Pascal Roques Formation & Conseil

{PRFC}

eclipsecon France 2017

Why are ARCADIA and Capella relevant for MBSE?

Introduction: Pascal Roques

- **Senior consultant, 25+ years of modeling experience**
  - **SADT, OMT, UML, SysML, ARCADIA/Capella**

- **UML2 and SysML Certified by the OMG**
- **Co-founder of the SysML France association**

- **Trainer for Thales on ARCADIA / Capella**
  - **130+ sessions, 1500+ trainees**
  - **Part of Clarity** Ecosystem for the Model Based Systems Engineering Solution Capella

- **Author of UML/SysML best-sellers in France**
- **… and of the first Capella book soon!**

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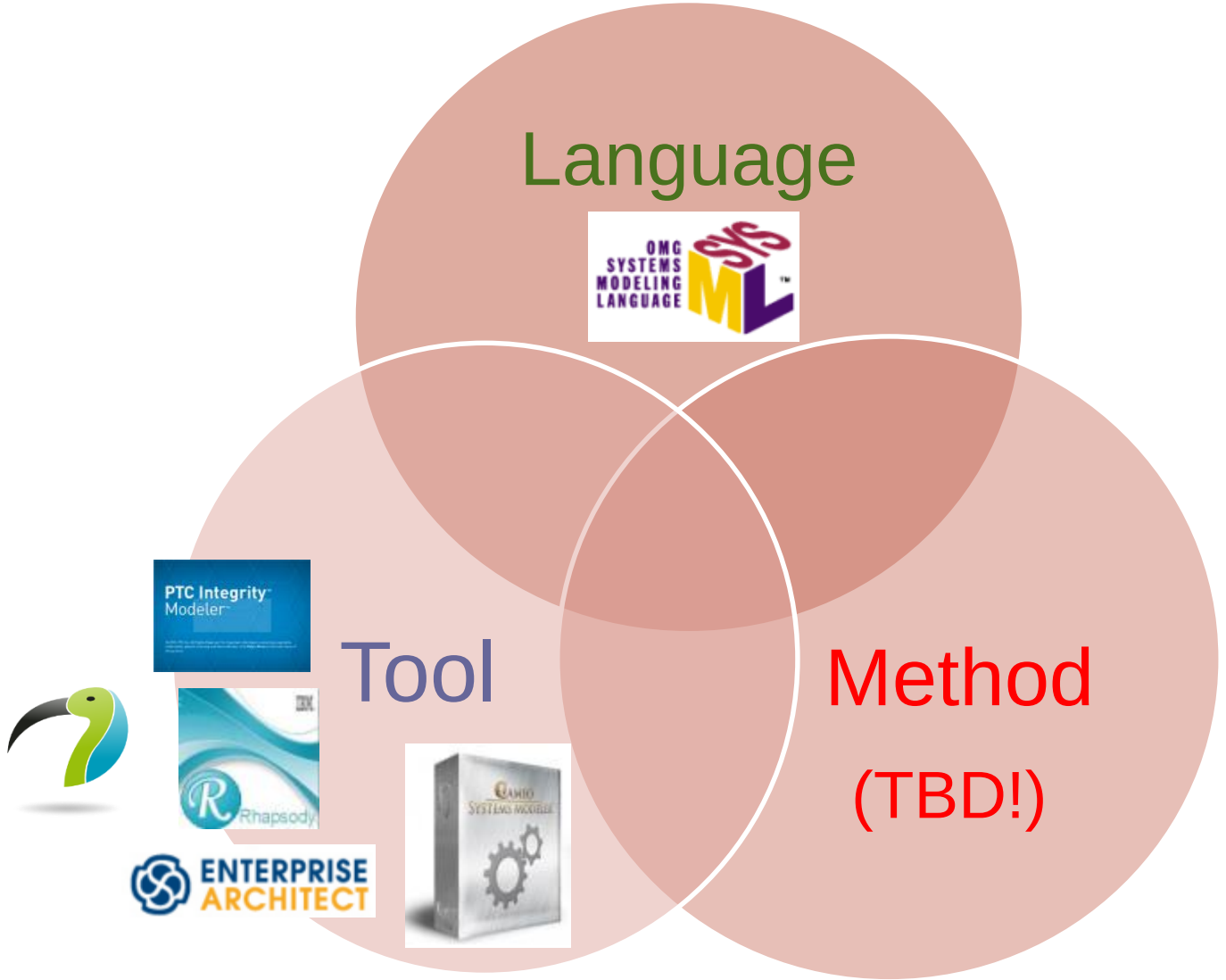
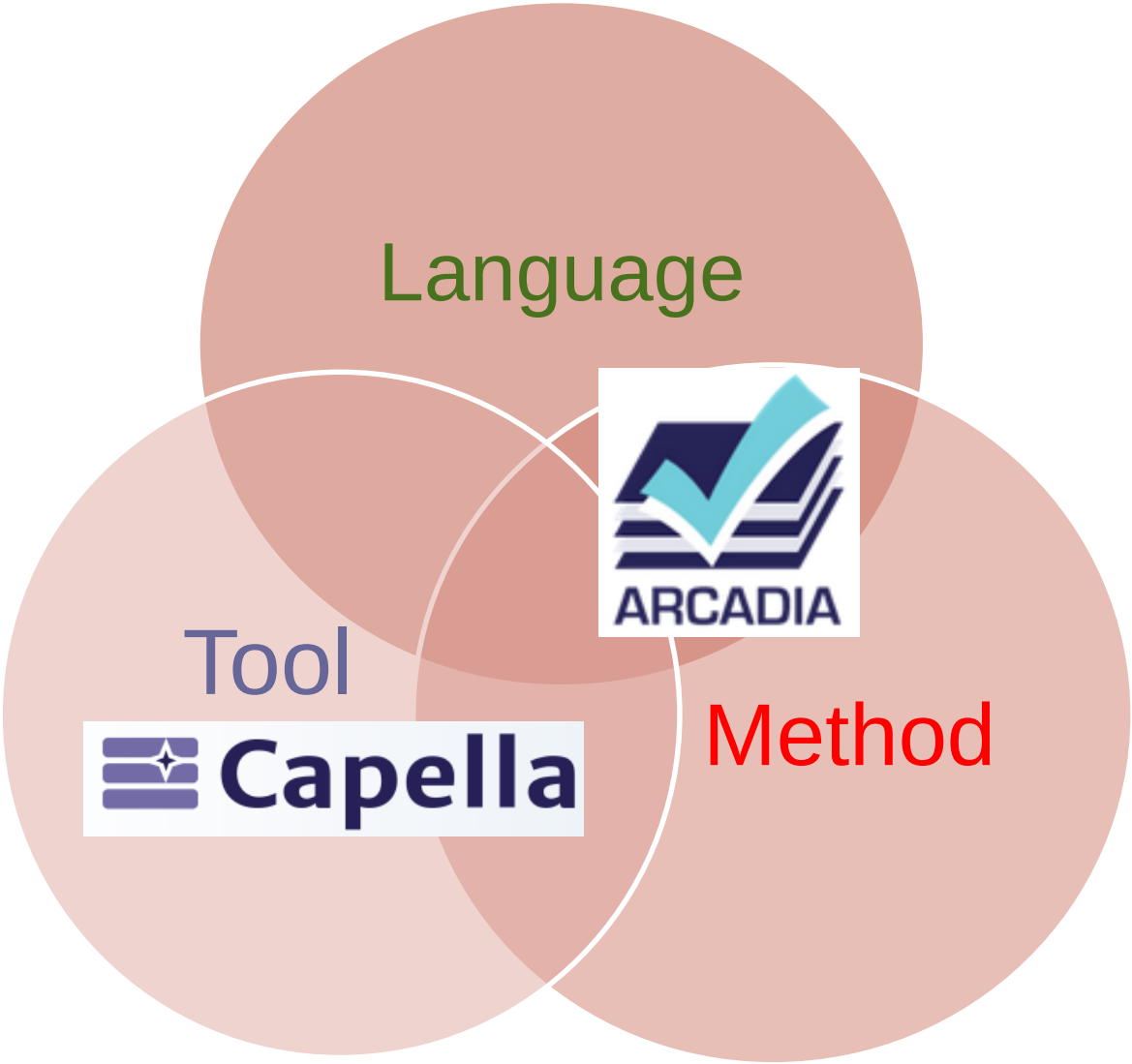
Agenda

1. Tooled-Up Modeling Method
2. Systems Engineering Continuity
3. User-Driven Modeling Tool
4. Open-Source!

MBSE pillars (SysML)

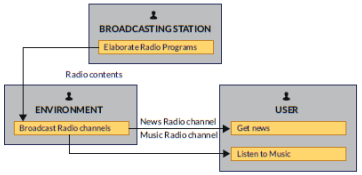
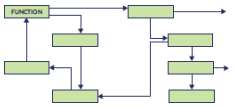
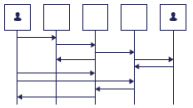
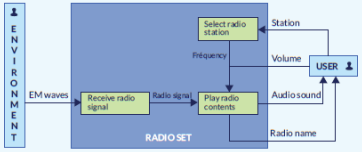
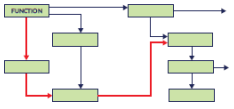
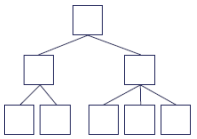
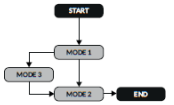
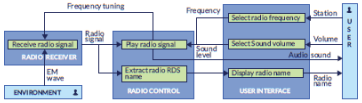
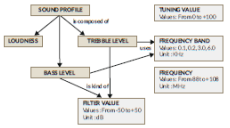
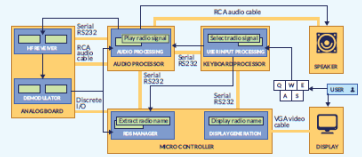
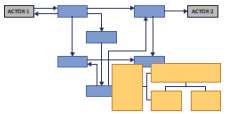
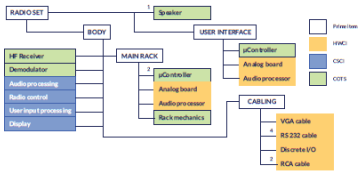
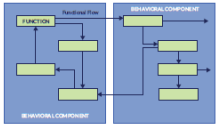


