AUTOSAR for Model-Based System Engineering

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User Group North America

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BMW Group BOSCH Continental DAIMLER Ford GM PSA GROUPE TOYOTA VOLKSWAGEN AKTIENGESELLSCHAFT

Agenda

- Overview
- Introduction
- The vehicle development process
- AUTOSAR software architecture
- AUTOSAR for Model-Based System Engineering
- Conclusion

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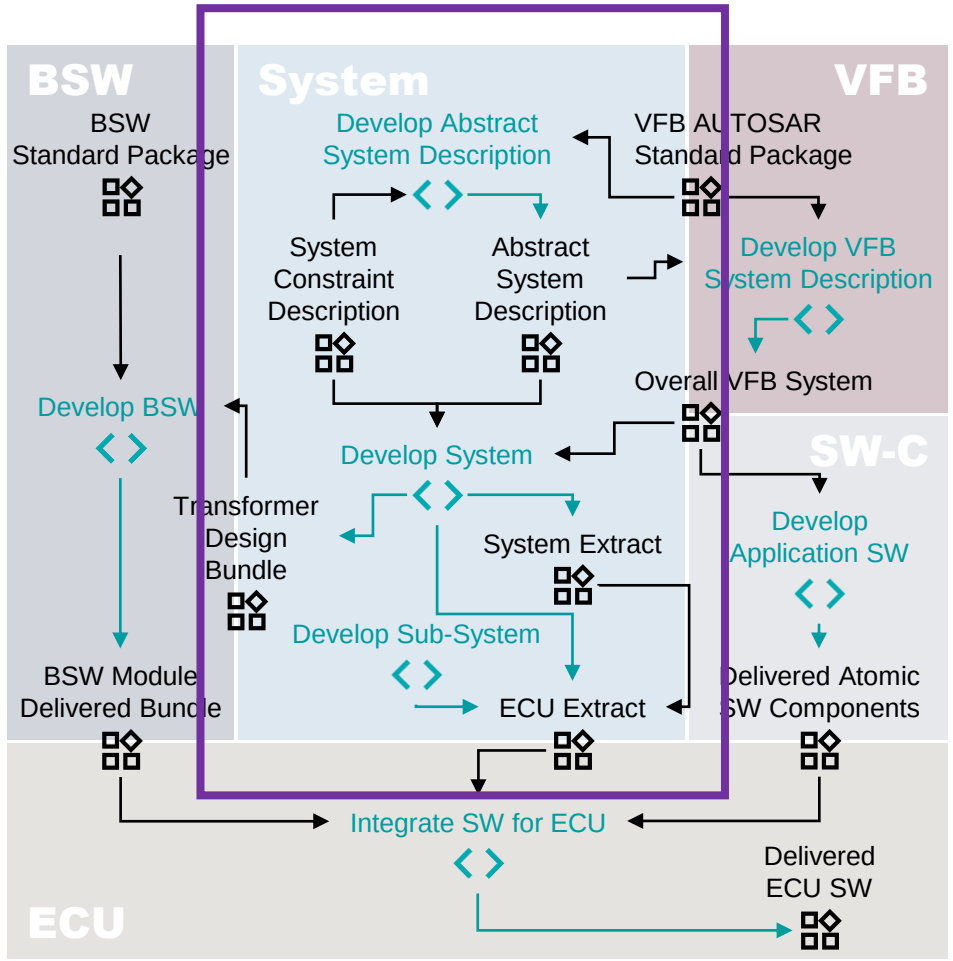
Overview

AUTOSAR Methodology by Michael Niklas-Höret (Continental) [1].



- Develop the system description according to the E/E architecture concept
- Develop the Virtual Function Bus to describe the abstract functionality
- Develop or buy COTS AUTOSAR Basic Software
- Develop application HW independent
- Integrate the different Workproducts to ECU

Overview

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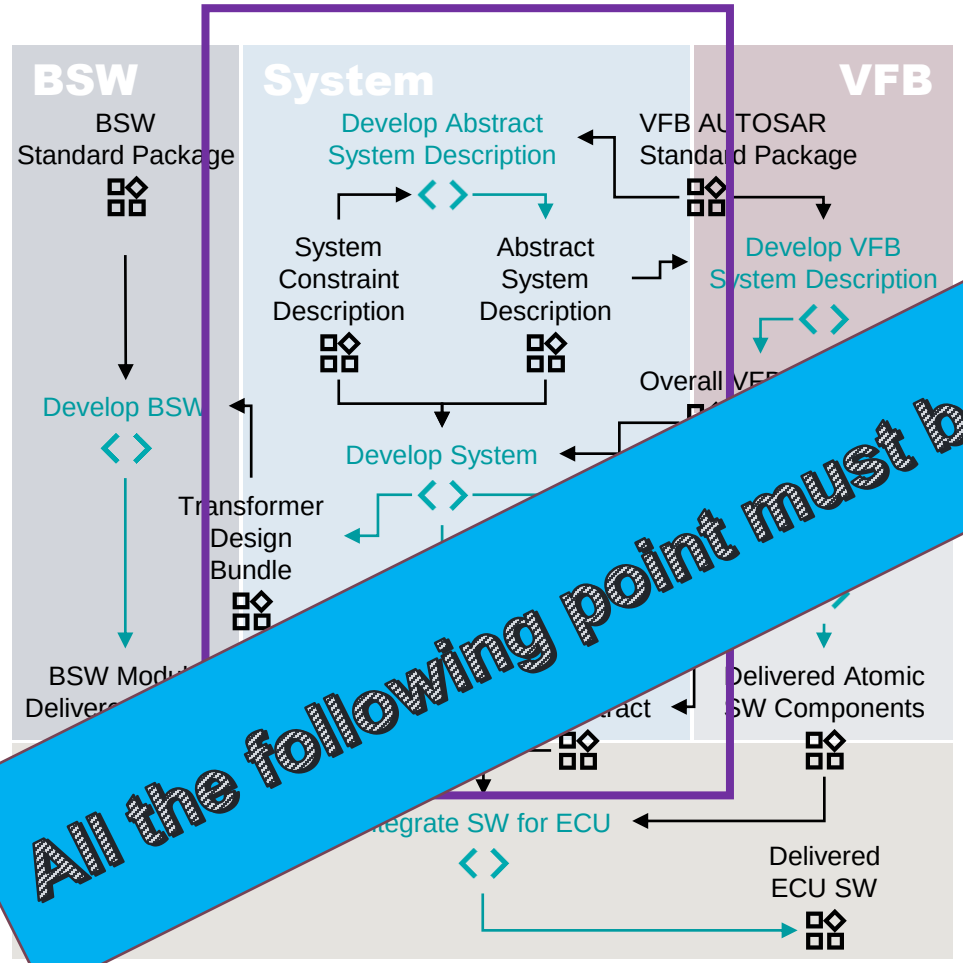

