



**International Council on Systems Engineering**  
*A better world through a systems approach*

*Panel: Bridging the Divide: Linking Architectural Specification  
and Verification by System Simulation*

## Digital Engineering with Co-Simulation Across the Engineering Cycle, Leveraging Open Standards

**Dr Mike Nicolai**

Head of Simcenter MBSE, Siemens



# Why Simulation in MBSE



# Digital Ship Construction

## sub-system trade-study

800x



time reduction for trade-study creation

“We decreased our decision time when making architecture changes from 1 week down to 3 minutes, after we integrated our methodology inside Simcenter Studio.”

Senior Manager, Marine OEM



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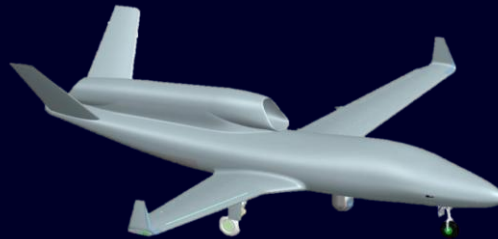
# Engineering Simplified

## Need

We need a high-flying drone that can watch over large areas in any weather condition.



## Design

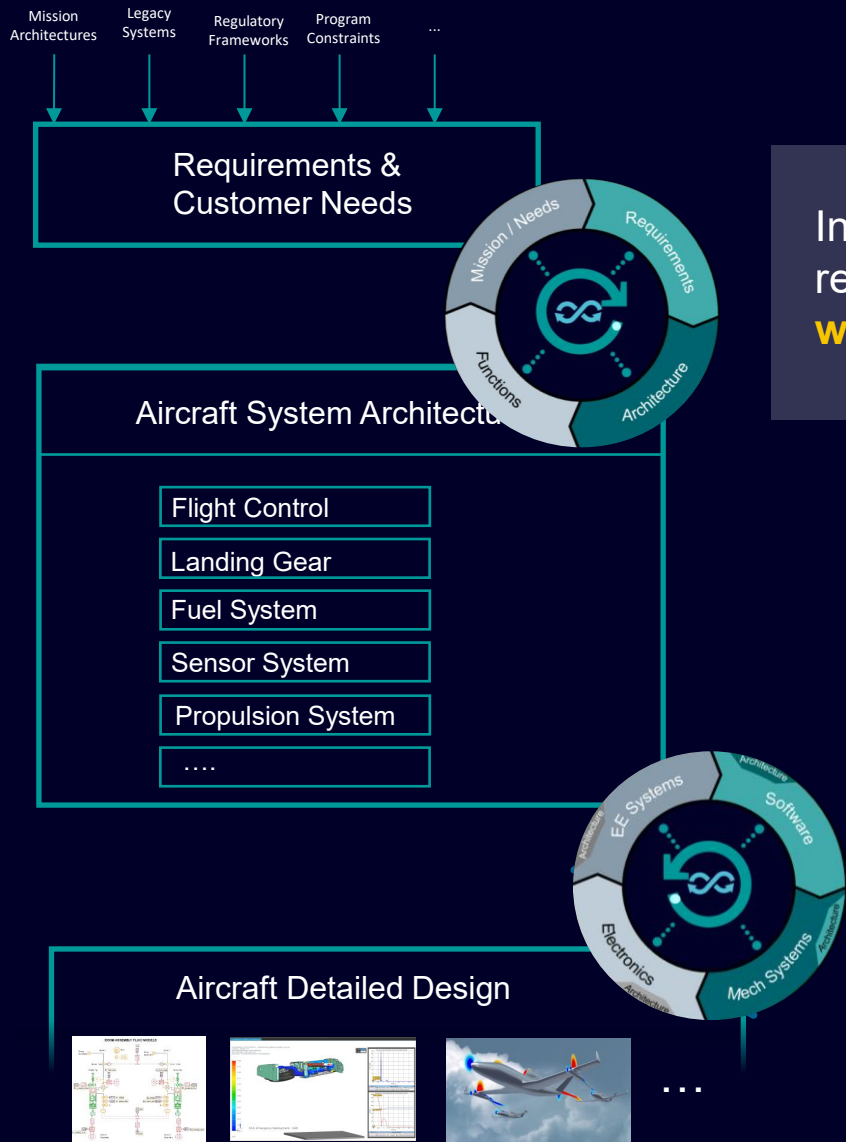
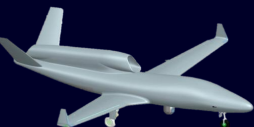


## Operate



# Aircraft System Architecture Development

We need a high-flying drone that can watch over large areas in any weather condition.



