Agenda for Adaptive Platform

• Introduction
• Goals for the presentation
  – What is the Adaptive Platform?
  – Why do you need Adaptive Platform?
• Requirements for future vehicle infrastructure
• Changing architectures for vehicles and ECUs
• Basic principles and scope of Adaptive Platform
• EB’s experience and plans
• Summary
What is AUTOSAR? AUTomotive Open System ARchitecture

**AUTOSAR is a Software**: AUTOSAR is a software abstraction layer between the Application Code and the ECU Hardware, i.e. Microcontroller. THE AUTOSAR software is comprised of three basic components:

1. Microcontroller Abstraction Layer (MCAL)
2. Basic Software (BSW)
3. Operating System (OS)

-> See next slide for an example
EB tresos AutoCore 7 based on AUTOSAR 4.0.3 & RfCs 4.1.x / 4.2
Current car infrastructure

• Basic software mostly based on AUTOSAR Classic or comparable system

Pro:
• Efficient on small microcontrollers
• Well suited for time-critical, safe and secure applications

Con:
• Only proprietary solutions for fail-over and redundant functionality
• Fixed, inflexible communication mechanisms
Requirements for a future car infrastructure

• Main drivers
  – Automated/Autonomous Driving
  – Car-2-X applications
    • Cloud based services

• Requirements
  – High computing power
  – High data rates
  – High availability, fail-operational systems
  – Updates over the air
### Requirements for a future car infrastructure

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Technical Solution</th>
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<tbody>
<tr>
<td>High computing power</td>
<td>High <strong>Performance Controllers</strong> and GPUs</td>
</tr>
<tr>
<td>High data rates</td>
<td>Ethernet (1 GigE, 10 GigE)</td>
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<td>High availability, fail-operational systems</td>
<td>Redundancy Concept</td>
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<td>Service oriented architecture (SOA)</td>
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<td>Update over the air</td>
<td>Usage of file systems</td>
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<td>Reliable security mechanisms</td>
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<td>Service oriented architecture (SOA)</td>
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Future architecture of a car infrastructure

• Split up ECUs in low performance IO Controller and high performance controller

• Establish a service oriented architecture (SOA)

• Performance Controller
  – High computation power
  – Widespread, POSIX-like Operating System (e.g. Linux)

• IO Controller
  – Provide Sensor and Actuator Services
  – Deeply embedded, real-time Operating System (e.g. AUTOSAR)
ECU Hardware Architecture for Performance Controllers

Pure Autosar

Microcontroller Partitioning

Core Partitioning

Hypervisor

Pure Performance
Architecture of the Adaptive Platform

“Adaptive AUTOSAR”

Adaptive SWCs

EB tresos AdaptiveCore

“Classic AUTOSAR”

AUTOSAR SWCs QM

AUTOSAR SWCs QM

RTE

DsCom

AUTOSAR OS

BSW

E2E

TimE

Linux Kernel

Performance Microprocessor
Adaptive Platform – Basic Principles

• Posix-like OS (e.g. Linux)
  – Well known standard
  – Provides Filesystem, dynamic processes, for example.
  – High potential for reuse of Software for other domains (military, industrial, automation, aerospace, ...)

• Service Oriented Architecture (SOA)
  – Register services in an ECU
  – Publish services to other ECUs (SOME/IP)
  – Concepts are oriented on CommonAPI from GENIVI.
Scope of Adaptive Platform

- Adaptive OS services
  - POSIX
  - Scheduling and Triggering
  - Execution Manager

- Platform Services
  - Security
  - Persistence
  - Diagnostic Manager
  - Time Services
  - Parameter API
  - Diagnostic Log & Trace

- Communication Services
  - New Middleware – ARA
  - SOME/IP
  - TCP/IP over Ethernet

- Classic AUTOSAR
  - Compatibility layer for AUTOSAR 4.x SWCs
  - Communication via SOME/IP

- Methodology
  - Extension of existing ARXML scheme

1 Specification may be subject to change
Adaptive AUTOSAR Roadmap

Adaptive Application

Adaptive AUTOSAR Services
- Execution Management
- Software Configuration Management
- Security Management
- Diagnostics
- Platform Health Management
- Logging and Tracing
- Hardware Acceleration
- Communications

Adaptive AUTOSAR Foundation

(Virtual) Machine / Hardware
AUTOSAR Roadmap

- **Classic Platform**
  - Release 4.2
  - Release 4.3
  - R4.2.2
  - R4.3.0

- **Foundation**
  - Release 1.0.0
  - R 1.0.0

- **Acceptance Test**
  - R1.1.0

- **Adaptive Platform**
  - Release 1.0.0
  - R1.0.0
EB tresos AdaptiveCore

- **OS Services**
  - Execution Manager
  - POSIX interface (PSE51)

- **Platform Services**
  - Diagnostics
  - Logging (DLT)

- **Communication Services**
  - Communication middleware (starting point: CommonAPI)
  - SOME/IP via Ethernet
Starting Point for the Adaptive Platform at EB

**EB Platform for Autonomous Driving**

**NVIDIA DRIVE™ PX**

- AUTOSAR SWCs ASIL-D
- AUTOSAR SWCs QM
- Safety RTE
- E2E
- Safety MCU

- AUTOSAR SWCs QM
- BSW
- MCAL
- TC0E

**Generic Linux Applications**

- E2E
- DsCom
- AUTOSAR OS

**Libraries**

- RTE
- BSW
- TimE

**Linux Kernel**

- Performance Microprocessors A/B

**Can | Ethernet | SPI | FlexRay | Lin**

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Summary for Adaptive Platform

• Adaptive Platform is not a replacement for Classic Platform.
• The Adaptive platform was created to tackle new requirements related to Automated/Autonomous Driving / Cloud interaction:
  – High Computing Power
  – High Communication Data Rates – Ethernet / IP Based
  – Fail-Operational / High Availability systems
  – Over the air updates
• The basic principles of Adaptive AUTOSAR are:
  – Usage of a Linux based OS (POSIX)
  – Service Oriented Communication
• And, of course, all this must be done Safely and Securely!
Get in touch!

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