AUTOSAR Adaptive Platform – a trustable software framework for connected and autonomous driving

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AUTOSAR Spokesperson

Symposium Testen - Automatisiertes und Vernetztes Fahren
Braunschweig, September 4th 2018

Topics

- AUTOSAR Introduction
- Challenges and Use Cases
- Developing the Adaptive Platform
- Roadmap, Achievements

(**AUT**omotive **O**pen **S**ystem **AR**chitecture)

is a worldwide development partnership of car manufacturers, suppliers and other companies from the electronics, semiconductor and software industry.

AUTOSAR – Core Partners and Partners

9 Core Partners

BMW Group

BOSCH

Continental

Ford

DAIMLER

PSA GROUPE

GM

TOYOTA

VOLKSWAGEN AG

53 Premium Partners

General OEM

VOLVO TRUCKS · HONDA The Power of Dreams · TATA MOTORS · HYUNDAI · VOLVO · RENAULT · NISSAN · Great Wall

Generic Tier 1

Autoliv · assystem · HELLA · dSPACE · DENSO · JTEKT · LEAR CORPORATION · DELPHI · Panasonic · ZF · NEC · ThyssenKrupp · CNH INDUSTRIAL · Valeo

Standard Software

Mentor Graphics · intel · MathWorks · KPIT · eSOL · VECTOR · SCSK · LUXOFT

Tools and Services

ALTRAN · ETRI · itk · L&T Technology Services · cea · Deloitte. · Green Hills SOFTWARE · TATA ELXSI LIMITED · LG Electronics · iav · ETAS · DASSAULT SYSTEMES · sodius · ARC CORE · Fraunhofer

Semiconductors

Infineon · RENESAS · NXP

38 Development Partners

ANSYS · Advanced Telematic · PRQA · avelabs · BASICWORX · E.S.R.LABS · INCHRON · rti · eJad · Timing Architects · PROVE & RUN · WAFER SPACE · BASELABS · itemis · silicon geeks · lhp · easycore · OFFIS · SPIRENT · GLIWA · FPT Software · C&S · OPENSYNERGY · Freetech · IP Camp · LAUTERBACH · IncQueryLabs · EVIDENCE · osb TTTech · ixia · excelfore · SYMTA VISION · nordsys · NCES · VALIDAS · seneos · AVIN SYSTEMS · PopcornSAR

127 Associate Partners
21 Attendees

Why do we rely on standards?

Share
efforts on non-differentiating parts

Compete
on innovative functions with increased design flexibility

Simplify
software and system integration

Reduce
costs on over-all software development

Distribute
development among suppliers

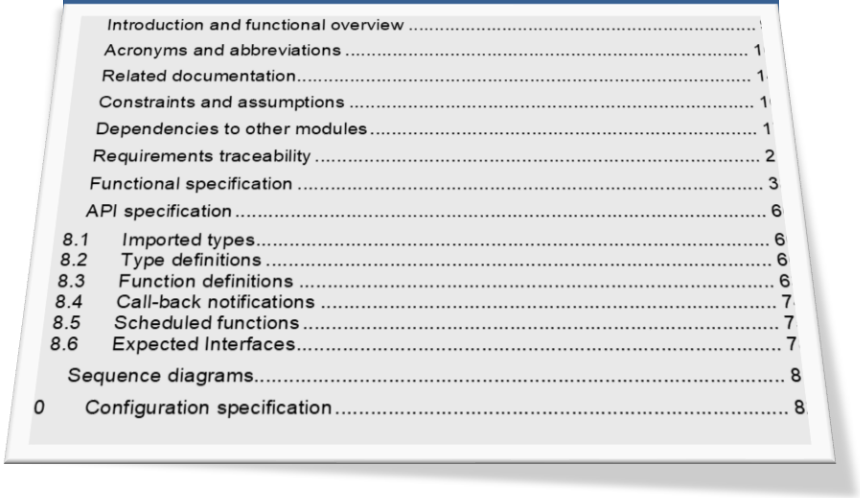
Enable
cooperation

Create
markets and enable new business models

What makes standardization successful?

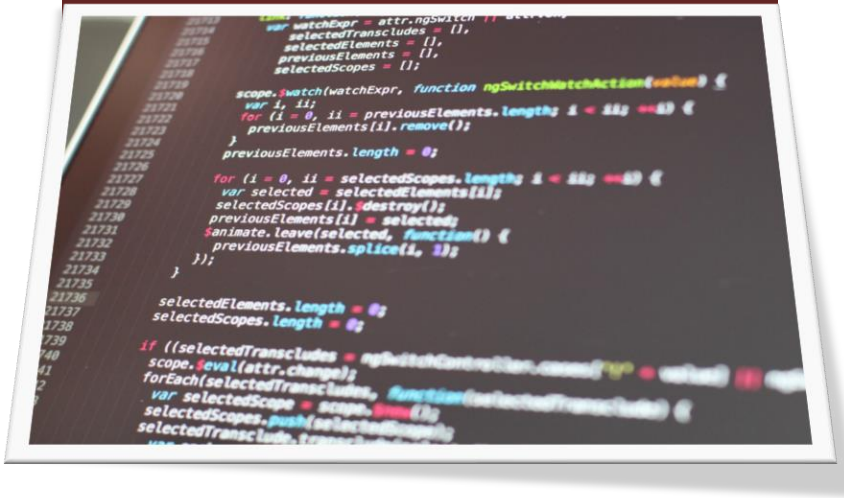
Yesterday

Paper standards with specifications only

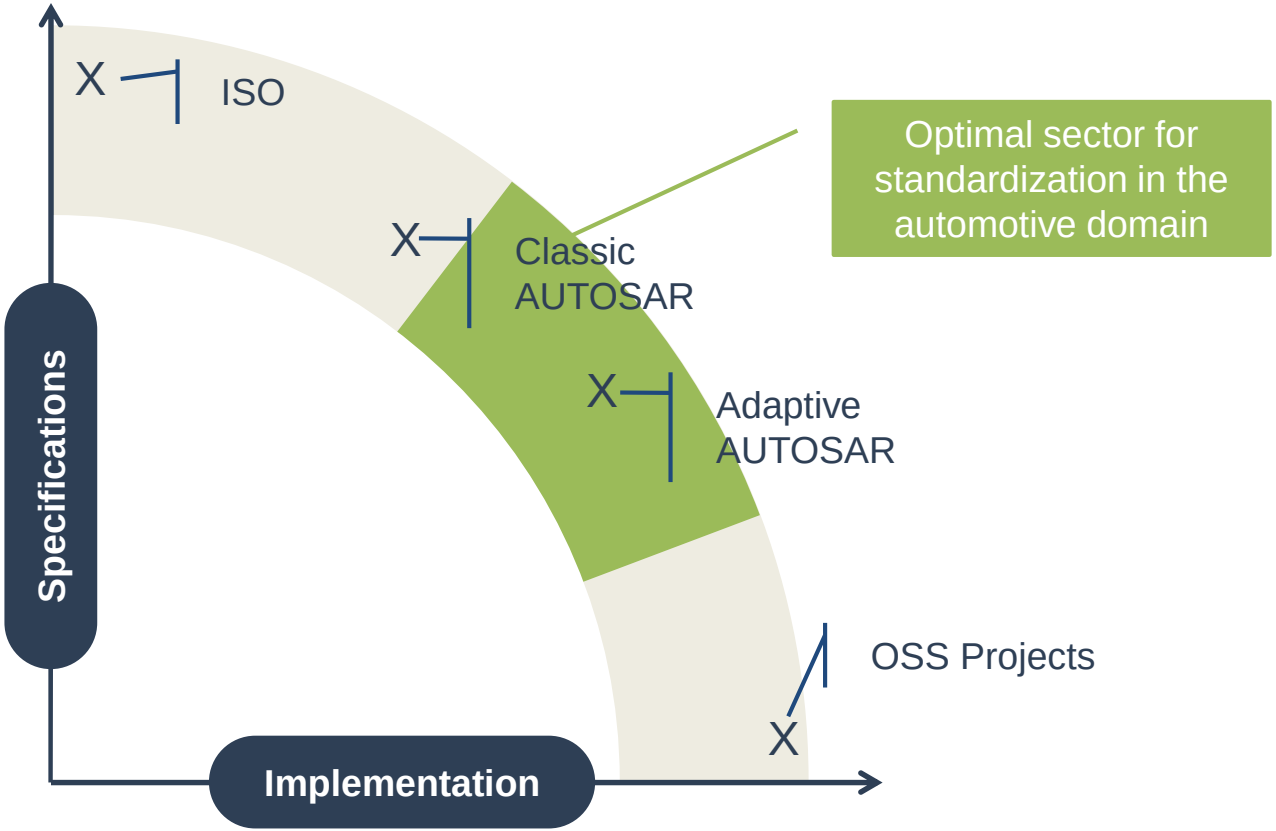


Today

Joint implementation based on specifications



Automotive software standardization at its best



Advantages of AUTOSAR's licensing model

AUTOSAR

Licensing

- all contributed IP of any partner is royalty free for all partners
- Source code and specifications are covered

