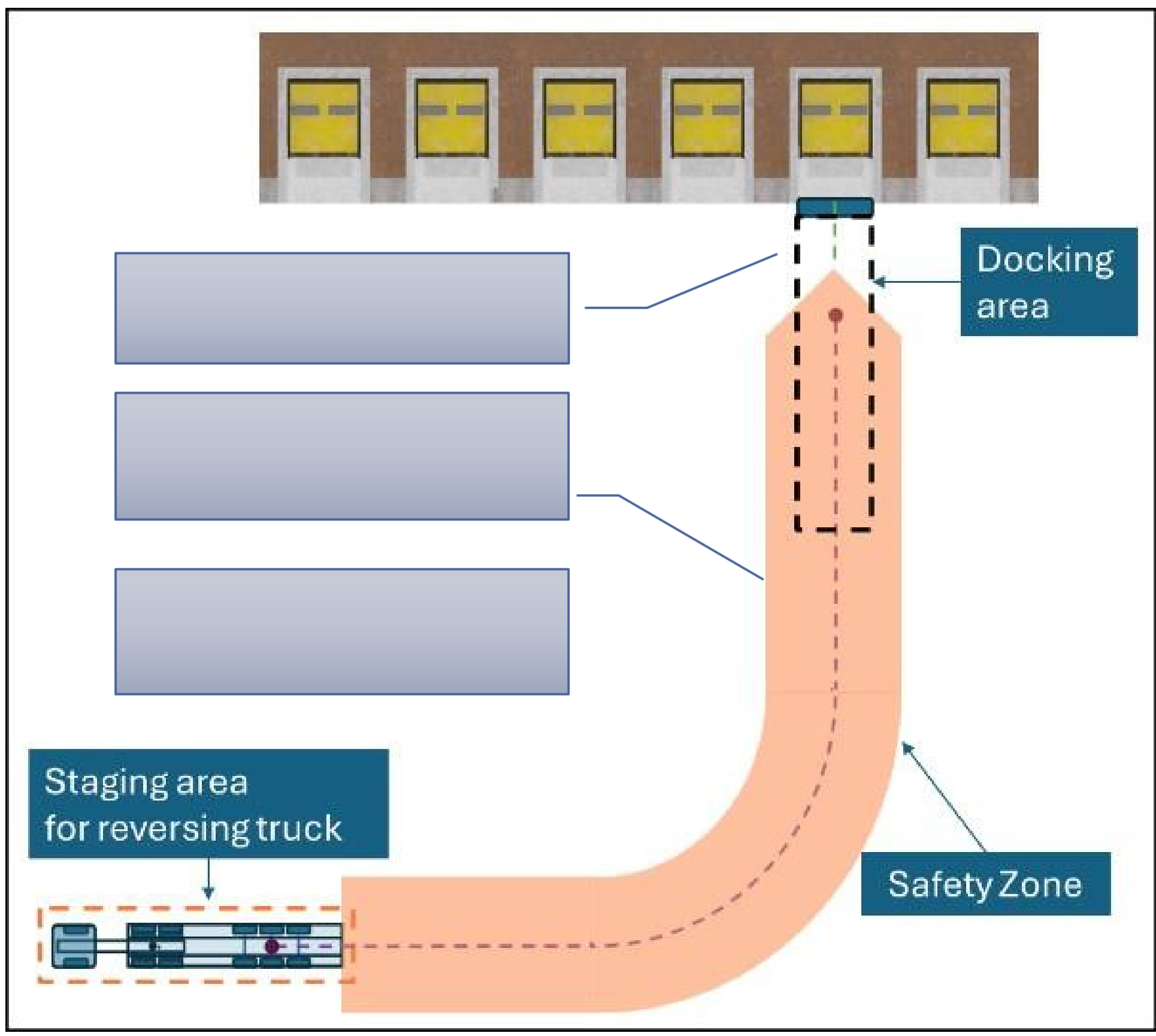


Figure 3. Test case setup

The logical scenario consists of all possible positions and orientations (and possibly other dynamic states) that a truck with a trailer could assume within a square staging area, with all environmental parameters (including lighting) set to baseline conditions.

