

▶▶ AUTOSAR Trends around the Globe

8th AUTOSAR Open Conference
2015-10-29

Agenda

► **Exploitation of AUTOSAR**

Communication Trends

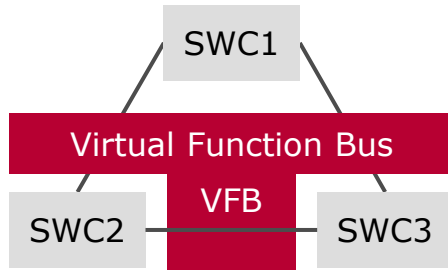
Functional Safety

Security

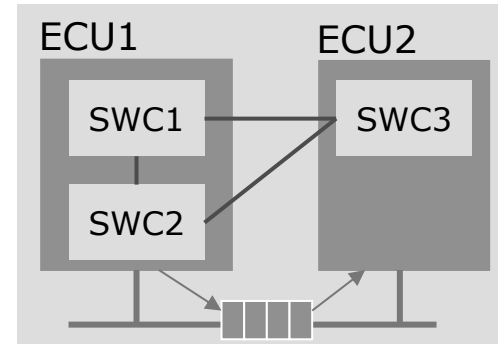


AUTOSAR Methodology

SW functionality of the vehicle is defined as a system of SWCs ...



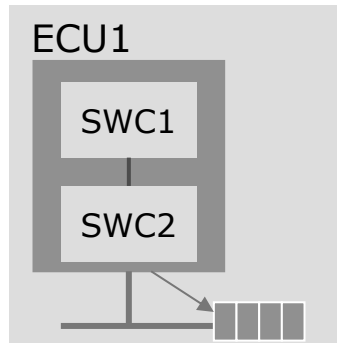
... SWCs are mapped to ECUs



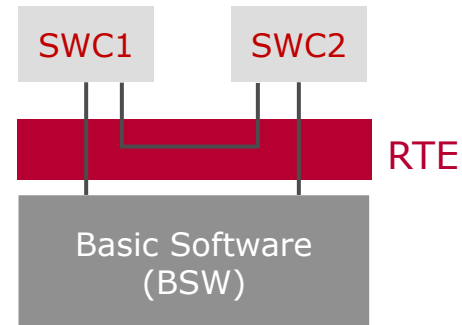
System Description*

Software Component Description*

An extract is created for each ECU...



The complete ECU is configured in detail



Extract of System Description*

ECU Configuration Description (ECUC)*

Basic Software (BSW)

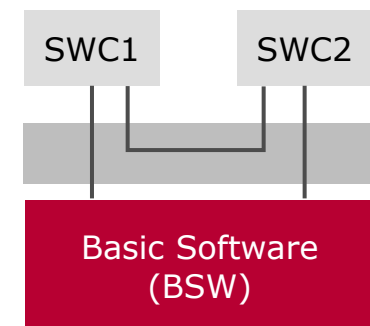
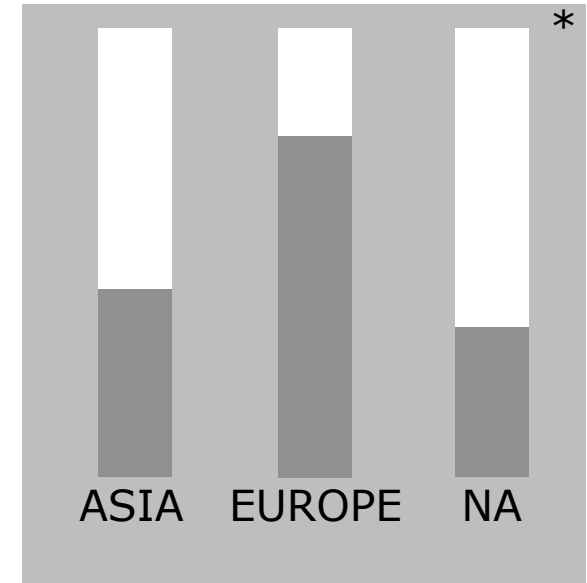
BSW is typically the 1st step to AUTOSAR

