Challenges and Proposals for Modern Vehicles

Geert Pater
Department Manager
Vehicle Standards Development
The Netherlands Vehicle Authority

Organization

• RDW is a non-commercial public body since 1949. It performs its tasks on behalf of the Ministry of Infrastructure and Water Management.

RDW in international context

• As the Type-Approval Authority of the Netherlands, RDW tests and inspects new vehicles, their systems and parts of over 1600 manufacturers and importers from all over the world. RDW also makes knowledge available through consultation and supports projects in other countries in the area of traffic safety. In addition, RDW closely cooperates with sister organizations in the area of European regulations.

International consultation

• Dutch legislation is based on European Directives. These are increasingly related to agreements that are made in the context of UNECE and EU. RDW participates in various consultation structures in which the international regulations are prepared.
The Netherlands Vehicle Authority

- Type Approval
- Oversight and Control
- Registration and information provisioning
- Issuing documents

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The Modern Vehicle as a Data Centre on Wheels

The Challenge
Are we prepared?
The Challenges

‘The European Type Approval System is not sustainable’

How do you test a car with > 100 million lines of software?
How do you test a car with connections to the outside world?

Software with Easter Eggs and dead code

No formal divide between entertainment and motor management (CAN BUS)
CAN BUS is an open system

'No vehicle is safe'

Testing 18 carkeys of modern cars. They all failed

Ransomware will be in a car within one year

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The Challenges

We need a new way of testing, certifying and monitoring

Virtual testing of the car should be possible, or better yet – the software has to get a drivers license.

We need a strong collaboration between authorities internationally and a natural way to exchange information and learn from each other.

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# Testing in the Netherlands

<table>
<thead>
<tr>
<th>Overall rank</th>
<th>Country</th>
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<th>Policy and legislation</th>
<th>Technology &amp; Innovation</th>
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KPMG Autonomous Readiness Index 2018

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Bridging the Gap Between Regulation and Innovation

Assessing Safety and Security
Finding Input for New Regulation

What Is RDW Doing?

Bridging the Gap!

- Learning Audit / Learning Experience - VSSF
- Vehicle Driving License – vDL
- Experimentation Law (January 2019)

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Finding Input New Regulation

VEHICLE SAFETY SECURITY FRAMEWORK (VSSF)

An ideation for a smooth co-creation for innovation and legislations
Could be seen as a deeper dive into e.g. Annex 6
Creating maturity by performing Learning Experiences

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The Learning Framework
Ideation for co-creation of "Innovation" and "Regulations"

1/20/2018
RDW - Vervoer Beleid & Maatschappij (VBM)
Geert Pater Partners, Senior Advisor, ICT | Road Hubber, Project Manager, ICT

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# Vehicle Safety and Security Framework (VSSF)

<table>
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<th>Goals</th>
<th>Strategy</th>
<th>Lifecycle</th>
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**Learning Areas**:
- Functional Safety, Cybersecurity and Privacy Engineering
- Software Requirements, Design and Development
- Software Configuration Management
- System Validation
- Product Statistics
- Human Machine Interaction
Basic Principles

Overview, Purpose, **Scope**, Process/Learning aspects, **Evidence**, Tooling and Tech, Specific Queries, Sample Questions

**Question based construction of information gathering**

Database of *>500 questions* dedicated to topics identified

“MOSCOW” based color coding principle – **Must, Should, Could and Would** be asked questions

Minimum *(At least)* Learning Set

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Gerard Doll - Director Vehicle, Regulation & Admission  
RDW
## Basic Principles (Sample Question set)

<table>
<thead>
<tr>
<th>SW DEVELOPMENT</th>
<th>Software Validation and Verification</th>
<th>Software Quality Assurance</th>
<th>SW DEVELOPMENT/AUTOPILOT</th>
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<td>41</td>
<td>Testing: Describe the test development exercise</td>
<td>229</td>
<td>Data Operations/Analysis (pertaining to SW in-use and monitoring)</td>
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<tr>
<td>44</td>
<td>Testing: Describe the test execution, reporting, traceability and regression testing exercise</td>
<td>230</td>
<td>Data Operations/Analysis (pertaining to SW in-use and monitoring)</td>
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<td>45</td>
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<td>6</td>
<td>CYBERSECURITY Patch Management</td>
<td>229</td>
<td>What is your opinion on which characteristics constitute a high quality software?</td>
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<td>7</td>
<td>CYBERSECURITY Patch Management</td>
<td>230</td>
<td>What are the quality attributes and metrics to gauge software product and process quality?</td>
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<tr>
<td>8</td>
<td>CYBERSECURITY Patch Management</td>
<td>231</td>
<td>Describe the structure of the quality assurance team assuming it is independent of the software development group.</td>
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<td>231</td>
<td>Data Operations/Analysis (pertaining to SW in-use and monitoring)</td>
</tr>
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</table>

### Sample Questions:

- **Question 1:** What is your opinion on which characteristics constitute a high quality software?
- **Question 2:** What are the quality attributes and metrics to gauge software product and process quality?
- **Question 3:** Describe the structure of the quality assurance team assuming it is independent of the software development group.

