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 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**.
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>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>
</tr>
<tr>
<td><strong>Annual Fee</strong></td>
<td>90,000 Euro</td>
<td>31,000 Euro</td>
<td>10,000 Euro</td>
<td>21,000 Euro</td>
<td>Free</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>
</tr>
</tbody>
</table>

- **Motivation**
  - Premium Plus: Market leaders to drive innovations in AUTOSAR standards
  - Premium: Development and exploitation of AUTOSAR standards (size >100)
  - Development: Development and exploitation of AUTOSAR standards (size <100)
  - Associate: Exploitation of AUTOSAR standards
  - Attendee: Development of AUTOSAR standards
  - Subscriber: Openness of AUTOSAR standards to eligible public

- **Annual Fee**
  - Premium Plus: 90,000 Euro
  - Premium: 31,000 Euro
  - Development: 10,000 Euro
  - Associate: 21,000 Euro
  - Attendee: Free
  - Subscriber: 3,000 Euro

- **Annual Contribution**
  - Premium Plus: 5 FTE + 1 FTE (Project Leader)
  - Premium: 1.5 FTE
  - Development: 0.5 FTE
  - Associate: None
  - Attendee: Individual agreement
  - Subscriber: None
More Than 360 AUTOSAR Partners

9 Core Partners

BOSCH  Continental  Ford  gm  STELLANTIS  TOYOTA  VOLKSWAGEN GROUP

65 Premium Partners

Cognizant Mobility  arm  BAE Systems  Capgemini  CATL  Delphi  Denso  DENSO  Vectron

80 Development Partners

ABUP  Airbaltic  AirPlug  avelabs  beansys  boyless  Clarinix  Clarinix  di-lux  ENSYSYS  Faurecia  Forvert  Giesecke+Devrient  h2x  HHLA Container Terminal  Hirschmann  iXIA  Iktos  Kinematics  Knappzach  Lauterbach  Linconix  MATRIKX  MINTEQ  Mentor Graphics  MINTEQ  Mentor Graphics  mindola  Moloni  Nortech  NCS  nDynamics  OceanGate  OpenSynergy  Paris Eiffel Tower  Phoenix Contact  QNX  Ralf Eberhart GmbH  RASP  REMCOM  RFx  RITStack  RTI  SafetyPro  Schilling  Semcor  Siemens  SIMION  sitelab  Software AG  SpotFire  Syrian Engineering Company  TDI  TESLA  THE MINERVA PROJECT  Tiberius  TITAN  TIIDA  Tissa  Tizmax  T~, Overflow Design  Tohoku Institute of Technology  TRientec  TRIDENT  TTech  Valaris  VALIDAS  VaultMicro  VERTIC  VERTIC  Verum  VOLTAR  w3x  WAGO  Xilinx  Xilinx  xPand  XSIC  xSAFETY

3 Premium Partners

DENSO

Plus

HUAWEI

Crafting the Core

3 Premium Partners

Plus

HUAWEI

Vector

80 Development Partners

+ 168

Associate Partners

+ 41

Attendees
AUTOSAR Partnership

Partner Development Since 2003

Core
PPP
Premium
Development
Associate
Attendee
AUTOSAR Partnership

Global Distribution of AUTOSAR Partners

42 Partners in North America
- 2 Core Partner
- 8 Premium Partner
- 6 Development Partner
- 22 Associate Partner
- 4 Attendee

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

3 Partners in Africa
- 2 Development Partner
- 1 Attendee

163 Partners in Asia
- 1 Core Partner
- 2 Premium Partner Plus
- 29 Premium Partner
- 35 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>Legal Team</td>
</tr>
<tr>
<td>Technical Steering</td>
<td>OSS-CB</td>
</tr>
<tr>
<td></td>
<td>Open Source Software CB</td>
</tr>
<tr>
<td>Standardization</td>
<td>Working Groups</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Core Partner
- Core Partner, Premium Partner Plus
- Core Partner, Premium Partner Plus, Premium Partner, Development Partner
# 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-UAM: Update & Conf. Management
- WG-V2X: Vehicle to X

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

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

Exploitation User Groups
- UG-IE
  Improved Exploitation

AUTOSAR User Groups

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*
      - ...

- **AUTOSAR Organization**
  - Contribution according to AUTOSAR DA via defined AUTOSAR processes
  - AUTOSAR Working Group
    - AUTOSAR WG—...
    - ...

- **Discussion of AUTOSAR work in development only between AUTOSAR partners with development license**
- **Discussing technical topics relevant for AUTOSAR standardization**
- **Discussion and work in language and culture of the 3rd party organization**
- **Documentation of input by AUTOSAR partners towards AUTOSAR in English**

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

Benefits of a Software Framework

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
f.1, f.2, f.n

Platform
e.1, e.2, e.n

Platform
d.1, d.2, d.n

Exchangeability between vehicle platforms

Platform
b.1, b.2, b.n

Platform
c.1, c.2, c.n

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 Middleware Approach

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>
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<td>New Market Entrant</td>
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- Have an **interface** with development processes
- **Embed tools** into an overall tool environment
### AUTOSAR Basic Principles

**Benefits of Exploiting the Standard (4)**

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

- Mechanics
- Electric Support
- Infotainment
- Linked Networks
- 90% of All E/E-Driven Innovations
- Vehicle-Backend Connection
- Zone Architecture

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

Distributed ECUs
Centralization
Integration
Domain Fusion


Vehicle Computer
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

- **Classic Platform**
  - **Real Time Requirements**: High, in the range of micro-seconds
  - **Safety Criticality**: High, up to ASIL-D
  - **Computing Power**: Low, ~ 1000 DMIPs

- **Adaptive Platform**
  - **Real Time Requirements**: Mid, in the range of milli-seconds
  - **Safety Criticality**: High, at least ASIL-B
  - **Computing Power**: High, > 20,000 DMIPs

- **Collaboration** (E.g. Infotainment)
  - **Real Time Requirements**: Low, in the range of seconds
  - **Safety Criticality**: Low, QM
  - **Computing Power**: High, ~ 10,000 DMIPs

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**

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
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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