

## WP-I – Application Interfaces – Achievements and Outlook

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BMW Group



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# AUTOSAR Application Interfaces

## Motivation

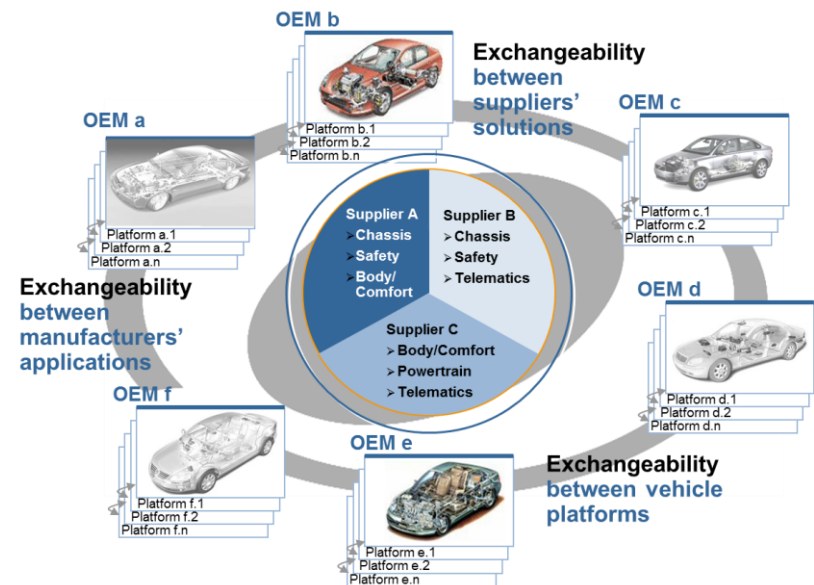
Since the AUTOSAR Basic Software became more and more stable, mature and complete we should start to come back to the original focus of AUTOSAR:

**Exchange  
of  
Application Software  
Artefacts**

It is about Time – now!

## Vision

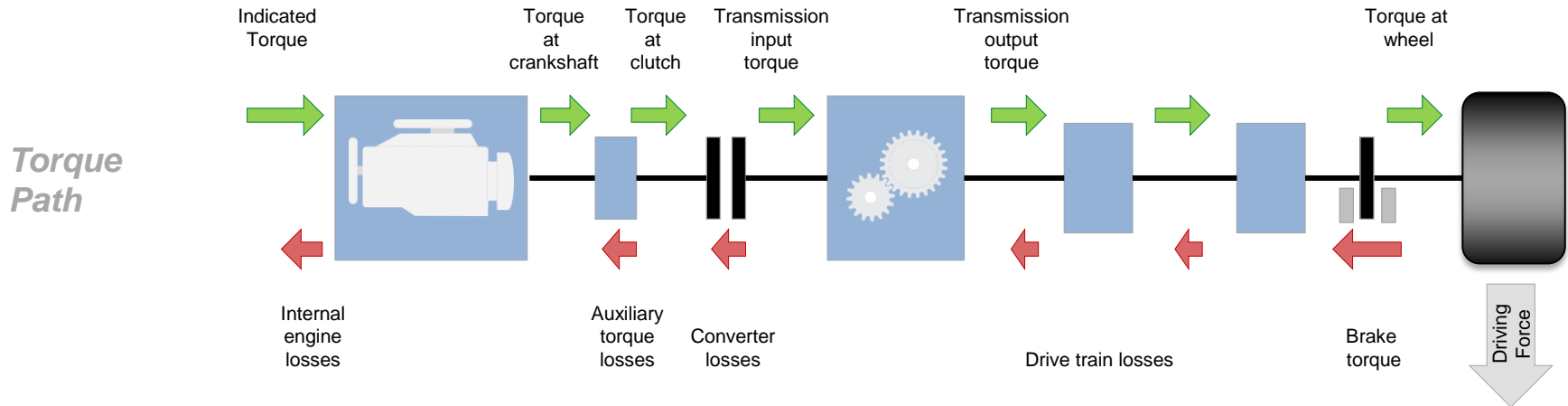
AUTOSAR aims to improve complexity management of integrated E/E architectures through increased reuse and exchangeability of SW modules between OEMs and suppliers.



