Self-Driving Automation
- a data, security and safety challenge
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A. Benefits of connected and automated delivery
The benefits of automated commercial vehicles (ACVs) are determined by its stakeholders – ask the skeptic ones first

More upside:
- Faster delivery
- Cheaper delivery
- Transparent delivery timing

Less downside:
- Less delivery damages
- Easy returns of deliveries
- Less gas emission
- Less delivery traffic impact

More upside:
- More local transportation revenue
- Capacity increase

Less downside:
- Cheaper infrastructure maintenance
- Less CV restriction violations
- Less accidents with CVs

- Creeping mode for closer curb side delivery
- Automated bundling, separation, loading and discharge to reduce manual effort per pound
- Platooning to optimize aerodynamics, acceleration and deceleration to reduce waste of energy
- Automated load, bundle and package tracking
- Real-time planning restriction data sharing and planning data planned routing and navigation
- E-mobility integration for residential / urban areas with long haul to delivery ports
- Freight modularization
- Autonomous driving
- Road observation
- Maximum weight per wheel reduction
- Restrictive routing
- Zero accident features (blind spot monitoring, AEBS, ELK)
B. Impact of new mobility technology on vehicle interior
The industry knows, that new mobility technology will change the vehicle’s interior

Source: google image search for AV interior
Self-Driving is just one trend that affects the future interior functionality, packaging and design.

Shared Mobility

Millennials define wealth by being a passenger.

E-Mobility

Electric drive trains show different packaging needs and energy restrictions.

Automotive Mega Trends:
The seat is the biggest interior packaging constraint – user needs and required features are under review

<table>
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<tr>
<th>INNOVATION PATH 2020</th>
<th>INNOVATION PATH 2010</th>
<th>INNOVATION PATH 2000</th>
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<tbody>
<tr>
<td><strong>USER NEEDS</strong></td>
<td><strong>FEATURES</strong></td>
<td><strong>PACKAGING</strong></td>
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<tr>
<td>SELF DRIVING</td>
<td>Grow: Learn, Exercise</td>
<td>• Learn, Exercise: Book/Device storage</td>
</tr>
<tr>
<td></td>
<td>Produce: Work, Communicate</td>
<td>• Work: Desk</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Communicate: Campfire, WebConf</td>
</tr>
<tr>
<td>SHARED MOBILITY</td>
<td>Enjoy: Relax, Entertainment</td>
<td>• Relax: Recline, make room &amp; massage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Pre-config based on body and style data</td>
</tr>
</tbody>
</table>

Structure: welcoming, turnable, reclinable, retractable passenger seat, info monitor for passenger, higher floor for batteries
Integration: rotation axle, power supply, communication, BYOD connectors

INNOVATION PATH 2000:
- Rotating, foldable, retractable driver seat, health sensors, haptic and pneumatic actuators
- Structure: rotating, foldable, retractable driver seat, health sensors, haptic and pneumatic actuators
- Integration: rotation axle, power supply, communication, BYOD connectors
C. Artificial Intelligence and its levels
Core processes are analysed and according to the digitization target rate categorized

5 Stages of Digitization

1. **Stage**: Data are collected
2. **Stage**: Data are (manually) analyzed
3. **Stage**: Data are used to predict events
4. **Stage**: Machine could optimize production according defined algorithms
5. **Stage**: Self-improvement to reach overall goals
ARTIFICIAL INTELLIGENCE

Predicting

Data Transfer

Sensors

Machine Learning

Data Analysis

Visualisation

Data Analysis

Predicting

Sensors
Artificial intelligence requires its own system design for automotive – the variants in system deployment must be considered.
To get a autonomous car on track, many complex algorithms are used

How can cars be Autonomous?

Artificial Intelligence and its levels
The connectivity of vehicles and infrastructure enables a multi-point perception – autonomy is replaced by dependency.