Liability

- Minimized for all partners

Open Source Software

Licensing

- Only contributed IP of specific partner is royalty free

Open Innovation Network

- All complements licensing for Linux

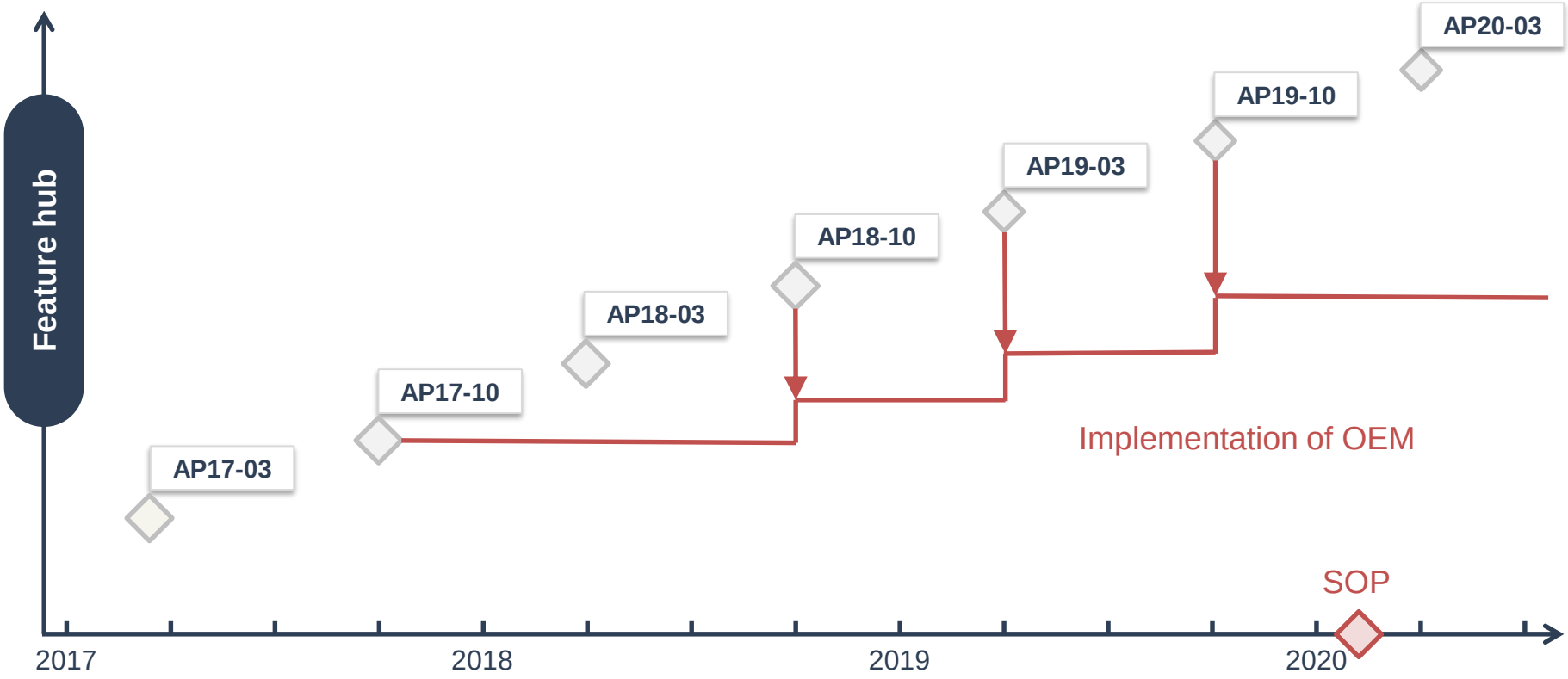
Liability

- Excluded

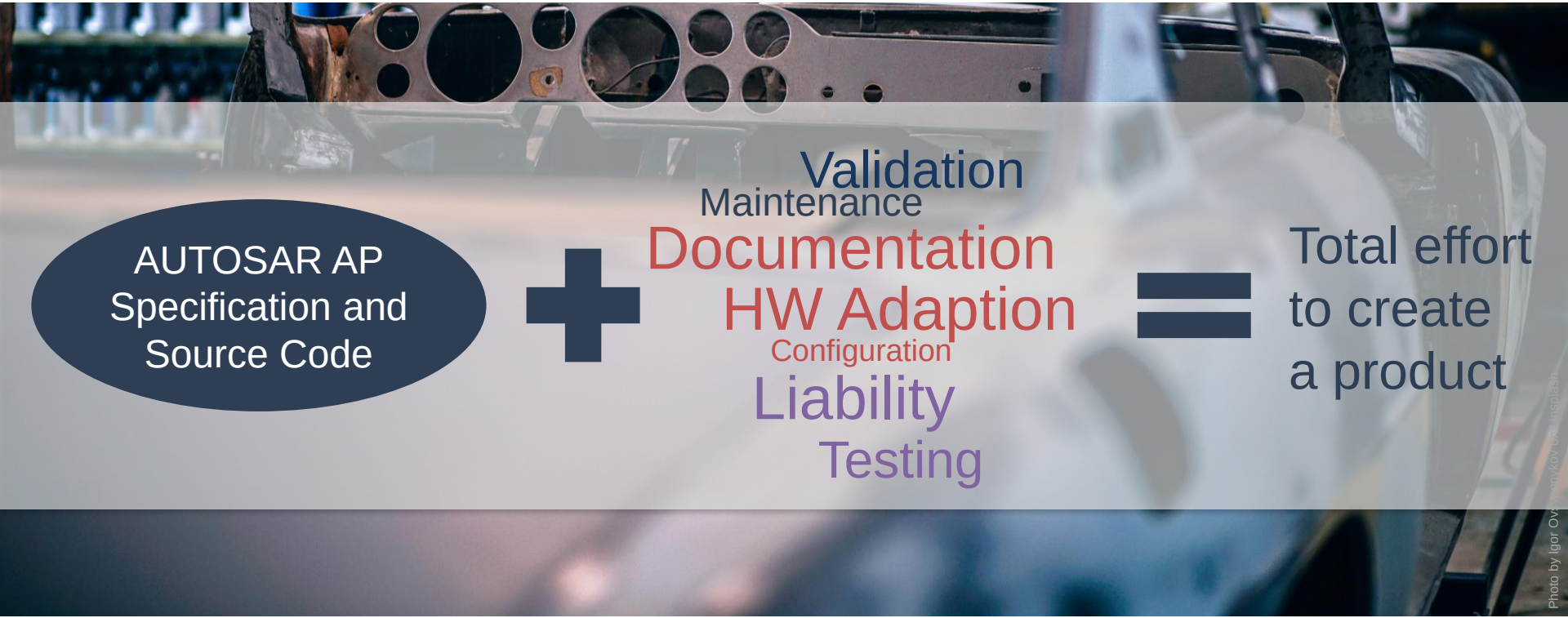
Key factors to make AUTOSAR Adaptive Platform a success