# Simplified Example System-View

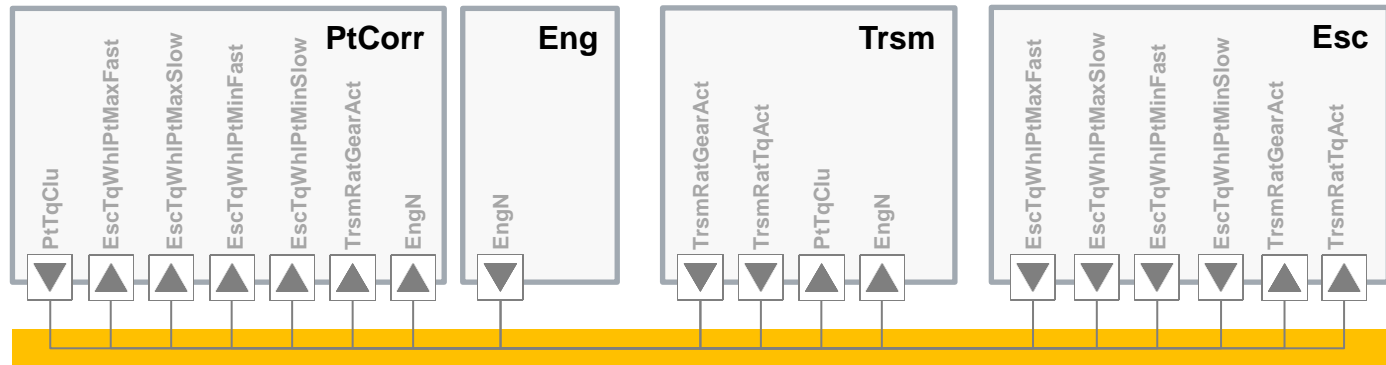
## Vehicle Aggregates

Combustion engine    Ancillaries    Clutch Or Converter    Transmission gearbox    Countershaft gearbox    Differential, Transfer case



