AUTOSAR the Next Generation – The Adaptive Platform

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Overview

Introduction

- Why AUTOSAR?

- AUTOSAR Classic
  - Overview and achievements

- Game changers
  - New challenges and use-cases
  - New functions

- Future of AUTOSAR
  - Adaptive Platform
  - New cooperation model
E/E innovations in vehicle development are increasing

90% of all innovations
Linked Networks

All major innovations are driven by E/E
Vehicles are connected to the back-end

Mechanics 1970
Electronic Support 1980
Infotainment 1990
Linked Networks 2000
90% of all innovations 2010
All major innovations are driven by E/E 2020
Vehicles are connected to the back-end
AUTOSAR has become a global standard
Partners 2015

- Europe: 93 Partners
- America: 28 Partners
- Africa: 1 Partner
- Asia: 69 Partners
Running the AUTOSAR partnership: three tier partnership structure

Core Partners
- Organizational control
- Administrative control
- Exploitation of the AUTOSAR standard

Premium Partners
- Contributing in working groups
- Exploitation of the AUTOSAR standard

Associate Partners
- Users of the AUTOSAR standard
- Exploitation of the AUTOSAR standard

Development Partners
- Dedicate expertise contributions in working groups
- Exploitation of the AUTOSAR standard
The principles of the development cooperation

- All Partners jointly develop a common automotive standard.

- AUTOSAR Partners grant each other a non-exclusive, non-transferable license under its essential intellectual property rights.

- AUTOSAR Partners do not assert against each other when commercially exploiting the AUTOSAR standard.

- As part of their exploitation of AUTOSAR, AUTOSAR Partners develop AUTOSAR compliant products.

- AUTOSAR Partners commit for product conformance to AUTOSAR specifications to ensure interoperability.
Complexity management by reuse and exchangeability

Exchangeability between manufacturers’ applications

OEM a
- Platform a.1
- Platform a.2
- Platform a.n

OEM b
- Platform b.1
- Platform b.2
- Platform b.n

OEM c
- Platform c.1
- Platform c.2
- Platform c.n

OEM d
- Platform d.1
- Platform d.2
- Platform d.n

OEM e
- Platform e.1
- Platform e.2
- Platform e.n

OEM f
- Platform f.1
- Platform f.2
- Platform f.n

Supplier A
- Chassis
- Safety
- Body/Comfort

Supplier B
- Chassis
- Safety
- Telematics

Supplier C
- Body/Comfort
- Powertrain
- Telematics

Exchangeability between suppliers’ solutions

Exchangeability between vehicle platforms
Exploring AUTOSAR: hardware-independent architecture

Yesterday

Software

Hardware

Today

Application Software

Hardware

Customized

Standardized
Exploring AUTOSAR: software architecture

SW Components

Middle Ware

Basic Software

ECU Resources

Application Layer

Runtime Environment

Microcontroller

System Services

Memory Services

Communication Services

I/O Hardware Abstraction

Complex Drivers

Onboard Device Abstraction

Memory Hardware Abstraction

Communication Hardware Abstraction

Microcontroller Drivers

Memory Drivers

Communication Drivers

I/O Drivers
The AUTOSAR project objectives will be met by
- specifying and
- standardizing
the central architectural elements across functional domains, allowing industry competition to focus on implementation.

Cooperate on standards, compete on implementation.

* Advanced Driver Assistance Systems
AUTOSAR focus today

**Major principles**
- Ensure stabilization of releases
- Max. 2 releases are maintained simultaneously
- Consider market needs of AUTOSAR partners

**Content**
- Architecture
- Methodology
- Application interfaces

**Process & Quality**
- Promote global use of the standard
- Establish a flexible work package structure
- Clear release and revision numbering scheme
- Ensure backward compatibility
- Life cycle plan for each release
- Continuous incorporation of new concepts
- Only validated concepts to be incorporated
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  - New functions

- **Future of AUTOSAR**
  - Adaptive Platform
  - New cooperation model
AUTOSAR achievements and outlook (1/2)