MBSE pillars (ARCADIA / Capella)



ARCADIA Summary

Clarity

	METHOD STEPS	TASKS	SAMPLE MODEL	CONCEPTS	DESCRIPTION MEANS
NEED	**Customer Operational Need Analysis** What the users of the system need to accomplish	✓ Define operational capabilities ✓ Perform an operational need analysis		- Operational capabilities - Actors, operational entities - Actor activities - Interactions between activities & actors - Information used in activities & interactions - Operational processes chaining activities - Scenarios for dynamic behaviour	 **Dataflow**: functions, op. activities interactions & exchanges **Scenarios**: actors, system, components interactions & exchanges 
	System/ SW/HW Need Analysis What the system has to accomplish for the Users	✓ Perform a capability trade-off analysis ✓ Perform a functional and non-functional analysis ✓ Formalise and consolidate requirements		- Actors and system, capabilities - Functions of system & actors - Dataflow exchanges between functions - Functional chains traversing dataflow - Information used in functions & exchanges, data model - Scenarios for dynamic behaviour - Modes & states	 **Functional chains, operational processes** through functions & op. activities   **Modes & states** of actors, system, components
SOLUTIONS	**Logical Architecture Design** How the system will work so as to fulfil expectations	✓ Define architecture drivers and viewpoints ✓ Build candidate architectural breakdowns in components ✓ Select best compromise architecture		*SAME CONCEPTS, PLUS :* - Components - Component ports and interfaces - Exchanges between components - Function allocation to components - Component interface justification by functional exchanges allocation	**Breakdown** of functions & components **Data model**: dataflow & scenario contents, definition & justification of interfaces 
	Physical Architecture Design How the system will be developed & built	✓ Define architectural patterns ✓ Consider reuse of existing assets design a physical ✓ Design a physical reference architecture ✓ Validate and check it		*SAME CONCEPTS, PLUS :* - Behavioural components refining logical ones, and implementing functional behaviour - Implementation components supplying resources for behavioural components - Physical links between implementation components	 **Component wiring:** all kinds of components
	Development Contracts What is expected from each designer/ sub-contractor	✓ Define a components IVVQ strategy ✓ Define & enforce a PBS and component integration contract		- Configuration items tree - Parts numbers, quantities - Development contract (expected behaviour, interfaces, scenarios, resource consumption, non-functional properties…)	**Allocation** of op.activities to actors, of functions to components, of behav.components to impl.components, of dataflows to interfaces, of elements to configuration items 

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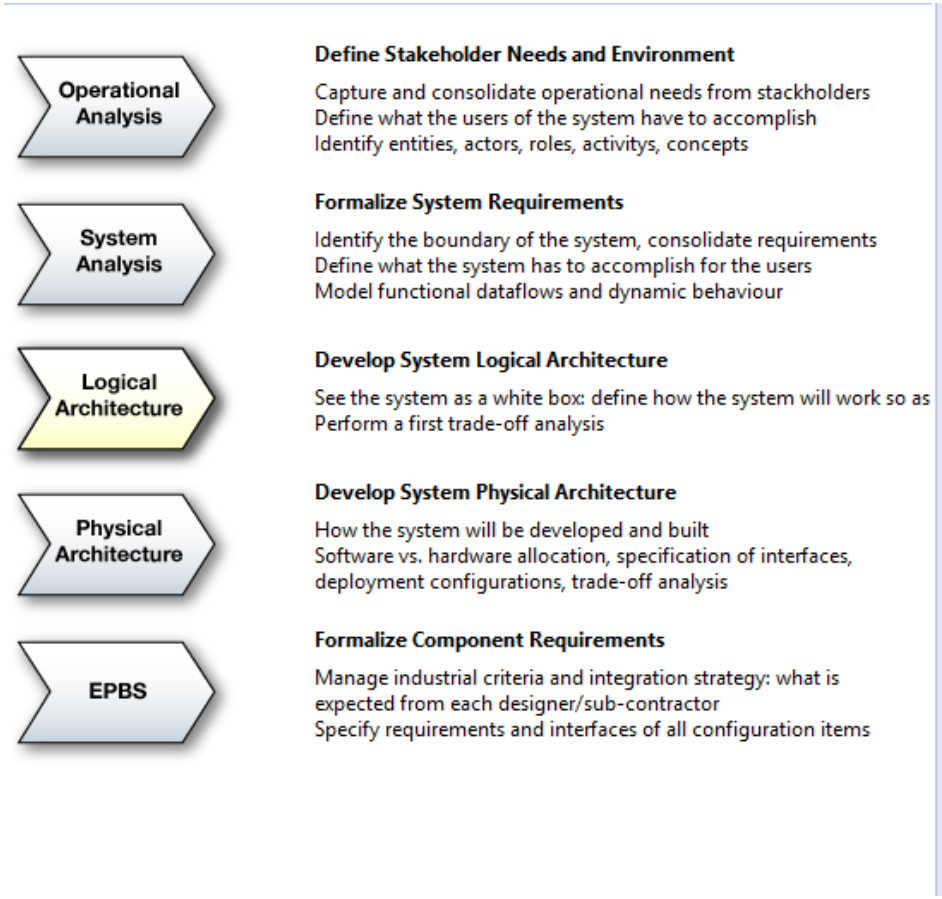
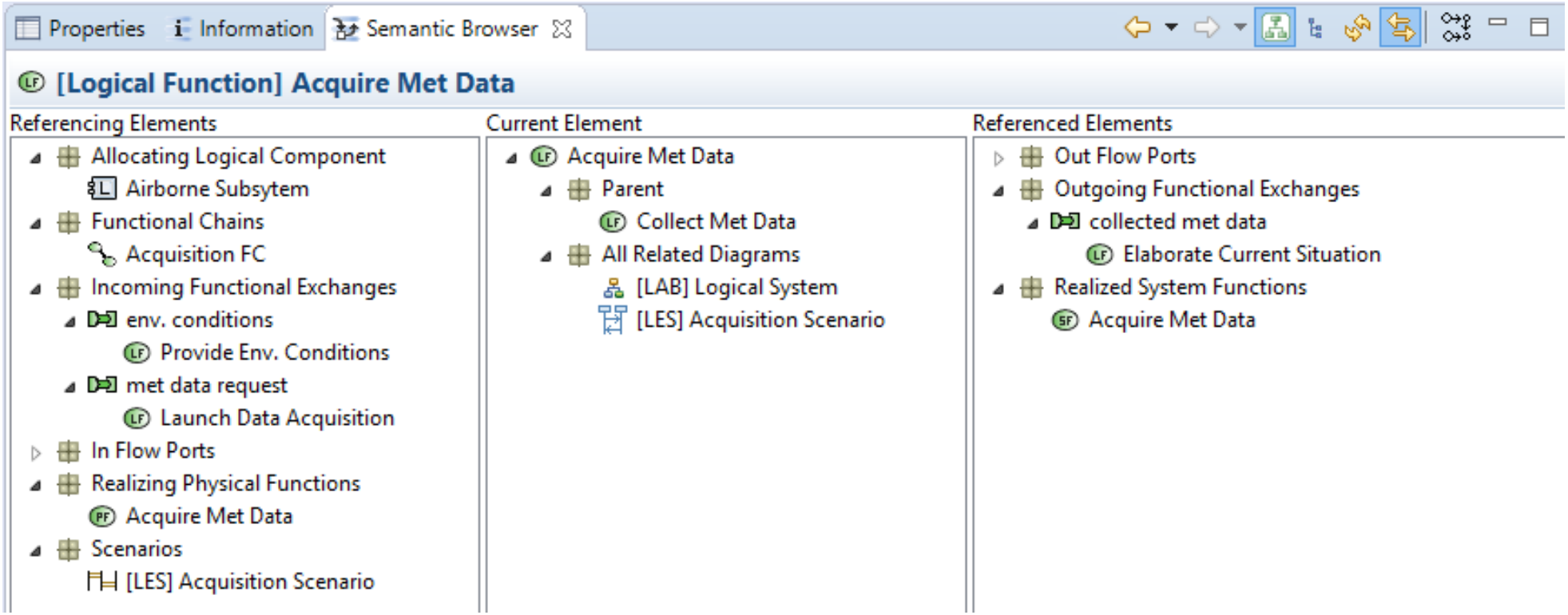
Methodological Guidance

