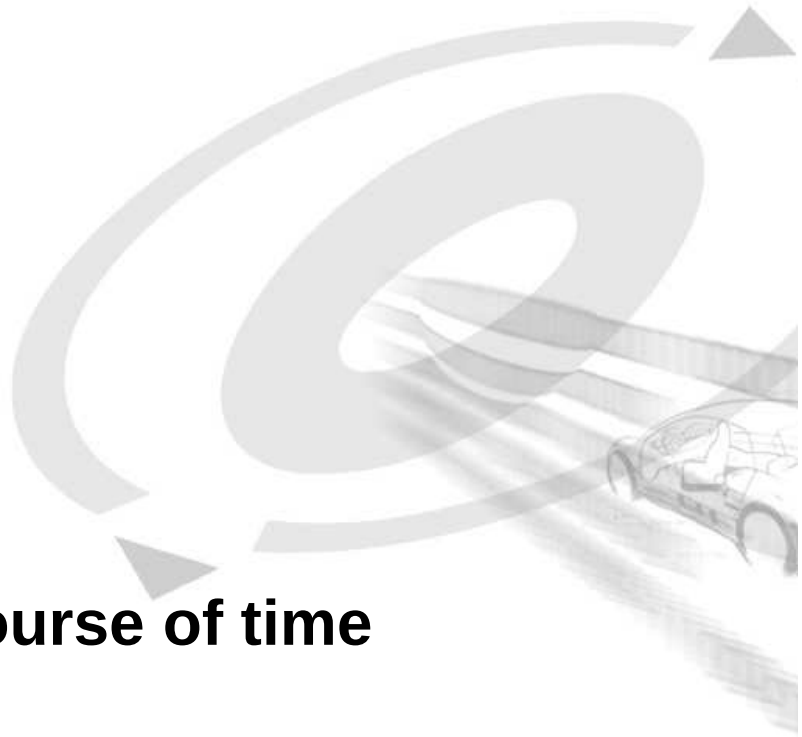


AUTOSAR - A standard in the course of time

Michael Niklas, Stefan Rathgeber

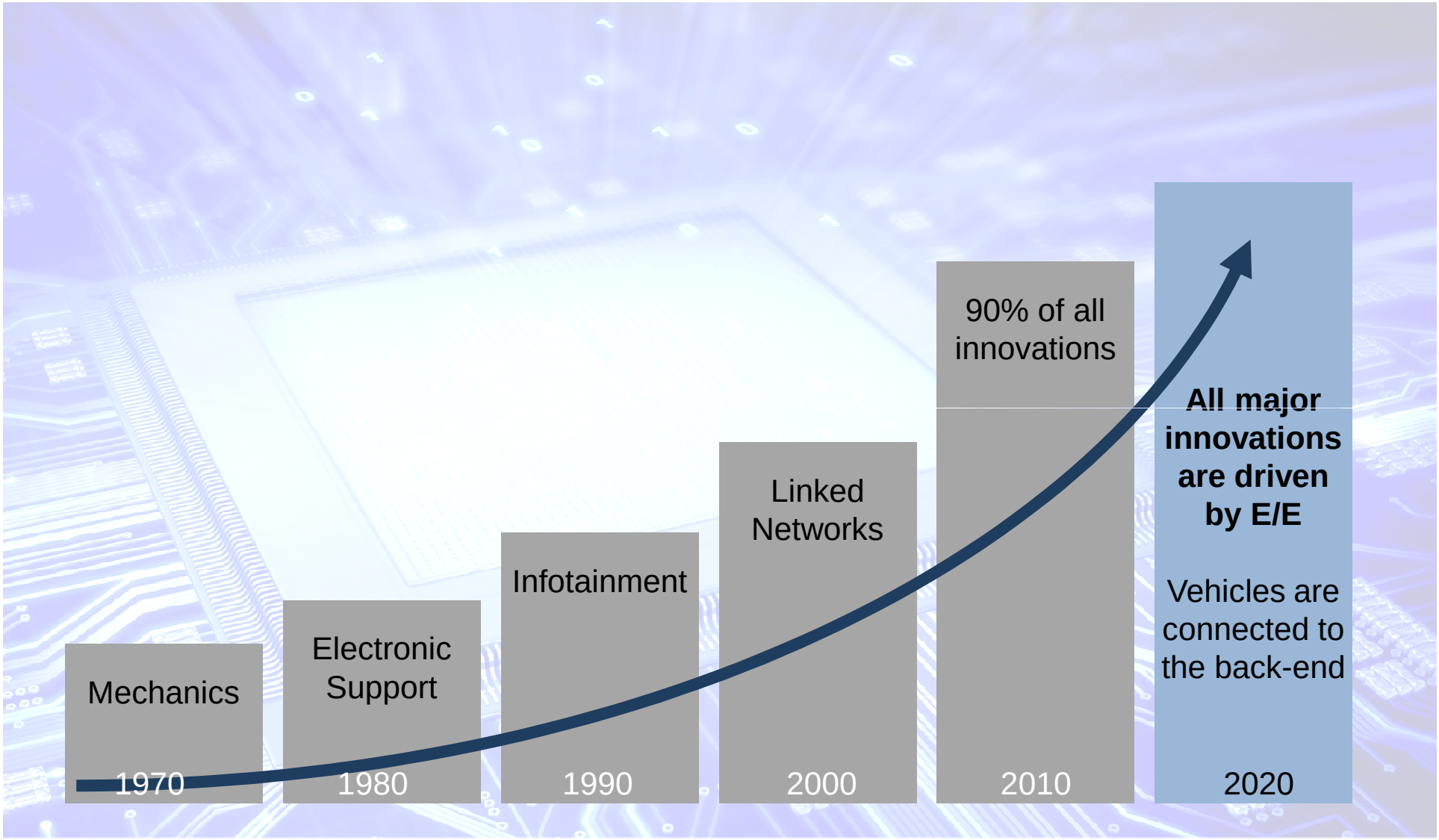
EUROFORUM Automotive Software Development

06.09.2016, Munich

Overview

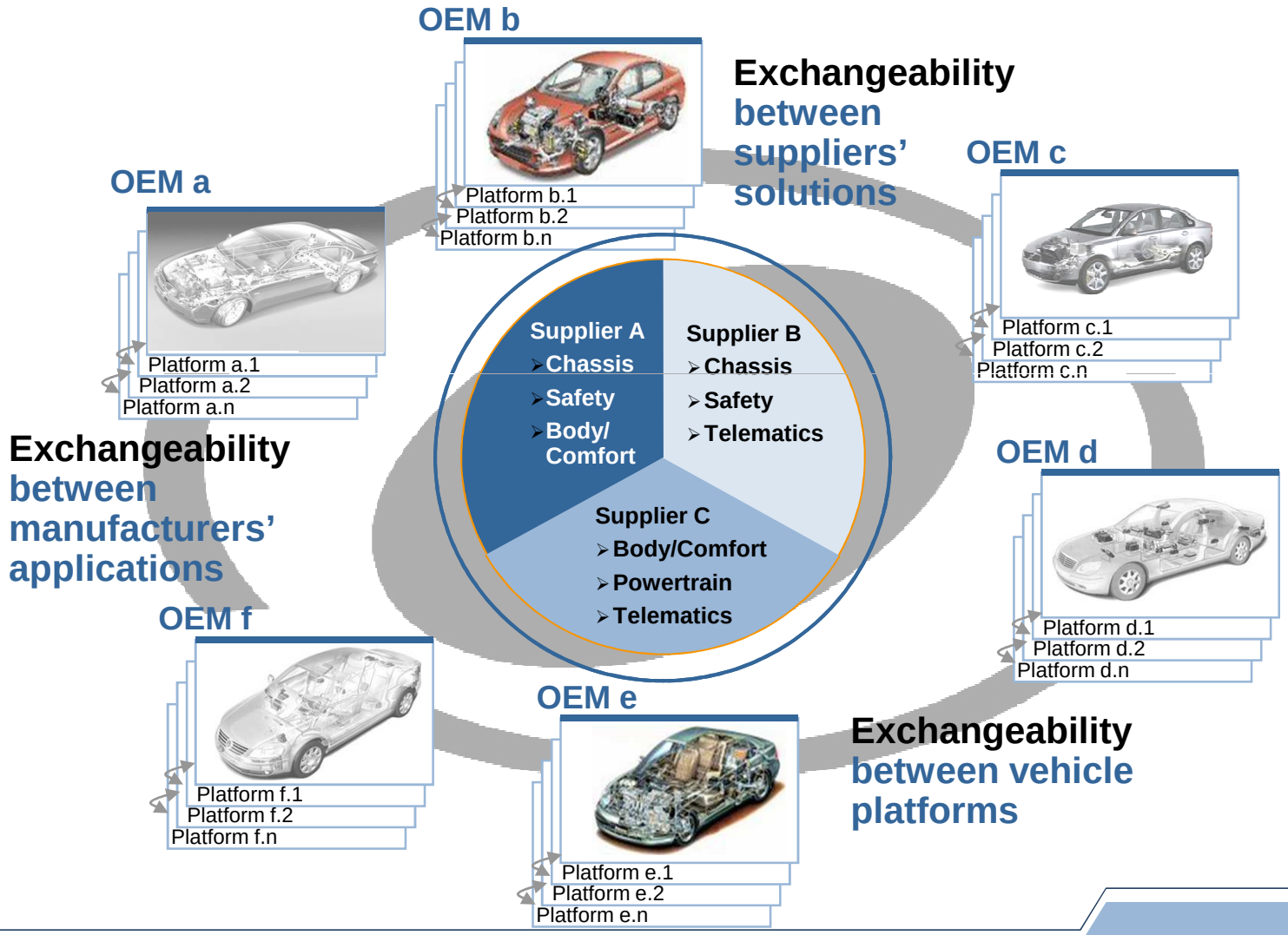
- Introduction
  - Why AUTOSAR?
- AUTOSAR Classic Platform
  - Overview and achievements
- Game changers
  - New challenges and use-cases
  - New functions
- Future of AUTOSAR
  - Adaptive Platform
  - New cooperation model
- Summary

