

▶▶ **AUTOSAR Overview**

Agenda

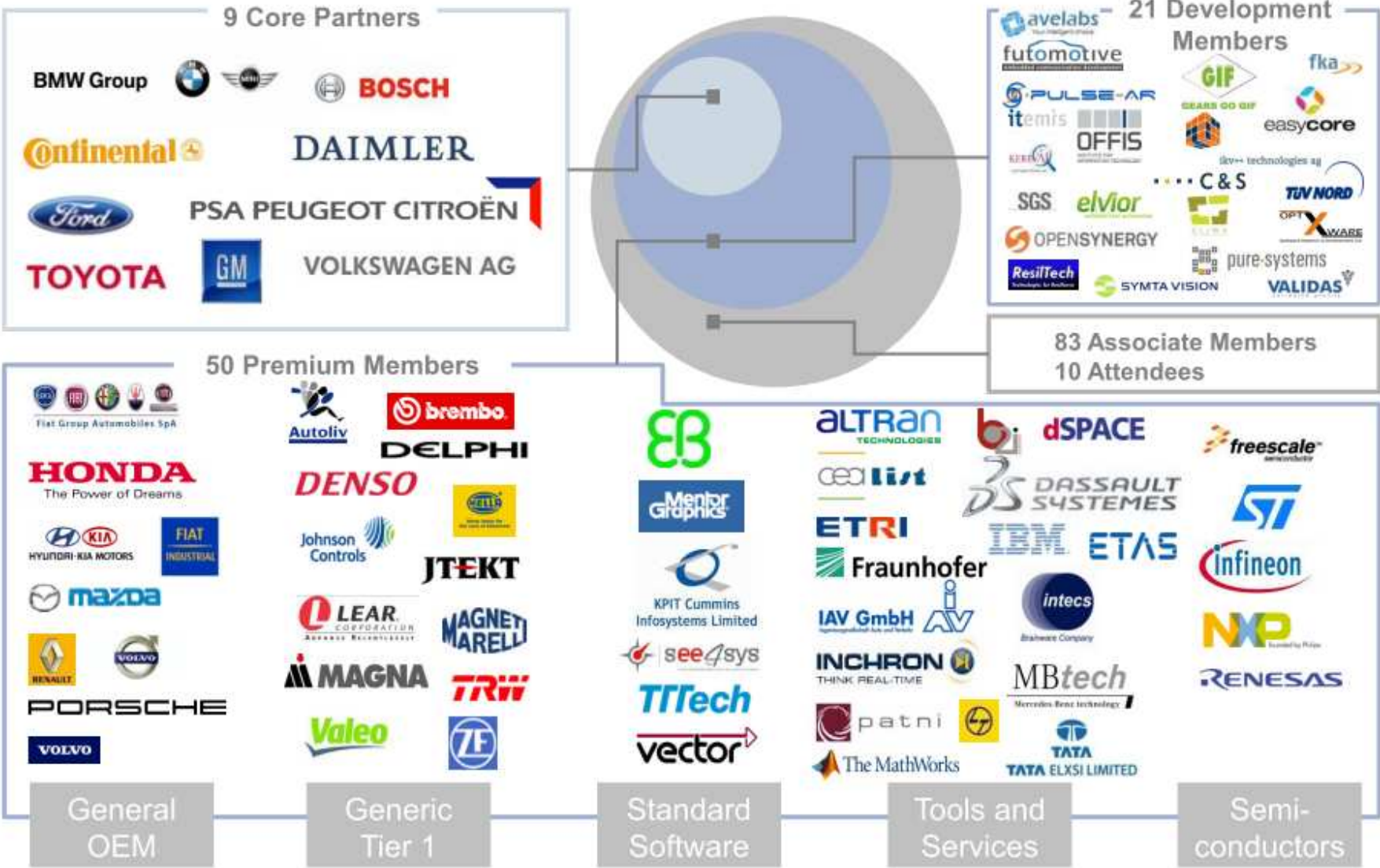
> AUTOSAR Overview

AUTOSAR Solution

AUTOSAR on the way

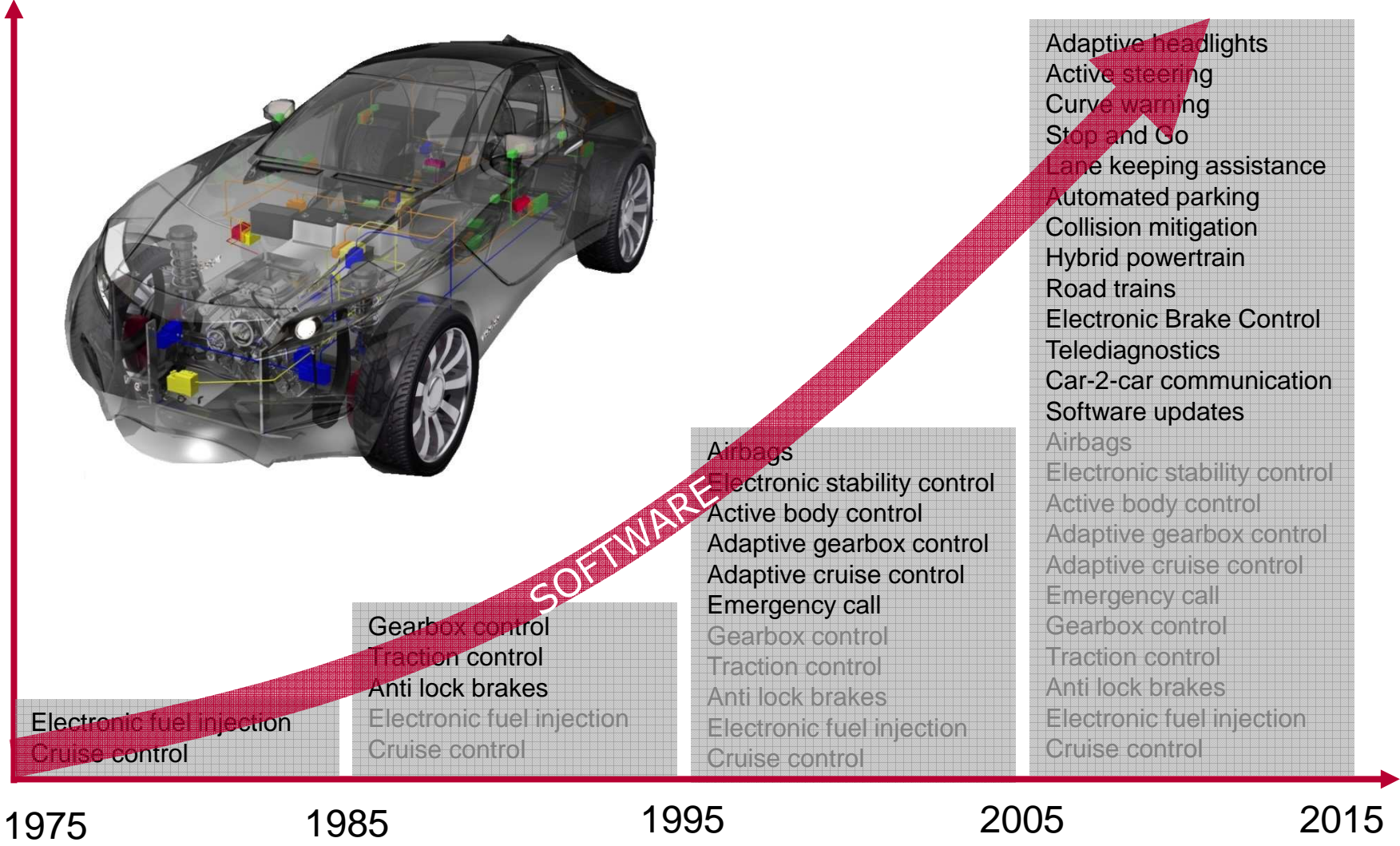
Overview and Objectives

AUTOSAR Partnership



Development of Functionality

>80% of automotive innovations are based on software



Why AUTOSAR?

The challenge:

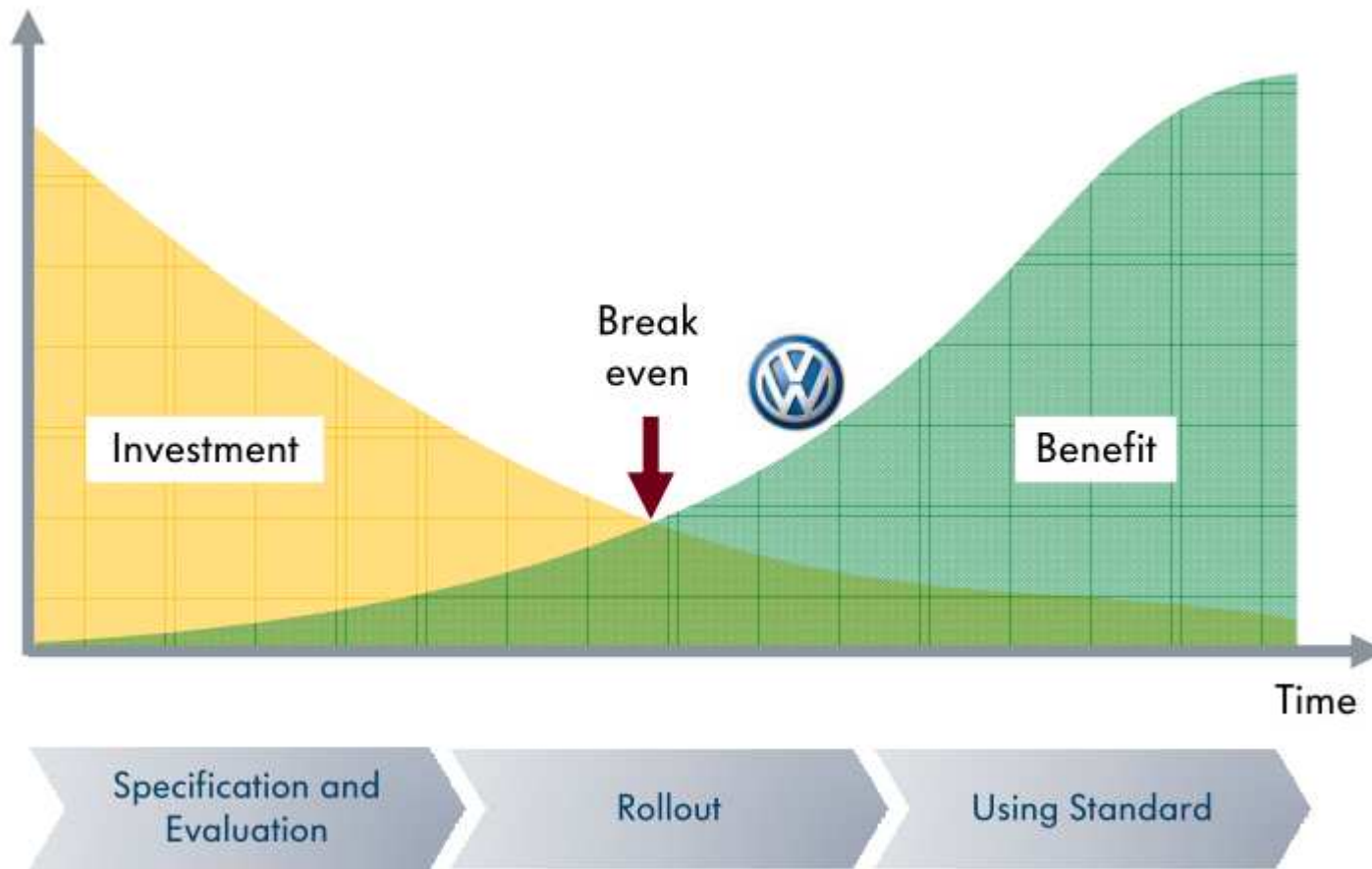
- ▶ E/E **complexity** is growing fast
- ▶ Quantity of **software** is exploding
- ▶ Many different **hardware platforms** are used
- ▶ Development **processes** and **data formats** are not harmonized

