



Automated Driving L3 and beyond – the key aspects

Virtual, 9 -10 September



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Landing in today's event: Intro



DARPA challenge 2010

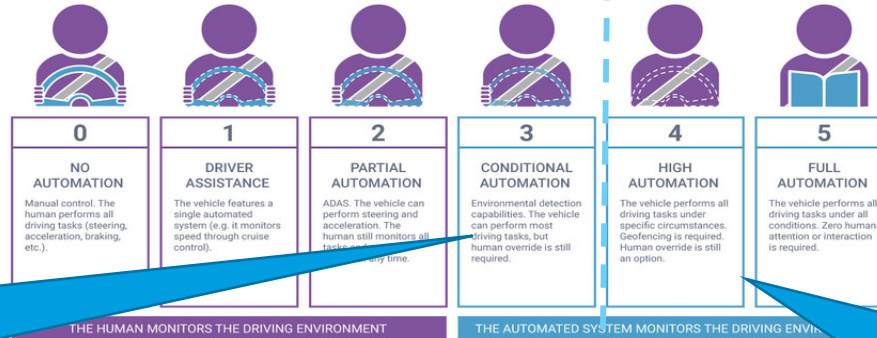
L3-L4 real-world testing landscape



SAE L3 automated driving system and beyond (HAD)

Image
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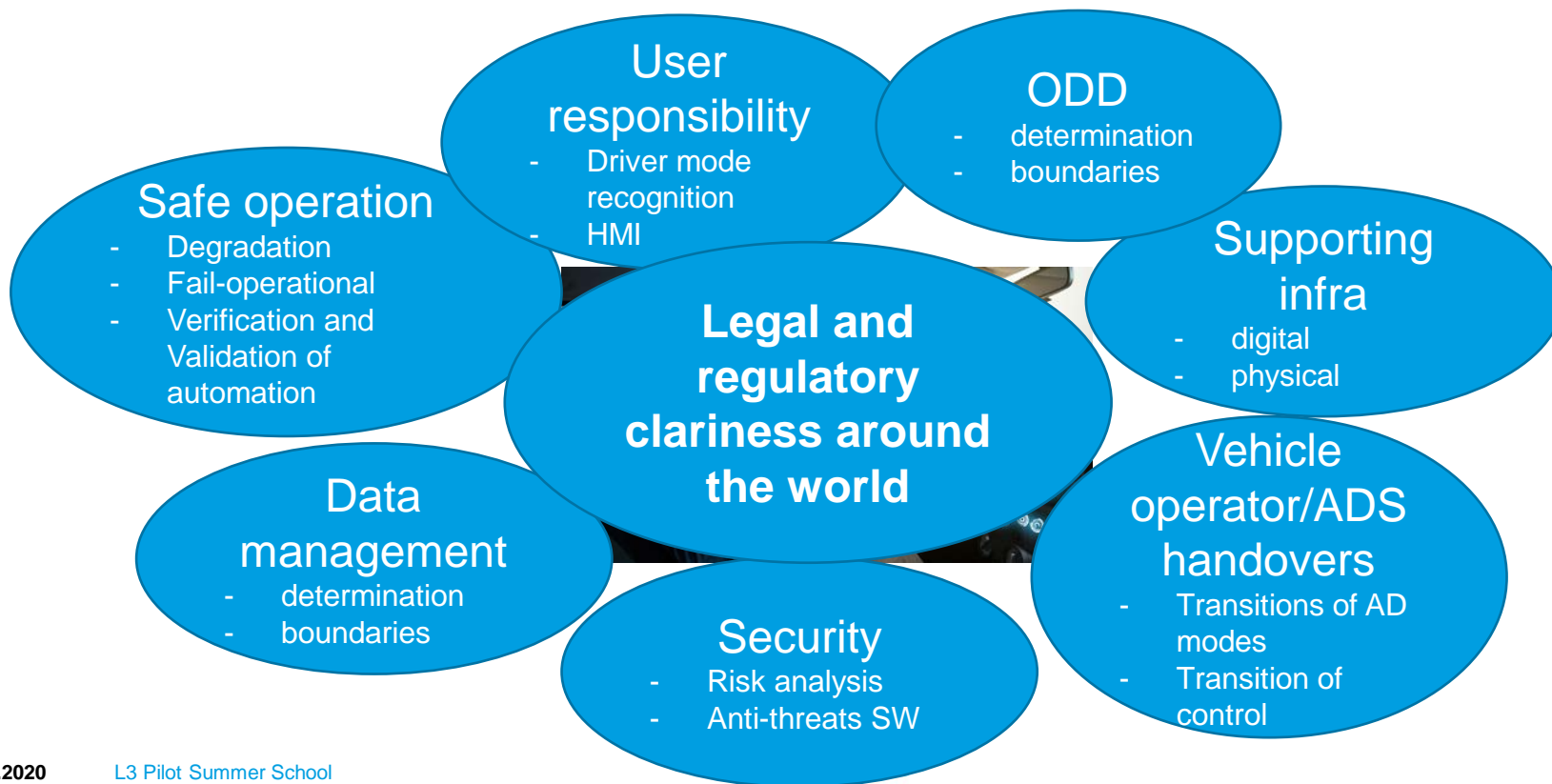
LEVELS OF DRIVING AUTOMATION

