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Diagnostic in Adaptive AUTOSAR

HPC Diagnostics

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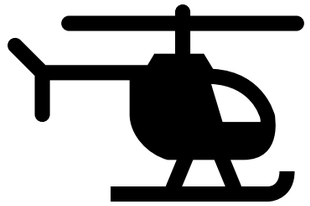

Short flyover over Adaptive Autosar

Once **you**'re in the forest, all the **trees look** pretty much alike

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What is the market driver for adaptive AUTOSAR

Game changer for AUTOSAR – selected main drivers

- Highly automated driving
- Car-2-X applications
- Internet of Things and cloud services
- Increasing of data rates
- Electric Powertrain

What is the main impact of adaptive Autosar for diagnostic?

Classic		Adaptive
Based on OSEK an „C“		Based on POSIX PSE51 System and C++ 14
Execution of code directly from ROM	from → to	Applicication is loaded from persitent memory into RAM
Same address space for all application (MPU for safety support)		Each applications has it own (virtual) address space (MMU support)
Optimize for signal-based communication	from → to	Service-oriented communication
Fixed task configuration and configuration		Support of multiple (dynamic) scheduling strategies
Specification		Specifaction and code
Static serialisation of PDUs		Dynamic serialisation

Source: https://www.autosar.org/fileadmin/HOW_TO_JOIN/AUTOSAR_Introduction.pdf

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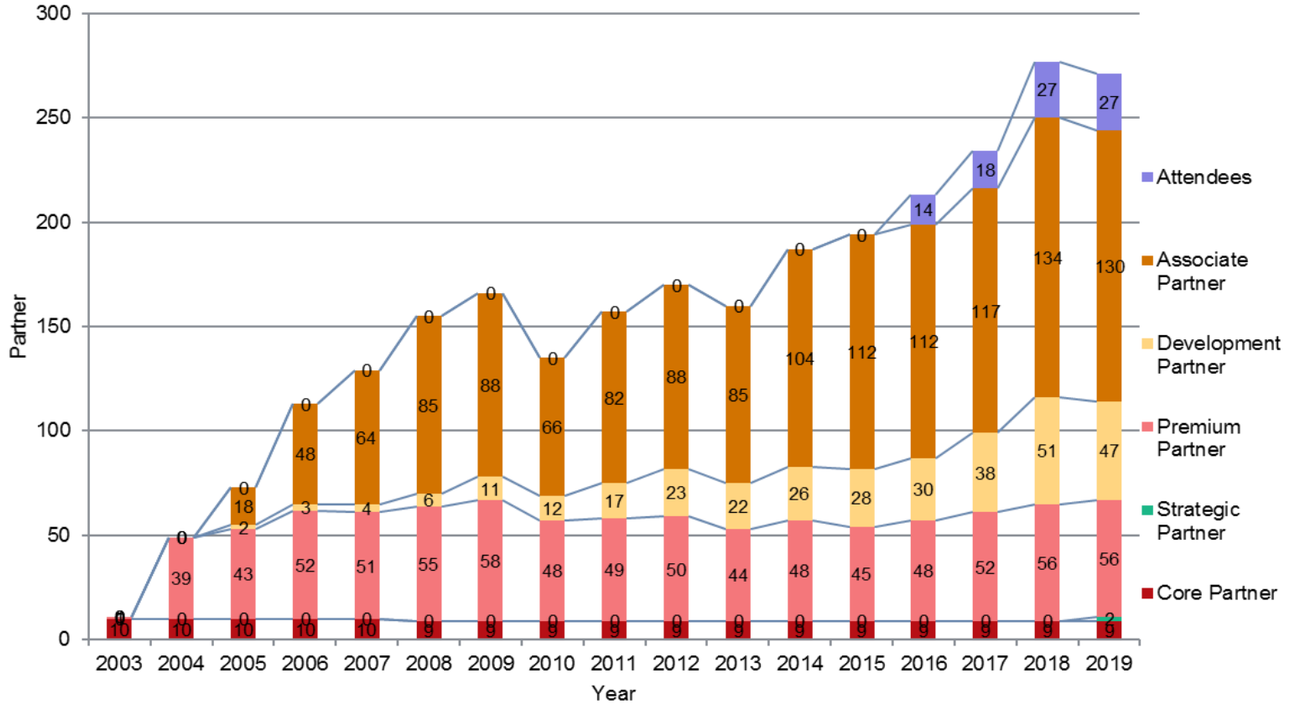
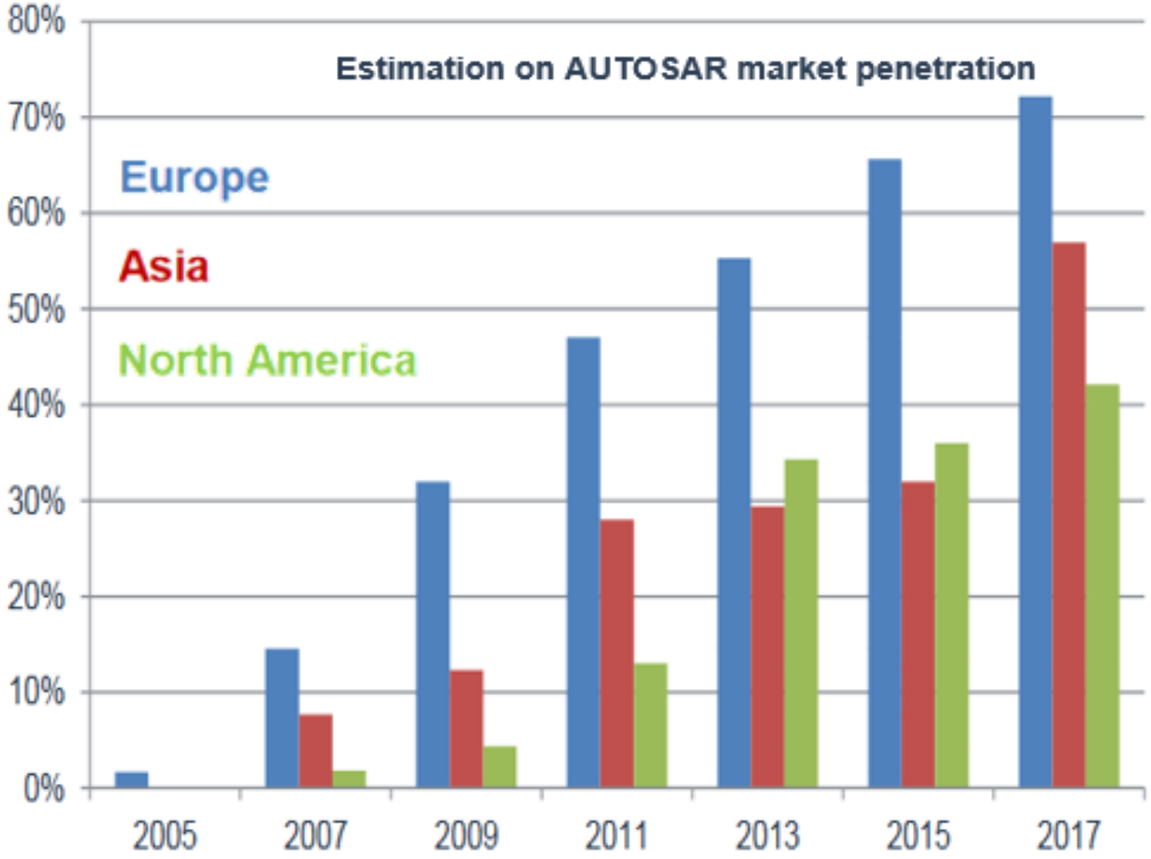
AUTOSAR is constantly growing