The main objective of **AUTOSAR**

→ **Improve software quality and reduce costs by re-use**

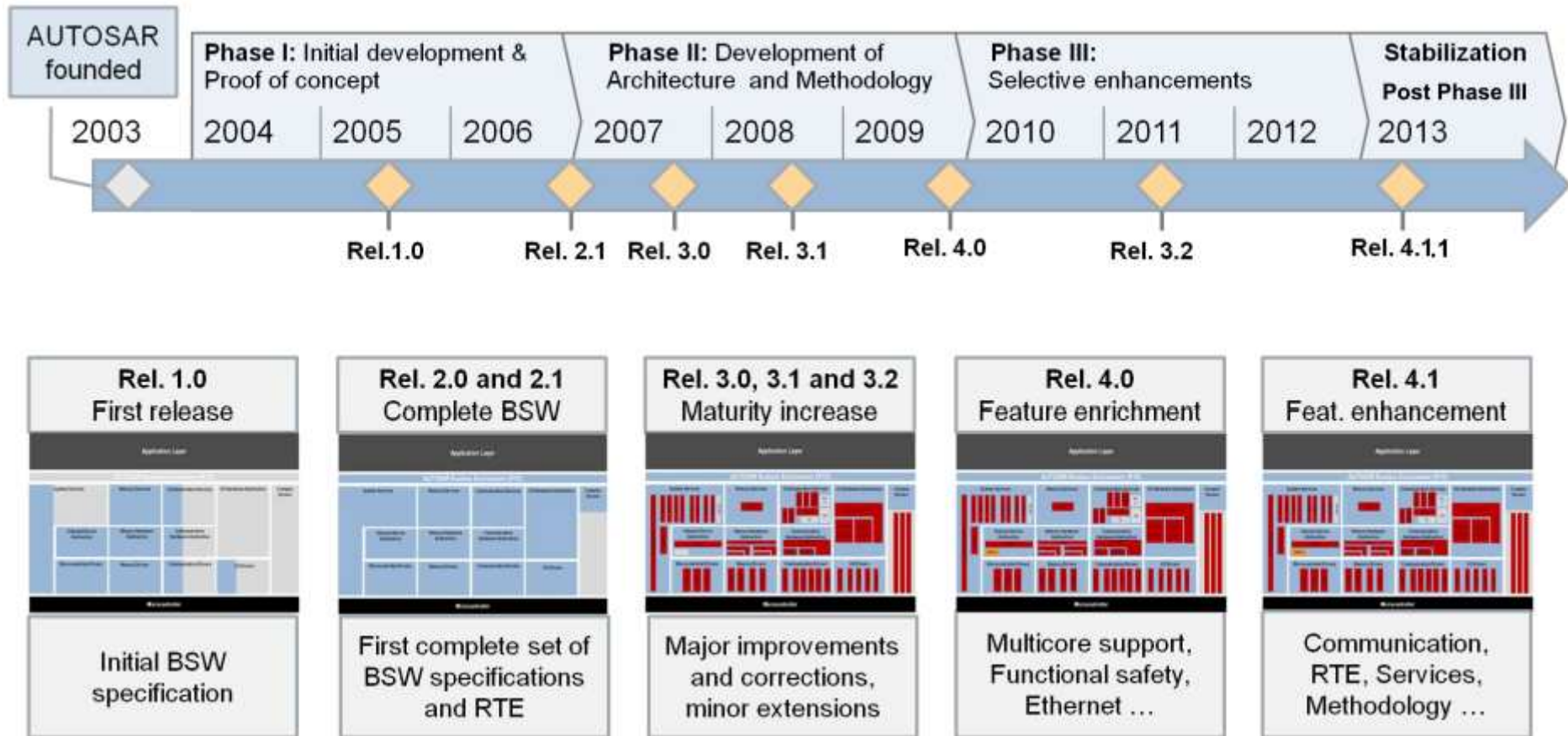
- ▶ Re-use of functions across carlines and across OEM boundaries
- ▶ Re-use of basic software
- ▶ Re-use of development methods and tools

Why AUTOSAR???



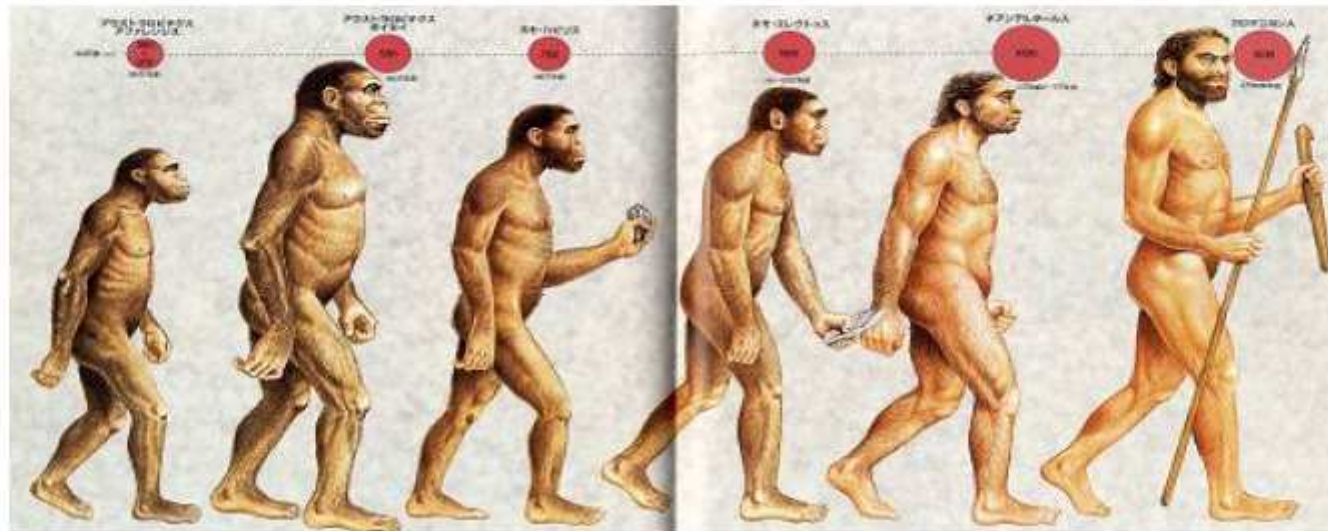
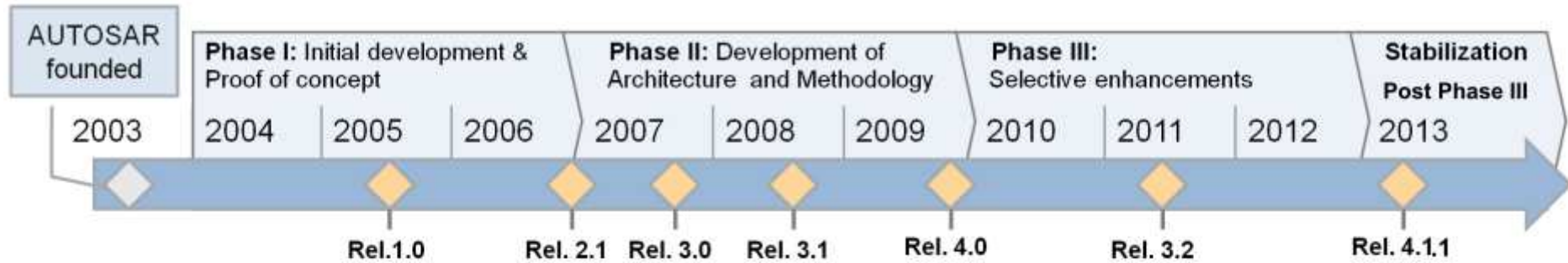
Source: Explore AUTOSAR Conference in Pune 2012

10 Years



Source: 6th AUTOSAR Open Conference

10 Years



Source: 6th AUTOSAR Open Conference

Introduction to AUTOSAR

AUTOSAR Status

AUTOSAR is a broadly used standard in Europe

AUTOSAR 3.x:

- ▶ First specification: 2007
- Mature solution used for series production 2010ff
- Adaptations necessary → OEM-specific extensions

AUTOSAR 4.x:

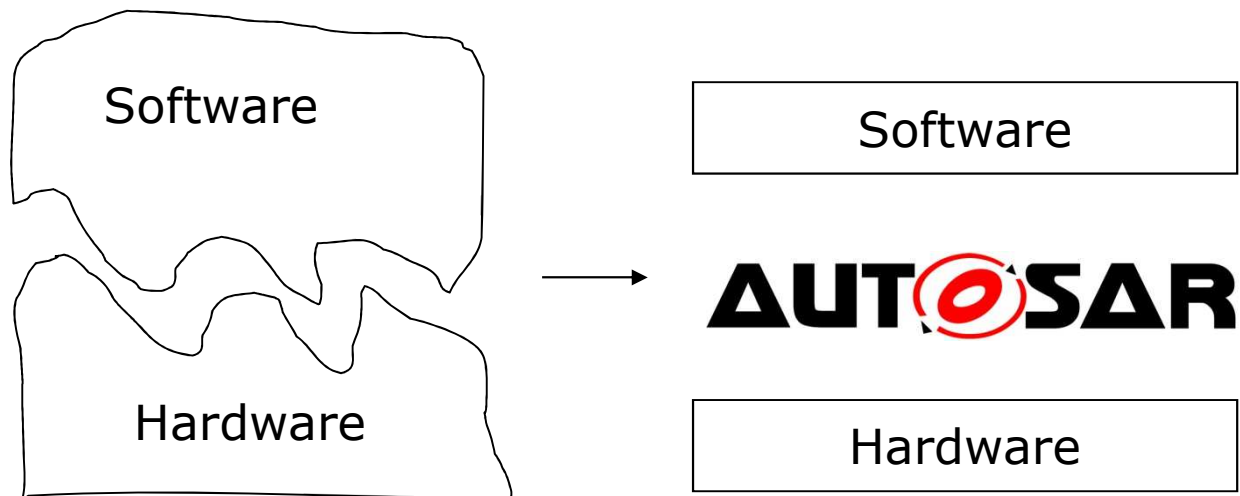
- ▶ First specification: 2009
- First mature specification: 2012 (4.0.3)
- 4.0.3 is the right version for development start in 2012
- New functions: safety, Ethernet/IP, multicore, ...