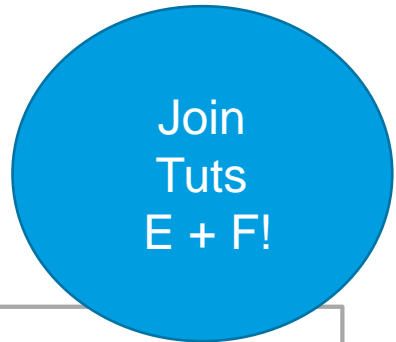


No minimal risk maneuver by the system...

Minimal risk maneuver by the system

HAD: Work in progress





Challenges to be discussed at the summer school

1. Automating data testing toolchain incl. simulations

Challenge

- Reduce **iteration cycles** and other processes to accelerate the development of the autonomous vehicle fleet
- Manage the **data** generated by self-driving vehicles and identify novel situations to increase consumer safety
- Accelerate the process of “teaching” vehicles how to handle unique environmental conditions (**edge case identification and testing**)

Targets

- Reduced “time to drive” and “time to analyze” to accelerate delivery of autonomous vehicles to the marketplace
- Automated end-to-end approach from data ingestion and processing, via neural network training to functional testing, and in-car deployment
- Accelerated progression through the sequences of autonomous driving levels for increased ROI

(continued)

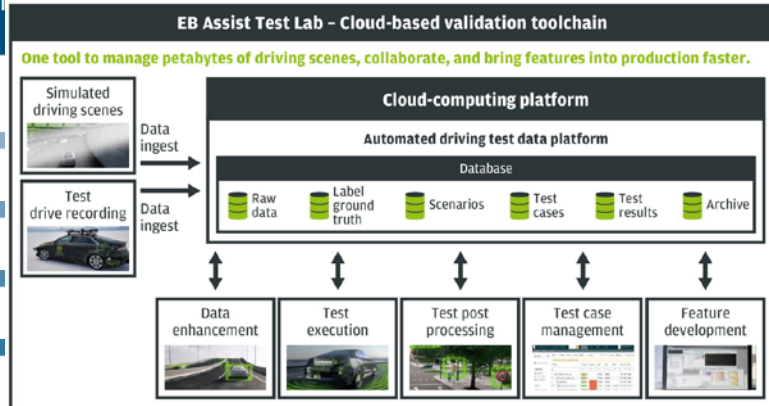
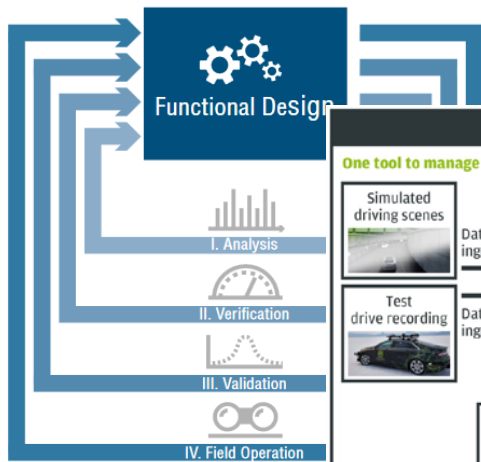
1. Automating data testing toolchain incl. simulations



Solutions

- Expedite **data analysis** to reduce the learning curve for intelligent AV controls
- Leverage **simulation** and **end-to-end engineering toolchains** to manage massive data flows in native vehicle data formats
- **Automate** deployment of functional testing

Process of Functional Design in acc. with ISO/PAS 21448 SOTIF



Example of EB platform



Challenges to be discussed at the summer school

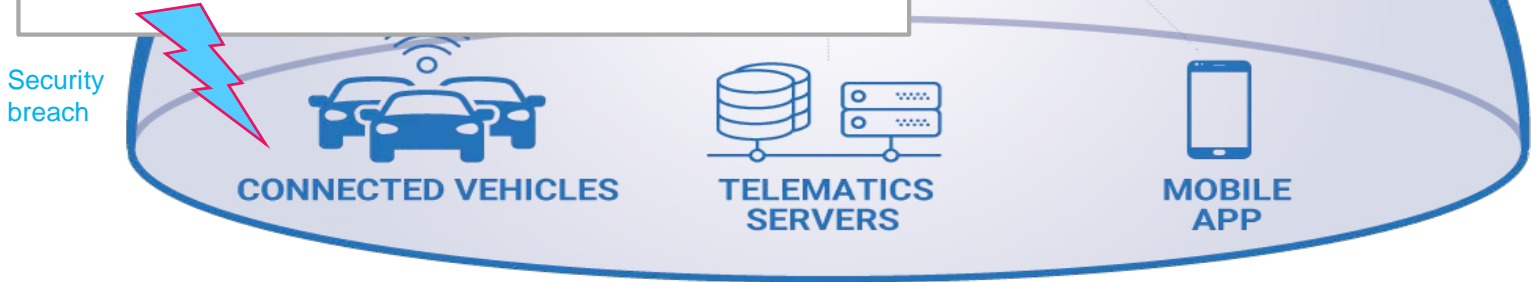
2. Cybersecurity

Challenge

Solutions

- Threat analysis and risk assessment tuned for AD systems where shared responsibility of user and driver missing (L3Pilot paper in this direction)
- Timely detection and rapid response to threats
- Safety and security co-engineering: Resilience
- Central (national?) Response to information security incidents – CERTs for AD road users

