

▶▶ AUTOSAR Jargon Buster – An A to Z of AUTOSAR

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Vector UK Conference – Wednesday 10th June 2015

Acronyms



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

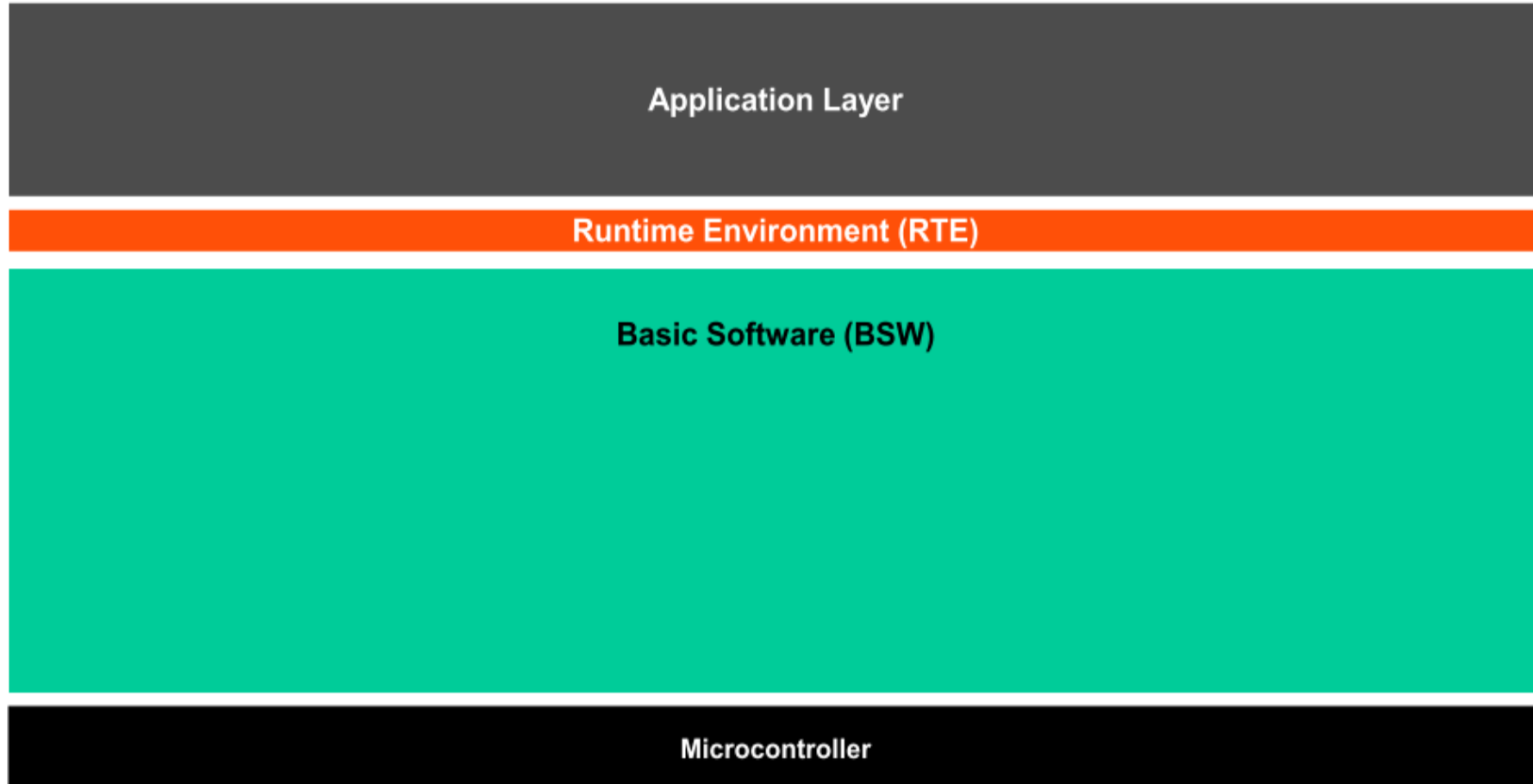
is a worldwide development cooperation of car manufacturers, suppliers and other companies from the electronics, semiconductor and software industry.

Since 2003 they have been working on the development and introduction of an open, standardized software architecture for the automotive industry.

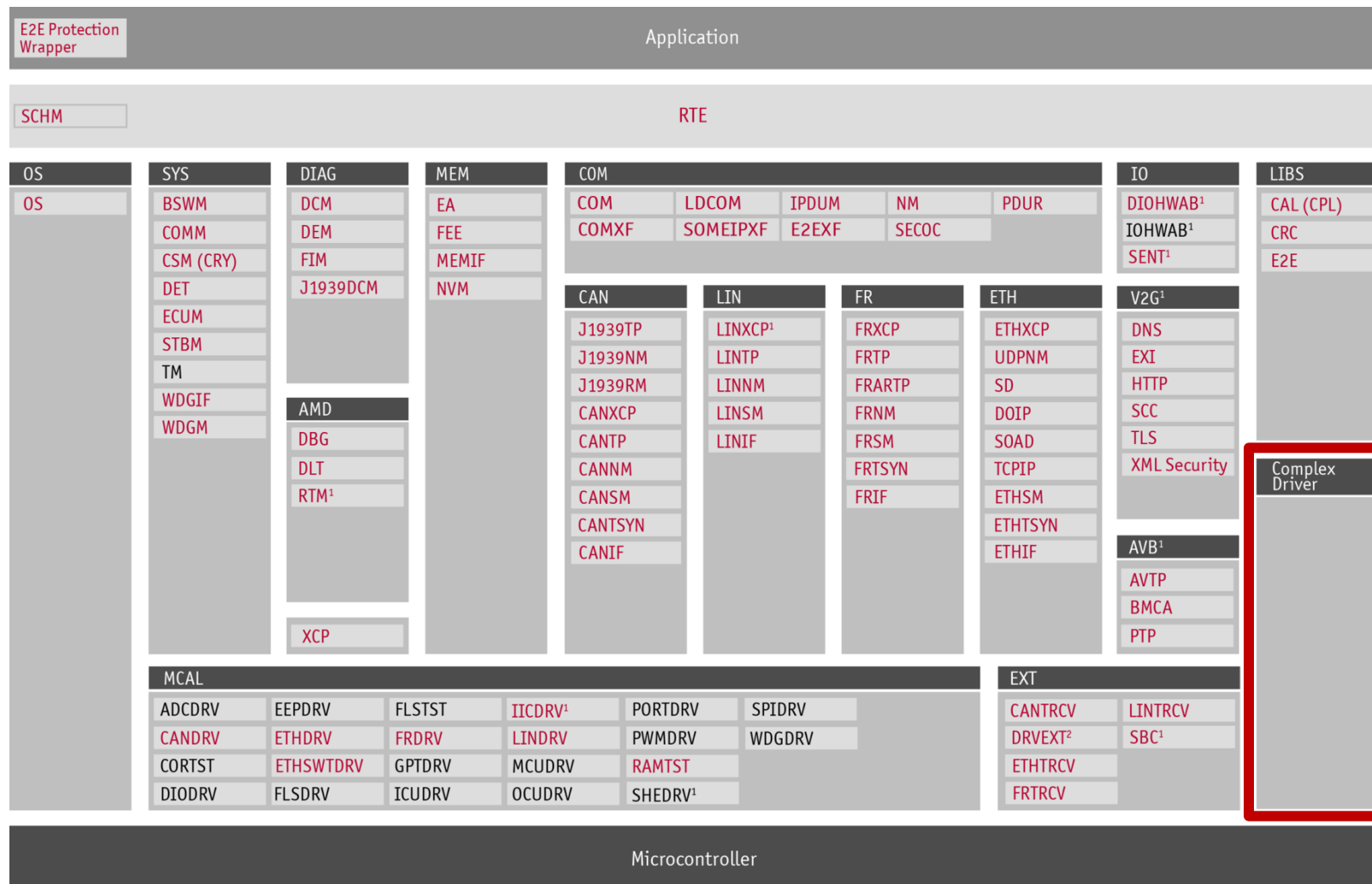
AUTOSAR has the working principle:

“Cooperate on standards, compete on implementation”

