

# Project Introduction



supported by [BMBF](#) in Germany





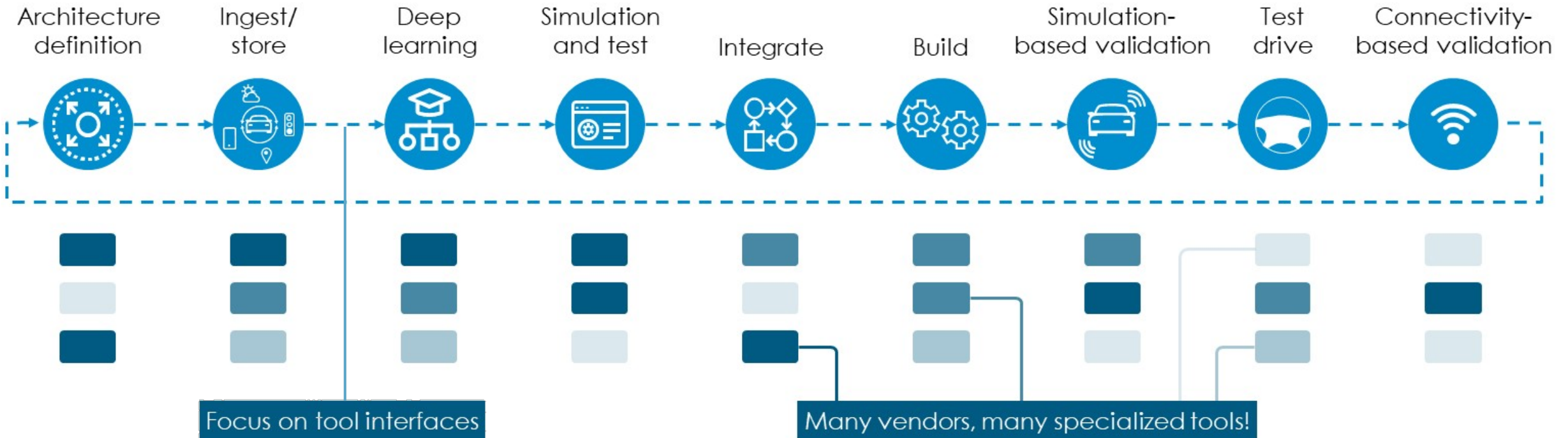
## Description:

The goal of PANORAMA is to research model-based methods and tools to master development of heterogeneous embedded hardware/software systems in collaboration with diverse and heterogeneous parties by providing best practice, novel analysis approaches, and guidance for development. To that end, the main line of action is geared to extending the scope and interoperability of current system level analysis approaches, particularly by enhancing existing abstract performance meta-models. The enhanced meta-model and the related tool framework will be a common and open platform to support collaborative development.

## Relation to openADx

# OpenADx

...with a wide-ranging tool landscape

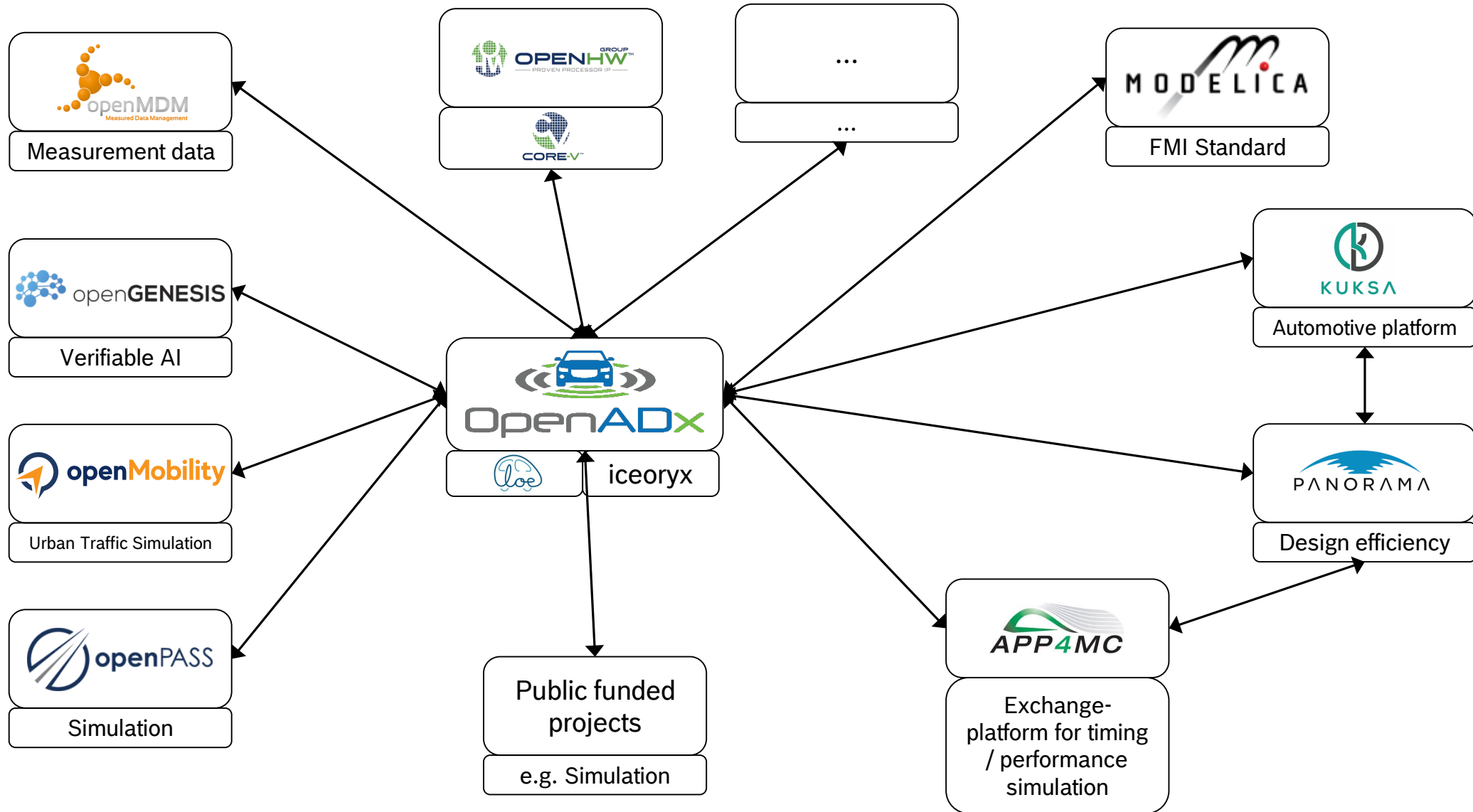


## GOALS

- › Industry-wide accepted definition of the AD toolchain
- › Tool interface standardization
- › Ensure efficient implementation and interoperability
- › Foundation for reference architecture