Number of Partners



Number of Products on the market



Working Group Organization

Project Leader Team

Cross-standard Working Groups (FO, CP, AP)

- **WG-A** Architecture Team
- **WG-MT** Methodology and Templates
- **WG-SEC** Automotive Security
- **WG-SAF** Functional Safety
- **WG-AIF** Application Interfaces
- **WG-IVC** In-Vehicle COM
- **WG-V2X** Vehicle to X
- **WG-DIA** Diagnostics
- **WG-RES** Resources
- **WG-UCM** Update & Conf. Management
- **WG-TSY** Time Synchronization

Autosar Diagnostics

Classic Platform Working Groups (CP)

- **WG-CP-RTE** Runtime Environment
- **WG-CP-MCBD** Multicore BSW Distr.
- **WG-CP-VAL** Validation
- **WG-CP-MCL** MCAL and NVRAM
- **WG-CP-LIB** Libraries

Adaptive Platform Working Groups (AP)

- **WG-AP-EMO** Execution Man. & OS
- **WG-AP-DI** Demonstrator Integration
- **WG-AP-ST** System Tests
- **WG-AP-PER** Persistency
- **WG-AP-CCT** Core Coding Team
- **WG-AP-CLD** Cloud Services

Legend:

- Lead Working Group
- Working Group

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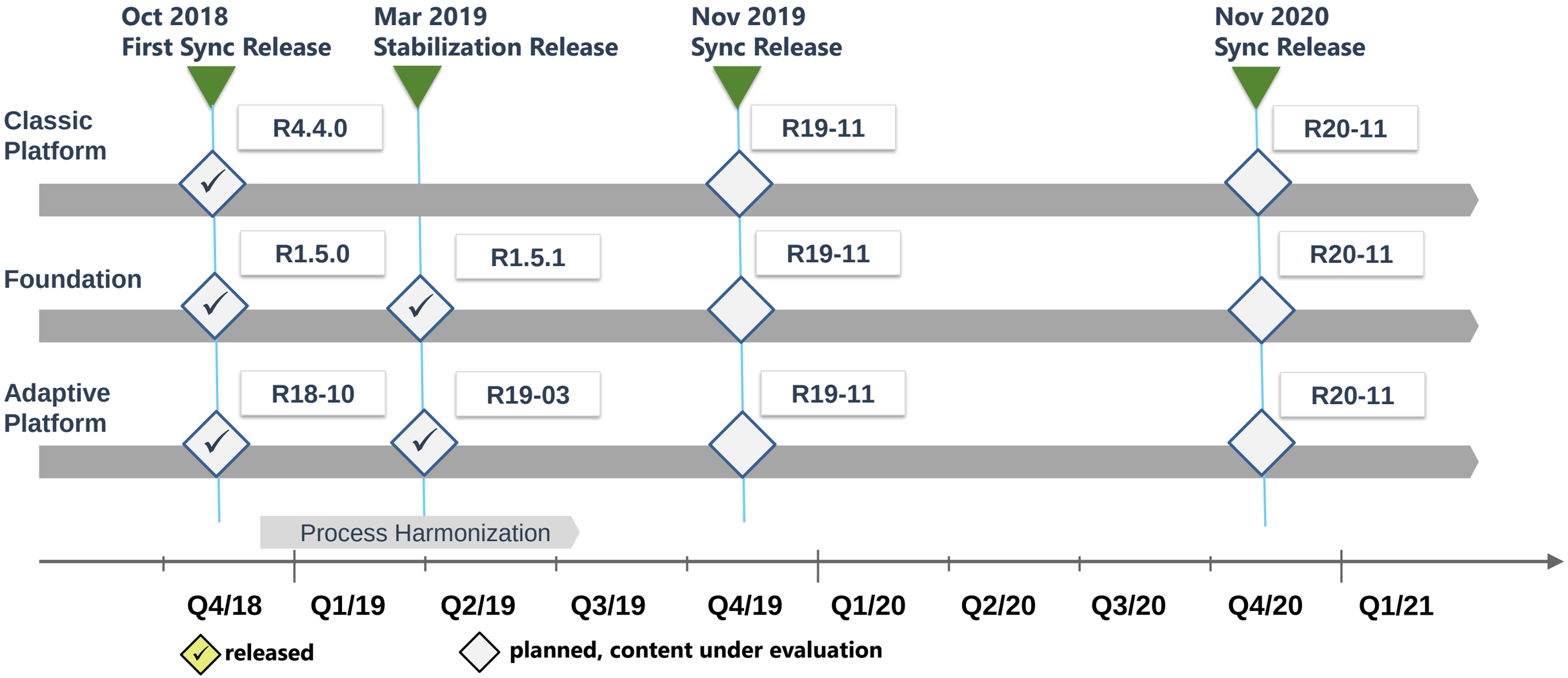
Release Plan