E/E innovations in vehicle development are increasing



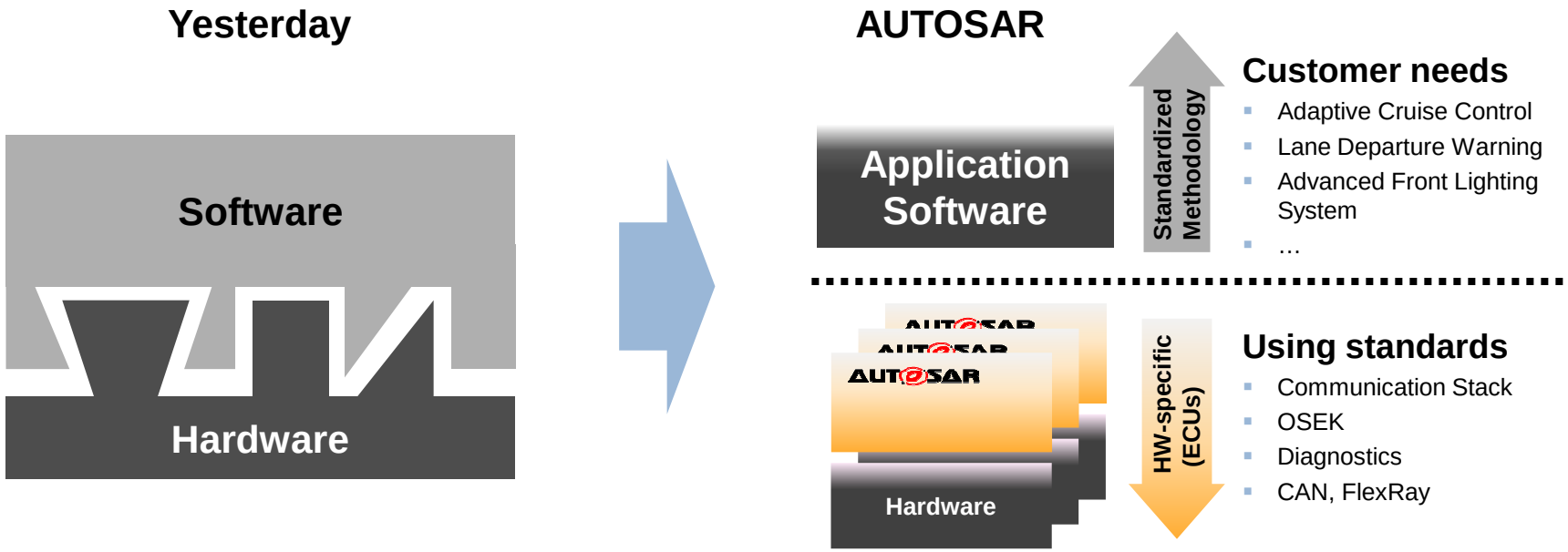
AUTOSAR vision

AUTOSAR aims to improve complexity management of integrated E/E architectures through increased reuse and exchangeability of SW modules between OEMs and suppliers.



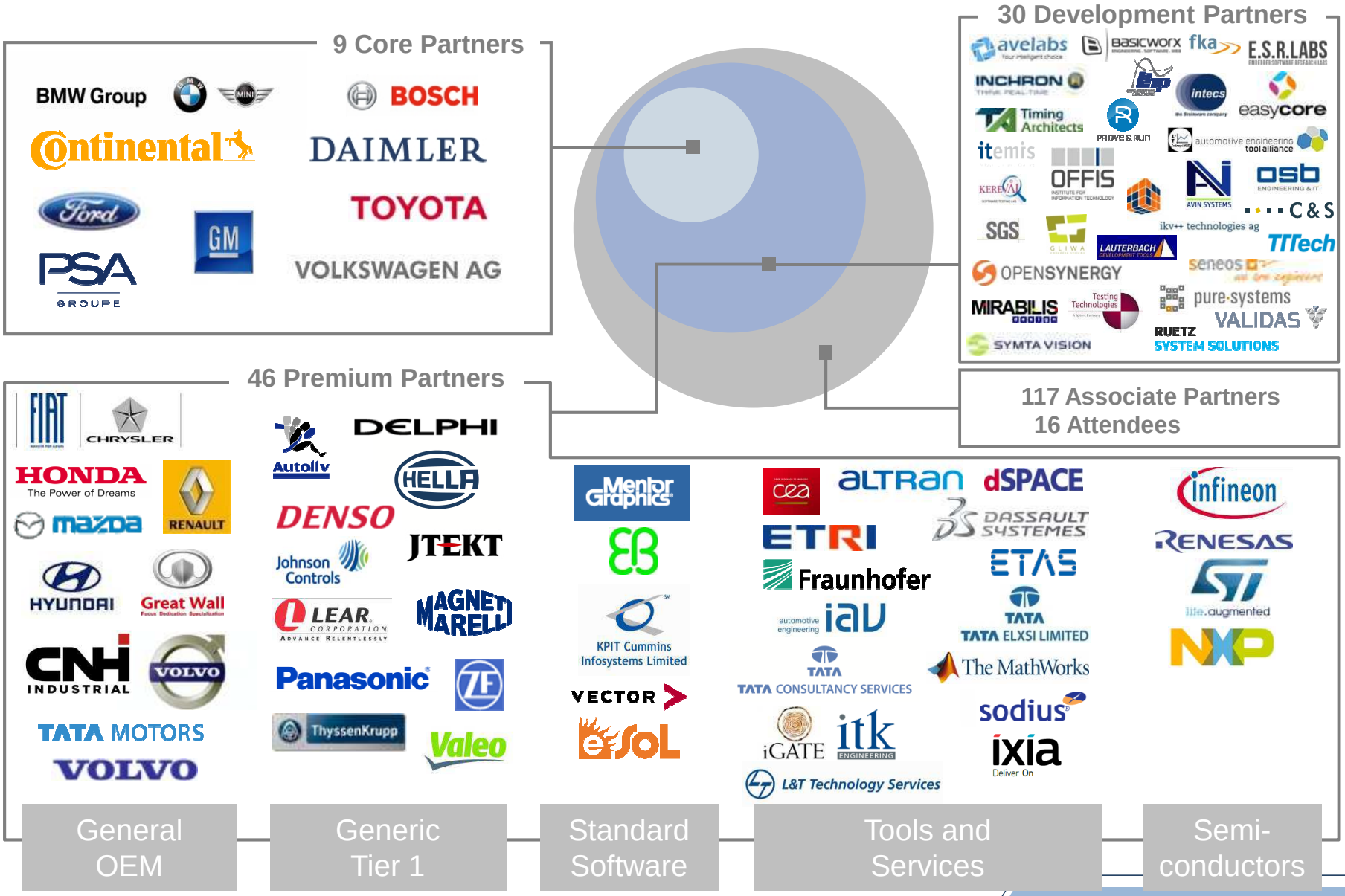
Aims and benefits of using AUTOSAR

AUTOSAR aims to standardize the software architecture of Electronic Control Units (ECUs). AUTOSAR paves the way for innovative electronic systems that further improve performance, safety and environmental friendliness.



- Hardware and software will be widely independent of each other.
- Development can be de-coupled by horizontal layers, reducing development time and costs.
- The reuse of software increases at OEM as well as at suppliers. This enhances quality and efficiency during development.

AUTOSAR – Core Partners and Partners (June 2016)



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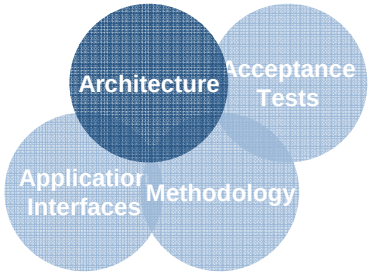
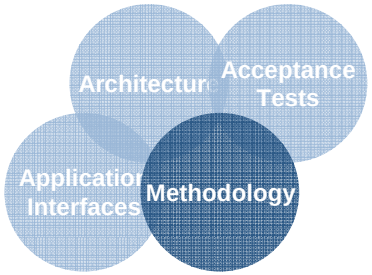
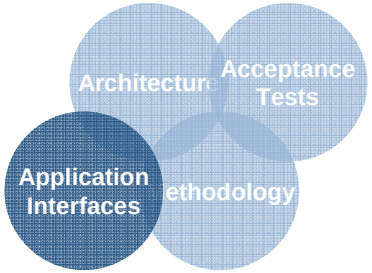
Main working topics



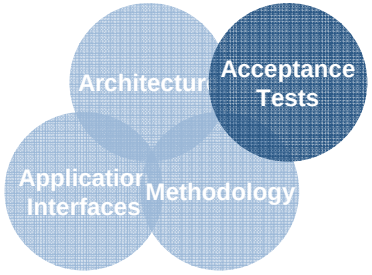
- **Architecture**
  Software architecture including a complete basic software stack for ECUs – the so called AUTOSAR Basic Software – as an integration platform for hardware independent software applications.



- **Methodology**
  Defines exchange formats and description templates to enable a seamless configuration process of the basic software stack and the integration of application software in ECUs. It includes even the methodology how to use this framework.