All the following point must be tackled from system engineering

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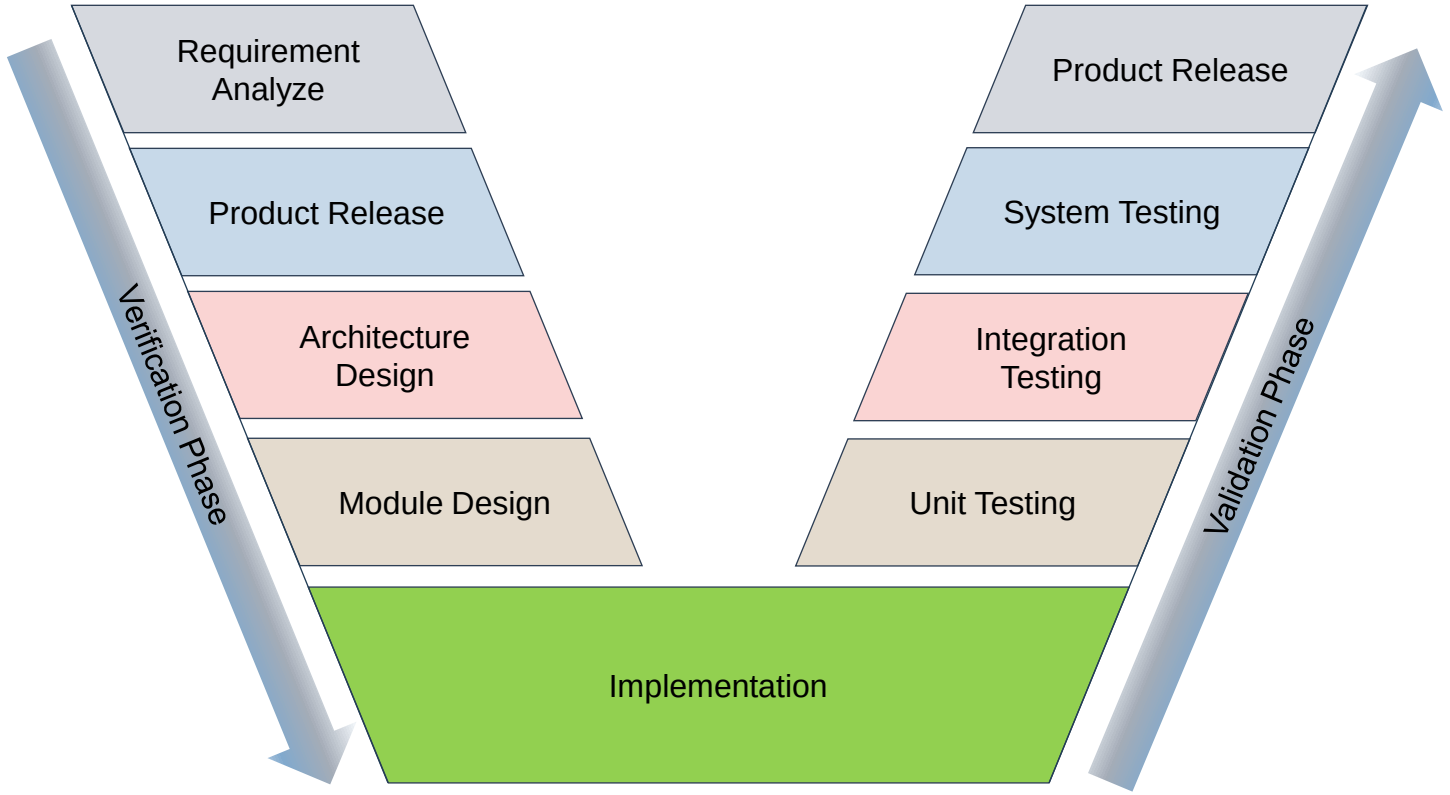
Introduction