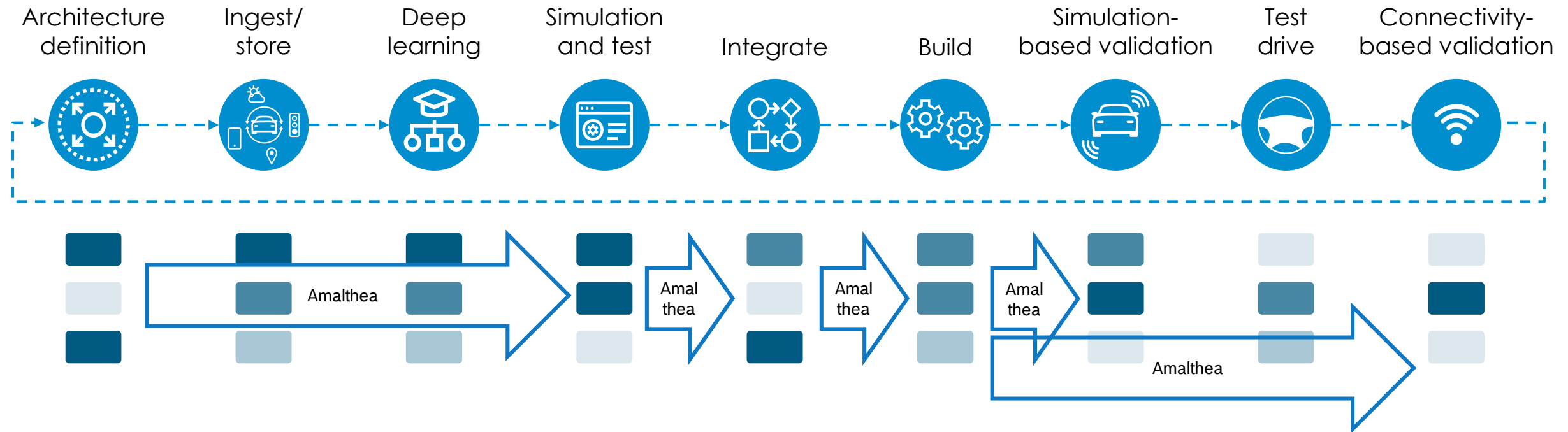
Make a complex tool landscape more accessible for enterprise users

# Cooperation and potential



# OpenADx & Timing Analysis

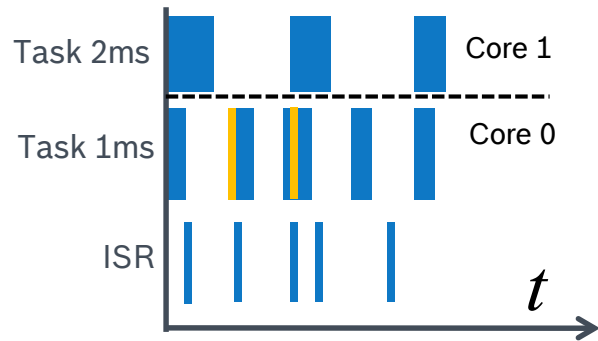
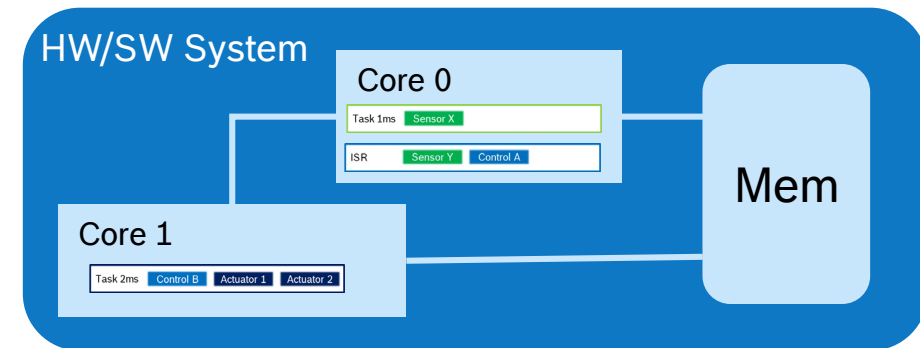
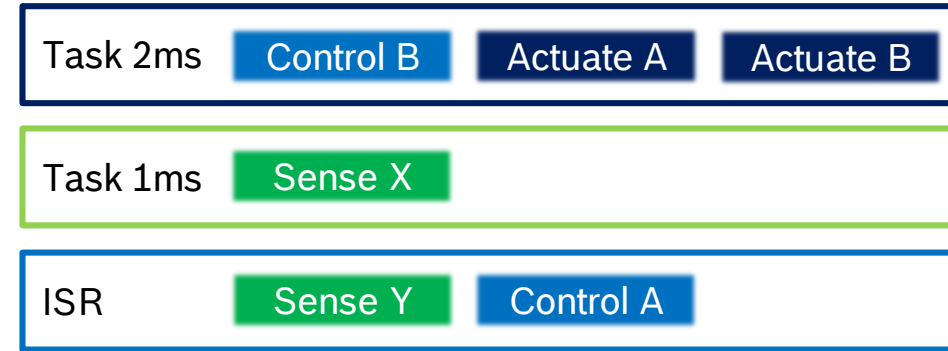
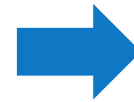
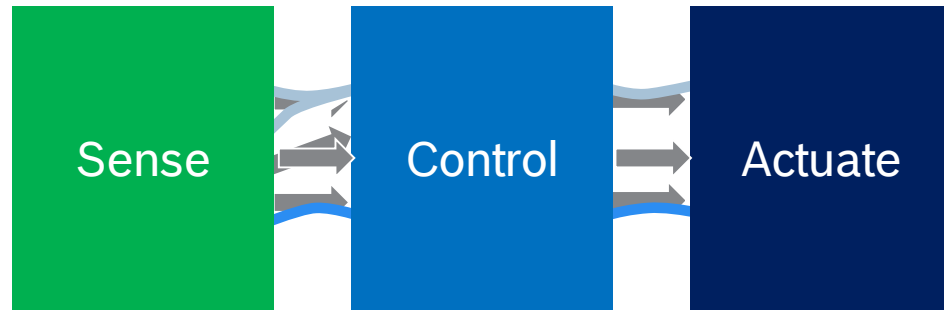
## Tool Landscape



→ INCHRON tool suite and Vector Timing Analysis tool suite and open source tools can be connected via AMALTHEA data model