## Functions

## Ports VFB



PtCorr = Powertrain Coordinator

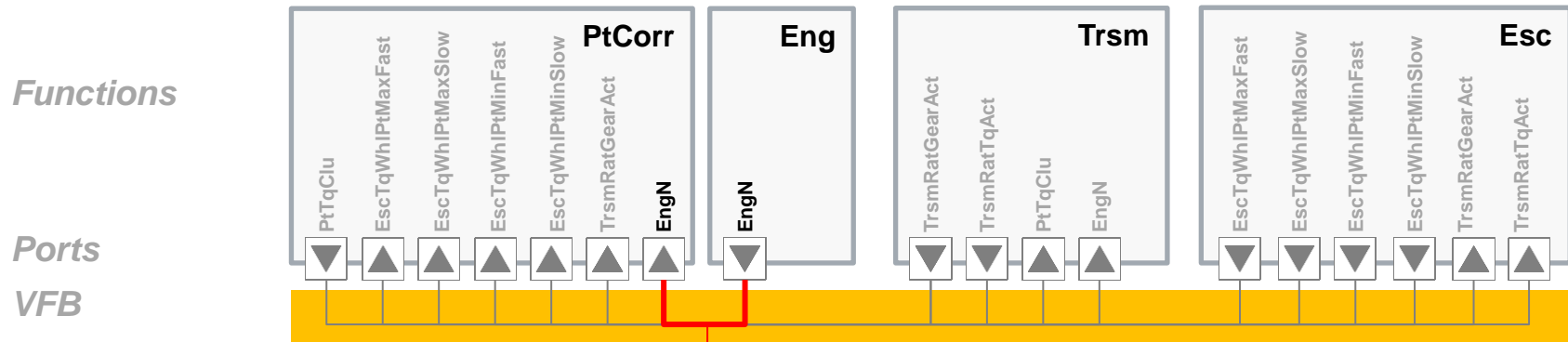
Eng = Engine

Trsm = Transmission

Esc = Electronic Stability Control

## Simplified Example

### Meta Data for ECU Internal Integer Representation



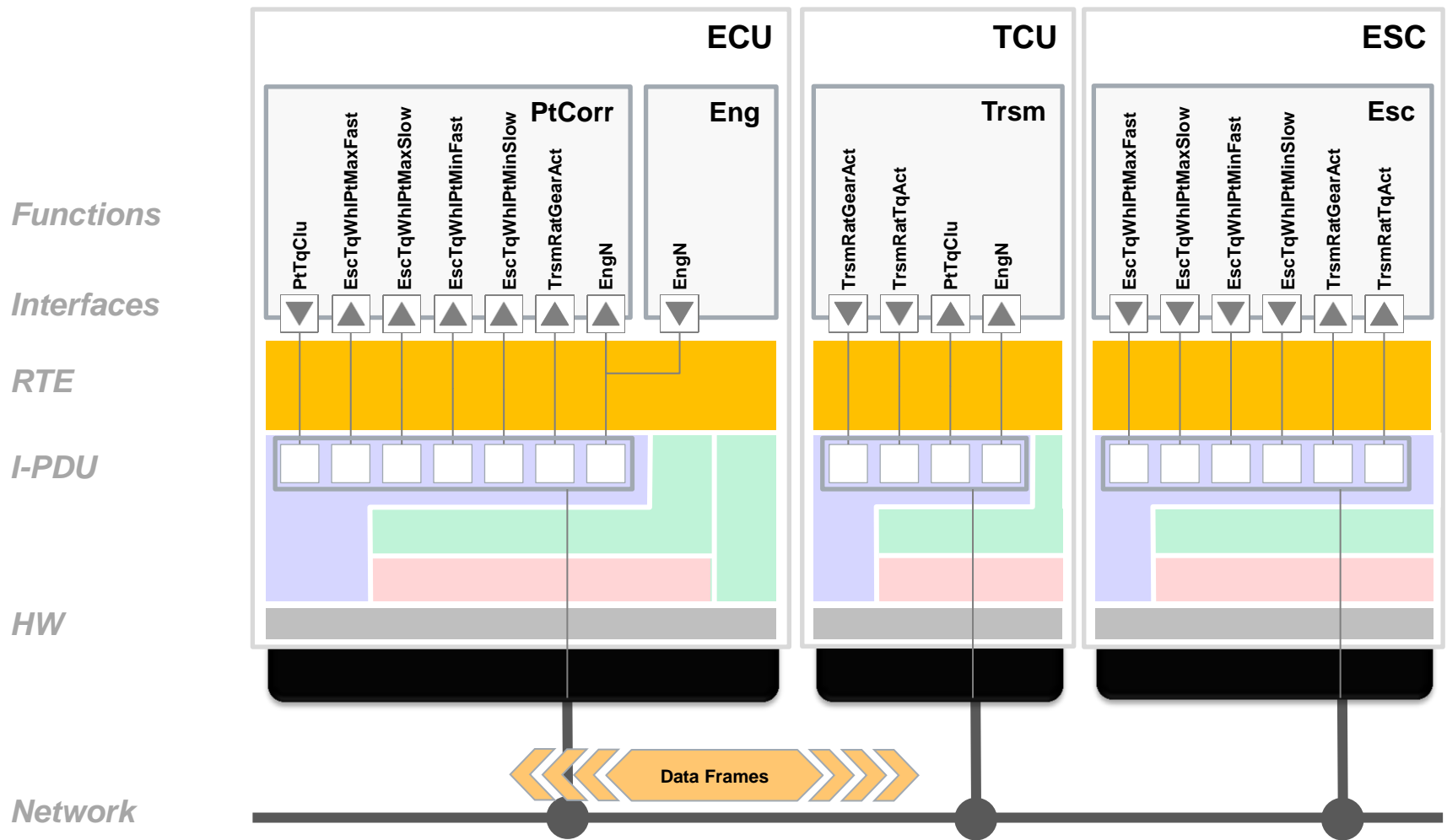
#### Interface

AUTOSAR Standardized Interface	EngN1
Data Type	Sint16
Number of Bits	16
Resolution	0.5 per Bit
Physical lower limit	- 0.0
Physical upper limit	+ 16383.5
Offset	0
Unit	Rpm
Remarks	-