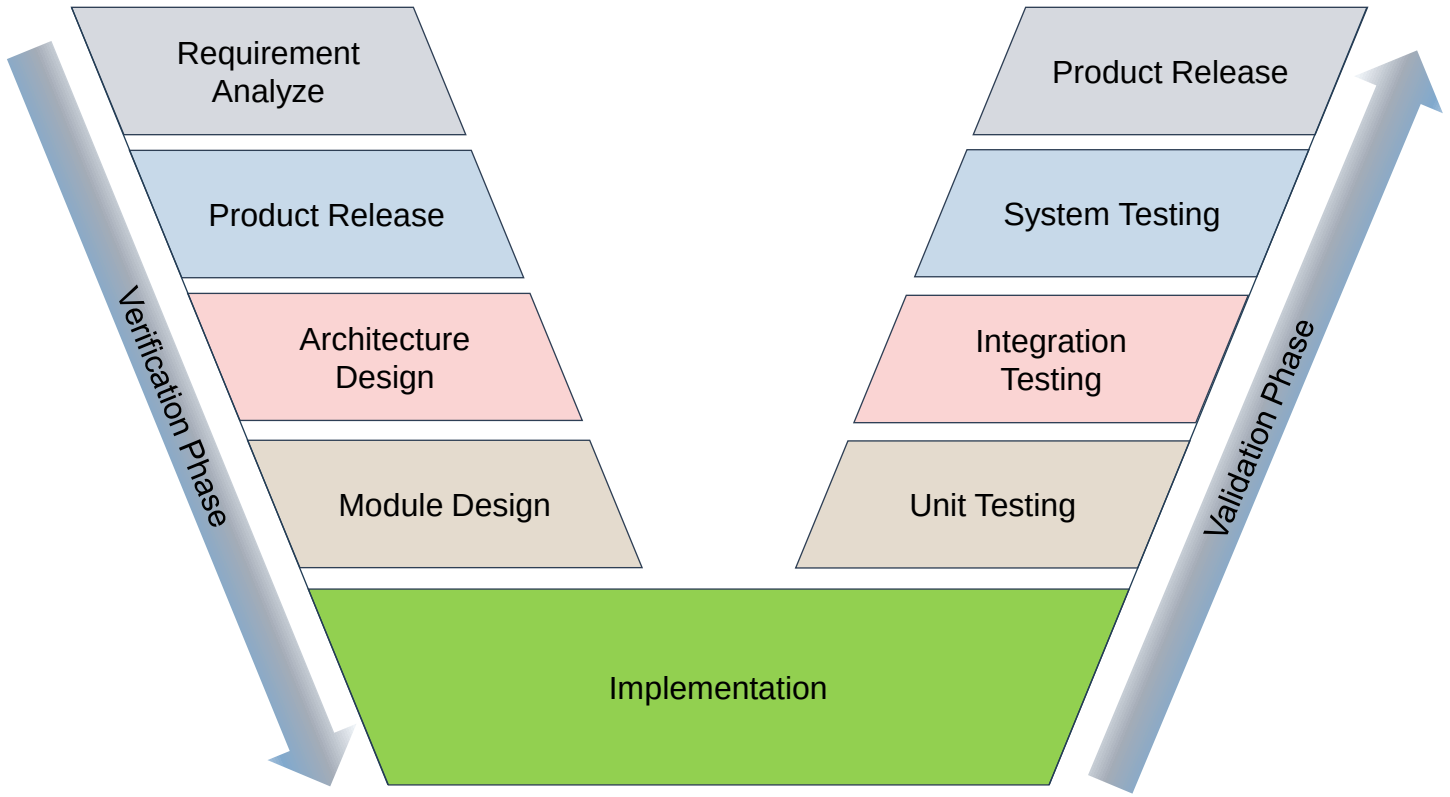
V-Cycle process



Introduction

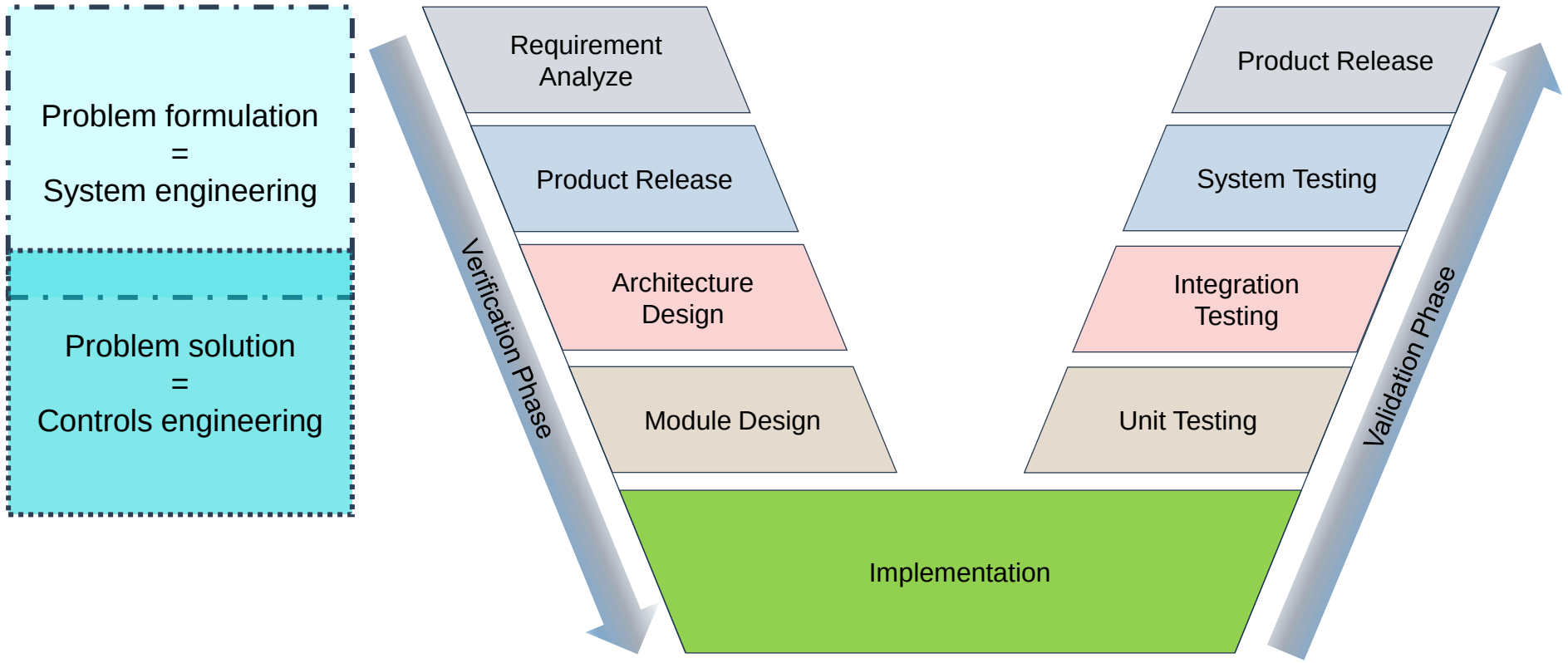
V-Cycle process

Problem formulation
=
System engineering



Introduction

V-Cycle process



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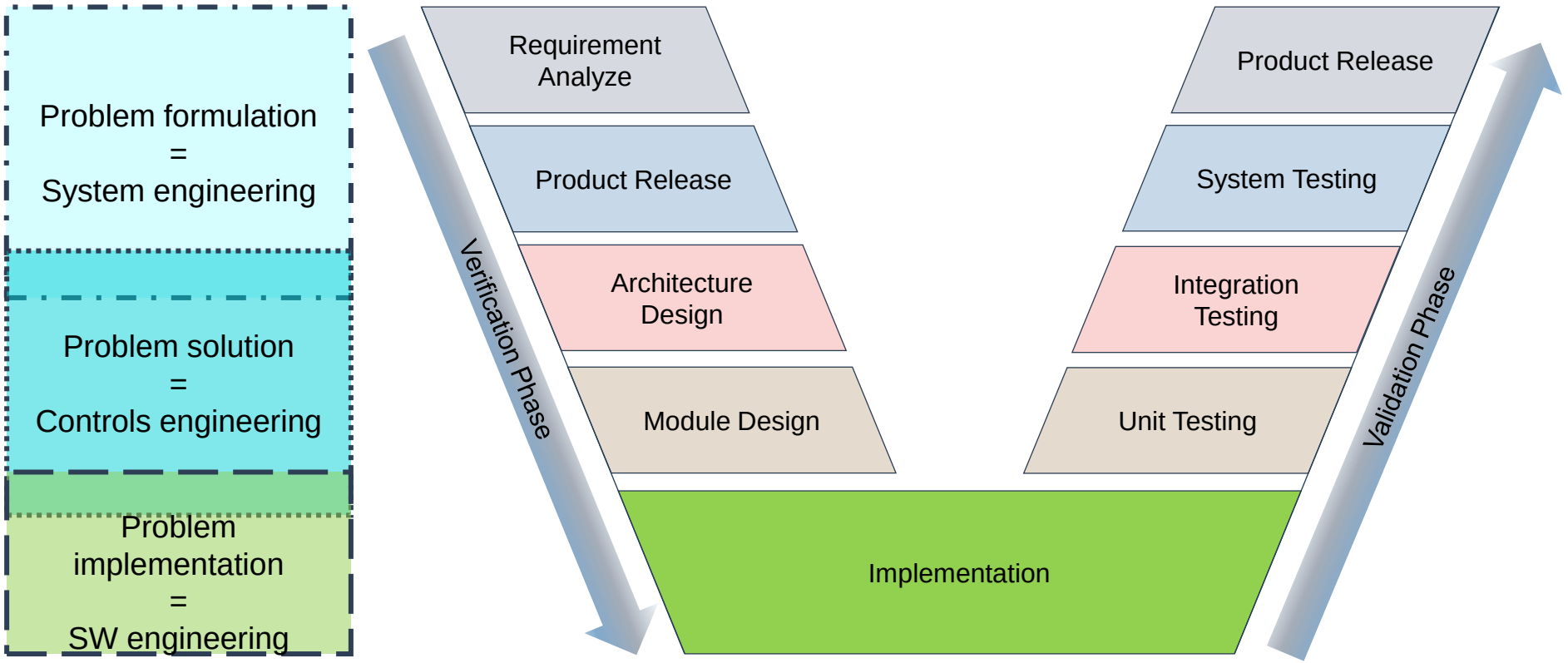
V-Cycle process



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The vehicle development process

Model-based system Engineering (MBSE) and AUTOSAR

Model-based systems engineering (MBSE) is a formalized methodology that is used to support the requirements, design, analysis, verification, and validation associated with the development of complex systems. **In contrast to document-centric engineering, MBSE puts models at the center of system design**

The vehicle development process

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AUTOSAR (AUTomotive Open System ARchitecture) is an open and standardized automotive software architecture, jointly developed by automobile manufacturers, suppliers and tool developers. The AUTOSAR-standard enables the use of a component-based software design model for the design of a vehicular system.

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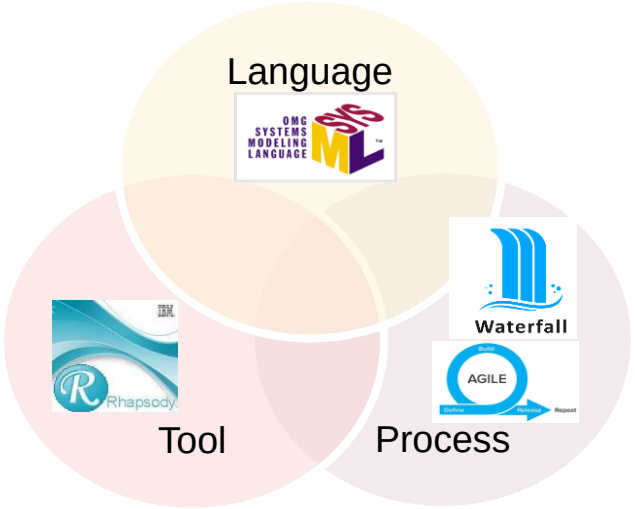