Overview and Objectives

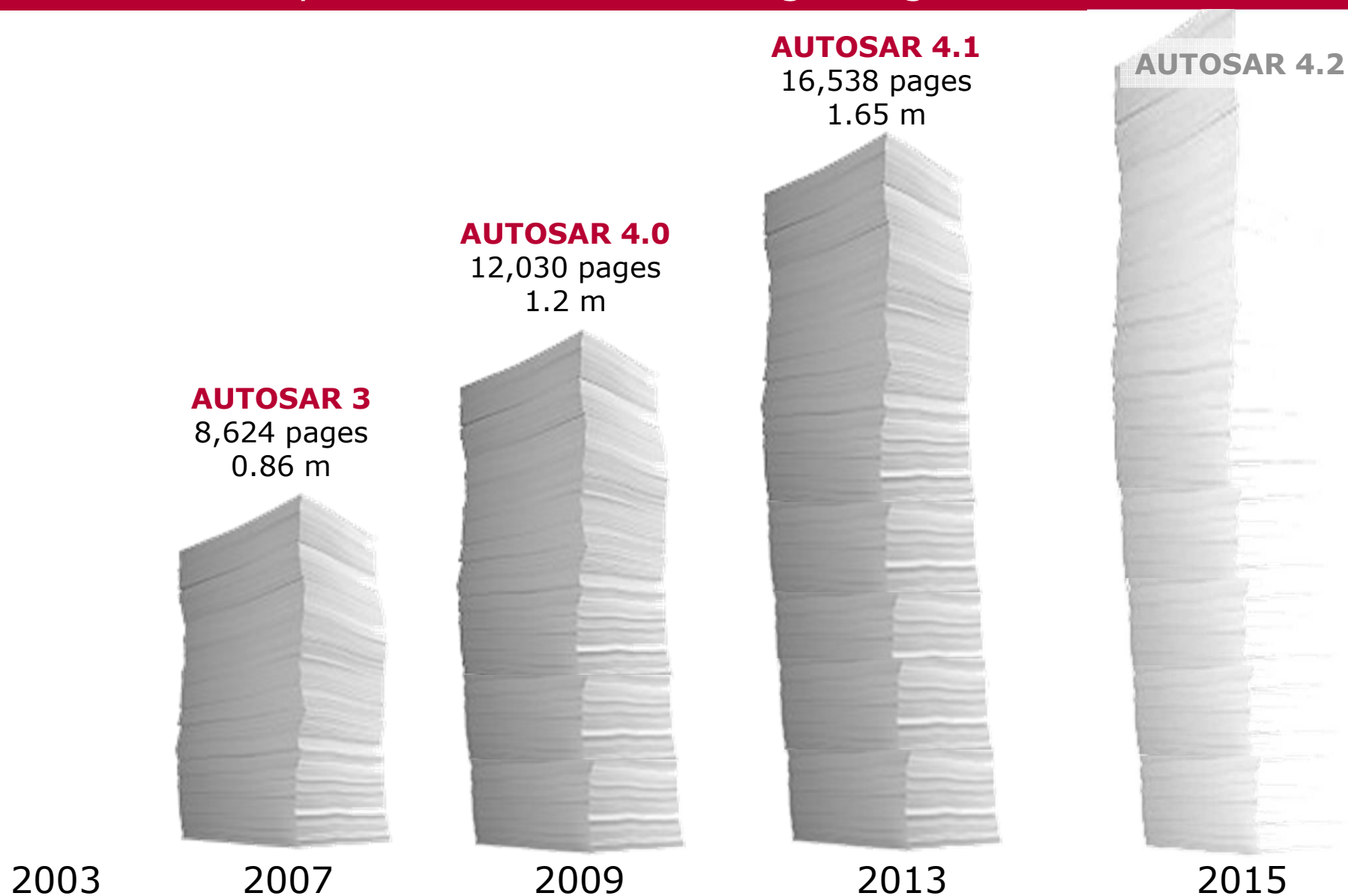
AUTOSAR Slogan

Two different AUTOSAR statements:

“Cooperate on standards – compete on implementation”

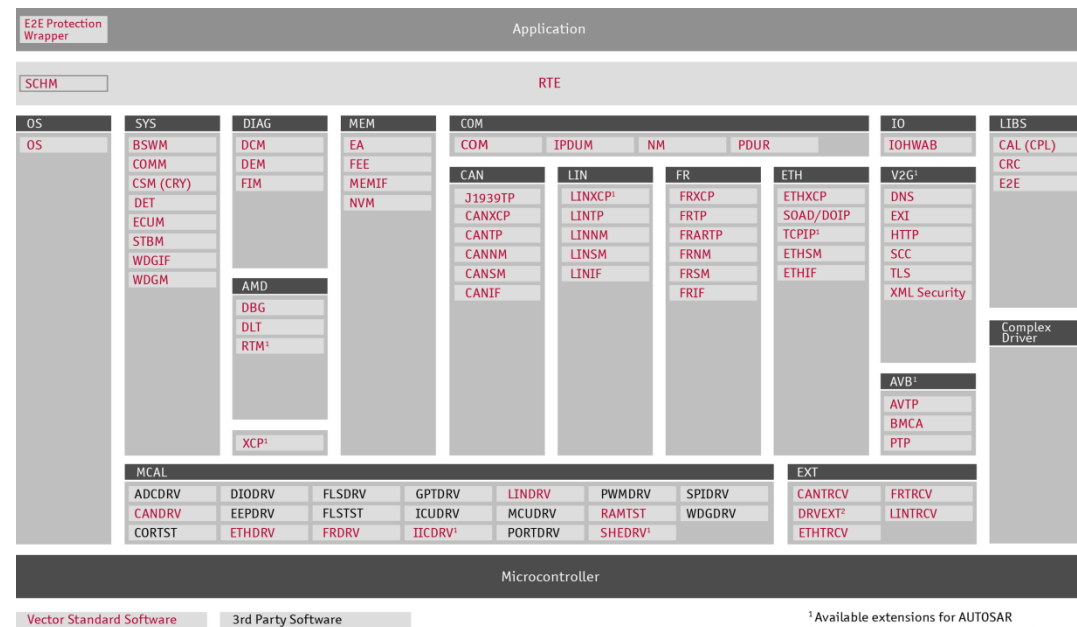


AUTOSAR Specification – “In the beginning was the word”



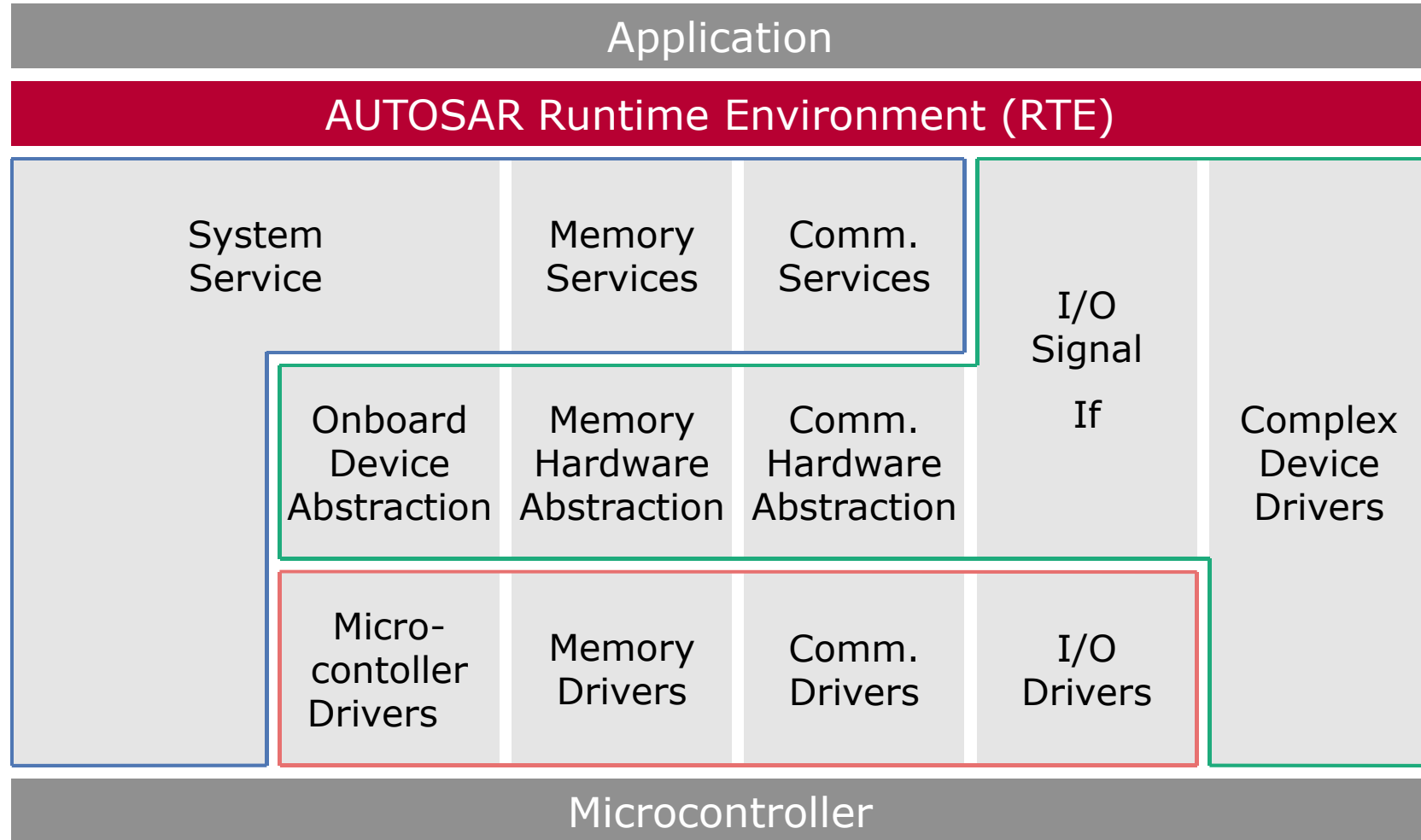
AUTOSAR Accomplishments

- ▶ **Standardization** of methods and data exchange formats
- ▶ **Standardization** of application software interfaces
- ▶ **Standardization** of basic software and network behavior
 - > Network Management
 - > Partial Networking
 - > ECU State Management
 - > Transport Protocols
 - > Non-Volatile Memory
 - > ...