In concept phase the goal is to refine the requirements **into specification** to define **what** the system must do.

## Technical Processes:

- Functional Analysis
- Safety Analysis
- Architecture Development
- Trade Studies
- Early Validation
- ...



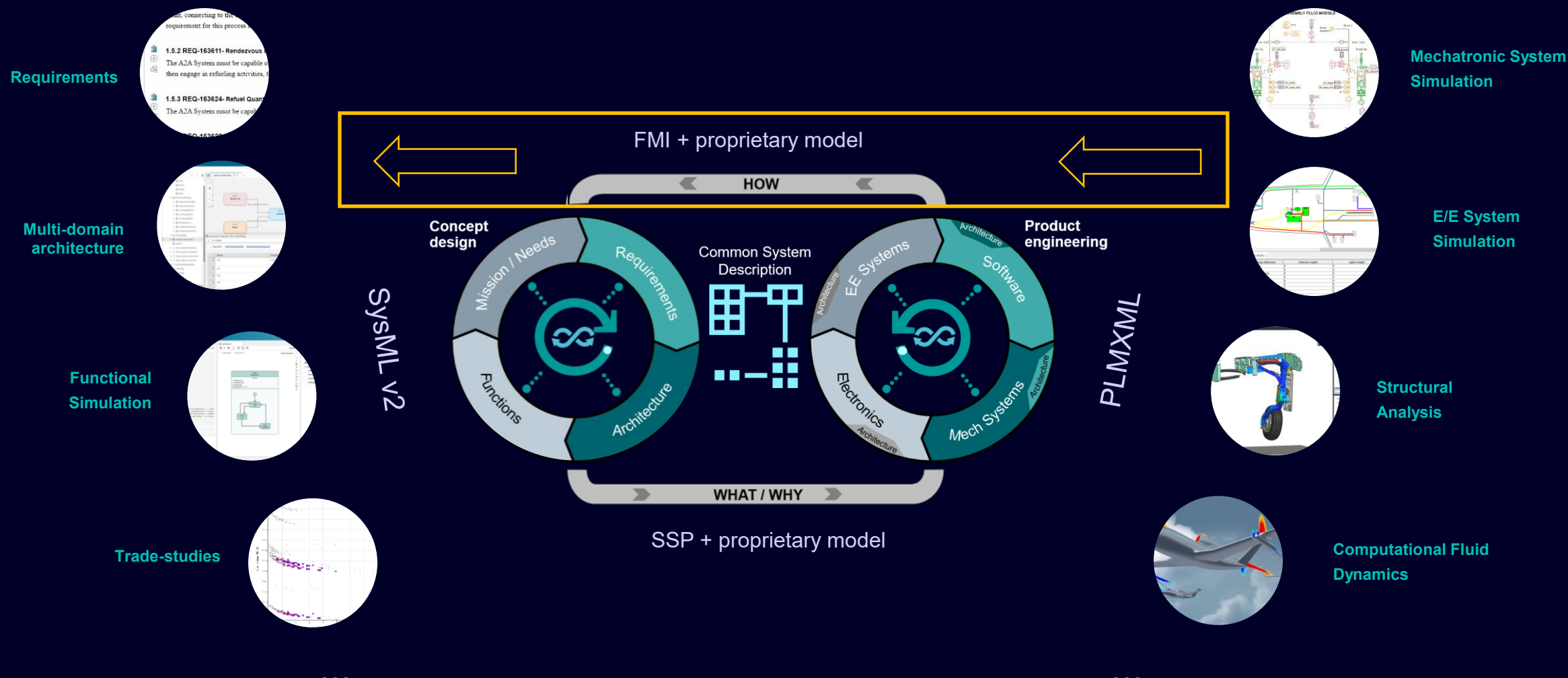
In design phase the goal is to engineer a solution **against specification**, it is to define **how** the system will be built.

## Technical Processes:

- Detailed Engineering
- Technical Analysis
- Implementation Design
- Integration Planning
- Design Validation
- ...