- Only ports with **compatible interfaces** can be connected to each other
- In case of **collaboration projects** the partners **should use** the **AUTOSAR Standard Interface Database** to assure compatibility of ports
- AUTOSAR has approximately **500** predefined interfaces which are called **Standardized Interfaces**

# Simplified Example

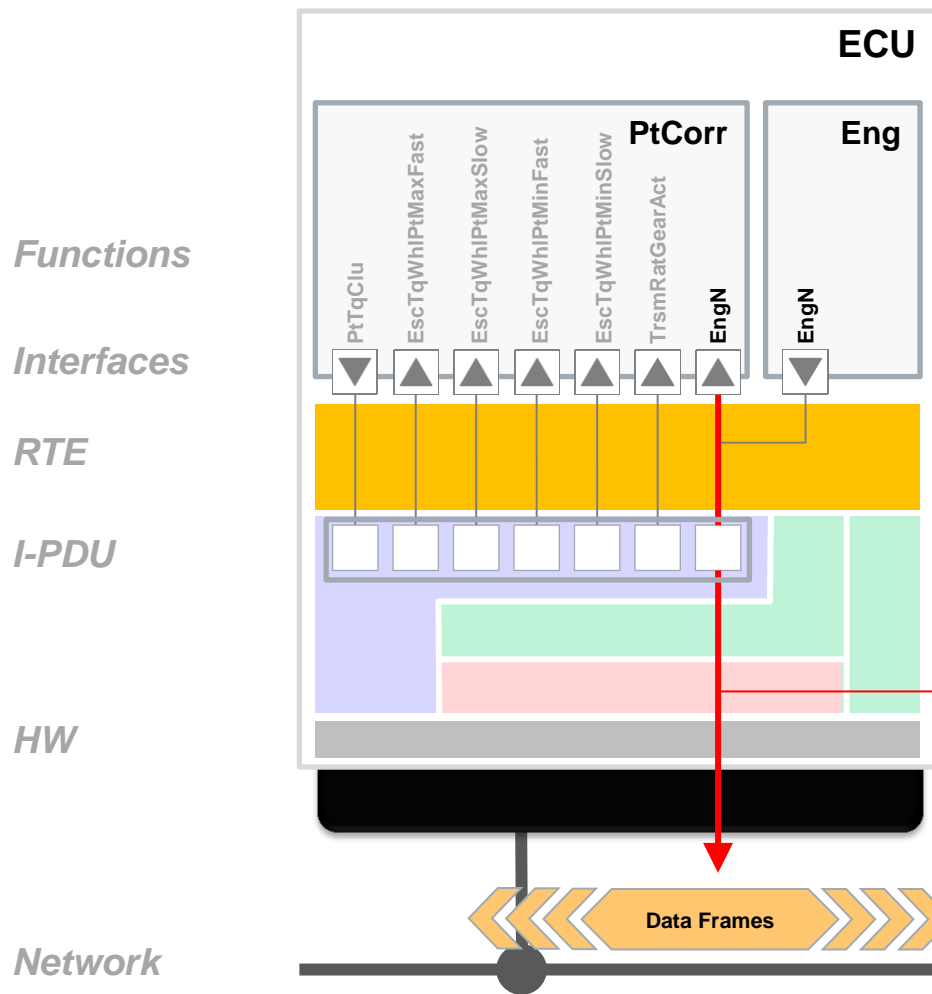
## ECU - and Signal Mapping



Each port sharing its information with a port on a different ECU needs a communication path through the network

# Simplified Example

## Signal Network Representation



- Due to limited bandwidth some signals need to be scaled down to a lower accuracy
- AUTOSAR standardized interfaces are containing the information how its data can be represented on the network.

