Securing Automated Driving - The Database Approach in PEGASUS

Dr.-Ing. Adrian Zlocki
Senior Manager Driver Assistance
fka, Germany

zlocki@fka.de, Tel.: +49 241 8025616

The PEGASUS Project – Key Figures

42 months term	January 1, 2016 – June 30, 2019
17 Partners	▪ OEM: Audi, BMW, Daimler, Opel, Volkswagen ▪ Tier 1: Automotive Distance Control, Bosch, Continental Teves ▪ Test Lab: TÜV SÜD ▪ SMB: fka, iMAR, IPG, QTronic, TraceTronic, VIRES ▪ Scientific institutes: DLR, TU Darmstadt
12 Subcontracts	▪ i.a. IFR, ika, OFFIS
Project Volume	▪ approx. 34,5 Mio. EUR ▪ Subsidies: 16,3 Mio. EUR
Personnel deployment	▪ approx. 1.791 man-month or 149 man-years

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Central Research Questions of the Project

What level of performance is expected of an automated vehicle?
How can we verify that it achieves the desired performance consistently?

Scenario Analysis & Quality Measures

- What human capacity does the application require?
- What about technical capacity?
- Is it sufficiently accepted?
- Which criteria and measures can be deducted from it?

Implementation Process

- Which tolls, methods and processes are necessary?

Testing

- How can complete-ness of relevant test runs be ensured?
- What do the criteria and measures for these test runs look like?
- What can be tested in labs or in simulation? What must be tested on test grounds, what must be tested on the road?

Reflection of Results & Embedding

- Is the concept sustainable?
- How does the process of embedding work?

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SP 3 Testing

- Detailing and completion of test scenarios of subproject 1, including technical quality measures as well as approval criteria
- Construction and filling of test specification database
- Establishment and verification of testing methods, interfaces, tools in the lab, on testing grounds and in real traffic
- Development and coordination of industrywide established models, tools and interfaces for the simulation
- Compilation of a test catalog and requirements for lab, testing ground and field coverage
- Construction of reference elements for practical testing and demonstration of functions
- Testing in the lab, on testing grounds and on the street