► Reasons to use AUTOSAR BSW

- New network protocols
- New suppliers
- New domains
- New platform

► Often **migration** from legacy applications

- Without RTE
- Configuration via legacy formats (DBC, LDF, FIBEX)



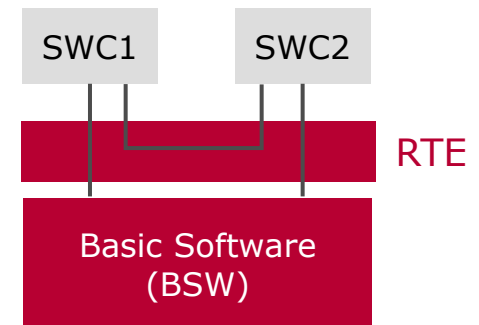
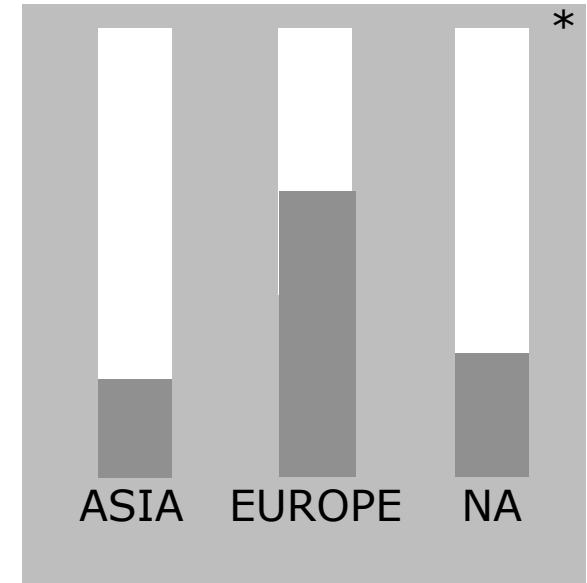
Runtime Environment (RTE)

Usage of RTE is increasing

► Reasons to use RTE

- Distributed development of SWCs
 - > SWCs from Tier1
 - > SWCs from OEM
 - > SWCs from 3rd party (specialized SW-companies)
- Use of partitioning concepts for
 - > MultiCore
 - > Safety (different MPU regions)
- Model-based development

- Use of RTE is key to benefit from AUTOSAR
- Overhead is typically less than expected

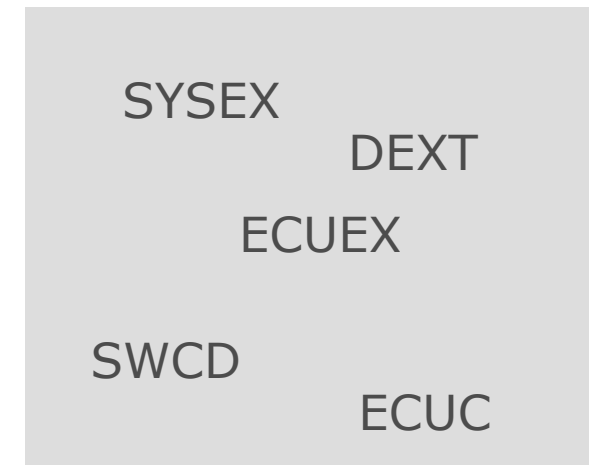
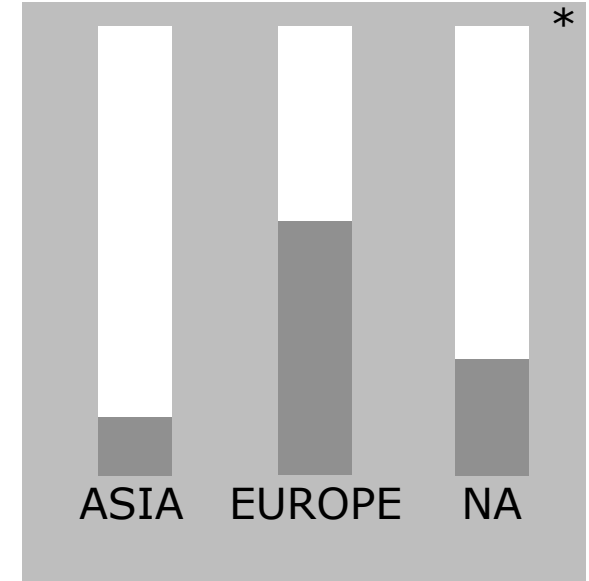