→ APP4MC can be used as open source tool framework

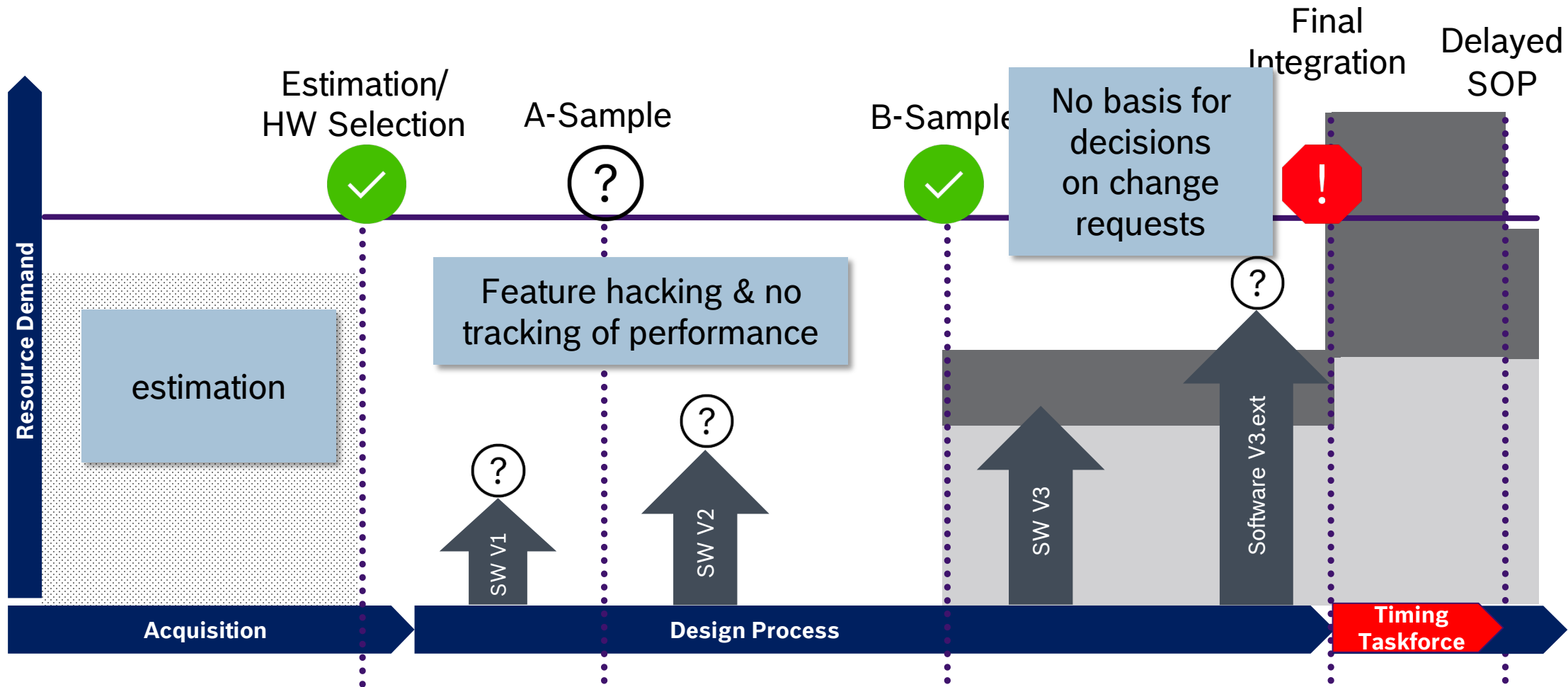
# It's about ... Timing



Max Latencies: 3.3 ms, 2.3ms

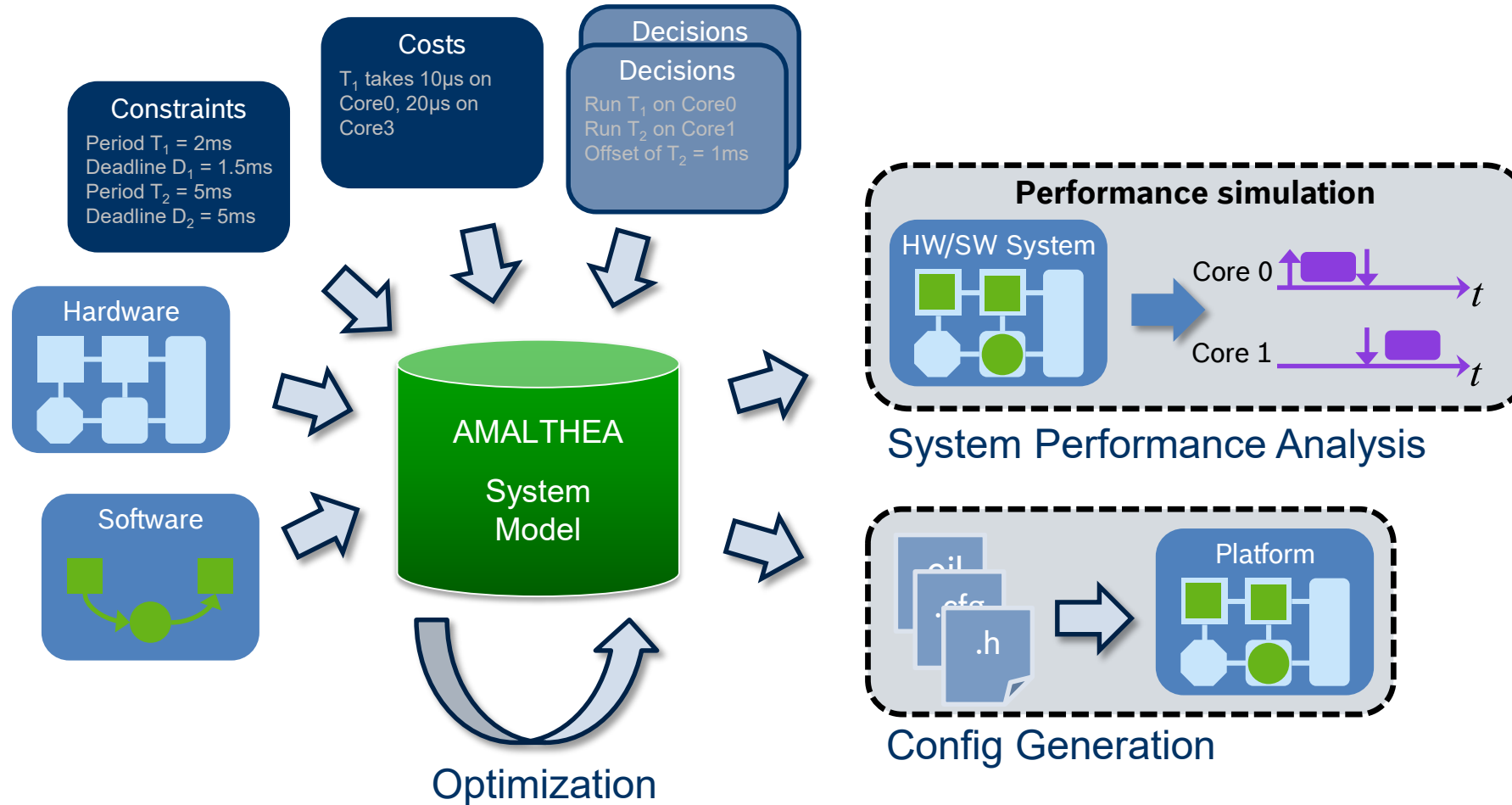
Core Utilizations, ...