- **Activity Browser**



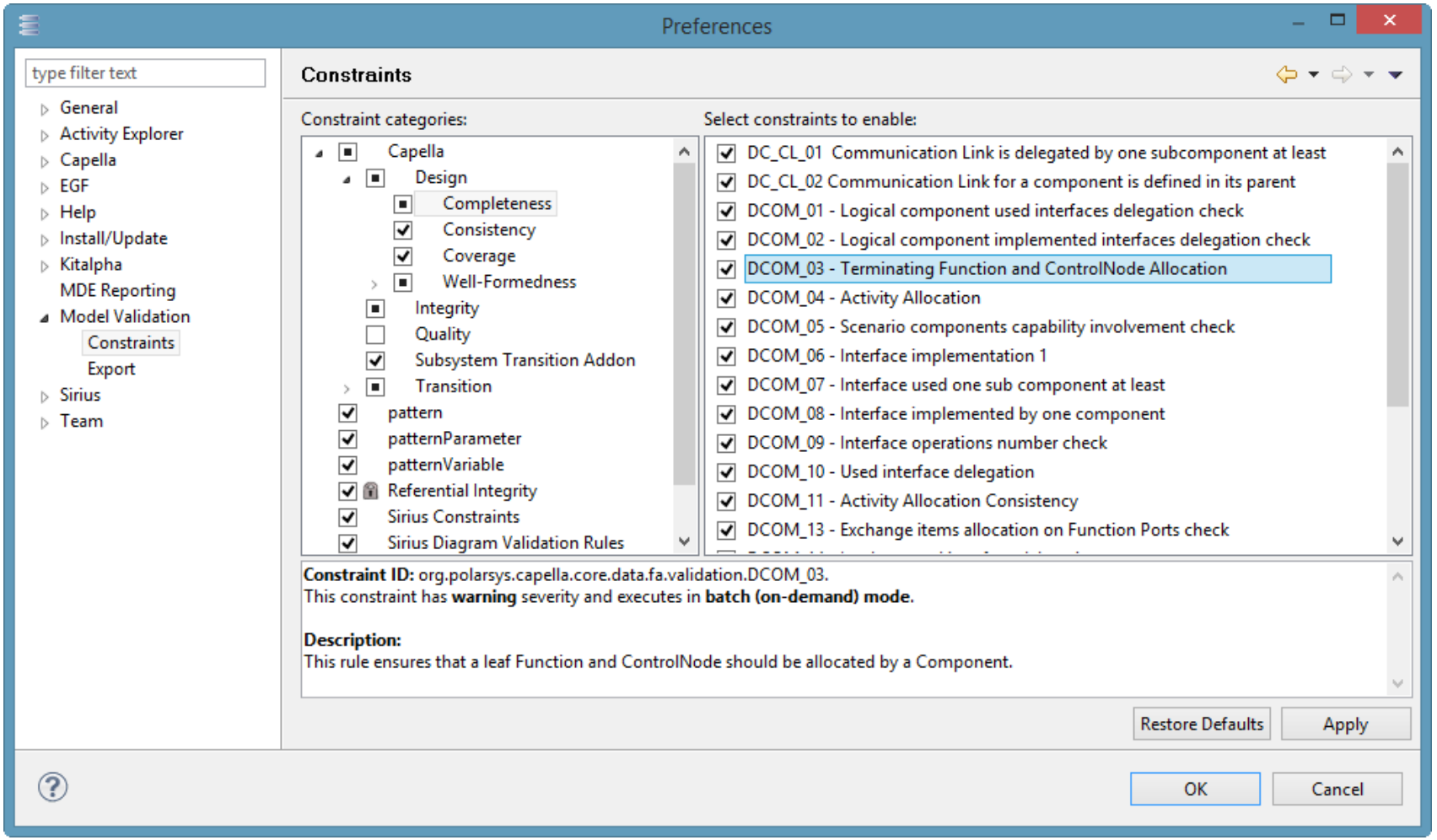
Methodological Guidance

- **Semantic Browser**



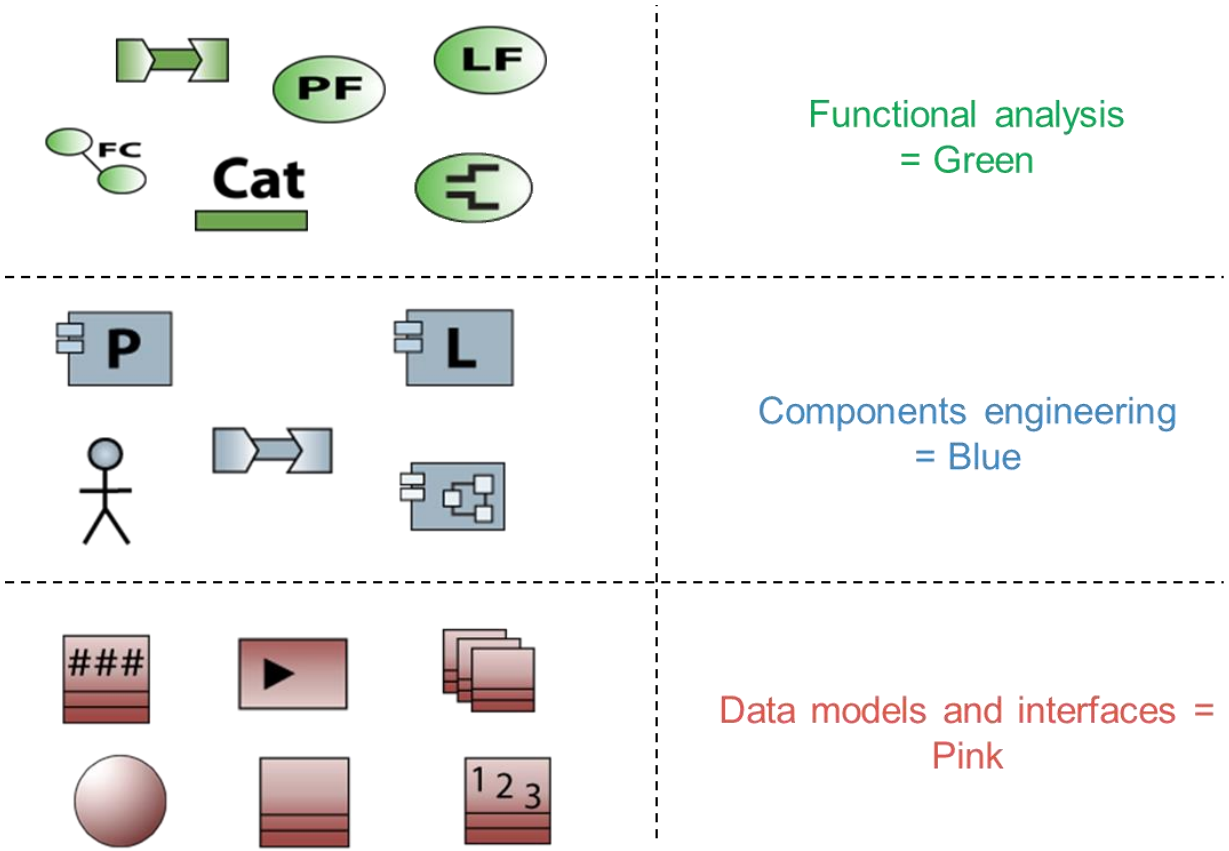
Methodological Guidance

- **Model Checking**



Methodological Guidance

- **Semantic Color Map**



Agenda

1. Tooled-Up Modeling Method
2. Systems Engineering Continuity
3. User-Driven Modeling Tool
4. Open-Source!

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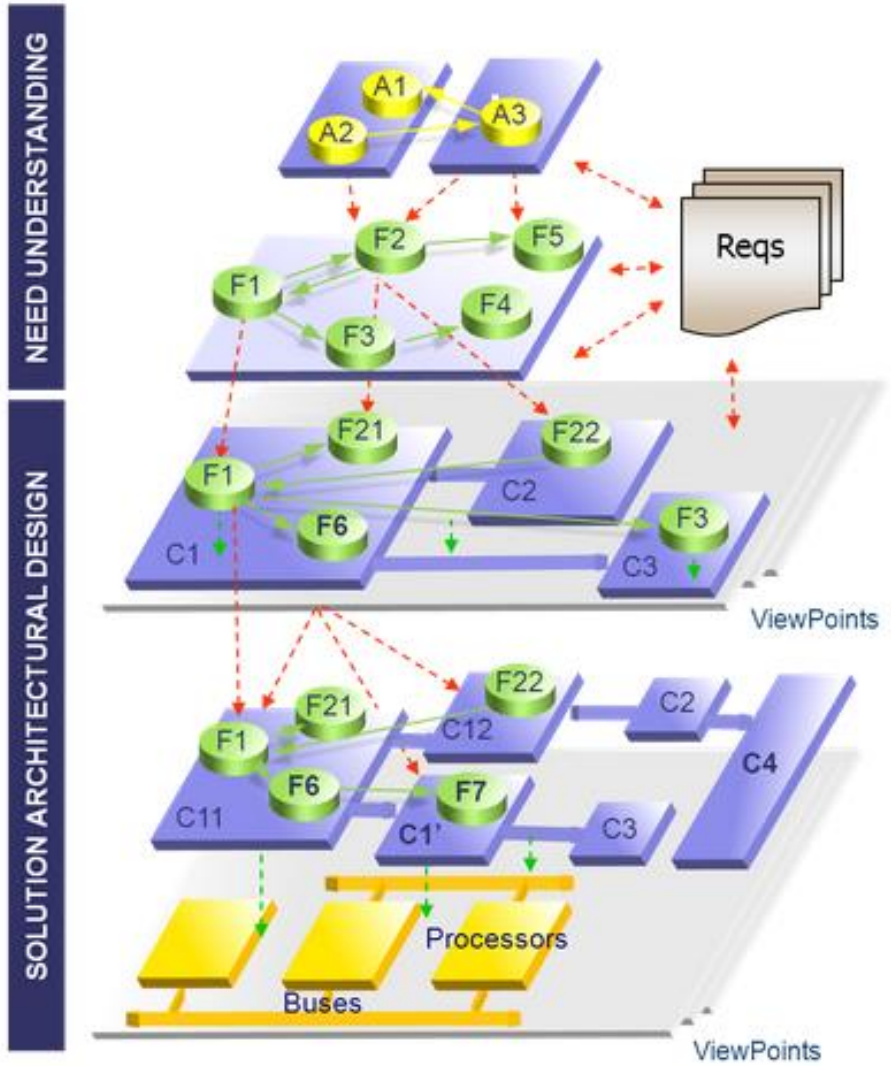
ARCADIA: Global View