AUTOSAR BSW

Layered View: Detailed



 Microcontroller Abstraction Layer

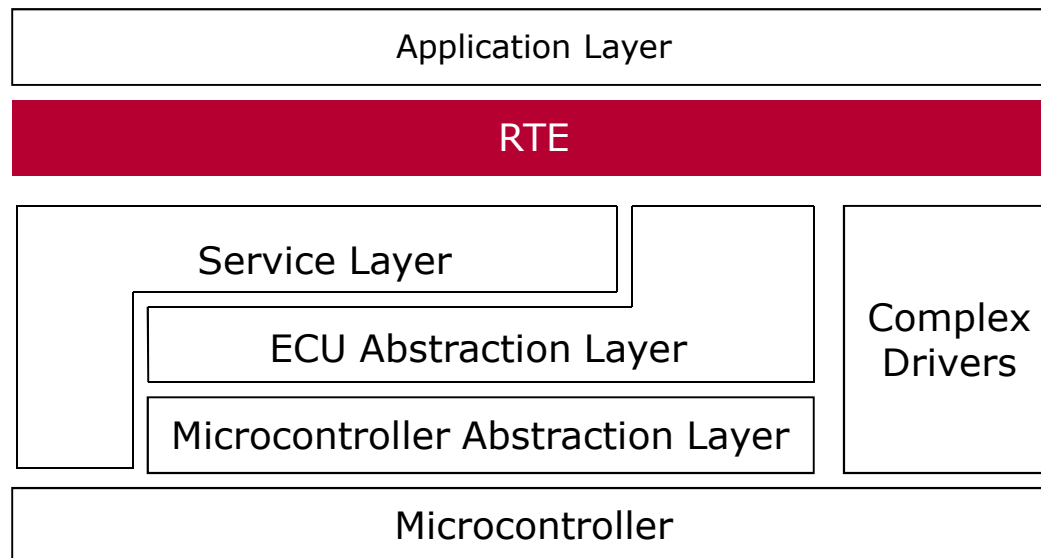
 ECU Abstraction Layer

 Service Layer

AUTOSAR RTE

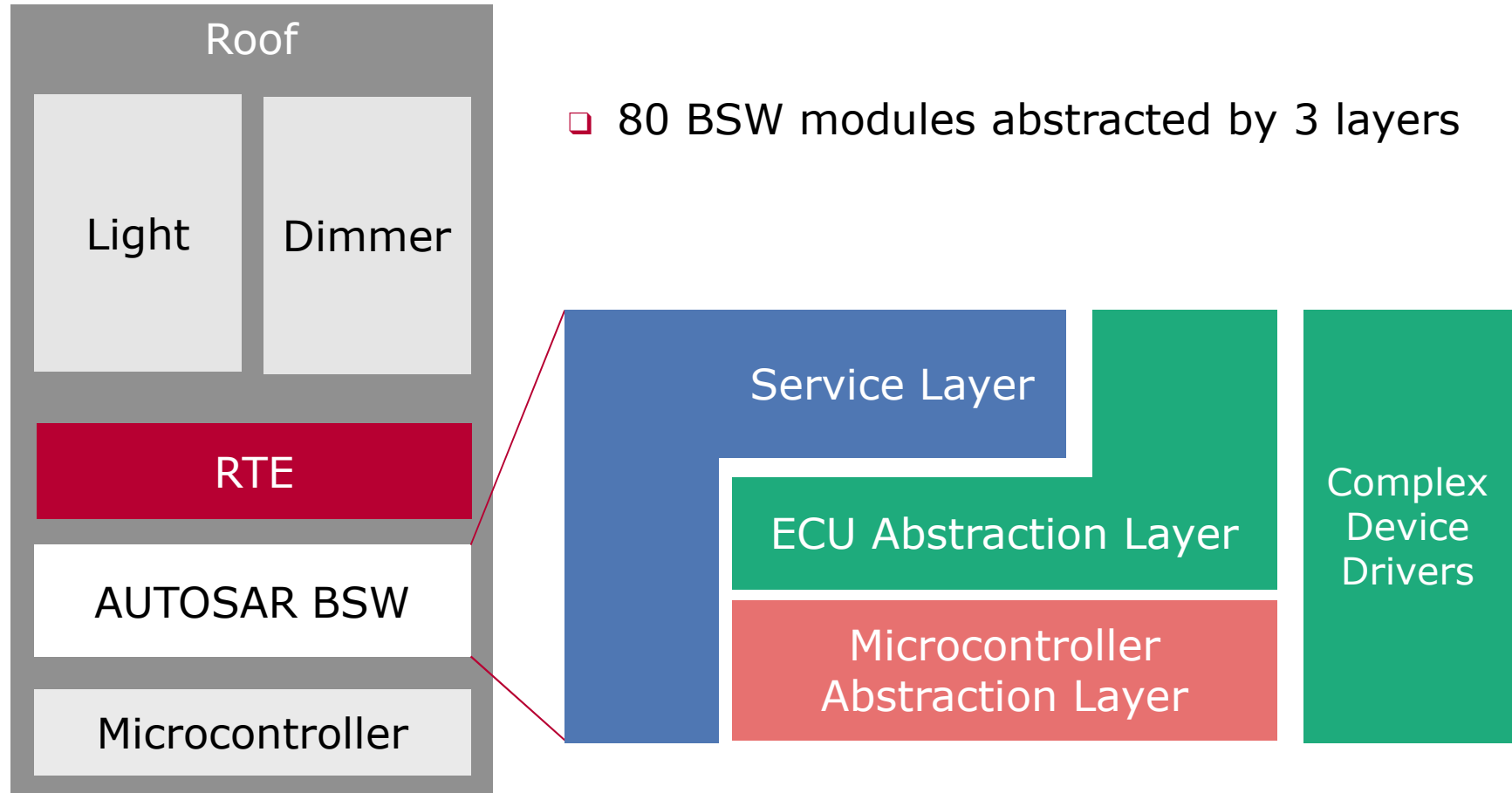
Architecture

- ▶ Task
 - ▶ Components independent of ECU mapping
- ▶ Functionality
 - ▶ Middleware providing communication services (intra / inter ECU)



AUTOSAR BSW

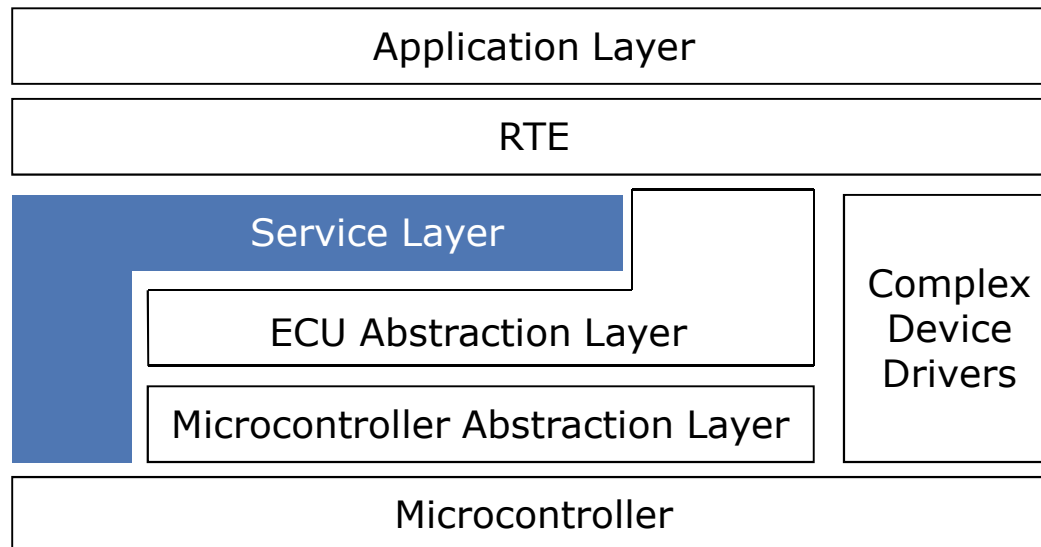
Layered View: Simplified



AUTOSAR BSW

Service Layer

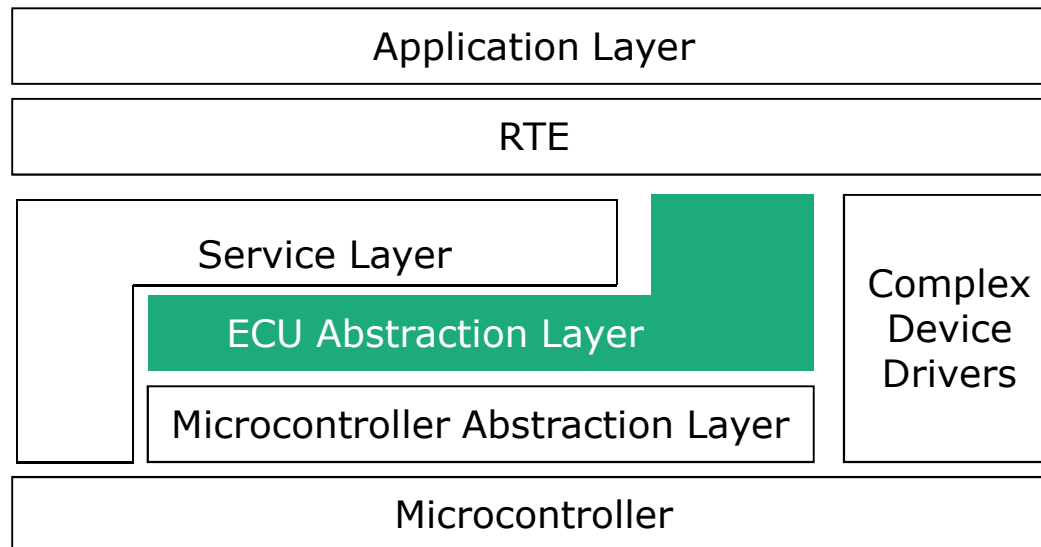
- ▶ Task
 - ▶ Services for application
- ▶ Functionality
 - ▶ Diagnostics, NVRAM Management, OS, Communication
 - ▶ Memory and ECU management



AUTOSAR BSW

ECU Abstraction Layer

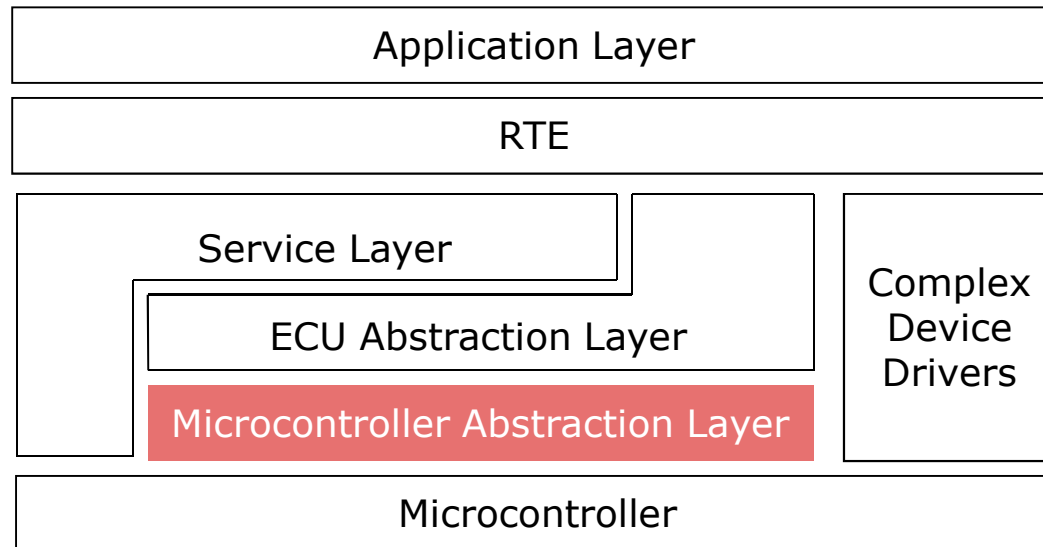
- ▶ Task
 - ▶ Make higher levels independent of ECU hardware
- ▶ Functionality
 - ▶ Driver for external devices
 - ▶ Interface for internal and external periphery (IO)



AUTOSAR BSW

Microcontroller Abstraction Layer

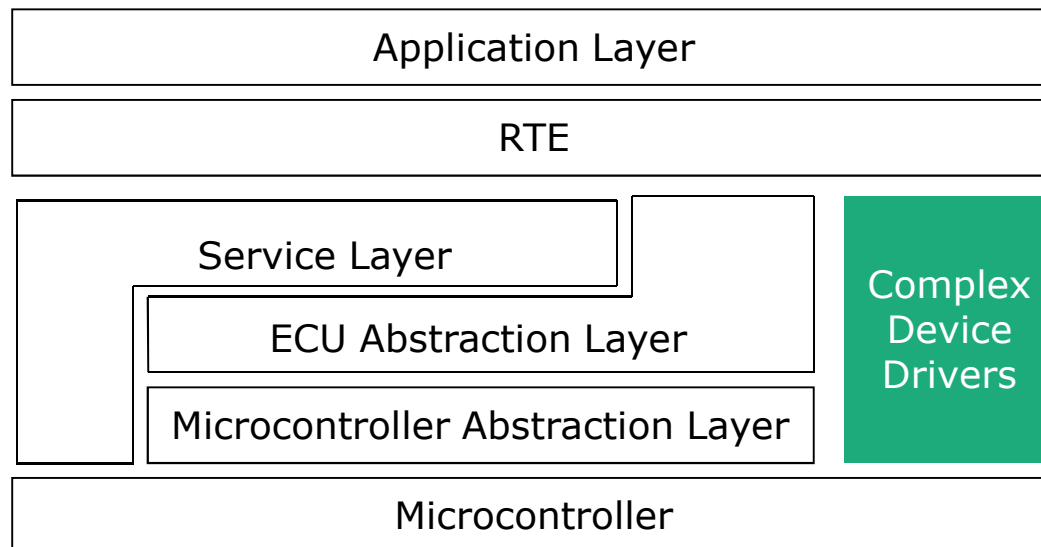
- ▶ Task
 - ▶ Make higher layers independent of microcontroller
- ▶ Functionality
 - ▶ Drivers with direct access to internal periphery of μC
 - ▶ Memory-mapped devices external to μC



AUTOSAR BSW

Complex Device Drivers

- ▶ Task
 - ▶ Offer functionality for complex sensors and actuators
- ▶ Functionality
 - ▶ Direct access to resources for critical applications
 - ▶ Examples: Injection control, tire pressure monitoring