# Development timeline



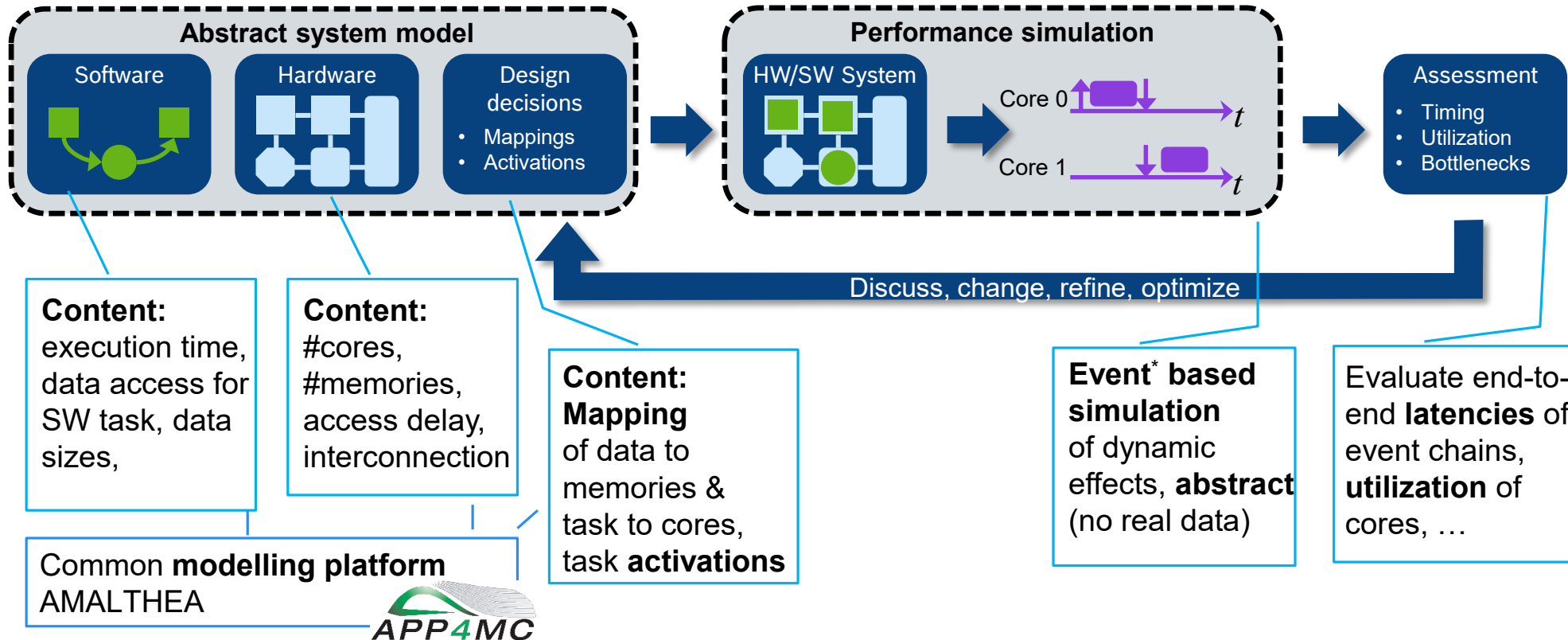


# What is AMALTHEA

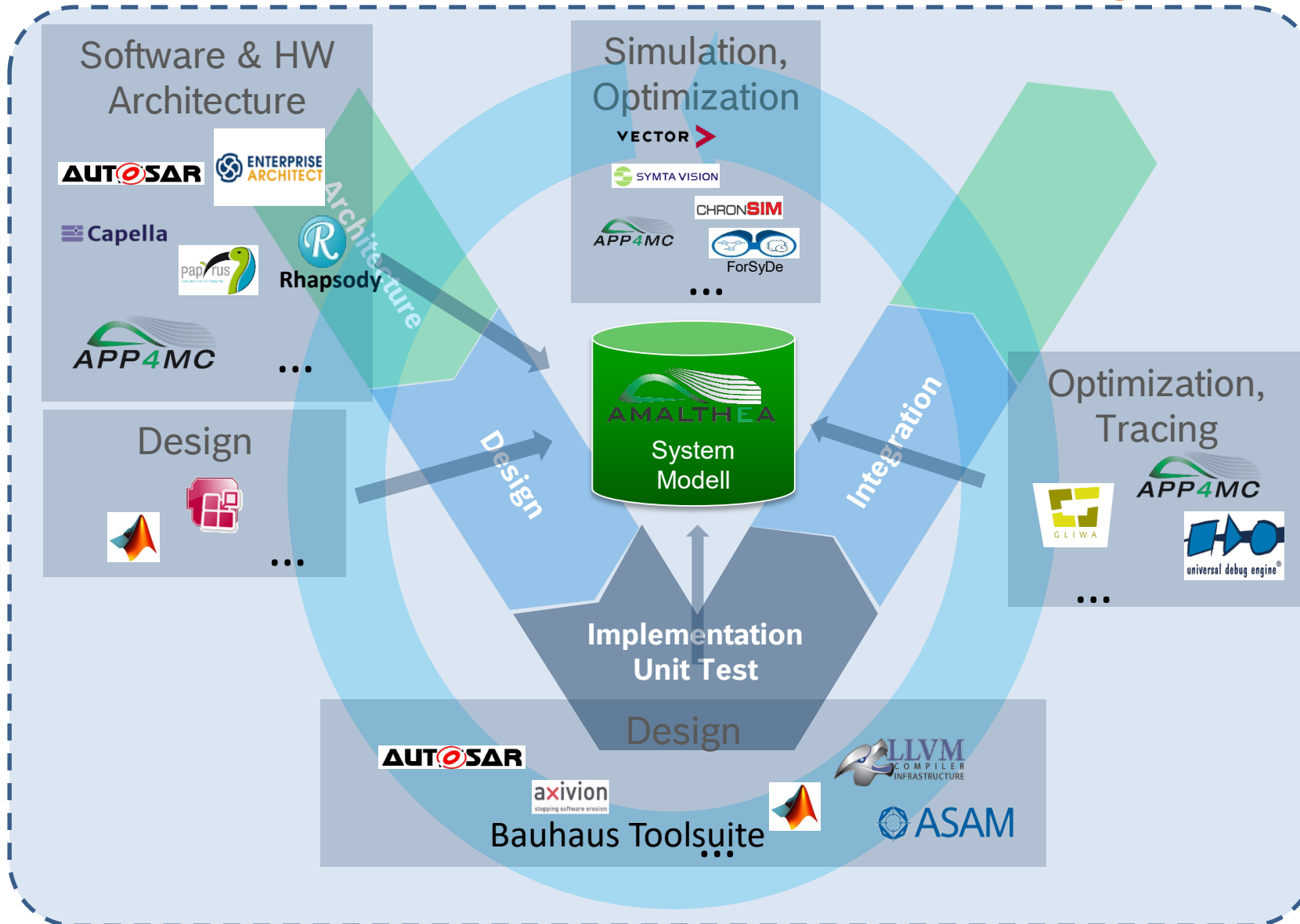


# Performance simulation

## Refinement cycle and model content



# Basic workflow



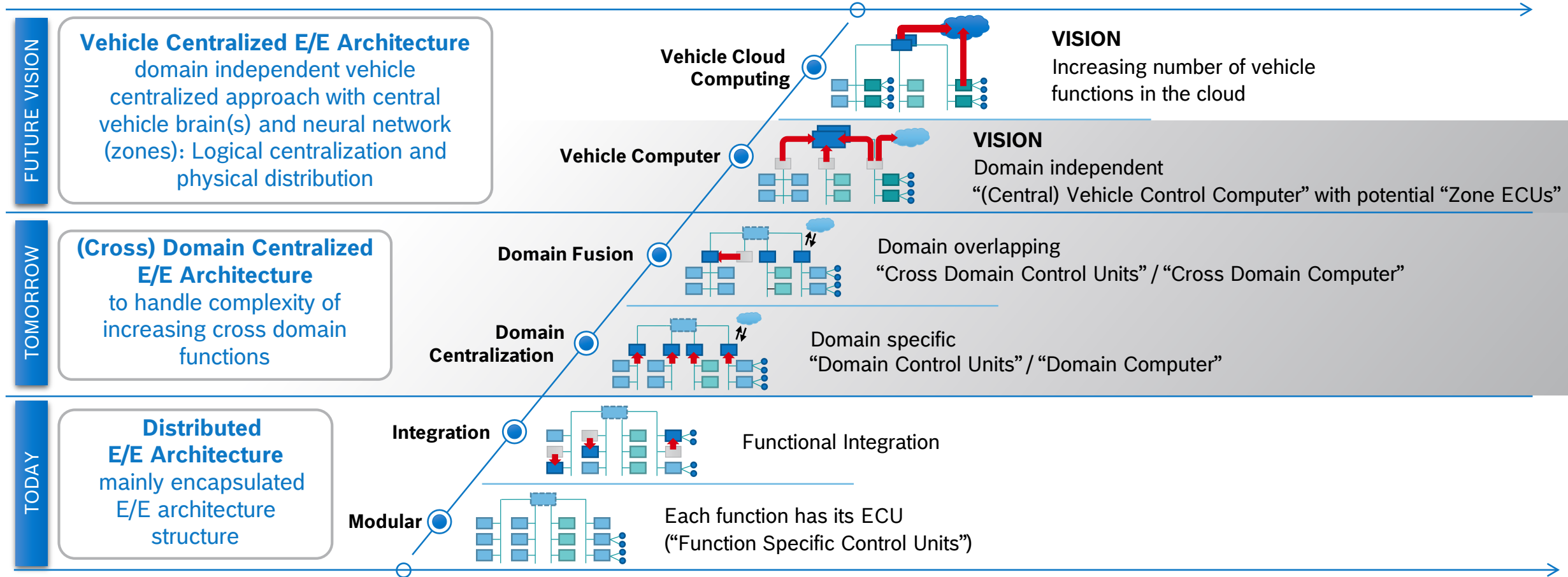
Based on Eclipse:

- **APP4MC** - <https://www.eclipse.org/app4mc/>
  - EMF
  - Xtend
  - Ease
  - E(fx)clipse
  - Sirius
  - Gef
  - Sphinx
  - ...
- **CAPRA** - <https://eclipse.org/capra>
  - Sirius
  - EMF
  - Xtend
  - ...