- **Continue yearly sync release in November**
- **Additional stabilization releases possible**

Planned concepts in the next two years

- 27 Concepts are planned for R19-11 and R20-11
- Current status

Setup	
MS0	
MS1	
MS2	none
MS3	none
MS4	none

- Concepts scheduled for R20-11 are marked with blue font

Classic Platform
(9 concepts)

- Ethernet Wake-up on Data Line
- VNSM
- BSW Distribution
- Firmware over the Air
- Meta data for application
- HealthMonitoring Harmonization CP
- NV Data Handling Enhancements
- 10-Base-T1S
- Variant Handling

Adaptive P. & Classic P.
(7 concepts)

- Security Extensions Harmonized
- IPSec Protocol
- DoIP Extension
- Signal Service Translation
- VFB++
- Unified Timing and Tracing approach
- RS Safety

Adaptive Platform
(11 concepts)

- Socket API
- V2X Support
- Adaptive MCD
- Integration of IAM
- Crypto API
- Recovery action via application
- Mode dependent configuration
- PHM Daisy Chaining
- UCM Master
- Service versioning ara::com
- AD Sensor Interfaces

ASAM HPC

ASAM HPC

Potential relevant for Diagnostics

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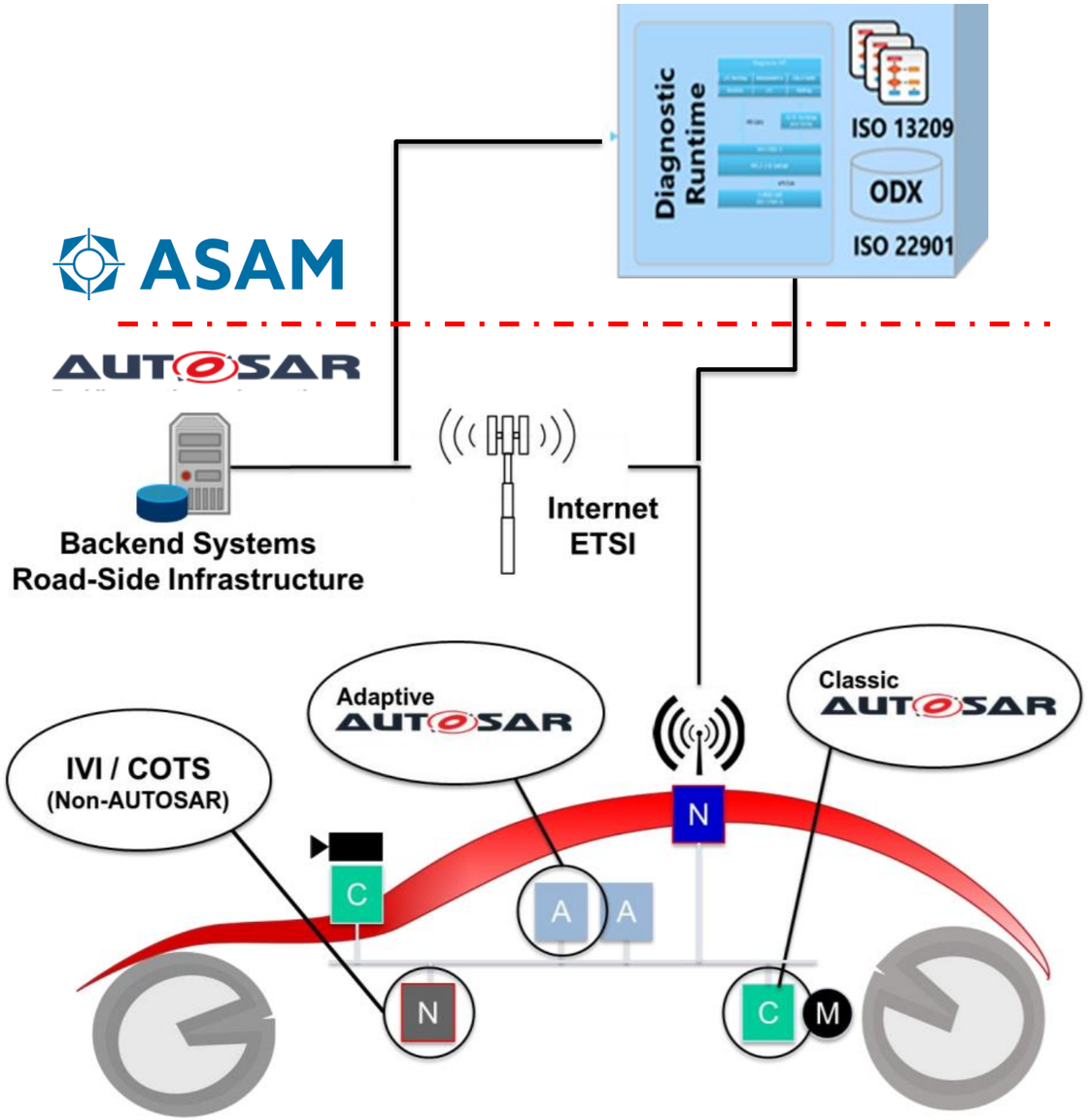
What is Adaptive AUTOSAR?

