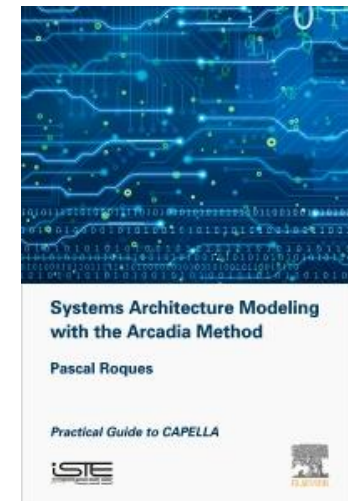
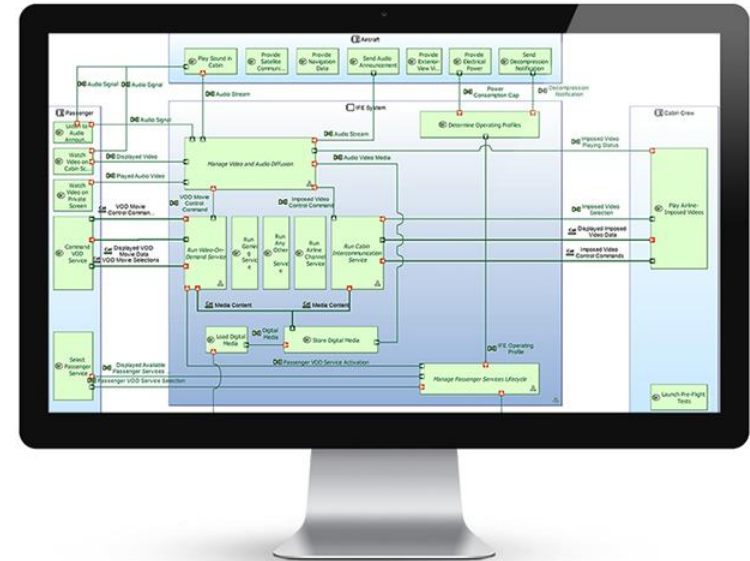


Guide to Arcadia and Capella Successful Adoption

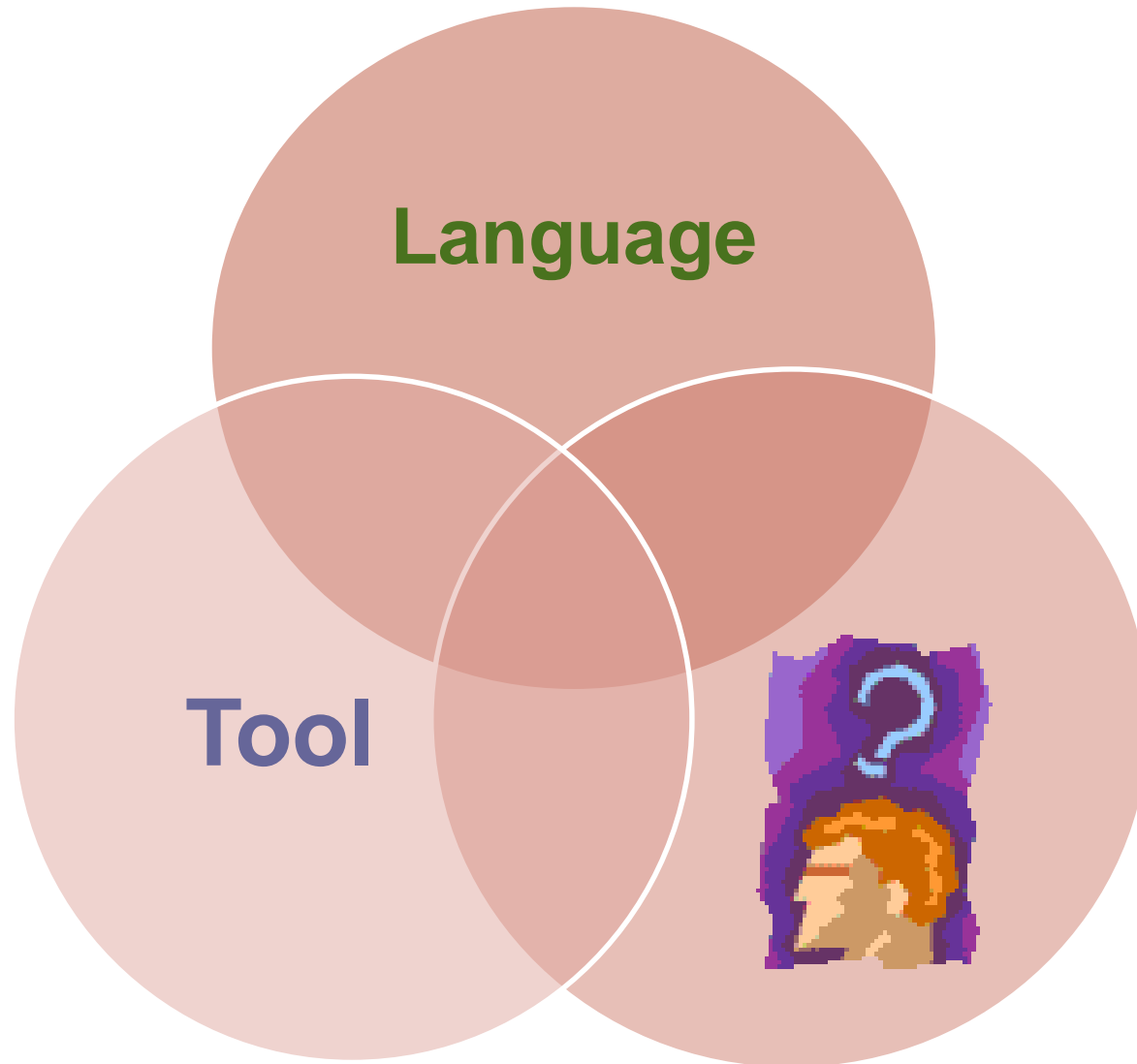
- Senior consultant, 25+ years of modeling experience
 - **SADT, OMT, UML, SysML, ARCADIA/Capella**
- **UML2 and SysML Certified by the OMG**
- **Trainer for Thales on Arcadia/Capella**
 - **130+ sessions, 1500+ trainees**
- Member of 
- **Author of UML/SysML best-sellers in France**
- **... and of the first Capella book!**