# AMALTHEA / APP4MC within Panorama Project

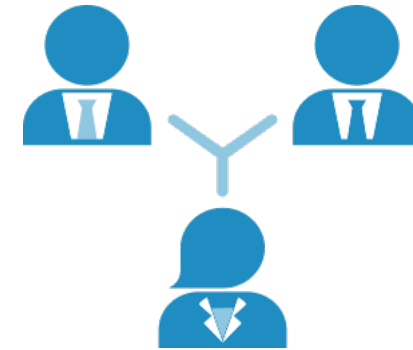
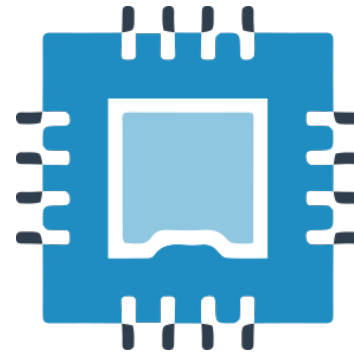
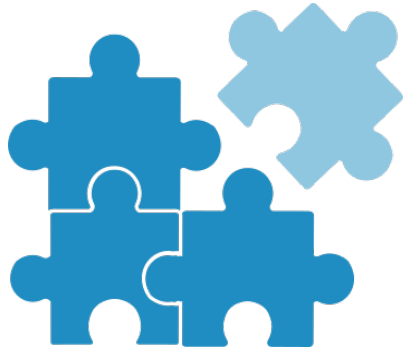
# Centralized E/E Architecture

Source: Bosch



**Centralization shifts integration effort from network to the ECU**

# Research focus



## Heterogeneous Functional Domains

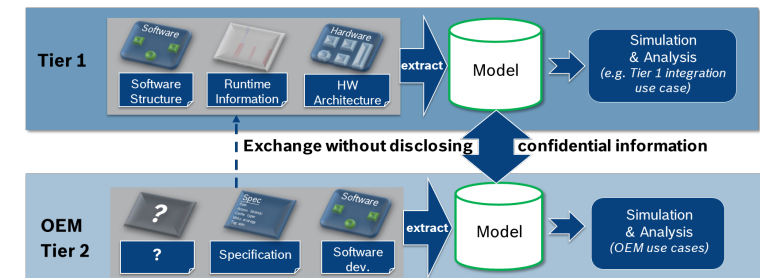
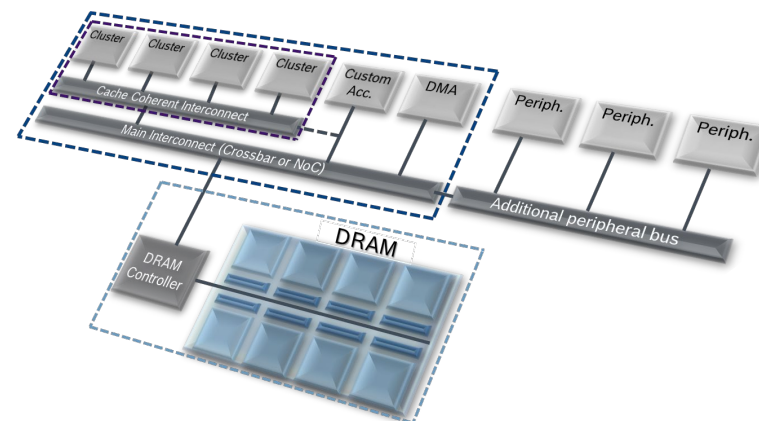
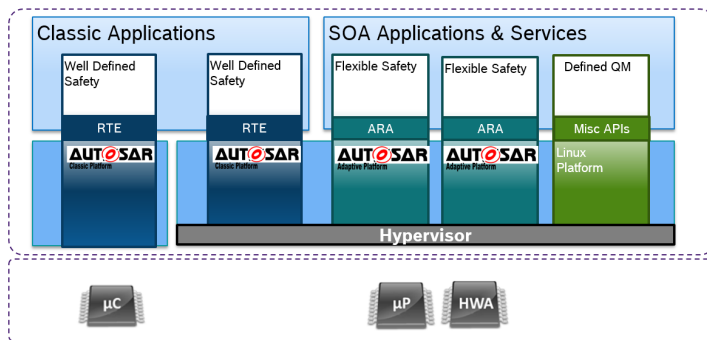
## Heterogeneous Hardware

## Heterogeneous Teams

Integration of heterogeneous function domains

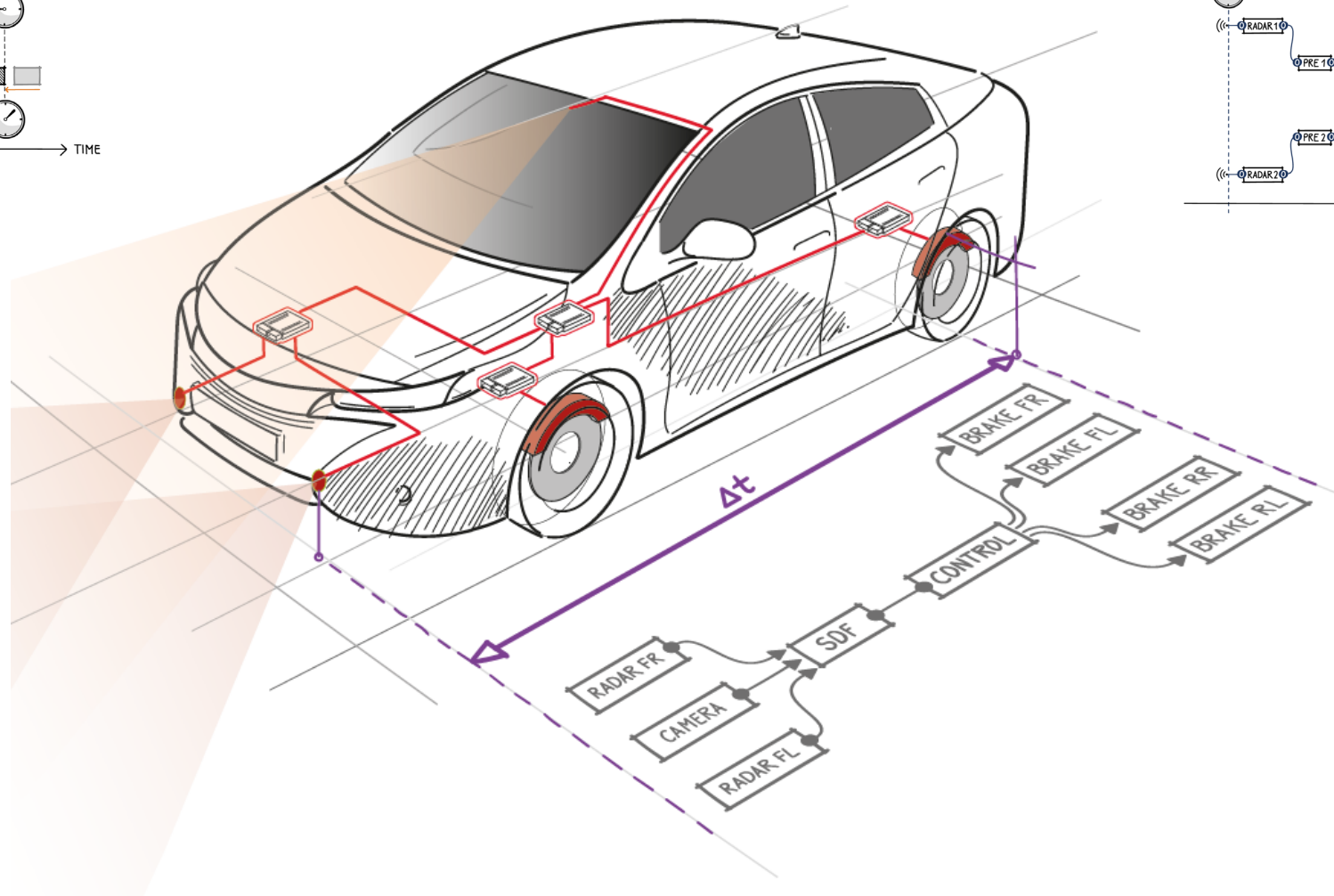
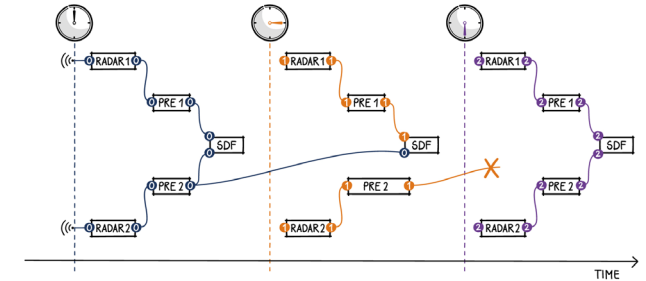
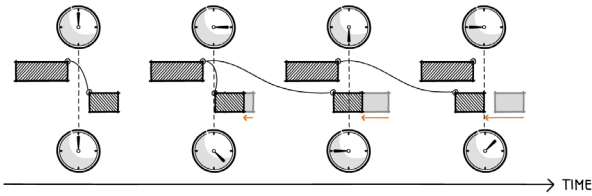
Use of heterogeneous specialized hardware

