AUTOSAR Introduction

Part 1 - The AUTOSAR Partnership and Standardization
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 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.
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.

*Ref to The 2019 Strategy&Digital Auto Report, strategy&, part of the PwC network
# AUTOSAR Partnership

## Types of Partnership

<table>
<thead>
<tr>
<th></th>
<th>Premium Plus</th>
<th>Premium</th>
<th>Development</th>
<th>Associate</th>
<th>Attendee</th>
<th>Subscriber</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Motivation</strong></td>
<td>Market leaders to drive innovations in AUTOSAR standards</td>
<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>
</tr>
<tr>
<td><strong>Annual Fee</strong></td>
<td>90,000 Euro</td>
<td>21,000 Euro</td>
<td>6,000 Euro</td>
<td>15,000 Euro</td>
<td>Free</td>
<td>3,000 Euro</td>
</tr>
<tr>
<td><strong>Annual Contribution</strong></td>
<td>5 FTE + 1 FTE (Project Leader)</td>
<td>1.5 FTE</td>
<td>0.5 FTE</td>
<td>None</td>
<td>Individual agreement</td>
<td>None</td>
</tr>
</tbody>
</table>
More Than 350 AUTOSAR Partners

### 9 Core Partners
- BOSCH
- Continental
- Ford
- GM
- STELLANTIS
- TOYOTA
- VOLKSWAGEN GROUP

### 65 Premium Partners
- Cognizant Mobility
- Denso
- HUAWEI
- VECTOR

### 79 Development Partners
- ABUP
- Airbiquity
- AirPlug
- avelabs
- BASELABS
- beyeless
- clarinox
- ESP
- ESD
- Eulogix
- FRT
- HANECOS
- INCHRON
- INTREPID
- INTEGRITY
- IP Cami
- Ixia
- KRONOS
- LAUTERMANN
- MFR
- Matrick
- Mitek
- NCS
- NORDYS
- NINJACORE
- OpenSynergy
- P1
- Ptolemy
- ProQa
- R3
- Ralf
- Satysave
- SafeSwiss
- Tachyon
- Tactthis
- TETT
- TTTech
- VALIDAS
- Vault Micro
- Verum
- Veltig
- Veoneer
- VOLKSWAGEN

### Plus
- 3 Premium Partners
- 165 Associate Partners
- 40 Attendees
AUTOSAR Partnership

Partner Development Since 2003
AUTOSAR Partnership

Global Distribution of AUTOSAR Partners

40 Partners in North America
- 2 Core Partner
- 8 Premium Partner
- 6 Development Partner
- 21 Associate Partner
- 3 Attendee

156 Partners in Europe
- 6 Core Partner
- 1 Premium Partner Plus
- 28 Premium Partner
- 37 Development Partner
- 55 Associate Partner
- 29 Attendee

3 Partners in Africa
- 2 Development Partner
- 1 Attendee

162 Partners in Asia
- 1 Core Partner
- 2 Premium Partner Plus
- 29 Premium Partner
- 34 Development Partner
- 89 Associate Partner
- 7 Attendee
AUTOSAR Organization

Official Roles

<table>
<thead>
<tr>
<th>Governance</th>
<th>Executive Board</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategic Management</td>
<td></td>
</tr>
<tr>
<td>Legal Team</td>
<td>Steering Committee</td>
</tr>
<tr>
<td>Technical Steering</td>
<td></td>
</tr>
<tr>
<td>OSS-CB</td>
<td>Project Leader Team</td>
</tr>
<tr>
<td>Open Source Software CB</td>
<td></td>
</tr>
<tr>
<td>Technical Steering</td>
<td></td>
</tr>
<tr>
<td>Core Partner</td>
<td>Working Groups</td>
</tr>
<tr>
<td>Core Partner, Premium Partner Plus</td>
<td></td>
</tr>
<tr>
<td>Core Partner, Premium Partner Plus, Premium Partner, Development Partner</td>
<td>Change Control Board</td>
</tr>
</tbody>
</table>
## AUTOSAR Organization

### Support Functions

<table>
<thead>
<tr>
<th>AUTOSAR Internal Affairs Officer (IAO), Spokesperson and Regional Spokespersons</th>
</tr>
</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 and Integration</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

