AUTOSAR Introduction

Part 1 - The AUTOSAR Partnership and Standardization
AUTomotive Open System ARchitecture
AUTOSAR Mission

AUTOSAR is a global partnership of leading companies in the automotive and software industry to develop and establish the standardized software framework and open E/E system architecture for intelligent mobility.
AUTOSAR Vision

AUTOSAR will be the **global established standard** for **software** and **methodology** enabling **open E/E system architectures** for future intelligent mobility supporting high levels of dependability, especially safety and security.
AUTOSAR Partnership

Collaboration Model With Proven Track Record

AUTOSAR has succeeded in **bringing together main players** in automotive E/E system development to form a powerful standard that is successfully used all around the world.
AUTOSAR Partnership
The Advantage of a Strong Community

31 international automotive OEM are AUTOSAR partners. **21** are under the **22 top-selling OEM** and covering **over 80%** of the **total market revenue** in 2019*.

Together with other Tier1 and Suppliers, our partners are collaborating to shape Future Intelligent Mobility.
## AUTOSAR Partnership

### Types of Partnership

<table>
<thead>
<tr>
<th>Premium</th>
<th>Development</th>
<th>Associate</th>
<th>Attendee</th>
<th>Subscriber</th>
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<tbody>
<tr>
<td>Development and exploitation of AUTOSAR standards (size &gt;100)</td>
<td>Development and exploitation of AUTOSAR standards (size &lt; 100)</td>
<td>Exploitation of AUTOSAR standards</td>
<td>Development of AUTOSAR standards</td>
<td>Openness of AUTOSAR standards to eligible public</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Motivation</th>
<th>Annual Fee</th>
<th>Annual Contribution</th>
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<tr>
<td>Development and exploitation of AUTOSAR standards (size &gt;100)</td>
<td>21,000 Euro</td>
<td>1.5 FTE</td>
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<td>Development and exploitation of AUTOSAR standards (size &lt; 100)</td>
<td>6,000 Euro</td>
<td>0.5 FTE</td>
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<tr>
<td>Exploitation of AUTOSAR standards</td>
<td>15,000 Euro</td>
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<td>Development of AUTOSAR standards</td>
<td>Free</td>
<td>Individual agreement</td>
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<td>Openness of AUTOSAR standards to eligible public</td>
<td>3,000 Euro</td>
<td>None</td>
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</table>
More Than 300 AUTOSAR Partners

9 Core Partners

BOSCH  Continental  Ford  gm  PSA Group  TOYOTA  VOLKSWAGEN

63 Premium Partners

1 Strategic Partner

DENSO  Crafting the Core

74 Development Partners

+ 158 Associate Partners

+ 33 Attendees
AUTOSAR Partnership
Partner Development Since 2003
AUTOSAR Partnership

Global Distribution of AUTOSAR Partners

38 Partners in North America
- 2 Core Partner
- 6 Premium Partner
- 6 Development Partner
- 23 Associate Partner
- 1 Attendee

153 Partners in Europe
- 6 Core Partner
- 29 Premium Partner
- 38 Development Partner
- 55 Associate Partner
- 25 Attendee

144 Partners in Asia
- 1 Core Partner
- 1 Strategic Partner
- 28 Premium Partner
- 28 Development Partner
- 80 Associate Partner
- 6 Attendee

3 Partners in Africa
- 2 Development Partner
- 1 Attendee
AUTOSAR Organization

Official Roles

**Governance**
- Executive Board

**Strategic Management**
- Legal Team
- Steering Committee
- Communication Team

**Technical Steering**
- OSS-CB
  - Open Source Software CB
- Project Leader Team
- CF-CCB
  - Consensus Finding CCB

**Standardization**
- CCB
  - Change Control Board
- Working Groups

Legend:
- □ Core Partner
- □ Core, Strategic Partner
- □ Core, Strategic, Premium, Development Partner
# AUTOSAR Organization

## Support Functions

<table>
<thead>
<tr>
<th>AUTOSAR Spokesperson and Internal Affairs Officer (IAO)</th>
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</thead>
<tbody>
<tr>
<td><strong>Business Administration</strong></td>
</tr>
<tr>
<td>- Partner and User Management</td>
</tr>
<tr>
<td>- Finance</td>
</tr>
<tr>
<td>- Meeting Management</td>
</tr>
<tr>
<td><strong>Communication Support</strong></td>
</tr>
<tr>
<td>- Marketing</td>
</tr>
<tr>
<td><strong>Technical Management</strong></td>
</tr>
<tr>
<td>- Standards</td>
</tr>
<tr>
<td>- Software Development Engineering</td>
</tr>
<tr>
<td><strong>Deliverable Management</strong></td>
</tr>
<tr>
<td>- Change Management</td>
</tr>
<tr>
<td>- Quality Assurance</td>
</tr>
<tr>
<td>- Release Management</td>
</tr>
</tbody>
</table>

| Legal Support |
| Requirements Management |

| Quality and Process Management |
| Technical Office and IT Infrastructure |
AUTOSAR Organization

