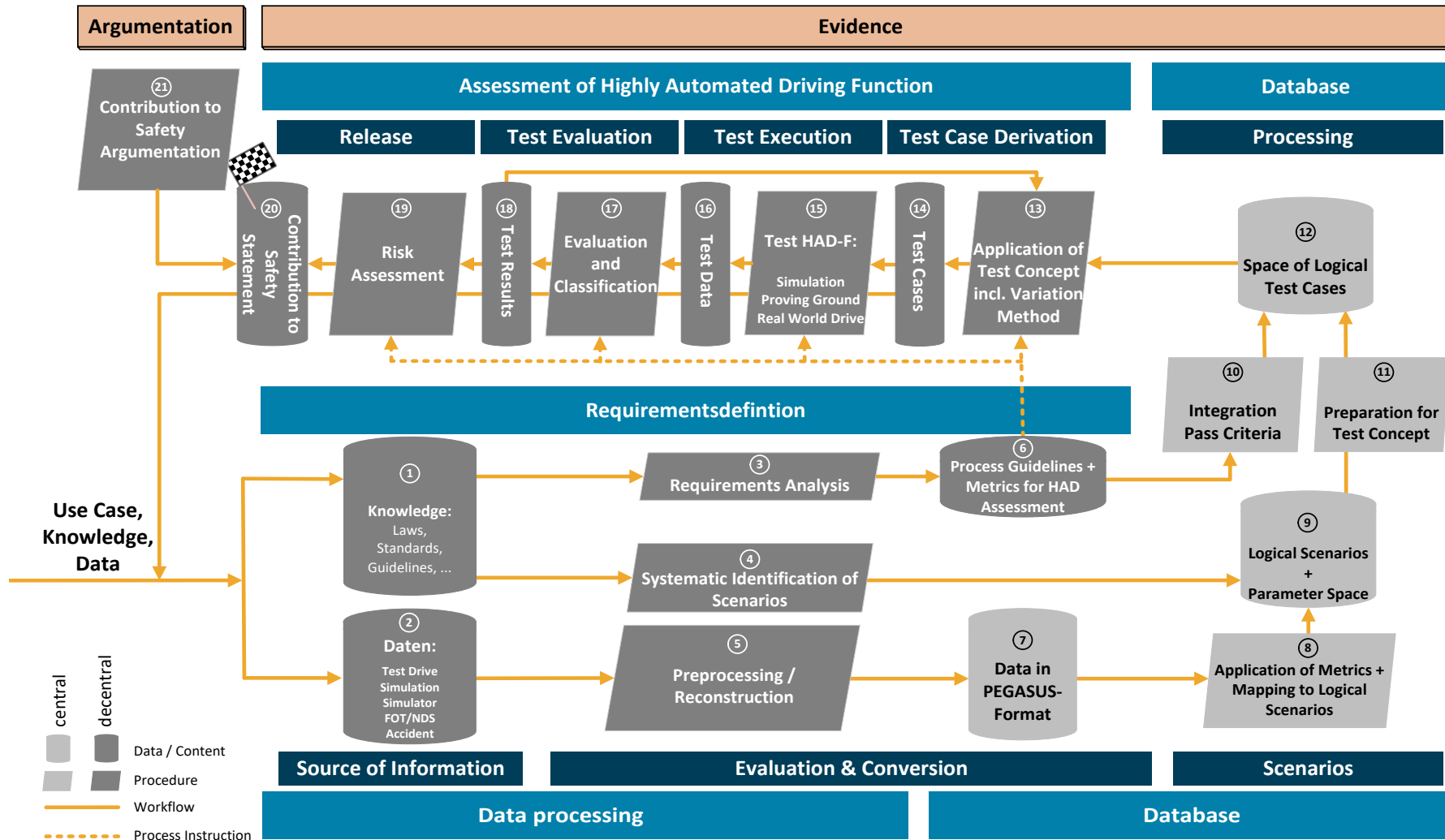


# Safety Argumentation

## ASAM Regional Meeting North Amerika

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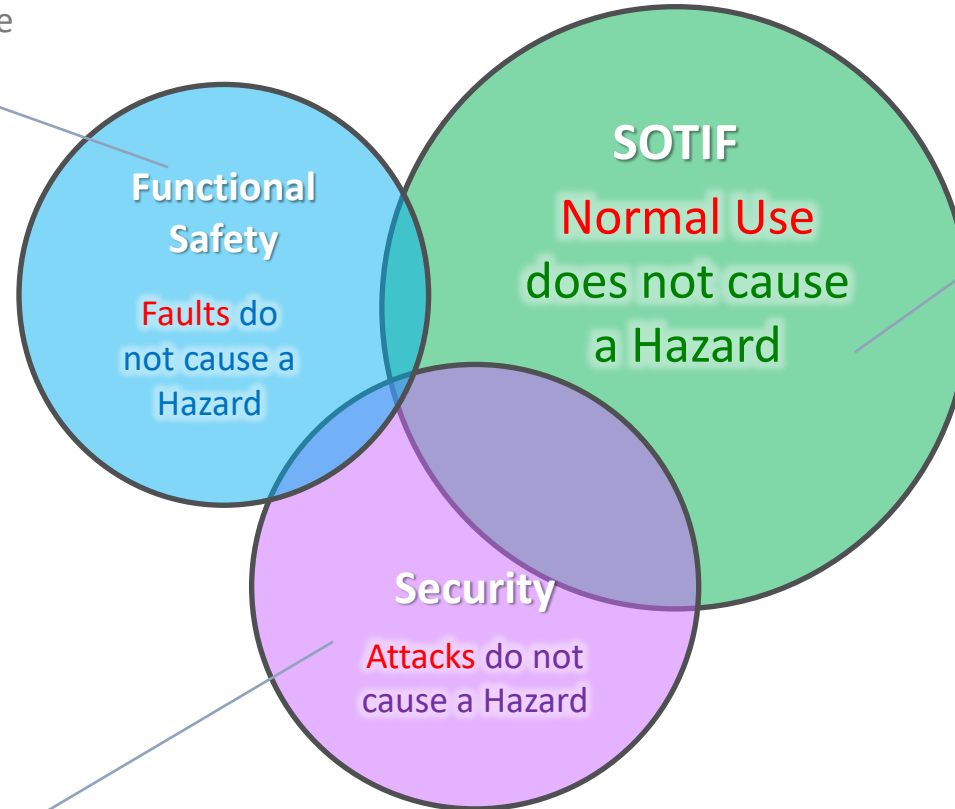


## Some Learnings from PEGASUS (my personal selection)

- safety approval for automated and connected vehicles is a **hard task**
- **think in scenarios** to come up with a overall systematic approach and an approach to manage complexity
- differentiate **levels of automation** as well as **cooperation**
- **human-in-the-Loop** is not always a helpful concept.
- safety-argumentation must rely on **different tools** with **different levels of evidence**.
- new and complex **tool chains** must be established – **reference architectures** are needed
- open or freely available **standards** are of high importance.
- without sufficient **models and simulations** it will not work and scale
- the **SOTIF**-approach is a good one ...

# Safety argumentation requires mastering three safety challenges

Requires safe and powerful compute (architecture, ASIL-level SoCs, actuators and control software)