AUTOSAR Project Leader Team

Working Groups

Cross-standard Working Groups

Lead Working Groups

- WG-A: Architecture Team
- WG-MT: Methodology and Templates
- WG-SEC: Automotive Security
- WG-SAIF: 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-DIA: Diagnostics
- WG-UCM: Update & Conf. Management

Classic Platform Working Groups (CP)

- WG-CP-RTE: Runtime Environment
- WG-CP-MCL: MCAL and NVRAM
- WG-CP-LIB: Libraries

Adaptive Platform Working Groups (AP)

- WG-AP-EMO: Execution Man. & OS
- WG-AP-DI: Demonstrator Integration
- WG-AP-ST: System Tests

- WG-AP-PER: Persistency
- WG-AP-CCT: Central Coding Team
AUTOSAR Organization
User Group Structure

Steering Committee / Project Leader Team

AUTOSAR User Groups

Regional User Groups
- UG-CN: China
- UG-NA: North America
- UG-IN: India

Exploitation User Groups
- UG-IE: Improved Exploitation

3rd Party Organizations

first 3rd Party
- 3rd Party User Groups
  - AUTOSAR Group*

other 3rd Party
- 3rd Party User Groups
  - AUTOSAR Group*

* Self-organizing group within 3rd party of or including AUTOSAR Partners.
AUTOSAR Organization

3rd Party Group – Contribution of 3rd Party Technical Interests

Example Collaboration Model:

3rd parties technical interests are elaborated in 3rd party organizations

Interested 3rd party organizations establish internal groups to interface to AUTOSAR.

3rd Party Organizations

- Self-organizing group within 3rd party of or including AUTOSAR Partners*

  - first 3rd Party
    - 3rd Party User Groups
      - AUTOSAR Group*
      - ...
  - other 3rd Party
    - 3rd Party User Groups
      - AUTOSAR Group*
      - ...

- Discussing technical topics relevant for AUTOSAR standardization*

- Discussing work in development only between AUTOSAR partners with development license

AUTOSAR Organization

- Contribution according to AUTOSAR DA via defined AUTOSAR processes

  - AUTOSAR Working Group
    - AUTOSAR WG-...
    - ...

- Documentation of input by AUTOSAR partners towards AUTOSAR in English

  - Discussion and work in language and culture of the 3rd party organization

* Discussion of AUTOSAR work in development only between AUTOSAR partners with development license
AUTOSAR Basic Principles

Benefits of a Software Framework

The AUTOSAR Software Framework promotes software module reuse and exchangeability.
AUTOSAR Basic Principles

Proprietary vs. AUTOSAR Middleware Approach

Proprietary Solution

- Application Software
- Basic Software
- Hardware

AUTOSAR

- Standardized Middleware
- 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)

<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>

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

- Reliability
- Availability
- Maintainability

Highly Automated Driving with Dependability

- Safety
- Security

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
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

- Mechanics
- Electric Support
- Infotainment
- Linked Networks

90% of All E/E-Driven Innovations

Major E/E-driven Innovations

Vehicle-Backend Connection

Zone Architecture

Distributed ECUs

Centralization

Integration

Domain Fusion

Vehicle Computer

2010

2020

2025

Domain/Vehicle Controller
Deeply Embedded ECUs
Obsolete ECUs
Integration Process
Intelligent Actuators/Sensors
AUTOSAR Software Framework

Deliverables

- **Acceptance Test**
- **Application Interfaces**
- **Sensor Interfaces**

- **Classic 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

**Real Time Requirements**
- **Classic Platform**: High, in the range of micro-seconds
- **Adaptive Platform**: Mid, in the range of milli-seconds
- **Collaboration**: Low, in the range of seconds

**Safety Criticality**
- **Classic Platform**: High, up to ASIL-D
- **Adaptive Platform**: High, at least ASIL-B
- **Collaboration**: Low, QM

**Computing Power**
- **Classic Platform**: Low, ~ 1000 DMIPs
- **Adaptive Platform**: High, > 20,000 DMIPs
- **Collaboration**: High, ~ 10,000 DMIPs

Microsoft Windows, Android, 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**

2. Connected
   • Platform
     **Process Separation • Process-Sys Separation • Safe Data Storage • Supervision • Failure Handling • Resource Budgeting • E2E for SOA • Exceptionless APIs • IAM • Crypto**

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

App Development

Software Package

Executable • Manifest
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
   - High quality due to widespread implementations

2. Efficiency
   - Established distributed development processes with standardized methods and templates

3. Field Proven

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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autosar.org
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