Submitted by the expert from the Netherlands

RDW

Informal document **GRVA-01-40**
1st GRVA, 25-28 September 2018
Agenda item 5

Challenges and Proposals for Modern Vehicles

Geert Pater
Department Manager
Vehicle Standards Development

The Netherlands Vehicle Authority

Organization

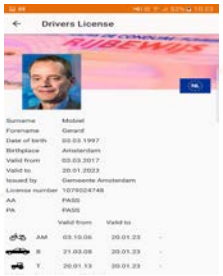
- RDW is a non-commercial public body since 1949. It performs its tasks on behalf of the Ministry of Infrastructure and Water Management.

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

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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?

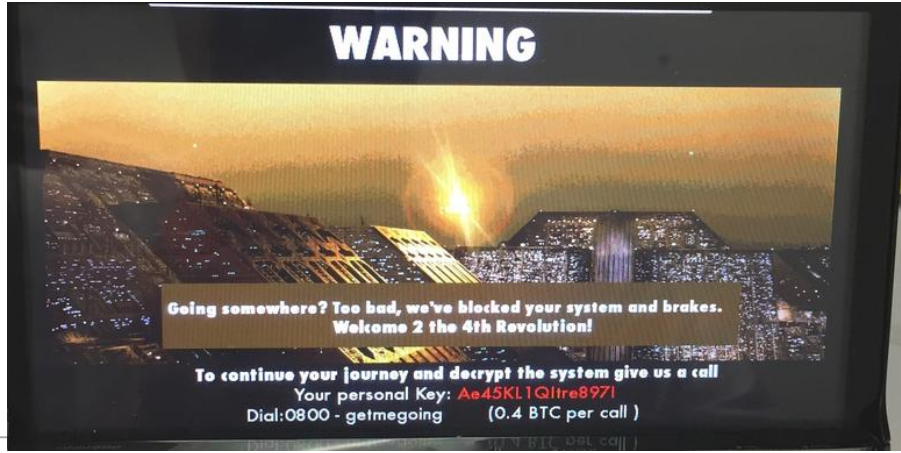
Software with Easter Eggs and dead code

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

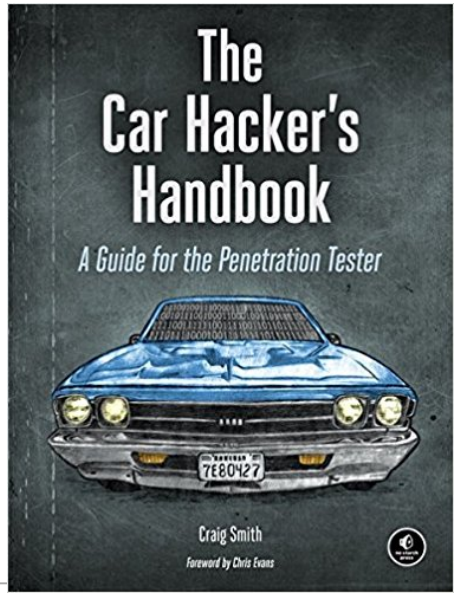


The Challenges

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.