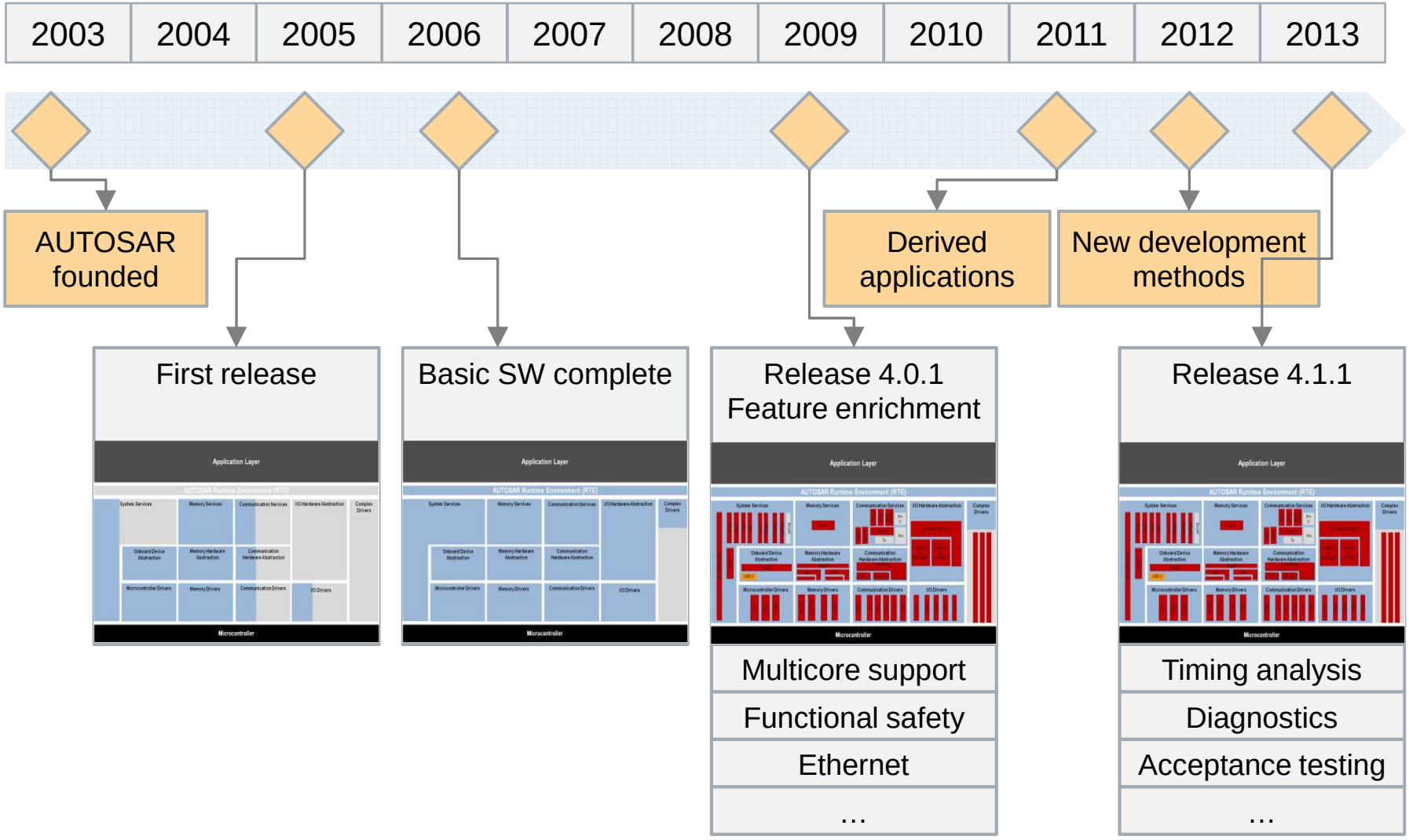


- **Application Interfaces**:
  Specification of interfaces of typical automotive applications from all domains in terms of syntax and semantics, which should serve as a standard for application software.



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

AUTOSAR achievements and outlook (1/2)
Milestones, just to name a few

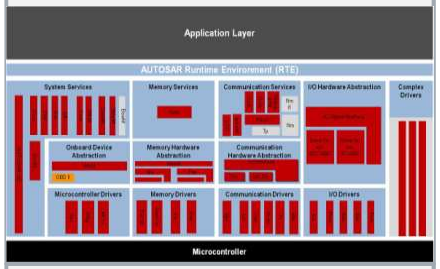


AUTOSAR achievements and outlook (2/2)
Milestones, just to name a few

2013	2014	2015	2016

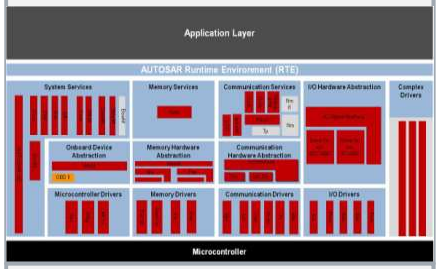
10 years of AUTOSAR
6th AOC, Nov 2013

Release 4.2.1



- Large data communication via Ethernet and CAN FD
- Integration of non-AUTOSAR systems
- …

Release 4.2.2



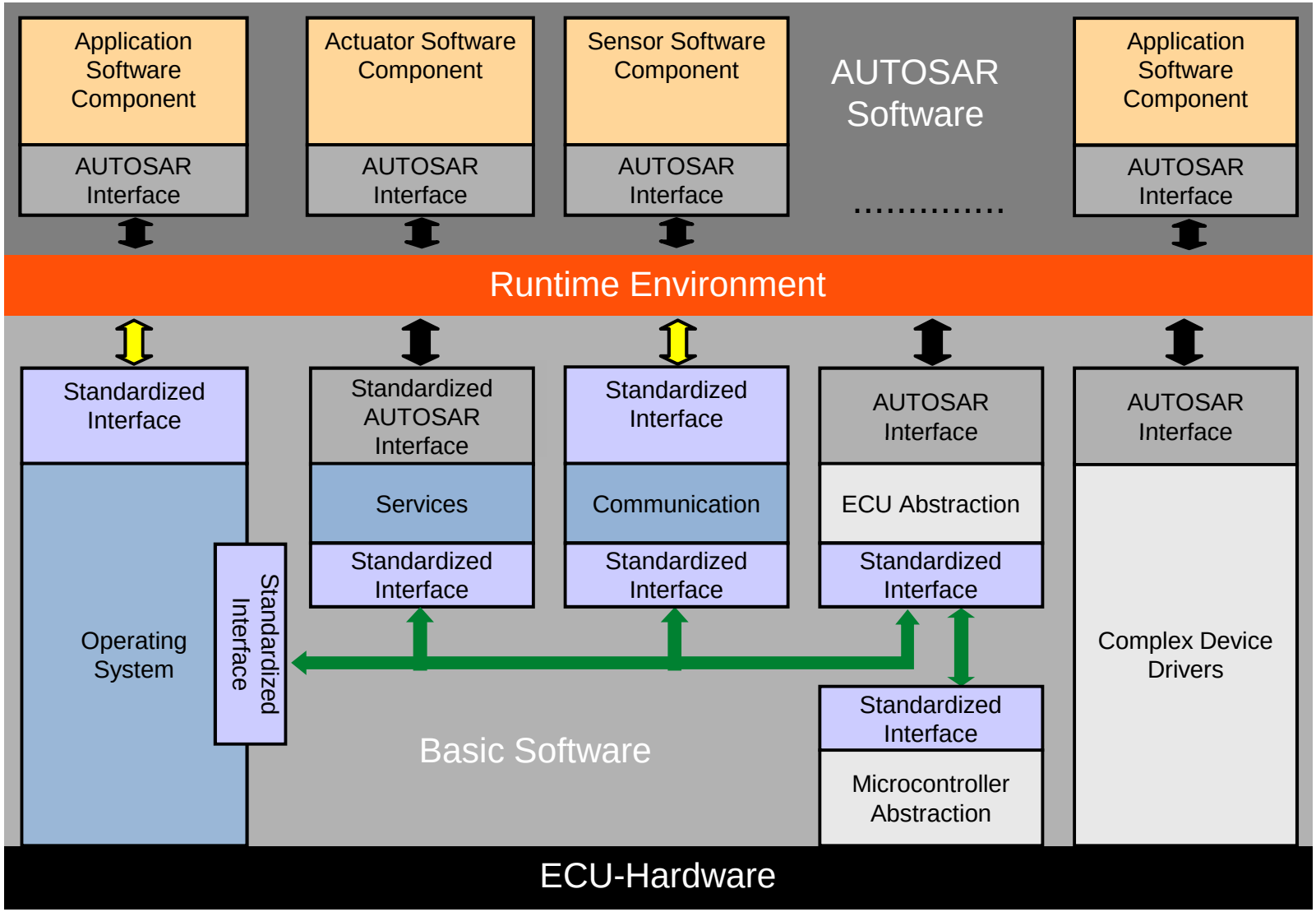
- CAN Flexible Data Rate
- Global time synchronization
- Sender Receiver Serialization
- …

Release 4.3.0

Long Term Objectives:

- Quality
- Maturity
- Backward compatibility
- Closing gaps
- Market needs
- Effort

Exploring AUTOSAR: software architecture



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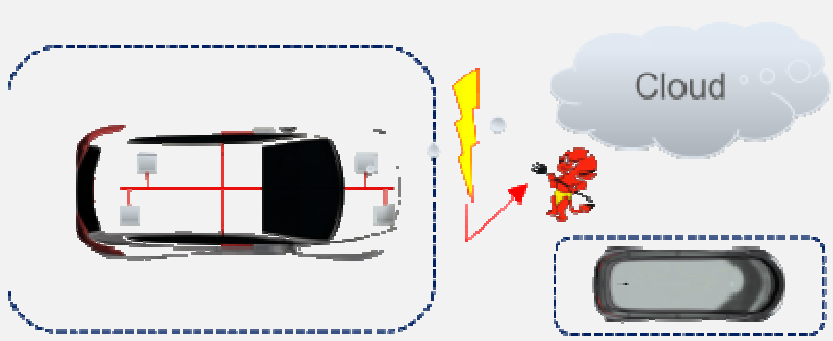
Starting Point: selected main drivers

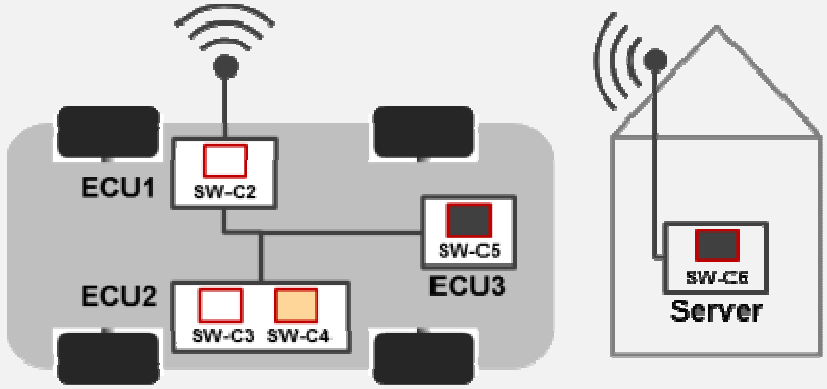
Main drivers for new automotive software systems have been determined.