BSW – Basic Software



CDD – Complex Device Driver



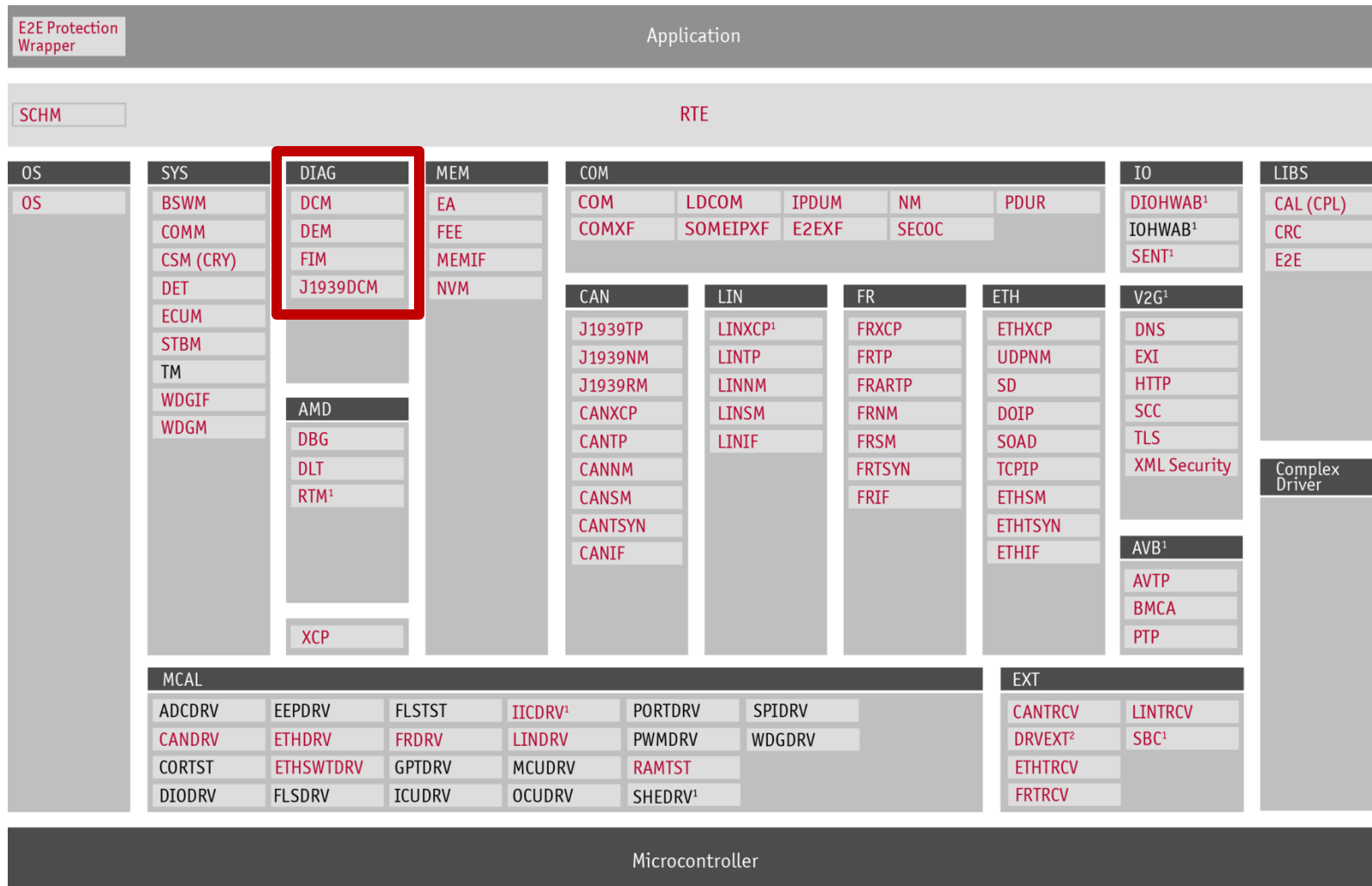
Vector Standard Software

3rd Party Software

¹ Available extensions for AUTOSAR

² Includes EXTADC, EEPEXT, FLSEXT, ETHSWTEXT and WDGEXT

Diagnostic Services



Vector Standard Software

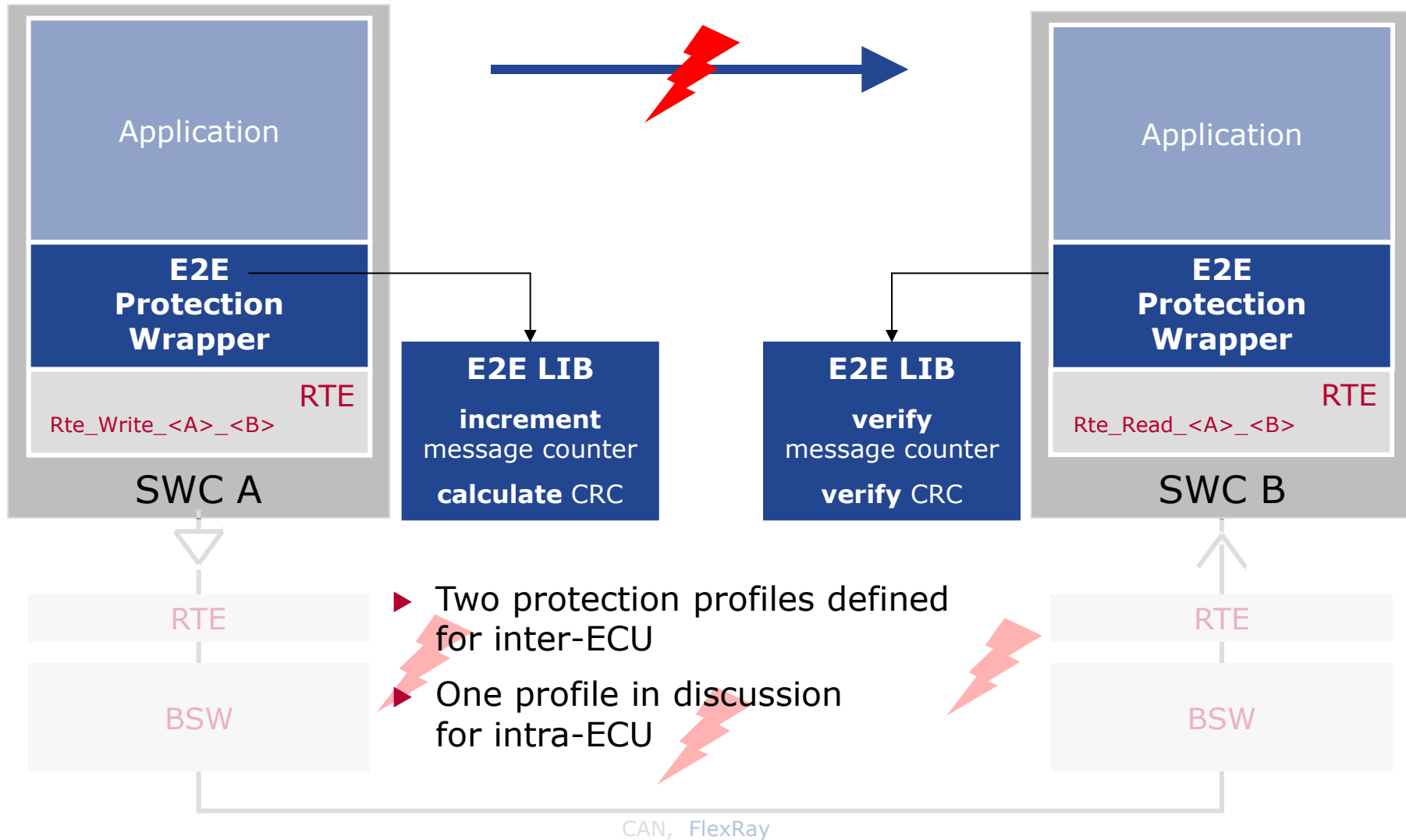
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DCM = Diagnostic Communication Manager
DEM = Diagnostic Event Manager

E2E – End-to-End Protection



CRC = Cyclic Redundancy Check

Features

► **Modularity**

- > Definition of a layered basic software architecture
- > Consideration of HW dependent and HW independent SW modules
- > Enable the transfer of functional SW components within a particular E&E system