Testing in the Netherlands

KPMG Autonomous Readiness Index 2018

Overall rank	Country	Total score	Policy and legislation		Technology & innovation		Infrastructure		Consumer acceptance	
			Rank	Score	Rank	Score	Rank	Score	Rank	Score
1	The Netherlands	27.73	3	7.89	4	5.46	1	7.89	2	6.49
2	Singapore	26.08	1	8.49	8	4.26	2	6.72	1	6.63
3	United States	24.75	10	6.38	1	6.97	7	5.84	4	5.56
4	Sweden	24.73	8	6.83	2	6.44	6	6.04	6	5.41
5	United Kingdom	23.99	4	7.55	5	5.28	10	5.31	3	5.84
6	Germany	22.74	5	7.33	3	6.15	12	5.17	12	4.09
7	Canada	22.61	7	7.12	6	4.97	11	5.22	7	5.30
8	United Arab Emirates	20.89	6	7.26	14	2.71	5	6.12	8	4.79
9	New Zealand	20.75	2	7.92	12	3.26	16	4.14	5	5.43
10	South Korea	20.71	14	5.78	9	4.24	4	6.32	11	4.38
11	Japan	20.28	12	5.93	7	4.79	3	6.55	16	3.01
12	Austria	20.00	9	6.73	11	3.69	8	5.66	13	3.91
13	France	19.44	13	5.92	10	4.03	13	4.94	10	4.55
14	Australia	19.40	11	6.01	13	3.18	9	5.43	9	4.78
15	Spain	14.58	15	4.95	16	2.21	14	4.69	17	2.72
16	China	13.94	16	4.38	15	2.25	15	4.18	15	3.13
17	Brazil	7.17	20	0.93	18	0.86	19	1.89	14	3.49
18	Russia	7.09	17	2.58	20	0.52	20	1.64	18	2.35
19	Mexico	6.51	19	1.16	17	1.01	17	2.34	19	2.00
20	India	6.14	18	1.41	19	0.54	18	2.28	20	1.91

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Bridging the Gap Between Regulation and Innovation

Assessing Safety and Security

Geert Pater, Genéva Sept 2018

What Is RDW Doing?

Bridging the Gap!