- Short development cycles
- Frontloading of validation
- Precision and quality of the standard
- Early availability of exemplary implementation
- Interoperability and increased quality

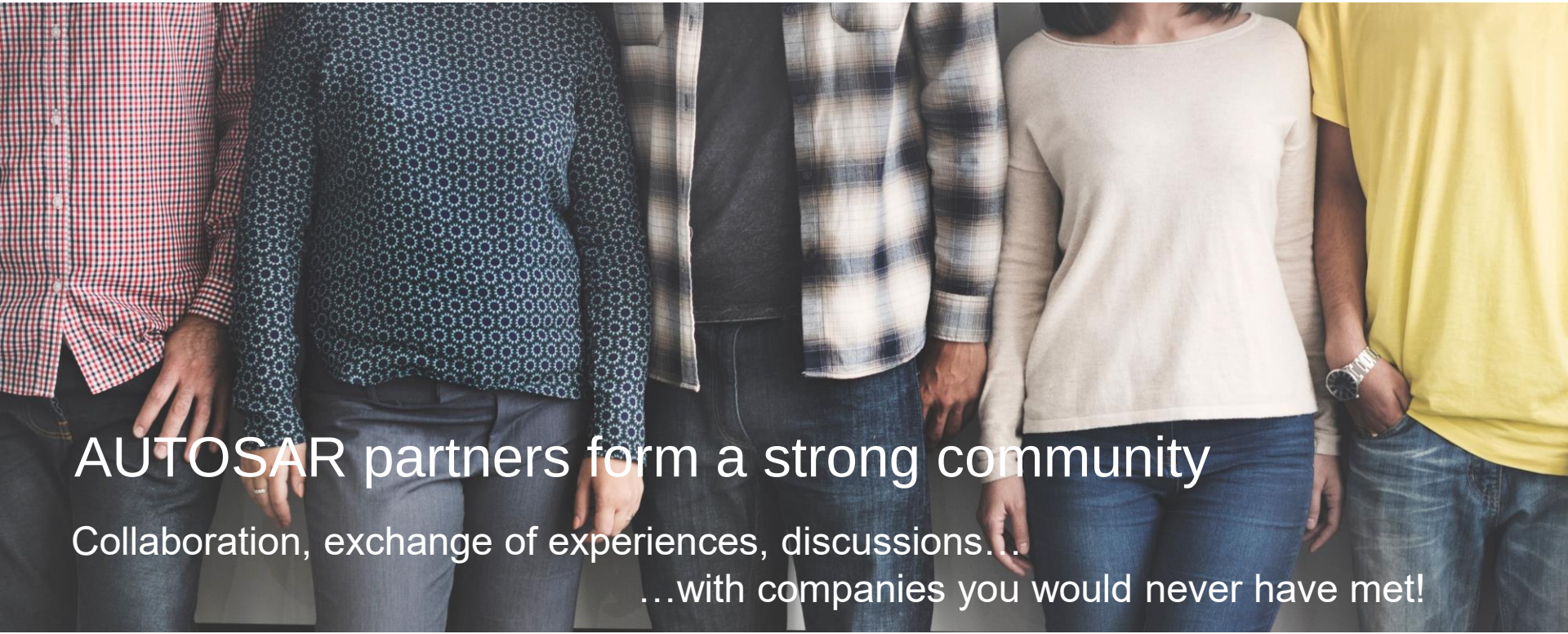
Flexible implementation of AUTOSAR Adaptive Platform



AUTOSAR Adaptive Platform
Making the series product



Besides all technical advantages

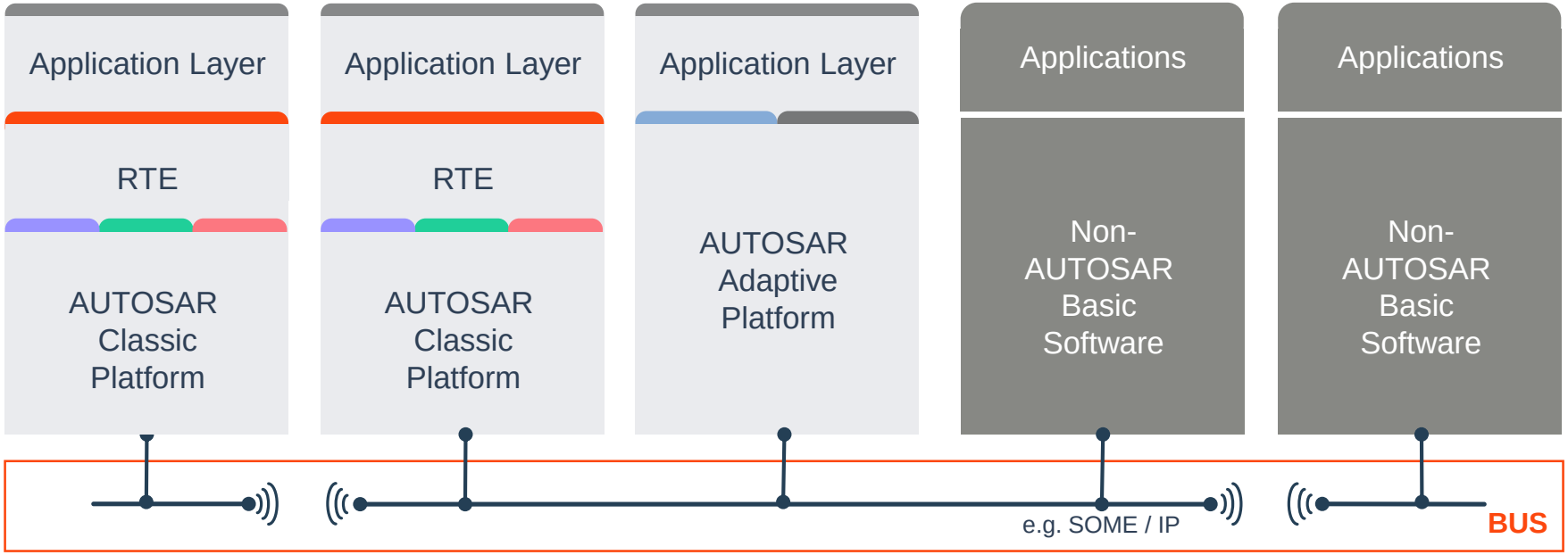


AUTOSAR partners form a strong community

Collaboration, exchange of experiences, discussions…

…with companies you would never have met!

AUTOSAR standardizes two software platforms – Classic and Adaptive



Common Bus Interface Specification

Topics

- AUTOSAR Introduction
- Challenges and Use Cases
- Developing the Adaptive Platform
- Roadmap, Achievements

Game changer for AUTOSAR – selected main drivers

Main drivers for new automotive software systems have been determined.

- Highly automated driving

Game changer for AUTOSAR – selected main drivers

Main drivers for new automotive software systems have been determined.

- Car-2-X applications
- Internet of Things and cloud services

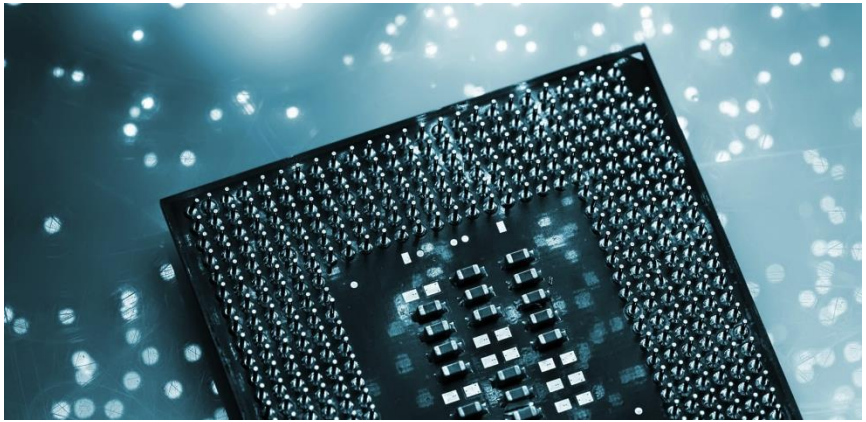
Game changer for AUTOSAR – selected main drivers

Main drivers for new automotive software systems have been determined.