Agenda

AUTOSAR Overview

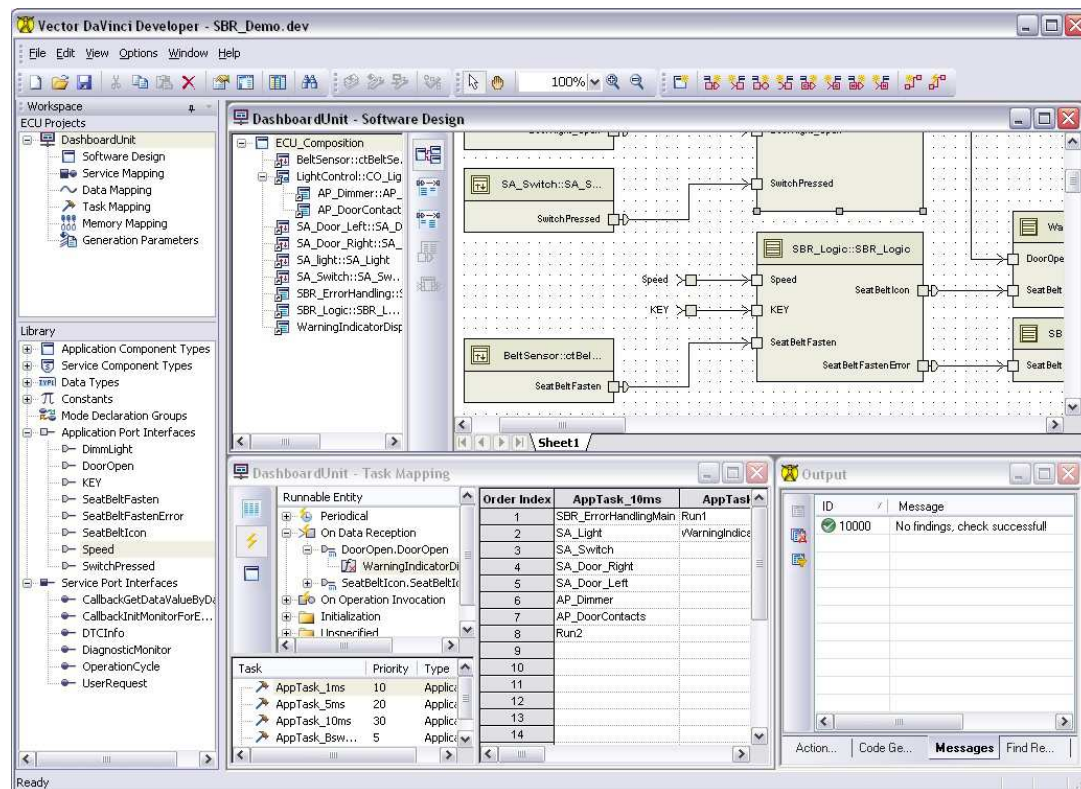
> AUTOSAR Solution

AUTOSAR on the way

Designing AUTOSAR SWCs

DaVinci Developer: SWC Design

- ▶ Define application architecture of AUTOSAR ECUs
- ▶ Integrate the SWC with the ECU basic SW
- ▶ Configure the AUTOSAR RTE

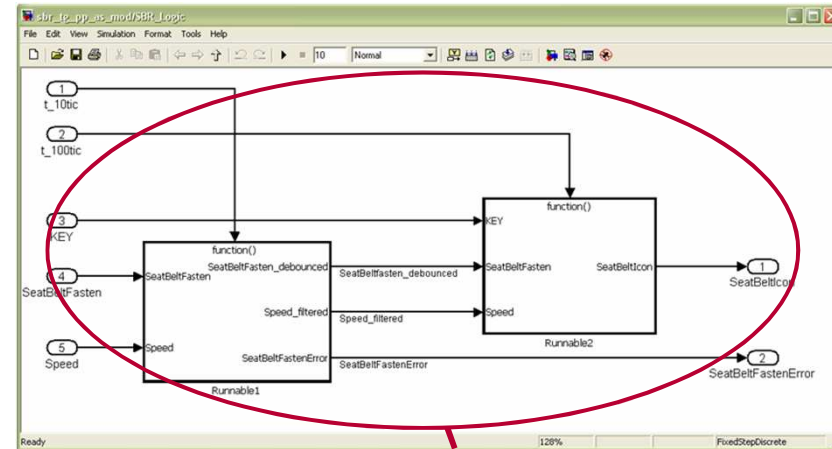


Designing AUTOSAR SWCs

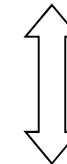
DaVinci Developer: Interaction with model-based development tools

Simulink/EmbedderCoder or TargetLink

- ▶ Develop the behavior model
- ▶ Generate SWC implementation code

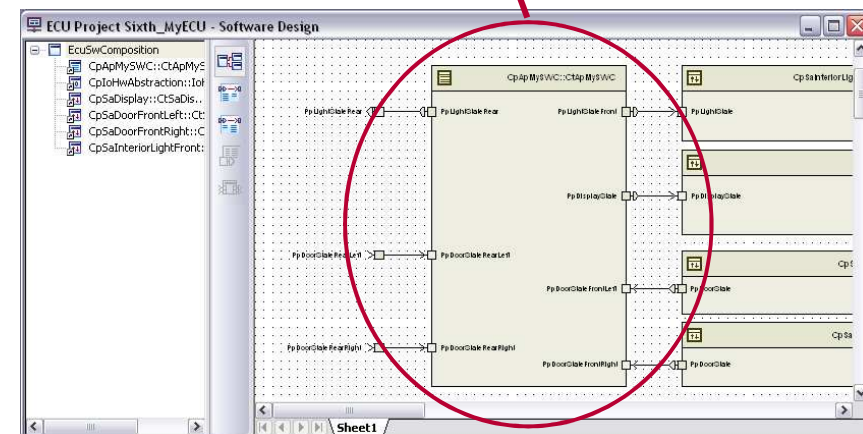


SWC description
(e.g. ports, runnables)
is exchanged via AUTOSAR XML



DaVinci Developer

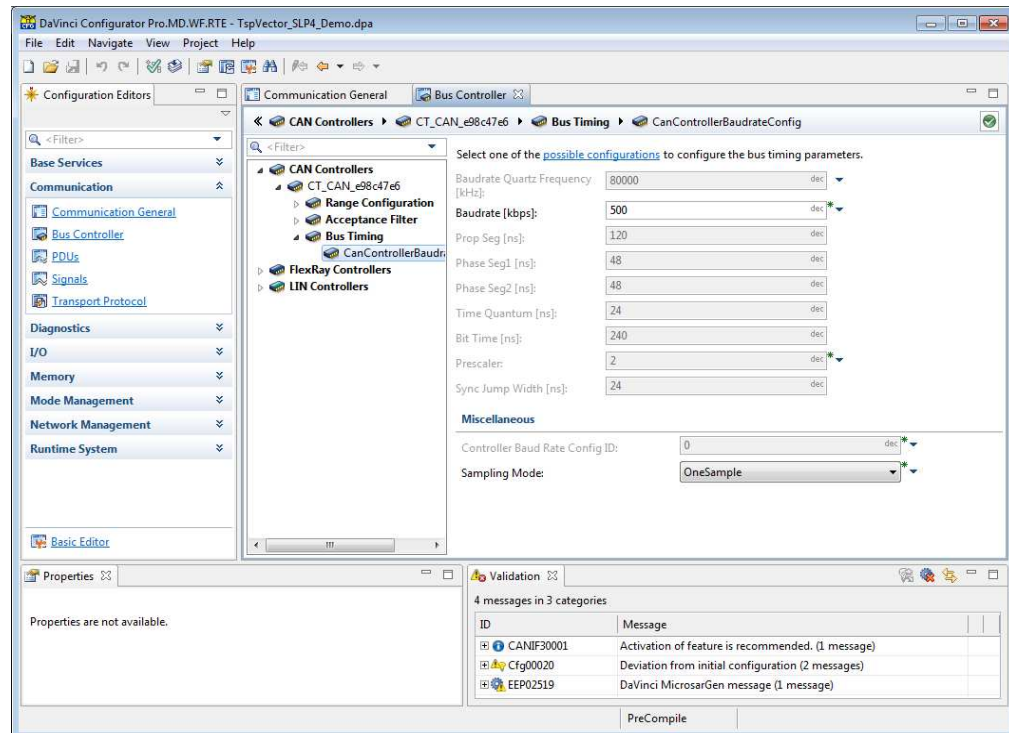
- ▶ Define SWC structure
- ▶ Integrate the SWC into the ECU application architecture
- ▶ Configure the RTE



DaVinci Configurator Pro

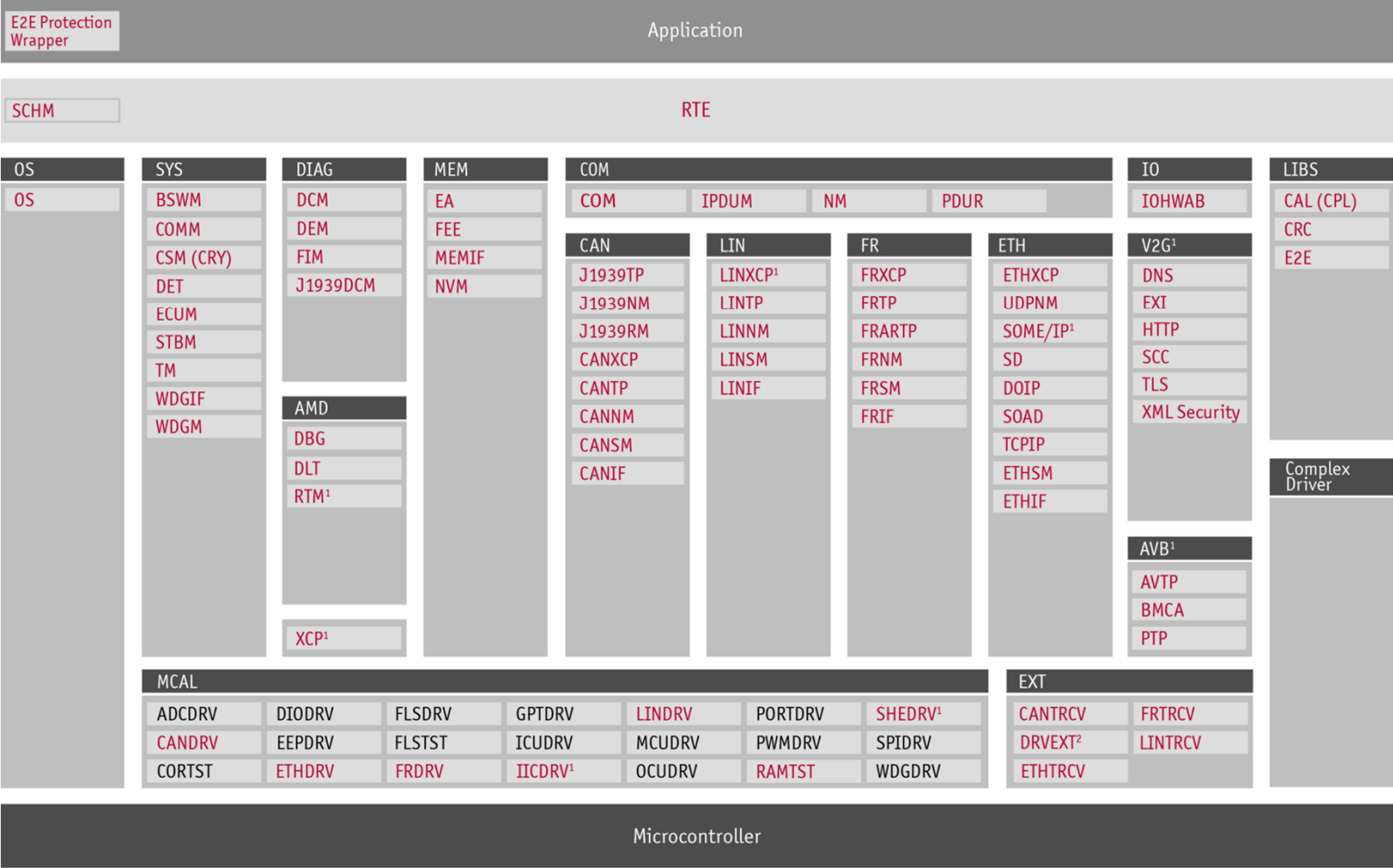
Configuring Basic Software

- ▶ One tool for configuration of complete BSW and RTE
- ▶ Comfort Editors and Assistants to support specific use cases
- ▶ Basic Editors (GCE) for native ECU-C view
- ▶ Easy navigation between editors