MBSE Enablers

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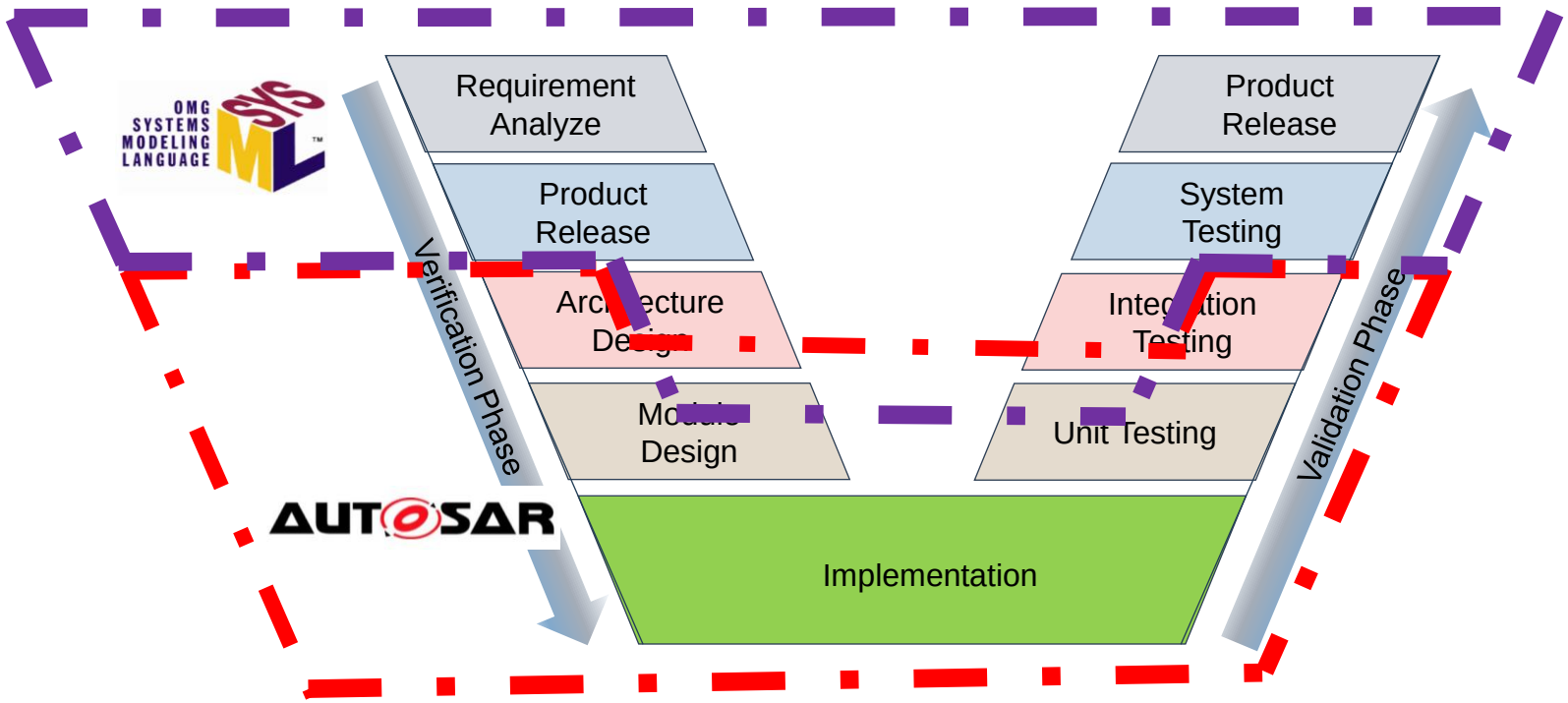

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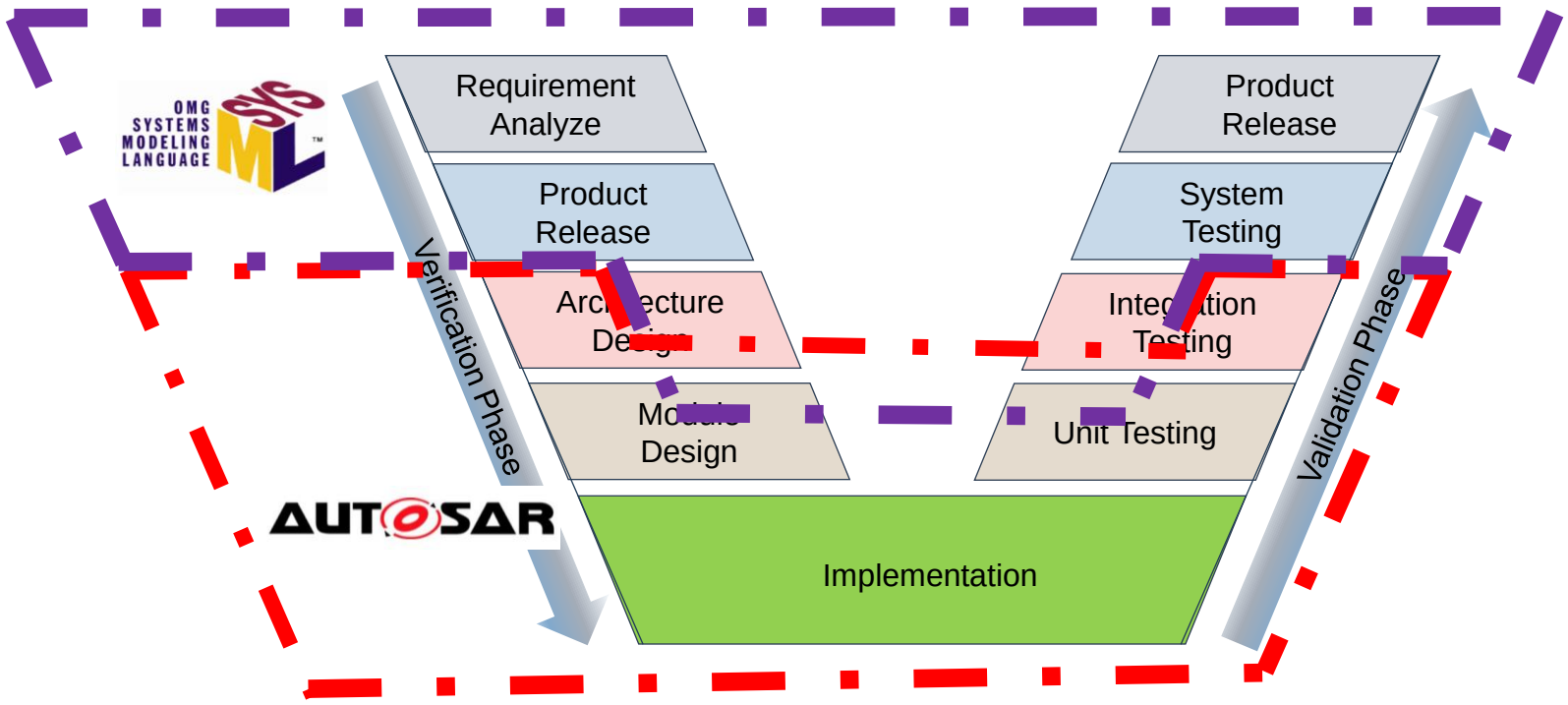

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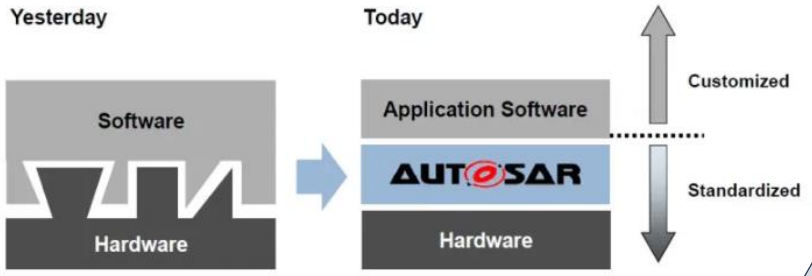
AUTOSAR software architecture