*Vector's evaluation based on OEM usage

Data Formats

Formal descriptions are more and more used

- ▶ **Communication** (SystemExtract)
 - ▶ FlexRay and Ethernet speed up usage
 - ▶ Gateway due to better configuration support
- ▶ **Diagnostics** (DiagnosticExtract)
 - ▶ Supports decentralized development
 - ▶ Pre-configuration of OEM requirements
- ▶ **Application** (SoftwareComponentDescription)
 - ▶ Most MBD tools support AUTOSAR
 - ▶ Benefit from optimized deployment
 - ▶ Support of virtual targets/simulations

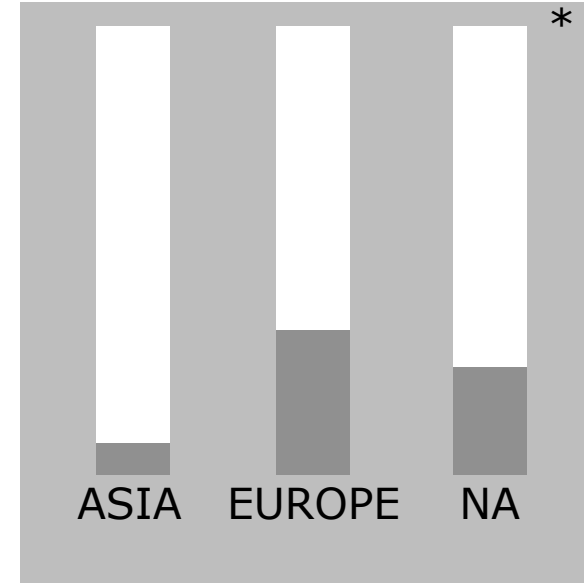


*Vector's evaluation based on OEM usage

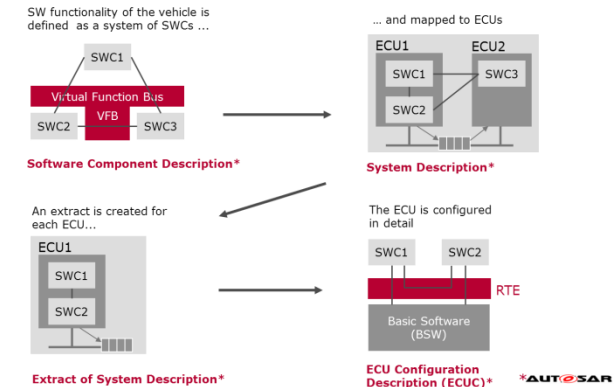
Development Methodology

Usage is still quite low

- ▶ Elements / benefits:
 - ▶ Full function oriented development by OEM
 - ▶ Distribution of OEM standardized SWCs for each vehicle project with an optimized mapping of SWCs to ECUs
 - ▶ Supplier can reuse his application software (SWCs) for several OEMs



- ▶ Big change in methods and organization
- ▶ **But only with this step the complete potential of AUTOSAR can be used !**