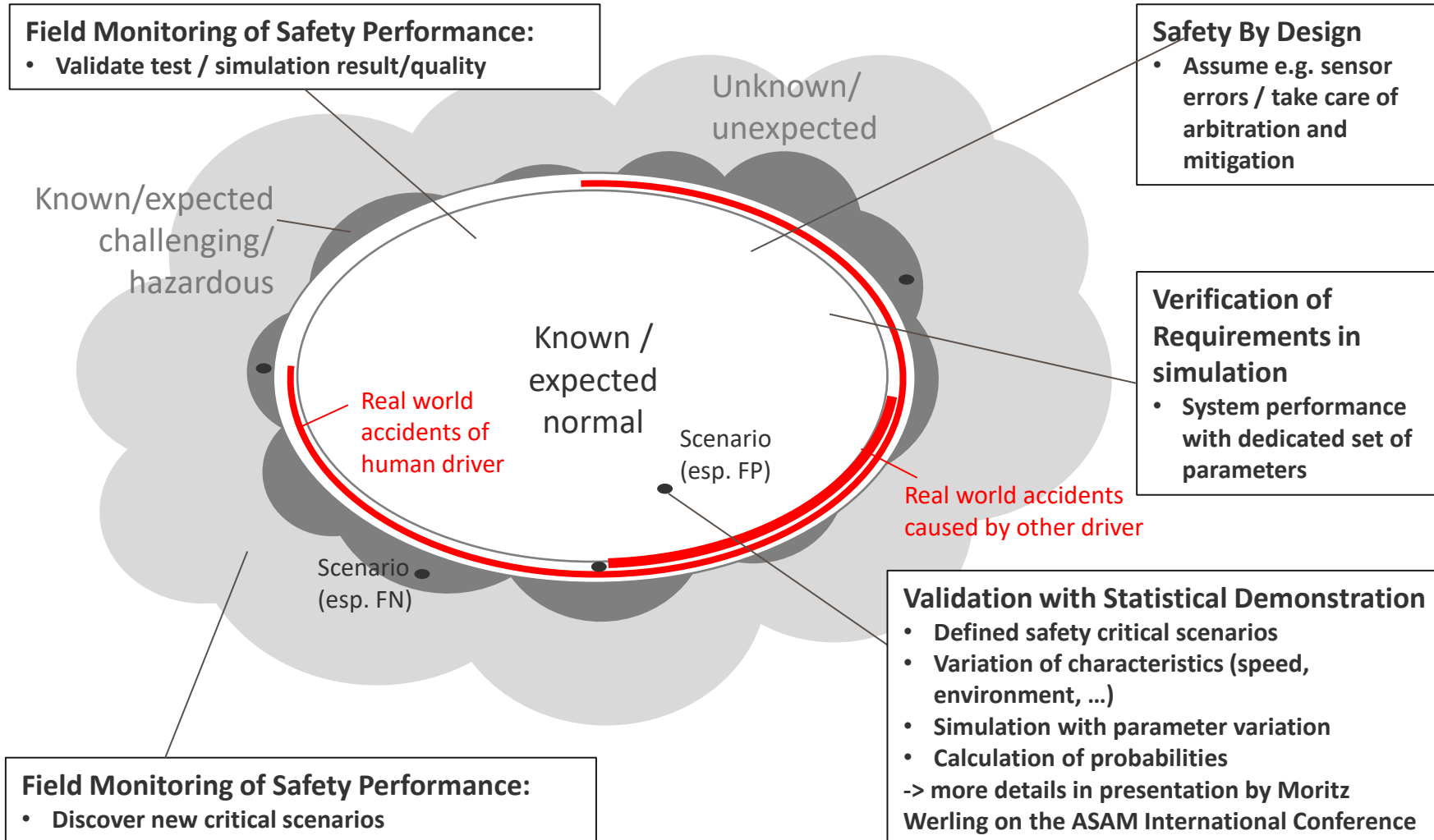


Requires the system to make manouver decisions with accident risk less than human driver

Requires smart security engineering (architectures, access protection etc.)

# SOTIF: Complete space of scenarios needs to be handled

## Basic idea on clustering the test space



## Main assessment criteria

Evaluation of test space along three basic criteria:

- **Safety** to handle the scenario situation **during activation**
  - No accident
  - Almost accident (e.g. ttc)
  - Accident (S1, S2, S3)
- **Ability** to detect **system boundaries** with ample time (to avoid activation/trigger handover request)
- **System** performance within **comfort** parameters (e.g. lateral / long. acceleration)

# PEGASUS Family

## PEGASUS – SET Level – VVM



The **PEGASUS Family** focuses on development / testing methods and tools for AD systems on highways and in urban environments

**PEGASUS**  
<https://www.pegasusprojekt.de/en/home>

- Scope: **First methodological framework**
- Use-Case: L3/4 on highways
- Partners: 17



### VV-Methods



- Scope: **Methods, toolchains, specifications for technical assurance**
- Use-Case: L3/4/5 in urban environments
- Partners: 23 partners
- Timeline: 07/2019 – 06/2023

### SET Level



- Scope: **Simulation platform, toolchains, definitions for simulation-based testing**
- Use-Case: L3/4/5 in urban environments
- Partners: 20 partners
- Timeline: 03/2019 – 10/2022