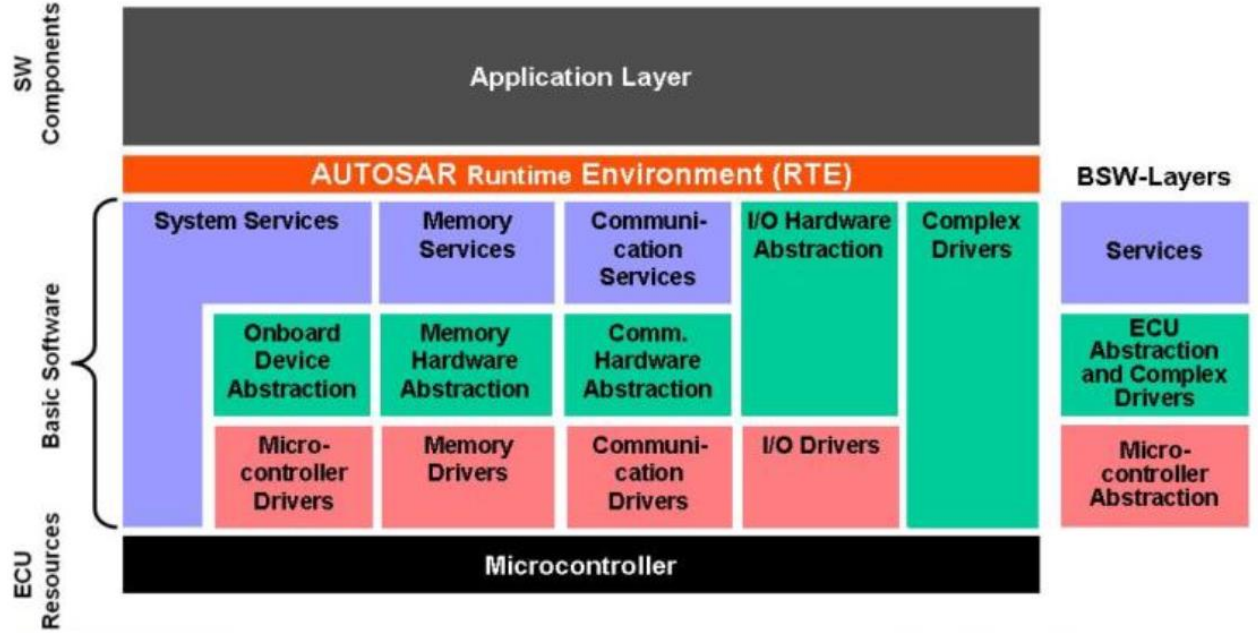


Fig. 2 AUTOSAR Layered Software Architecture

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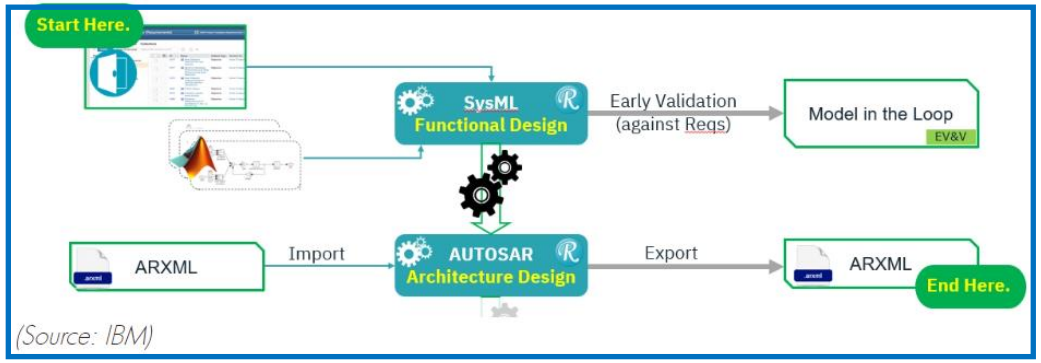
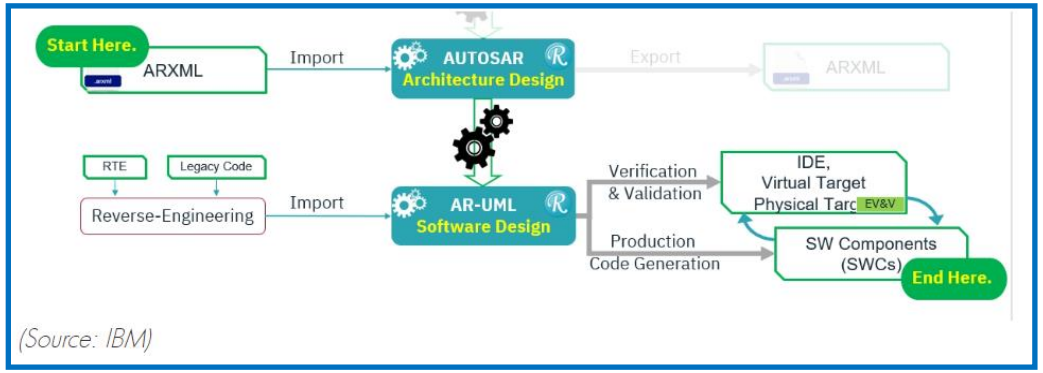
AUTOSAR for Model-Based System Engineering

SysML to AUSTOSAR workflow and toolchain

Requirements elicitation and validation Domaine: **SysML Domaine**



Solution definition Domaine: **AUTOSAR Domaine**



AUTOSAR for Model-Based System Engineering

SysML to AUSTOSAR workflow and toolchain

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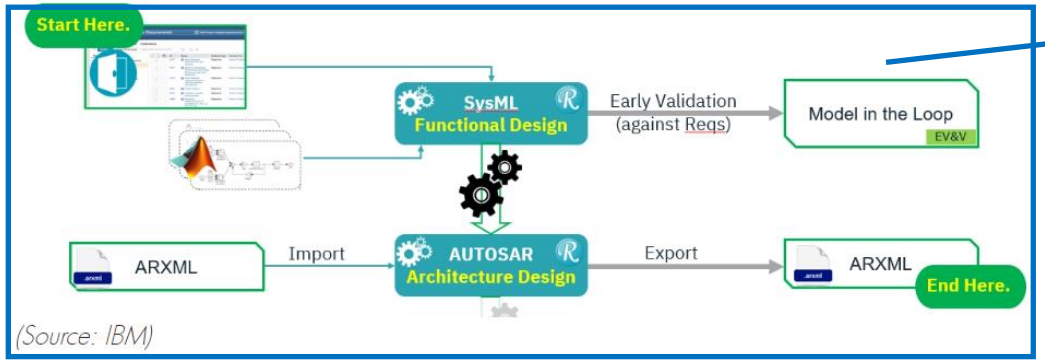
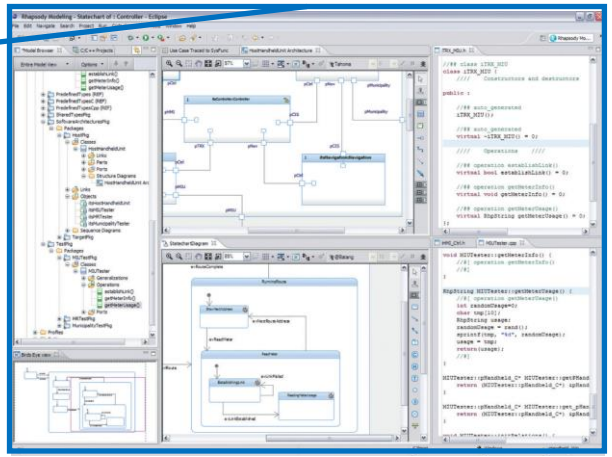
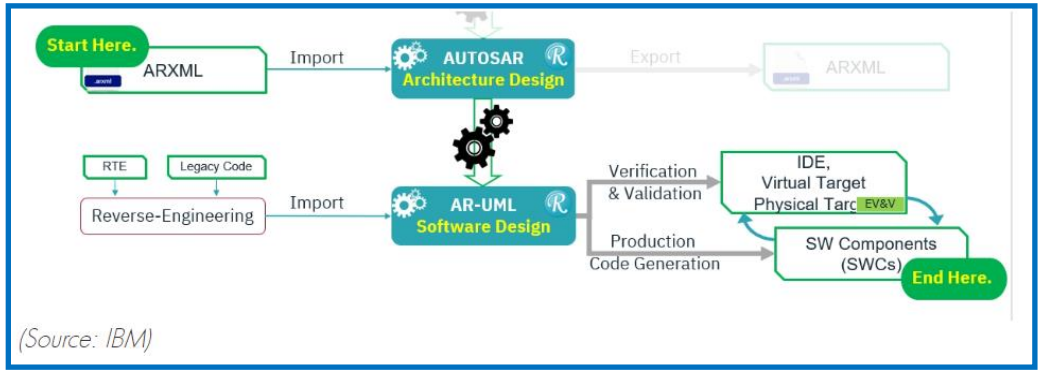




Solution definition Domaine: AUTOSAR Domaine



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SysML to AUSTOSAR workflow and toolchain

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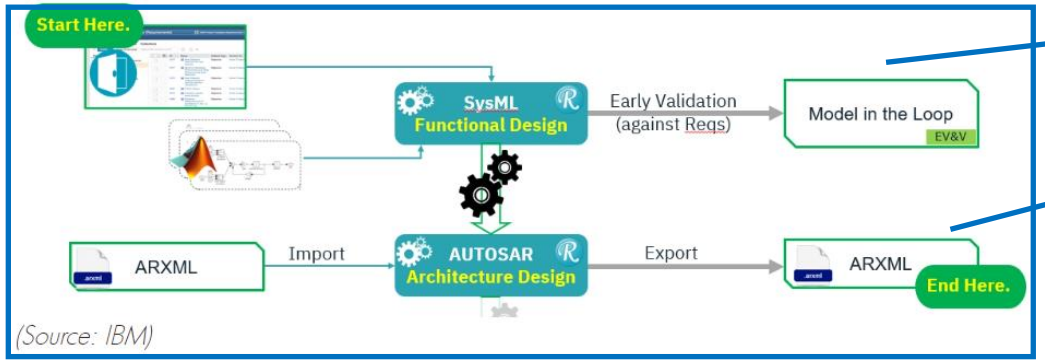