- Increasing data rates

Game changer for AUTOSAR – selected main drivers

Main drivers for new automotive software systems have been determined.



- New processor technologies

Autonomous vehicle: It´s all about trust !

(Basic Picture: Volkswagen Concept Car Sedric, Geneva Car Salon 2018)

Timeline to full automation

2017 → 2020 → 2023 → 2026

Level 3 automated driving - Conditional automation:
Trustworthy software platform enables developers by safety and security measures do develop onboard software for automated driving.

Level 4 highly automated driving:
E/E Systems cope with all situations automatically in defined use cases. SW platform provides the framework to cope with sensor and data fusion. Perception supports algorithm processing.

The Future: Level 5 full automation
Localization and backend systems providing filtering, data mining and data provision capabilities to support E/E onboard system development.

Topics

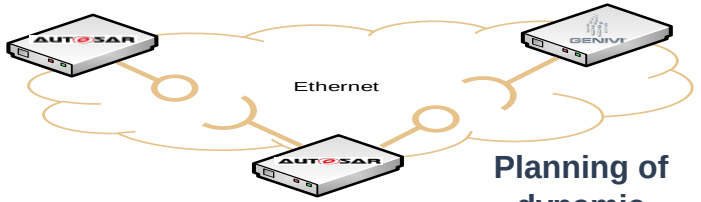
- AUTOSAR Introduction
- Challenges and Use Cases
- **Developing the Adaptive Platform**
- Roadmap, Achievements

AUTOSAR Adaptive Platform – emerging from deeply embedded systems

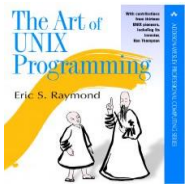
Application framework
- Support for run-time configuration
- Service-oriented communication
- Partial update, system update and upgrade capabilities

Formats for design data
- Configuring of dynamic behavior (e.g. constraints for scheduling and communication)
- Consider automotive specific cooperation scenarios
- Support integration with existing systems (Classic Platform)

Reference architecture
- Reuse existing (non-automotive) standards
- Ease software development
- Support automotive use-cases and protocols
- Reference Implementation

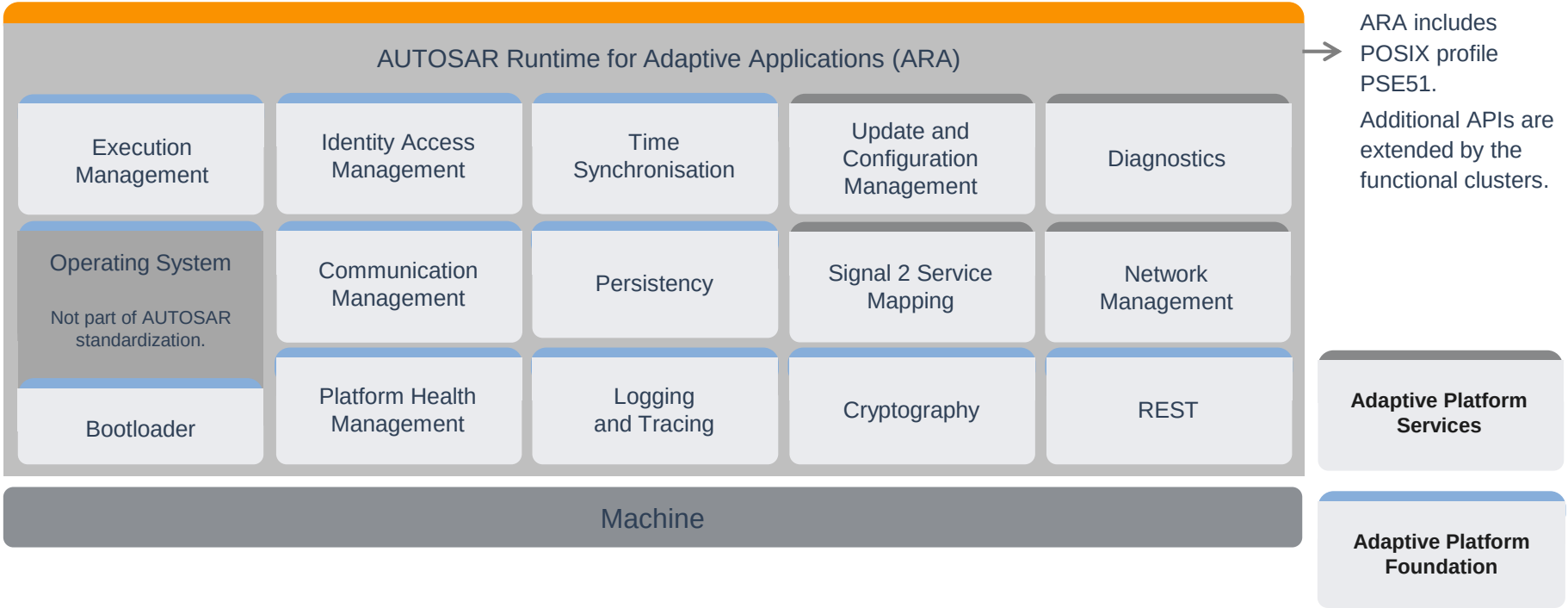


Planning of dynamic communication



… and many more

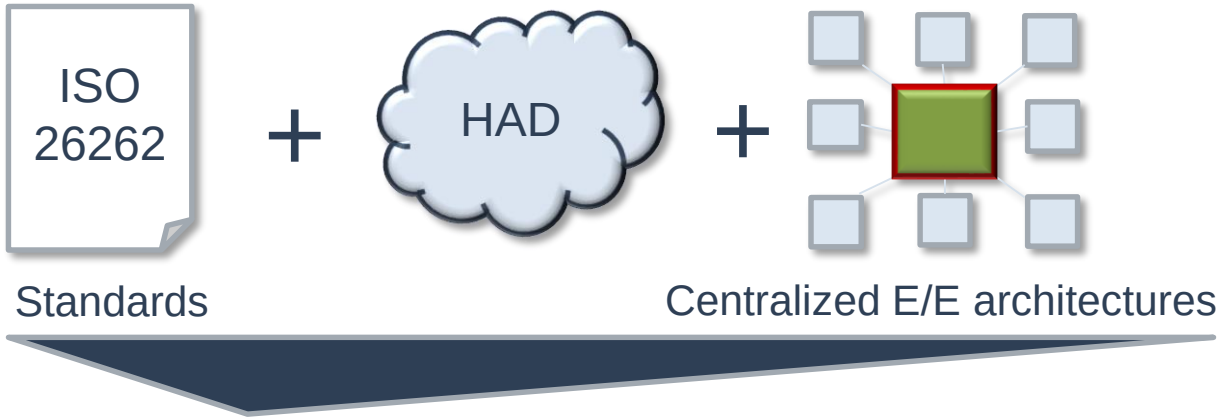
AUTOSAR runtime for adaptive applications – logical architecture



Classic Platform vs. Adaptive Platform
Technical characteristics

AUTOSAR Classic Platform	AUTOSAR Adaptive Platform
Based on OSEK	Based on POSIX
Execution of code directly from ROM	App. is loaded from persistent memory into RAM
Same address space for all applications (MPU support for safety)	Each application has its own (virtual) address space (MMU support)
Optimized for signal-based communication (CAN, FlexRay)	Service-oriented communication
Fixed task configuration	Support of multiple (dynamic) scheduling strategies
Specification	Specification and code

Safety expectations, where do they come from?



