Von der Fahrerassistenz zum autonomen Fahren – Herausforderungen an die Skalierbarkeit und die Verfügbarkeit

Funktionale Sicherheit und Security in der Fahrzeugelektronik

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Delphi Portfolio

Electrical/Electronic Architecture
- Electrical/Electronic Distribution Systems
- Connection Systems

Electronics & Safety
- Electronic Controls
- Infotainment and Driver Interface Systems
- Services

Powertrain Systems
- Gasoline Engine Management Systems
- Diesel Engine Management Systems

Product & Service Solutions
- Diesel
- Independent Aftermarket
- Original Equipment Service

ottomatika
CONTROLTEC
HellermannTyton
QUANERGY
DELPHI
Increasing Automated Driving levels drive progression from fail-safe behavior to fail-operational
Technology Content of Future Automated Vehicles

- Sensors and Perception
- Computing Platforms and Control Systems
- Electrical Architecture and Network Management
- Vehicle Connectivity and Cloud Services
- User Experience (e.g. HMI)
- Functional Safety and Security
Scalable Architecture Requirements

Low Variant

Mid Variant

High Variant

NCAP base vehicles
changing NCAP requirements

Level 2 vehicles
flexible to changes in NCAP and market demand

Level 3+ vehicles
premium content to differentiate

Flexible, scalable architectures needed to address the full range of market requirements and provide “future proof” capabilities for feature growth
Scalability for ADAS Functionality

Features

- Advanced emergency braking (NCAP)
- Lane support systems (up to SAE Level 2)
- Blind spot detection (NCAP)
- Adaptive cruise control (SAE Level 2)
- Junction assist (NCAP)
- Traffic jam assist (up to Level 3)
- Lane change support (up to Level 3)
- Surround view (Comfort)
Platform Supporting the Path to Highly Automated Driving – 2017 Market Introduction

Computing platform for Audi:
zFAS (zentrales Fahrerassistenzsystem)

+ Flexible and scalable software and hardware platform
+ Time triggered framework
+ Centralized fusion of sensors

Network of strong automotive partners

zFAS central computing approach sets a new industry platform standard for ADAS architectures
Next Step: Automated Driving (AD)

From fail silent to fail degraded

- Reuse of the existing system
  - *Avoid recertification and driving test of the base system.*

- Simplified architecture
  - *An „aircraft on the road“ can not be the solution.*

- The fallback solution is no longer the driver, in a level 4 system the car is the backup
  - *System needs to be capable of switching over to a fail degraded state, e.g. with a fallback control unit.*

- The system need to manage critical situations as e.g. tunnel, low sun or missing lane markers, hand over to driver is not longer an option
  - *Increased number of sensors, e.g. 3 different sensors to the front to enable a 2 out of 3 decision.*

- Environment models needs to be enhanced
  - *Switch to higher amount of sensor data or even to raw data*
Add on for Automated Driving

Features

- Advanced emergency braking (NCAP)
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- Junction assist (NCAP)
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- Lane change support (up to SAE Level 3)
- Surround view (Comfort)
- Highway pilot (SAE Level 4)
- Valet parking (SAE Level 4)
Overall Field of View (FoV)
Worst Case Scenario Example

Result

Necessary Field of View depending on the minimum risk maneuver defined by the OEM!
## Key Takeaways

### System
- Fail operation is covered on system level, not on ECU level!
- Remaining Field of View has to be sufficient for the required minimum risk maneuver

### Hardware
- AD ECU has to support ASIL D
- ADAS ECU may be sufficient in ASIL B
- Required calculation power depending on sensor data rate

### Software
- Software has to support the shift of functionality during run time
- Synchronization mechanisms are needed to enable a take over within the Fault Tolerant Time Interval
The future. Now.