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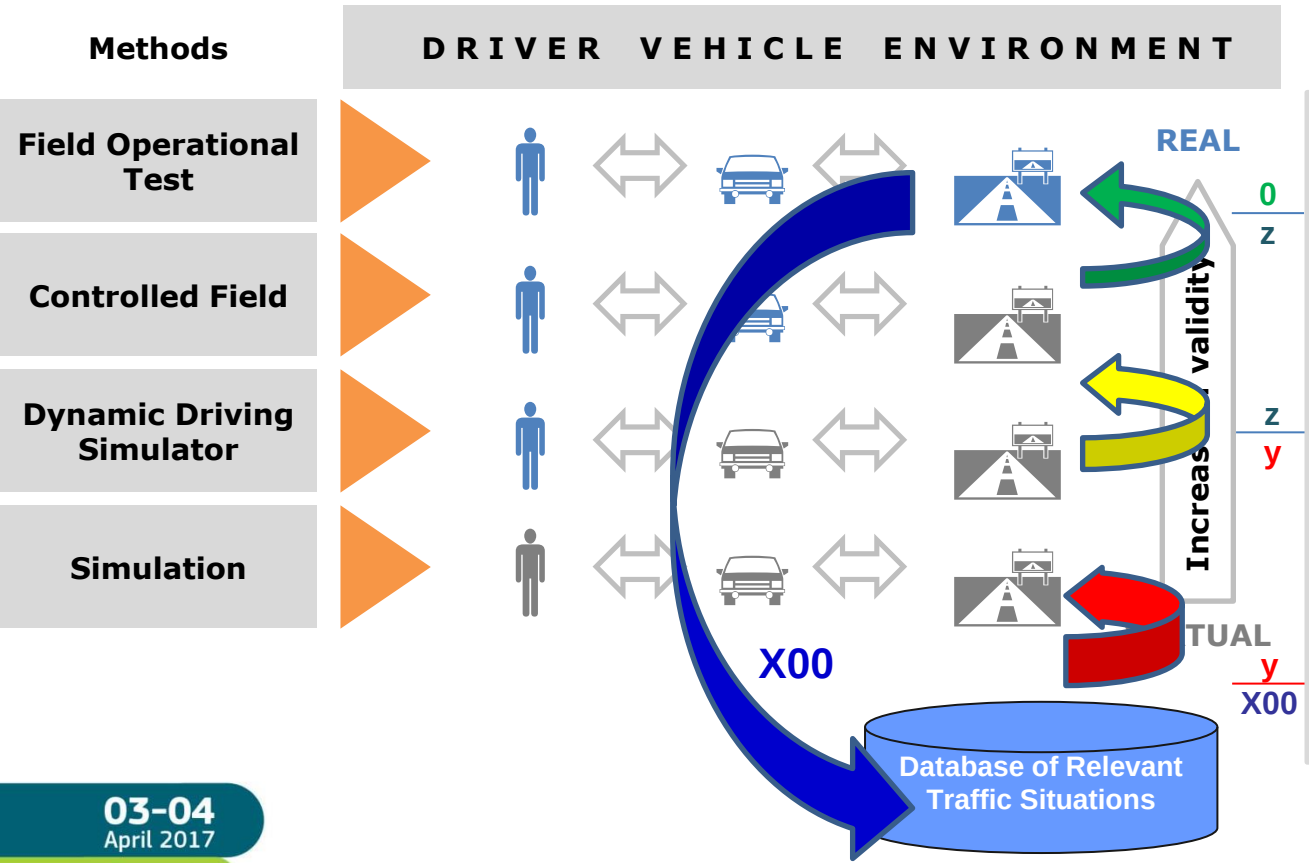
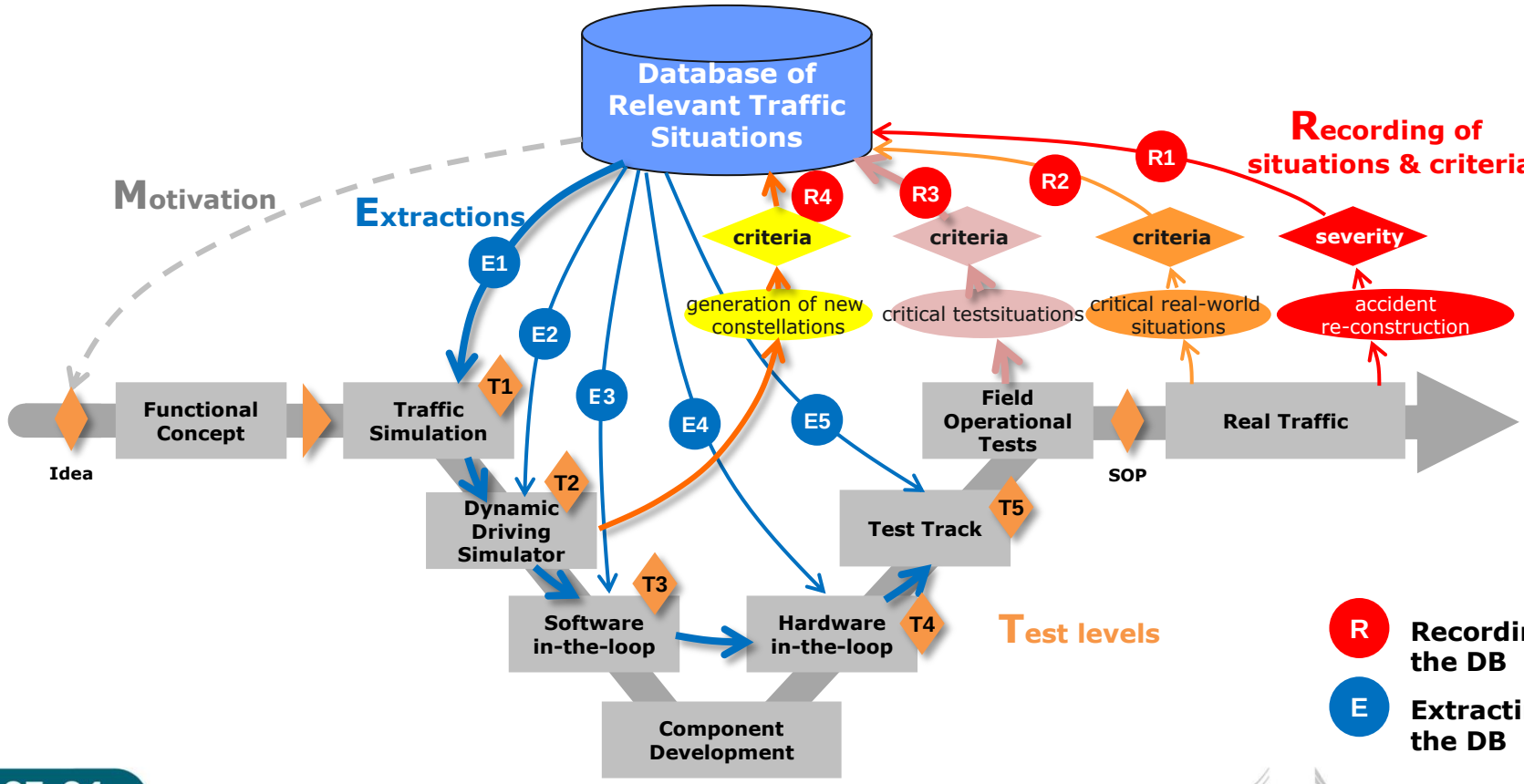
Challenges on Validation Methodology for CAD



Challenges for Automated Driving

- **No accepted evaluation framework** for ADAS is available balancing effectiveness, controllability and acceptance (<Level 3).
- **No evaluation methodology** available for **automated driving** (>Level 3).
- **Safety impact** of automated driving of higher automation levels is difficult to determine, no measurements possible.
- Often **user related issues** are the limit of automated functions (e.g. take over, mixed mode).