► **Configurability**

- > Increase the reuse Basic SW modules provided by different suppliers
- > Scalability of the E/E-system across the entire range of vehicle product lines

► **Standardized**

- > Standardization of different APIs to separate the AUTOSAR SW layers

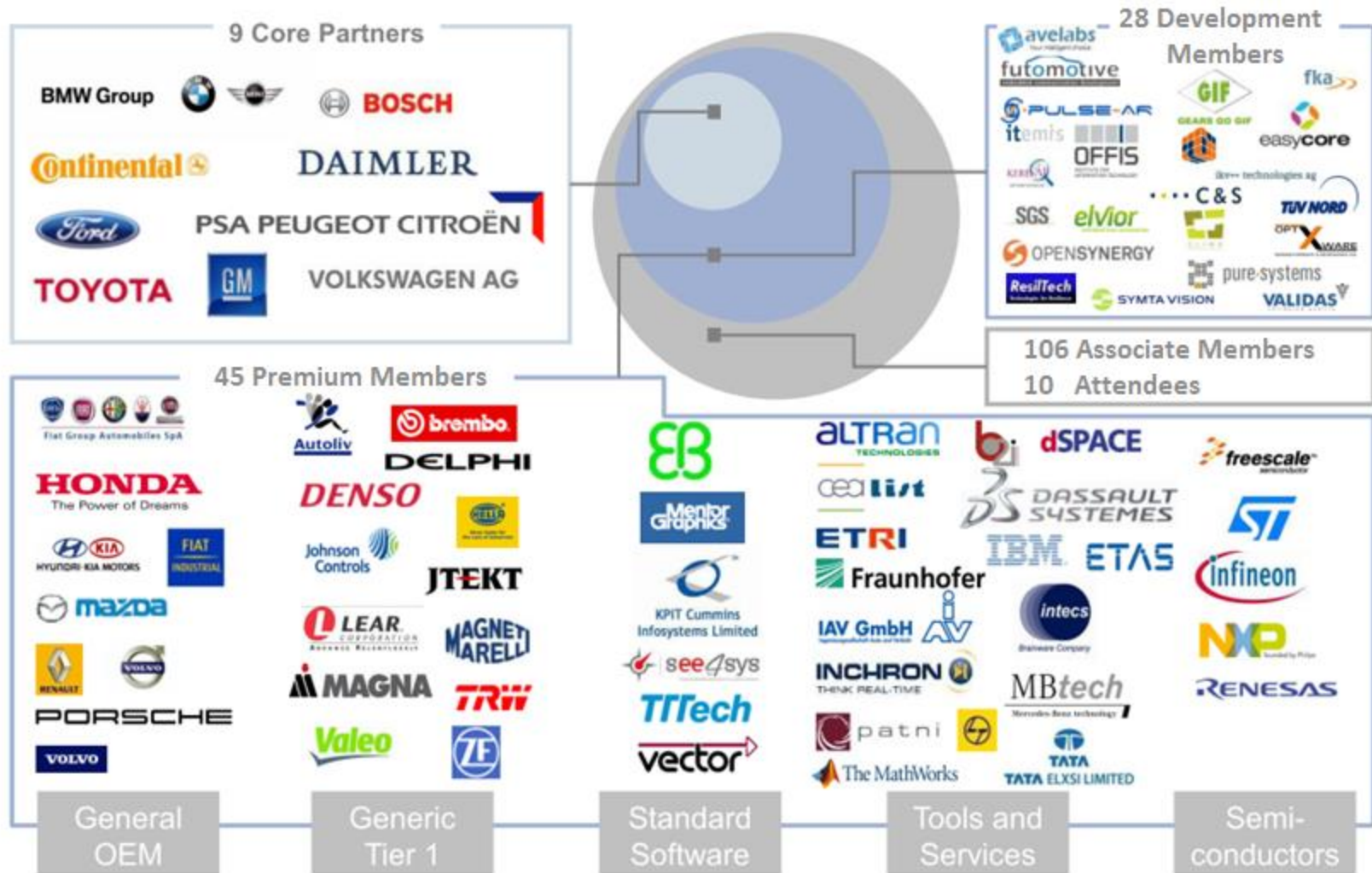
► **Runtime Environment (RTE)**

- > Provision of inter and intra-ECU communication across a vehicle network
- > Enables the easy integration of customer specific SW modules