- Future-proof basis for automotive ECUs
- Key advantage: to develop ECU applications independently of one another
- Standardization of the runtime for Adaptive Applications (ARA)
  -> main focus on functional cluster for (virtual) machines
- Standardization by AUTOSAR Consortium (almost every OEM)



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D-Server
in Adaptive Autosar

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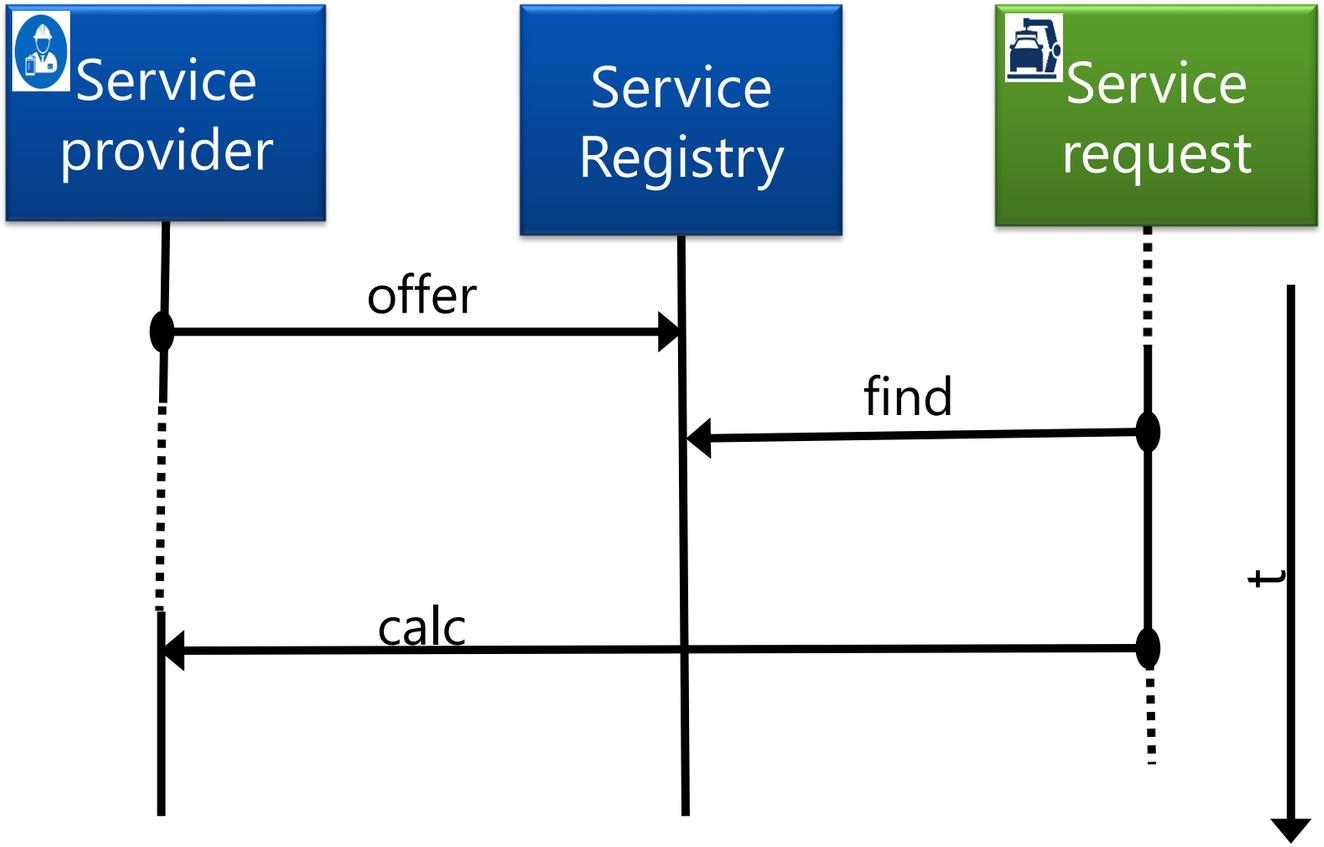
Service-Oriented Communication (SoC)



- The **AUTOSAR Adaptive architecture** organizes the software as **functional cluster** These clusters offer common functionality as services to the applications
- In comparison to the AUTOSAR Classic Platform the Runtime Environment for the Adaptive Platform dynamically links services and clients during runtime

Source: https://www.autosar.org/fileadmin/user_upload/standards/adaptive/17-10/AUTOSAR_SWS_CommunicationManagement.pdf