What the users of the system need to accomplish

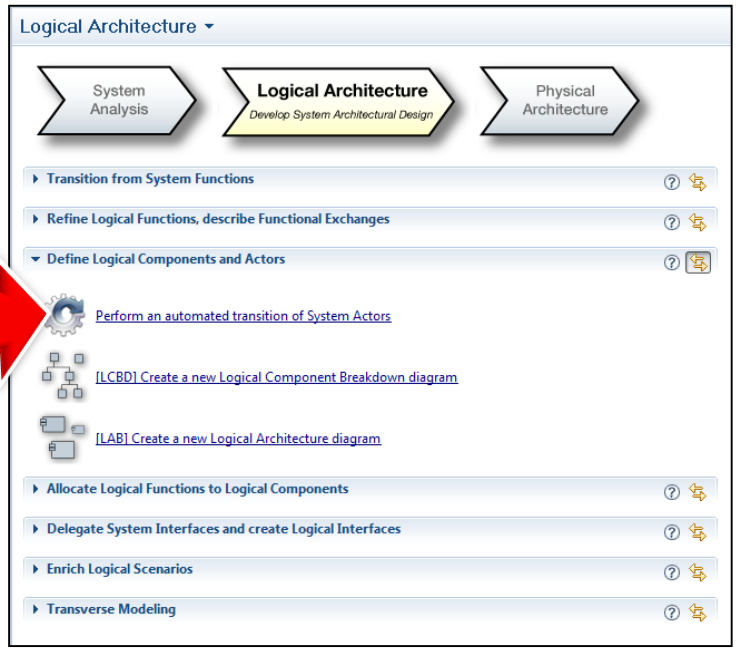
What the system has to accomplish for the users

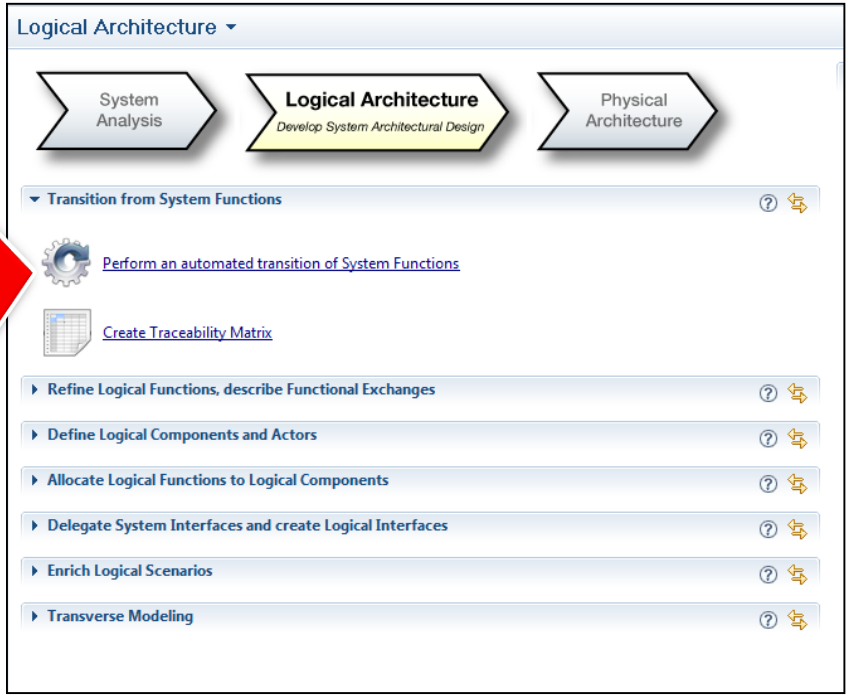
How the system will work to fulfill expectations