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

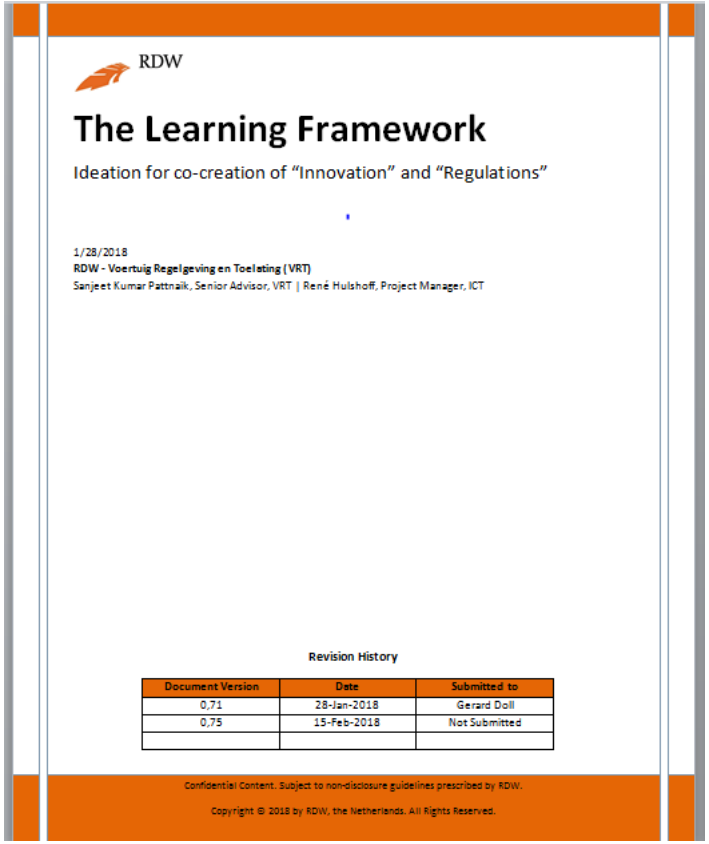
Finding Input New Regulation

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

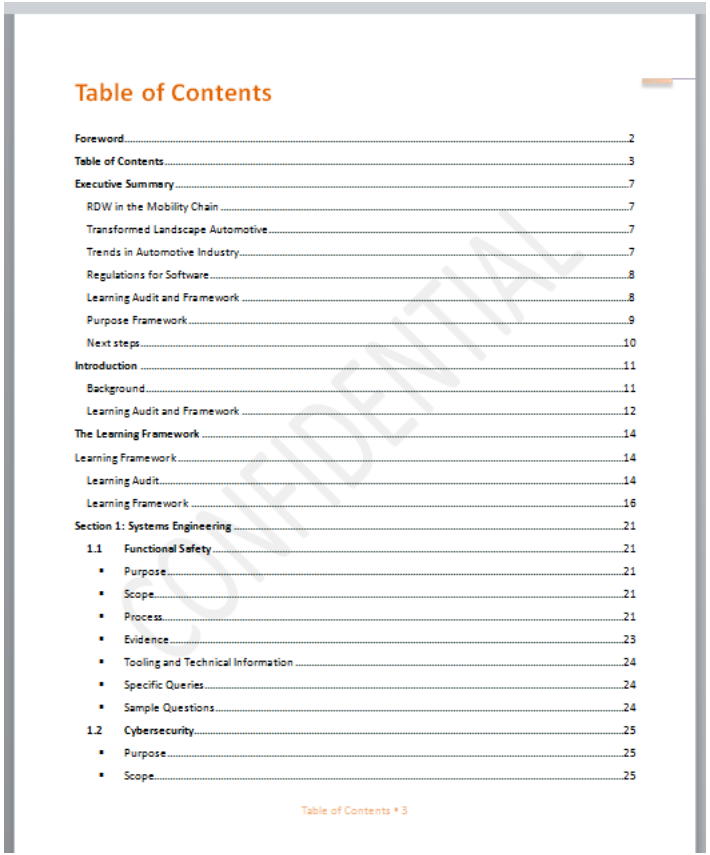
Ideation for co-creation of “Innovation” and “Regulations”

1/28/2018

RDW - Voertuig Regelgeving en Toelating (VRT)
Sanjeet Kumar Pattnaik, Senior Advisor, VRT | René Hulshoff, Project Manager, ICT

Revision History

Document Version	Date	Submitted to
0,71	28-Jan-2018	Gerard Doll
0,75	15-Feb-2018	Not Submitted