CCAM = Cooperative, Connected and Automated Mobility
ODD = Operational Design Domain
SAF = Safety Assurance Framework
UC = Use Case

Results

Tests have been performed using virtual simulations, an automated 1:14 scale truck, and a manual driven full-size truck. Same control software is used for both the scale truck and in the virtual simulation. Evaluation has been made using 3 KPIs shown in Figure 3: Docking precision, Safety Zone infractions, and ODD conditions for object detection.

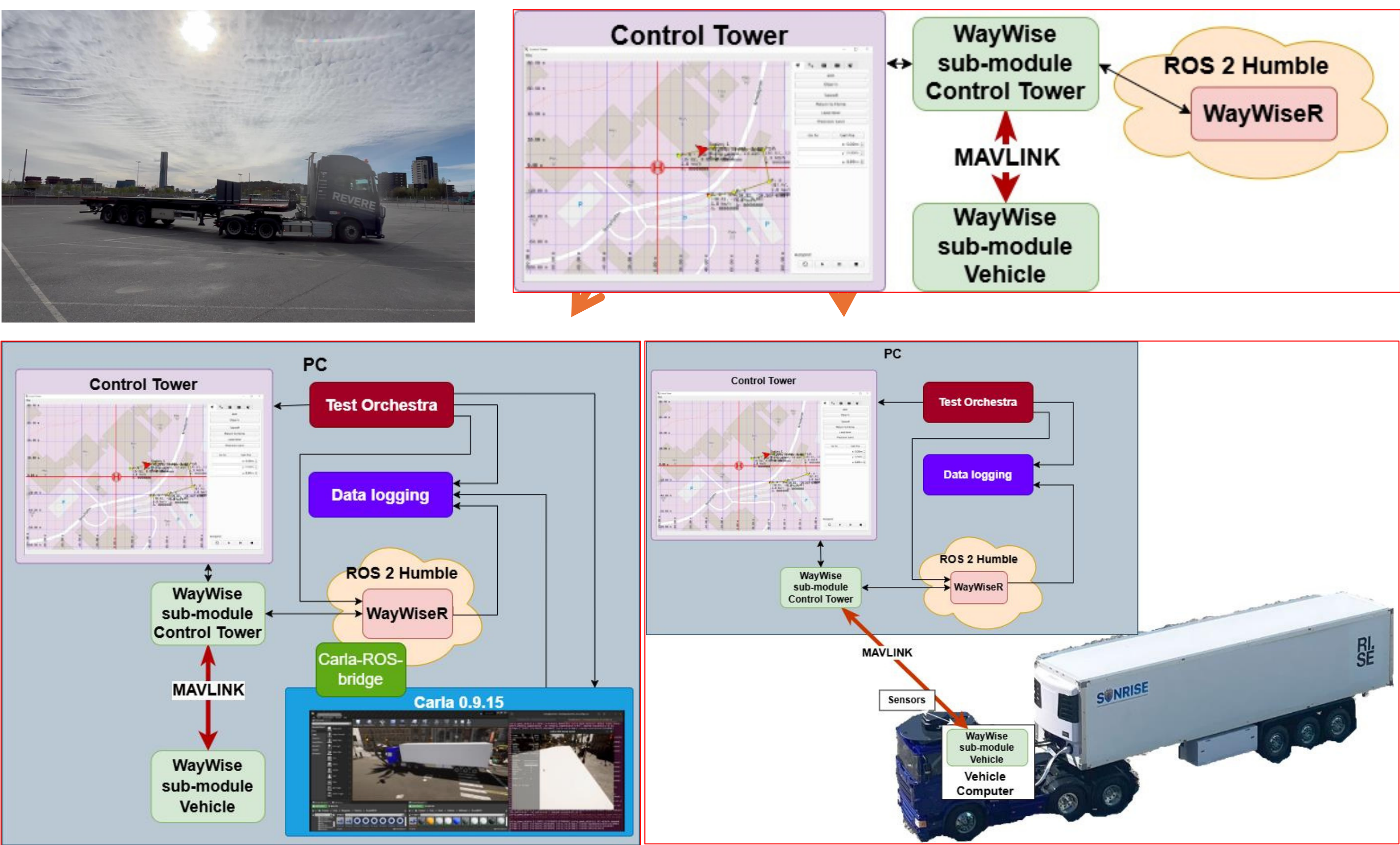


Figure 4. Test environments including tool architecture for software.