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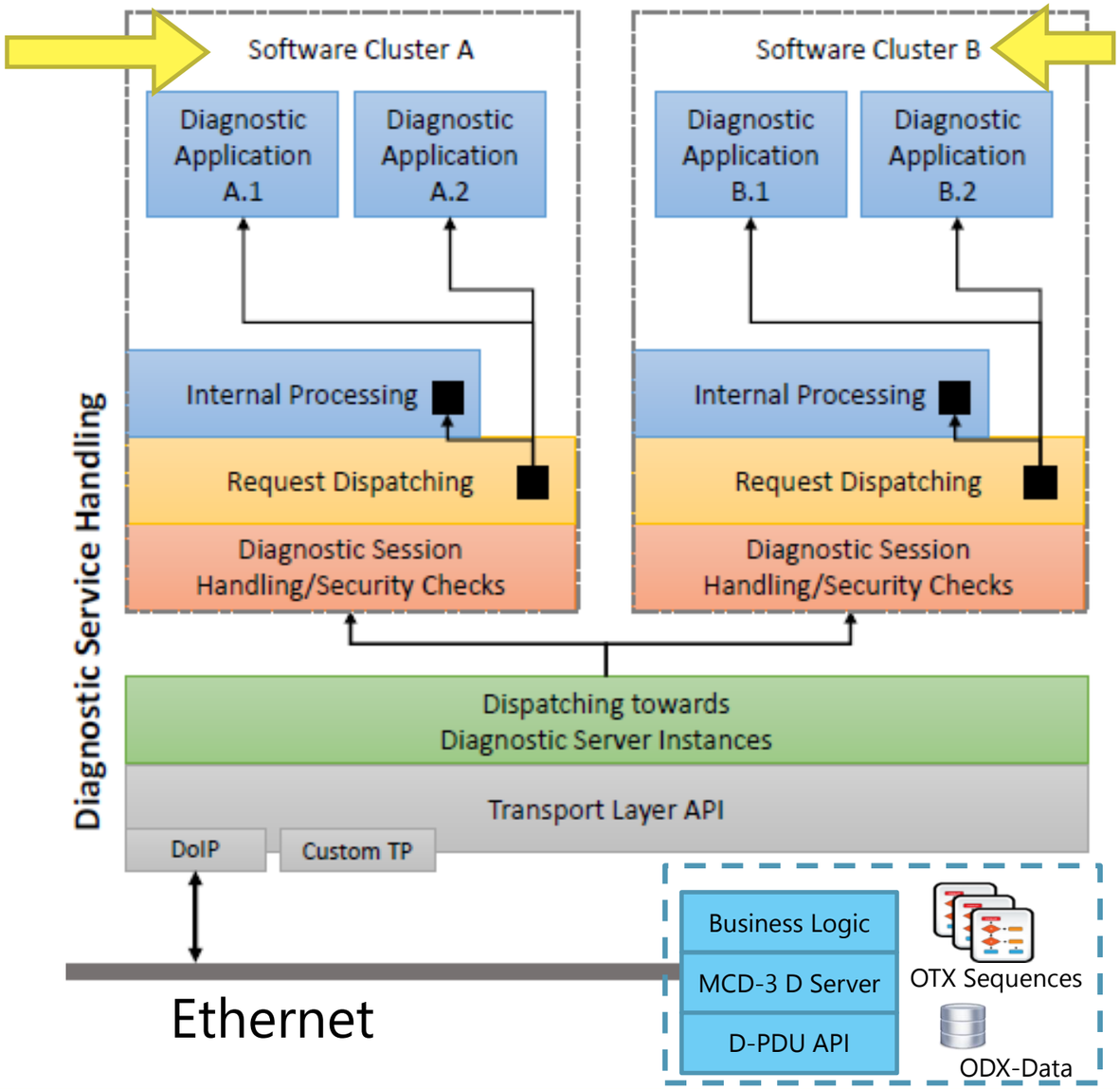
Diagnostics Management(DM) in Adaptive AUTOSAR 19/03

- The Adaptive AUTOSAR platform can be extended with new software packages without re-flashing the entire ECU
- The individual software packages are described by Software Cluster
- To support the current approach of diagnostic management (like software updates), each SoftwareCluster has its own Diagnostic Address
- Diagnostic Management is intended to support an own diagnostic server instance per installed Software Cluster
- The Diagnostic Management uses its own serializer ARA::DIA, similar to ARA::COM
  This serializer and the DM parts can be generated



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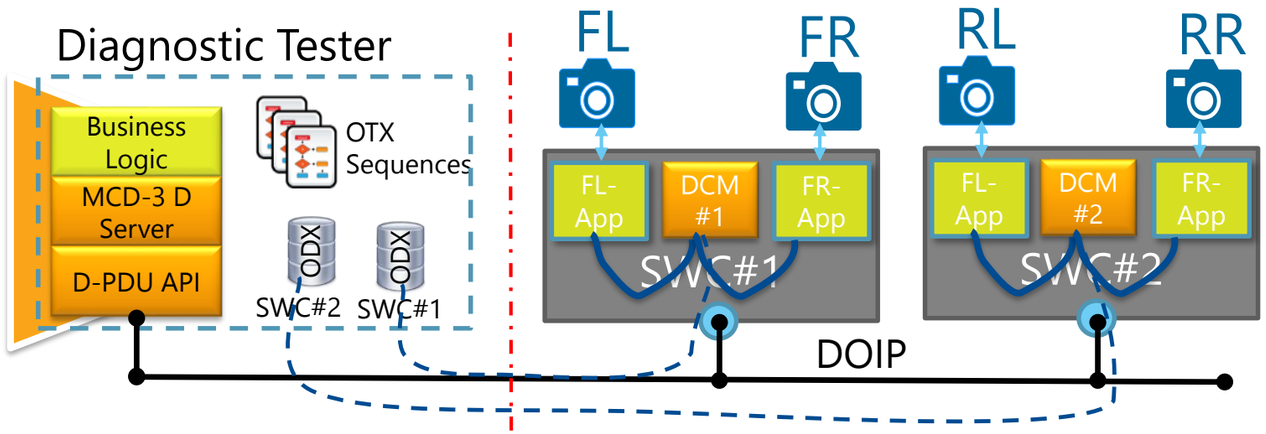
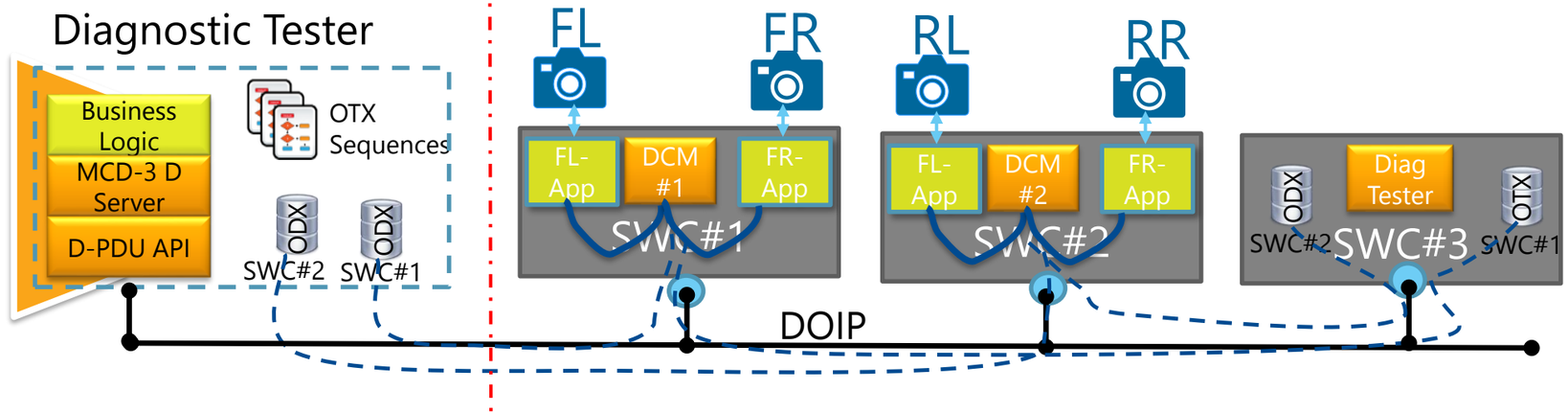
DOIP Communication with each SoftwareCluster