*Milestones, just to name a few*

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>AUTOSAR founded</td>
</tr>
<tr>
<td>2004</td>
<td>First release</td>
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<tr>
<td>2005</td>
<td>Basic SW complete</td>
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<tr>
<td>2006</td>
<td>Feature enrichment</td>
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<tr>
<td>2007</td>
<td>Multicore support</td>
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<tr>
<td>2008</td>
<td>Functional safety</td>
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<tr>
<td>2009</td>
<td>Ethernet</td>
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<tr>
<td>2010</td>
<td>Timing analysis</td>
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<tr>
<td>2011</td>
<td>Diagnostics</td>
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<tr>
<td>2012</td>
<td>Acceptance testing</td>
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<tr>
<td>2013</td>
<td>Release 4.1.1</td>
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</table>

AUTOSAR the Next Generation – The Adaptive Platform
**AUTOSAR achievements and outlook (2/2)**

*Milestones, just to name a few*

<table>
<thead>
<tr>
<th>Year</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
</table>

**10 years of AUTOSAR**

6th OC Nov 13

**Release 4.2.1**

- Large data communication via Ethernet and CAN FD
- Integration of non-AUTOSAR systems
- ...

**Release 4.3.0**

Long Term Objectives:
- Quality
- Maturity
- Backward compatibility
- Closing gaps
- Market needs
- Effort

10 years of AUTOSAR – The Next Generation – The Adaptive Platform
AUTOSAR release management
The principle of maximal two (2!) active major releases

Revisions based on major rel. x

1

2

Minor rel. based on major rel. y

Backward compatible concepts

Long-term concepts with controlled compatibility

Further Development

Minor release

Initial release

Development  Evolution  Maintenance  Issue Notice

Major release z development
Exploring AUTOSAR:
Example: energy efficient technologies

➢ Partial Networking
  ■ Shutting down and starting up communication of groups of ECU (Partial Network Cluster - PNC) during normal bus communication.
  ■ ECU that shall be shut down require special transceiver hardware.

➢ Pretended Networking
  ■ ECU local approach to switch into a low power mode while keeping up bus communication, e.g. by using mechanisms of ECU degradation.

➢ ECU Degradation
  ■ ECU local approach to reduce the number of active components and/or semiconductors in an ECU, e.g. degrade line drivers, MCU capabilities.
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- New functions

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Starting Point: selected main drivers

Main drivers for new automotive software systems have been determined.

- Highly automated driving
- Car-2-X applications
- Vehicle in the cloud
- Increased connectivity
Selected main drivers for new automotive software systems (1/4)

Highly automated driving will be on the road.

Use cases

- Support dependable systems including fail-operational systems
- Support of cross domain computing platforms
- Support of high-performance micro-controllers and computing
- Distributed and remote diagnostics
- …
Selected main drivers for new automotive software systems (2/4)

Car-2-X applications will require the interaction of vehicles and off-board systems.

- Support cloud interaction
- Software as product
- Integration of non-AUTOSAR systems
- …
Selected main drivers for new automotive software systems (3/4)

Vehicle in the cloud will require dedicated means for security.

Layer 1
Individual ECU

Layer 2
In-vehicle network

Layer 3
E/E-Architecture

Layer 4
Connected vehicle

Use cases
- Secure on-board communication
- Security architecture
- Secure cloud interaction
- ...

Cloud
Selected main drivers for new automotive software systems (4/4)

Upcoming use cases will lead to a stronger interaction of automotive software systems.

Use cases

- Consideration of non-AUTOSAR and off-board systems within methodology
- Dynamic deployment of software components
- Interaction with non-AUTOSAR and off-board systems
Influence by new players
Cooperation with other standards

Open to connect with others

Identifying / monitoring open source projects
Challenges for the AUTOSAR partnership

Cooperation
- Efficient cooperation with other standardization bodies and/or open source projects
- New cooperation models to reduce time-to-market while increasing quality
- New players in the automotive industry
- Adaptation of development speed

Development
- Support major new features, future market needs and current technology trends
- Fast, efficient and high quality of software standardization by implementation
- Using existing software solutions for standardization, e.g. from consumer electronics
- Frontloading of validation and early availability of implementation
Over the years AUTOSAR continued to expand

The worldwide growth of AUTOSAR evokes new challenges for the standard as well as for the organization and its partners

AUTOSAR’s answer to this growing complexity: AUTOSAR products
**AUTOSAR products**

**Goals**
- Increase flexibility of releases
- Keep standard manageable while extending it
- Facilitate application of the standard