Braking needs more system and communication robustness than warning.
D. Functional Safety for automated vehicles
Highly Automated Driving shifts a lot of existing safety strategies from “failsafe” to “feature availability”

Operational fail needs to provide the necessary feature

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<tr>
<th>Assignment</th>
<th>Description</th>
<th>Example for safety goal</th>
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<tr>
<td>A</td>
<td>Assign safety goals</td>
<td>Create a safety goal for each hazardous event that has an ASIL.</td>
</tr>
<tr>
<td>B</td>
<td>Combine similar goals</td>
<td>Similar goals can be combined, but the highest ASIL of the individual goals is assigned.</td>
</tr>
<tr>
<td>C</td>
<td>Assign a safe state</td>
<td>Assign a safe state to each safety goal.</td>
</tr>
</tbody>
</table>
Non-transparency, Error Rate, Training-Based, and Instability are Traits of Machine Learning that Impact Safety in Autonomous Vehicles

- **Non-Transparency**
  - ML models contain knowledge in an encoded form
  - The more complex a model, the less transparent it is

- **Error Rate**
  - ML models do not operate perfectly and inherently have an error rate
  - It must be assumed that any ML model will periodically fail

- **Training-Based**
  - ML models are trained using a subset of possible inputs, there is no guarantee it represents the entire space of possible inputs

- **Instability**
  - Due to non-linearity, even when the training set remains the same, the training process may produce a different result each time
Using the W-Model Helps Make Sure New Changes to the ML Algorithm are Beneficial and Traceable

Common Model for Training Neural Networks
E. Somewhat special - Cyber-Security for Embedded Systems
Charlie Miller and Chris Valasek became famous by hacking a Jeep Cherokee

The following is a list of vehicles observed during scanning that seem vulnerable:

- 2013 DODGE VIPER
- 2013 RAM 1500
- 2013 RAM 2500
- 2013 RAM 3500
- 2013 RAM CHASSIS 5500
- 2014 DODGE DURANGO
- 2014 DODGE VIPER
- 2014 JEEP CHEROKEE
- 2014 JEEP GRAND CHEROKEE
- 2014 RAM 1500
- 2014 RAM 2500
- 2014 RAM 3500
- 2014 RAM CHASSIS 5500
- 2015 CHRYSLER 200
- 2015 JEEP CHEROKEE
- 2015 JEEP GRAND CHEROKEE

They estimated the number of vulnerable vehicles to be somewhere between 292,000 and 471,000.

Attack surfaces can be classified in different groups
A risk assessment is a systematic approach to identify, analyze and evaluate risks based on common threats and vulnerabilities.

**Assets**
- Scope and boundaries
  - Product & Organization info
  - SAE J3061, ISO/IEC27005
  - NIST SP 800-53, NHTSA Guideline

**Threats**
- Incident scenarios with consequences
- Likelihood of incident scenarios
- Assessed consequences
- Risk with value level
- Current risk

**Vulnerabilities**
- Incident scenarios with consequences
- Likelihood of incident scenarios
- Assessed consequences
- Risk with value level

**Controls**
- Risk acceptance criteria
- Planned risk

**Context Establishment**
- Security Risk Identification
- Security Risk Analysis
- Security Risk Evaluation
F. Contact information
INVENSITY assists its clients in analyzing complex challenges and delivers innovative solutions in all aspects of product development.
INVENSITY executes its projects with the collaboration of all its Centers of Excellence

Powertrain development improvement through Best-Practices, Gaps und Lessons learned in 5 global teams

**Challenge & Solution**

<table>
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<tr>
<th>Project</th>
<th>Challenge</th>
<th>Solution</th>
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| ISO 26262 ramp-up for a major multinational corporation in all of its regional branches and integration in the existing product development processes | Best-Practices, Gaps and Lessons Learned will be ascertained, together with 5 different development teams, for:  
- Requirement management - 1 Month  
- Configuration and change management - 1 Month  
- Technical Safety Concept on system-/component level - 3 Months  
- Software level technical safety concept - 3 Months  
- Hardware level technical safety concept - 2 Months  
- Tests and safety validation - 2 Months |

**Keywords**

- ISO 26262
- Gap Analysis
- ASPIEC
- ISEPAK

**Results**

- Weekly status report on Best-Practices, Gaps and Lessons Learned
- Guidance in the form of detailed needed corrective actions for each deliverable
- Guidance in the form of detailed needed adjustments to existing client's engineering guidelines
- Role definition of involved parties
If you have any questions, please don’t hesitate to contact us

innovation made by talents

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