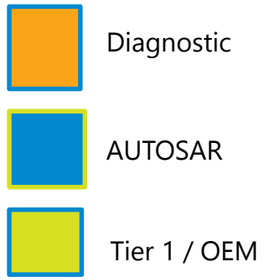
External Tester using DOIP



SoftwareCluster(SWC) have their own Diagnostic Adresses.

External and internal Tester using DOIP (planned for Nov 2019)





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MC-Server

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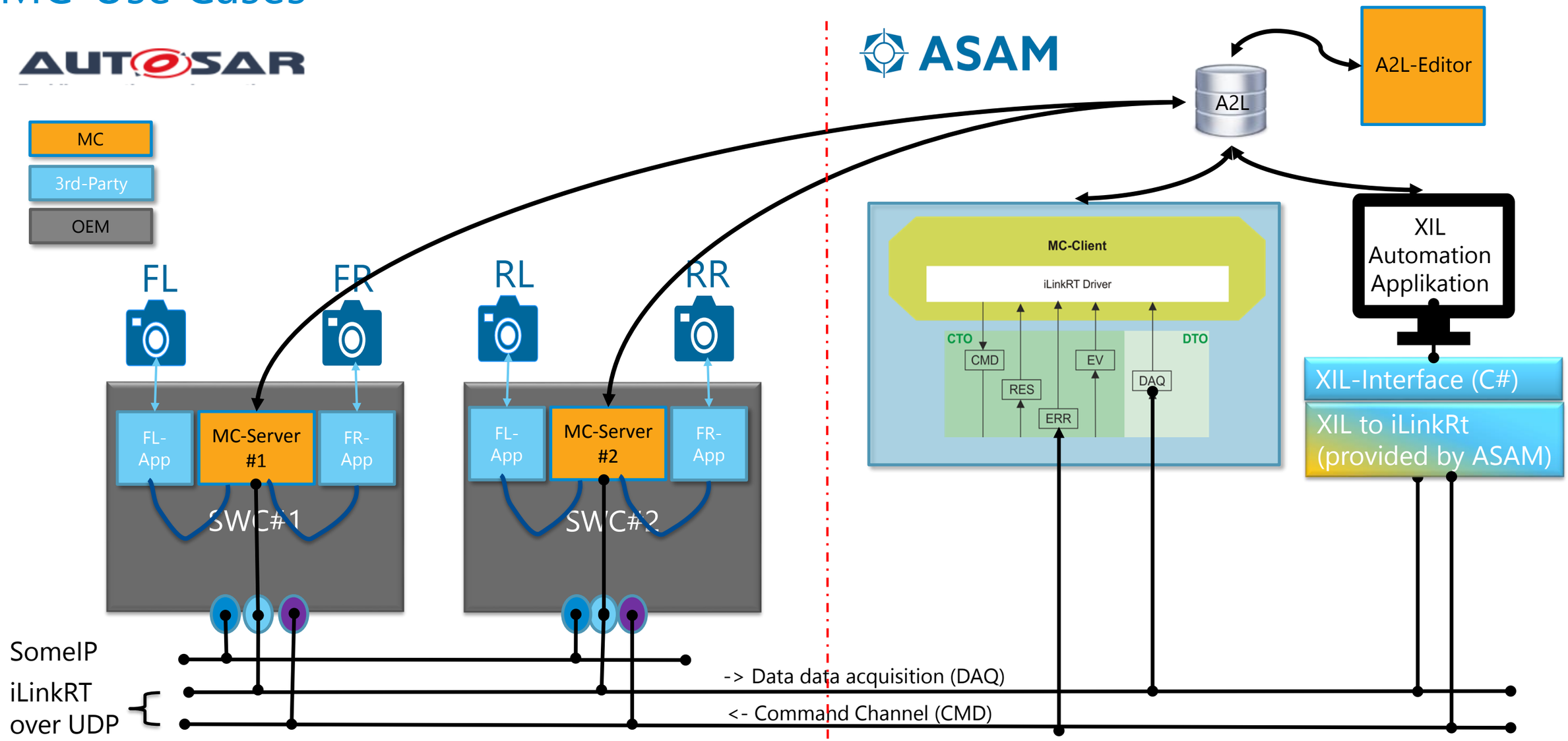
MC-Use Cases



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Possible Offboard work packages

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Vehicle Information Table - > Physical Link (pre adaptive)