Highly automated driving

Car-2-X applications



Vehicle in the cloud



Increased connectivity

Selected main drivers for new automotive software systems (1/4)

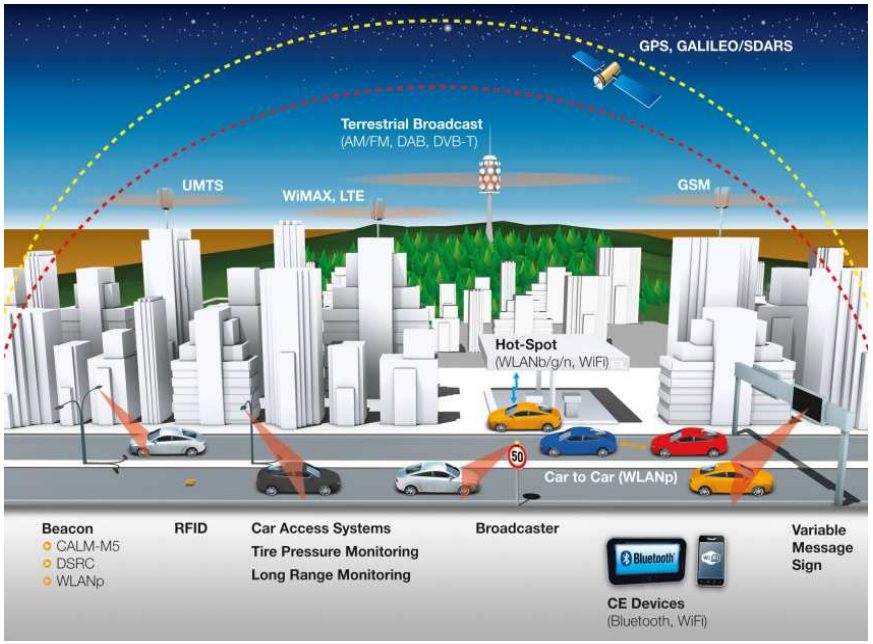
Highly automated driving will be on the road.

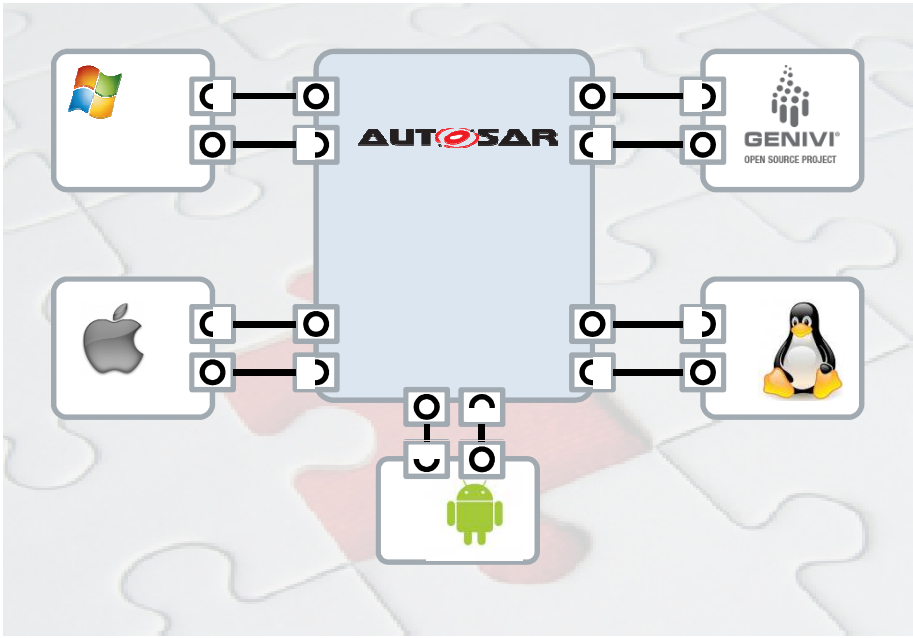
Use cases

- Support dependable systems including fail-operational systems
- Support of cross domain computing platforms
- Support of high-performance micro-controllers and computing
- Distributed and remote diagnostics
- …

Selected main drivers for new automotive software systems (2/4)

Car-2-X applications will require the interaction of vehicles and off-board systems.



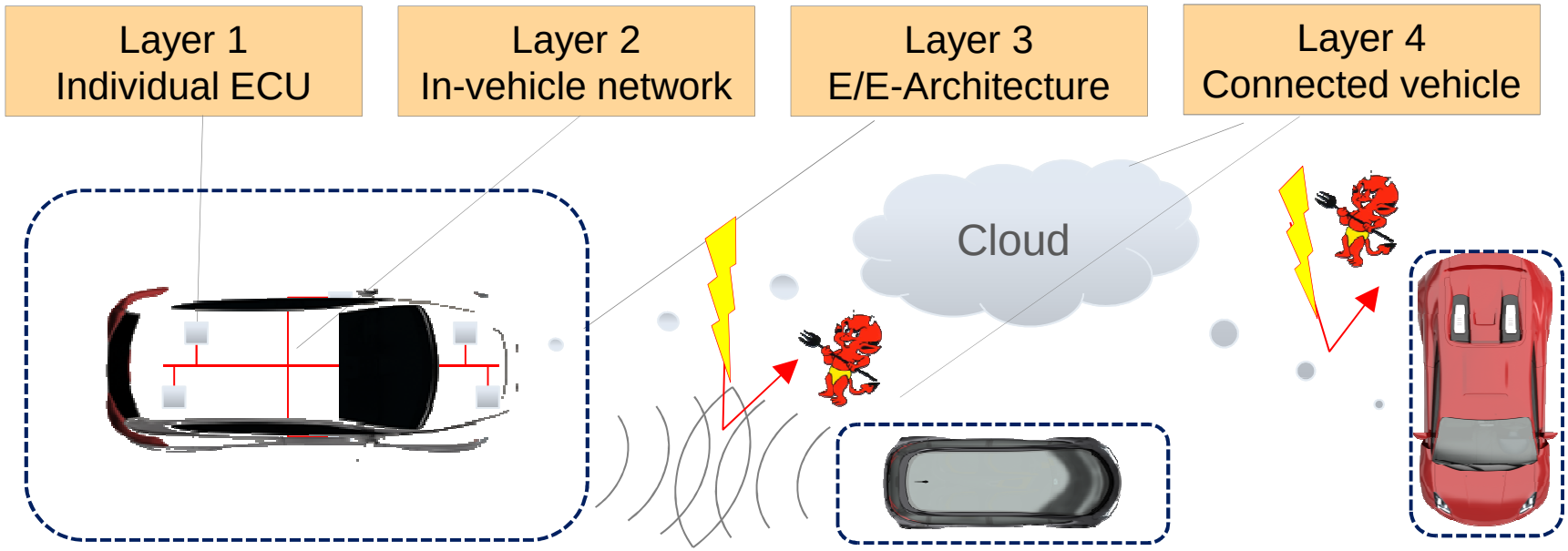


Use cases

- Support cloud interaction
- Software as product
- Integration of non-AUTOSAR systems
- …

Selected main drivers for new automotive software systems (3/4)

Vehicle in the cloud will require dedicated means for security.

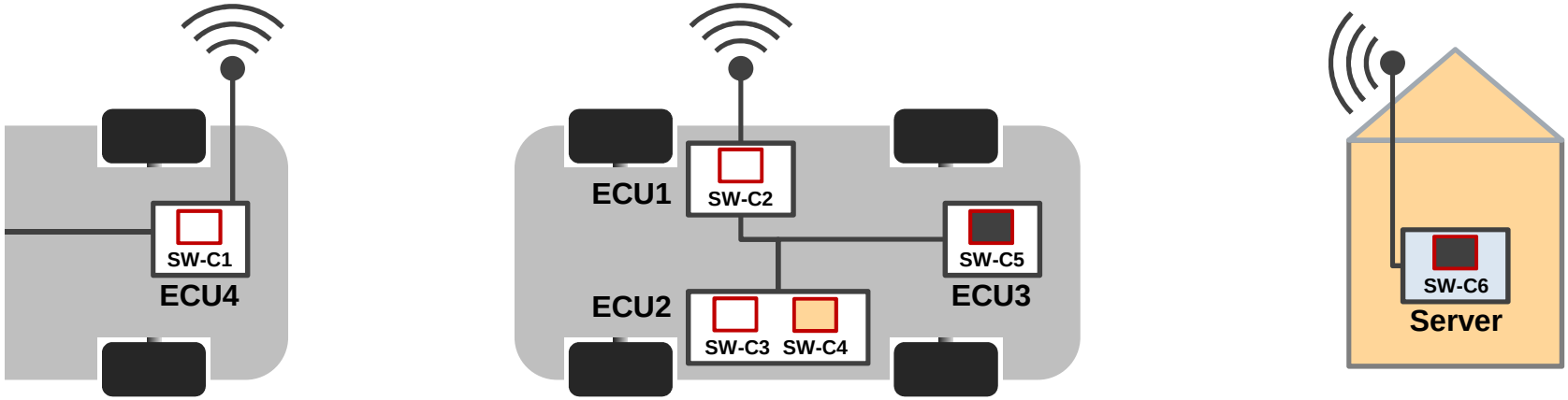


Use cases

- Secure on-board communication
- Security architecture
- Secure cloud interaction
- …

Selected main drivers for new automotive software systems (4/4)

Upcoming use cases will lead to a stronger interaction of automotive software systems.



