AUTOSAR Adaptive Platform

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The E/E world today from an AUTOSAR perspective

- **Classic Application SW-C**
  - Runtime Environment
    - Service Layer
    - ECU Abstraction Layer
    - Microcontroller Abstraction Layer
  - Microcontroller
    - AUTOSAR Classic Platform

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- **Connectivity**
- **Infotainment**
- **Non-AUTOSAR Platform**
- **Proprietary communication**

- Software Abstraction
- Common Bus Interface Specification
AUTOSAR Classic Platform – static execution model

SHCFrontLeft: SeatHeatingControl
Implementation
MainCyclic
Setting

SHCFrontLeft: SeatHeatingDriver
Implementation
MainCyclic
Setting

Runtime Environment
OSTask_10ms
OSTask_Background
OSTask_100ms

Service Layer
AUTOSAR Classic Platform – static communication relationships

Communication over VFB

OEM specific mapping

Application 1

Runtime Environment

I-Signal

Communication Services

Communication Hardware Abstraction

Communication Drivers

Hardware

Application 2

Runtime Environment

I-Signal

Communication Services

Communication Hardware Abstraction

Communication Drivers

Hardware
Perfect world?
Main drivers for a new software platform

- Highly automated driving
- Car-2-X applications
- Vehicle in the cloud
- Increased connectivity
Technology drivers

Ethernet

- High bandwidth
- Communication system is not the limiting aspect anymore
- Switched networks
- Efficient point-to-point communication
- Efficient transfer of long messages

Processors

- Switch from microcontroller to processors with external memory (and maybe filesystems)
- Many core processors
- Parallel computing
- „Cheap“ availability of computing power
- Heterogeneous architectures: Special purpose processors
Another platform for different applications

Real time requirements

Safety criticality

Computing power

Platform supporting „Planned dynamics“

AUTOSAR Classic Platform

Infotainment
AUTOSAR Adaptive Platform – characteristics

**Application framework**
- Support for run-time configuration
- Service-oriented communication
- Partial update

**Formats for design data**
- Planning of dynamic behavior (e.g. constraints for scheduling and communication)
- Consider automotive specific cooperation scenarios
- Support integration with existing systems (Classic Platform)

**Reference architecture**
- Reuse existing (non-automotive) standards
- Ease software development
- Support automotive use-cases and protocols

Support of different scheduling strategies
Planning of dynamic communication

… and many more
**Planned dynamics – scheduling**

Scheduling architecture for mixed-criticality task systems on multicore platforms

Highest-criticality tasks (as today)

Partitioned EDF scheduling to eases software development.

Global EDF to share the workload between different cores.

Lowest criticality

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Planned dynamics – communication

SHFrontLeft: SeatHeatingCtrl
PM: PowerManagement

Local ServiceDiscovery

Remote ServiceDiscovery

Middleware
Adaptive AUTOSAR Services
Adaptive AUTOSAR Foundation
(Virtual) Machine / Hardware

Well

Ethernet

SHFrontRight: SeatHeatingCtrl

Middleware
Adaptive AUTOSAR Services
Adaptive AUTOSAR Foundation
(Virtual) Machine / Hardware
Architecture of the AUTOSAR Adaptive Platform

Adaptive Application

<table>
<thead>
<tr>
<th>Standardized Adaptive AUTOSAR API</th>
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<tbody>
<tr>
<td>Standardized Interface</td>
<td>Middleware</td>
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Adaptive AUTOSAR Services

- Vehicle Software Configuration Manager
- Security Manager
- Diagnostic Manager
- Platform Software Configuration Manager
- Application Execution Manager
- Software Health Monitor
- Hardware Acceleration Manager

Adaptive AUTOSAR Foundation

(Virtual) Machine / Hardware

- In scope of R1.0.0
- Planned for future releases
The system can start up and execute applications controlled by the Execution Manager.

Applications can communicate with other applications using service oriented communication via Ethernet.

The system features an integrated failure management.
The challenge: Integration of different platforms

- Software Abstraction
- Common Bus Interface Specification
Summary

New challenges and applications

Provision of standard in time…

…with the right scope

AUTOSAR Adaptive Platform