*Vector's evaluation based on OEM usage

▶▶ Agenda

Exploitation of AUTOSAR

▶ **Communication Trends**

Functional Safety

Security



Automotive Ethernet

▶ Drivers in different domains

▶ Diagnostics

- > Fast ECU re-programming

▶ ADAS and backbone

- > Demand for higher bandwidth
- > Synchronized/deterministic transmission

▶ Multimedia

- > Audio/Video Bridging

▶ Connectivity

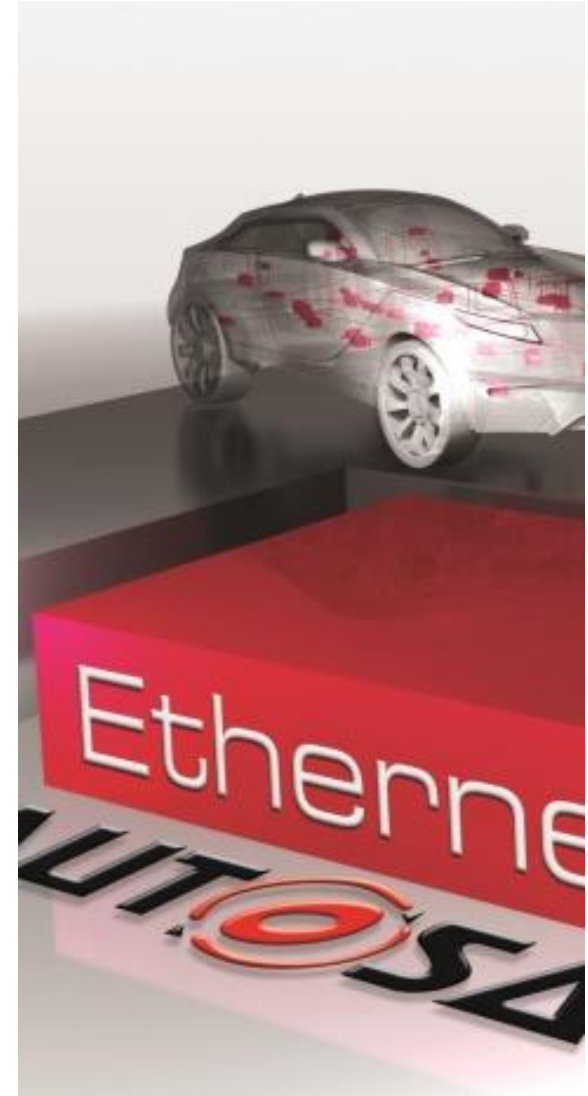
- > TCP/IP as the universal protocol

▶ AUTOSAR Ethernet provides

→ More bandwidth

→ New communication principles

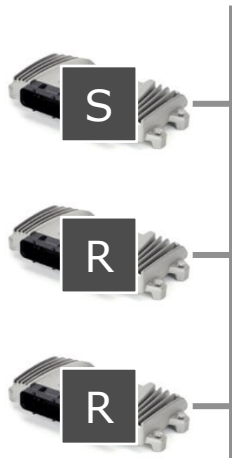
- > not a bus but actively switched network
- > new addressing (unicast)
- > serialization of data structures
- > service oriented communication



Ethernet - Not a bus but actively switched network

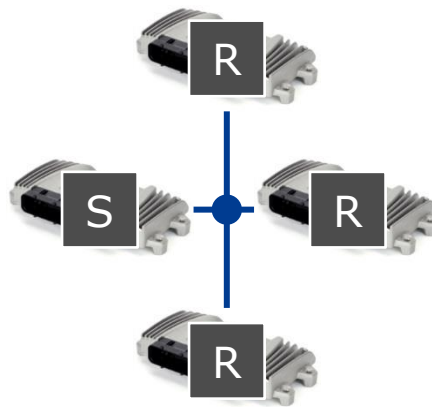
CAN (FD)

- ▶ Bus
- ▶ Broadcast



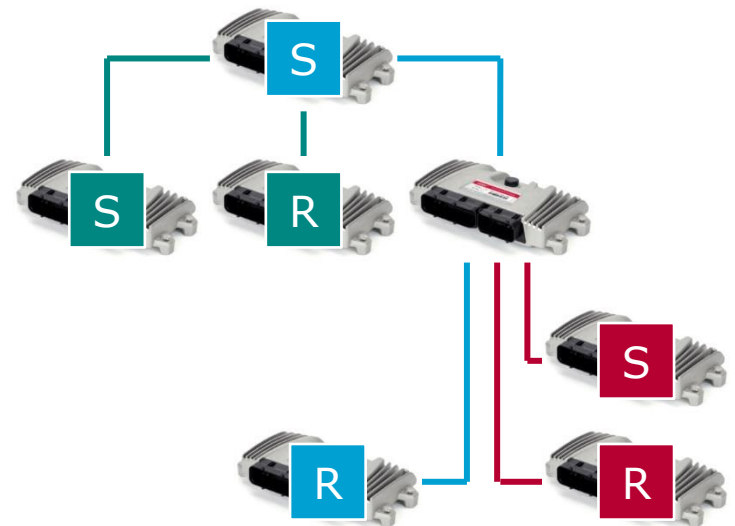
FlexRay

- ▶ Active Star
- ▶ Broadcast



Ethernet

- ▶ Fully switched network (point-to-point)
- ▶ Unicast
- ▶ Multicast and broadcast