► **Acceptance Tests**

- > Standardization of test specifications

Global Partnership

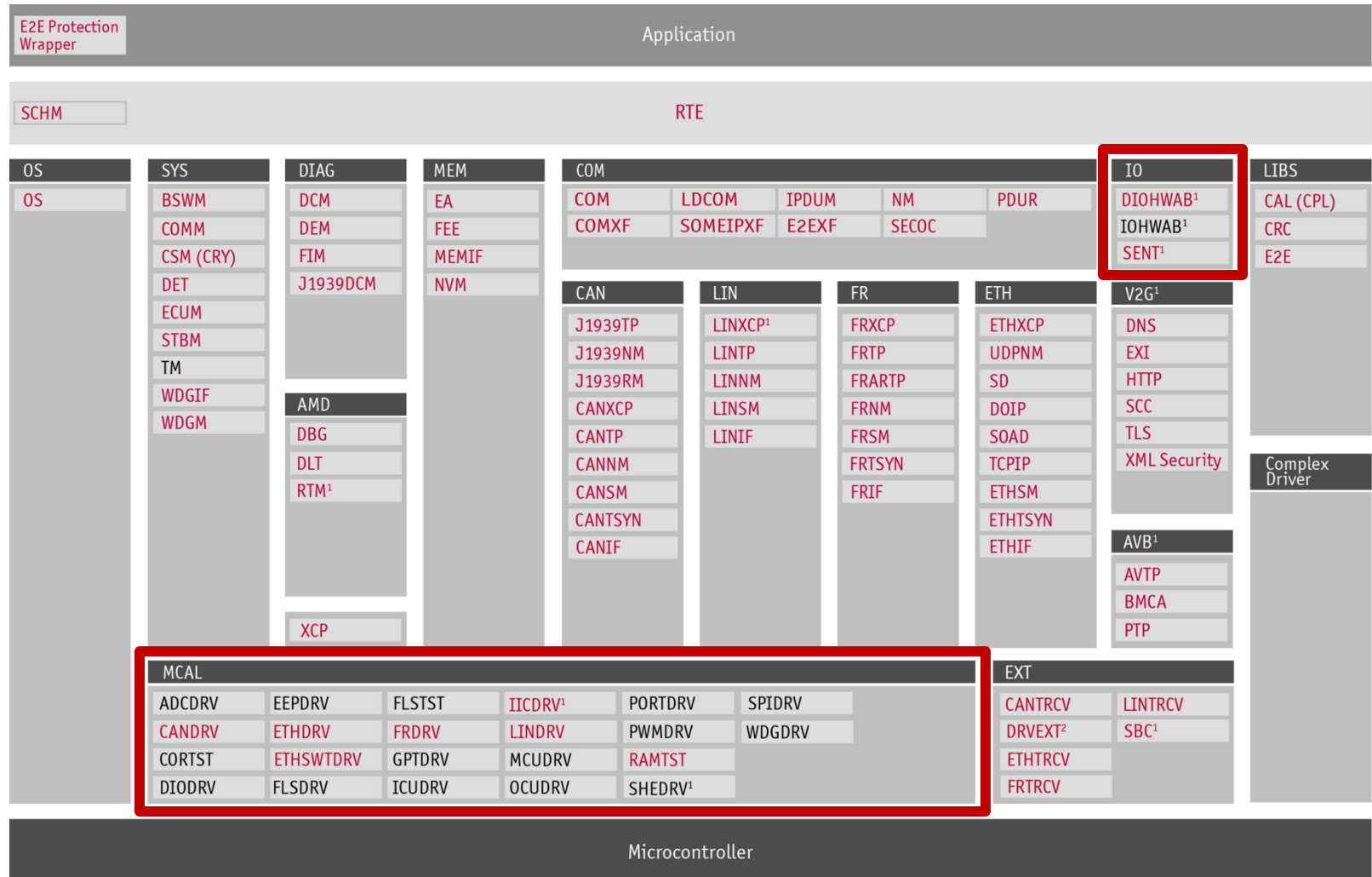


9 Core Partners, 45 Premium Members, 28 Development Members, 106 Associates*

A truly global development cooperation

*1st June 2015

Hardware Abstraction



Vector Standard Software

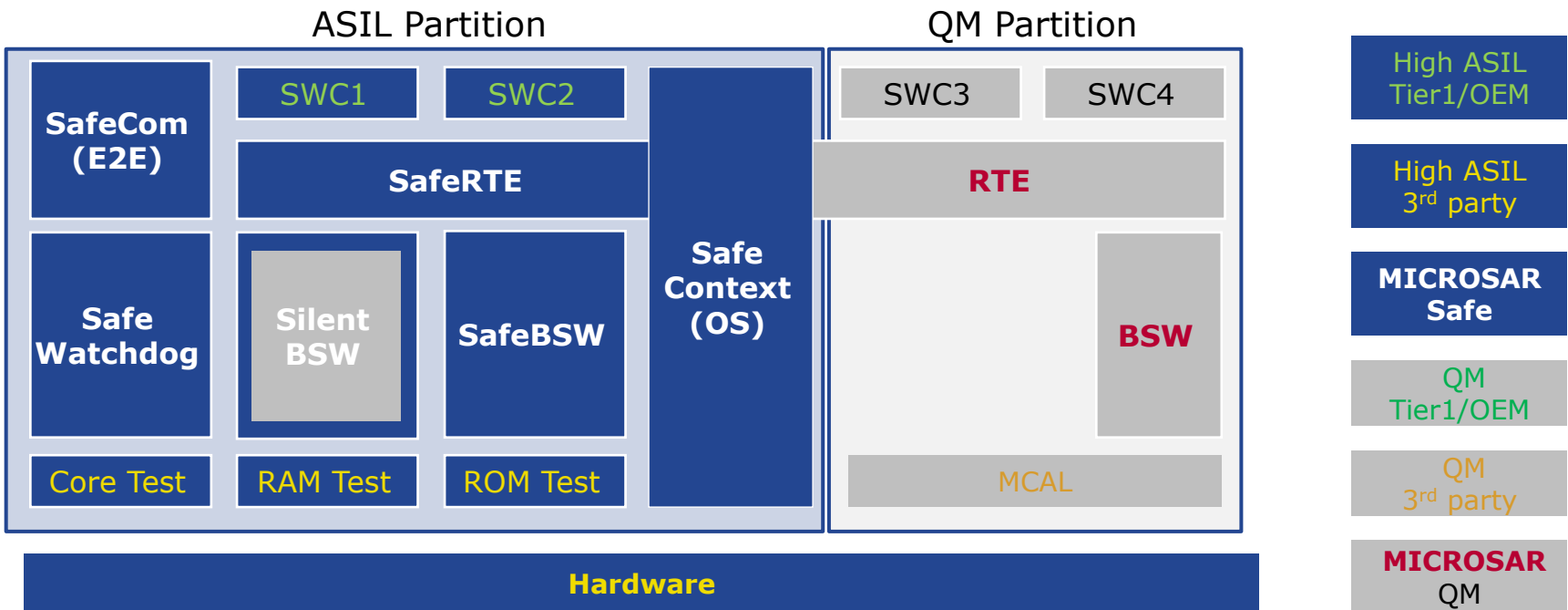
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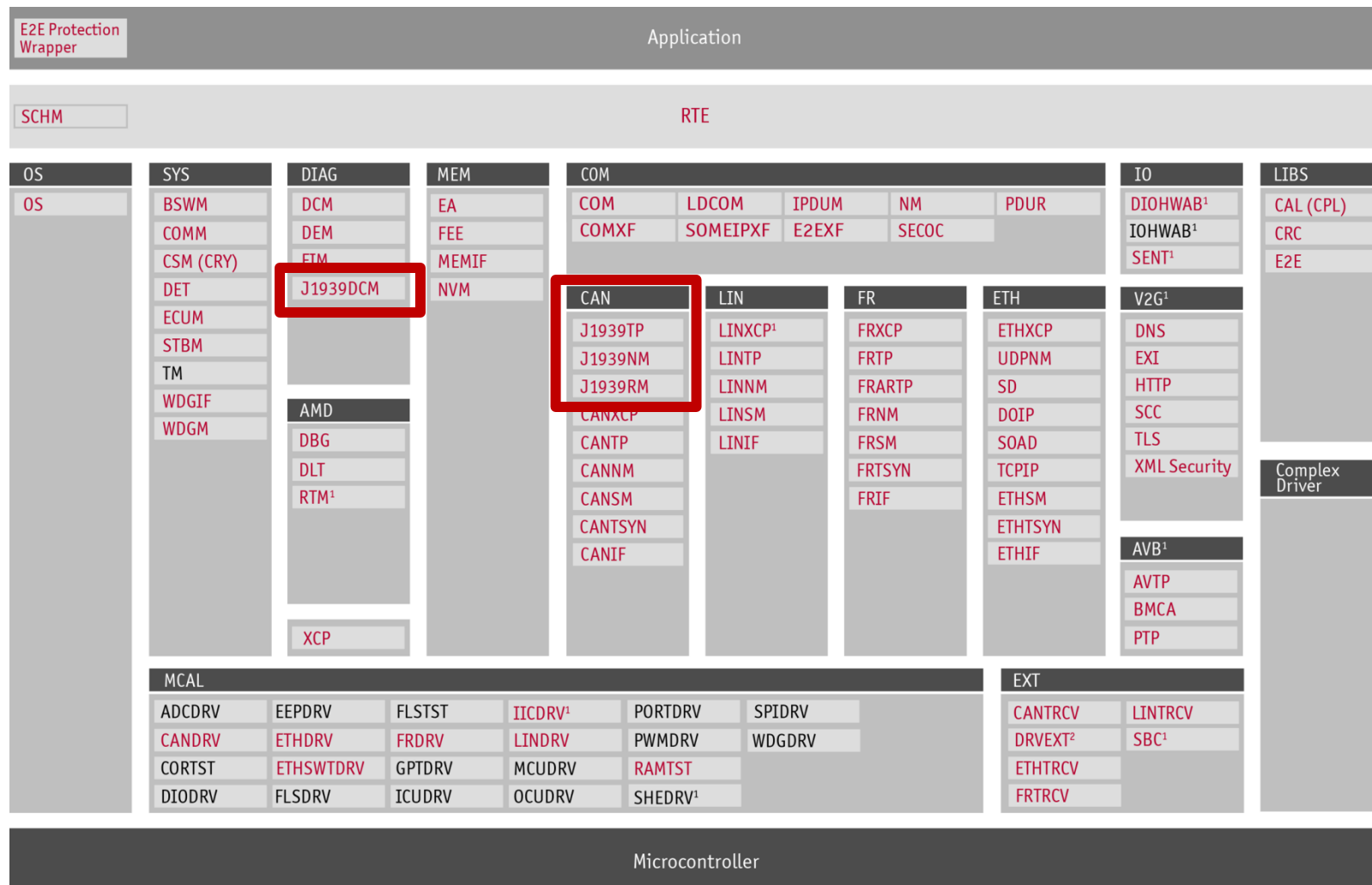
MCAL = Microcontroller Abstraction Layer

ISO 26262 (Functional Safety)



- ▶ Safety Software is protected by **SafeContext** Memory Protection
SafeWatchdog Timing Protection
- ▶ Ensuring correct communication **SafeCom (E2E)** Comms. between ECUs
SafeRTE Comms. within the ECU
- ▶ BSW for Memory Partitioning **SilentBSW** FfI (Memory)
- ▶ BSW with Safety Requirements **SafeBSW** Realizing BSW TSRs