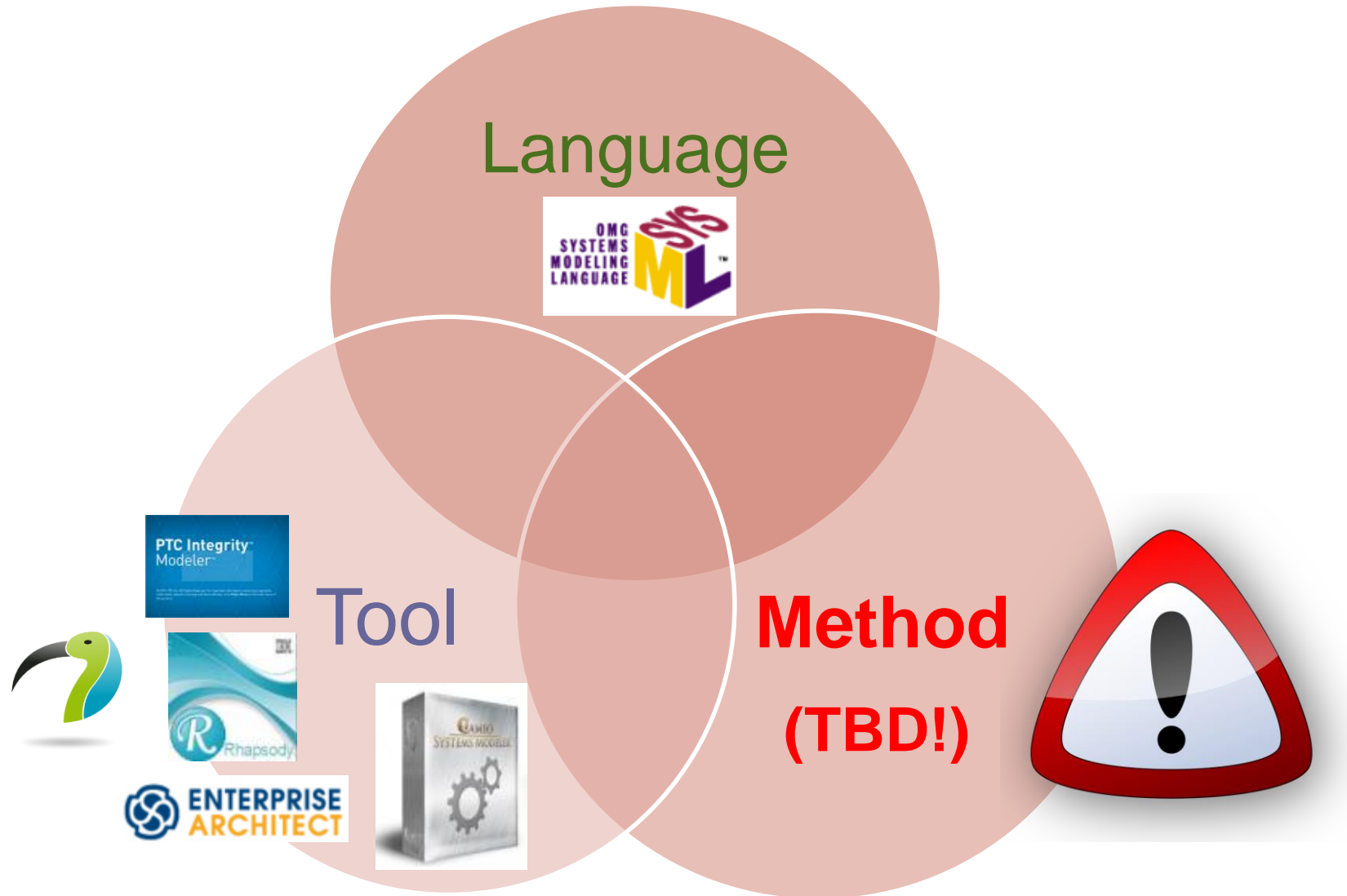


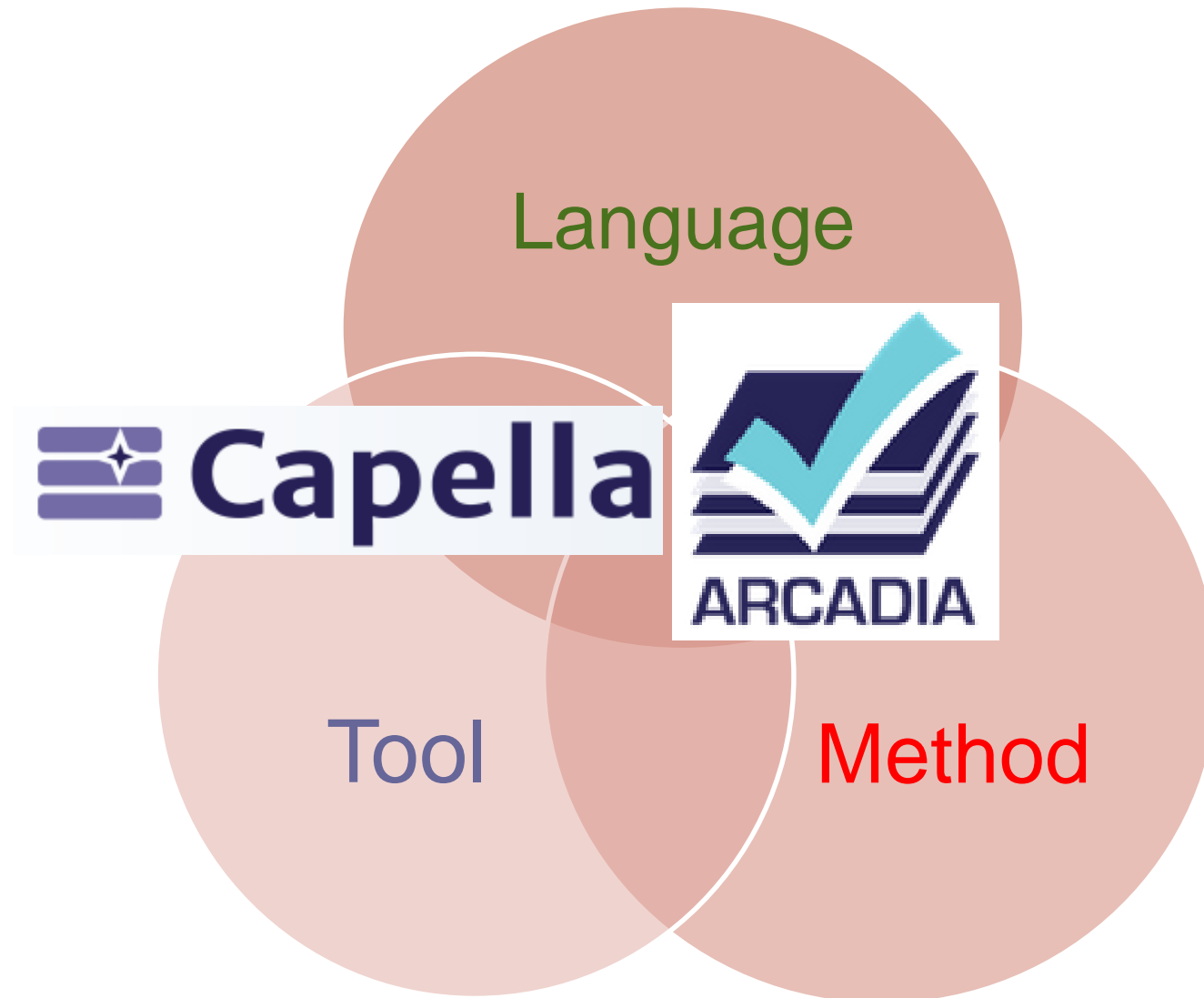
From Document-Centric to Model-Centric!



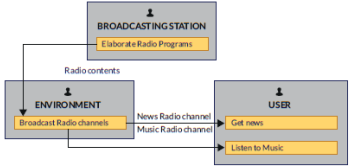
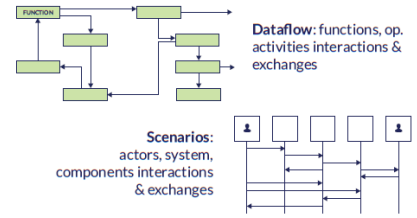
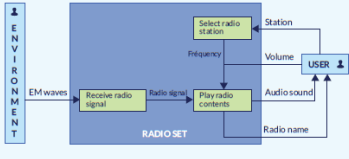
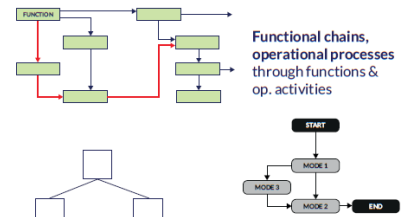
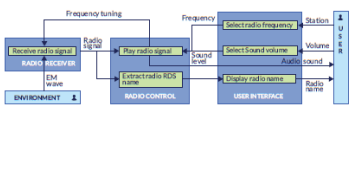
