3,5 Jahre PEGASUS – Ein Überblick

3,5 Years PEGASUS – an Overview
The PEGASUS-history

Mid 2014:
First Discussion about a Common Proving Center for AD

Autumn 2014:
Focusing on a Method for Safeguarding

January 2015:
Project Outline

September 2015:
Project Description
The PEGASUS-history

January 2016:
Project start with 17 partners
OEM: Audi, BMW, Daimler, Opel, Volkswagen
Tier 1: ADC, Bosch, Continental
Test Lab: TÜV SÜD
SMB: fka, iMAR, IPG, QTronic, TraceTronic, VIRES
Scientific institutes: DLR, TU Darmstadt
Subcontracts: IFR, ika, OFFIS

Mid 2016:
Convention of an Advisory Board
• Federal Ministry for Economic Affairs and Energy
• Federal Ministry of Transport and Digital Infrastructure
• Federal Ministry of Justice and Consumer Protection
• German Association of the Automotive Industry (VDA)
• German Road Safety Council (DVR)
• ADAC

Key-facts:
42 Months Term
1.791 man-month or 149 man-years
34,5 Mio. EUR Budget
4 Sub-Projects
13 Workpackages
38 Sub-Workpackages

Associated Partner:
Federal Highway Research Institute (BASt)
dSPACE
The PEGASUS-history

November 2017: PEGASUS-Half-Time-Event in Aachen

Presentation of Intermediate Results

<table>
<thead>
<tr>
<th>Scenario Analysis &amp; Quality Measures</th>
<th>Implementation Process</th>
<th>Testing</th>
<th>Reflection of Results &amp; Embedding</th>
</tr>
</thead>
<tbody>
<tr>
<td>What human capacity does the application require?</td>
<td>Which tools, methods and processes are necessary?</td>
<td>How can completeness of relevant test runs be ensured?</td>
<td>Is the concept sustainable?</td>
</tr>
<tr>
<td>What about technical capacity?</td>
<td></td>
<td>What do the criteria and measures for these test runs look like?</td>
<td>How can the PEGASUS-Partners embed the results?</td>
</tr>
<tr>
<td>Is it sufficiently accepted?</td>
<td></td>
<td>What can be tested in labs or in simulation? What must be tested on proving grounds, what must be tested on the road?</td>
<td></td>
</tr>
<tr>
<td>Which criteria and measures can be deducted from it?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For the first time: Presentation of the PEGASUS-Approach

⇒ PEGASUS becomes International
The PEGASUS-history

**Germany:** BMVI, BMWi, BMJV, KBA, BASf, DVR, ADAC, Ethics commission (Prof. Hilgendorf)

**Europe:** OICA → UN-ECE Horizontale Initiative; EU-Commission, EU Strategic Transport and Innovation Agenda

**China:** CATARC

**Japan:** METI, JAMA, Toyota, Honda, Nissan

**Korea:** Hyundai

**US:** NHTSA, US DOT, AutoAlliance, RAND

**Singapur:** CETRAN

**World wide:**
ISO: ISO/TC 22/SC 33/WG 9 und WG16 sowie ISO TR21959 Part 2 und SOTIF
DIN SAE: Spec Project Terms and definitions

Addtl. Cooperation Requests & bilateral Exchange:
→ FP Nouvelle France Industrielle, AutoAlliance, Jaguar LandRover, Hyundai, Volvo, RDW, etc.
The statement that we all need

YOU ARE GOOD ENOUGH
With PEGASUS, we contribute to answer the question...

How safe is safe enough and how can we verify that it achieves the desired performance consistently?

...by introducing a

Scenario Based Method to Assess Highly Automated Driving Functions
PEGASUS Method for Assessment of Highly Automated Driving Function (HAD-F)

<table>
<thead>
<tr>
<th>Argumentation</th>
<th>Evidence</th>
</tr>
</thead>
</table>

Safety argumentation

Safety evidence
Goal:
Safety argument

Start:
Use-Case

PEGASUS Method for Assessment of Highly Automated Driving Function (HAD-F)

<table>
<thead>
<tr>
<th>Argumentation</th>
<th>Evidence</th>
</tr>
</thead>
</table>

Data in PEGASUS-Format

Application of Metrics + Mapping to Logical Scenarios

Preparation for Test Concept
Integration
Pass Criteria

Application of Test Concept incl. Variation Method

Risk Assessment
Release
Test Evaluation
Test Execution
Test Case Derivation

Source of Information
Evaluation & Conversion
Scenarios

Argumentation

Contribution to Safety

Data / Content Procedure
Workflow Process Instruction

Preprocessing / Reconstruction
Systematic Identification of Scenarios

Daten: Test Drive Simulation Simulator FOT / NDS Accident 2019

Use Case, Knowledge, Data

V1.4 Status 21.09.2018

Central / Decentral

Space of Logical Test Cases

Test Cases
Test Data
Test Results
Evaluation and Classification

Requirements Analysis

Date:

© PEGASUS
Goal: Safety argument

Start: Use-Case
Goal: Safety argument

"How safe is safe enough?"

"How can we prove it?"

Start: Use-Case

Assessment of Highly Automated Driving Function

Requirements definition

Evidence

Data processing

Database

PEGASUS Method for Assessment of Highly Automated Driving Function (HAD-F)
Major 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?

- **How good is good enough?**
- **How can I proof it?**
- **What else do I need?**
- **How will the PEGASUS approach be applied?**
Vielen Dank für Ihre Aufmerksamkeit!

Many thanks for your attention!