

Session 1:
**Dependability challenges
for autonomous cars**

(Chair: Henrique Madeira)

Aspects and Challenges on the Way to upcoming
Automated Cars - **Stefan Poledna, TTTech**

Challenges in Dependability and Verification for
Self-Driving Cars - **Jonas Nilsson, Volvo Cars**

Self-driving cars: what for?

- Reduce road accidents and fatalities
- Economic reasons (save time, money, reduce infrastructure cost, ...)
- New business models for road transportations
- ...



Stefan Poledna

Current state: NHTSA classification

- ✓ **Level 0:** The driver completely controls the vehicle at all times.
- ✓ **Level 1:** Individual vehicle controls are automated, such as electronic stability control or automatic braking.
- ✓ **Level 2:** At least two controls can be automated in unison, such as adaptive cruise control in combination with lane keeping .
- ✓ **Level 3:** The driver can fully cede control of all safety-critical functions in certain conditions. The car senses when conditions require the driver to retake control and provides a “sufficiently comfortable transition time” for the driver to do so.
- ✓ **Level 4:** The vehicle performs all safety-critical functions for the entire trip, with the driver not expected to control the vehicle at any time. As this vehicle would control all functions from start to stop, including all parking functions, it could include unoccupied cars

State of the art

innovation

further out

["U.S. Department of Transportation Releases Policy on Automated Vehicle Development"](#). National Highway Traffic Safety Administration. 30 May 2013. Retrieved 18 December 2013

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State of the art

- Challenges

- A Time-Triggered Platform Approach

Innovation

- Further challenges and discussion

further out

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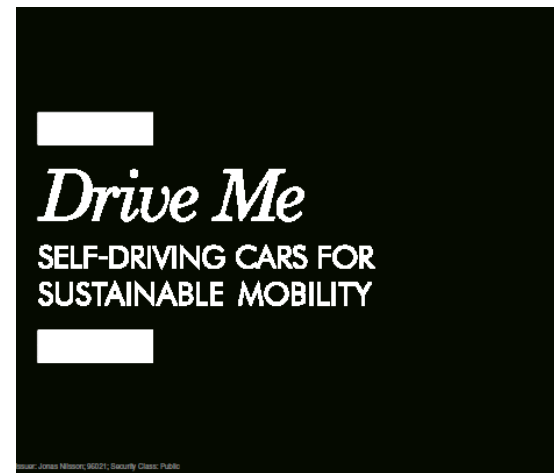
Jonas Nilsson

Drive Me project

Drive Me project in Gothenburg area. A large-scale test of self-driving vehicles, including 100 Volvo cars.

Some constraints:

- Limit the scope: only some roads
- Only in some weather conditions
- No level crossing in these roads
- Almost no pedestrians
- Speed limitations
- ...



Jonas Nilsson

Drive Me project

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Some constraints:

- Challenges
- Impact of challenges on architecture, sensors, etc.
- Discussion
- Speed limitations
- ...

Drive Me
SELF-DRIVING CARS FOR
SUSTAINABLE MOBILITY



of
enborg

LINDHOLMEN
SCIENCE PARK

TRANSPORT
STYRELSEN

TRAFIKVERKET
SWEDISH TRANSPORT ADMINISTRATION

Challenges

- Safety
- Security
- Fail-operational
- Driver interaction
- Software reuse and integration
- System complexity
- Cost... redundancy everywhere
- Consumer defined semiconductor
- Accelerated development, automotive industry practices, standardization

Validation in complex systems:
how to show completeness
and correctness?

Further challenges

- Challenges in the environment sensing
 - Object classification and sensor fusion for safety
 - Standardization of semantic interfaces for sensor fusion
- Legal (liability issues and many more)
- Further challenges outside (road, maps,...)
- Further challenges inside car (deal with flat tire, engine malfunctions, ...)

How to achieve the goals without bankrupt the car makers and car component makers?