Static application Dynamic application Car-2-X application

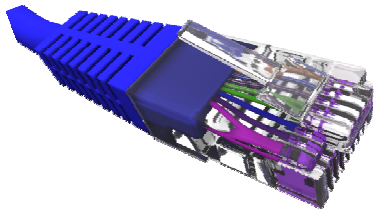
Use cases

- Consideration of non-AUTOSAR and off-board systems within methodology
- Dynamic deployment of software components
- Interaction with non-AUTOSAR and off-board systems

Technology Drivers

Ethernet

- High bandwidth
- Communication system is not limiting aspect any more
- Switched network
- Efficient point-to-point communication
- Efficient transfer of long messages



Processors

- Switch from microcontroller to processors with external memory (and maybe filesystems)
- Many core processors
- Parallel computing
- „Cheap“ availability of computing power

Heterogeneous architectures

- Special purpose processors

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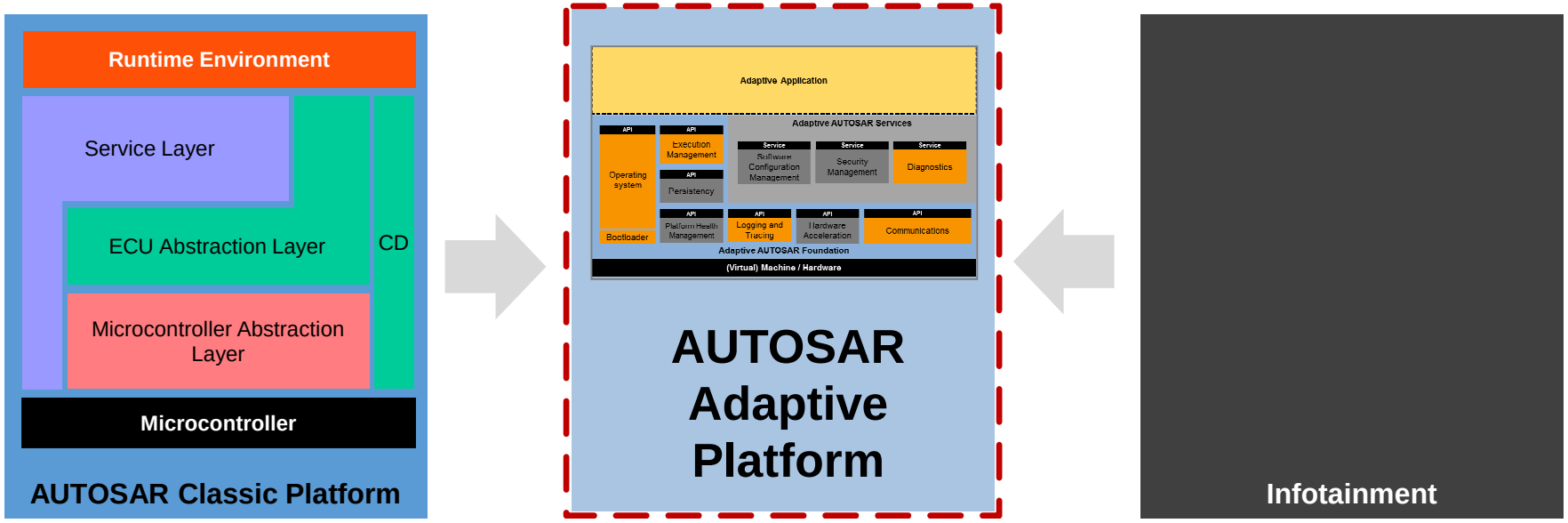
Another Platform for Different Applications

Real time requirements

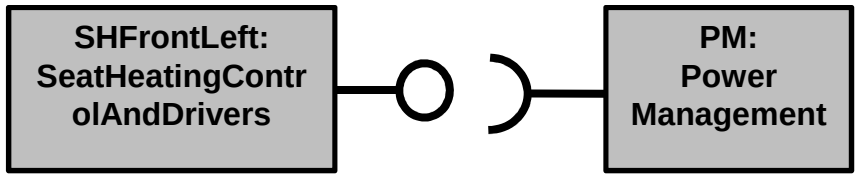
Safety criticality



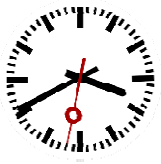
Computing power

AUTOSAR Adaptive Platform – characteristics

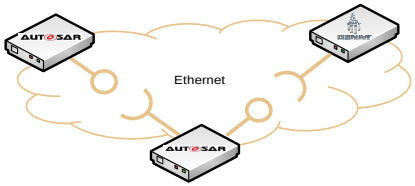
Application framework
- Support for run-time configuration
- Service-oriented communication
- Partial update



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

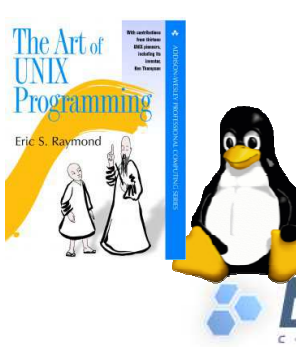


Support of different scheduling strategies



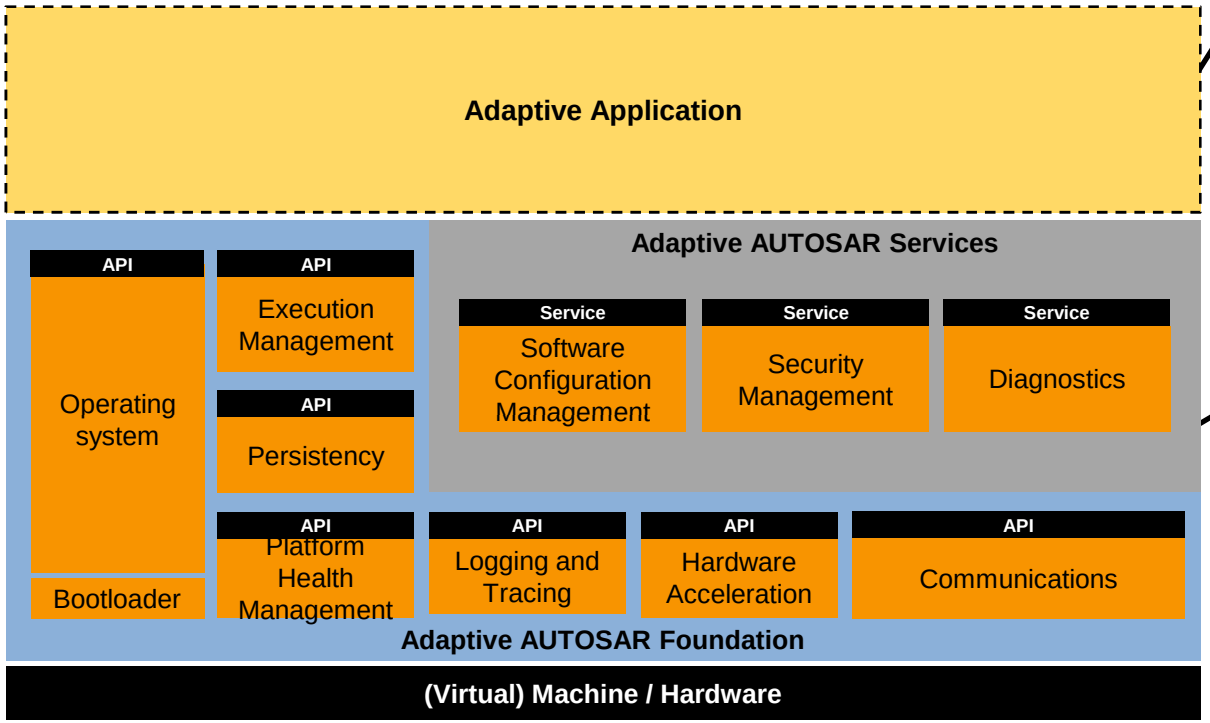
Planning of dynamic communication

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



… and many more

Architecture
Adaptive Platform level



Adaptive AUTOSAR API:
APIs and services exposed to Applications by functional clusters.

Adaptive AUTOSAR specification:
Behavior of software platform from Application and Network perspective.