Involvement of heterogeneous, collaborating parties  
For design and development



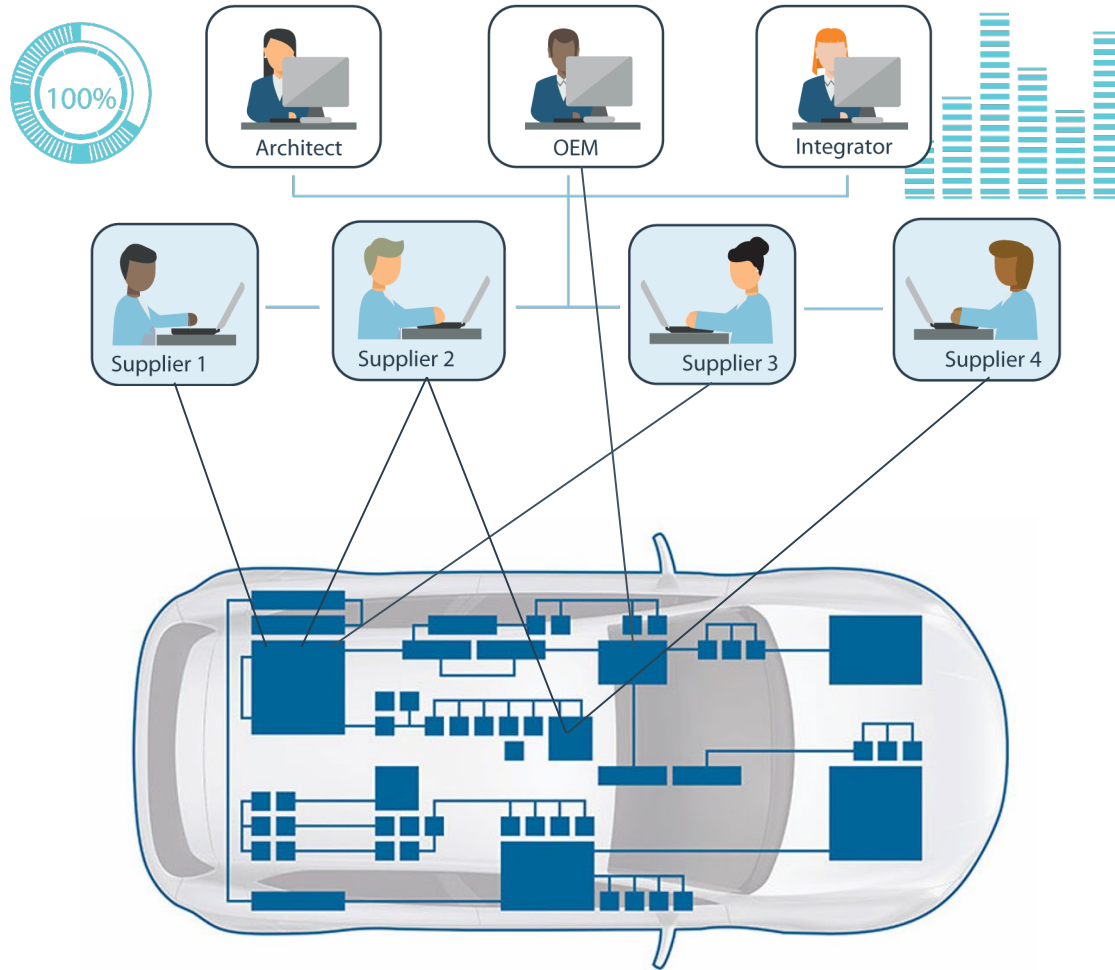
# Heterogeneous Functional Domains

## End-To-End Analysis of Distributed Functions in Vehicle Networks



Source: INCHRON GmbH

# Heterogeneous Teams



## Challenges

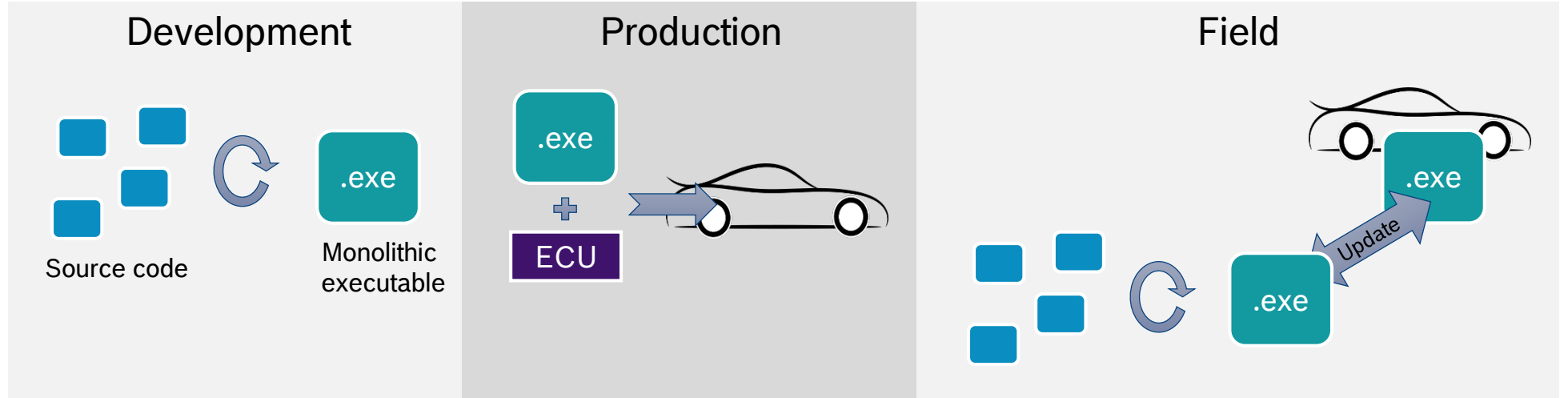
- Tool landscape
- Intellectual Property
- Processes
- Know How
- Responsibility
- ...