Vector Embedded AUTOSAR Software

MICROSAR



Vector Standard Software

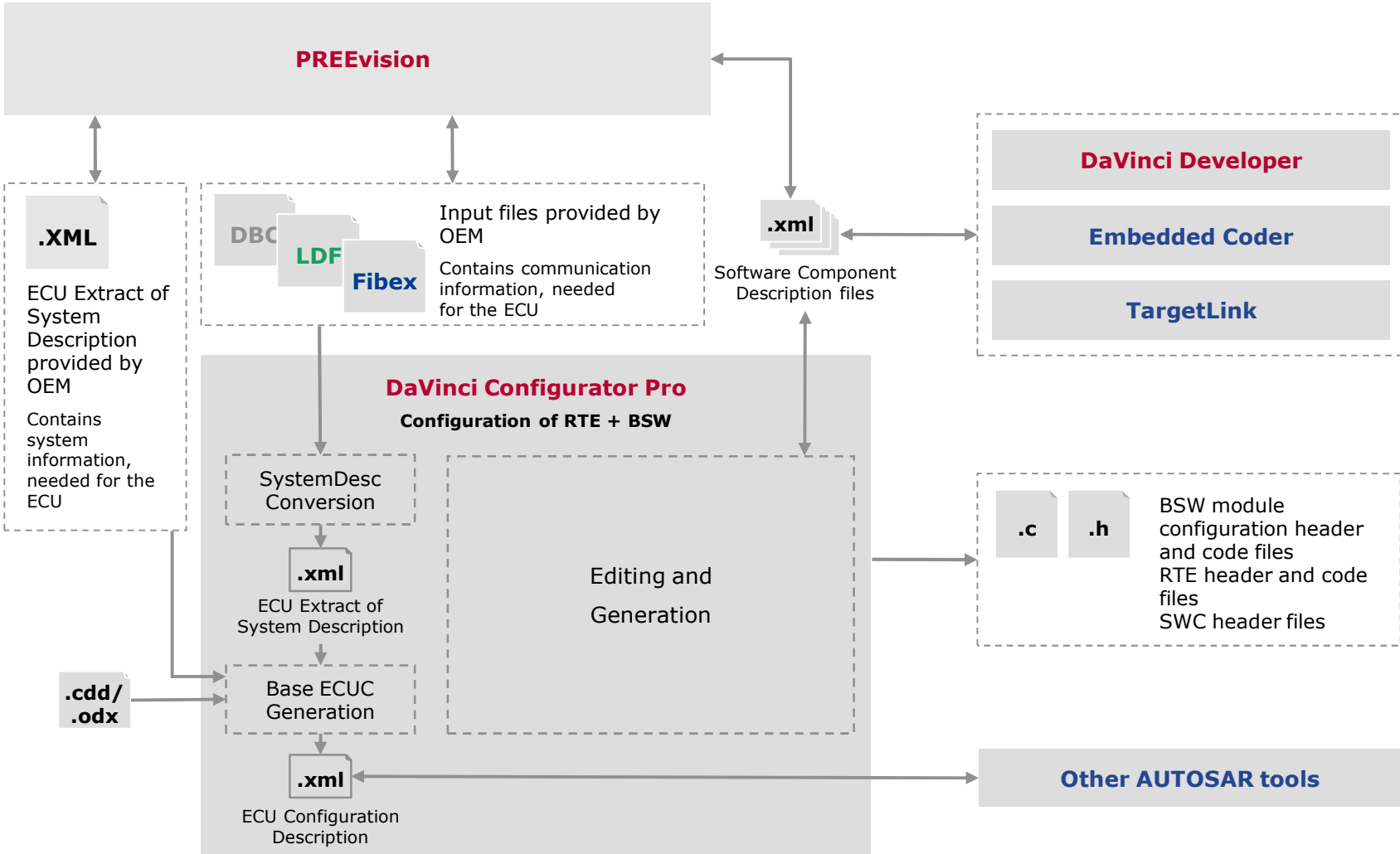
3rd Party Software

¹ Available extensions for AUTOSAR

² Includes EXTADC, EEPEXT, FLSEXT, and WDGEXT



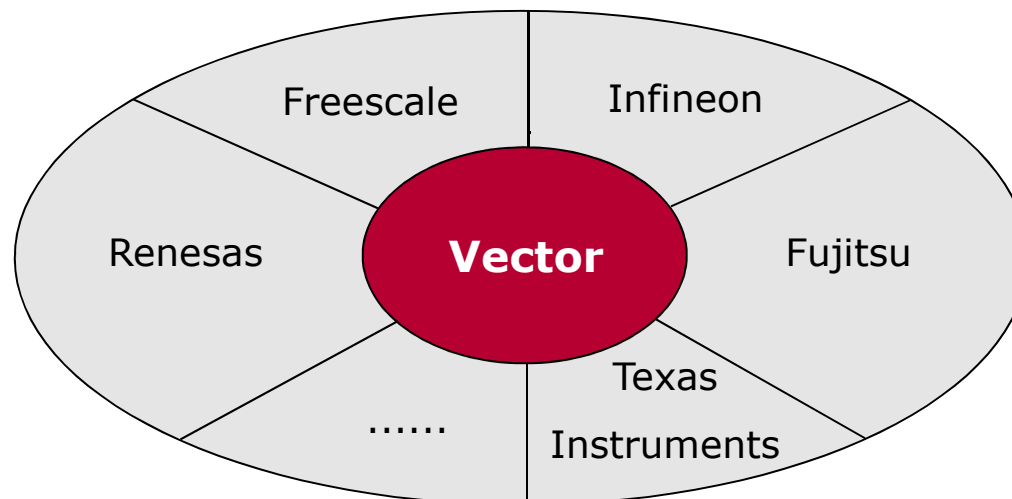
Workflow AUTOSAR 4.x



MICROSAR – Vector AUTOSAR Basic Software

Large variety of platforms supported

- ▶ Vector cooperates with microcontroller manufacturers to integrate the MCAL (Microcontroller Abstraction Layer) which are provided by them
- ▶ An individual solution for your favored microcontroller is possible at any time



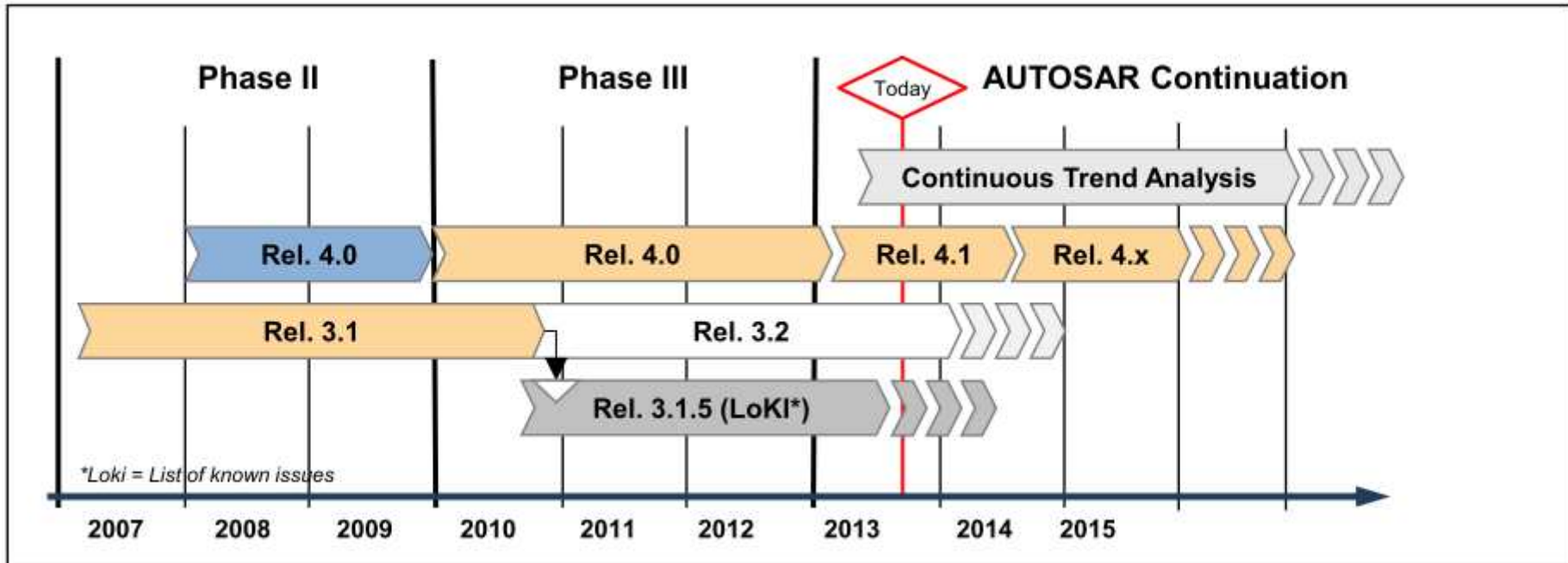
Agenda

AUTOSAR Overview

AUTOSAR Solution

> AUTOSAR on the way

AUTOSAR Releases



- ▶ AUTOSAR is stabilizing with R3.2 and 4.x
- ▶ AUTOSAR is worldwide in massive series roll-out
- ▶ High acceptance in the market is achieved
- ▶ Existing releases will be used over long period of time in many applications

Source: 6th AUTOSAR Open Conference

AUTOSAR - Exploitations

▶ **SOP of a complete AUTOSAR solution (BSW + RTE)**

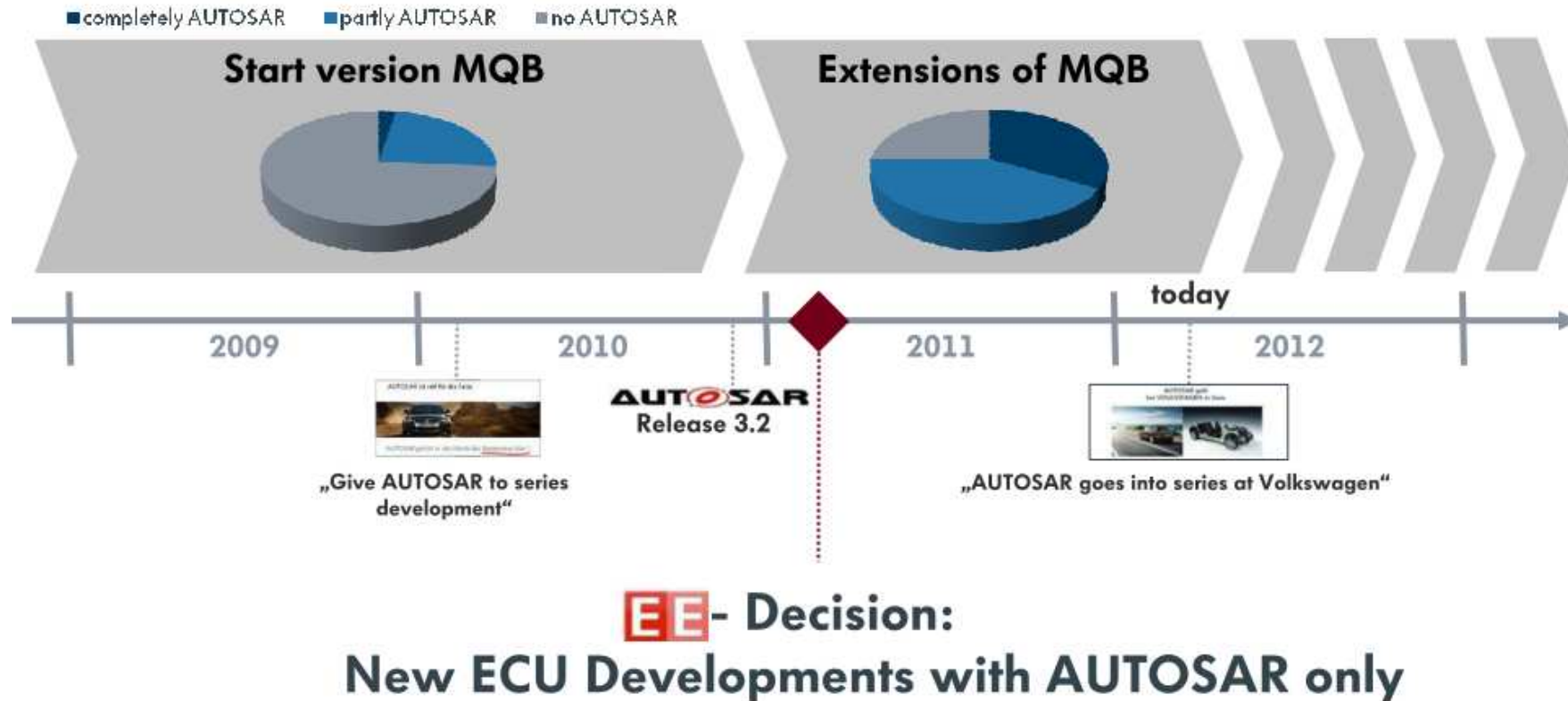
	2010	2011	2012	2013	2014	2015	2016	...
AUTOSAR 3.x								
AUTOSAR 4.x								

- ▶ **AUTOSAR 3.x** is used in serial production projects by:
 - ▶ Audi / Volkswagen / Porsche
 - ▶ **Daimler**
 - ▶ Fiat / Chrysler
 - ▶ Volvo Trucks (incl. Construction Machines)

- ▶ **AUTOSAR 4.x** is used in serial production projects by:
 - ▶ BMW
 - ▶ **GM**
 - ▶ Toyota
 - ▶ **Volvo Cars**

- ▶ **AUTOSAR 4.x** is generally announced by
 - ▶ Ford
 - ▶ PSA
 - ▶ ...