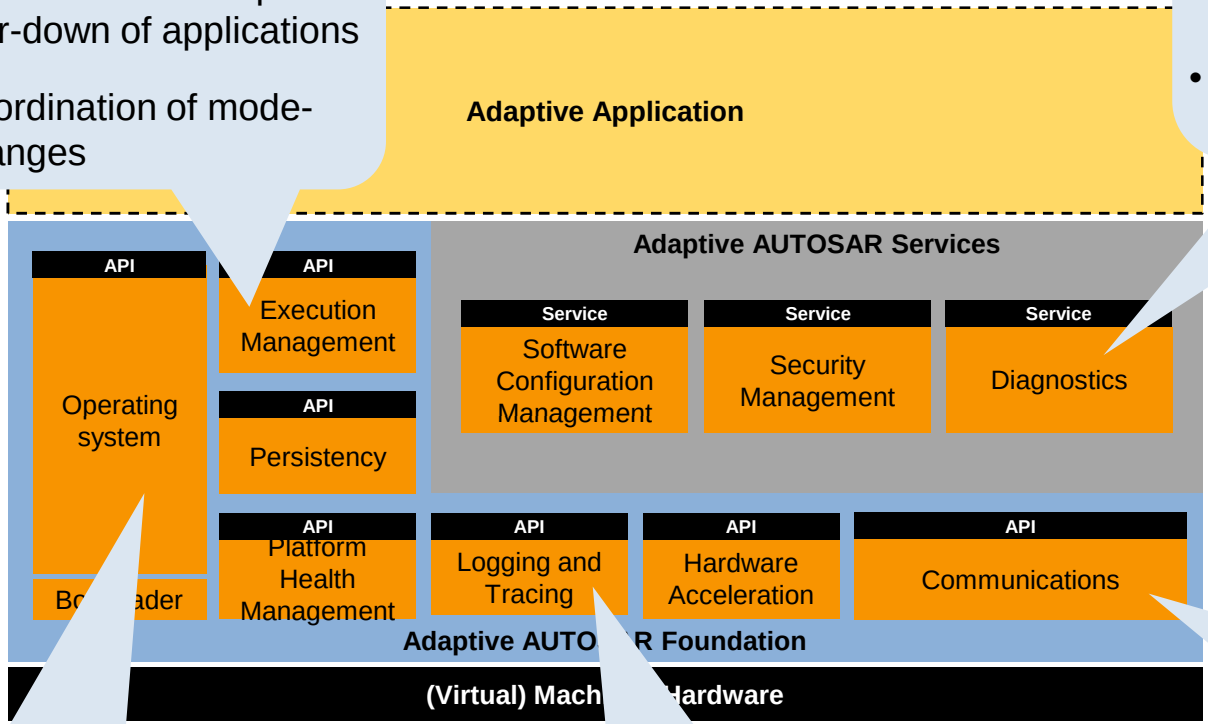
Organized in functional clusters, not specification of internal architecture!

Functional Clusters:

- Assemble functionalities of the Adaptive Platform
- Define clustering of requirements specification
- But, do not constrain the SW architecture of a platform implementation
  ➔ **No definition of modules**

Architecture
Adaptive Platform level – functional clusters

- Ordered and mode-aware startup and tear-down of applications
- Coordination of mode-changes



- Collection of diagnostic event data
- Data exchange with the diagnostic backend
- Provision of standardized diagnostic protocols

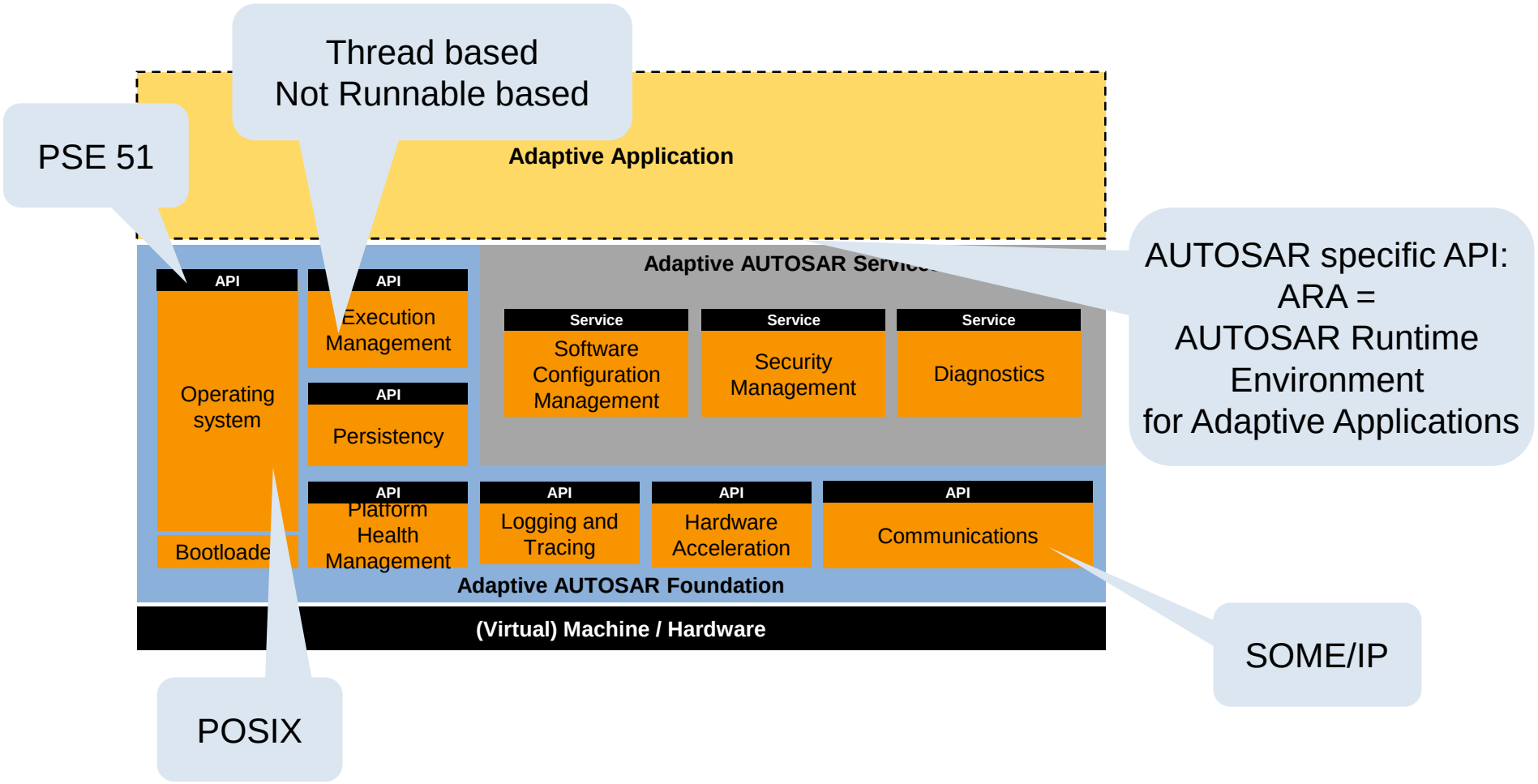
- Provision of isolated runtime environments for applications
- Standardized access to HW

Collection and distribution:

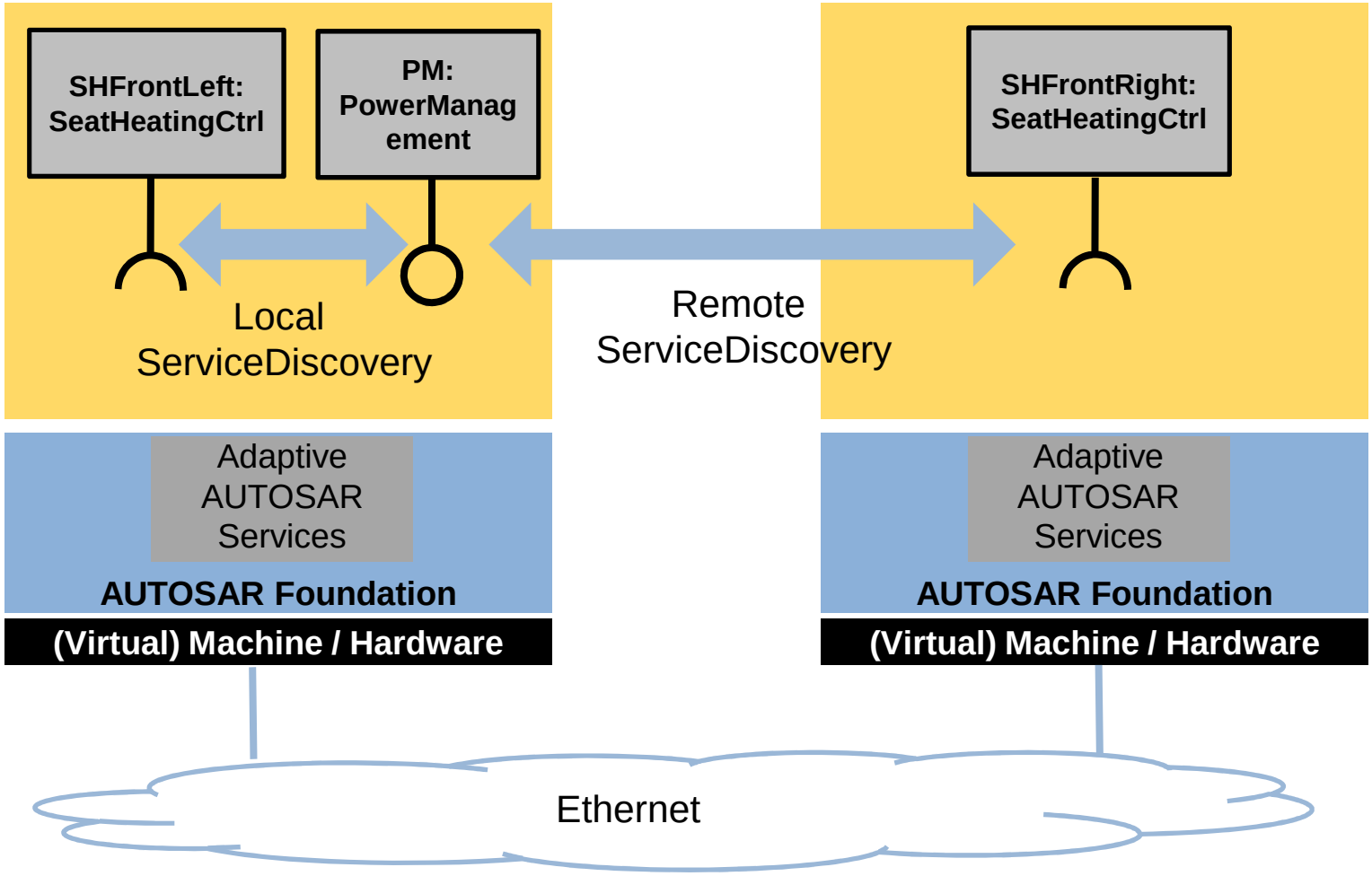
- Measurement data
- Setting of log level