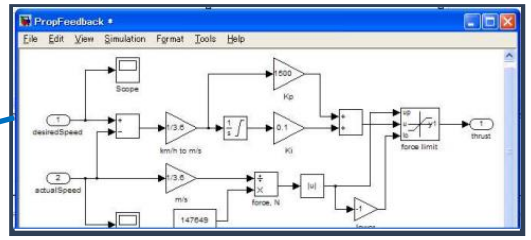

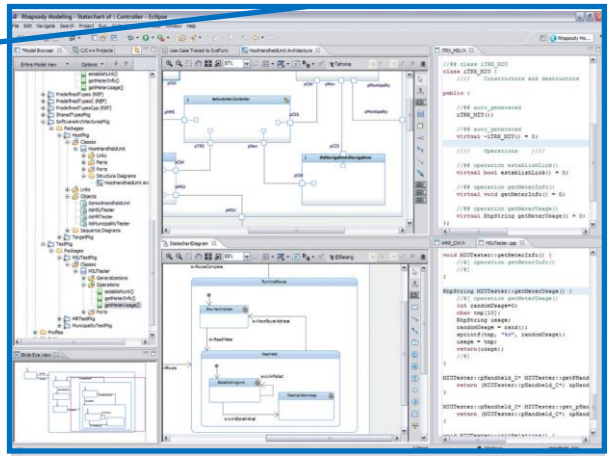

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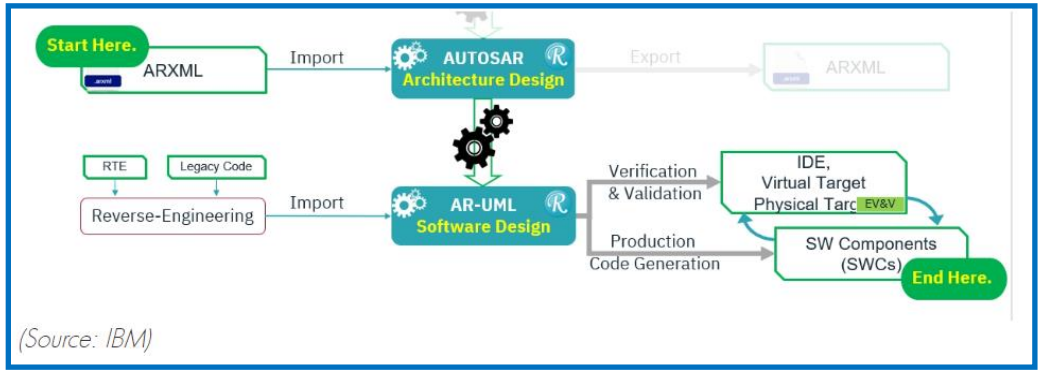

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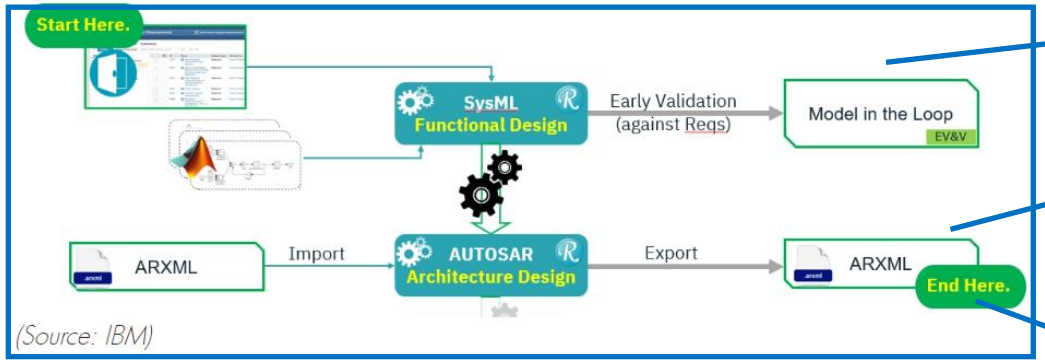

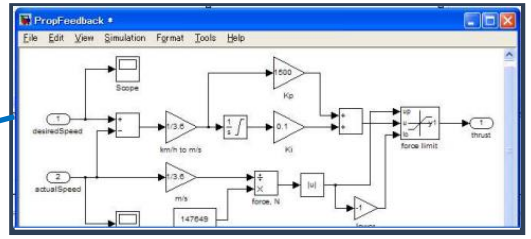

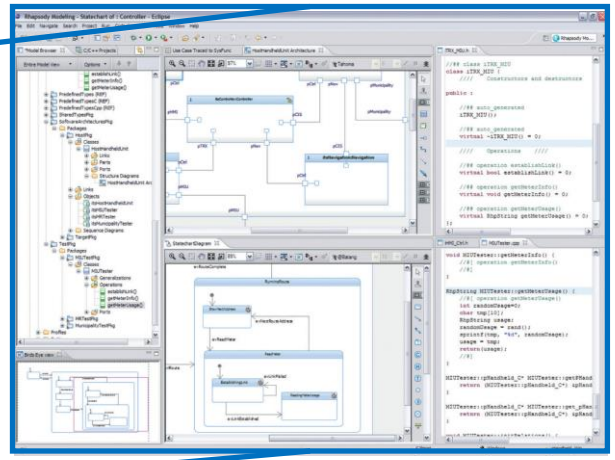

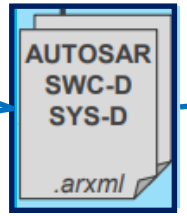

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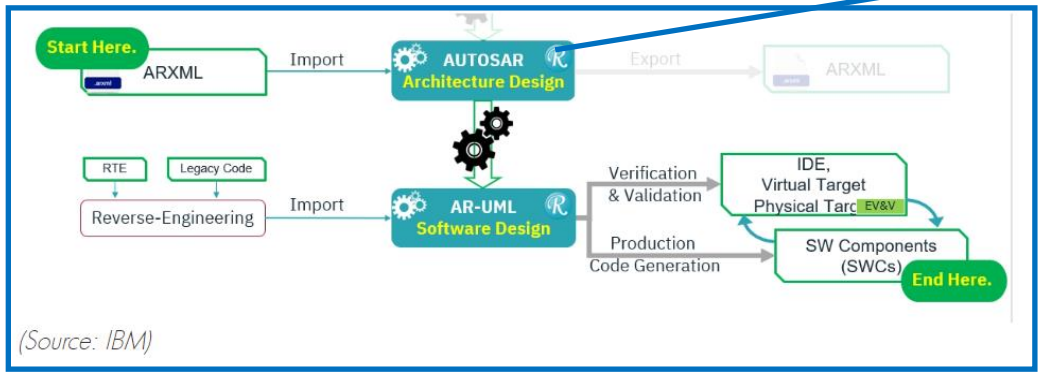

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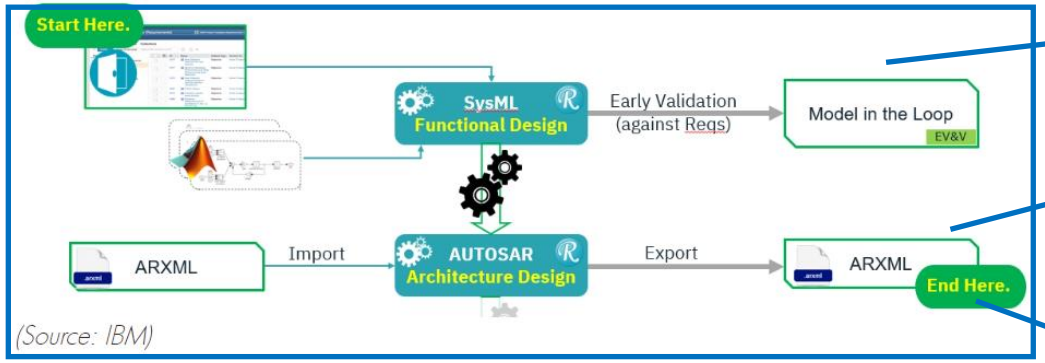

