# **AUT@SAR**

# **AUTOSAR Introduction**

Part 1 – The AUTOSAR Partnership and Standardization

STELLANTIS TOYOTA VOLKSWAGEN GROUP







## Agenda

#### Part 1

#### The AUTOSAR Partnership

- Organization
- Basic Principles
- The AUTOSAR Standardization

Part 2

- Architecture and Features
- Smart Solutions Based on AUTOSAR
- Processes and Quality



# AUT@SAR

#### **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.





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.



The advantage of a strong community

31 international automotive OEM are AUTOSAR partners. 19 are under the 20 top-selling OEM and covering around 80% of the total market revenue in 2022\*.

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

AUTOSAR

TATA MOTOR

300

VOLKSWAGEN GROUP

279

STELLANTIS

ΤΟΥΟΤΑ

189

HYUNDA

783



50

HONDA

**FAW** 

TESLA

#### Types of partnership

	Premium Plus	Premium	Development	Associate	Attendee	Subscriber
Motivation	Leading innovations and project development in AUTOSAR standards	Development and exploitation of AUTOSAR standards (size >100)	Development and exploitation of AUTOSAR standards (size < 100)	Exploitation of AUTOSAR standards	Development of AUTOSAR standards	Openness of AUTOSAR standards to eligible public
Annual Fee	90,000 Euro	31,000 Euro	10,000 Euro	21,000 Euro	Free	3,000 Euro
Annual Contribution	5 FTE + 1 FTE (Project Leader)	1.5 FTE	0.5 FTE	None	Individual agreement	None



Number of Partners

**AUT@SAR** 

#### Partner Development since 2003



Year

\*Amounts considered at the end of each

year

Info



#### Partners in North America

**AUT@SAR** 

- 2 Core Partners
- 8 Premium Partners
- 5 Development Partners
- 21 Associate Partners
- 5 Attendees

#### Partners in Europe

- 6 Core Partners
- 1 Premium Partner Plus
- 26 Premium Partners
- 30 Development Partners
- 48 Associate Partners
- 29 Attendees

#### Partners in Africa

- 4 Development Partners
- 1 Attendees



#### Partners in Asia

174

- 1 Core Partner
- 2 Premium Partners Plus
- 32 Premium Partners
- 36 Development Partners
- 93 Associate Partners
- 10 Attendees

#### **Standard Presentation**

China

Hub

#### **Official Roles**





#### Support Fuctions

AUTOSAR Internal Affairs Office (IAO), Spokesperson and Regional Spokespersons

Business Administration	Communication Support	Technical Management	Deliverable Management				
<ul> <li>Partner and User Management</li> <li>Finance</li> <li>Meeting Management</li> </ul>	Marketing	<ul> <li>Standards</li> <li>Software Development Engineering and Integration</li> </ul>	<ul><li>Change Management</li><li>Quality Assurance</li><li>Release Management</li></ul>				
Legal Support		Requirements Management					
Quality and Process Management							
Technical Office and IT Infrastructure							



#### **Overview of Working Groups**

	AUTOSAR Project Leader Team										
	Working Groups										
Cross-standard Working Groups											
	Lead Working Groups										
	WG-A Architecture Team	<b>WG-MT</b> Methodology and Templates	WG-SEC Automotive Securit	y	WG-SAF Safety Team						
	WG-AIF Application Interfaces	WG-CLD Cloud Services	WG-DIA Diagnostics		WG-IVC In-Vehicle COM						
	WG-TNT Timing and Tracing	WG-TSY Time Synchronization	WG-UCM Update & Conf. Manager	ment	WG-V2X Vehicle to X						
	Classic Platform Wor	Adaptive Platform Working Groups (AP)									
	WG-CP-RTEWG-CP-IRuntime EnvironmentMCAL and N	MCL WG-CP-LIB IVRAM Libraries	WG-AP-EMO Execution Man. & OS	WG-AP-DI Demonstrator Integratio	wG-AP-ST System Tests						
			WG-AP-PER Persistency	WG-AP-CCT Central Coding Team							



#### User Groups Structure





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

- Example Collaboration Model:
- 3<sup>rd</sup> parties technical interests are elaborated in 3<sup>rd</sup> party organizations
- Interested 3<sup>rd</sup> party organizations establish internal groups to interface to AUTOSAR.





Benefits of a Software Framework

The standardized **AUTOSAR** software framework ensures an advanced complexity management for integrated E/E architectures through increased reuse and exchangeability of software modules within and between OEMs and suppliers.