- Construction and supervision of service based communication
- Local and remote

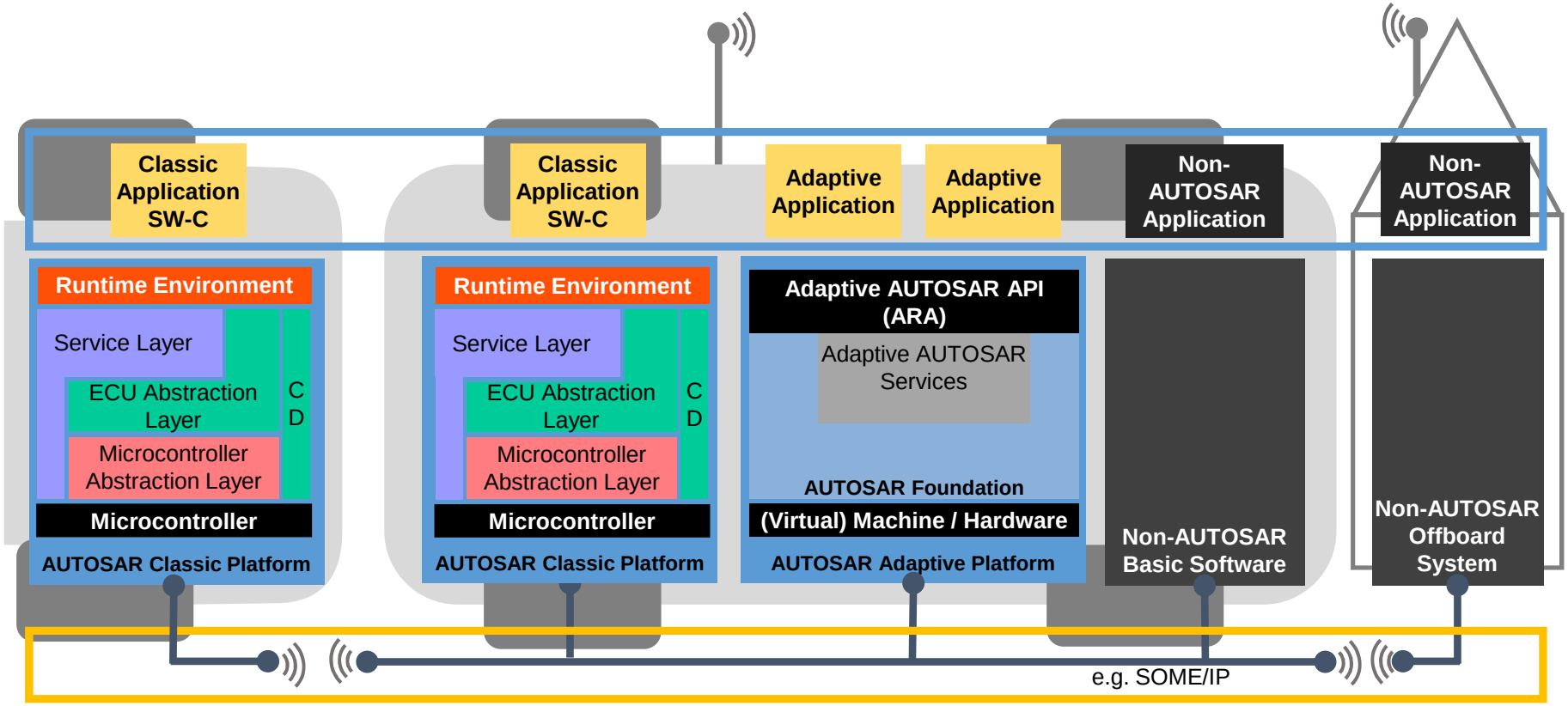
Architecture
Adaptive Platform level – most important technical decisions



Transparent Communication with Dynamic Topology



The Challenge: Integration of Different Platforms

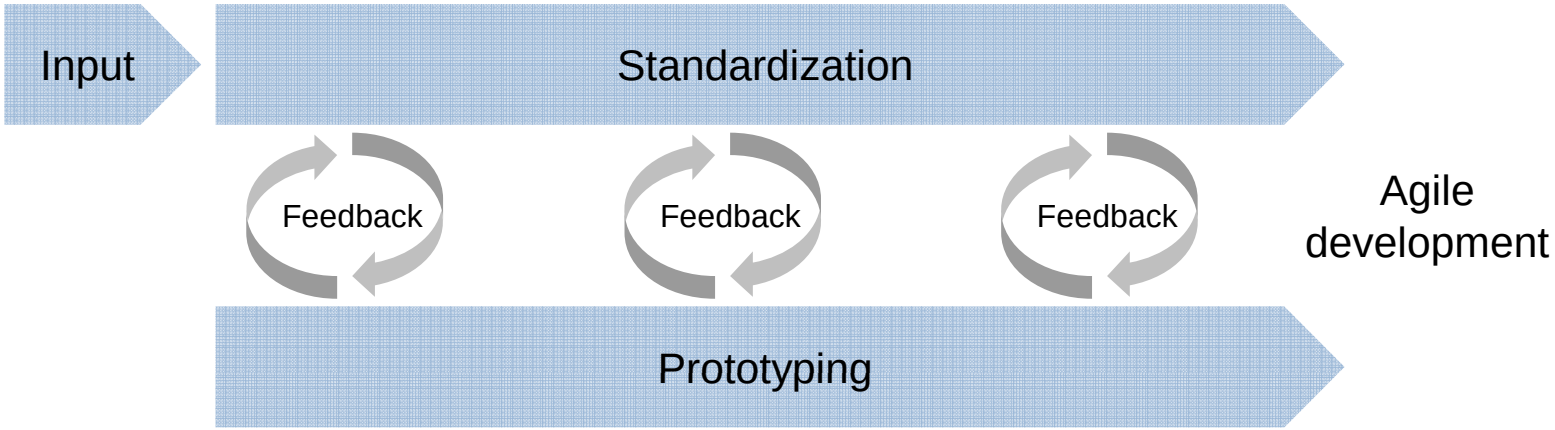


Software Abstraction

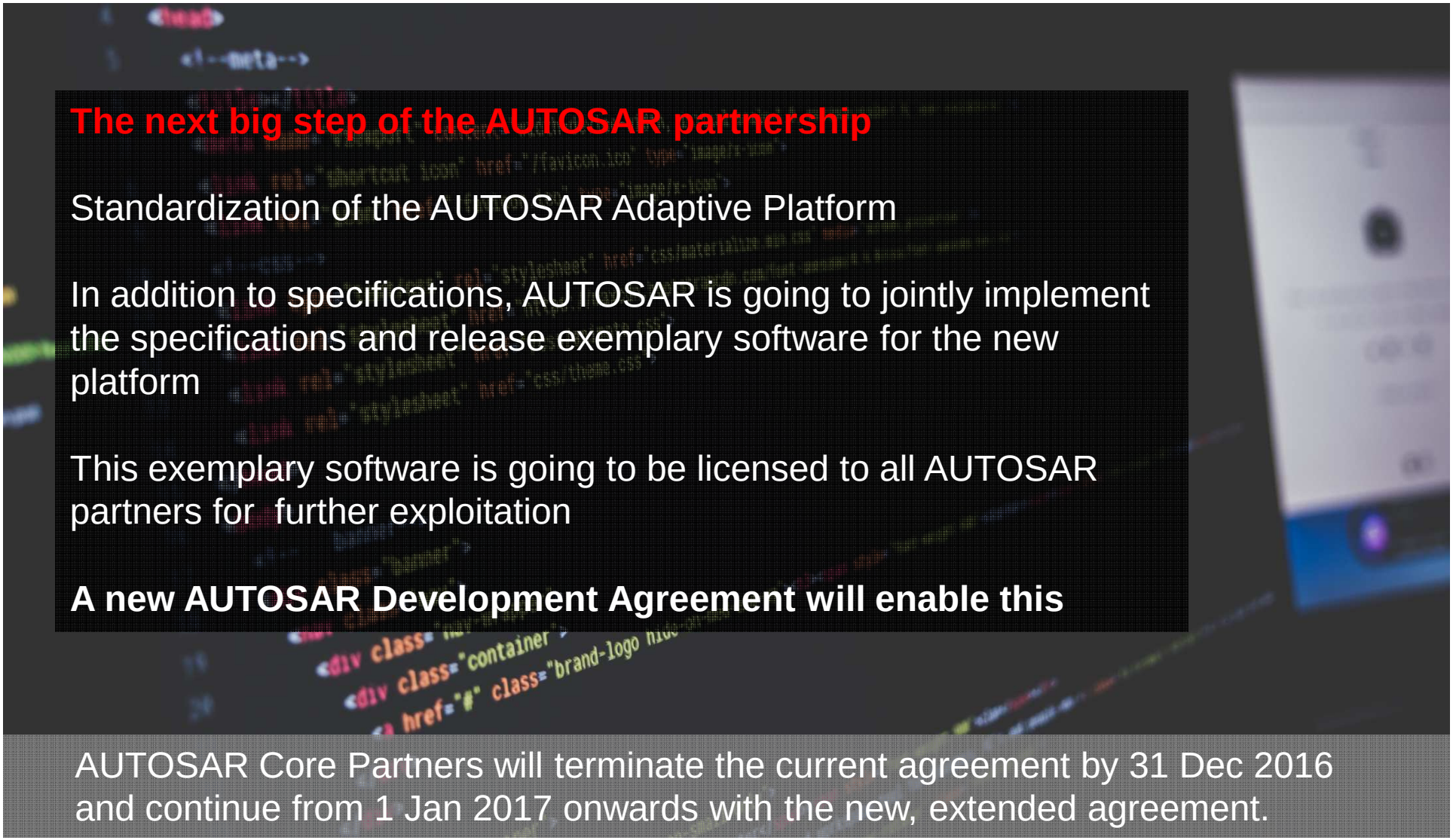
Common Bus Interface Specification

Standardization process and specification validation

Specifications will be validated in parallel with the standardization.