- **System architectures** capable up to ASIL D
- Reliable system architectures

Demand

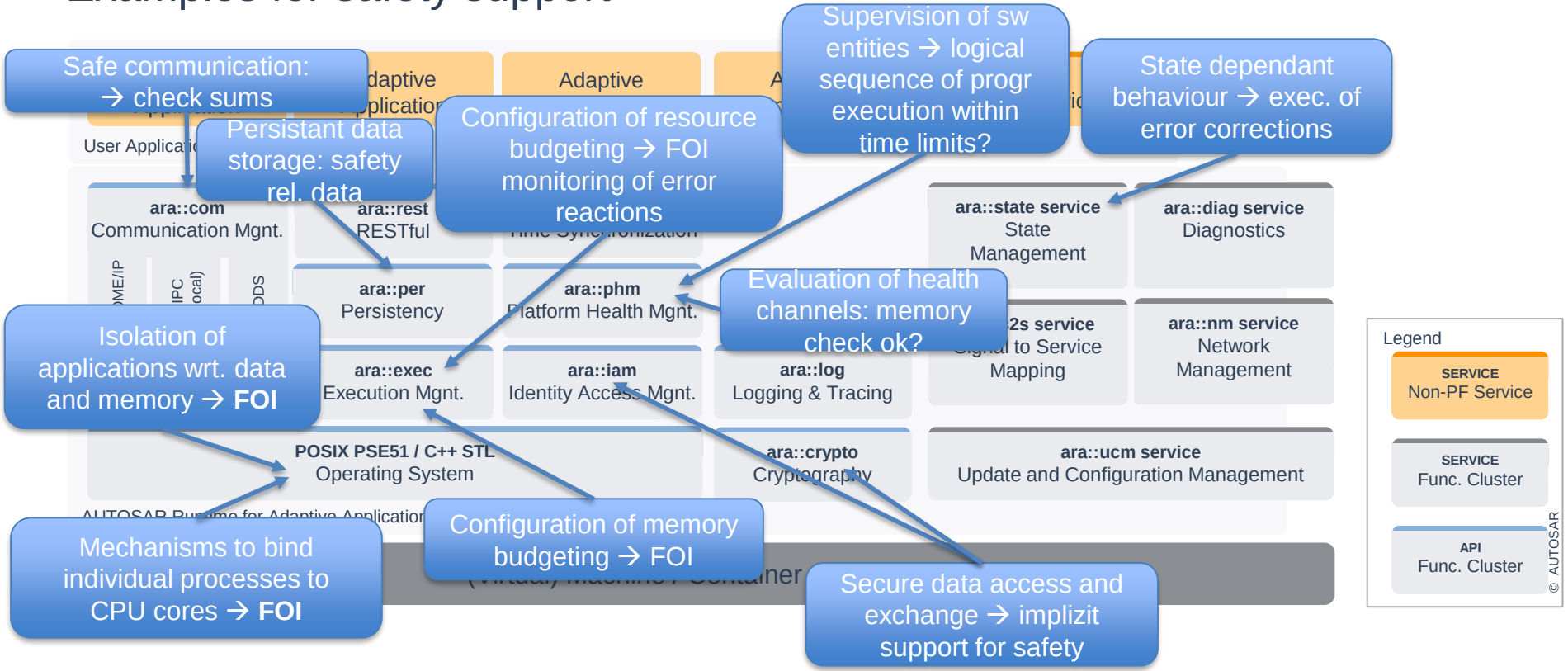
- Separation
- Failure mitigation
- Freedom from interference
- …

Supported by Autosar Adaptive Platform:

- Architectural decisions
- Features
- …

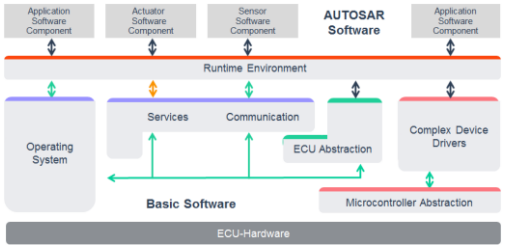
Features and architectural constraints

Examples for safety support



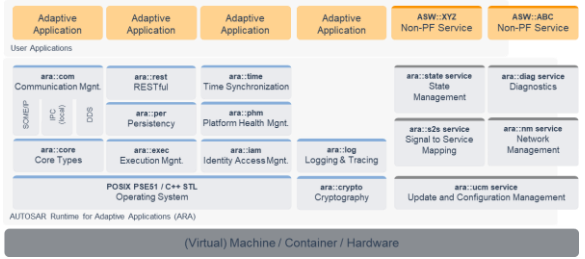
Safety approach

Classic Platform



- Definition of Safety mechanisms integrated into the Layered Architecture
- Possibility to tailor Safety mechanisms to project needs
- SEooC approach applicable

Adaptive Platform



- Definition of Safety mechanisms integrated into the service oriented approach
- Possibility to tailor Safety mechanisms to project needs
- Definition of the Platform Health Manager

➔ Interoperability between Classic and Adaptive Platform on bus level (e.g. E2E communication)

Security

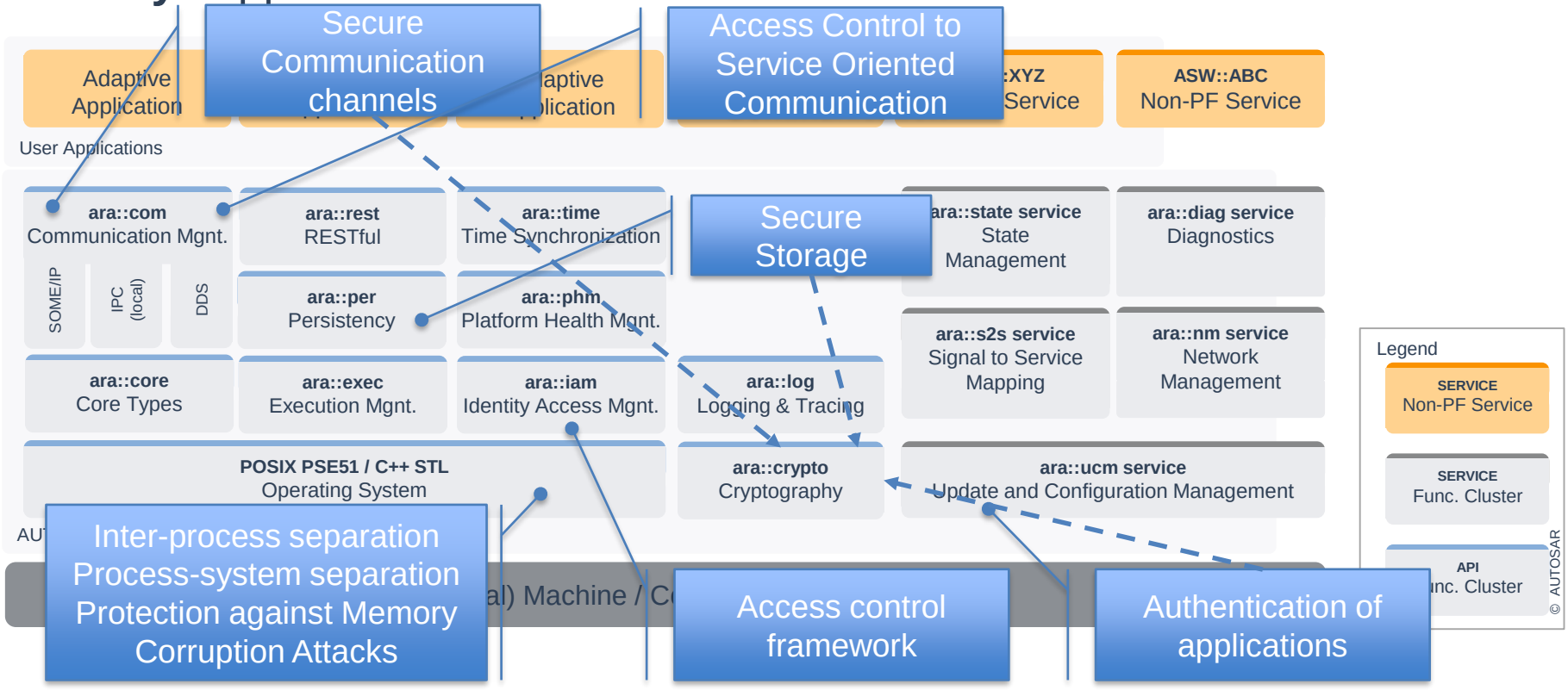
- AUTOSAR goals
  - Support the development of secure systems through the two standards
  - To provide layered automotive security approach, to define measures at specific layers:
    - Individual ECU
    - In vehicle network
    - E/E architecture
    - Connected vehicle
  - Provide und support Coexistence and Interoperability of Security measures between CP and AP
- Adaptive Platform Security Feature Team
  - Responsible for providing features that enable the development of a secure system
  - Provide security controls to platform functional clusters and for secure deployment of adaptive platform application