+ future projects of the PEGASUS Family

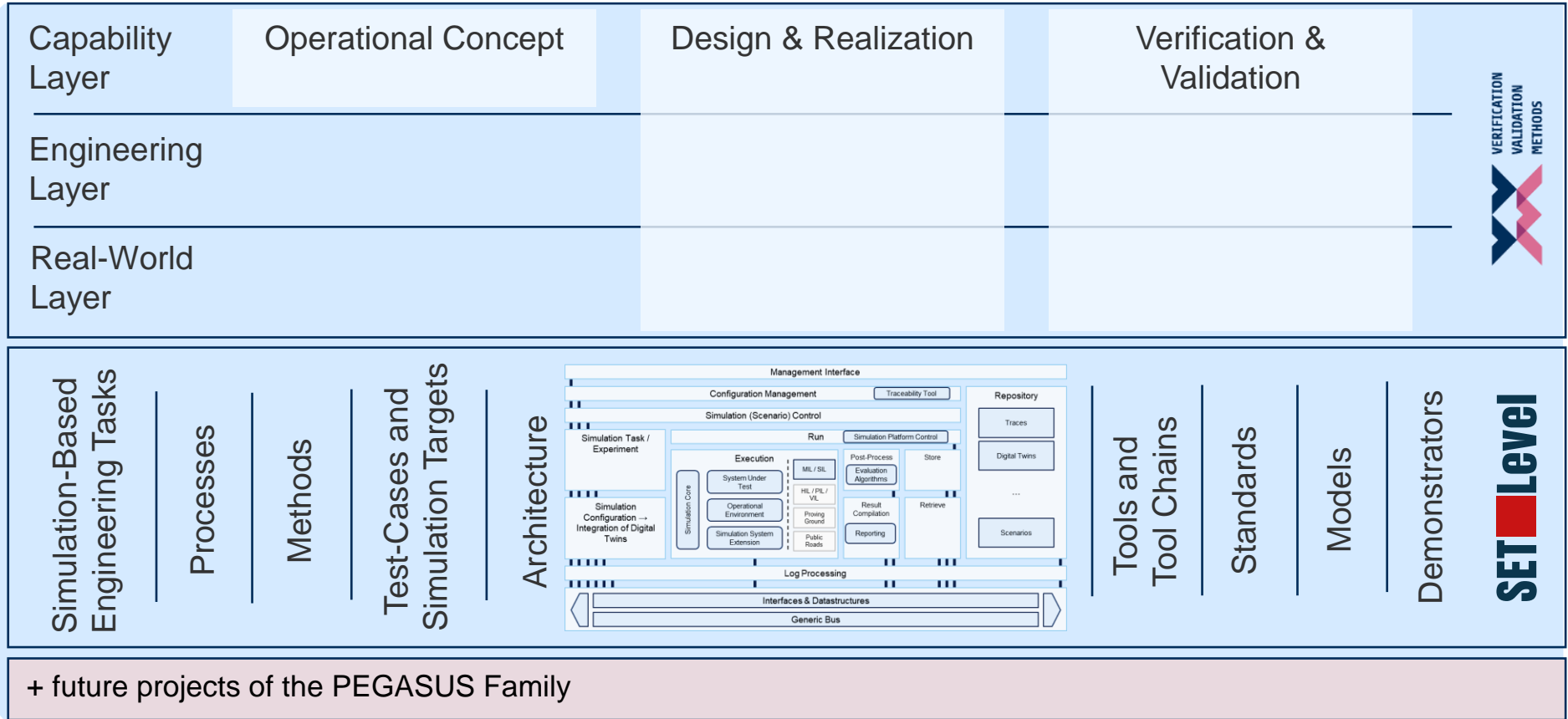
2016

2019

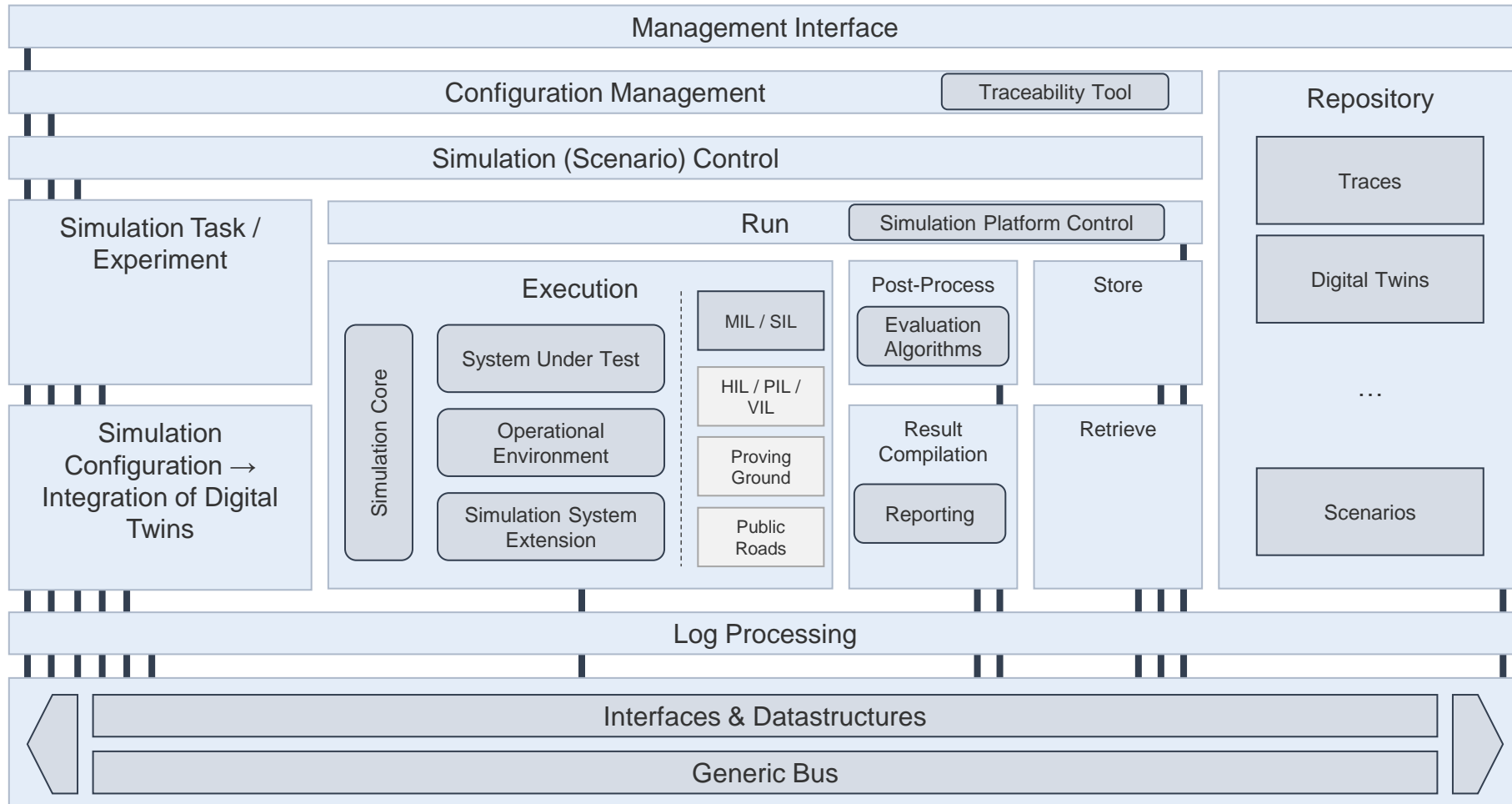
Time →

# PEGASUS Family

PEGASUS – SET Level – VVM



# Generic Open Analysis/Testing Architecture (GOATA)



Based on: F. Köster, S. Hallerbach,  
P. R. Mai, B. Engel: ASAM SIM:Guide: ASAM OpenX in Context: 2021.

# GAIA-X – Guiding Principles

- GAIA-X will be the basis for a digital ecosystem in which data and services can be made available, integrated/merged, shared and used securely and with an ultimate level of trust.
- Based on European values, GAIA-X implements the following guiding principles:
  - European data protection principles
  - authenticity and trust
  - openness and transparency
  - sovereignty and self-determination
  - free market access as well as European stability and growth
  - modularity and interoperability
  - usability
- European/international visibility and impact