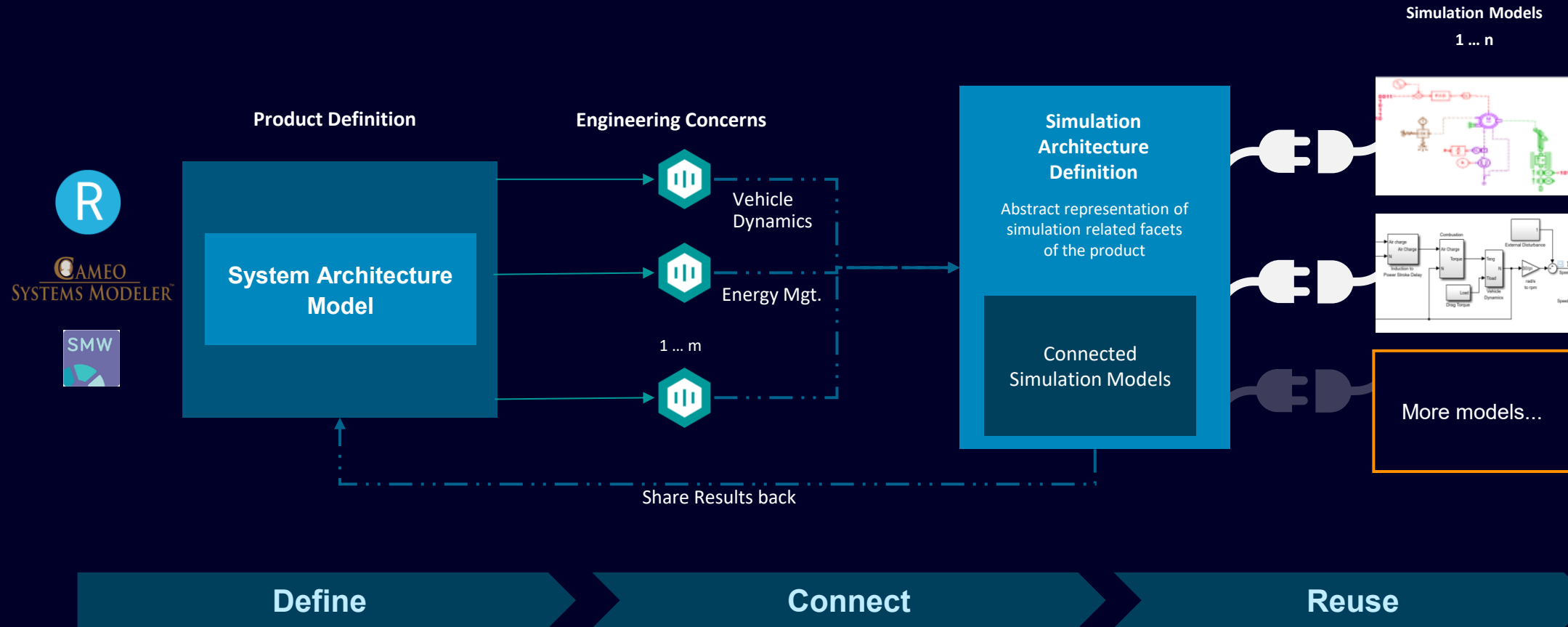
# Concept Phase – Looping between the What and the How.