J1939



Vector Standard Software

3rd Party Software

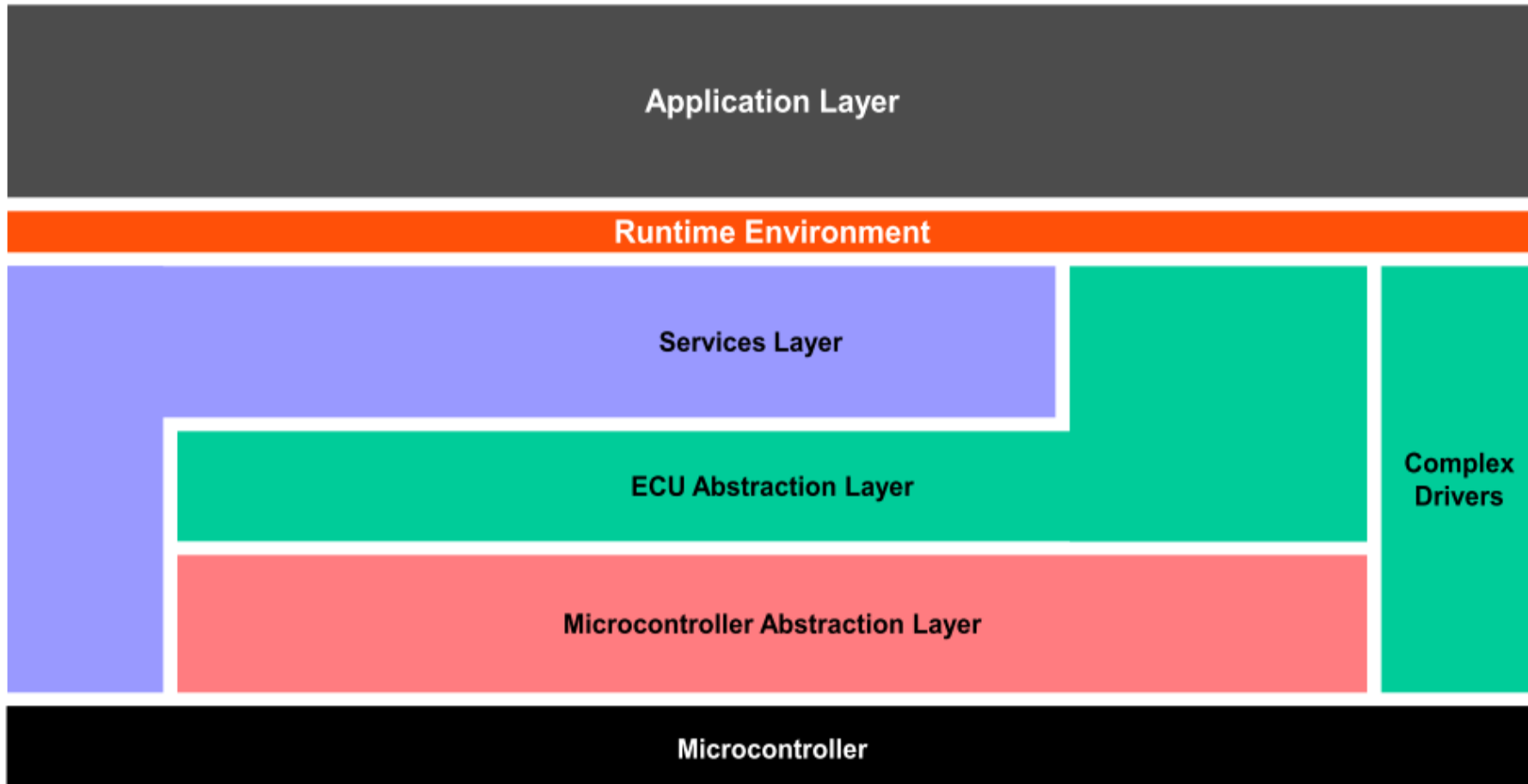
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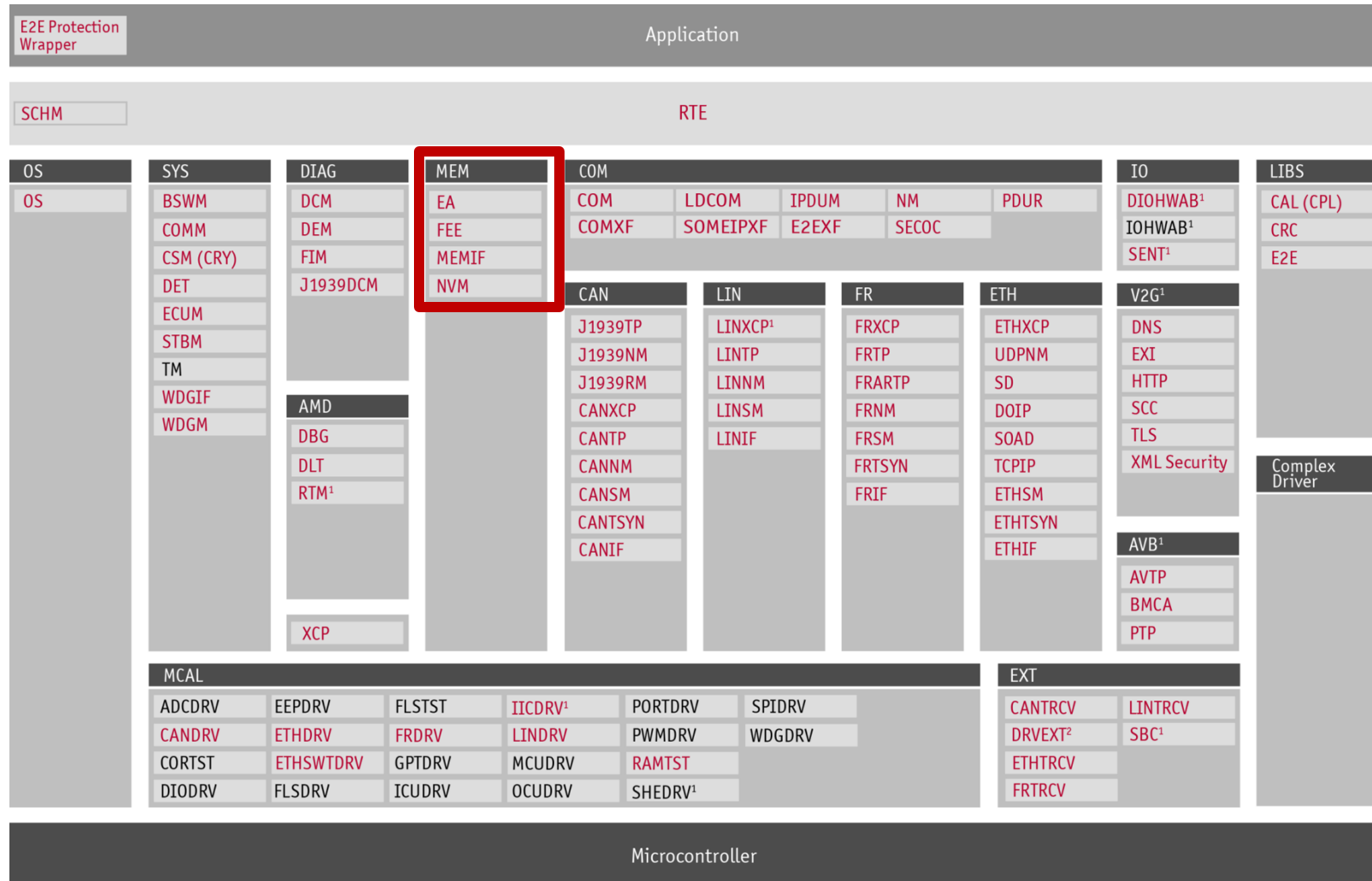
Know-How

- ▶ “Introduction to AUTOSAR” **Webinar** recording:
<https://vector-group.webex.com/vector-group-eng/lsr.php?RCID=7c60cb423cc49fbb36e110bbbef80670>
and slides:
<http://www.vector.com/portal/medien/cmc/events/Webinars/2015/VectorWebinarAUTOSARIntroduction20150505EN.pdf>
- ▶ Free of charge **E-Learning**:
http://elearning.vector.com/vi_autosar_introduction_en.html
- ▶ AUTOSAR **Training**:
http://vector.com/vu_class_autosar_en.html
- ▶ **Information** about Vector’s AUTOSAR solutions:
http://vector.com/vi_autosar_solutions_en.html
- ▶ Order a **FREE** AUTOSAR **Poster** and **Glossary**:
https://vector.com/vi_infomaterial_orderlist_autosar_en.html

Layered Architecture



Memory



Vector Standard Software

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**EA = EEPROM Abstraction, FEE = Flash EEPROM Emulation
NVM = Non-Volatile Memory, MEMIF = Memory Interface**