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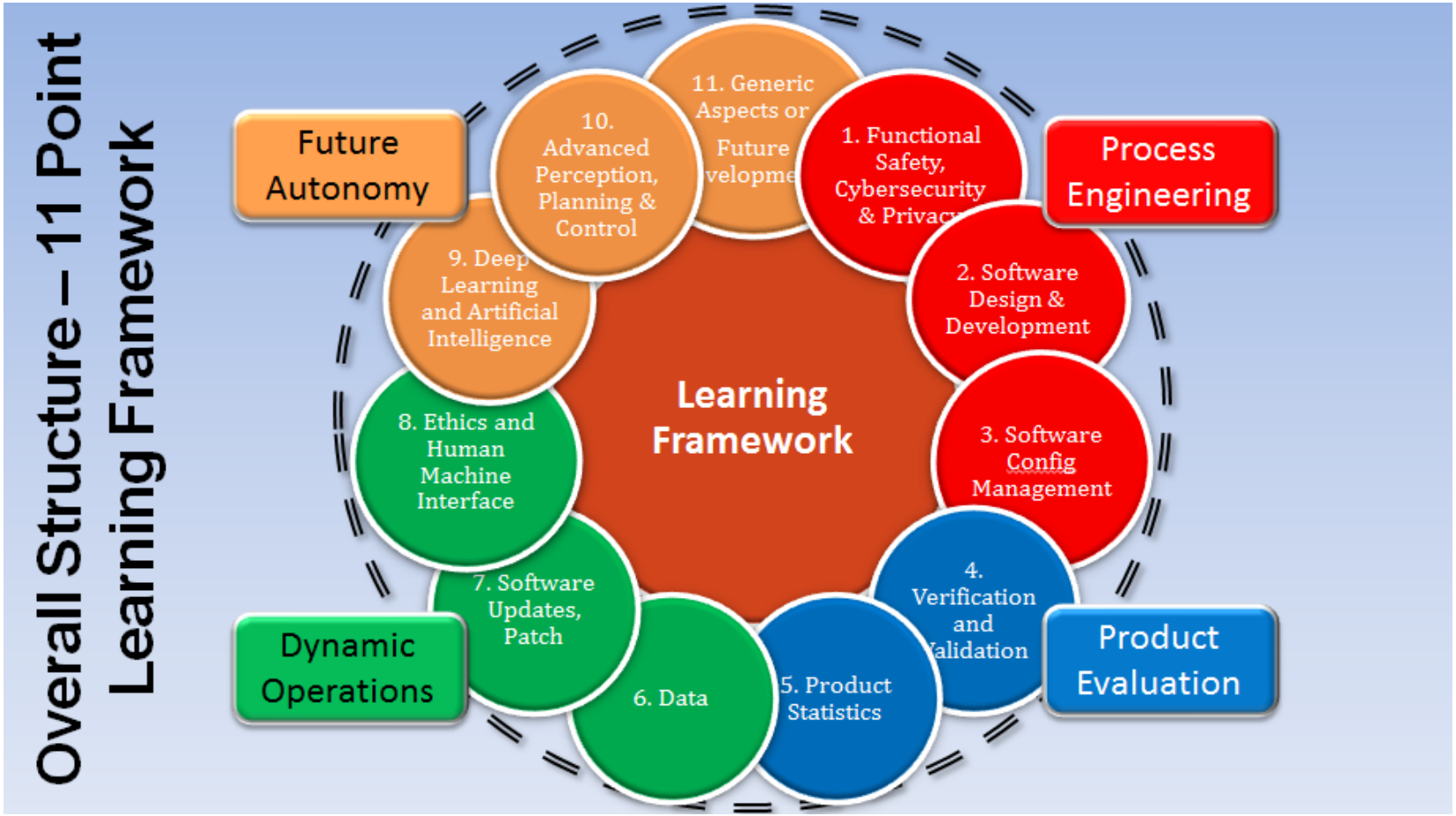