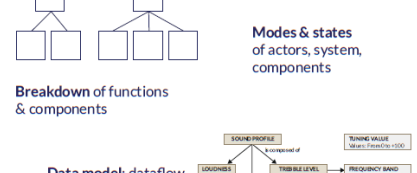
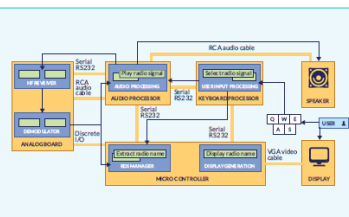
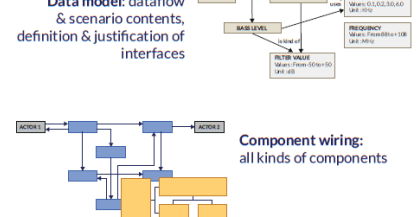
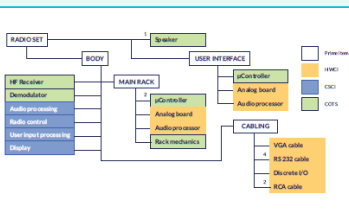
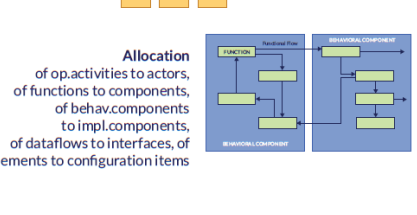
- Models are not only dedicated to documentation
- Models become major engineering artifacts!