The future of AUTOSAR



The next big step of the AUTOSAR partnership

Standardization of the AUTOSAR Adaptive Platform

In addition to specifications, AUTOSAR is going to jointly implement the specifications and release exemplary software for the new platform

This exemplary software is going to be licensed to all AUTOSAR partners for further exploitation

A new AUTOSAR Development Agreement will enable this

AUTOSAR Core Partners will terminate the current agreement by 31 Dec 2016 and continue from 1 Jan 2017 onwards with the new, extended agreement.

The AUTOSAR Core Partners are fully committed to standardization of AUTOSAR Adaptive Platform.
All partners are asked to renew their membership!

Number-crunching algorithms and high interconnectivity are the demands of future technologies. The Adaptive Platform is exactly what we need.

New requirements call for new solutions. AUTOSAR will provide the optimal standard for car-2-x communication and highly automated driving.

AUTOSAR will be a key success factor for future challenges in automotive E/E.

AUTOSAR is a key enabler on the way to the self-driving car.

Our aim is to provide extensive connectivity to our customers. AUTOSAR will be the basis for that.

AUTOSAR is our standard of choice for realizing new technologies such as autonomous driving and interconnectivity.

AUTOSAR is in a good position for future developments in the fields of connectivity as well as highly automated driving.

AUTOSAR a worldwide standard, but we don't want to stop there. We see AUTOSAR well prepared for the new demands of the market.

AUTOSAR enabled increased flexibility by still decreasing costs. We are fully committed to AUTOSAR and to its existing and new architecture.

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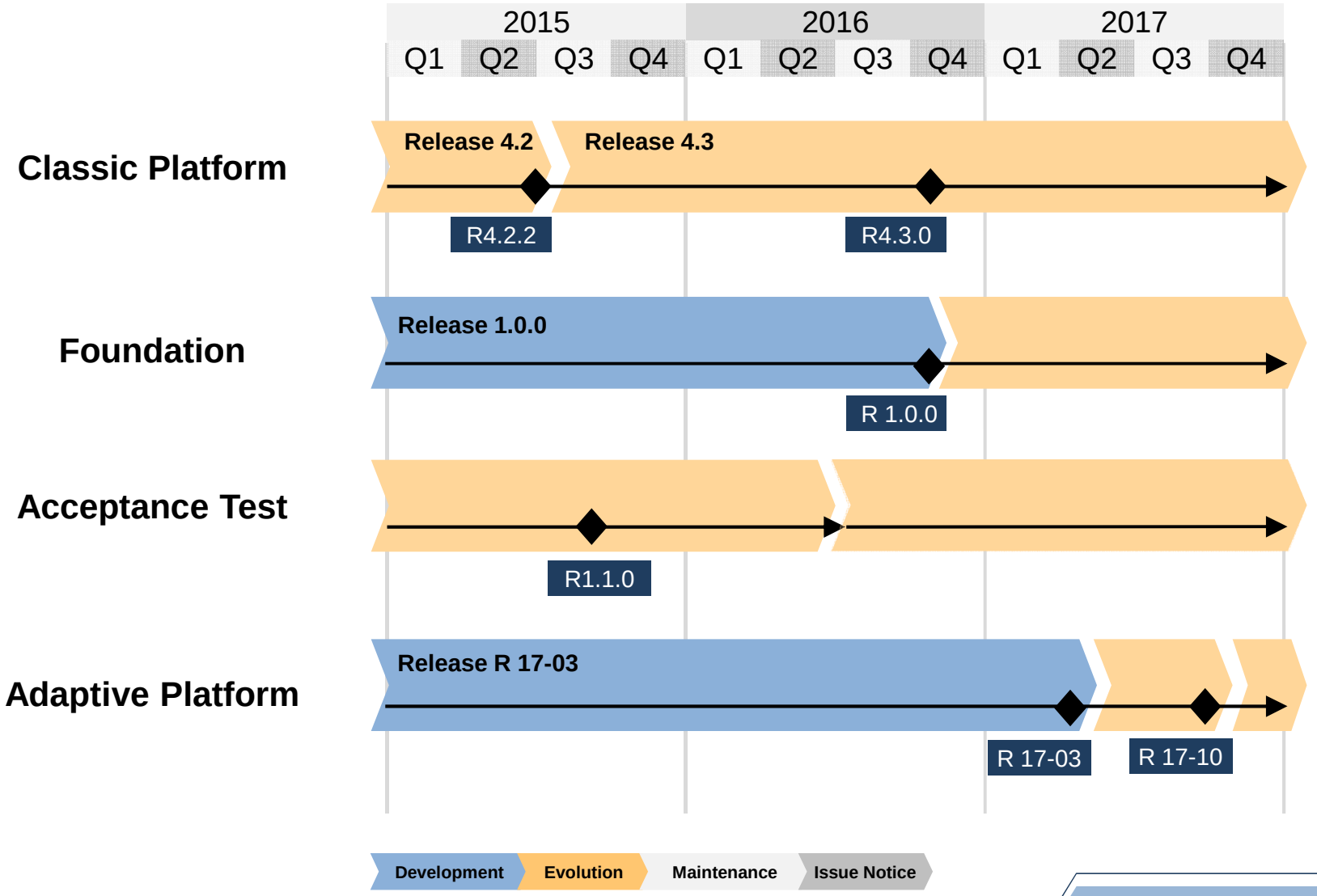
Releases and revisions of AUTOSAR



Summary

Achievements

- Established a worldwide software standard focusing on automotive applications
- Classic Platform is massively used in series production

AUTOSAR Standards

- Already launched: AUTOSAR Classic Platform and AUTOSAR Acceptance Tests
- Planned for 2016/17: AUTOSAR Foundation and AUTOSAR Adaptive Platform

Future of AUTOSAR

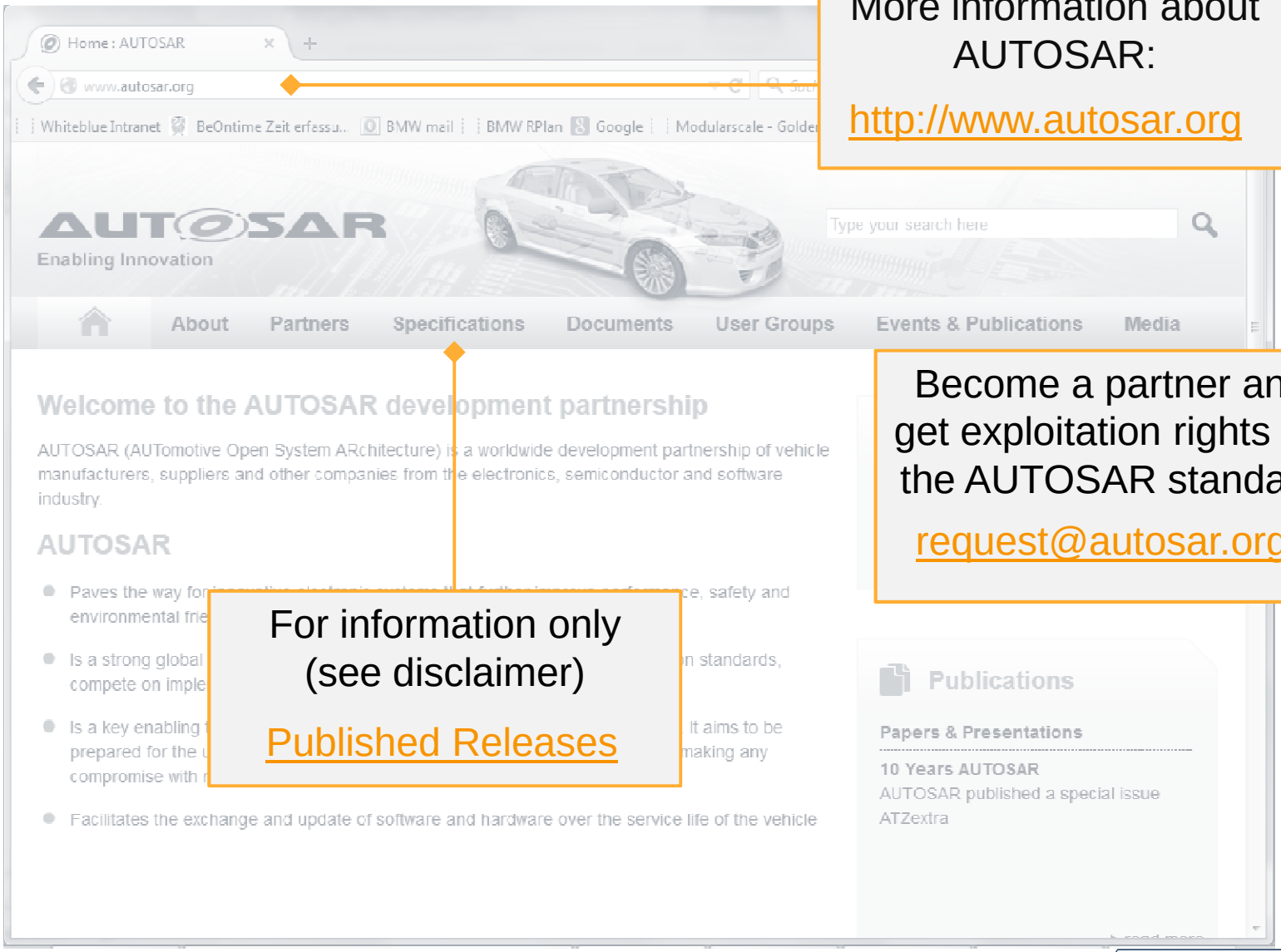
- Improvement and stabilization of existing standard
- Anticipate the future by providing the next generation of platform software
- Creation of new eco-systems by new collaboration models

AUTOSAR will continue to be THE creator of automotive software standards.

More information available online

More information about AUTOSAR:

http://www.autosar.org



For information only (see disclaimer)

Published Releases

Become a partner and get exploitation rights for the AUTOSAR standard

request@autosar.org