- Security by design: a holistic approach (not only vehicle but the eco-system)
- Security automation
- Practices for Creating an Effective *Computer Security Incident Response Team (CSIRT)*





Join
Tut. C!

Challenges to be discussed at the summer school

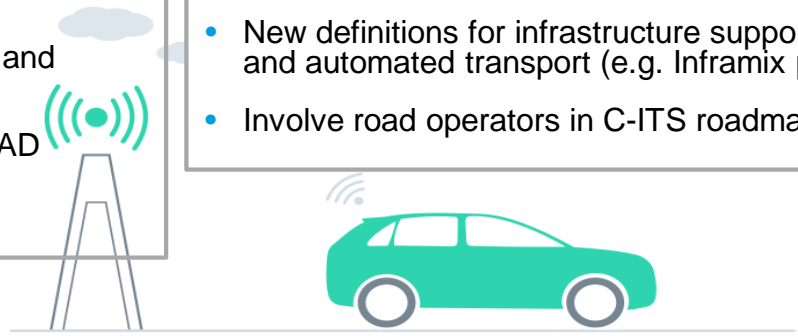
3. Infrastructure amendments and the (V2)X factor

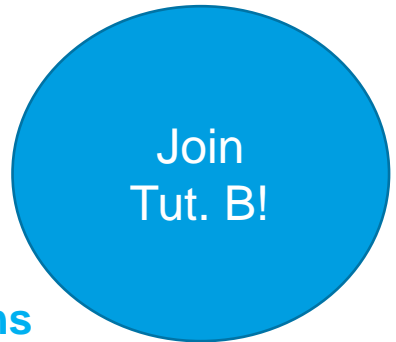
Challenge

Solutions

- Manage updates of existing infrastructure
- Manage the costs for reliable connectivity
(road operator core business affected by connectivity and automation)
- Design for the transition period where both Avs and traditional road users constitute the traffic
- Install new elements specifically for supporting AD
- Training road operators

- Hybrid connectivity models (ITS-G5 and cellular)
- User-centered research focusing on challenging urban environments (e.g. Smart intersections)
- New definitions for infrastructure support to AD and automated transport (e.g. Inframix project)
- Involve road operators in C-ITS roadmap by EC





Challenges to be discussed at the summer school

4. Control and shared User/AD system responsibility

Challenge

- Keep the vehicle user aware and in the loop always
- Keep the road user aware about AV intentions
- Determine and measure driver's takeover time (from AD to manual operation)
- Model interactions of vehicles and humans at different driving scenarios → use that to train AVs

Solutions

- Study in simulation and real life, driver workload and cooperation with the automation
- Study in simulation system/user transitions of control
- Design eHMI elements for AVs to other road users interactions

Driver out of the loop concept

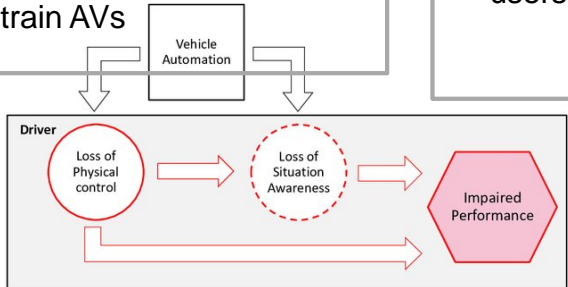


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Challenges to be discussed at the summer school

5. AD Public road testing admission



Challenge

- National regulations differ / no regulations is a problem
- Roads quality may differ from country to country
- Safety driver presence may alter the results
- L3 and up perception and control system not mature

Solutions

- Common CodeOfPractice to be followed by the industry proposed by EC
- Design dedicated fields for AD trials where close to reality scenarios can be reproduced
- Raise public awareness on the AD characteristics



Summer School synopsis



Tut. A

AD key aspects,
L3Pilot CoP,
Public roads
testing admission
procedures

Tut. B

How automation
affects drivers'
performance in
transition
situations
requiring control-
and tactical-level
responses

Tut. C

New paradigms
for infrastructure
support to AD
and automated
transport

Tut. D

Hidden cyber
threats in the
HAD ecosystem
and possible
countermeasures



Tut. E

Enhancing existing
pipelines that will
support the creation
of new testing
scenarios

Tut. F

Teach car-driving
agents to navigate
never-before-seen
roads within
simulations



Thank you for your kind attention.

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