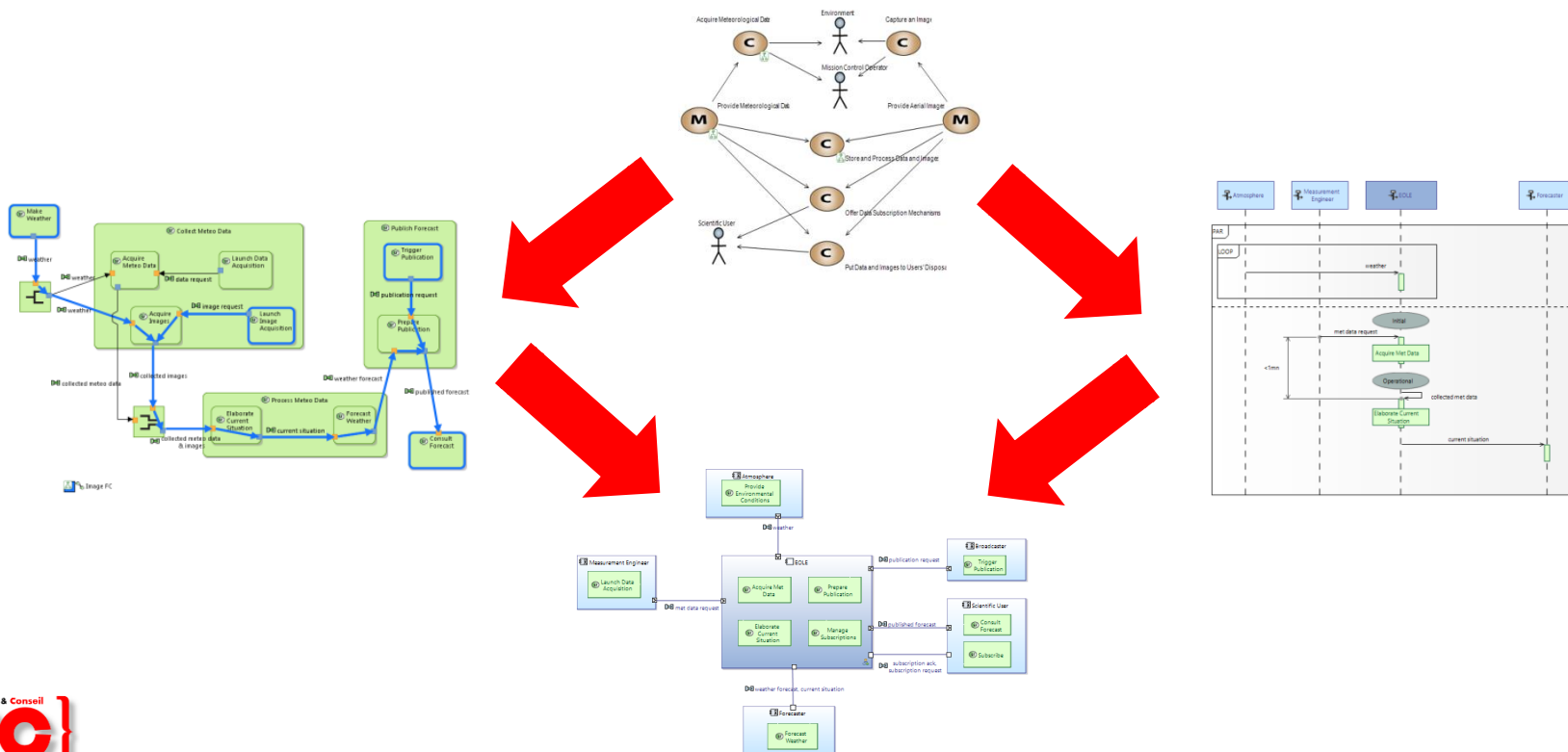


Many concepts, diagrams and even levels are optional!