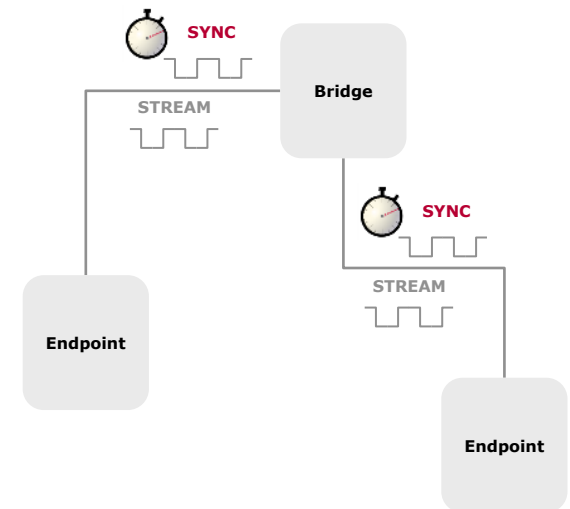


S Sender **R** Receiver

Automotive Ethernet – beyond AUTOSAR

▶ TSN - Time Sensitive Networks

- ▶ AVB (e.g. for synchr. video transmission)
 - > Time synchronization
 - > Bandwidth reservation
 - > Worst-case latency presetting (2,000 μ s)
- ▶ and beyond AVB (FlexRay like features)
 - > Deterministic communication (time-based scheduling)
 - > Very low transmission latency (100 μ s)
 - > High availability of clock data



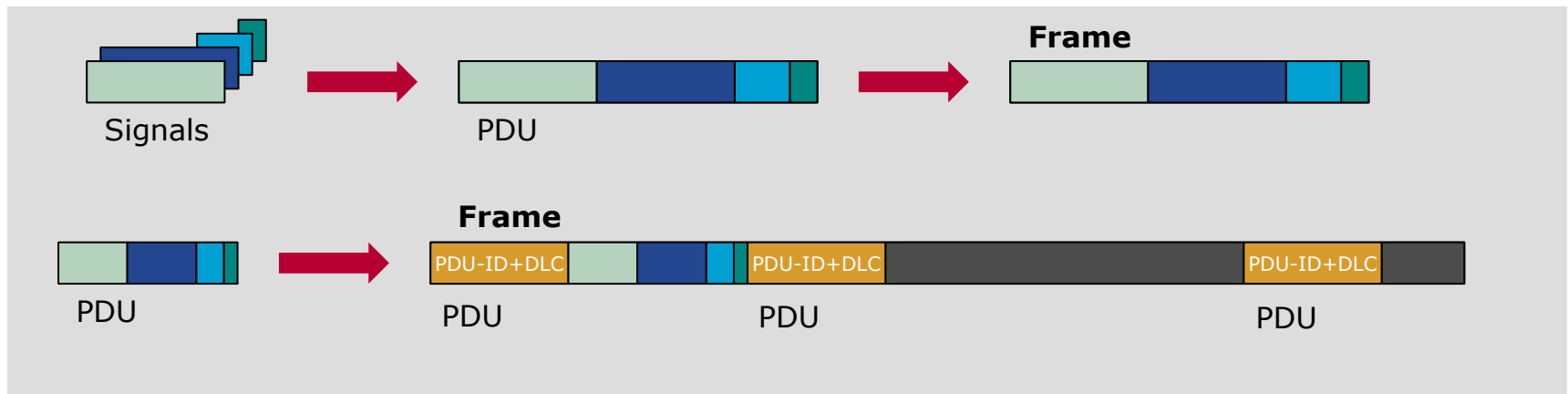
CAN FD / Container PDU

▶ **CAN FD**

- ▶ CAN FD starts to supplement/replace CAN
- ▶ Faster reprogramming is often the driver
- ▶ Higher bandwidth

▶ **... allows usage of Container PDU**

- ▶ New communication abstraction:
 - > vehicle wide PDU definition
- ▶ Increases flexibility in function deployment