How the system will be developed and built

Automated Transitions

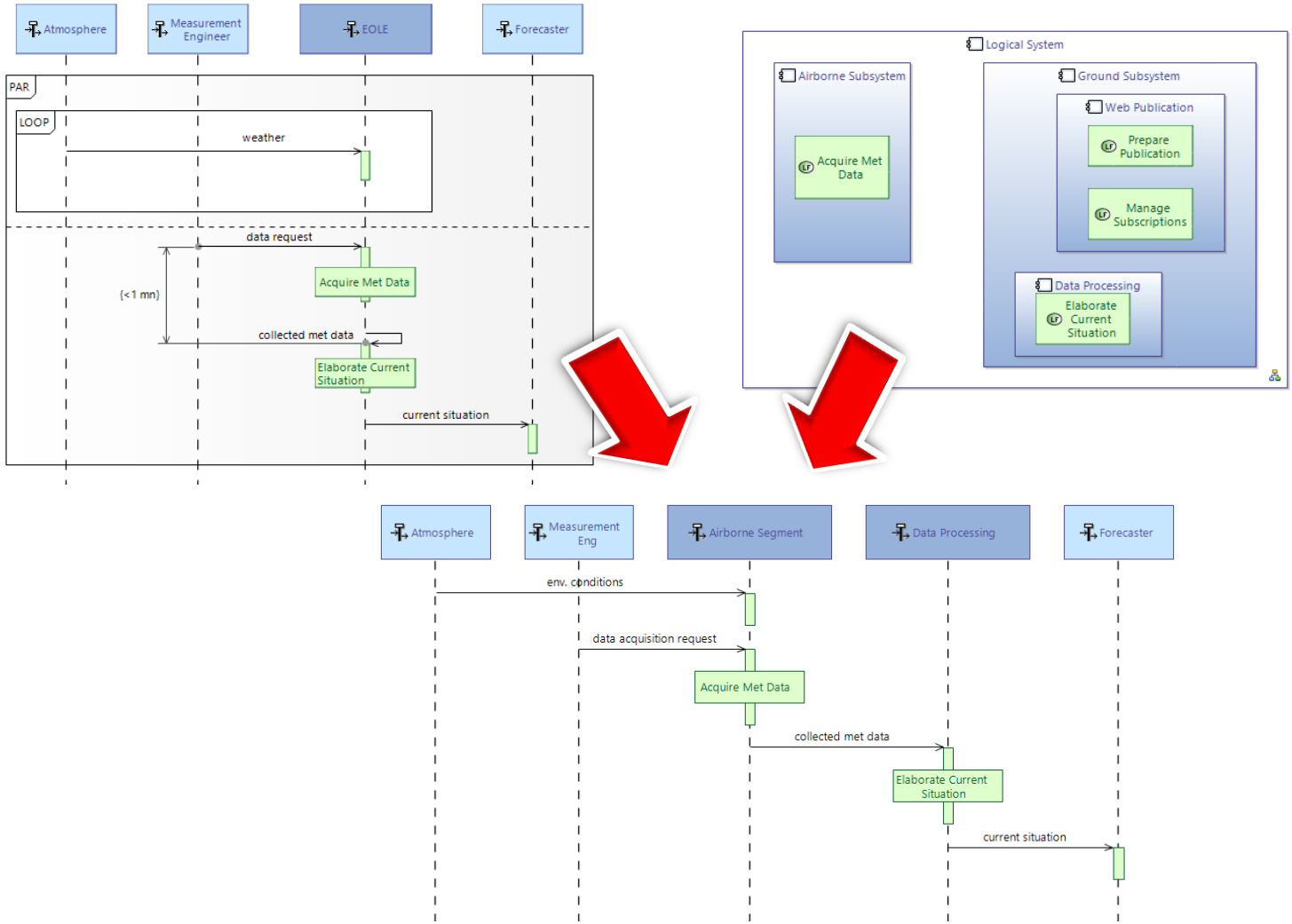
- **Functions / Actors / etc.**



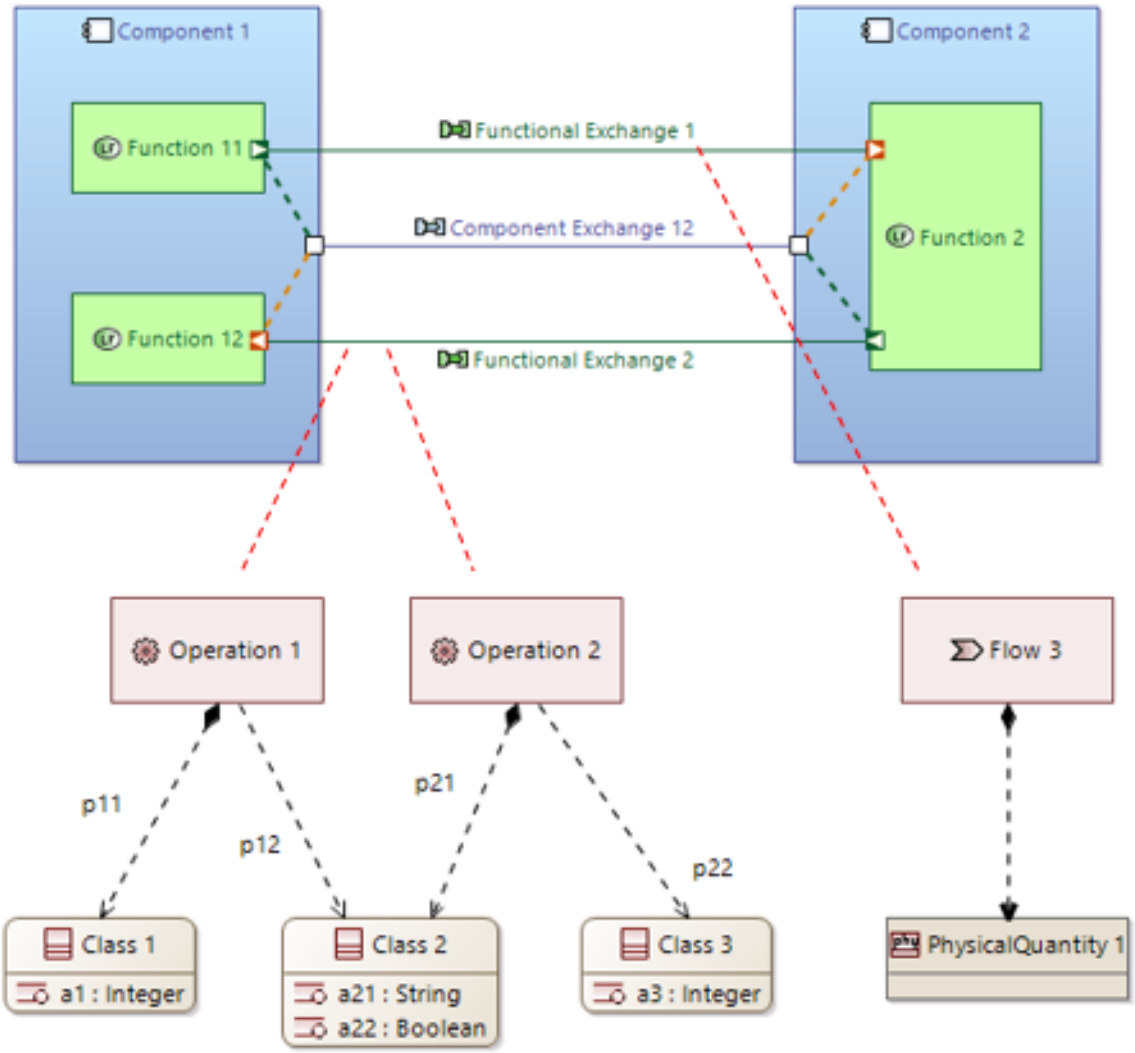


Automated Transitions

- **Even Scenario Transition!**



Functions / Components / Data



Components

↓

Functions

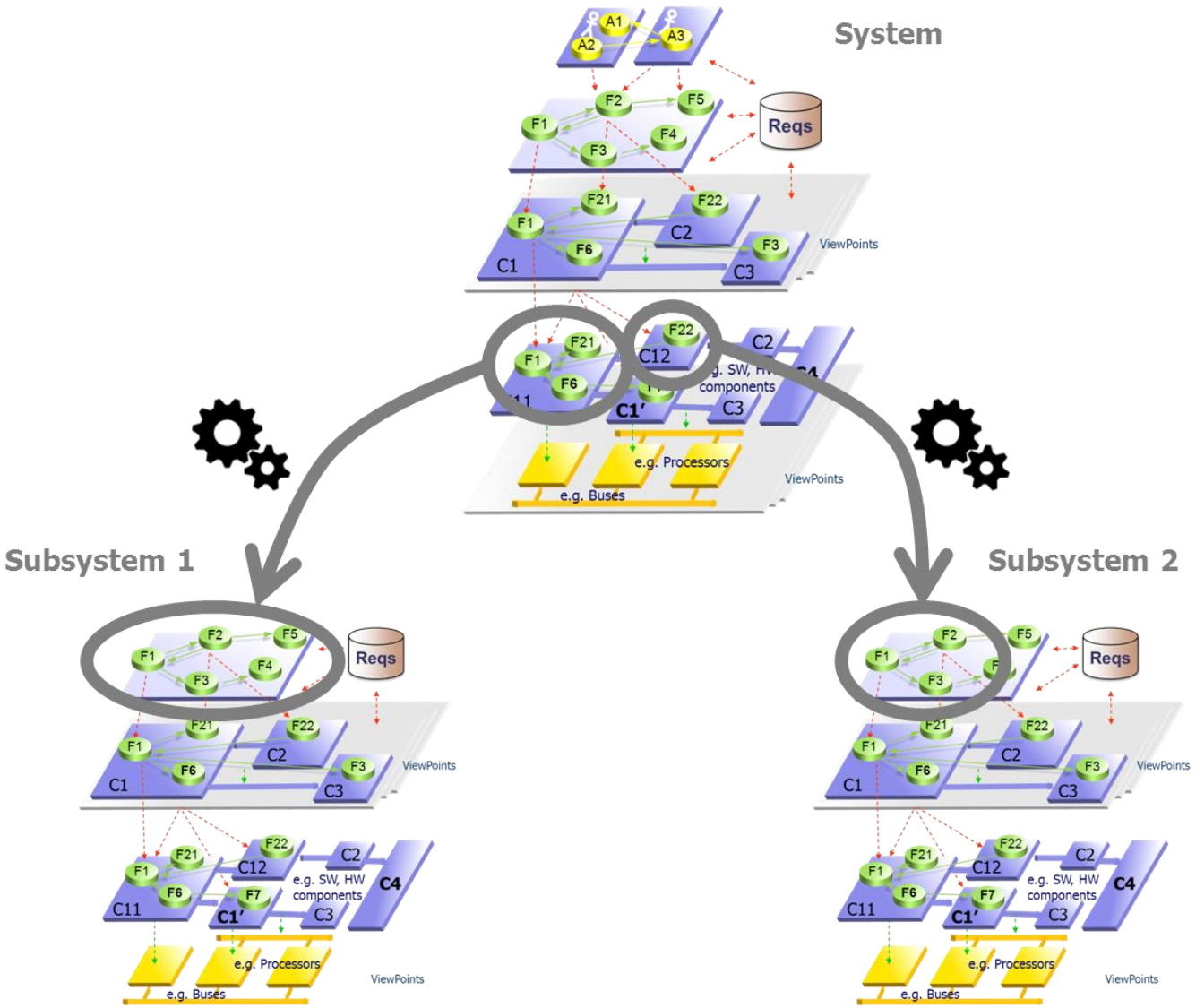
↓

Exchange Items

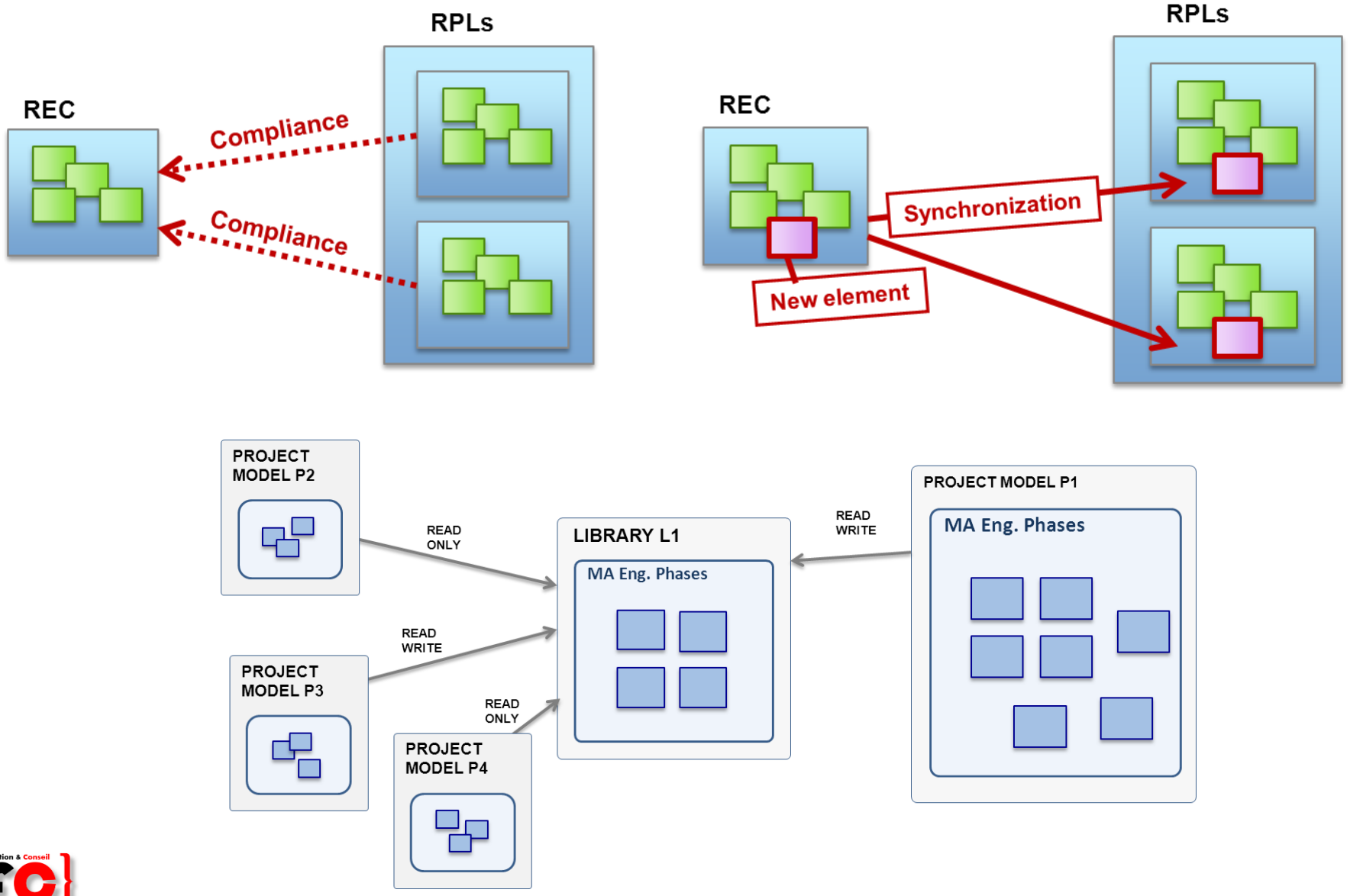
↓

Types

System/Subsystem Transition

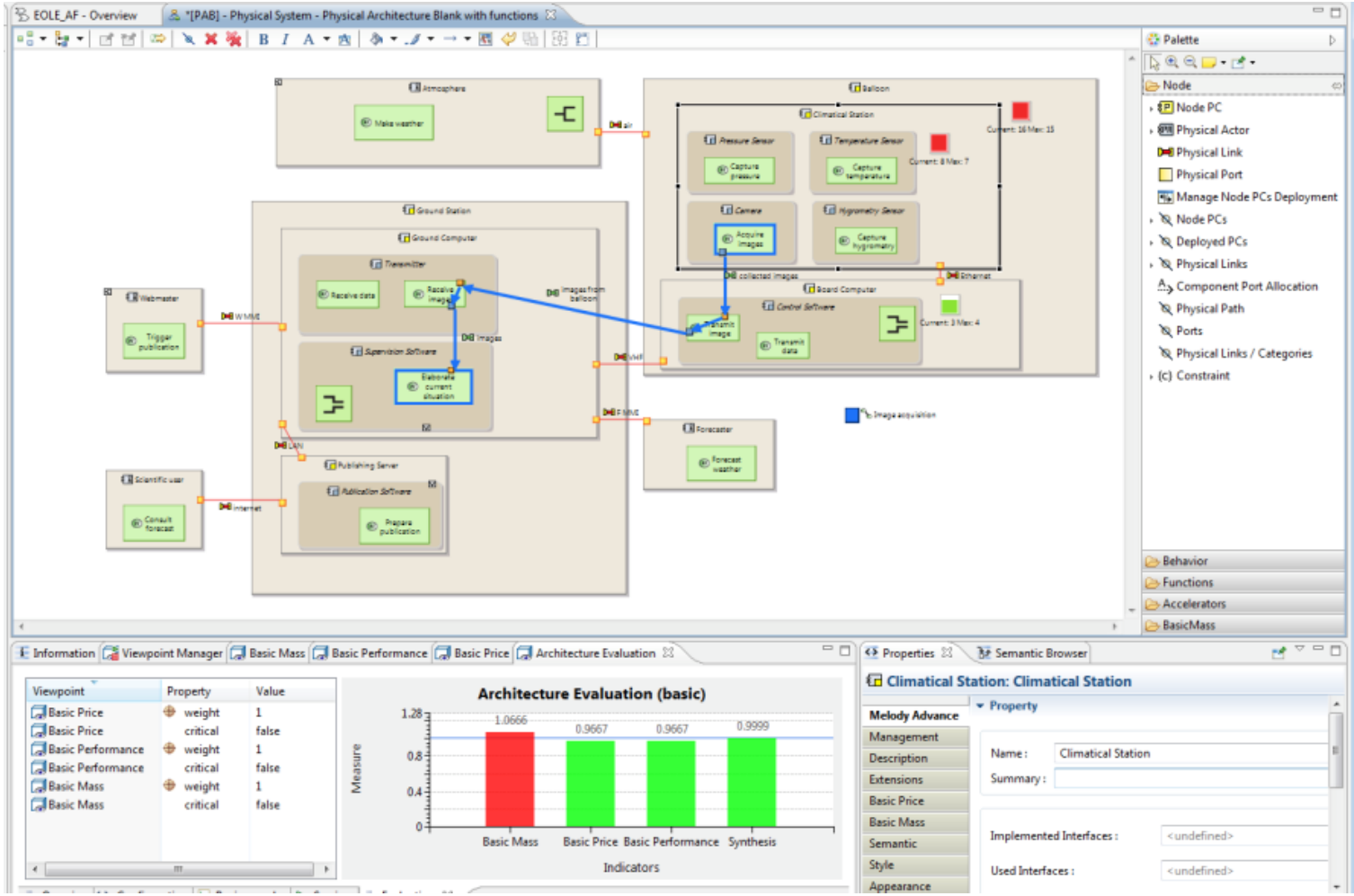


Replicable Elements and Libraries



Architecture Evaluation

- **Viewpoints**



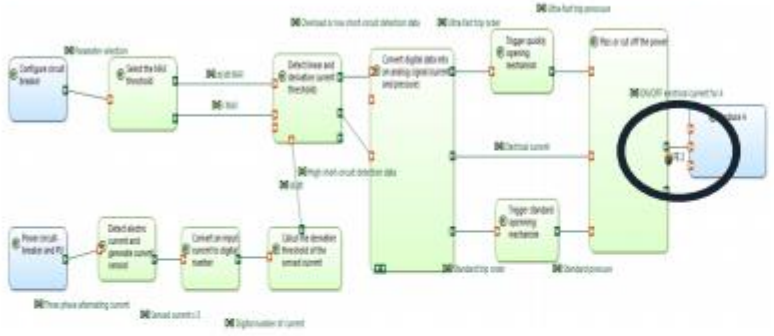
Capella Studio

1. Integration of Capella in Kitalpha