Database Approach to Develop and Validate CAD



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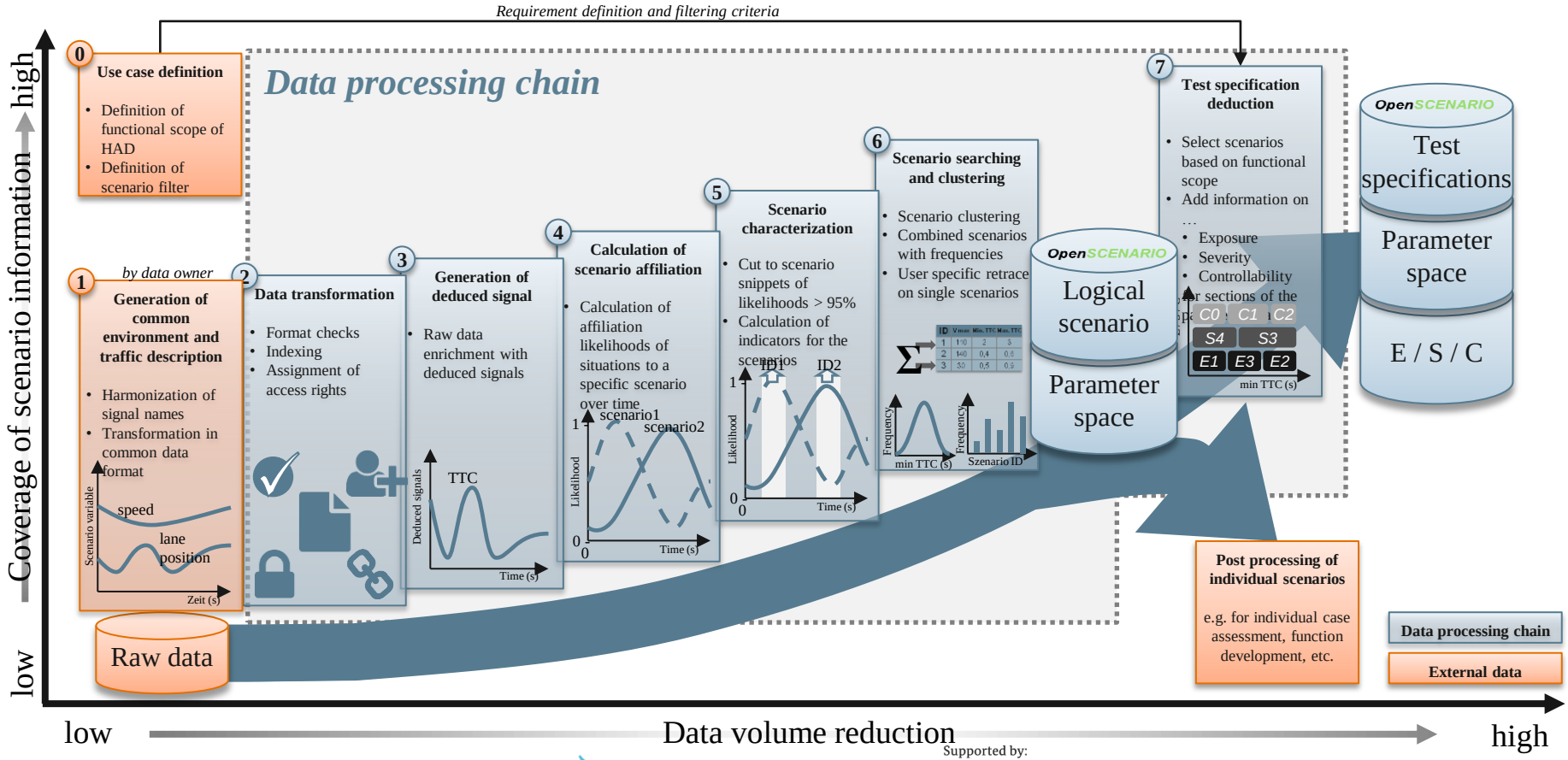
Database and Database Processing Chain



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Database User Interface

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Summary

- Testing and Validation of automated vehicles requires new methods and tools for an efficient safeguarding process.
- Available and known methods and tools can be utilized in the overall circuit process and therefore increase effectiveness.
- Core element of the circuit process is a database and a data processing chain for the relevant scenarios, which is currently established in the German PEGASUS project.
- The data processing chain needs to be able to process different data sources and heterogeneous data quality in order to provide common test specifications.
- The presented database concept allows an efficient processing of high data volumes by means of a flexible tool chain.

Thank you!

Contact:

fka Forschungsgesellschaft Kraftfahrwesen mbH Aachen
Adrian Zlocki
zlocki@fka.de
+49 241 80 25616

www.pegasusprojekt.de

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