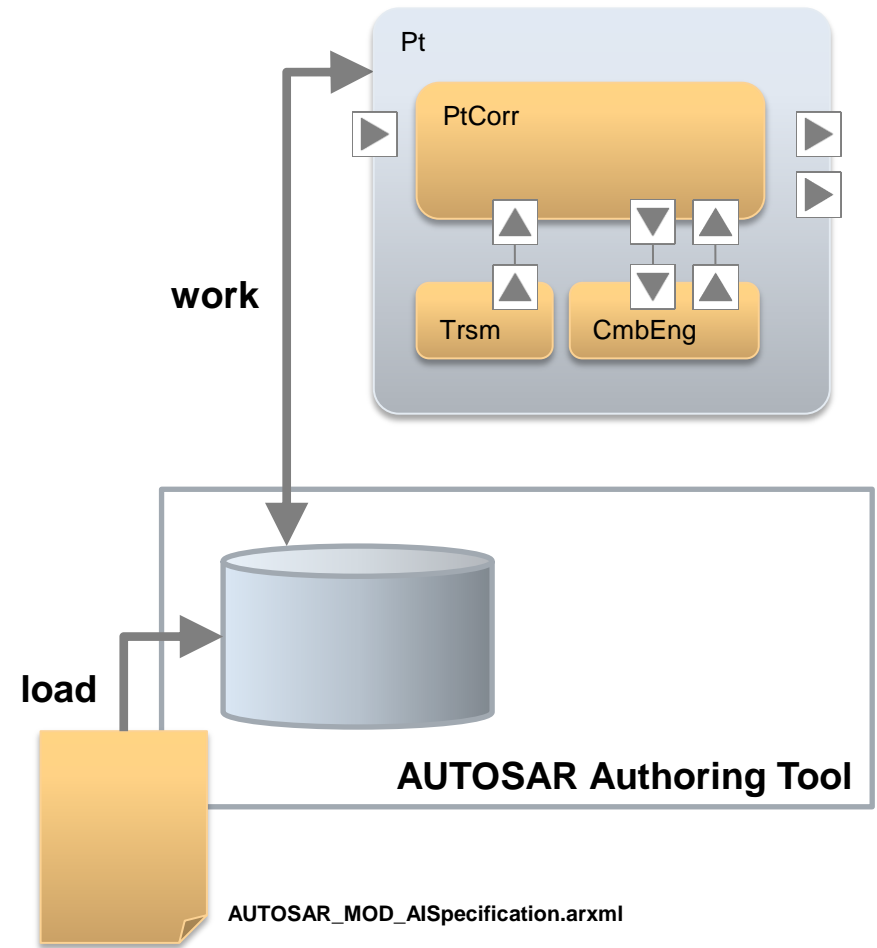
AUTOSAR Standardized Interface	EngN1
Network Representation	12 bits
Resolution	4.0 per Bit
Physical lower limit	- 0.0
Physical upper limit	+ 16380
Offset	0
Unit	Rpm

## Achievements of WP-I (1/2)

### Strong Data Base for Product Development

The WP-I Artefact Data Base actually contains:

- Nearly 300 Application Data Types
- More than 200 Computation Methods and Data Constraints
- More than 1600 Keywords for Name Deduction
- Based on that
  - more than 500 Standardized AUTOSAR Interfaces and
  - nearly 1900 Port Prototype Blue-Prints are available
- And around 300 composition examples are showing how you can apply the standard.
- All artifacts are consequently named according to a standardized naming convention



**You just need to load the `AUTOSAR_MOD_AISpecification.arxml` – File<sup>1)</sup> into your authoring tool and you can immediately start working on creating value for your products!**