2. Definition of a Capella Target Application
3. Integration of Capella-specific generators
4. Extensions of the textual editors
5. Customization of the html documentation generation

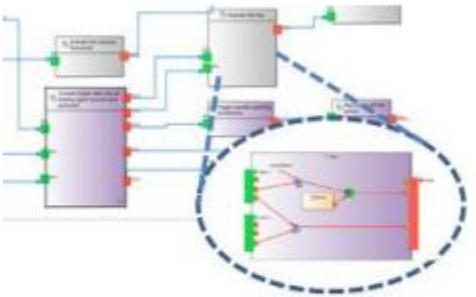
Architecture Evaluation

- **Coupling with External Tools**
  - **Example: Safety Architect**

Feared event added to Capella dataflows (viewpoint)

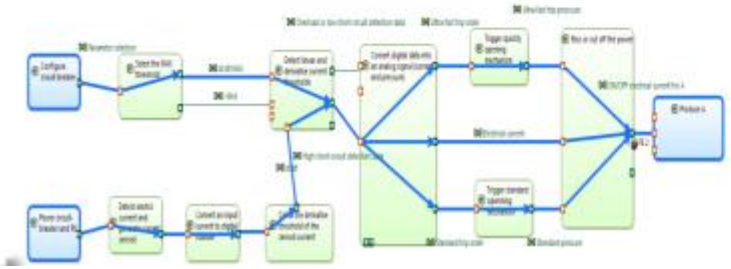


In Safety Architect, analysis of block local failure conditions



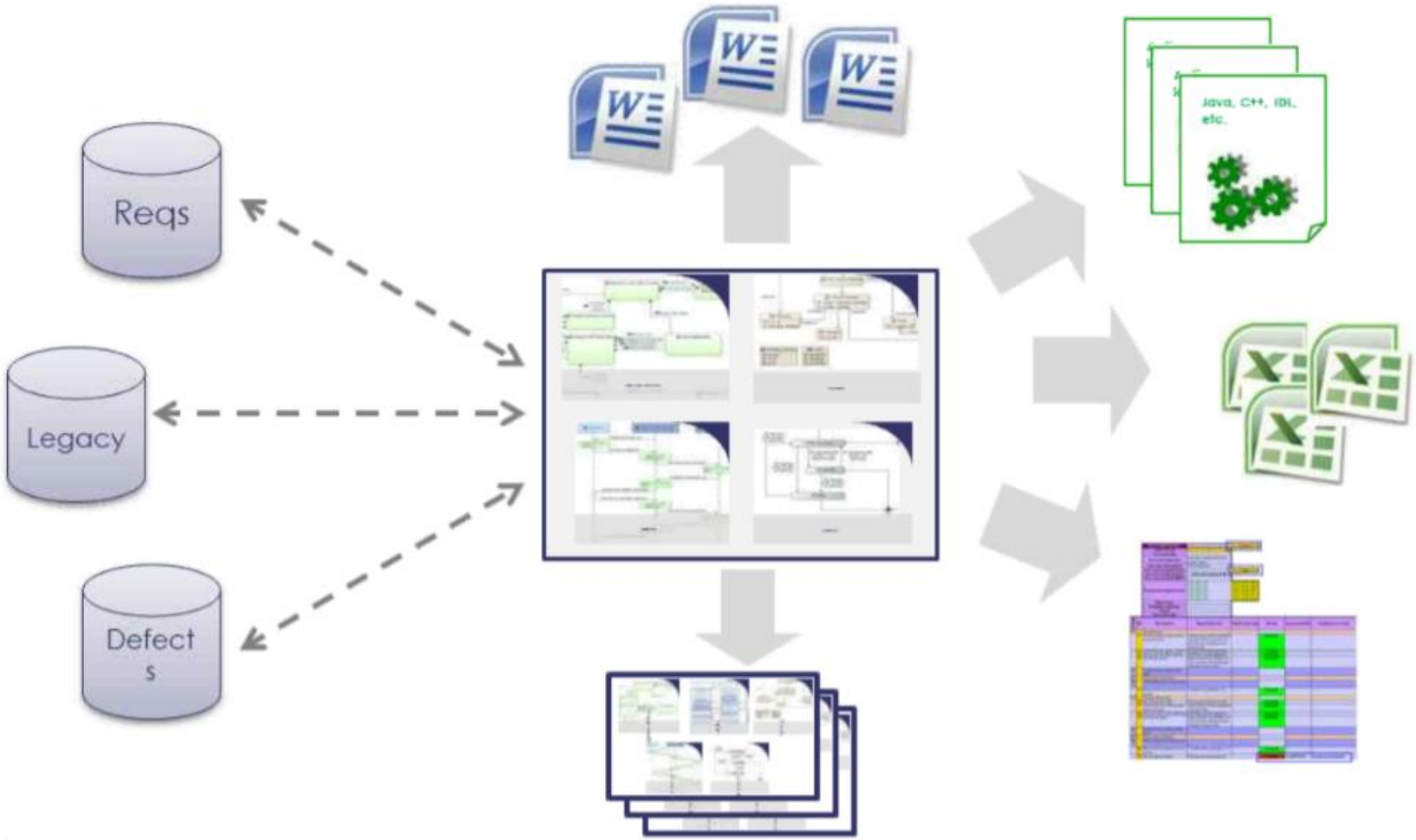
Functional Hazard Analysis (FHA)

In Capella, visualization of fault trees as critical functional chains



In Safety Architect, automated generation of fault-trees

True MBSE!