Classic Platform vs. Adaptive Platform
Technical characteristics – additional security features

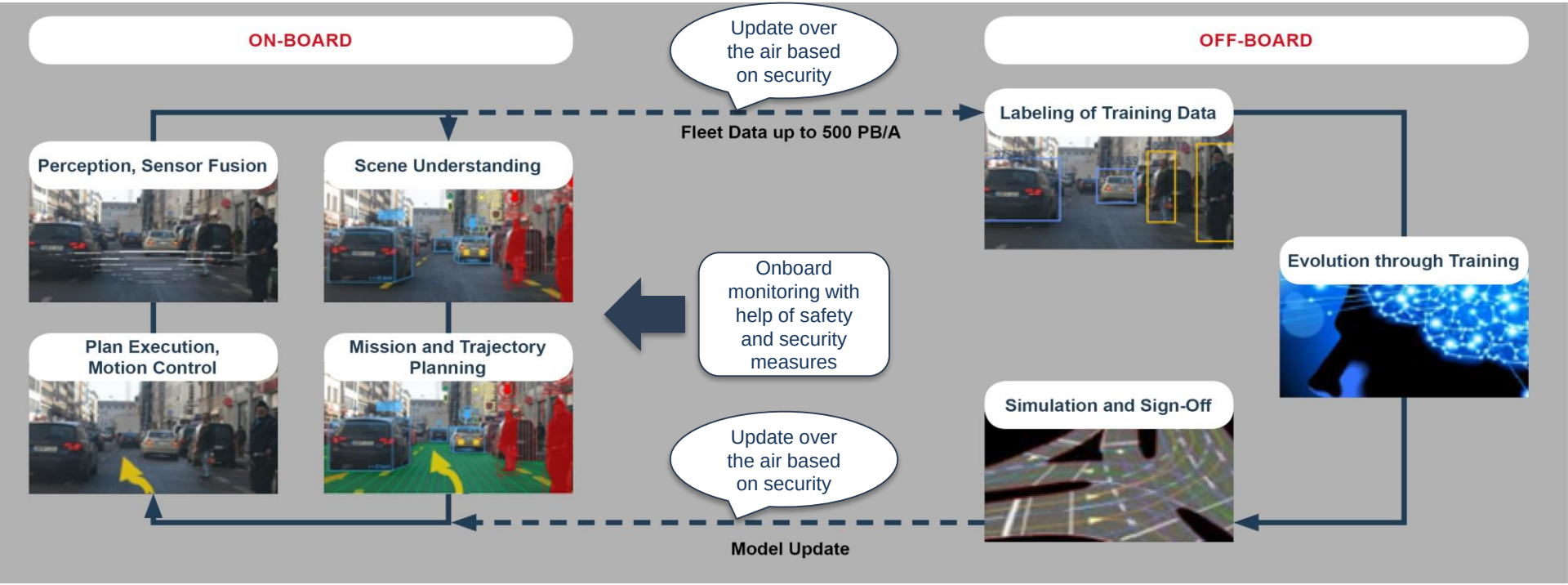
AUTOSAR Classic Platform	AUTOSAR Adaptive Platform	
Based on OSEK	Based on POSIX	POSIX compliant OS security features
Execution of code directly from ROM	App. is loaded from persistent memory into RAM	Applications must be authenticated
Same address space for all applications (MPU support for safety)	Each application has its own (virtual) address space (MMU support)	Individual process tree / no awareness of other processes
Optimized for signal-based communication (CAN, FlexRay)	Service-oriented communication	Secure communication channels (TLS, IPsec) Access control to services
Fixed task configuration	Support of multiple (dynamic) scheduling strategies	Predefined quota of memory allocation and fair distribution of processor time
Specification	Specification and code	

Features and architectural constraints

security support

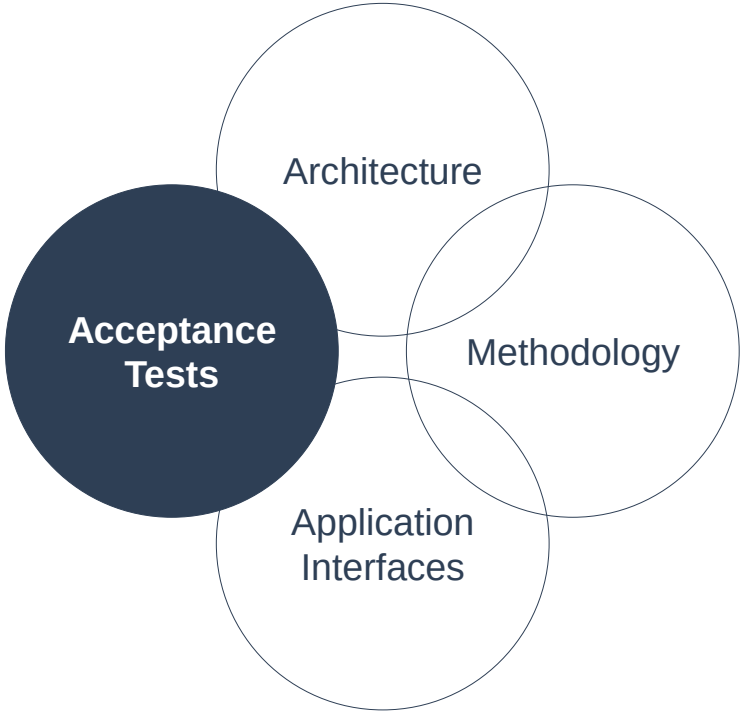


Intelligence functionality within the vehicle should run on a trusted platform based on safety and security