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### Basic Principles (Minimal learning set)

#### Minimum Set of Learning Checklist

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<th>Teams</th>
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<td>Software Quality and Assurances</td>
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<td>Configuration Management and Configuration Data</td>
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<td>Autopilot</td>
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<td>Product platform and Architecture (high level)</td>
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<td>Verification and Validation</td>
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<td>37</td>
<td>Driver Engagement (and Technology ceiling)</td>
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Vehicle Driving License (vDL)

What if technology takes over all driving tasks?
Background

• Limited knowledge of driving behavior; how to license self driving vehicles?
• RDW challenged Green Dino to develop a license for AI-drivers
• Green Dino started ‘robotTUNER’ a new company for assessment and training of robot / AI-drivers.

Result: ‘Digital Driving License Project’. A collaboration of stakeholders who want to attribute to an international standard for licensing of intelligent vehicle operating systems, human and AI.

Initial Group
Nvidia, AON Risk Solutions, Ricardo, HAN-Automotive Research, 2getthere, Roborace and initiators robotTUNER and RDW.
**NEW ADDITION IN THE TYPE APPROVAL PROCESS**

**SOFTWARE AUTOMATED VEHICLES**

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**CURRENT SITUATION**

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New work item proposal (ISO)
Safety of Intelligent Vehicle Operating Systems (SIVOS)

Proposed process of testing:

1. Virtual Environment
2. Scale Modelling
3. Proving Ground
4. Driving Exam
5. Driving License
6. In Use Compliance
1. **Virtual Environment**
   - From simulators used for training humans, we know the ‘average human driver’ performance in a broad set of ‘traffic situations’ (use cases, or Operational Design Domain).
   - The AI-driver ‘competes’ in a virtual environment against this average human driver.
   - Knowledge (theory) and skills are tested and related to human performances and risk profiles.
   - The safety manager of a supplier can provide the evidence.
2. **Scale Modelling**
   - The validity of simulation output is not proven yet. Scale modelling is a (traditional) cost effective method for live tests.
   - The impact on the traffic system can be assessed using scale modelling and augmented reality. Stress testing (e.g. hacking) can show vulnerabilities.
   - Standard hardware is used. Only the software is tested (sensor testing belongs to vehicle testing).
   - Under supervision of RDW
3. Proving Ground

- To make sure the software and hardware are integrated well by the manufacturer, a real life test on a closed proving ground is performed for validation purposes.
- Happy flow tests and stress tests (aviation).
- Under supervision of RDW
vDL

4. **Driving Exam**

- Just as for humans, the last step is a driving exam on public roads. In this exam (45 – 60 min), some situations from a predetermined list should be negotiated positively.
- Validation of safe interaction in complex traffic situations
- Under supervision of CBR
5. Driving License

• For the specific use cases / Operational Design Domain’s, the AI-software obtains the driving license (ISO certificate) = stepped admission.

• The innovation strength / reliability of a manufacturer counts.

• RDW will give approval after licensing by CBR = compliance with the digital driving license methodology
vDL

6. **In Use compliance**
   - Given the ever-changing software, monitoring is needed when the vehicle is used on public roads. Unsafe software updates, hacking or malicious software would otherwise not be noticed.
   - Traffic flow is monitored for detection of anomalies or abnormal behavior such as ignoring traffic rules or endangering other road users. Those vehicles that are detected as an anomaly need to be rechecked by auditors, or pulled off the roads if necessary.
   - Software version shows the fitness of the software.
   - Under supervision of RDW (software PTI)
Next Steps:

• ISO proposal ‘SIVOS’ now at NEN: Dutch National Standardization Organization.

• Approved by Technical Committee (NC 345042).

• Q2 2018: forming working groups.

• First pilot driving license in the Netherlands in 2019.

• Hopefully: an ISO standard in 2022

Note: The development of a new ISO standard is only possible with international support and resources.
Join us

From a regulatory standpoint, the next three years will be an awful big adventure.

Join us to bridge the gap and let's work together to enable automotive innovation.
Contact

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