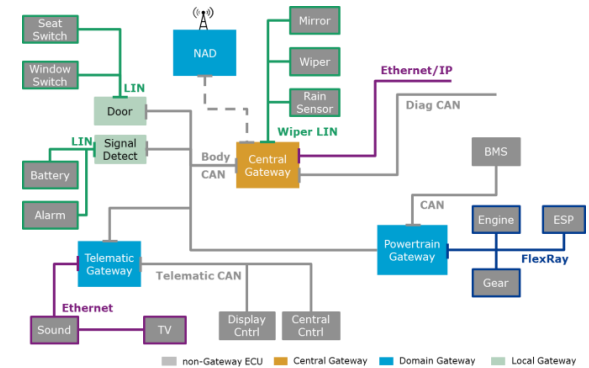
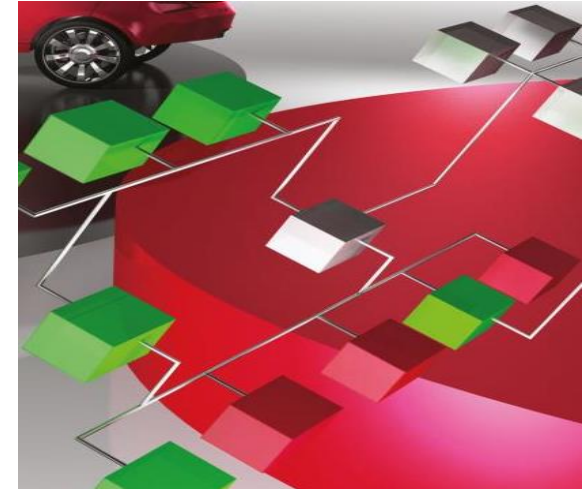


Gateway

- ▶ **Trend on gateway is based on**
 - ▶ Much higher data rates
 - ▶ More complex topologies
 - ▶ New bus-systems

- ▶ **High performance gateways can be realized with AUTOSAR**
 - ▶ Routing on different levels
 - ▶ Postbuild supported (loadable/selectable)
 - ▶ Avoidance of double buffering

- ▶ **Additional functionalities possible**
 - ▶ Firewall
 - ▶ Data collector
 - ▶ Ethernet mirroring



Agenda

Exploitation of AUTOSAR

Communication Trends

▶ **Functional Safety**

Security



Functional Safety Concepts are accepted and used

► Evolution of Safety Concepts

1. **Low end** solutions (without MPU or ECC)
2. **Partitioning** for mixed-criticality systems
 - > Typical approach today
 - > Restart of partitions increases availability
3. **Complete ASIL BSW**
 - > Speedup of ASIL/ASIL communication
 - > Less complex – higher availability
4. **Fail operational** systems
 - > Redundancy concepts provided on system level

► Safety will develop

- update of ISO 26262 planned for 2018
- Improved safety analysis
- Safety for trucks / motorcycles
- Inclusion of semiconductor aspects
- Usage of partitions and multicore to increase availability

Asia:

JASPAR activities

Europe:

Driving ISO26262 revision

NA:

Legislation (NHTSA) activities



Agenda

Exploitation of AUTOSAR

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Functional Safety

▶ **Security**



Protection Against Risks from Malicious Actions

▶ **State-of-the-art usage in AUTOSAR**

- ▶ Access protection in diagnostics
- ▶ Signatures for software download

▶ **New technologies & methods in AUTOSAR**

- ▶ Secure Onboard Communication (SecOC)
- ▶ Policy management (AUTOSAR concept)
- ▶ Crypto interface (AUTOSAR concept)
 - > HW acceleration
 - > Key management
 - > Certification handling
 - > Random generator

▶ **Upcoming topics**

- ▶ Protection against remote cyberattacks
 - > Firewalls
 - > Intrusion detection/prevention
- ▶ Secure Offboard Communication
 - > VPN, TLS

Asia:

starting JASPAR activities

Europe:

Rising number of technical security consulting requests

NA:

Legislative and standardization activities
(SAE J3061)



Summary



We observe a significant increase in 2015 in all markets ...

... higher penetration will gain even more benefit



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