➤ How to interact

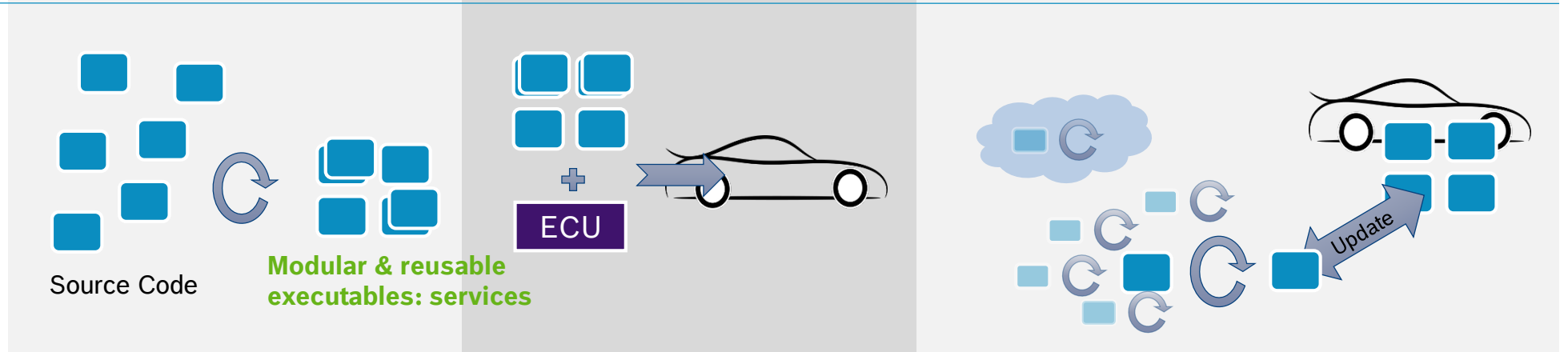


# Heterogeneous Teams

Classic approach

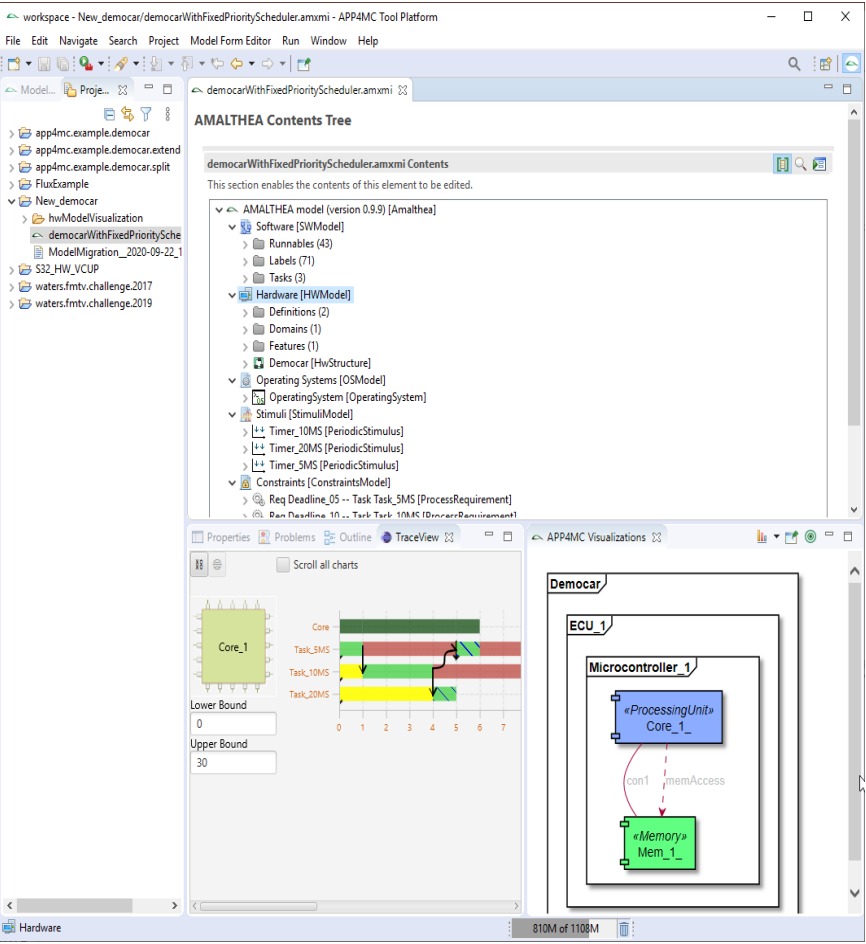


Modular approach

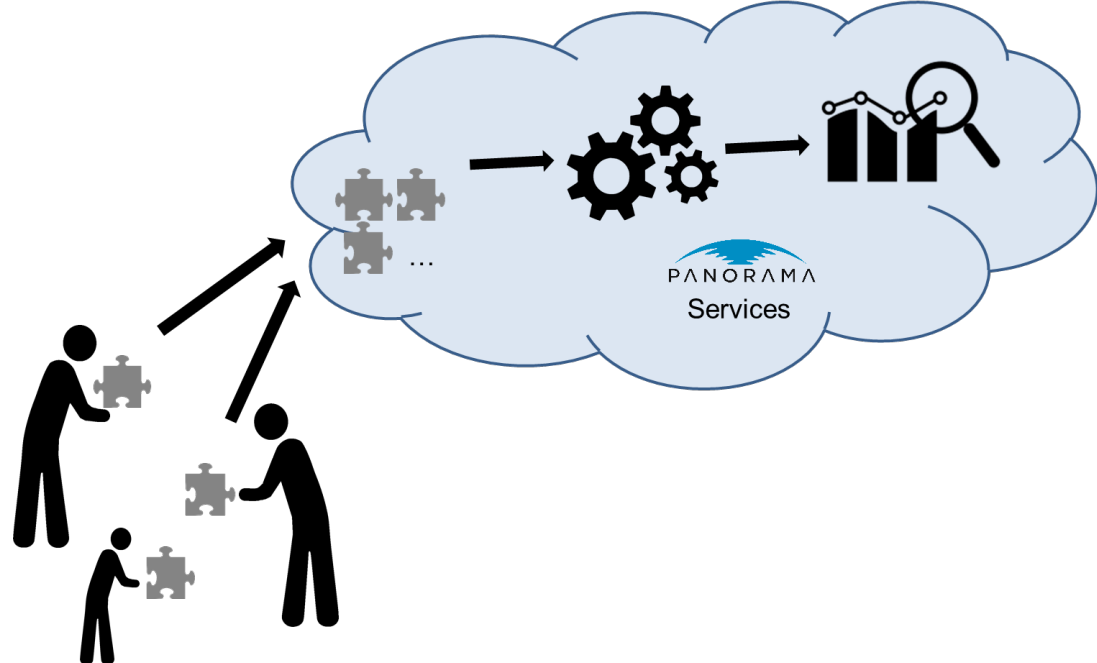


# Demo

## Provisioning of APP4MC IDE

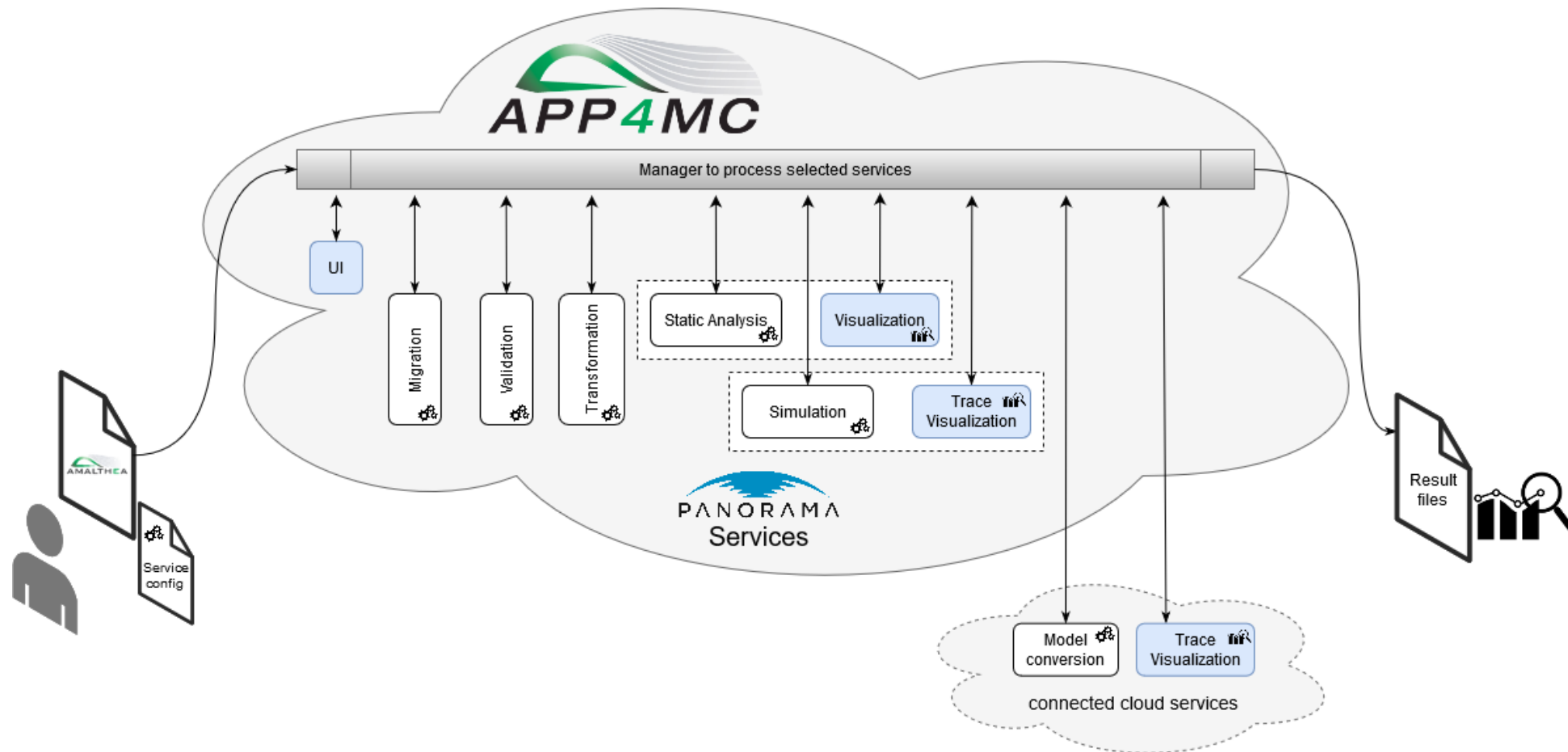


## Cloud based services



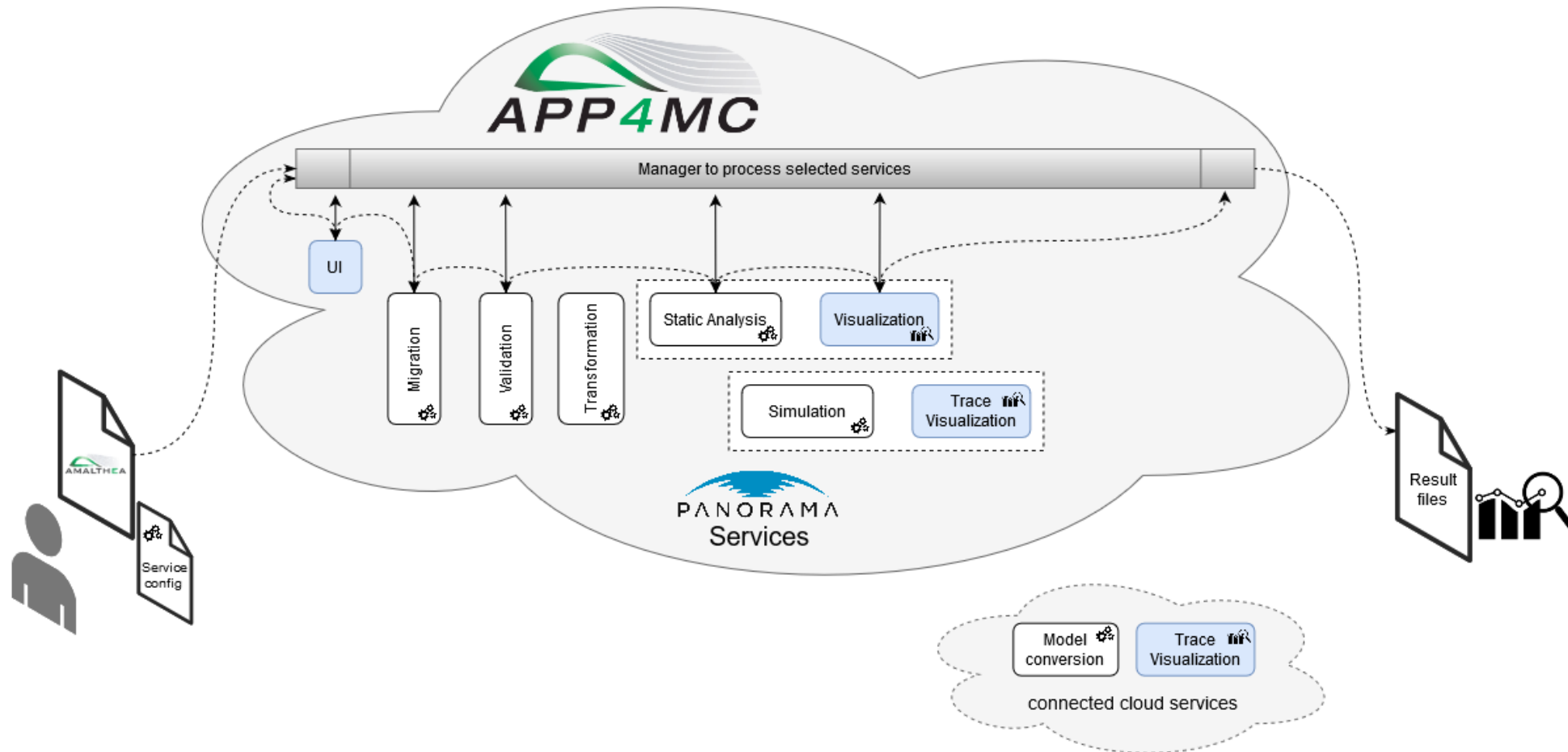
# Focus: Cloud based services

Eclipse APP4MC - Panorama cloud services



# Focus: Cloud based services

Eclipse APP4MC - Panorama cloud services  
(Example workflow)





## Cloud Manager

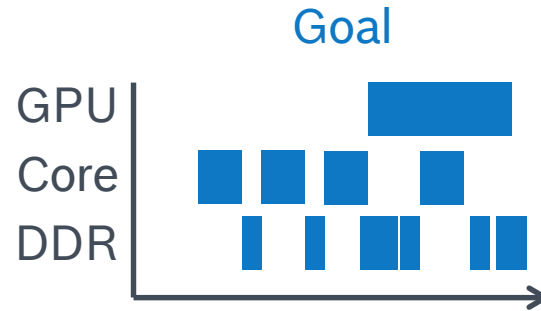
Start Workflow

Administration

<http://app4mc.eclipseprojects.io/>

# Benefits

Status quo



Improve **insight** in dynamic system behavior

- ▶ Systems in development
- ▶ Systems in field



**Assess** design choices & requirements

- ▶ Systems in acquisition
- ▶ Systems in planning or development



**Identify** opportunities

- ▶ Prioritization of critical event-chains
- ▶ Derive OS configurations (e.g., thread priorities)

# Thank you!



## Follow us



<https://www.panorama-research.org/>  
<https://itea3.org/project/panorama.html>  
<https://www.eclipse.org/app4mc/>



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