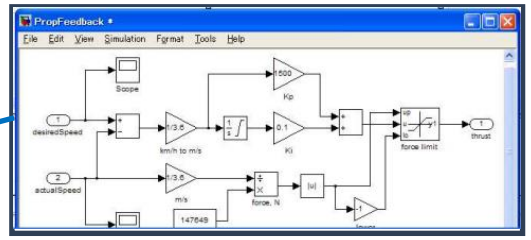

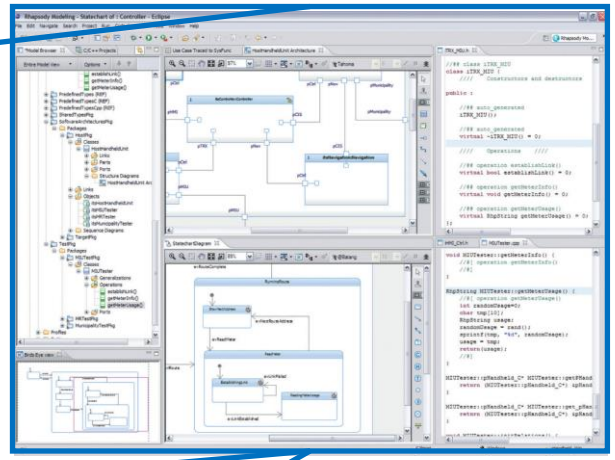

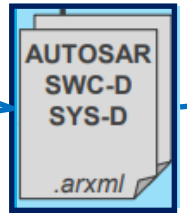

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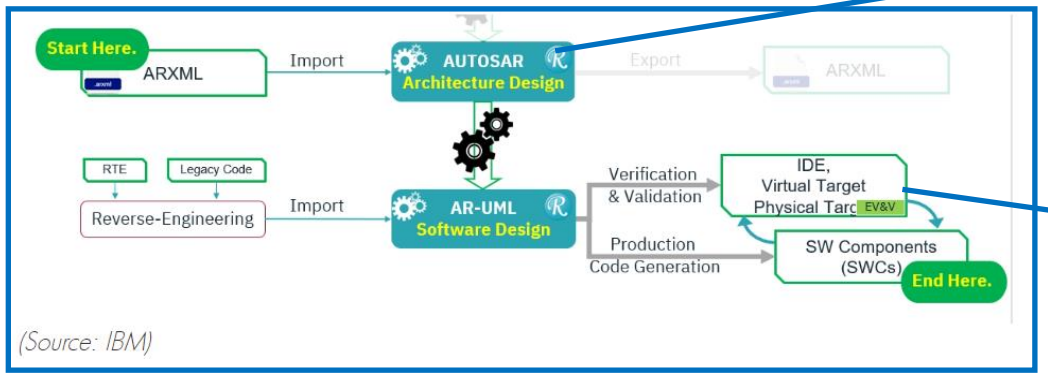

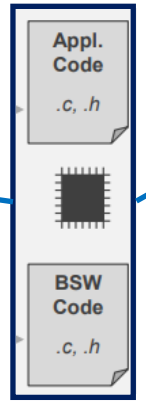

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Conclusion

IBM Rhapsody enables the AUTOSAR design from the system conception phase

The Mode-Based System Engineering enabled by system design tools such as Rhapsody and the system model language SysML enhanced with IBM AUTOSAR Profile provides an environment that gives the means needed for designing complex AUTOSAR solutions.

Conclusion

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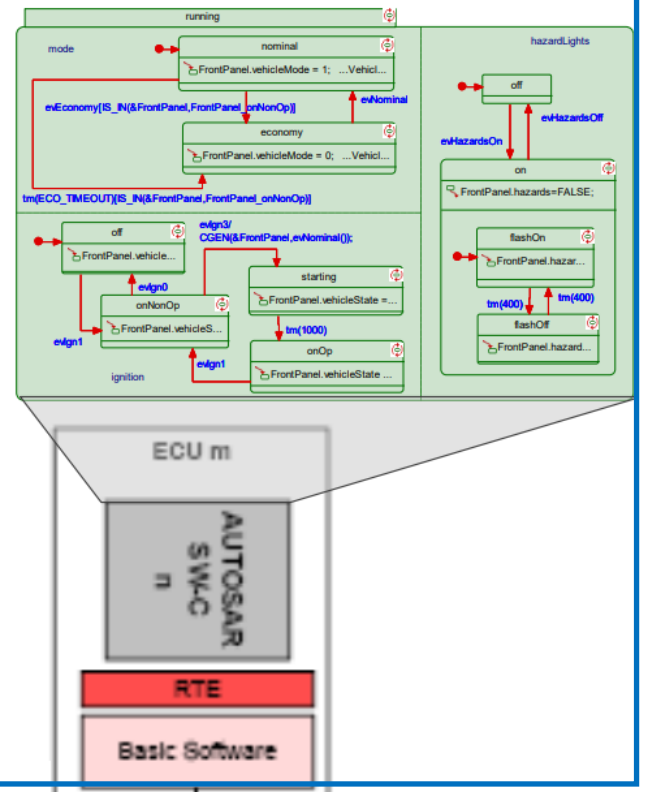
Rhapsody AUTOSAR BMT Implementation

- Modeling the behavior of the AUTOSAR Software Component using UML/SysML Graphical Models
  - Statecharts
  - Activity Diagrams (Flowcharts)
  - C code
- Generate code for the behavior of an AUTOSAR Software Component
  - Regarding the related AR definitions, targeting the RTE



Source documents

1. Impact of the Zone Architecture on the in Vehicle SW Distribution, Michael Niklas-Höret (Continental)
2. IBM Rhapsody MBSE and Simulation, Edmund Mayer, P.E.
3. Processes and tools for the development of modular embedded automotive software, EB (Elektrobit) 2012
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6. Sodius Willert : https://www.sodiuswillert.com/en/blog/make-autosar-work-for-you-with-ibm-rhapsody-autosar-extension
7. https://automotivetechis.wordpress.com/autosar-concepts/