	METHOD STEPS	TASKS	SAMPLE MODEL	CONCEPTS	DESCRIPTION MEANS
NEED	Customer Operational Need Analysis What the users of the system need to accomplish	<ul style="list-style-type: none"> Define operational capabilities Perform an operational need analysis 		<ul style="list-style-type: none"> Operational capabilities Actors, operational entities Actor activities Interactions between activities & actors Information used in activities & interactions Operational processes chaining activities Scenarios for dynamic behaviour 	 <p>Dataflow: functions, op. activities interactions & exchanges</p> <p>Scenarios: actors, system, components interactions & exchanges</p>
	System/SW/HW Need Analysis What the system has to accomplish for the Users	<ul style="list-style-type: none"> Perform a capability trade-off analysis Perform a functional and non-functional analysis Formalise and consolidate requirements 		<ul style="list-style-type: none"> 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 	 <p>Functional chains, operational processes through functions & op. activities</p> <p>Modes & states of actors, system, components</p>
SOLUTIONS	Logical Architecture Design How the system will work so as to fulfil expectations	<ul style="list-style-type: none"> Define architecture drivers and viewpoints Build candidate architectural breakdowns in components Select best compromise architecture 		<p>SAME CONCEPTS, PLUS:</p> <ul style="list-style-type: none"> Components Component ports and interfaces Exchanges between components Function allocation to components Component interface justification by functional exchanges allocation 	 <p>Breakdown of functions & components</p> <p>Modes & states of actors, system, components</p>
	Physical Architecture Design How the system will be developed & built	<ul style="list-style-type: none"> Define architectural patterns Consider reuse of existing assets design a physical Design a physical reference architecture Validate and check it 		<p>SAME CONCEPTS, PLUS:</p> <ul style="list-style-type: none"> Behavioural components refining logical ones, and implementing functional behaviour Implementation components supplying resources for behavioural components Physical links between implementation components 	 <p>Data model: dataflow & scenario contents, definition & justification of interfaces</p> <p>Component wiring: all kinds of components</p>
	Development Contracts What is expected from each designer/sub-contractor	<ul style="list-style-type: none"> Define a components IVVQ strategy Define & enforce a PBS and component integration contract 		<ul style="list-style-type: none"> Configuration items tree Parts numbers, quantities Development contract (expected behaviour, interfaces, scenarios, resource consumption, non-functional properties...) 	 <p>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</p>

Customize Arcadia!

- Define the right modeling approach for your project/product
- Arcadia must be tailored to your context:
 - Type of system (size, complexity, etc.)
 - Nature of project (small, distributed, etc.)
 - Background of people



- **Modeling is a skill, Modeling is difficult**
 - **A lot of concepts, How to choose the right diagram?**
 - **When to stop?**

- **Begin with Training**
 - **Ask experts**
 - **Books are not sufficient**
 - **Different levels of training for different levels of modeling**

- **Continue with Coaching**
 - **Keeps you on rails**
 - **Model Review**



■ Start with a pilot project

- Not too big, nor critical,
- Not too simple (“Toy” problem)
- Imply a small set of core modelers (volunteers), and a modeling “champion”
- Keep the focus on project deliverables, and model only as far as you need to answer the questions



■ Provide simple guidelines

- Focus on simple products with obvious near term value that SEs would have to create anyway
- Select Arcadia diagrams in a preferred sequence
- Model validation rules help ease the fear to newcomers that they are going to “mess up” the model
- Avoid too complex diagrams

- **Correct and enrich the process from feedback**
 - Applying best practices often requires failing a few times, first
 - Do not apply techniques blindly
 - Deployment has to be wise and incremental
 - Projects will need to schedule time and resources to deploy infrastructure and train workforce

- **Model as a team!**
 - Collaboration in a multi-center modeling effort
 - Identify and imply all important Stakeholders
 - Make the model become the reference of the SE work!
 - Don't forget to create the right diagrams for the right readers !

- **Model with a purpose!**
 - Identify your modeling objectives
 - Don't model too much
 - Don't model too early (upfront)
 - Integrate Metrics into your process

- **Don't forget Configuration and Version Management**
 - Monitor the evolution of the model
 - Provide appropriate process and tooling for:
 - Baselines, branches, diff/merge, model partitioning, user rights...
 - Coordinate interactions with other models



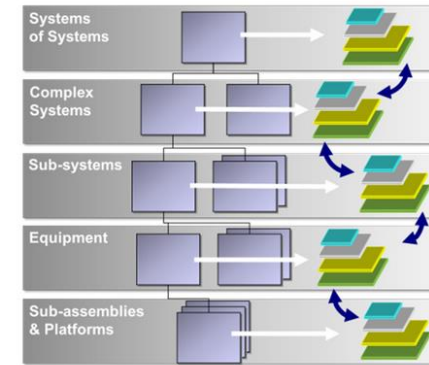
- **Don't duplicate models with documents**
 - **Documentation should be inside the model**
 - **Navigate through the model**
 - **Generate mandatory documentation**

- **MBSE must be integrated into existing SE processes**
 - **Model development becomes infused within the product development schedule**
 - **Management must be willing to pay the startup costs and give time for the effort to pay dividends**