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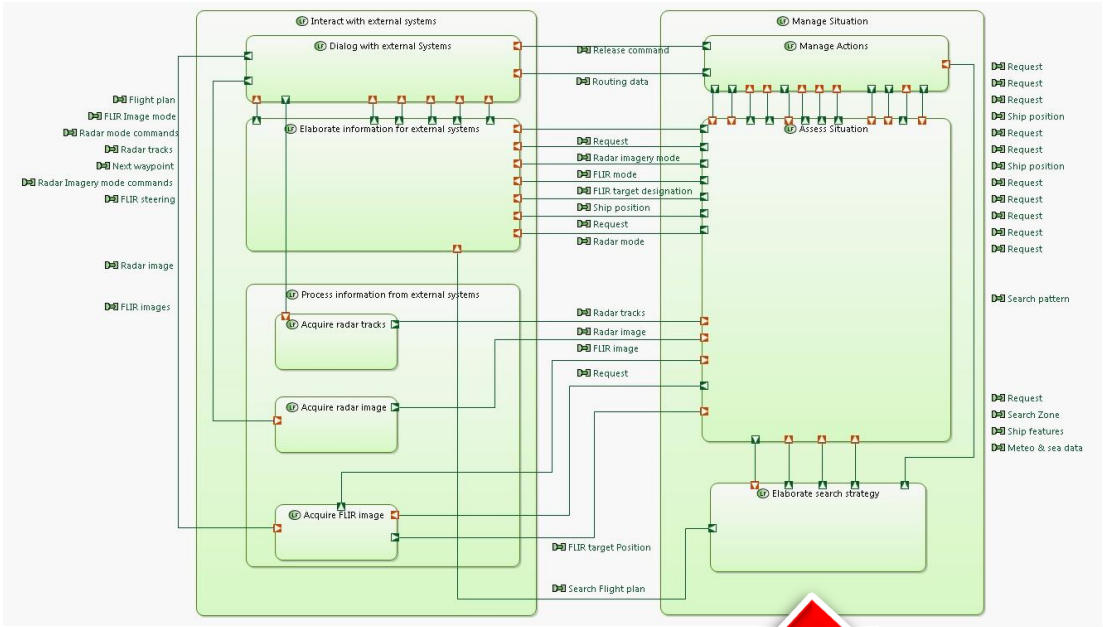
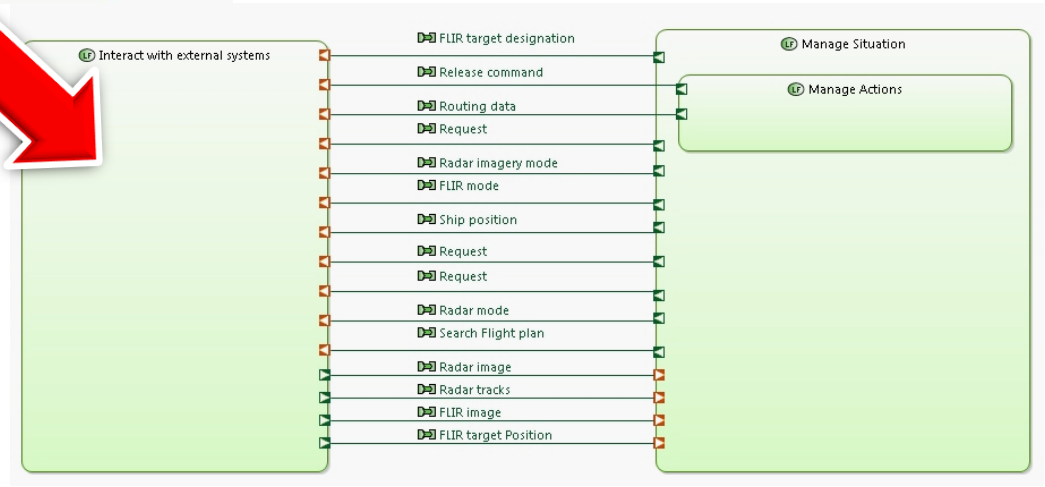
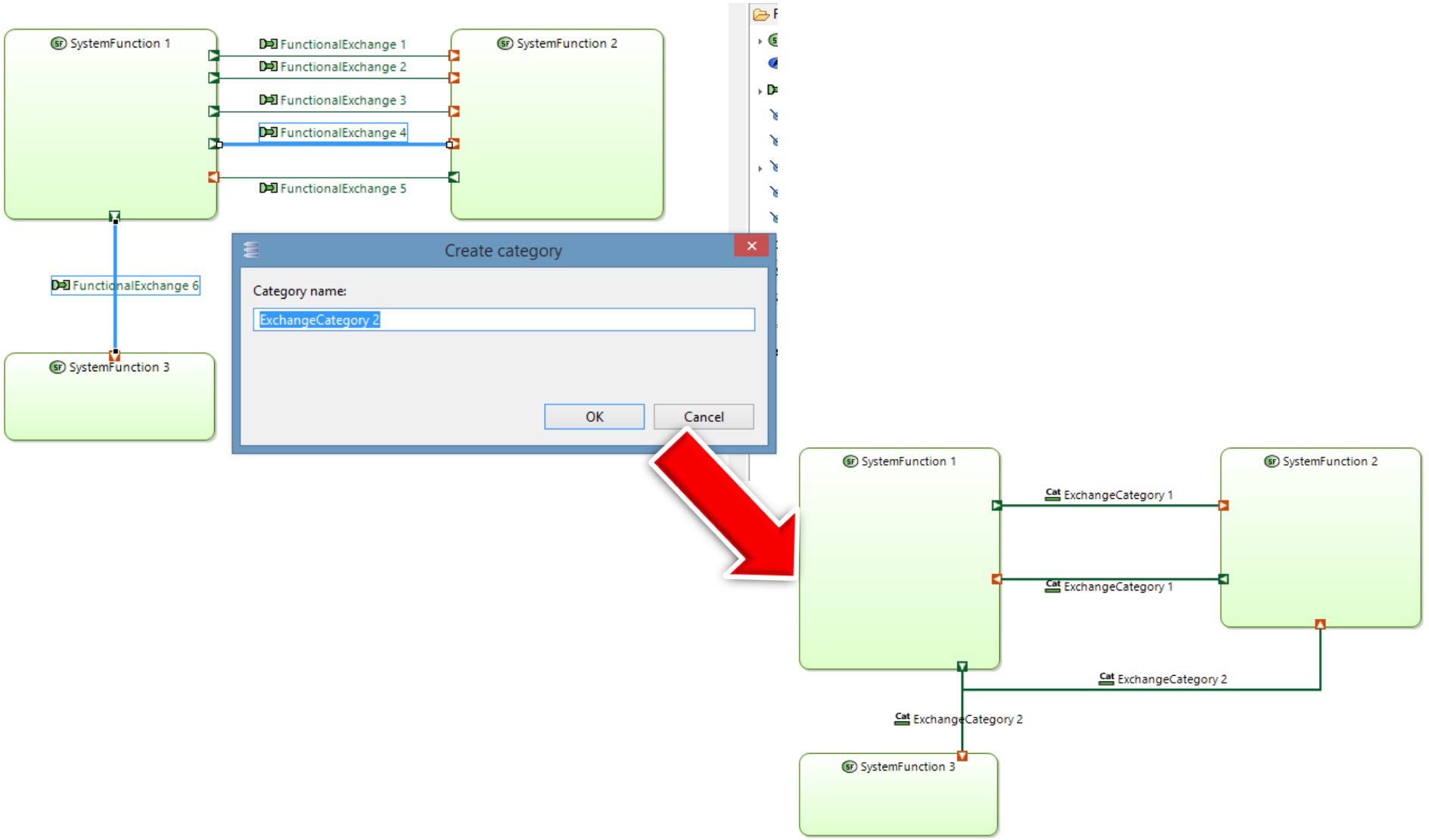
Computed Links