Open standards for co-simulation and exchange



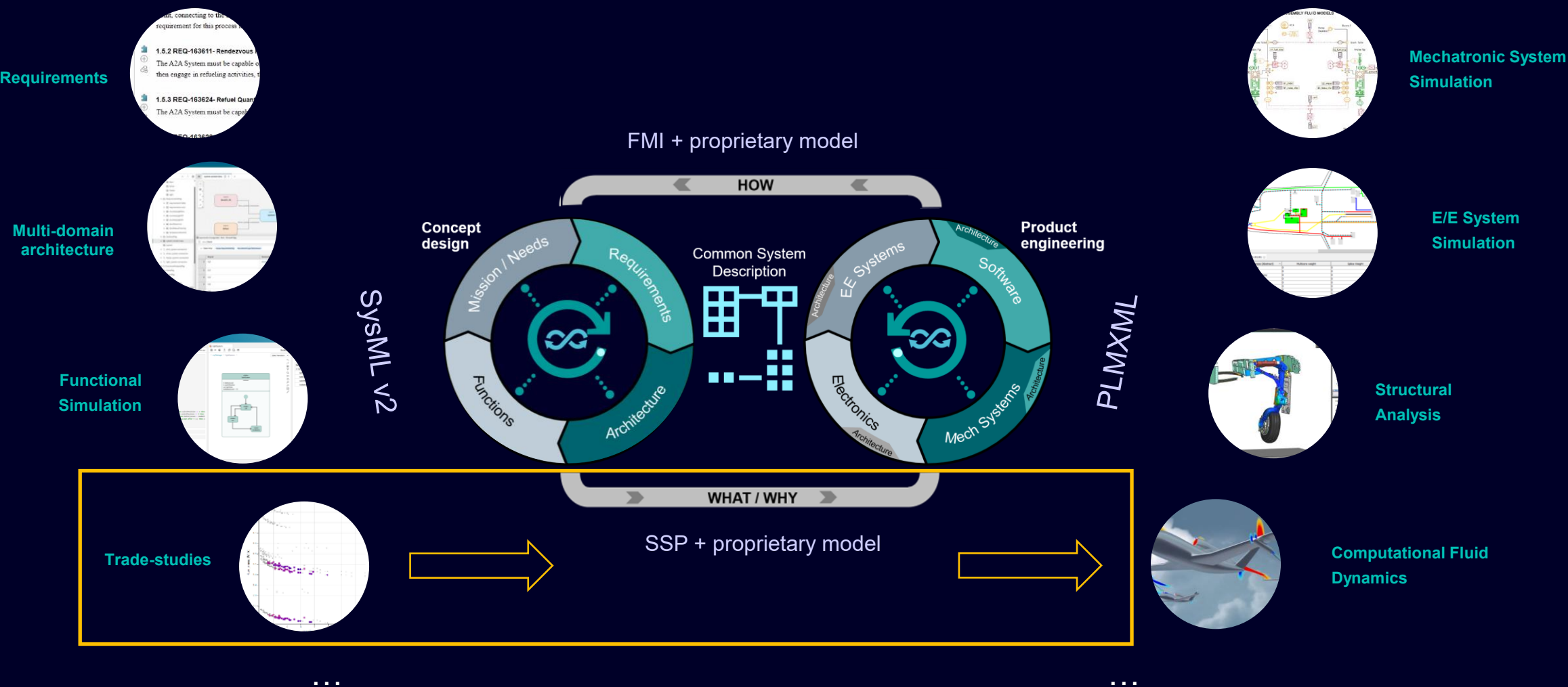
# System Architecture Modeling and Simulation Framework

## Enable reuse of existing simulation assets with co-simulation



# Concept Phase – Looping between the What and the How.

Open standards for co-simulation and exchange



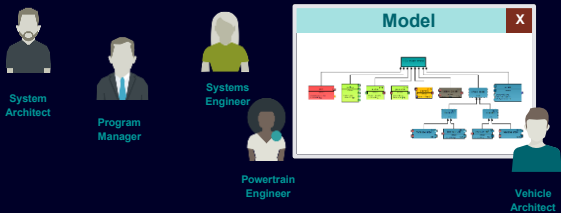


# Automatic Trade Study generation and execution

From a Function to Logic Architecture to make better decisions with models



PRODUCT FUNCTION



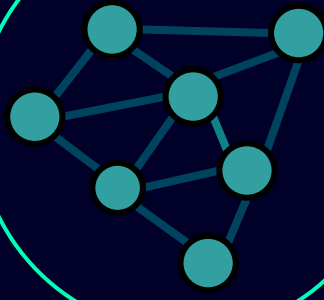
ENGINEERING DATA



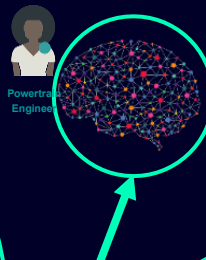
PRODUCT IN USE



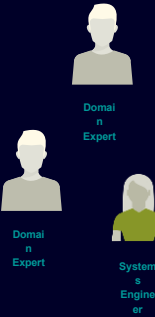
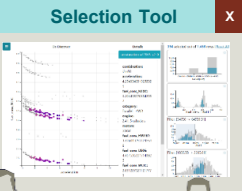
GENERATE



VERIFY



ALTERNATIVES



Capture

Explore

Discover

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# Contact

Dr. Mike Nicolai  
Head of Simcenter MBSE

[Mike.Nicolai@siemens.com](mailto:Mike.Nicolai@siemens.com)  
<https://www.linkedin.com/in/mike-nicolai/>  
+32 471 359894