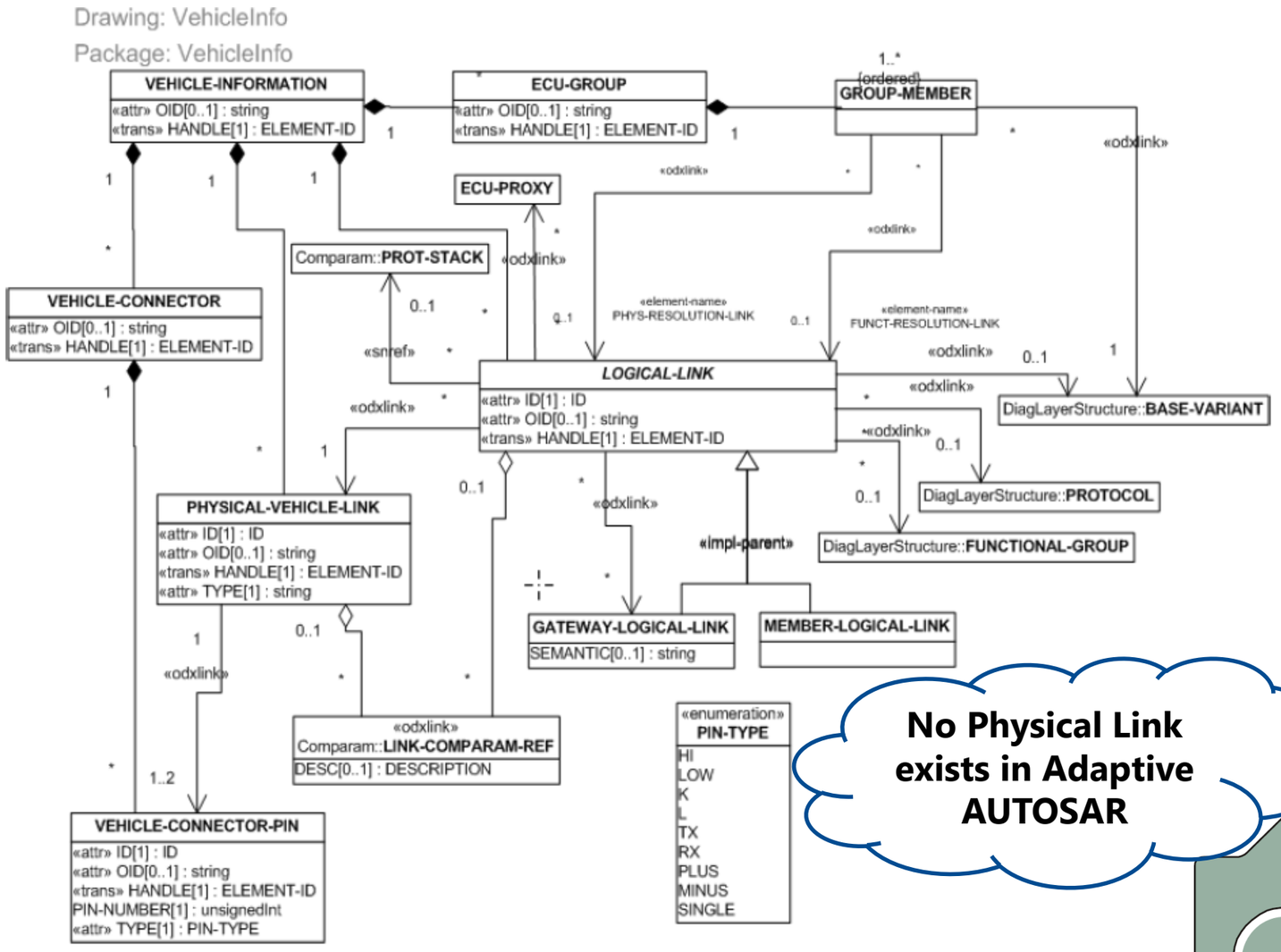
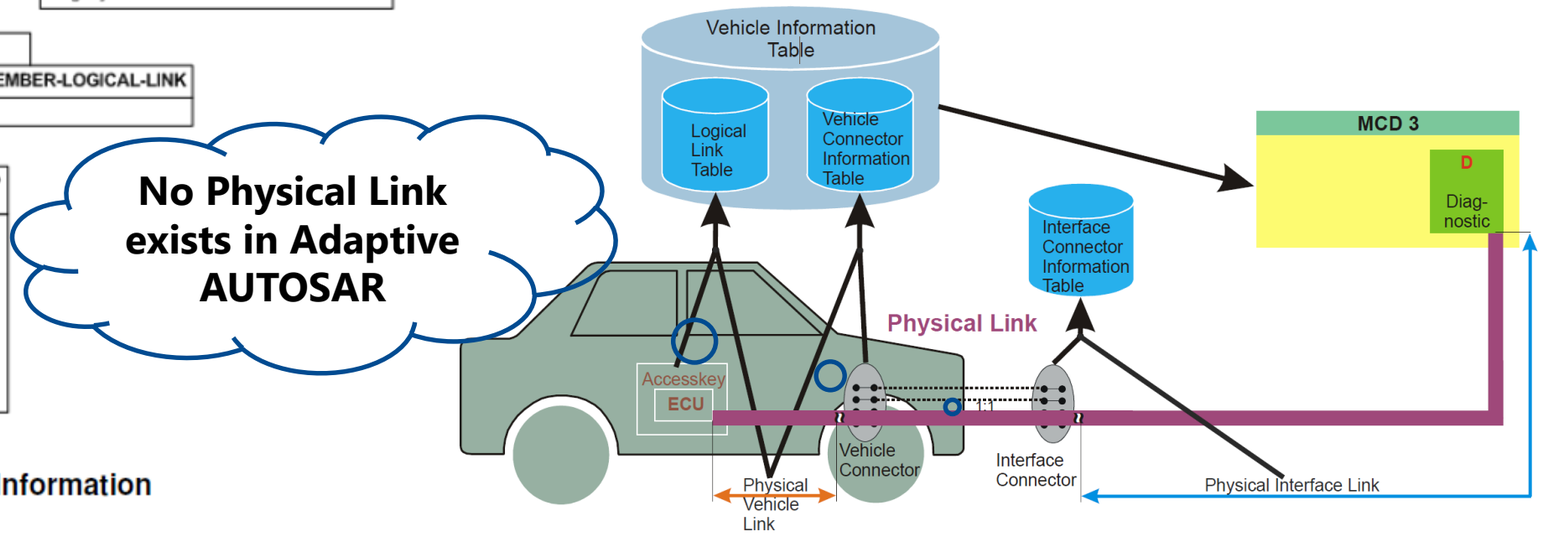


Figure 121 — UML representation of Vehicle Information

- The Vehicle Info-Spec includes the static routing information for a given vehicle and the physical links
- A physical link is a Physical Vehicle Link connected to a Physical Interface Link, so it is the connection from the interface of the Diagnostic system to the ECU in the vehicle



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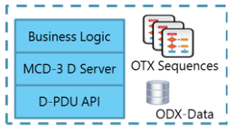
Service-Oriented Communication (SoC)



AUTOSAR

ECU #1
Dcm
Dcm

ECU #2
Dcm
DCM

ECU #3
Dcm
Dcm

FL
FR
RL
HMI
RR
ADAS

Vehicle Info Spec. from ODX is now a vehicle specific registry. The physical vehicle link will no longer be defined at data definition time, instead it needs to be generated at runtime.