**AUTOSAR products**
- AUTOSAR Classic Platform (today)
- AUTOSAR Acceptance Tests (today)
- AUTOSAR Adaptive Platform (planned)
- AUTOSAR Foundation (planned)
Overview

➢ Introduction
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Future of AUTOSAR

➢ Adaptive Platform
➢ New cooperation model
Future of AUTOSAR: objectives and challenges

Objectives

- Maintain stability and compatibility of existing standard
- Main directions for the future:
  - Reflect new use cases of today’s and future market needs
  - Adapt to upcoming market needs
  - Support new technologies

Challenges

2014 2020

**Anticipate the future** – identification of technological trends, key features and upcoming challenges for AUTOSAR

**Stabilize the standard** – maintain the standard, reduce complexity and increase usability, improve job sharing
New AUTOSAR product: The Adaptive Platform

Extend AUTOSAR Classic Platform by support of adaptive deployment and interaction with non AUTOSAR systems.
Architecture of the AUTOSAR Adaptive Platform

AUTOSAR Adaptive Services
- SW Configuration
- Platform Resources
- Platform Modes
- ...

AUTOSAR Adaptive Foundation
- Communication
- HW Acceleration
- ...

Application Level
- Application Software Component
- Backend Proxy
- Application Software Component
- Application Software Component

Standardized Adaptive API

AUTOSAR Adaptive Platform

(Virtual) Machine / HW

Standardized AUTOSAR Adaptive Lib

Standardized AUTOSAR Adaptive Service

Platform Functionality

Service Oriented Communication
**Standardization process and specification validation**

Specifications will be validated in parallel with the standardization.

- Operating system definition based on POSIX
- Middleware technologies for the implementation of service oriented communication, e.g. SOME/IP
- Definition of execution model(s) to support the different use cases of access freedom, e.g. full access, sandboxing
- Use of package format and managers for application deployment
**Approach to requirements elicitation and decision making**

AUTOSAR took strategic responsibility and incrementally extended the level of contribution.

<table>
<thead>
<tr>
<th>Year</th>
<th>Study Group</th>
<th>Selected Experts</th>
<th>Full Partnership</th>
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<tbody>
<tr>
<td>2013</td>
<td>Strategy</td>
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<tr>
<td></td>
<td>Identify future demands</td>
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<td>2014</td>
<td>Use Cases</td>
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<tr>
<td></td>
<td>Collect initial set of use cases</td>
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<td>2014</td>
<td>Features</td>
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<td></td>
<td>Derive features required for implementation of use cases</td>
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<td>2015</td>
<td>Main Requirements</td>
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<td></td>
<td>Cluster new features as main requirements and project objectives</td>
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<td>2015</td>
<td>Selection</td>
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<td></td>
<td>Decide on Adaptive Platform as extension of AUTOSAR standard</td>
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<td>2015</td>
<td>Specification</td>
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<tr>
<td></td>
<td>Define capabilities of Adaptive Platform</td>
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Releases and revisions of AUTOSAR

<table>
<thead>
<tr>
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<th>Q1</th>
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- **Release 4.2**
- **Release 4.3**
- **3.2.3 - LoKI**
- **R4.2.2**
- **R4.3.0**
- **R1.0.1**

Adaptive Platform

Development  Evolution  Maintenance  Issue Notice

*) Release date not fixed
Summary

Achievements

- Established a worldwide standard focusing on automotive applications
- Release 4.2.2 ready for series production
- Acceptance Tests Release 1.0.0 released

AUTOSAR Products

- Already launched: AUTOSAR Classic Platform and AUTOSAR Acceptance Tests
- Planned: AUTOSAR Adaptive Platform and AUTOSAR Foundation

Future of AUTOSAR

- Improvement and stabilization of existing standard
- Anticipate the future: identification of technological trends, key features and next challenges for AUTOSAR
- Feasibility studies started in January 2015

AUTOSAR will continue to be the automotive standard excluding multimedia.
More information available online

More information about AUTOSAR:
http://www.autosar.org

Become a partner and get exploitation rights for the AUTOSAR standard
request@autosar.org

For information only (see disclaimer)

Published Releases
Do you have questions?

Cooperate on standards, compete on implementation.