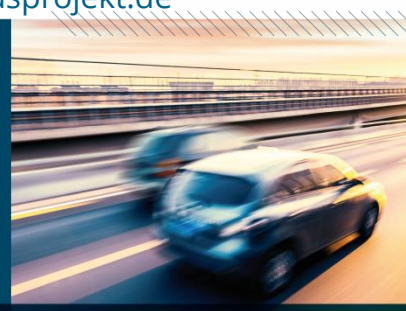


DEVELOPMENT-ACCOMPANYING PROVING GROUND TESTING



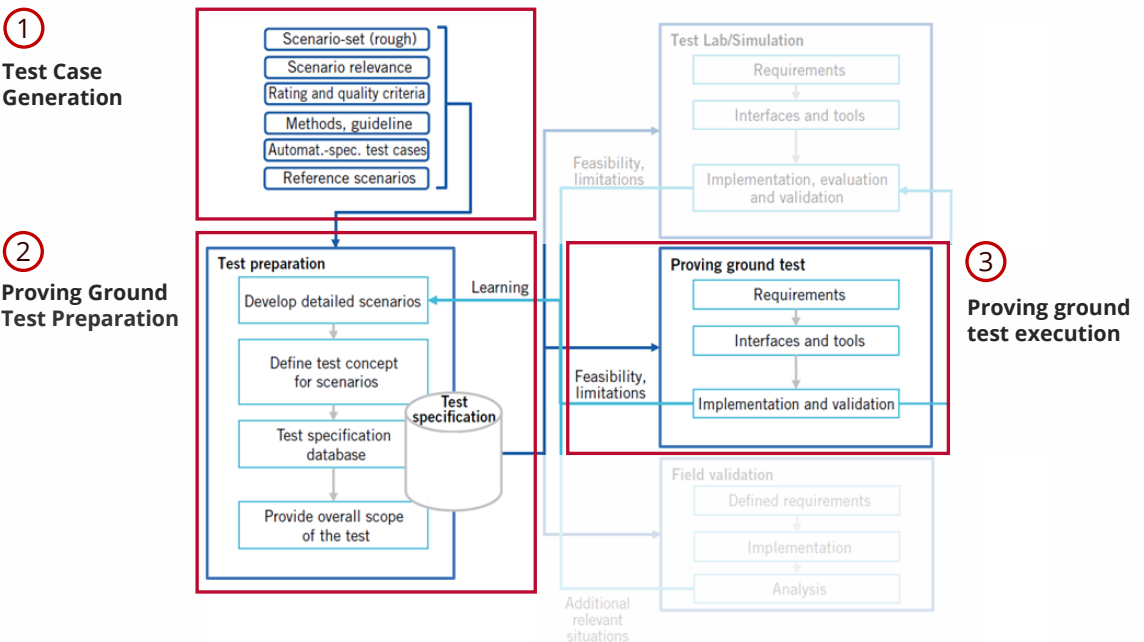
Using standardized scenario description formats for proving ground tests to enable seamless vehicle testing from simulation to real world:



Motivation

- Simultaneous control of multiple vehicles
- Time and location based vehicle synchronization
- Continuous testing from SW in the Loop (SIL) to Vehicle in the Loop (VIL)
- Capability to use the same test equipment on the highway and in urban canyons, for development accompanying testing up to homologation
- Covering different levels of automation up to SAE level 5
- Standardization of a generic interface - ISO 22133-1 Standardization for Proving Ground Equipment Communication