Overview of Working Groups

Project Leader Team

Working Groups

Cross-standard Working Groups

Lead Working Groups

Classic Platform Working Groups (CP)

Adaptive Platform Working Groups (AP)

WG-A
Architecture Team

WG-MT
Methodology and Templates

WG-SEC
Automotive Security

WG-SAFL
Safety Team

WG-AIF
Application Interfaces

WG-CLD
Cloud Services

WG-DIA
Diagnostics

WG-IVC
In-Vehicle COM

WG-RES
Resources

WG-TSY
Time Synchronization

WG-UCM
Update & Conf. Management

WG-V2X
Vehicle to X

WG-CP-RTE
Runtime Environment

WG-CP-MCBD
Multicore BSW Distr.

WG-AP-EMO
Execution Man. & OS

WG-CP-LIB
Libraries

WG-AP-DI
Demonstrator Integration

WG-CP-MCL
MCAL and NVRAM

WG-AP-PER
Persistency

WG-AP-CCT
Central Coding Team

WG-AP-ST
System Tests
AUTOSAR Organization

User Group Structure

User Groups

UG-CN
China
- Demonstrator development
- BSW integration

UG-NA
North America
- Common Training: OEM-Tier1 Workflows/ Security
- Safety
- Ethernet

UG-IE
Improved Exploitation
- 6 thesis on optimizing the use of AUTOSAR
- Establishment of Adaptive Platform
AUTOSAR Basic Principles

Benefits of a Software Framework

The **AUTOSAR Software Framework** promotes software module reuse and exchangeability.

Exchangeability between suppliers’ solutions

- **Supplier A**
  - Chassis
  - Safety
  - Body/Comfort

- **Supplier B**
  - Chassis
  - Safety
  - Telematics

- **Supplier C**
  - Body/Comfort
  - Powertrain
  - Telematics

Exchangeability between manufacturers’ applications

- **Platform a.1, a.2, a.n**
- **Platform f.1, f.2, f.n**
- **Platform e.1, e.2, e.n**

Exchangeability between vehicle platforms

- **Platform b.1, b.2, b.n**
- **Platform c.1, c.2, c.n**
- **Platform d.1, d.2, d.n**
AUTOSAR Basic Principles

Proprietary vs. AUTOSAR Middleware Approach

Proprietary Solution

- Application Software
- Basic Software
- Hardware

AUTOSAR

- Application Software
- Standardized Middleware
- Virtualization / OS / Hardware
- Standardized Methodology
- Hardware Specific ECU
AUTOSAR Basic Principles

Benefits of the AUTOSAR Middleware Approach

AUTOSAR paves the way for innovative electronic systems with improved performance, safety and security.

- **Hardware** and **software** widely independent of each other
- **Decouplable development** (by abstraction) through horizontal layers; therefore, **reduced** development **time** and **costs**
- **Enhanced quality** and **efficiency** through software reuse
AUTOSAR Basic Principles

Benefits of Exploiting the Standard (1)

- Establish **distributed development** among suppliers
- Compete on innovative functions with increased **design flexibility**
- **Simplify** software and system integration
- **Reduce** overall software development costs
AUTOSAR Basic Principles

Benefits of Exploiting the Standard (2)

- Enhance efficient **variant handling**
- **Reuse software** modules across OEMs
- Increase efficiency of **application development**
- **Invent** new business models
AUTOSAR Basic Principles

Benefits of Exploiting the Standard (3)

- Have an **interface** with development processes
- **Embed tools** into an overall tool environment

<table>
<thead>
<tr>
<th>OEM</th>
<th>Supplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tool Provider</td>
<td>New Market Entrant</td>
</tr>
</tbody>
</table>
AUTOSAR Basic Principles

Benefits of Exploiting the Standard (4)

- Enable **new business models** through standardized interfaces
- **Understand easily** how automotive software is developed
Agenda

Part 1
► The AUTOSAR Partnership
► The AUTOSAR Standardization
  • Challenges in the Mobility Sector
  • The Software Framework

Part 2
► Architecture and Features
► Smart Solutions Based on AUTOSAR
► Processes and Quality
Challenges in the Mobility Sector

Selected Main Drivers for Standardization

Highly Automated Driving with Dependability
- Reliability
- Availability
- Maintainability

V2X, Internet of Things, Cloud-Based Services
- Security
- QoS
- Over the Air (OTA) Update/Upgrade
Challenges in the Mobility Sector

Selected Main Drivers for Standardization

Increasing Data Rates and Volume

- Automotive Ethernet
- 5G

New Automotive Processor Technologies

- Centralized multi-core processors
Challenges in the Mobility Sector

Highly Automated Driving - It's all About Trust!