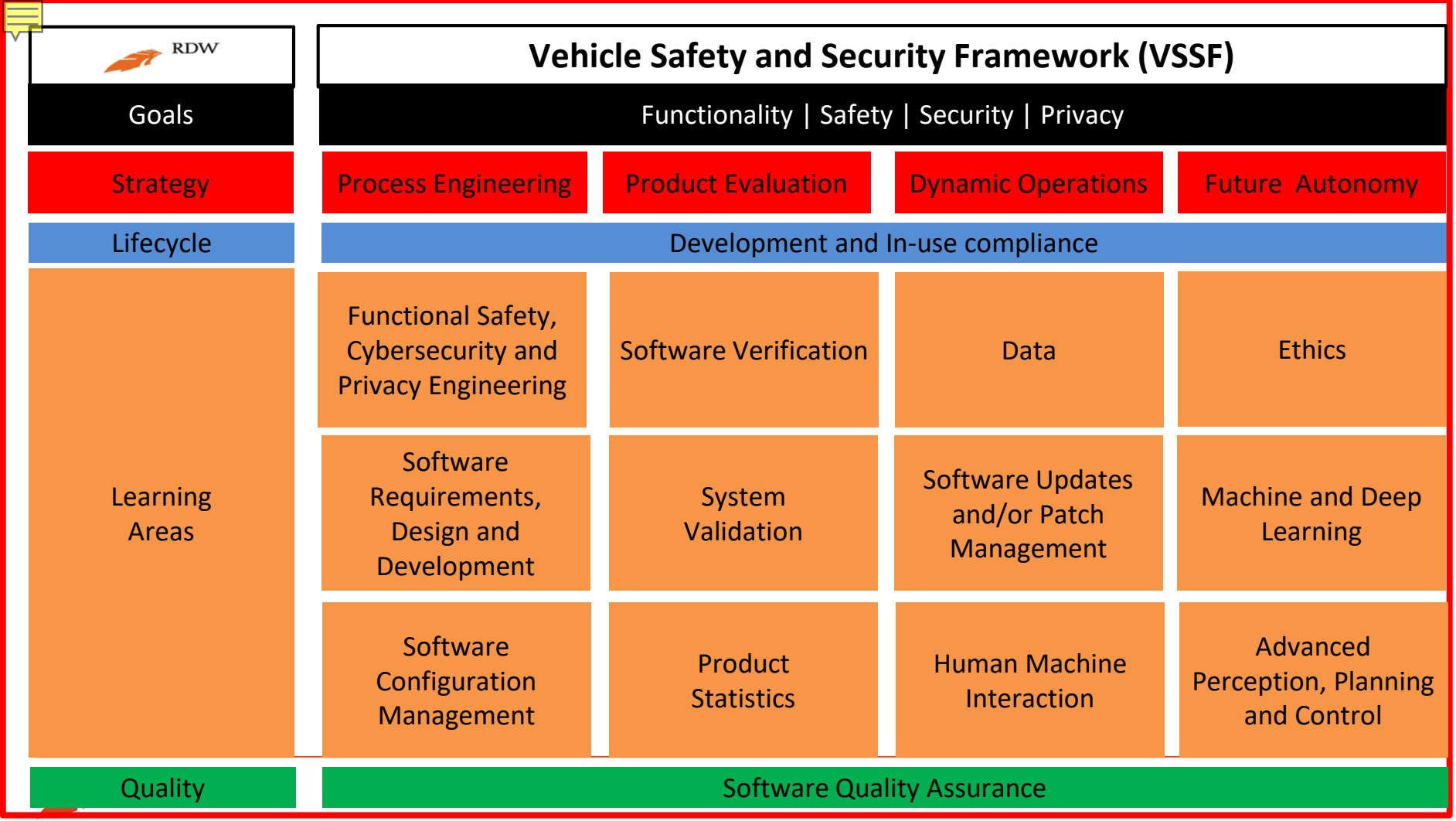
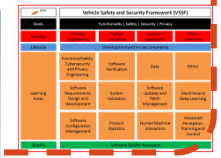