<sup>1)</sup> e.g. from Release 4.0.3 or higher

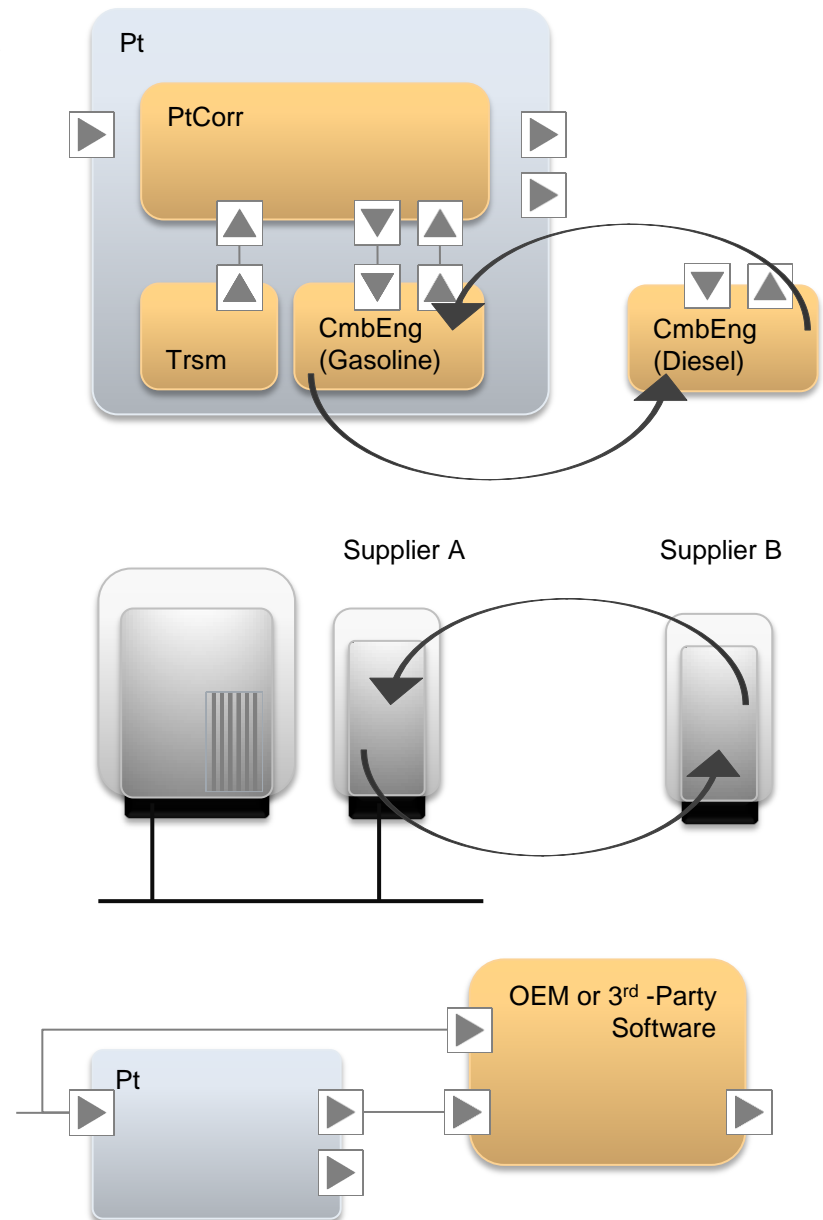
## Achievements of WP-1 (2/2)

### Standardized Interfaces for flexible Business

Due to the Standardizations of WP-1 business cases like

- providing variants for particular components (e.g. Gasoline versus Diesel Engine)
- exchanging suppliers for certain aggregates (e.g. Transmission) and the respective control units
- Providing OEM specific features developed against the AUTOSAR Standardized Interfaces.

are now supported by the highly automatized tool chains.





## ***Further Activities of WP-I***

### ***Outlook***

1. Further Maintenance, Upgrading and Extension of the existing Data Base
2. This also includes extensions for PT-Transmission and ESP interfaces.
3. Further extensions to the Multi-Media Domain (GENIVI-Systems) are possible if the respective market needs are identified.
4. Evaluation of market needs in order to further automatize the integration processes for Software Exchange (e.g. extended WP-I by Diagnostics- or Sensor / Actuator Patterns).

**Many thanks for your  
attention!**

**Do you have Questions?**

## Questions

1. You mentioned the term Port Prototype Blue Print. Could you please explain the meaning of Blue Prints?
2. You mentioned the term Pattern. Could you please explain what that is and what it means for AUTOSAR?
3. Currently WP-I provides solutions for the Classic Platform. How will WP-I activities apply for the Adaptive Platform?

## Blueprints

Blueprints are the pre-definition of model element instances, which form the basis for further modeling. Blueprints are model elements from which other model elements can be derived by copying. They act as a template for projects to create the real elements.