Benefits of Applying the AUTOSAR SW Framework (1)



- Supports distributed development
   among suppliers
- Standardizes non-competitive SW
- Allows competition on innovation with increased design flexibility
- Simplifies software and system integration
- Reduces overall software costs
- Supports SW update and upgrades over the air



Benefits of Applying the AUTOSAR SW Framework (2)



- Enhances efficient variant handling
- Reuses software modules across OEMs
- Increases efficiency of application development



Benefits if Applying the AUTOSAR SW Framework (3)



- Supports a clearly structured development process based on a metamodel with templates and virtualization
- Can support modern development
   processes
- Embeds tools into an overall tool environment



Benefits of Applying the AUTOSAR SW Framework (4)



- Enables **exploitation models** through standardized interfaces
- Could become vendor for SW stacks
- Has access to comprehensive documentation of specs and methodology
- Can contribute to market for training courses and engineering support
- Has access to training material



Proprietary vs. AUTOSAR Middleware Approach



Benefits of the AUTOSAR Middleware Approach

AUTOSAR provides a holistic ecosystem for innovative electronic systems with high **performance, safety and security** requirements.

- Hardware and software widely
   independent of each other
- Distributed, parallel development (by abstraction) through horizontal layers; therefore, reduced development time and costs
- Enhanced quality and efficiency through software reuse

## **AUTOSAR**<sup>M</sup>





## 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

Select Main Drivers for Software Defined Vehicles

#### Connected, Automated, Shared, and Electrified driving



Highly Automated Driving with Dependability

- Safety
- Security
- Reliability, Availability and Maintainability





V2X, Internet of Things, Cloud-Based Services

- Security
- QoS
- Over the Air (OTA) Update/Upgrade



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



**Standard Presentation** 

**Software-Defined Vehicle** 

## The AUTOSAR Opening Strategy

A Set of Measures to Meet the Challenges

- Regional Representations
- ✓ 3rd Party Collaboration
- Premium Partner Plus
- Derived Applications
- Easier Access to a limited scope of AUTOSAR Work
- Automotive API

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AUTOSAR Open Framework

#### **Derived Applications**

- Mobility infrastructure
- Agricultural machinery
- Maritime Shipping
- Railway
- Urban Mobility
- Industrial Automation
- Building Automation
- Household appliance
- Medical technology



## The AUTOSAR Opening Strategy

Easier Access to Provide AUTOSAR Compatible Components or Products

The new "Associate Partner" variant "Light"

- For free.
- Exploitation rights for very limited scope of AUTOSAR standards.





## The AUTOSAR Opening Strategy

Foster Collaboration for Software Defined Vehicles (SDV)

#### The planned AUTOSAR Open Framework (AOF)

- to enable open collaboration in the SDV ecosystem considering the overarching purpose of AUTOSAR.
- to foster an ecosystem of complementary standards, software implementations, and capabilities
- to allow new activities **beyond the limits** of the AUTOSAR Development Cooperation.
- is **open for interested parties** from the automotive and related industries to develop joint solutions.



## The AUTOSAR Software Framework

#### Deliverables



## The AUTOSAR Software Framework

#### Deliverables

Safety

Power

Criticality



Three Pillars for ADAS Applications



- . Safe and Secure
- 2. Connected



3. Dynamic and Updateable

## The mixed-critical automotive extension to POSIX

- Standard automotive connectivity
- Automotive-specific functional add-ons
- Functional Safety and Cyber Security
- E/E Architecture development
  - Top-down workflow for distributed development
  - Formal exchange formats



Three Pillars for ADAS Applications (1)



#### 1. Safe and Secure

2. Connected



- External Communication:
   TLS DTLS IPsec
- In-Vehicle Communication:
   SecOC IPsec MACsec

#### • Platform

Safe Data Storage • Supervision • Failure Handling • Resource Budgeting • E2E for SOA • Exceptionless APIs • Identity Access Management • Crypto • Firewall • Intrusion Detection System Management



Three Pillars for ADAS Applications (2)



Three Pillars for ADAS Applications (3)





Four Pillars Form the Standard Solution for Today's Automobiles





3. Field Proven





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



1. Functional Safety



- Mature safety features (e.g. watchdog, E2E communication protection, etc.)
- Scalable from QM up to ASIL D









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





3. Field Proven





- AUTOSAR stacks from different vendors
- Cost effective by supporting a wide range of µControllers
- Flexible due to CDD



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







Performance

- Mature by many years of application
- High quality due to widespread implementations
- Established distributed development processes with standardized methods and templates



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

- 1. Functional Safety
- 11 2. Efficiency
  - 3. Field Proven
- . Performance

- Hard real time capabilities
- Event triggered applications
- Flexible through supporting a wide range of protocols and networks
- Scalable by configuration



# AUTOSAR

# Thank you for your attention