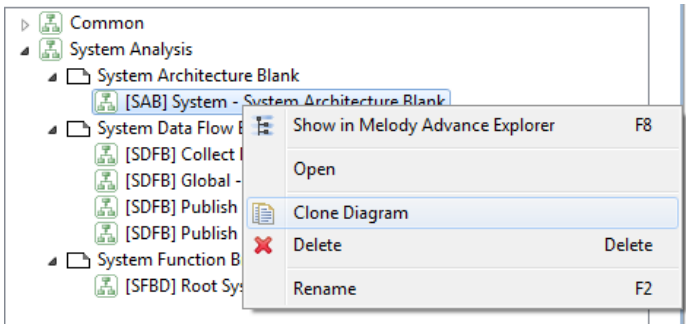


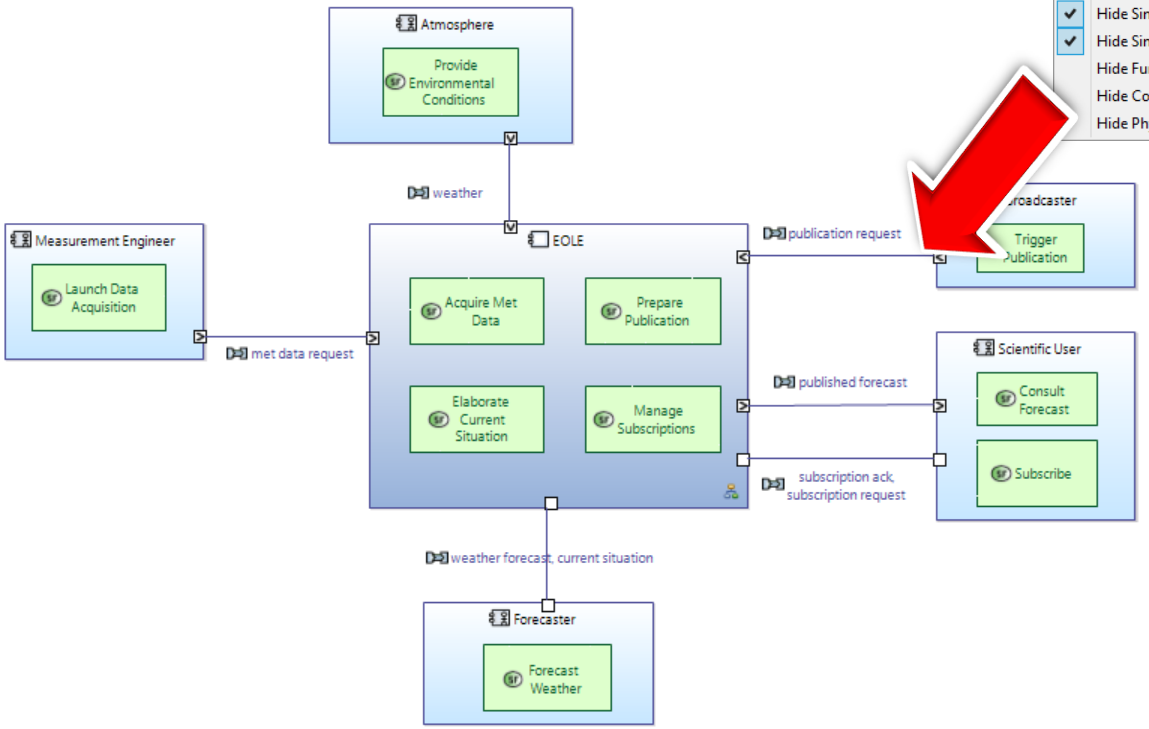


Category

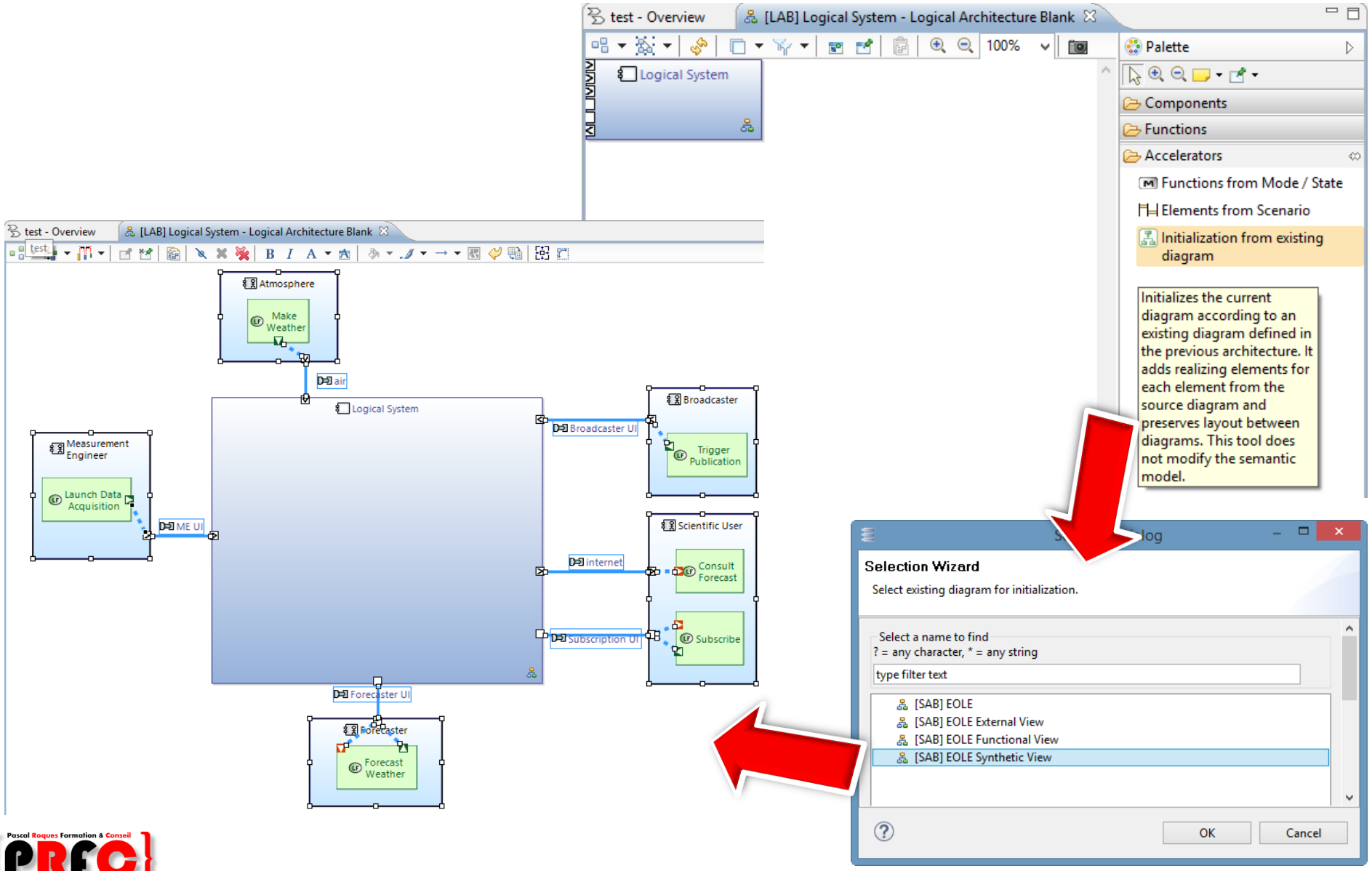

SystemFunction 1
FunctionalExchange 1
FunctionalExchange 2
FunctionalExchange 3
FunctionalExchange 4
FunctionalExchange 5
SystemFunction 2
FunctionalExchange 6
SystemFunction 3
Create category
Category name:
ExchangeCategory 2
OK
Cancel
SystemFunction 1
SystemFunction 2
Cat ExchangeCategory 1
Cat ExchangeCategory 1
Cat ExchangeCategory 2
Cat ExchangeCategory 2
SystemFunction 3

Advanced Diagram Management

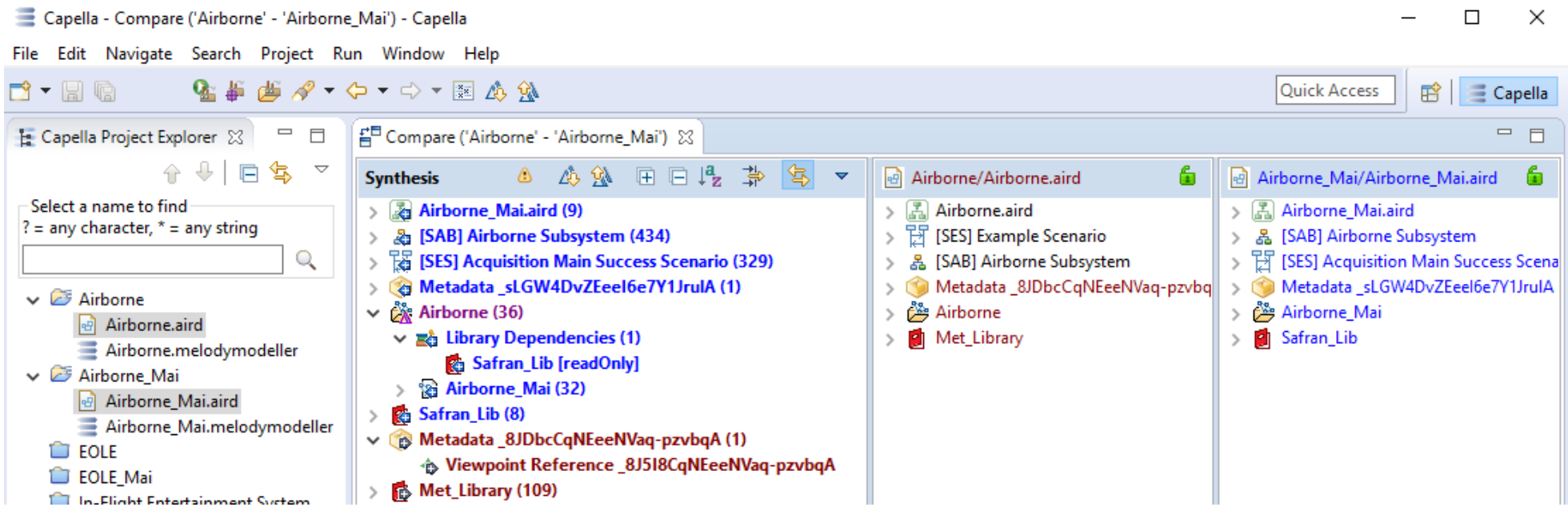




Powerful Accelerators!



Model Diff / Merge



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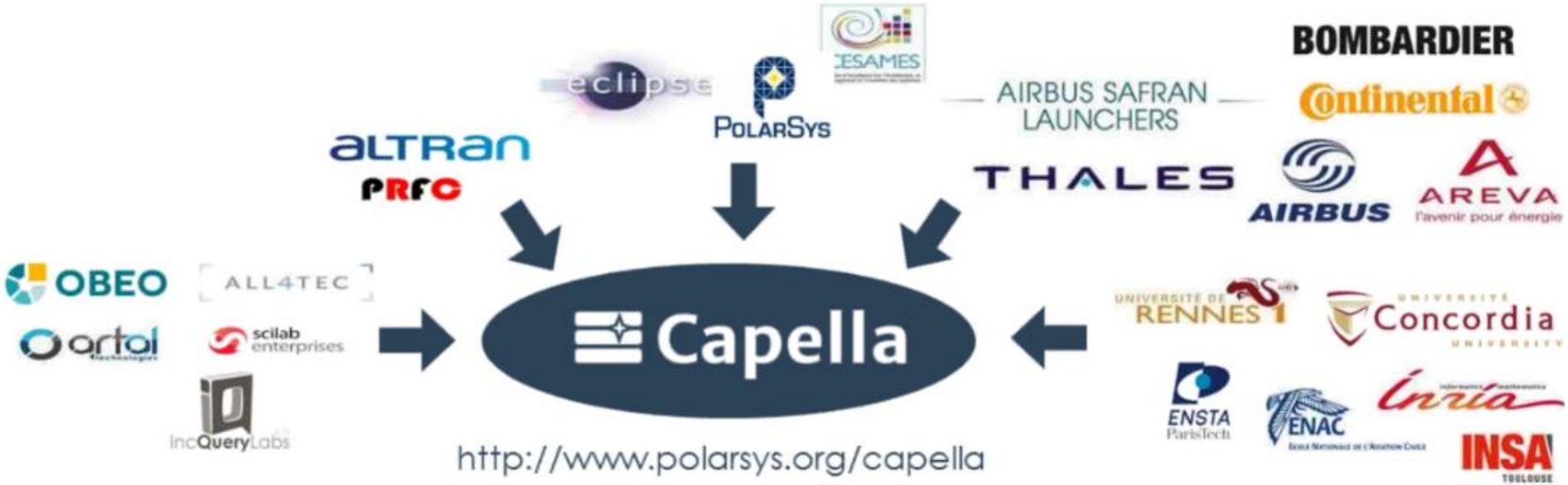
Capella Ecosystem



Initial 3-year (French) collaborative project

Larger industry consortium currently being initiated

To Learn More…

Web Sites:

- www.polarsys.org/capella
- //wiki.polarsys.org/Capella
- //polarsys.org/forums/index.php/f/13/

- www.obeo.fr/en/capella-professional-offer

- www.prfc.fr

- www.clarity-se.org/