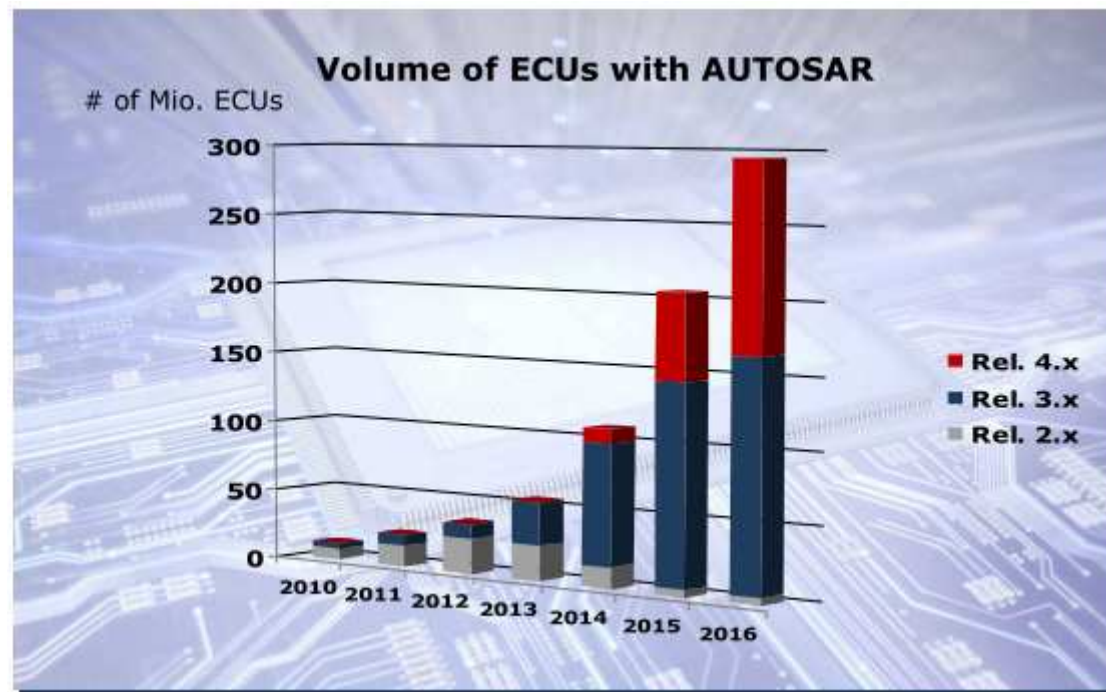
AUTOSAR in VW



Source: Explore AUTOSAR Conference in Pune 2012

AUTOSAR's market

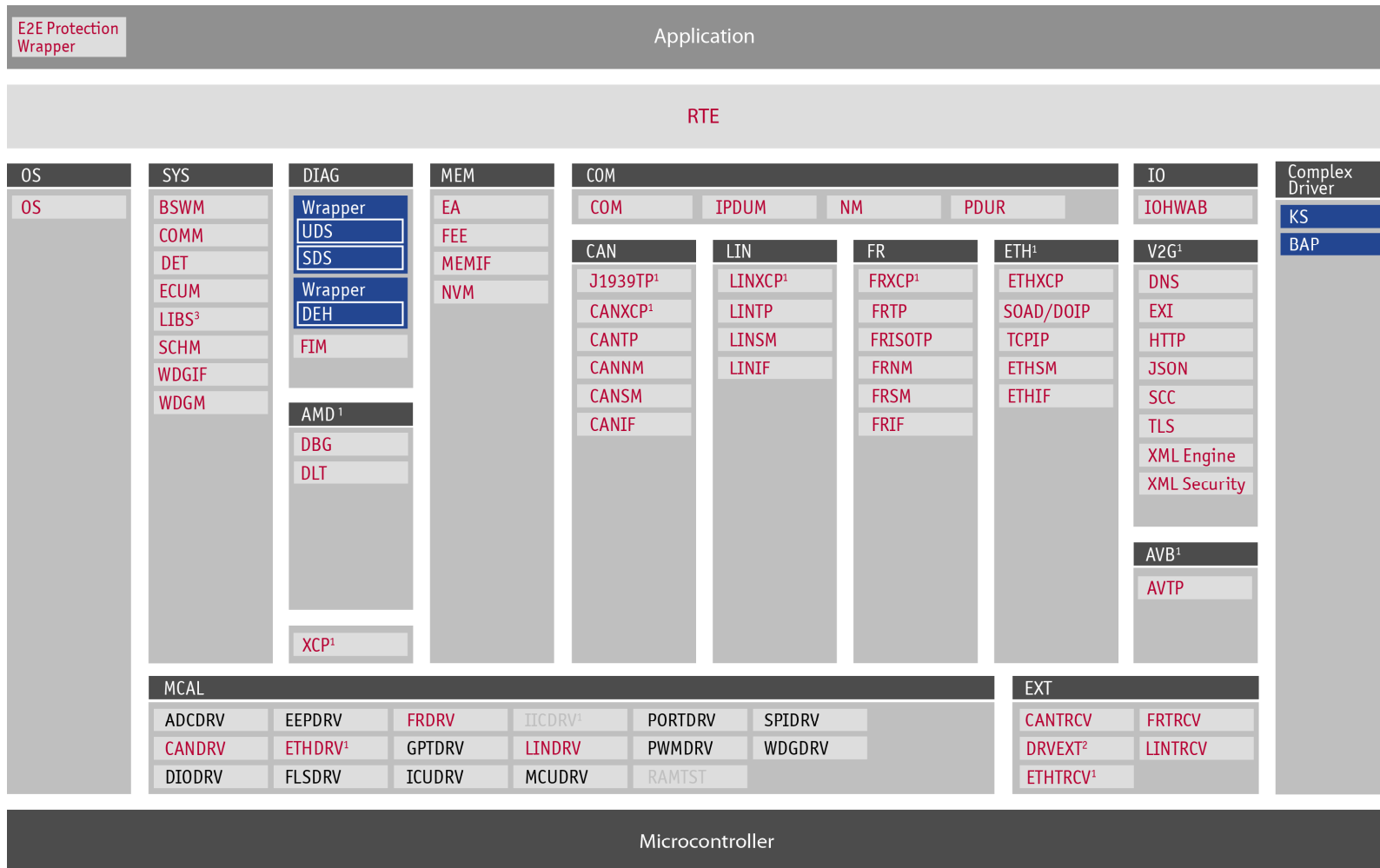
- ▶ At least 25% of the total number of ECUs produced in 2016 will have AUTOSAR inside (based on planning of AUTOSAR OEM Core Partner only)



Source: Explore AUTOSAR Conference in Pune 2012

MICROSAR 3 for VW Group

MQB (technical identical to MLBevo)



Vector Standard Software

3rd Party Software

3rd Party distributed by OEM

Not Used by OEM

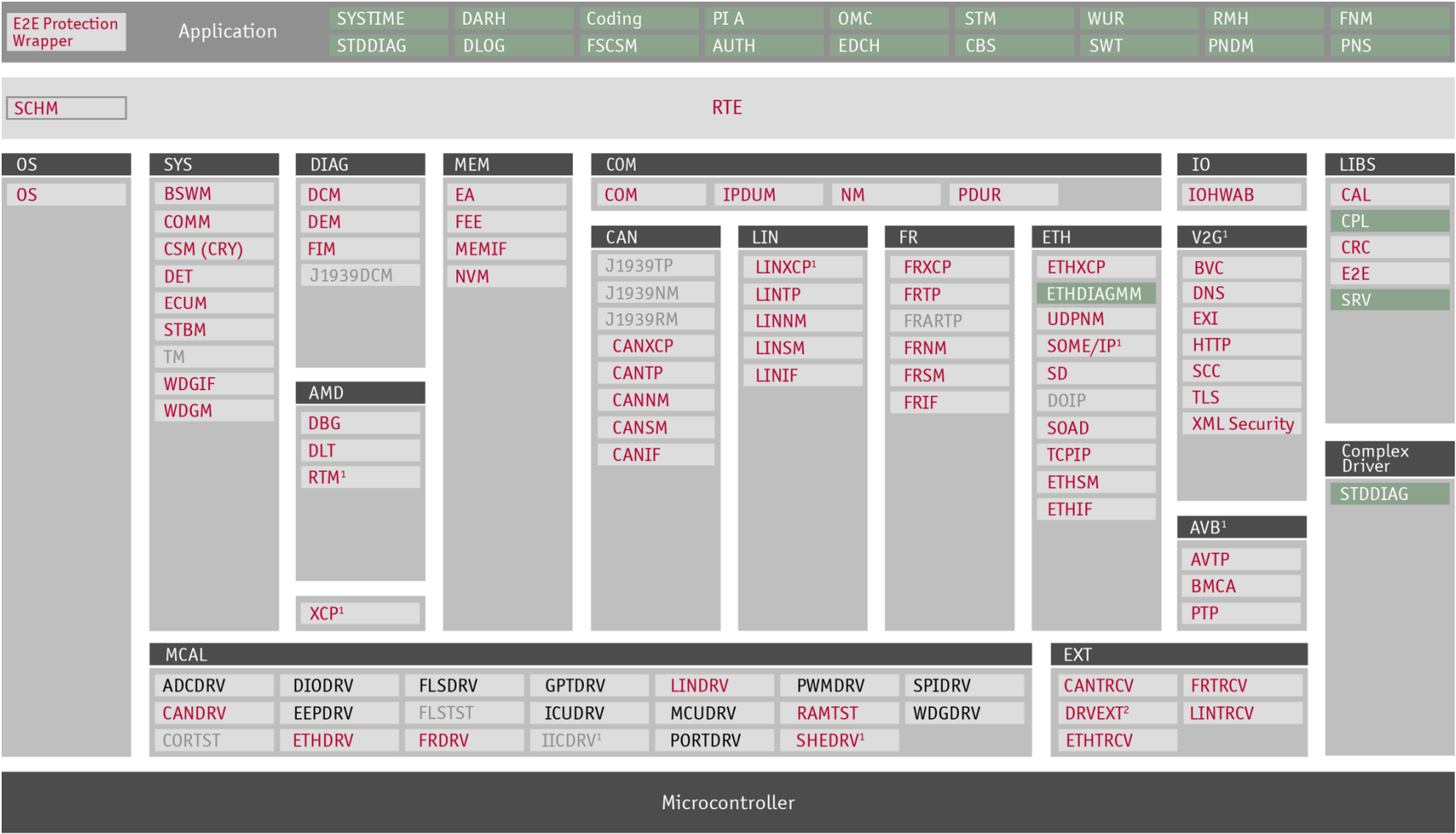
¹ Available extensions for AUTOSAR

² Includes EXTADC, EEPEXT, FLSEXT, and WDGEXT

³ Includes E2E, CRC, CAL (CPL)