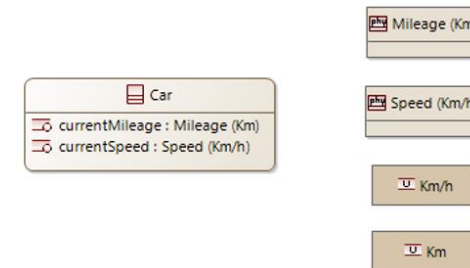
■ Do not create “Monster” Models

- Model recursively
- Don't mix responsibilities
- System – Subsystem add-on

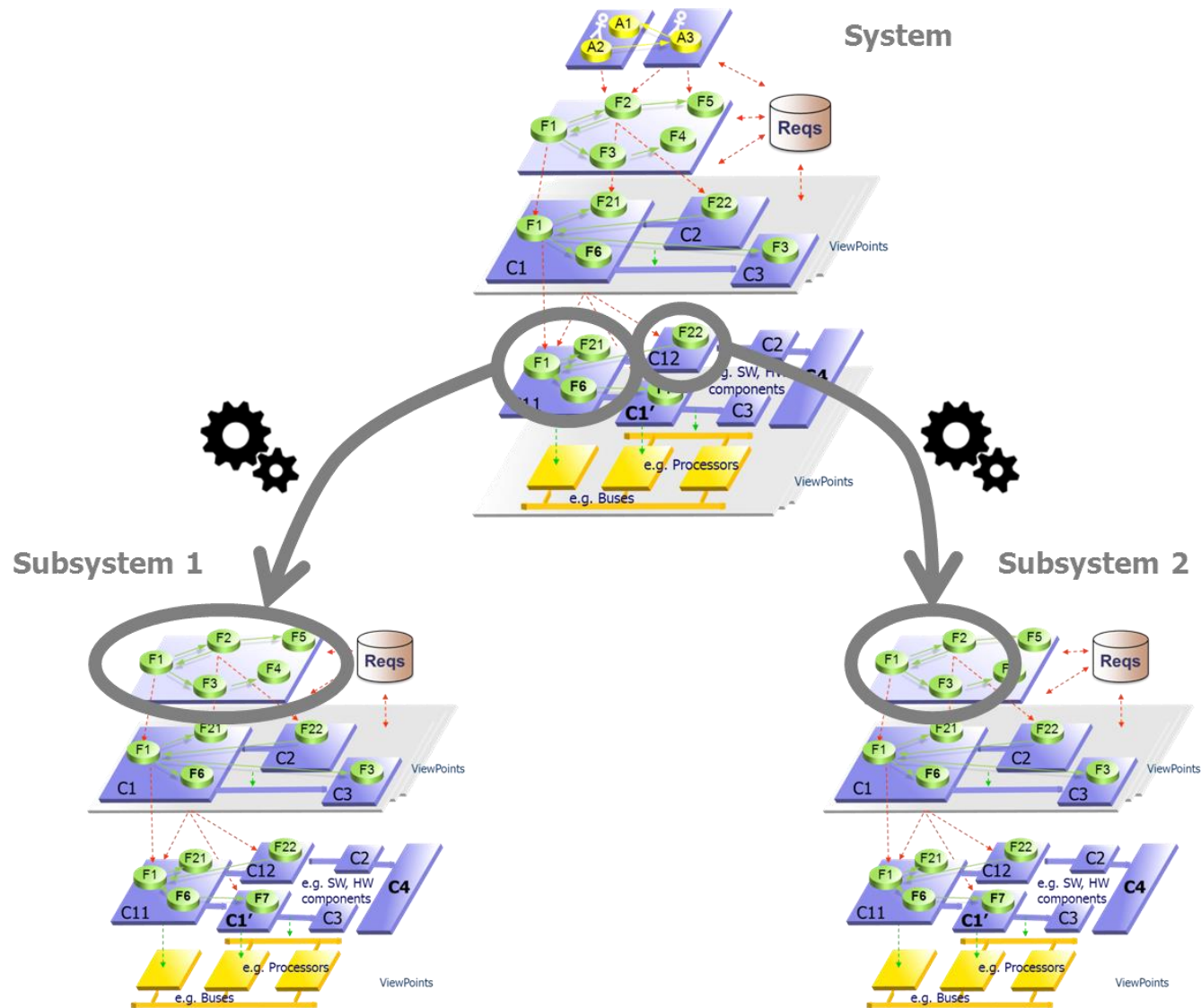


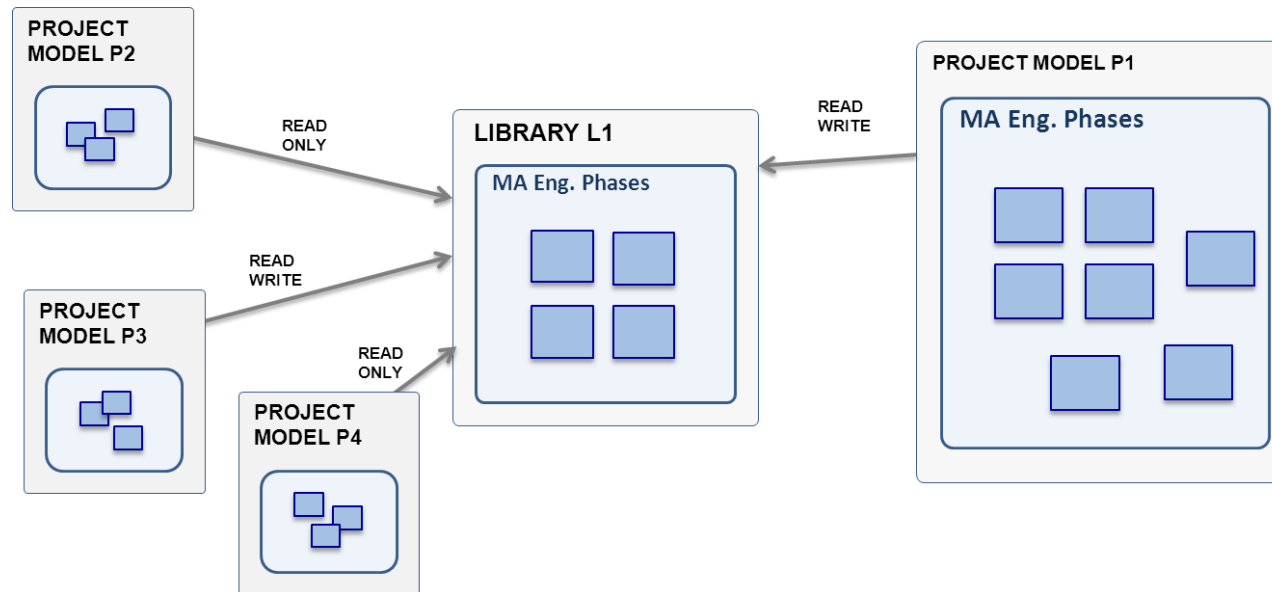
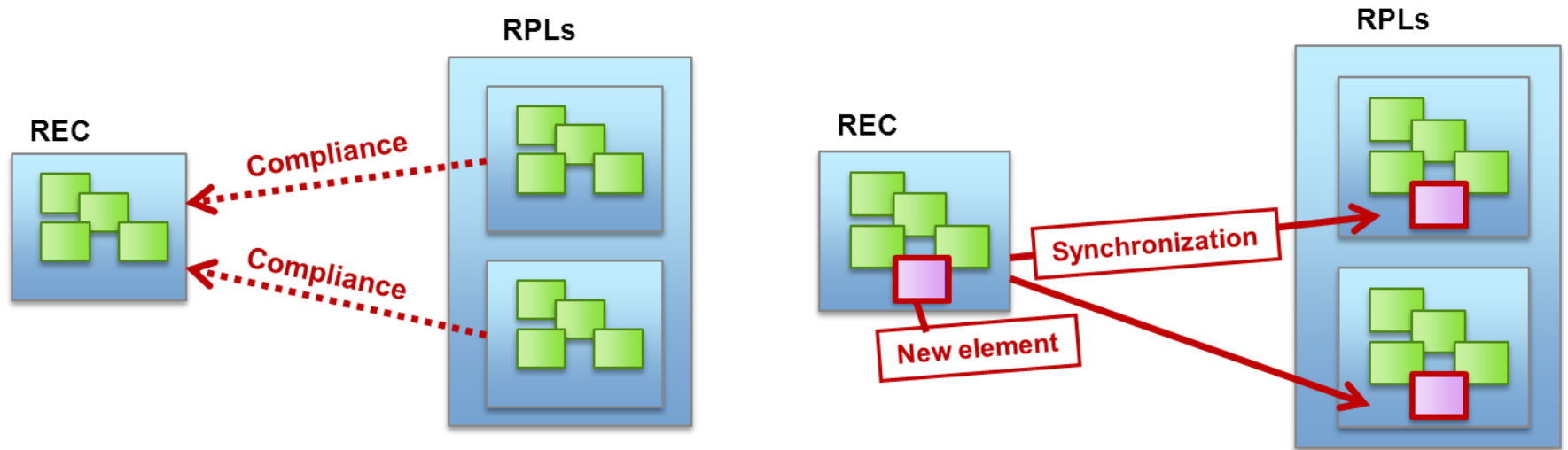
■ Build Libraries of Reusable Assets:

- Units, Basic Types, Domain Types
- Physical Components... (REC/RPL)

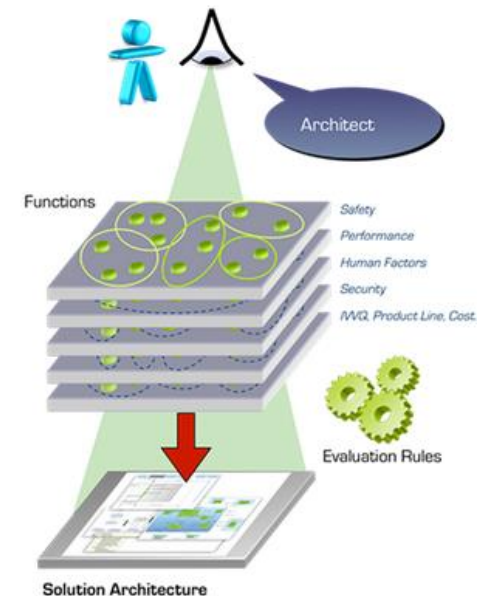


System/Subsystem Transition





- **Provide additional tooling:**
 - **Naming conventions**
 - **List of mandatory and optional validation rules**
 - **Documentation generation templates**
 - **Specialty Viewpoints**



- Specialty Viewpoints

The screenshot displays the Capella software interface. The main workspace shows a physical architecture diagram with components like Atmosphere, Balloon, Ground Station, and Board Computer. A blue arrow indicates a data flow from the Balloon's 'Acquire images' component to the Ground Station's 'Elaborate current situation' component. The bottom of the interface features an 'Architecture Evaluation (basic)' bar chart and a 'Properties' panel for the 'Climatical Station' component.