Relation to the PEGASUS Test Framework

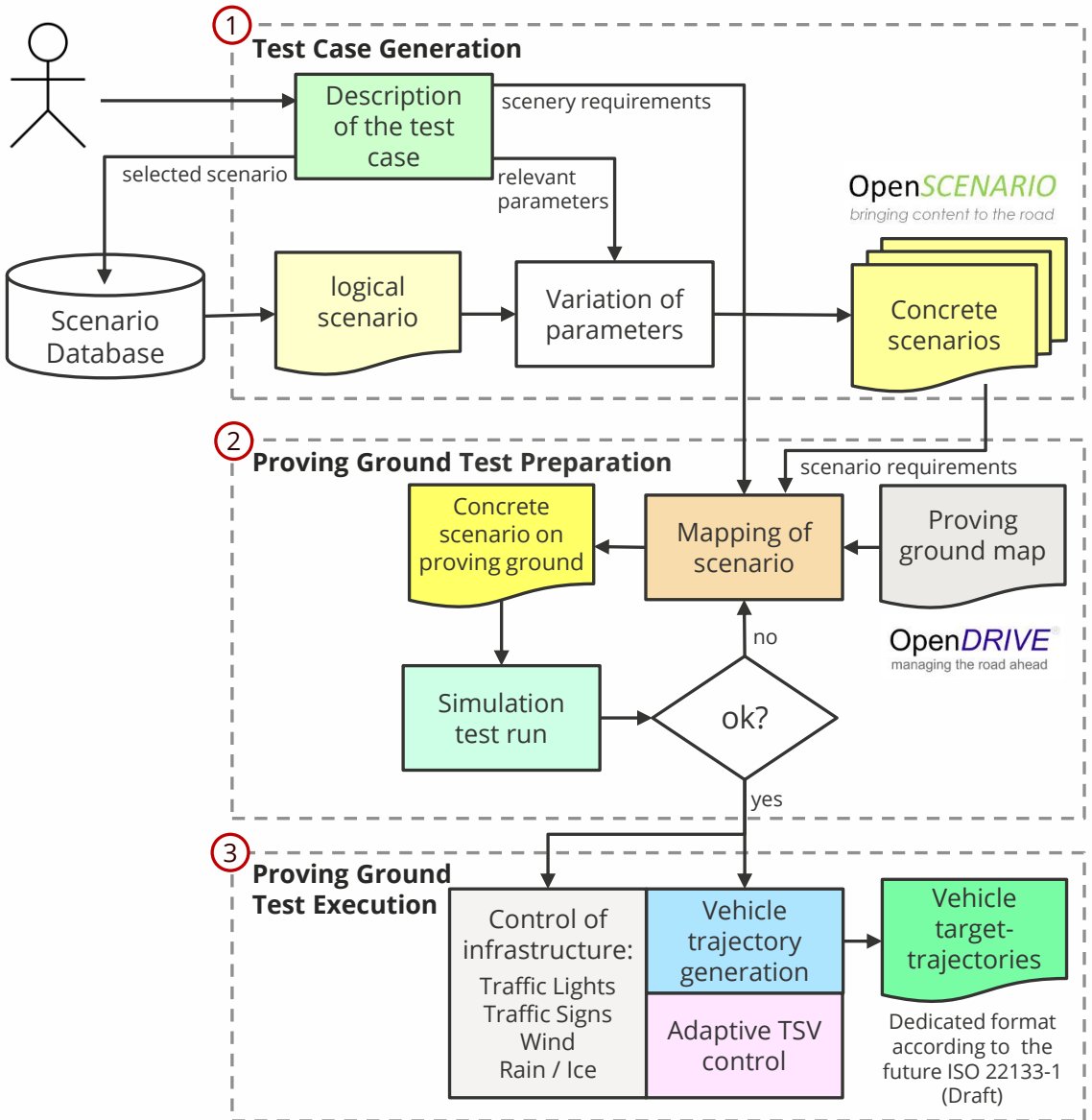


DEVELOPMENT-ACCOMPANYING PROVING GROUND TESTING



Test cases, designed and obtained from simulation, are adapted to characteristics of the dedicated proving ground for real-world test execution:

➔ Test Case Generation, Adaptation and Execution Workflow within PEGASUS



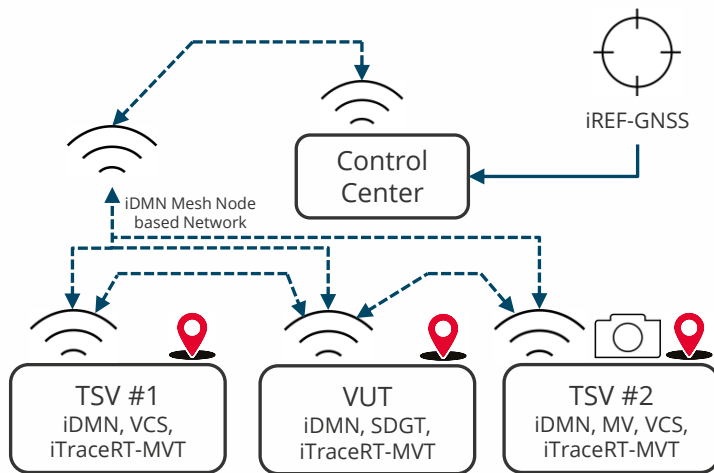
Testing and Safeguarding – Stand 25

DEVELOPMENT-ACCOMPANYING PROVING GROUND TESTING



Proving ground tests with multiple moveable and stationary objects require advanced metrology and safety:

Hardware Components



Legend:

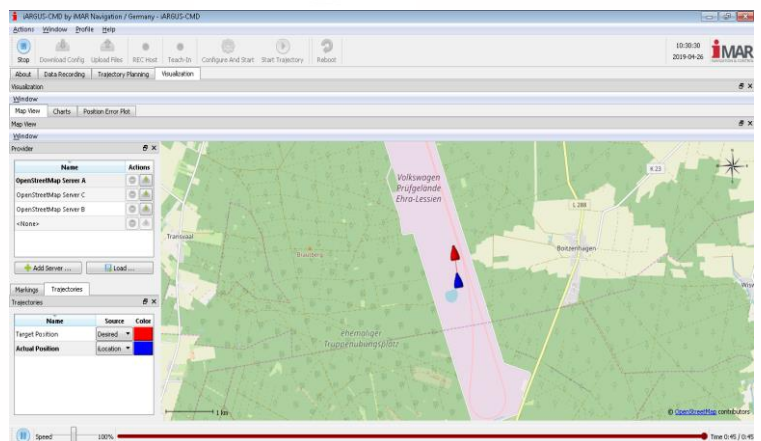
CC:	Control Center
VUT:	Vehicle under Test
TSV:	Traffic Support Vehicle
VCS:	Vehicle Control System
SDGT:	Safety Driver Guidance Tool
MV:	Machine Vision based system for environmental perception and collision avoidance
iREF-GNSS:	RTK based GNSS Correction Data for 2 cm position accuracy
iDMN:	Dynamic Mesh Communication Network (tripod or onboard mounted hotspots)
iTraceRT-MVT:	Vehicle Localization with very low latency (INS/GNSS)



Software: Control Center

Features:

- Import of **OpenScenario** and **OpenDrive** data
- Integrated **trajectory generator / visualization**
- **Generic interface** to **direct controlled TSVs, SCTs** and also **steering robots**
- **Active and passive infrastructure elements** support
- **Trigger / Action** support
- **Relational and adaptive synchronization control** between moveable test objects
- **Geo fence** support for **safety**
- **Configuration Wizard** support for measurement, communication and control features



Screenshot of Control Center for the proving ground © iMAR Navigation

The here presented workflow has been designed, implemented and demonstrated with the support of the PEGASUS Project in a collaboration between Audi AG and iMAR Navigation GmbH

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Testing and Safeguarding – Stand 25

DEVELOPMENT-ACCOMPANYING PROVING GROUND TESTING



Exemplary execution of a scenario specified in OpenScenrio in simulation and on the proving ground:



Detailed information on the simulation setup can be found at stand 21



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