Towards an integrated approach to testing automated driving on public roads

ITS World Congress 2019, Singapore

Aria Etemad
Volkswagen Group Innovation
1,000 drivers
100 cars
10 countries
## Pilot across Europe

<table>
<thead>
<tr>
<th>COUNTRY / REGION / PARTNER</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BE / Brussels</strong></td>
</tr>
<tr>
<td><strong>DE / Aachen</strong></td>
</tr>
<tr>
<td><strong>DE / Munich</strong></td>
</tr>
<tr>
<td><strong>DE / Offenbach</strong></td>
</tr>
<tr>
<td><strong>DE / Wolfsburg</strong></td>
</tr>
<tr>
<td><strong>DE / Ingolstadt</strong></td>
</tr>
<tr>
<td><strong>FR / Paris and other regions</strong></td>
</tr>
<tr>
<td><strong>IT / Turin and Trento</strong></td>
</tr>
<tr>
<td><strong>LU / NL</strong></td>
</tr>
<tr>
<td><strong>SE / Gothenburg</strong></td>
</tr>
<tr>
<td><strong>UK / Coventry</strong></td>
</tr>
</tbody>
</table>

+ Cross-border activities
Facts

€68 million BUDGET

48 months DURATION, starting in September 2017

€36 million FUNDING

34 PARTNERS, among them OEMs, suppliers, research, SMEs, insurers, authorities and user groups

12 COUNTRIES involved: Austria, Belgium, France, Finland, Germany, Greece, Italy, Netherlands, Norway, Sweden, Switzerland, UK
1,000 drivers 100 cars 10 European countries Piloting Automated Driving on European Roads.

Methodology
Data
Evaluation

Fleet
Piloting
Code of Practice

PREPARE
DRIVE
EVALUATE

DEPLOY - Europe-wide Piloting Environment - User Studies - Business Studies

Traffic Jam  Motorway  Parking  Urban
1,000 drivers 100 cars 10 European countries Piloting Automated Driving on European Roads.
L3Pilot Data Flow

Categories of data:
1 Derived Vehicle Data (CAN, GPS, PIs, video, and/or video annotations)
2 Subjective Data (interviews, questionnaires, simulator studies)
3 External Data (weather, map, infrastructure, other traffic participants, ...)
4 Open Data (aggregated data)
Pseudonymization Process

<table>
<thead>
<tr>
<th>First name</th>
<th>Last name</th>
<th>Driver ID</th>
<th>SHA256(Driver ID + salt)</th>
<th>Age</th>
<th>Gender</th>
<th>Nationality</th>
</tr>
</thead>
<tbody>
<tr>
<td>David</td>
<td>Davidson</td>
<td>001</td>
<td>1a064a72...1afe5341</td>
<td>26</td>
<td>Male</td>
<td>Earth</td>
</tr>
<tr>
<td>Stan</td>
<td>Stanson</td>
<td>002</td>
<td>b2452fbb...02753647</td>
<td>38</td>
<td>Male</td>
<td>Mars</td>
</tr>
<tr>
<td>Nelly</td>
<td>Nelson</td>
<td>003</td>
<td>339b0d9a...212960be</td>
<td>29</td>
<td>Female</td>
<td>Venus</td>
</tr>
</tbody>
</table>

H5 file Start timestamp End timestamp Driver ID Trip ID (SHA256 of start timestamp + salt) var
2019-04-23.h5 1530364592574 1530364652474 1a064a72 691ea24d...b79b5524 ... 2019-04-24.h5 1530364651438 1530364677843 b2452fbb 4a8c43dd...1d228db6 ... 2019-04-25.h5 1530364651778 1530364651234 339b0d9a dc0d005d...4e26967a ...

Consolidated database (Consortium has access)

<table>
<thead>
<tr>
<th>Trip ID</th>
<th>Start timestamp</th>
<th>End timestamp</th>
<th>Max/min/avg var</th>
</tr>
</thead>
<tbody>
<tr>
<td>691ea24d</td>
<td>1530364592574</td>
<td>1530364652474</td>
<td></td>
</tr>
<tr>
<td>4a8c43dd</td>
<td>1530364651438</td>
<td>1530364677843</td>
<td></td>
</tr>
<tr>
<td>dc0d005d</td>
<td>1530364651778</td>
<td>1530364651234</td>
<td></td>
</tr>
</tbody>
</table>

Master table of participants which only OEM has access to

H5 data for selected partner

SHA256 driverID is only link between these

23 October 2019
L3Pilot Common Data Format (L3Pilot CDF)

• In order to facilitate the analysis of data in L3Pilot, a common data format was developed based on experience from previous projects (AdaptIVe, euroFOT, UDrive, etc.)

• The CDF is **made available to the public** via Github: https://github.com/l3pilot/l3pilot-cdf
  • Everyone is invited to use the format and contribute to it
  • Use open source tools and formats to facilitate use in other projects

• Detailed information on the format can be found on http://indexsmart.mirasmart.com/26esv/PDFfiles/26ESV-000043.pdf (public access)
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Europe-wide Piloting Environment - User Studies - Business Studies

Traffic Jam

Motorway

Parking

Urban
History of the Code of Practice (CoP)

PReVENT: RESPONSE 3 „CoP ADAS“

AdaptIVe: Response 4 „Legal aspects AD“

L3Pilot: „Code of Practice AD“

2008 2014 2017 2017 2021
## Categories of the CoP

<table>
<thead>
<tr>
<th>Definition Phase</th>
<th>Concept Selection Phase</th>
<th>Design Phase</th>
<th>Validation &amp; Verification Phase</th>
<th>Post Start of Production Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Overall Guidelines and Recommendations</strong>&lt;br&gt;Minimum Risk Manoeuvre, Documentation, Existing Standards</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>ODD Vehicle Level</strong></th>
<th><strong>ODD Traffic System &amp; Behavioural Design</strong></th>
<th><strong>Safeguarding Automation</strong></th>
<th><strong>Human-Vehicle Integration</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Function Description, System Limits, Scenarios, Testing etc.</td>
<td>Automated Driving Risks, Mixed Traffic Simulation Approach, Ethics, etc.</td>
<td>Functional Safety, Cybersecurity, SOTIF, Updates etc.</td>
<td>Provide Guidelines for HMI, Mode Awareness/Confusion, Controllability etc.</td>
</tr>
</tbody>
</table>
L3Pilot Annual Quantitative Survey

- **1st longitudinal study** on user acceptance of AD.
- **Representative, quantitative** and **international** approach.
- L3Pilot annual survey will provide **insights into user acceptance and attitudes** towards **automated driving** of the **general public** and its **development over time**.

**Impact**
- **Recommendations** for public and private decision-makers
- **Knowledge** about future market potential for AD systems
- **Development** of Automation Acceptance Index (AAI)
Thank you for your kind attention.

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