Source based on BMW Group, 2017

TESTING

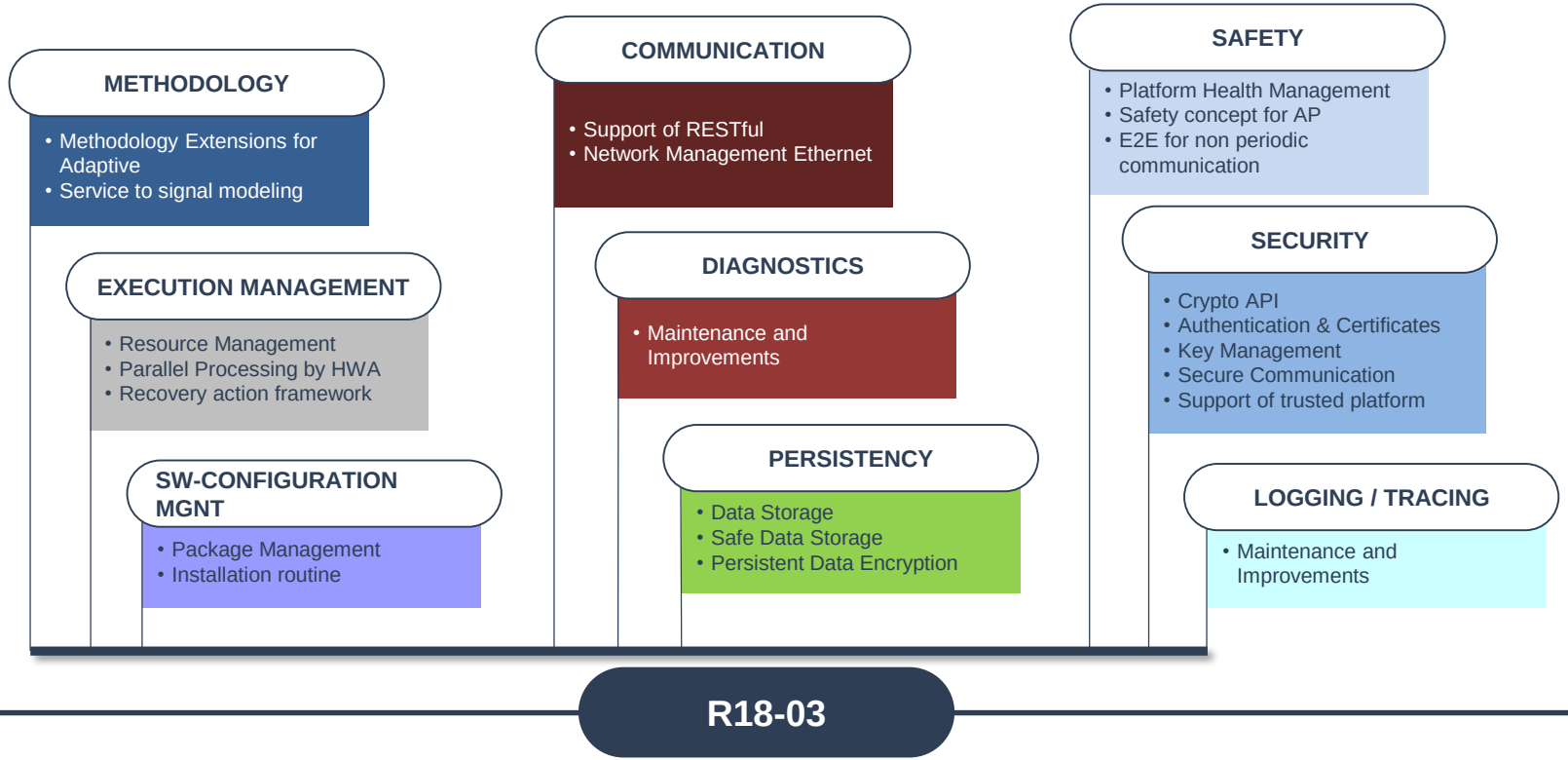


Specification of test cases intending to validate the behavior of an AUTOSAR implementation with AUTOSAR application software components or within one vehicle network.

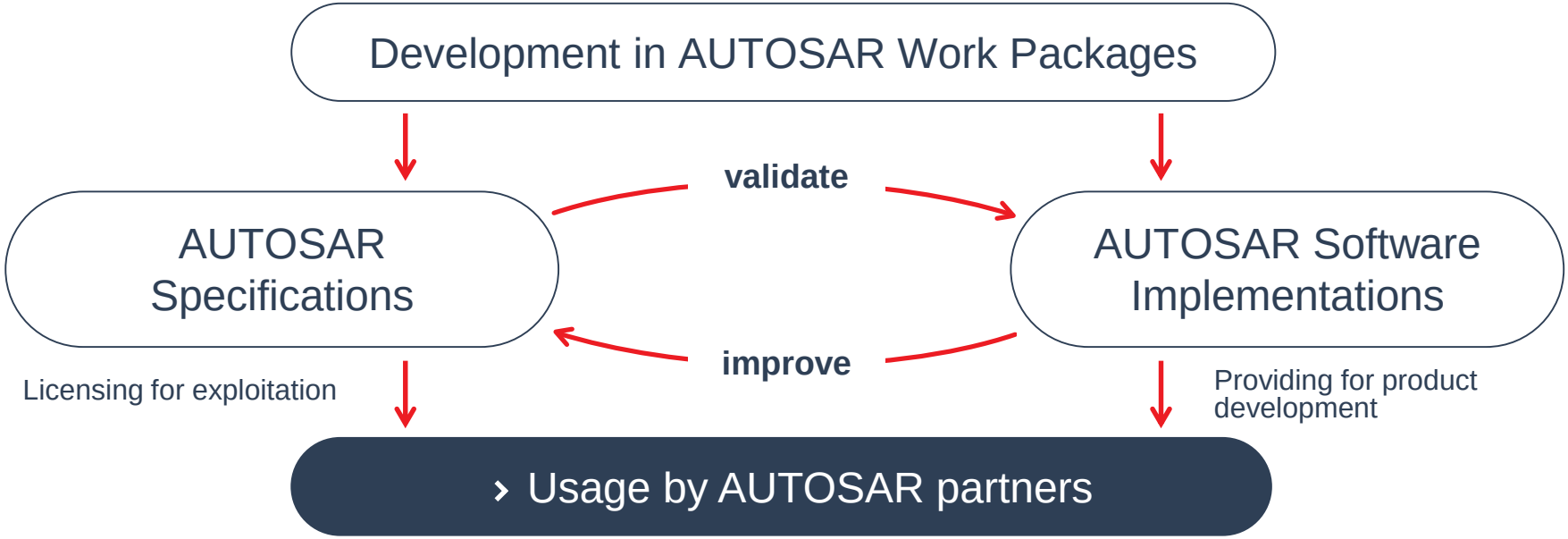
Verification & Validation

- AUTOSAR Platforms via Acceptence Tests are straight due to supplied test cases.
- AI input increases complexity because of non deterministic behaviour.
- UoA applications need to supply diagnostic functionality for safety by themselves w.r.t. required diagnostic coverage.
- V&V needs to be tailored to criticality, requirement maturity and complexity of application → Efficiency of V&V.

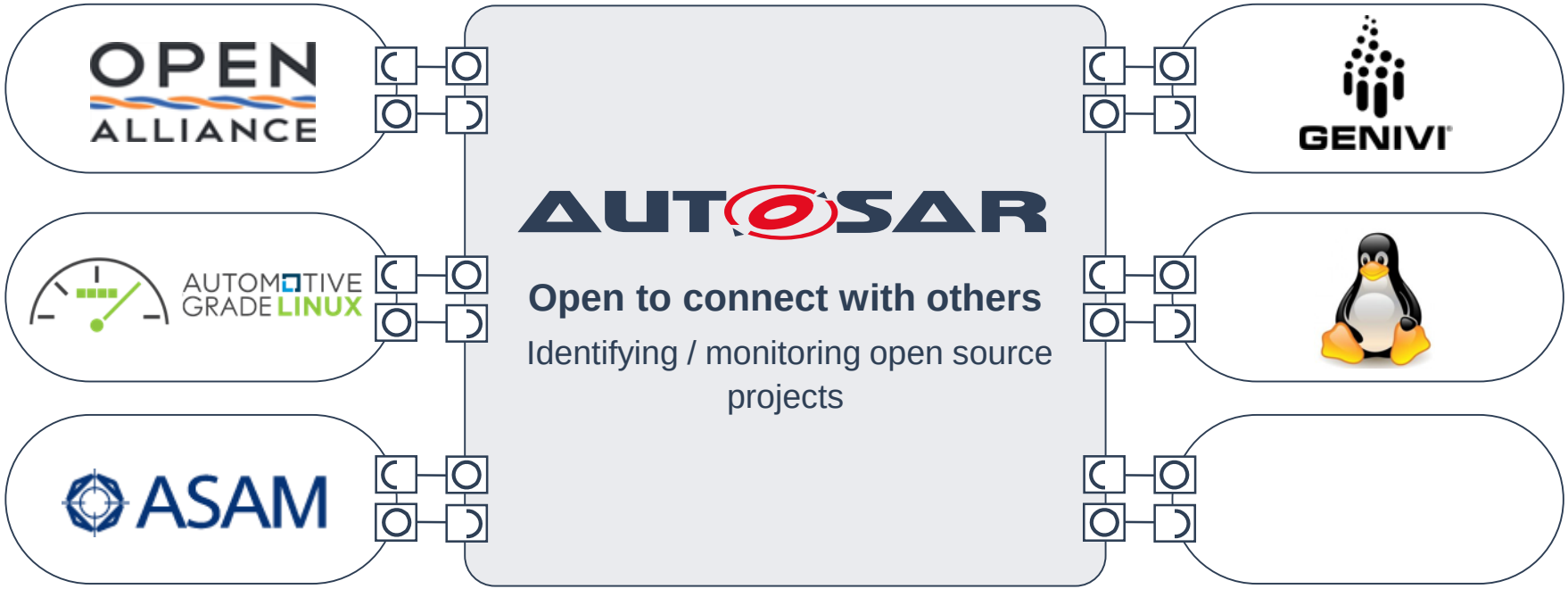
Features of Adaptive Platform Release 18-03.



