Agenda

MAC Stuttgart, 11.4.2019

1. Future Mobility System - our vision
2. Mobility System - main Items
3. Challenge – handling of complexity
4. Mathworks tools – role and usage
5. Results – development status
6. Field of actions – our system engineering strategy
7. Summary
Future Mobility System – our vision

The ILO1 connects the central transport systems on the last and first mile
Mobility System – main items

Our objective - development of functions to increase performance and safety for the overall system
Challenge – handling of complexity

The Mobility System is decentralized, unclear, unsynchronized and solutions are interest driven

Our company objective
• maximum development speed and high-performance creativity - with minimal developers

Our technical system objective
• Modularization and strong integration
• Automatization
• Requirement & Testing solutions in a reals and virtual world

Our human system objective
• Active part in systems working groups

Our organizational strategy
• Use and support of standards
• Build interfaces and bridges
• Discovering good and innovative system partners
Mobility System – handling of complexity

The understanding of the system is trained through a virtual environment.
Mobility System – Virtual World

The virtual use cases and analysis are controlled with Matlab Simulink

- **Parametrisation**: Full virtual environment
  - Automated Emm! parametrisation and Emm! simulation control
  - Emm! Matlab-scripts

- **Simulation**: Vehicle model incl. Emm! controller and AD-functions

- **Visualisation**: Full item visualization / .mp4-Video
  - Automated Emm! analysis
  - Emm! simulation analysis

**Interfaces**
Integration with Simulink-blocks (C++, ROS, TCP-IP)
Mobility Subsystems - Real-Time function (HW&SW) testing

The system testing of real time functions testing are controlled with Matlab Simulink

- Parameterization
- Real-time simulation
- Visualization in Unreal Engine
- Automated Emm! parametrization and Emm! simulation control
- Interfaces: integration with Simulink driver blocks (UDP, TCP-IP)
Mobility System – Integration testing

All real time control functions are based on Matlab Simulink

test execution

with real-time signal diagnostics

Visualisation of measurements

… in webinterface

simulative analysis offline

Correction steps
Results - ILO 1 in Singapore 1.19

Executed rides commissioned from the "Infrastructure" for greater safety and better traffic flow

- Development from scratch within 9 months
- Modularized architecture – e.g. execution with external AD-modules possible
- Conformity according to ISO 26262
- Constantly improved of system stability
- Ongoing improvement of functionality
Results – System Engineering capabilities

Emm! solutions offers engineering services with full coverage of system understanding.
Field of actions – our system engineering strategy

Based of our todays status there are options for improvement

Our company objective
• maximum development speed and high-performance creativity - with minimal developers

Our technical system strategy
• Modularization and strong integration
  • increase completeness - with partners
  • flexible robust interface management

• Automatization
  • increase execution speed
  • extend flexibility
  • in conformance with standards (e.g. ISO 26262)

• Requirement & Testing solutions in a augmented world
  • extend perception capabilities
  • adapt machine learning
  • use data analytics
  • extend our requirement and testing management
A Future Mobility System (FMS) was described – system engineering capabilities are a key success factor

Future Mobility System – how it works

Handling of complexity is a core competence

Requirements and Testing – powerful tools are a must

Functional solutions – system engineering capabilities are key success factor

Summary
Thank you very much for your attention

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