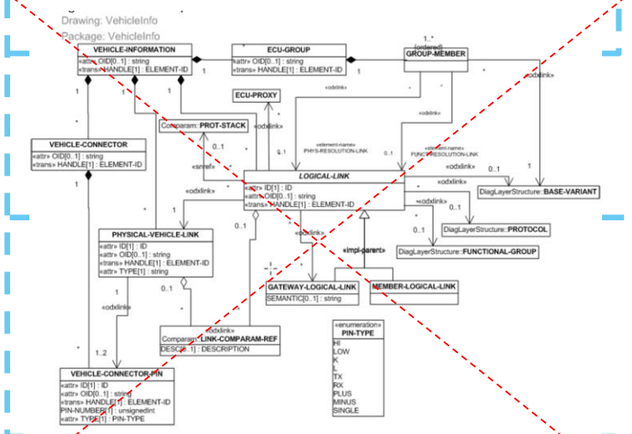


Figure 121 — UML representation of Vehicle Information

CAM
CAM
HMI
ADAS
CAM
CAM

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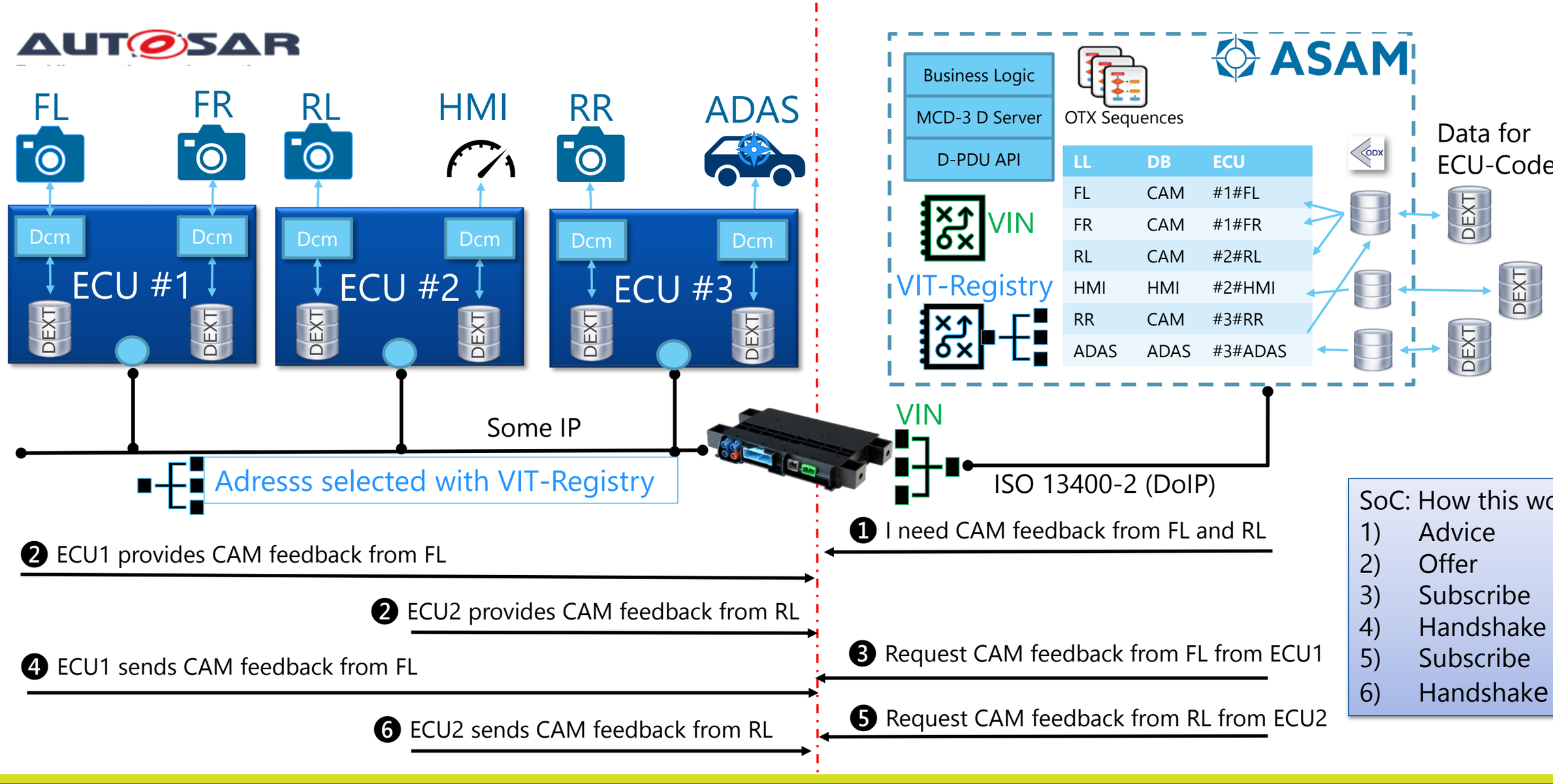
KPIT

Service-Oriented Communication (SoC) - Diagnostic



SoC: How this works
1) Advice
2) Offer
3) Subscribe
4) Handshake
5) Subscribe
6) Handshake

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Do we need two Standardization Organizations to take care of Onboard-Diagnostics?

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