AUTOSAR™
Thank you for Listening
BMW Group
BOSCH
Continental
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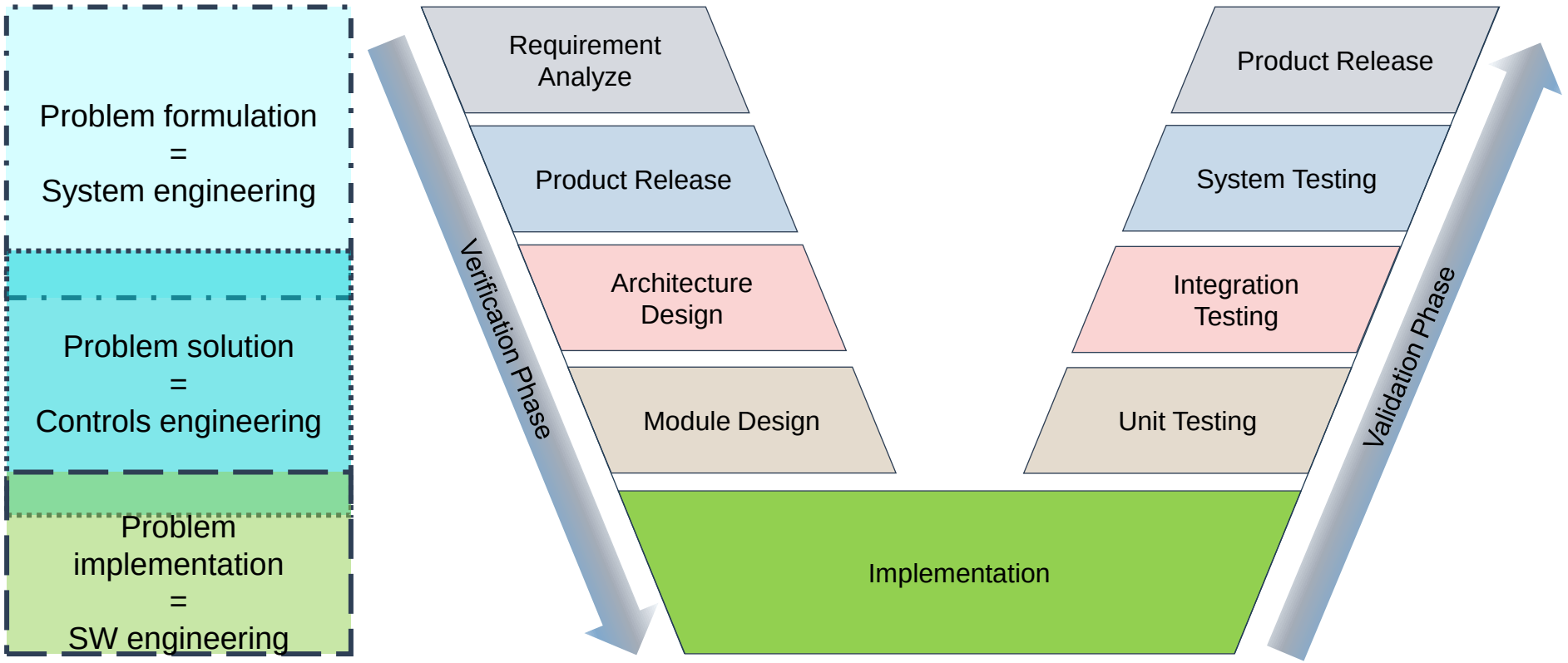
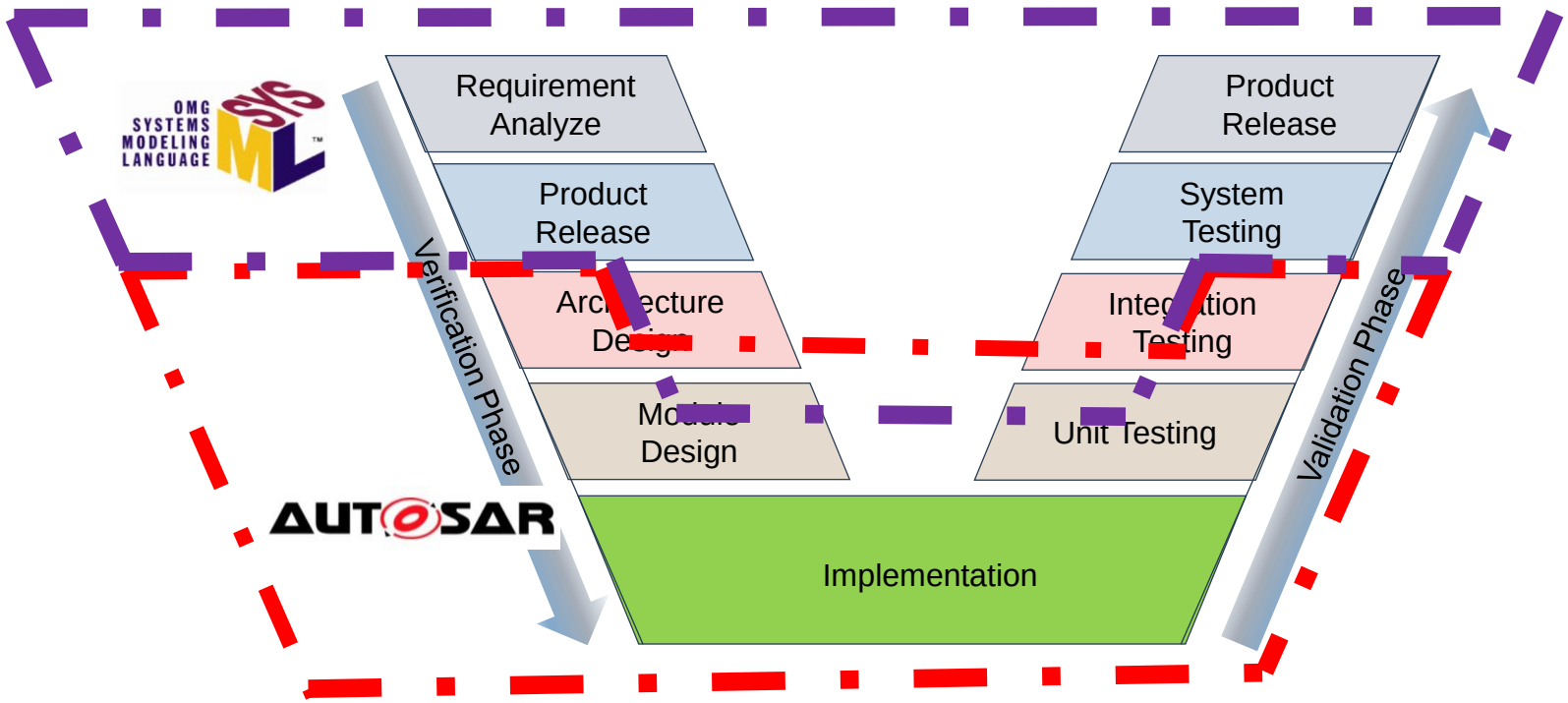
The vehicle development process

V-Cycle process



The vehicle development process

Model-based system Engineering (MBSE) and AUTOSAR



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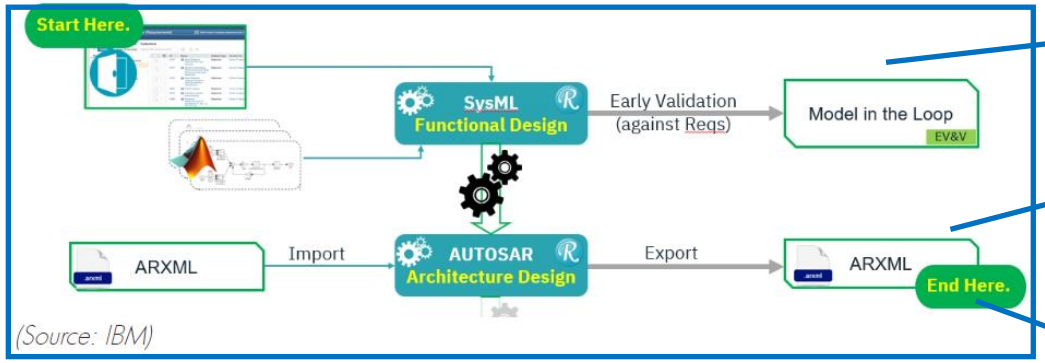

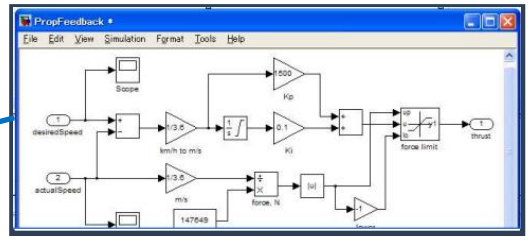

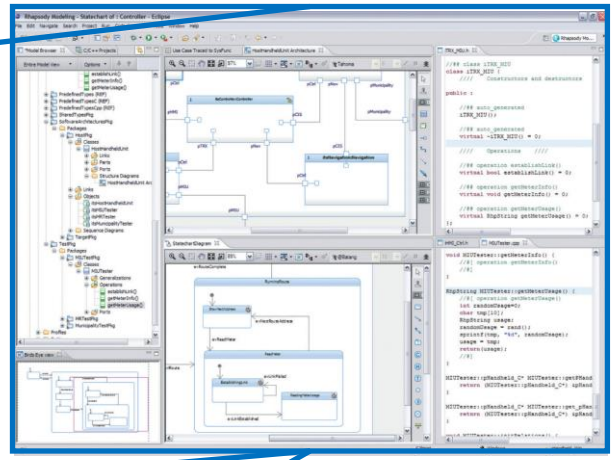

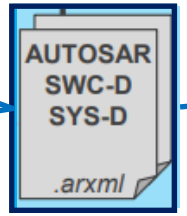

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