BAC 4.0 MICROSAR Basic-Software for BMW

Overview



Vector Standard Software

3rd Party Software

BMW BAC 4.x Modules

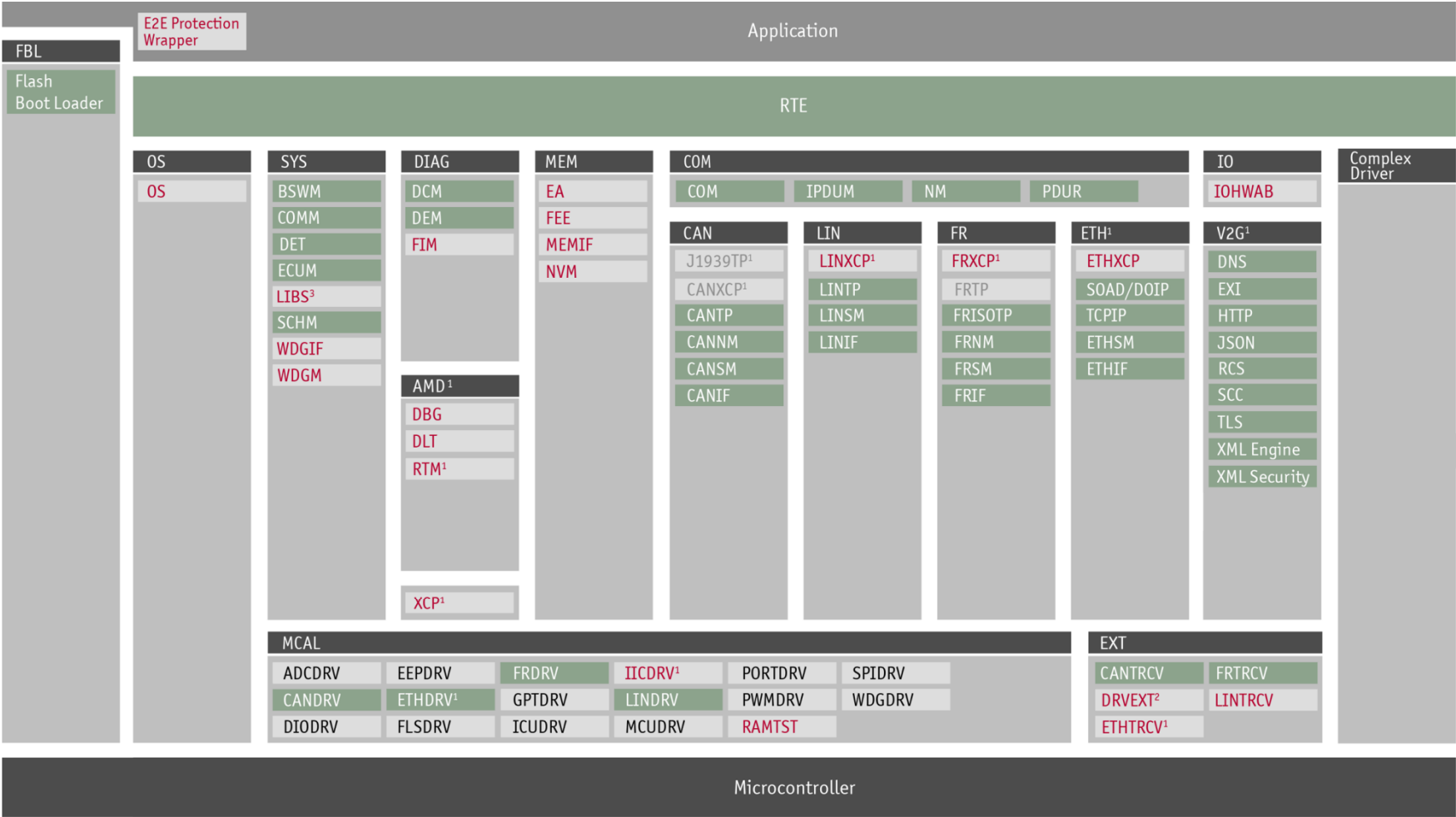
Not Used by OEM

¹ Available extensions for AUTOSAR

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MICROSAR 3 for Daimler SLP10

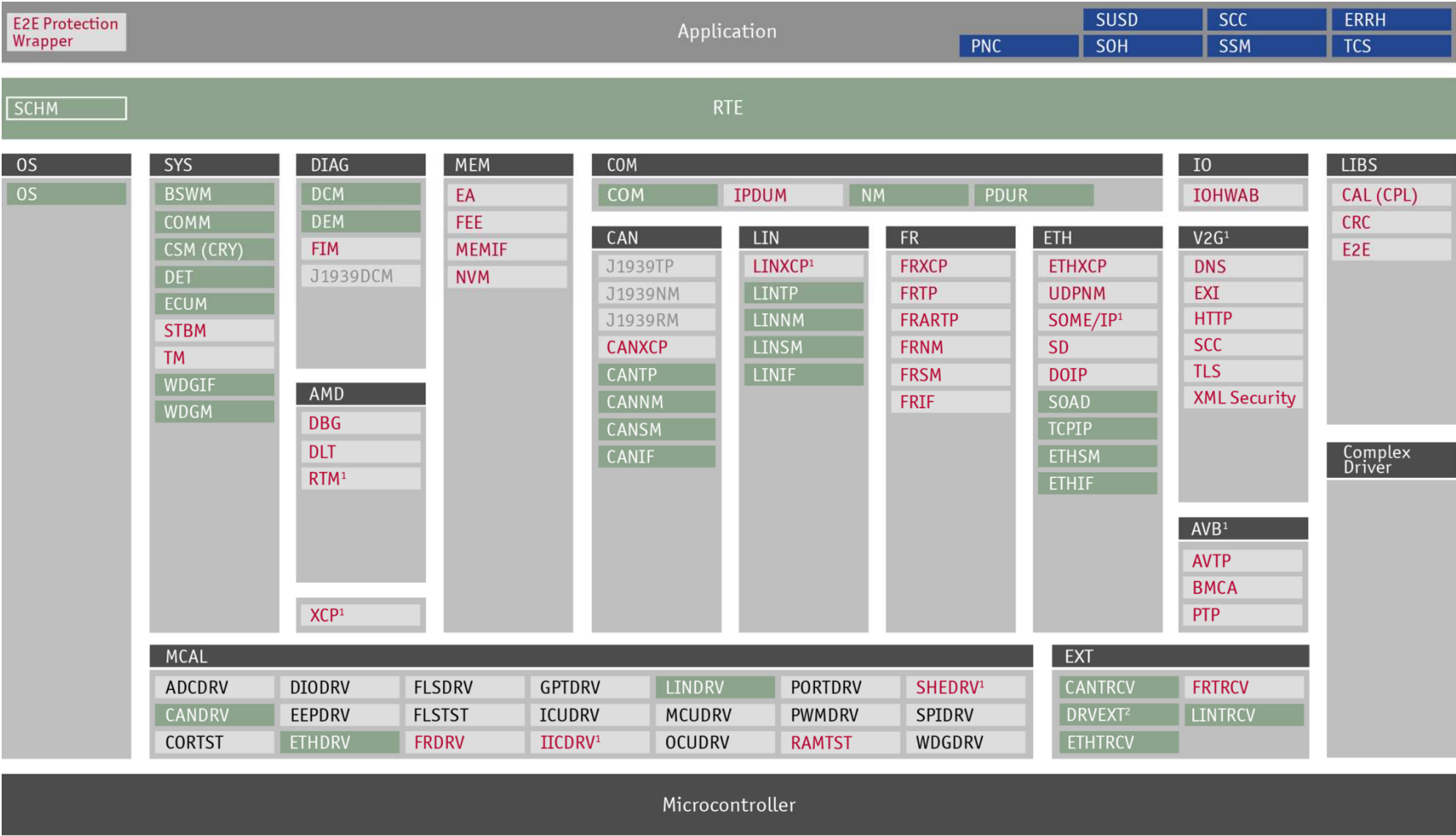


Vector Standard Software	3rd Party Software
Daimler SLP 10	Not Used

¹ Available extensions for AUTOSAR
² Includes EXTADC, EEPEXT, FLSEXT, and WDGEXT
³ Includes E2E, CRC, CAL (CPL)



MICROSAR for General Motors (GM)



Standard Software

3rd Party Software

GM ECU Type B

GM Standard Utility Modules (SUMs)

¹ Available extensions for AUTOSAR

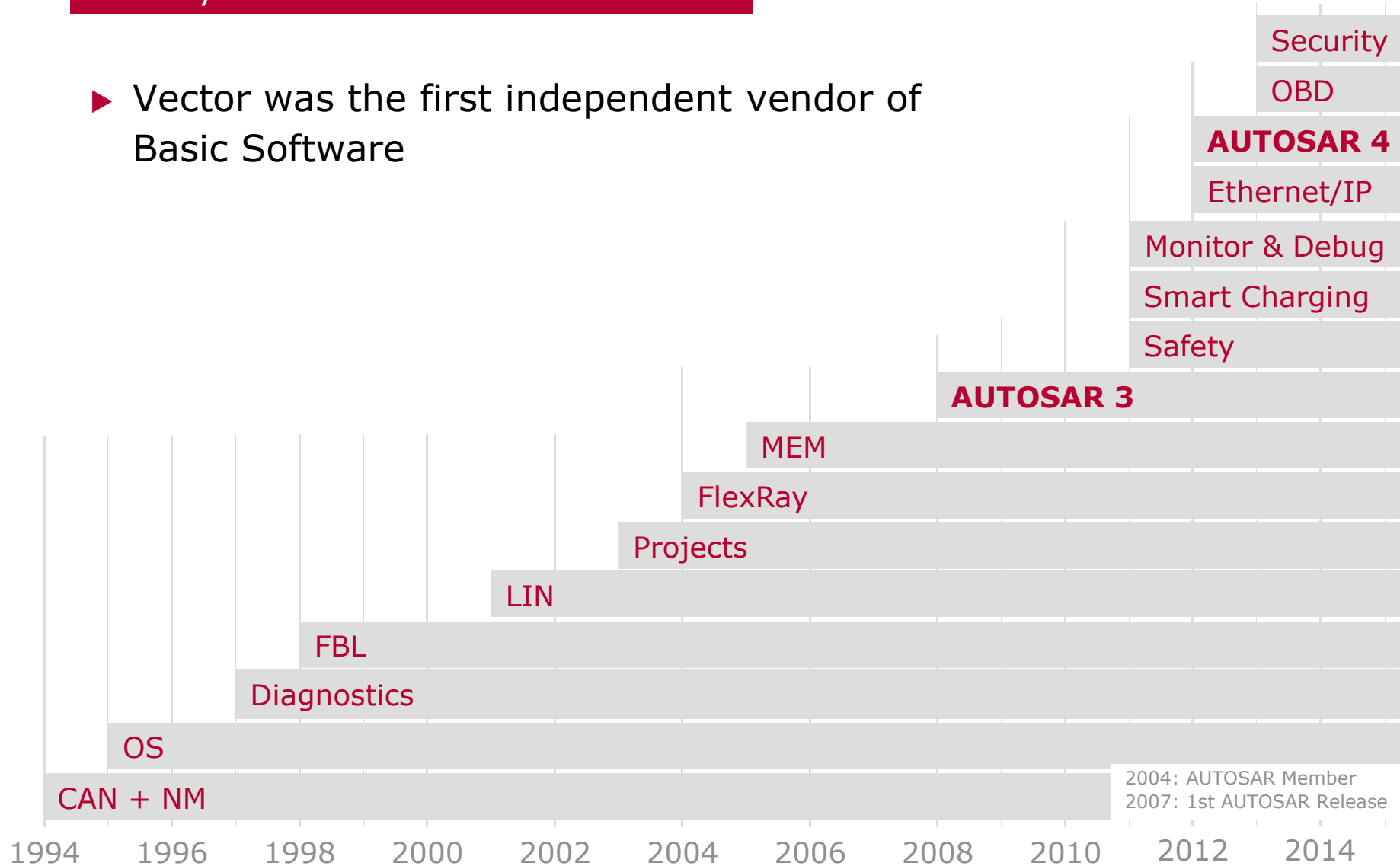
² Includes EXTADC, EEPEXT, FLSEXT, and WDGEXT



Why Vector

History Embedded Software at Vector

- ▶ Vector was the first independent vendor of Basic Software



- ▶ Cooperation with Chinese customers from 2009
- ▶ FAW, ChangAn, Foton, PATAC, DFM...



Case Study

Developing a driver library for engine controllers with AUTOSAR Complex Device Drivers (CDD)



Thank you for your attention.

For detailed information about Vector
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