High dependability will require

- a balance between safety and availability through redundancy and degradation concepts.
- protection against common cause or common mode failures through physical and software diversity.
- comprehensive system monitoring and diagnosis.
- high system reliability.
- Over The Air (OTA) serviceability.
- certifiable development processes.
Challenges in the Mobility Sector

Driving Innovations in E/E Architectures

- 1970 - Mechanics
- 1980 - Electric Support
- 1990 - Infotainment
- 2000 - Linked Networks
- 2010 - 90% of All E/E-Driven Innovations
- 2020 - Vehicle-Backend Connection
- 2025 - Zone Architecture

- Distributed ECUs
- Centralization
- Integration
- Domain Fusion
- Domain/Vehicle Controller
- Deeply Embedded ECUs
- Obsolete ECUs
- Integration Process
- Intelligent Actuators/Sensors

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AUTOSAR Software Framework

Deliverables

- Acceptance Test
- Application Interfaces
- Sensor Interfaces

Classical Platform

Adaptive Platform

Foundation

- Released as an own standard
- Released as part of the standard it is extending
- A extends B
- A is planned to extend B
- Specification available
- Demonstrator Code available
AUTOSAR Software Framework

The AUTOSAR Platforms

<table>
<thead>
<tr>
<th>Classic Platform</th>
<th>Adaptive Platform</th>
<th>Collaboration E.g. Infotainment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High</strong>, in the range of micro-seconds</td>
<td><strong>Mid</strong>, in the range of milli-seconds</td>
<td><strong>Low</strong>, in the range of seconds</td>
</tr>
<tr>
<td><strong>High</strong>, up to ASIL-D</td>
<td><strong>High</strong>, at least ASIL-B</td>
<td><strong>Low</strong>, QM</td>
</tr>
<tr>
<td><strong>Low</strong>, ~ 1000 DMIPs</td>
<td><strong>High</strong>, &gt; 20.000 DMIPs</td>
<td><strong>High</strong>, ~ 10.000 DMIPs</td>
</tr>
</tbody>
</table>

Real Time Requirements
- **High**, in the range of micro-seconds
- **High**, up to ASIL-D
- **Low**, ~ 1000 DMIPs

Safety Criticality
- **High**, up to ASIL-D
- **High**, at least ASIL-B
- **Low**, QM

Computing Power
- **Low**, ~ 1000 DMIPs
- **High**, > 20.000 DMIPs
- **High**, ~ 10.000 DMIPs

Operating Systems
- Microsoft Windows, Android, Linux, Automotive Grade Linux, GENIVI, Robot Operating System (ROS)
AUTOSAR Adaptive Platform

Three Pillars for ADAS Applications

1. Safe and Secure

2. Connected

3. Dynamic and Updateable
AUTOSAR Adaptive Platform

Three Pillars for ADAS Applications (1)

1. Safe and Secure
   - External Communication: **DTLS**
   - In-Vehicle Communication: **SecOC • IPsec**
   - Platform
     - Process Separation • Process-Sys
     - Separation • Safe Data Storage • Supervision • Failure Handling • Resource Budgeting • E2E for SOA • Exceptionless APIs • IAM • Crypto

2. Connected

3. Dynamic and Updateable
AUTOSAR Adaptive Platform

Three Pillars for ADAS Applications (2)

1. Safe and Secure
2. Connected
3. Dynamic and Updateable
AUTOSAR Adaptive Platform

Three Pillars for ADAS Applications (3)

1. Safe and Secure
2. Connected
3. Dynamic and Updateable
AUTOSAR Classic Platform

Four Pillars Form the Standard Solution for Today’s Automobiles

1. Functional Safety
2. Efficiency
3. Field Proven
4. Performance
AUTOSAR Classic Platform

Four Pillars Form the Standard Solution for Today’s Automobiles (1)

1. **Functional Safety**
   - Mature safety features (e.g. watchdog, E2E communication protection, etc.)

2. **Efficiency**
   - Scalable from QM up to ASIL D

3. **Field Proven**

4. **Performance**
AUTOSAR Classic Platform

Four Pillars Form the Standard Solution for Today´s Automobiles (2)

1. Functional Safety
   • AUTOSAR stacks from different vendors

2. Efficiency
   • Cost effective by supporting a wide range of μControllers
   • Flexible due to CDD

3. Field Proven

4. Performance
AUTOSAR Classic Platform

Four Pillars Form the Standard Solution for Today’s Automobiles (3)

1. Functional Safety
   - Mature by many years of application
2. Efficiency
   - High quality due to widespread implementations
3. Field Proven
   - Established distributed development processes with standardized methods and templates
4. Performance
AUTOSAR Classic Platform

Four Pillars Form the Standard Solution for Today’s Automobiles (4)

1. Functional Safety
   - Hard real time capabilities
   - Event triggered applications

2. Efficiency
   - Flexible through supporting a wide range of protocols and networks
   - Scalable by configuration

3. Field Proven

4. Performance
Thank you for your attention

If you’d like to become a partner, contact us at:

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http://autosar.org

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