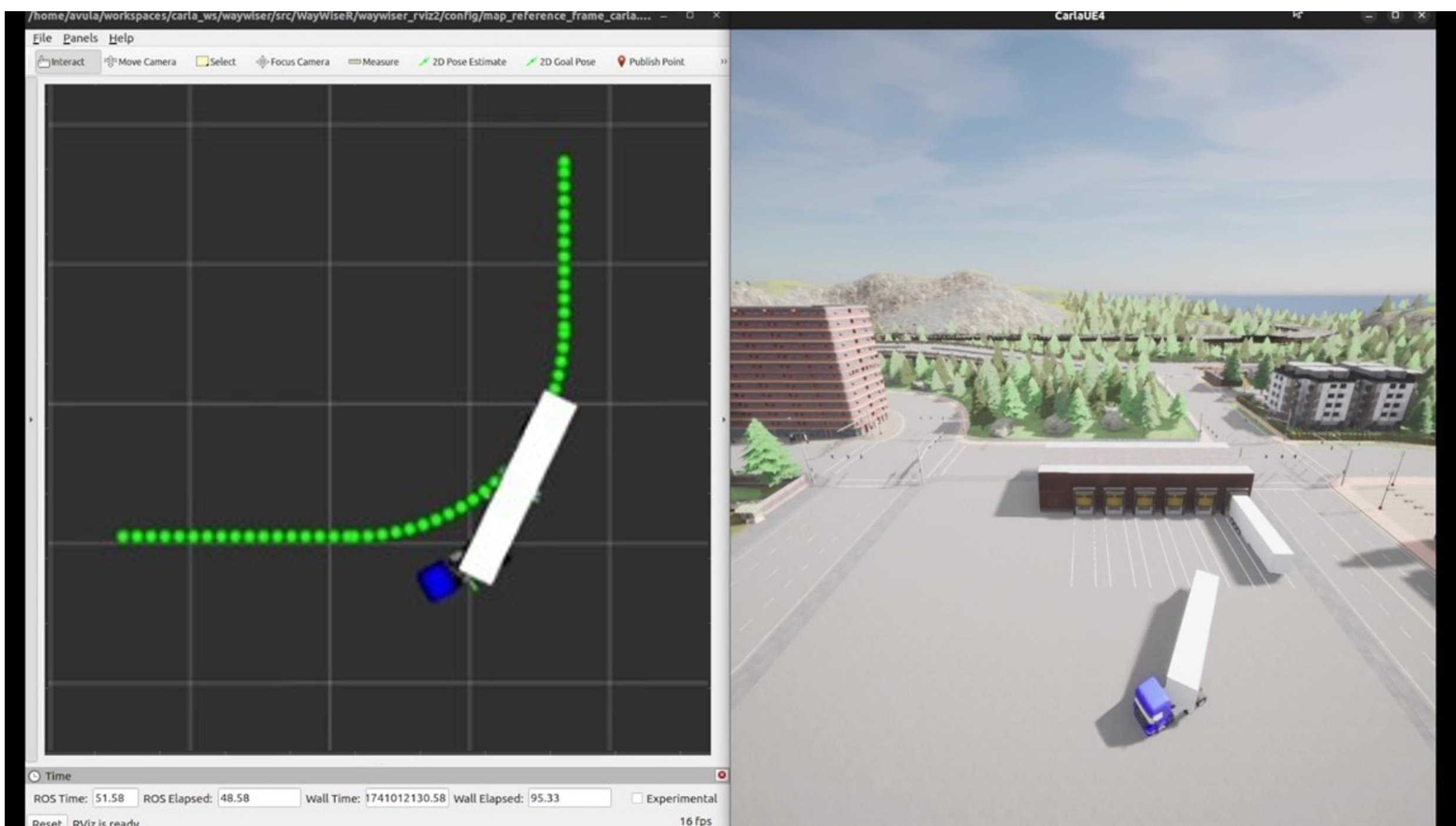


Figure 5. Snapshot from simulation combining Carla and WayWise.

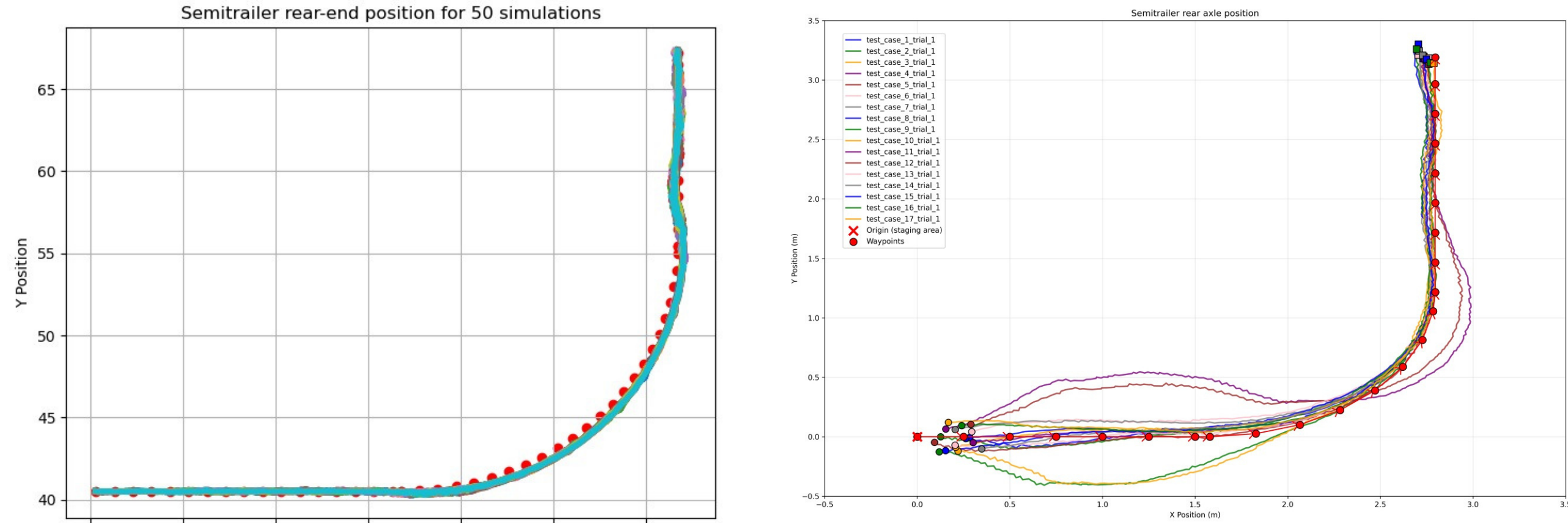


Figure 6. Results from Carla (left) and tests with scale truck (right).

Key take aways

- UC4.2 successfully demonstrates a practical application of the SAF, defining and applying clear safety test objectives.
- Successful validation of Environment and Safety Argument Blocks in both simulation and physical testing.
- Supported the construction and assessment of a safety case.

References

- M. Skoglund et. al., “Formalizing Operational Design Domains with the Pkl Language”, IEEE IV 2025
- M. Skoglund et. al., “Methodology for Test Case Allocation based on a Formalized ODD”, DECSoS / SafeComp 2025

KPI = Key Performance Indicator

Partners



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