Networks

- ▶ AUTOSAR supports different network technologies, old and new



CAN

LIN

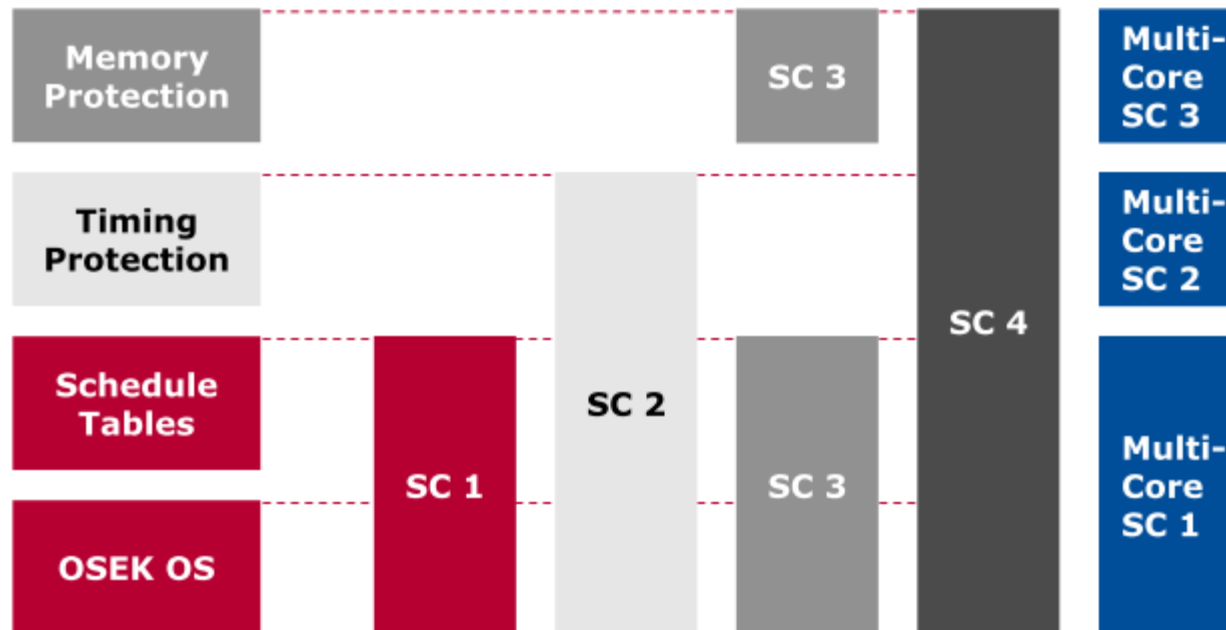
CAN-FD

FlexRay

Ethernet

- ▶ AUTOSAR abstracts the application software away from the physical bus
 - > Tier-1 application is independent of the underlying bus technology
 - > The ECU supplier can provide to different OEMs using different busses

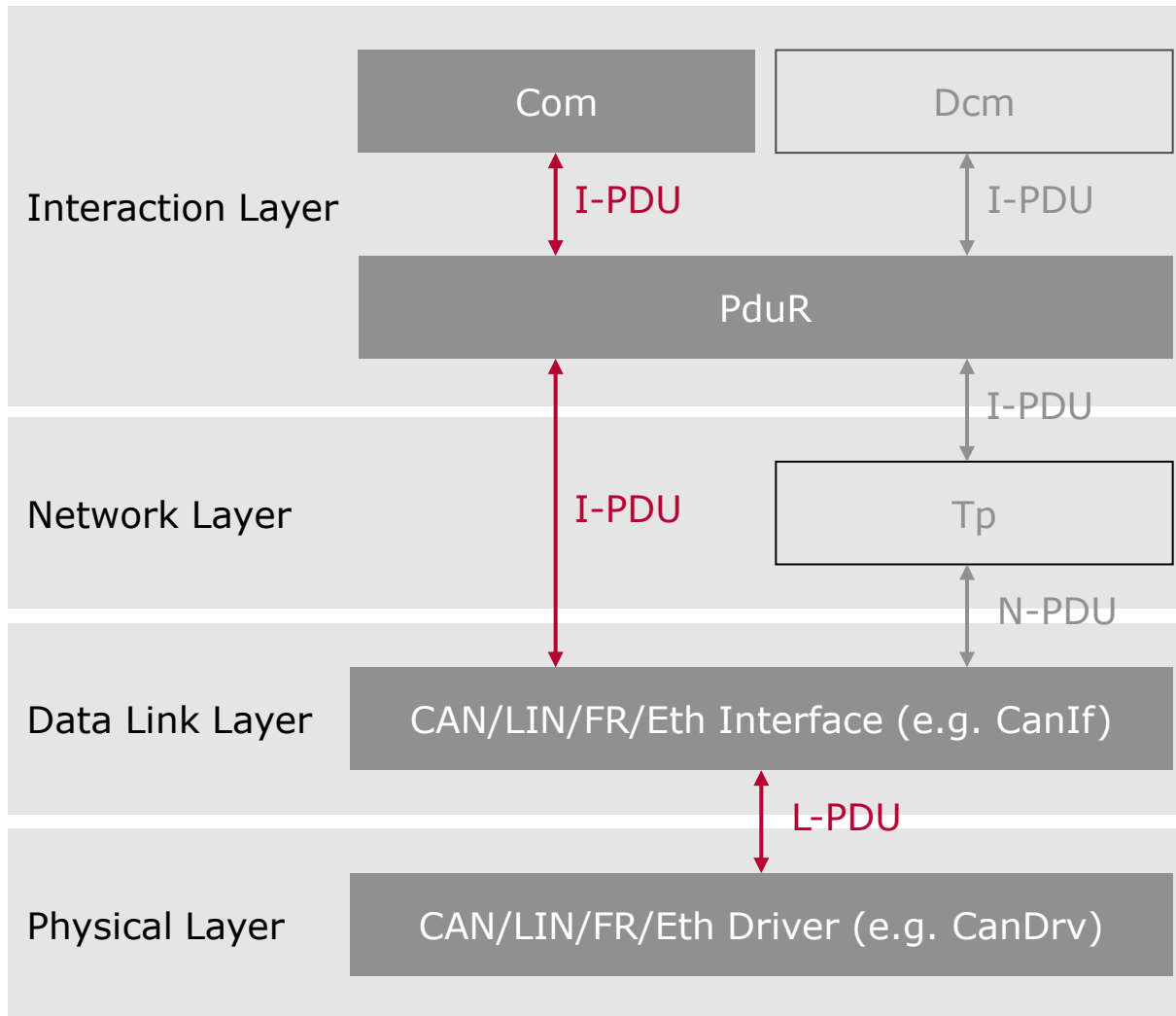
OS – Operating System



- ▶ **AUTOSAR OS** extends the OSEK*/VDX standard operating system
- ▶ Further OS extensions are defined by **Scalability Classes**

OSEK = Offene Systeme und Deren Schnittstellen für die Elektronik im Kraftfahrzeug
(English: Open Systems and the Corresponding Interfaces for Automotive Electronics)

PDU – Protocol Data Unit



Application Data has to be mapped to the Network (Com) Signals.

This assignment is done when performing the **Data Mapping**.