Overall Structure – 11 Point Learning Framework
Learning Framework
Process Engineering
Product Evaluation
Dynamic Operations
Future Autonomy
1. Functional Safety, Cybersecurity & Privacy
2. Software Design & Development
3. Software Config Management
4. Verification and Validation
5. Product Statistics
6. Data
7. Software Updates, Patch
8. Ethics and Human Machine Interface
9. Deep Learning and Artificial Intelligence
10. Advanced Perception, Planning & Control
11. Generic Aspects or Future velopme


RDW
Vehicle Safety and Security Framework (VSSF)
Goals
Functionality | Safety | Security | Privacy
Strategy
Process Engineering
Product Evaluation
Dynamic Operations
Future Autonomy
Lifecycle
Development and In-use compliance
Learning Areas
Functional Safety, Cybersecurity and Privacy Engineering
Software Verification
Data
Ethics
Software Requirements, Design and Development
System Validation
Software Updates and/or Patch Management
Machine and Deep Learning
Software Configuration Management
Product Statistics
Human Machine Interaction
Advanced Perception, Planning and Control
Quality
Software Quality Assurance

VSSF Process Overview

Learning Session

Learning Framework



Information Analysis
- Information Gathering
- Analysis

Assessment by competent authority

Product Approval maintenance

Initial / Full Product Assessment

Process Approval maintenance

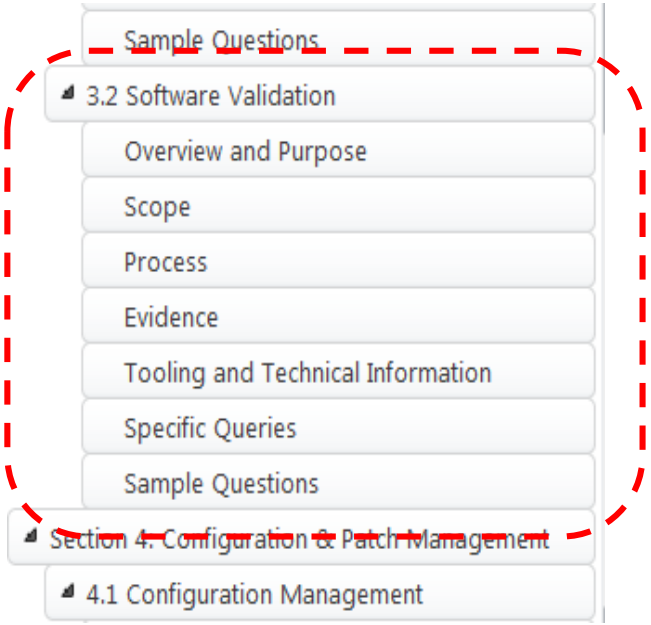
Process Assessment

Type Approval

Requirements Development
- Best Practice
- Standards
- Regulations

Program Development
- New program
- Adapt/ modify TA

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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Basic Principles (Sample Question set)

SW DEVELOPMENT	Software Validation and Verification	43	Testing: Describe the test development exercise							Test Cases, Test Procedures, Certification requirements, Low level requirements testing, untestable requirements, multiple level of test
SW DEVELOPMENT	Software Validation and Verification	44	Testing: Describe the test execution, reporting, traceability and regression testing exercise							Dry runs, Simulator, emulator, documenting environment, readiness
SW DEVELOPMENT	Software Validation and Verification	45	Testing: Describe any procedures for Automation in the verification process							Templates, Scripts, traceability tools, test execution tools, debugger t memory tools, emulators, simulators, coverage tools, static analysis to
CYBERSECURITY	Patch Management	6	Describe the vulnerability analysis process							Refer to reference docs
CYBERSECURITY	Patch Management	7	Describe the technical process of patching							Refer to reference docs
CYBERSECURITY	Patch Management	8	Do you have any processes in place for standardization of production systems across geographical regions for easier operations and accessibility? If yes, describe							Refer to reference docs
CYBERSECURITY	Patch Management	9	Do you have certain processes for maintaining and updating list of security controls and their configurations? If yes, describe							Refer to reference docs
CYBERSECURITY	Patch Management	10	Do you have an automated or manual vulnerability reporting mechanism? If yes, describe							Refer to reference docs
SW DEVELOPMENT	Software Quality Assurance	229	What is your opinion on which charecteristics constitute a high quality software?							Efficiency, Maintainability, Portability
SW DEVELOPMENT	Software Quality Assurance	230	What are the quality attributes and metrics to gauge software product and process quality?							
SW DEVELOPMENT	Software Quality Assurance	231	Describe the structure of the quality assurance team assuming it is independent of the software development group.							
SW DEVELOPMENT/AUTOPILOT	Data Operations/Analysis (pertaining to SW in-use and monitoring)	240	Describe each of the operations!							Collection, Recording, Storage, Sharing, Auditing, Re/De-constructi
SW DEVELOPMENT/AUTOPILOT	Data Operations/Analysis (pertaining to SW in-use and monitoring)	241	What are the instances which data are collected for analysis and improvement?							Incidents, Events or crashes as well as normal scenarios to improve
SW DEVELOPMENT/AUTOPILOT	Data Operations/Analysis (pertaining to SW in-use and monitoring)	242	What data is stored, maintained and readily available for investigation or standardization?							In case of a certain untoward incident, the corresponding dataset c evidence to evaluate the issue
SW DEVELOPMENT/AUTOPILOT	Data Operations/Analysis (pertaining to SW in-use and monitoring)	243	What is the average process of detecting malfunctions, degrading and failures through data?							Data collection should also entail a process to discover malfunctior degradations and failures and not just commercial use in order to r commercial patterns
SW DEVELOPMENT/AUTOPILOT	Data Operations/Analysis (pertaining to SW in-use and monitoring)	244	Are you aware and in compliance with data recording and sharing protocols?							The legality aspect of recording and sharing of data needs discussio stakeholders and authorities

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Basic Principles (Minimal learning set)