The usage of Blueprints concept covers two main goals

- Inputs for deriving objects into series projects (DeriveFromBlueprint)
- Validation of derived objects through modeled mapping features

Blueprintable elements in Application Interfaces domain involves

- Ports
- CompuMethods
- PortInterfaces
- DataConstrains
- ApplicationDatatypes
- ComSpecs (w.r.t to NetworkRepresentation)

## Patterns

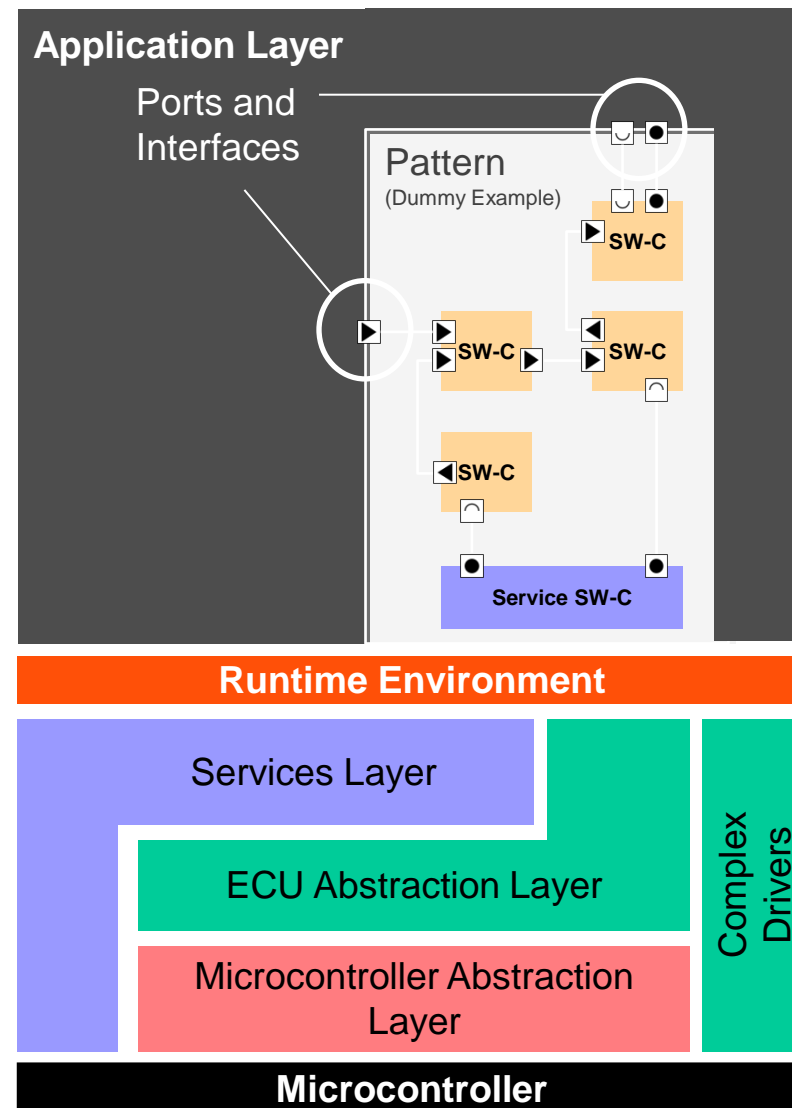
### Definition

- A pattern is a solution for a known problem and
- can consist of
  - Components,
  - Ports,
  - Interfaces, and / or
  - functional specifications
- and could also effect the basic software

### Examples

The following Patterns are already under evaluation

- Sensor / Actuator Pattern
- Adapter Pattern



## WP-I for the Adaptive Platform

- The Adaptive Platform supports a service oriented approach for data access.
- Therefore the WP-I Artefact Data-Base can be used to provide services to access certain data in the ECUs based on the classic platform.
- Different technical solutions are thinkable, how these services could be implemented, but it is obvious that safety and security aspects will also play an important role in this context.
- WP-I will consider the respective requirements and market needs of the AUTOSAR partnership.