Joint development of AUTOSAR specifications and exemplary software implementations for the AUTOSAR Adaptive Platform



Transparent to other standards



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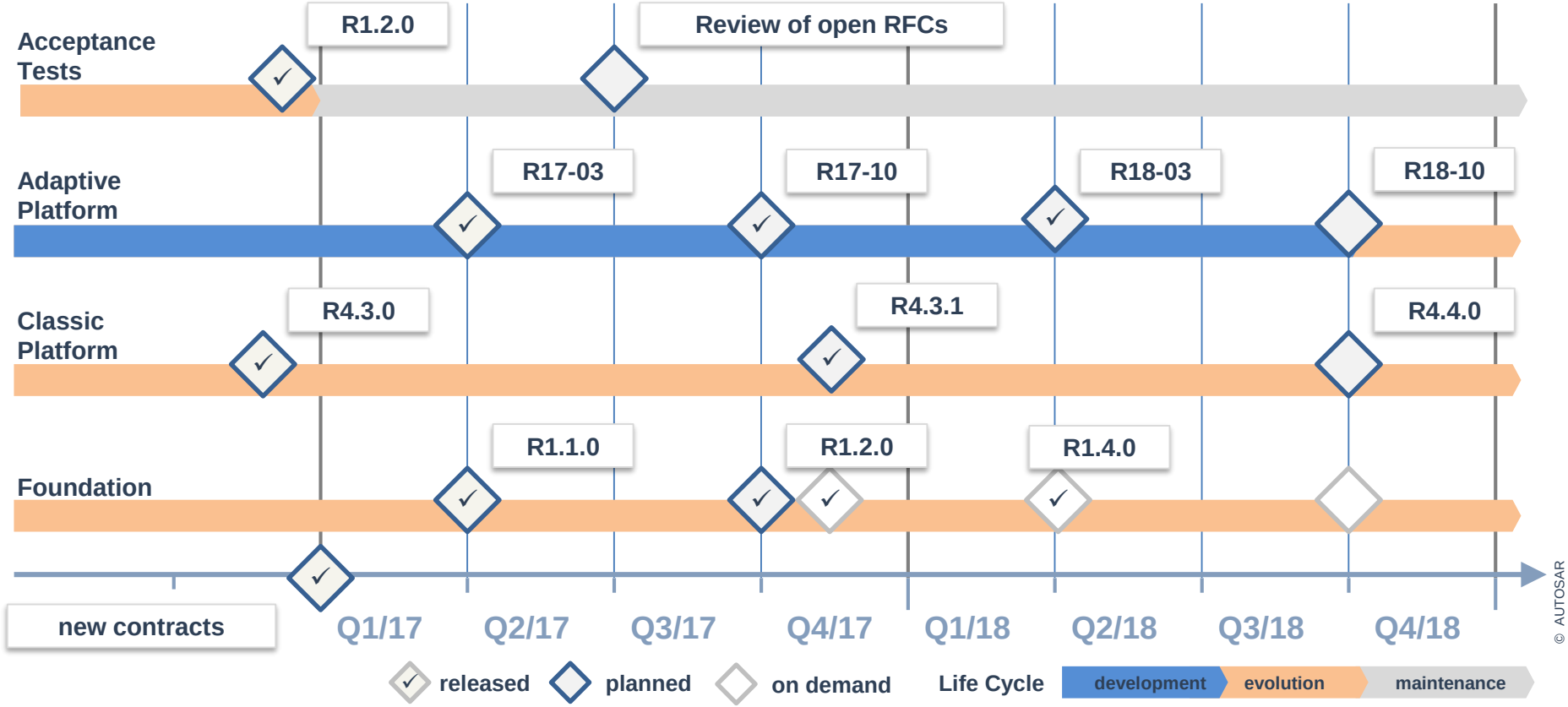
- **Roadmap, Achievements**

AUTOSAR Platform Roadmap



The AUTOSAR Core Partners are fully committed to the standardization of the AUTOSAR Adaptive Platform

- Number-crunching algorithms and high interconnectivity are the demands of future technologies. The Adaptive Platform is exactly what we need.
- AUTOSAR is one of the key enablers for autonomous driving cars.
- AUTOSAR is our standard of choice for realizing new technologies such as autonomous driving and interconnectivity.

11th AUTOSAR

Open Conference and Networking Reception

Networking Reception		Conference
Tuesday, **November 6th, 2018** 7:00 pm – 10:00 pm	+	Wednesday, **November 7th, 2018** All-day

Venue:
The Portman Ritz-Carlton Shanghai
1376 Nanjing Xi Lu, Shanghai 2000-40, China

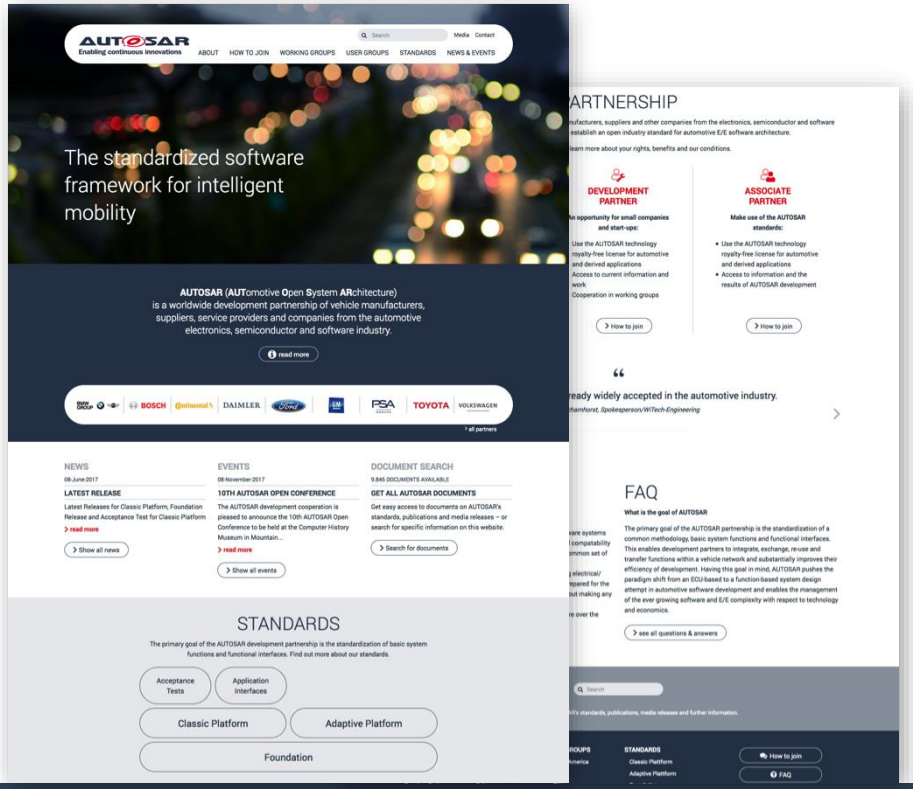
Further information:
https://www.autosar.org/news-events/

Further information on AUTOSAR

For more information on AUTOSAR:

- Working results
- User Experiences
- Exploitation

You are welcome to have a look at AUTOSAR's publications available at the AUTOSAR website www.autosar.org.



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