Minimum Set of Learning Checklist

Teams	#	Sub topic	Priority	Yes/No
SW Development	1	Software Verification and Validation	1	
	2	Software Quality and Assurances	2	
		Configuration Management and Configuration Data		
Autopilot	14	Product platform and Architecture (high level)	1	
	15	Configuration Management (VIN Based, Region/Country based)	2	
	16	Field loadable software and updates	3	
	17	Verification and Validation	4	
	18	Data collection, storage and retrievability (operations)	5	
Cybersecurity	28	Overall Cybersecurity Engineering Process (An overview)	1	
	29	CS Risk Assessment (Threat Analysis and Risk Management)	2	
	30	Vulnerability Management	3	
	31	Risk Treatment and Residual Risk Management	4	
	32	Cyber Assurance Levels (CAL)	5	
	33	Post-production monitoring, incidence risk assessment and event response	6	
	34	Patch Management	7	
HMI	35	Approach or Process of Design and Implementation	1	
	36	Requirements for HMI development	2	
	37	Driver Engagement (and Technology ceiling)	3	
	38	Risk Assessment based on HMI	4	

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.

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Vehicle

Software

Software

Hardware

NEW ADDITION IN THE TYPE APPROVAL PROCESS

SOFTWARE AUTOMATED VEHICLES

Admittance

Virtual testing

Testtrack exam

Surveillance

Safe and predictable traffic behavior of automated systems

PROCESSES ARE SIDE BY SIDE

CURRENT SITUATION

Admittance

European Type Approval

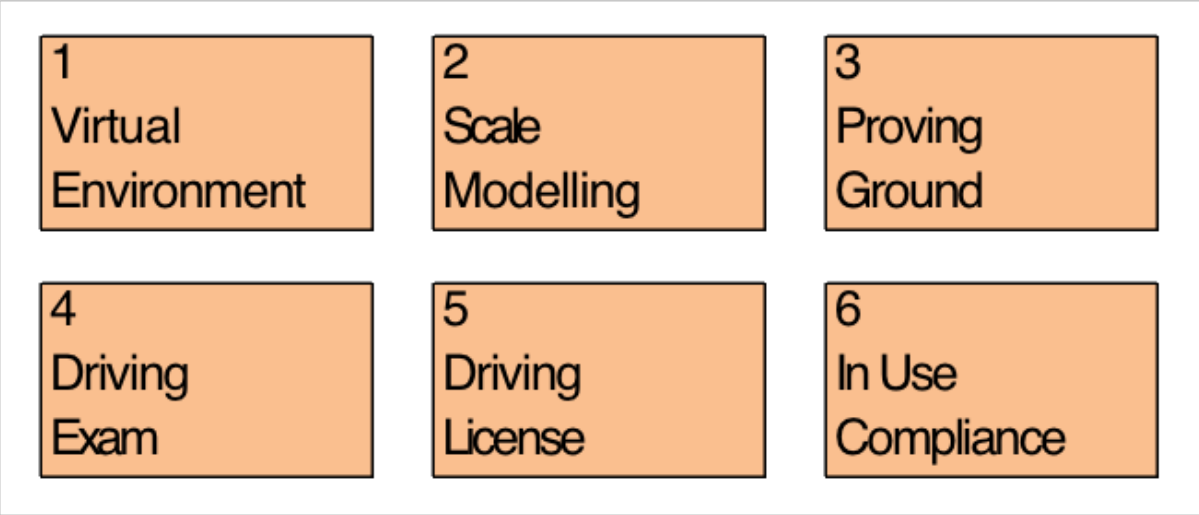
Surveillance

- Manufacturer
- Vehicle
- Driver

vDL

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

Proposed process of testing:



vDL

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

vDL

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

vDL

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

vDL

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 of the roads if necessary.
- Software version shows the fitness of the software.
- Under supervision of RDW (software PTI)

vDL

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.

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Join us

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

Join us to bridge the gap and lets work together to enable automotive innovation

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