- **Data Mapping** means assigning Data Elements to Network Signals

PDU: Protocol Data Unit

L-PDU: Link Layer PDU

N-PDU: Network Layer PDU

I-PDU: Interaction Layer PDU

DCM: Diagnostic Communication Manager

Quality Standards

▶ SPICE

- ▶ Development of embedded software conformant to Automotive SPICE and ISO/IEC 15504

▶ ISO 26262

- ▶ Development for selected embedded software products in accordance with ISO 26262

▶ CMMI

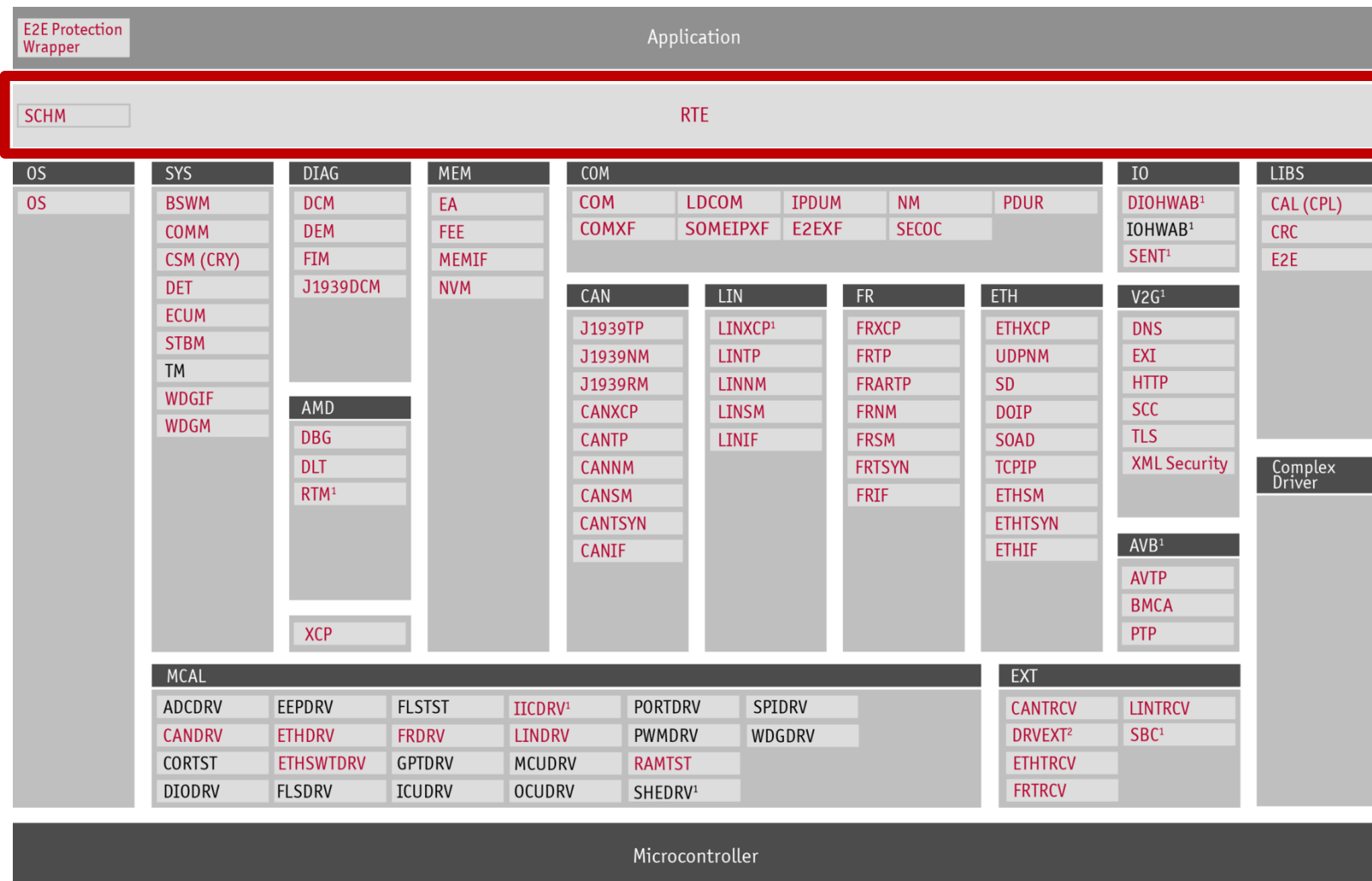
- ▶ Development of customer-specific ECU software based on the Capability Maturity Model Integration (CMMI)

▶ ISO 9001:2008

- ▶ Worldwide for all subsidiaries



RTE – Runtime Environment



Vector Standard Software

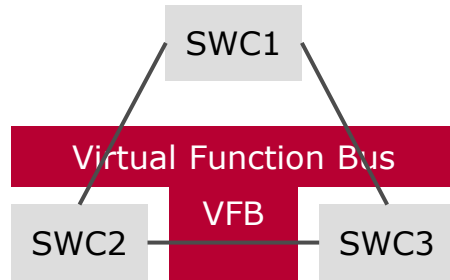
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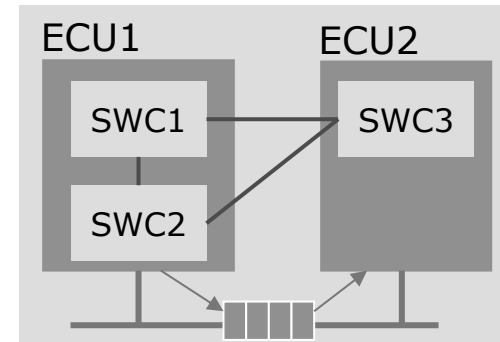
SWCs – Software Components

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



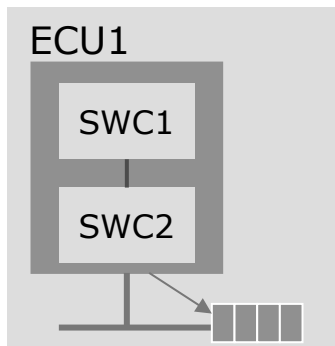
Software Component Description*

... and mapped to ECUs



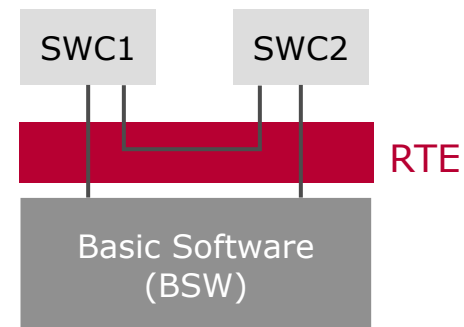
System Description*

An extract is created for each ECU...



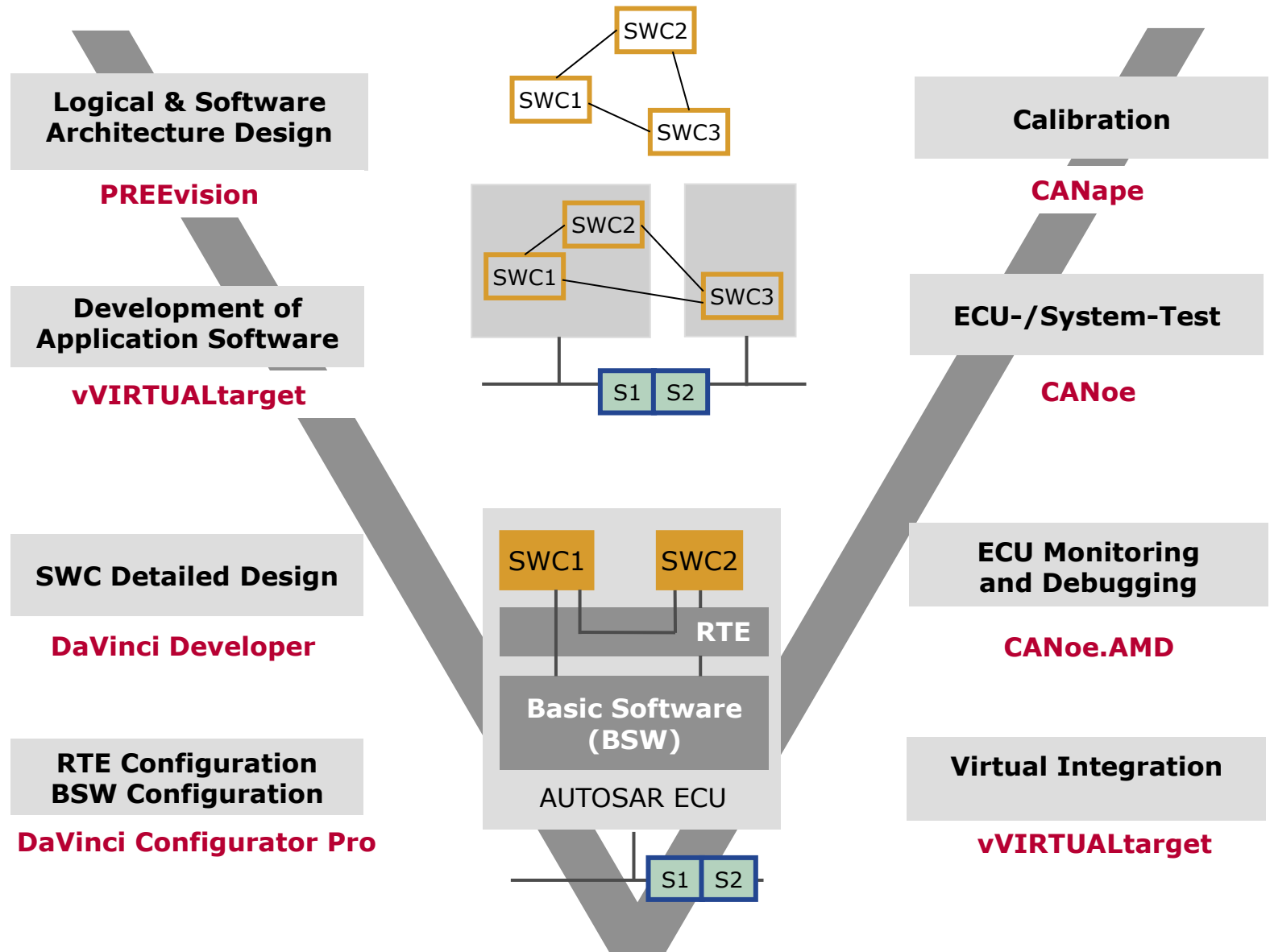
Extract of System Description*

The ECU is configured in detail



ECU Configuration Description (ECUC)*

Tooling



USPs – Unique Selling Points of Basic Software Suppliers

High performance & high quality

powerful tooling	optimized code	mature product
supportive GUI with comfort views, multi-user, diff & merge, automatisms, validation, all ASR data formats, part of Vector ASR tool chain, vVIRTU ALTARGET	pre-configuration, minimal ASR-overhead, HW optimized drivers and OS	ASPICE Level 3, ISO 26262, PLA approach, ALM+, 5 th generation of configuration tool, 20 years of experience, 1,200 person years ASR development, > 500 ASR projects

for all projects

all OEMs	all μ Cs	all functions	all types
AUTOSAR: Audi, BMW, Daimler, FCA, GM, HMC, JLR, Patac, Porsche, Toyota, VAB, VCC, VW, ... CBD: > 40	ARM, Atmel, Freescale, Infineon, Microchip, NXP, Panasonic, Renesas, Spansion, STM, TI, Xilinx > 100	CAN, CAN FD, LIN, FR, MOST, Ethernet, SOME/IP, SD, AVB, DoIP, SCC, XCP, J1939, OBD, Postbuild, FBL, ASIL-D, Security, Multicore, ...	Evaluation, Prototype, Production, SIP, EIP, Safety, 3rd party integration, SWC integration, around the globe

with planning reliability

up-front specification	turnkey delivery	no hidden costs
quote based on detailed questionnaire	delivery date defined for customers use case; tested on target HW	fixed price integration in customer project, maintenance incl. spec changes

with value for money

focus on TCO	scalable license	long term benefit
turnkey product instead of project work	license only what is needed, flexible business model	cost saving programs, flat-rate, volume discount

This is unique around the world!

Vector

AUTOSAR
is very beneficial

but
introduction is a challenge

It is **good to have**
experienced guidance
and **mature equipment**



Worldwide

OEM	AUTOSAR Version	Scope	Communication Definition	Methodology
OEM A	3.x	Communication	System Descr.	SWC+BSW
OEM B	3.x	Comm. / complete	DBC, LDF	SWC+BSW
OEM C	3.x	CAN / LIN / FR	DBC, LDF, Fibex	SWC+BSW
OEM D	3.x → 4.x	CAN / LIN	DBC, LDF	SWC+BSW
OEM E	3.x	CAN / LIN	DBC, LDF	SWC+BSW
OEM F	4.x	CAN	DBC	BSW
OEM G	3.x → 4.x	complete	DBC, LDF, Fibex	BSW
OEM H	4.x	CAN / LIN / FR	DBC, LDF, Fibex	BSW
OEM I	4.x	CAN / LIN / FR	System Descr.	SWC+BSW
OEM J	4.x	complete	Fibex	SWC+BSW
OEM K	4.x	CAN & FlexRay	System Descr.	SWC+BSW
OEM L	3.x/4.x	Communication	?	SWC+BSW



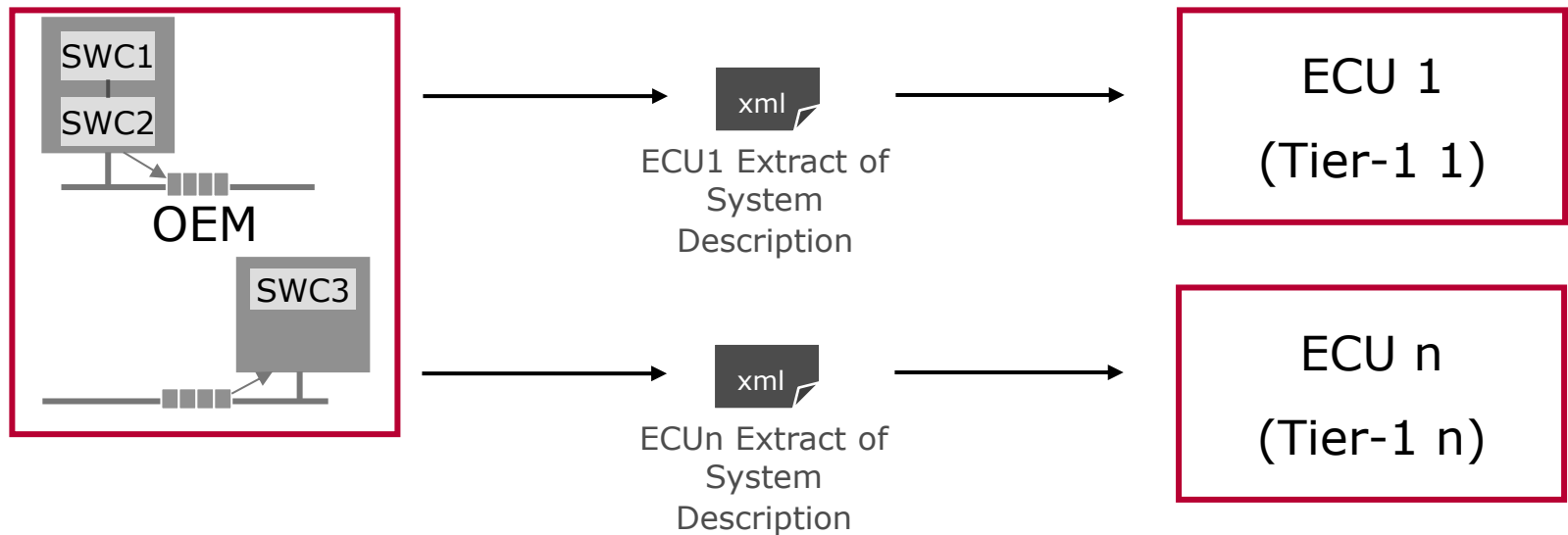
**Differences in
functionality**

**Differences in data
formats and workflow**

→ AUTOSAR is one standard, with different adoptions worldwide

XML Files

- ▶ Workflow between the OEM and Tier-1
 - ▶ ECU Extract of System Description (ECU Extract)
 - ▶ Replaces DBC, LDF and/or Fibex files
- ▶ OEM creates ECU Extract (in ARXML*) based on vehicle system design
- ▶ Tier-1 configures an AUTOSAR ECU based on the ECU Extract
 - ▶ Tier-1 creates an ECU Configuration (ECU-C) file (also in ARXML)



*ARXML = AUTOSAR XML (Extensible Markup Language) Format

whY AUTOSAR?

The challenges:

- ▶ E&E **complexity** is growing fast
- ▶ The **quantity of software** is increasing exponentially
- ▶ Many different **hardware platforms** are available
- ▶ Different **development processes** and **data formats** are used

The main objectives of AUTOSAR: **AUTOSAR**

→ **Improve software quality and reduce costs by reuse**

- ▶ Re-use of software functions across carlines and across OEM boundaries
- ▶ Re-use of development methodologies and tools
- ▶ Re-use of the BSW (Basic Software)

AUTOSAR is not the problem...

it is the solution!

▶▶ Zzzzz...

(If you are still awake...)

Thank you for your attention!

Enjoy the remaining presentations...

Any Questions Please?

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