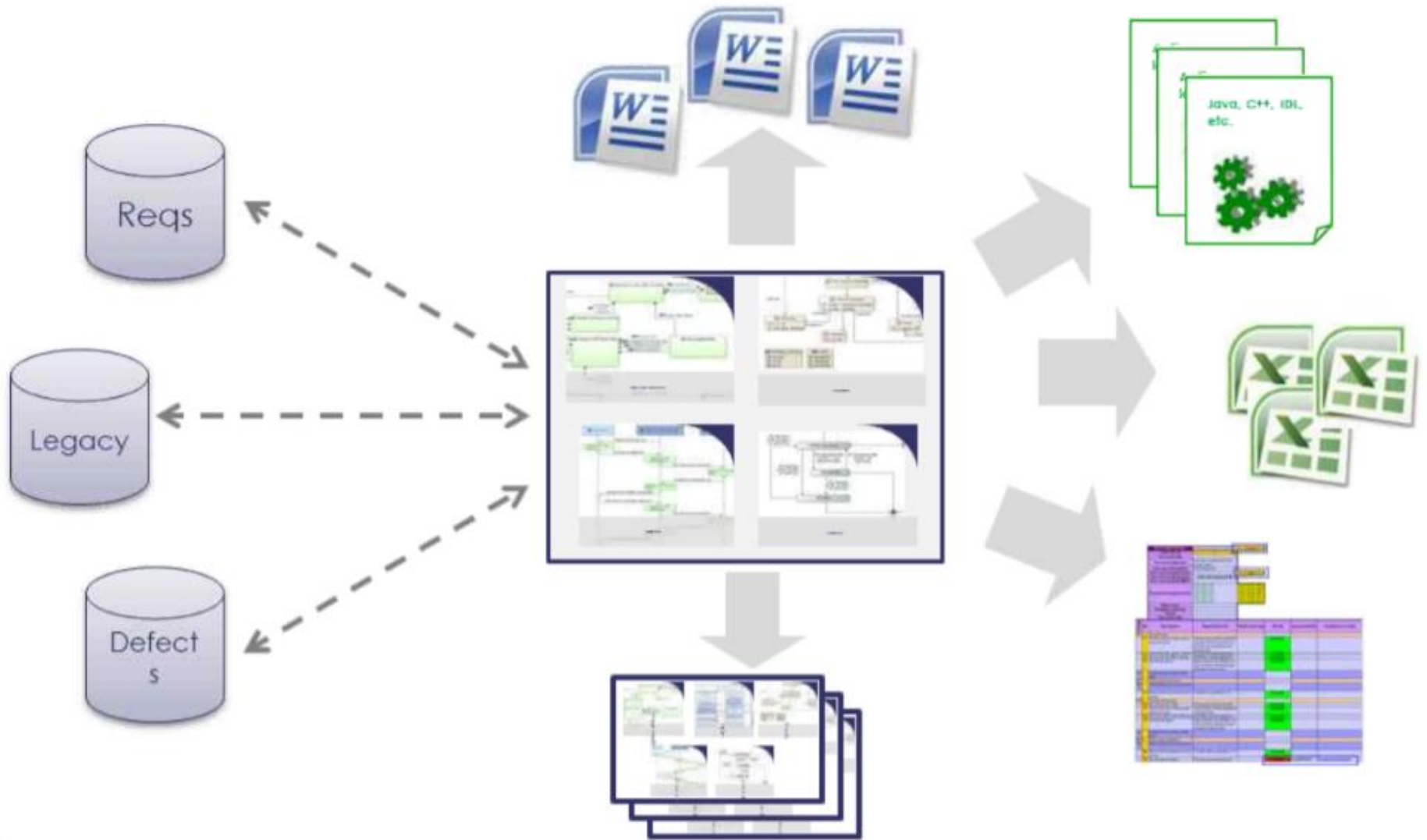
Architecture Evaluation (basic)

Indicator	Measure
Basic Mass	1.0666
Basic Price	0.9567
Basic Performance	0.9567
Synthesis	0.9999

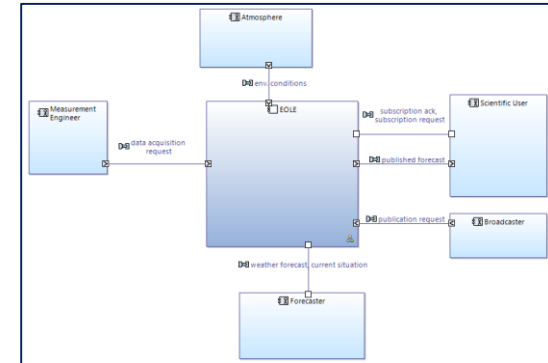
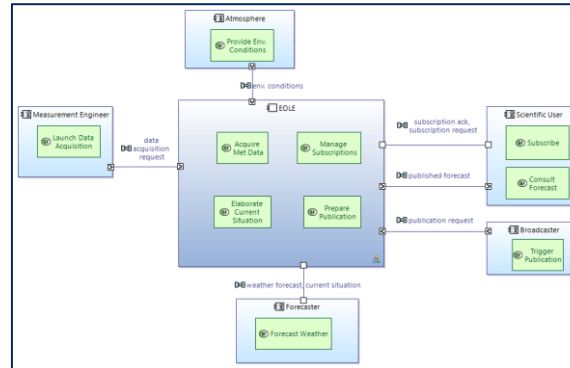
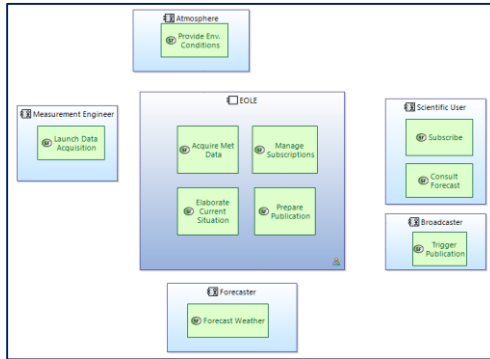
Properties: Climatical Station: Climatical Station

Property	Value
Name	Climatical Station
Summary	
Implemented Interfaces	< undefined >
Used Interfaces	< undefined >

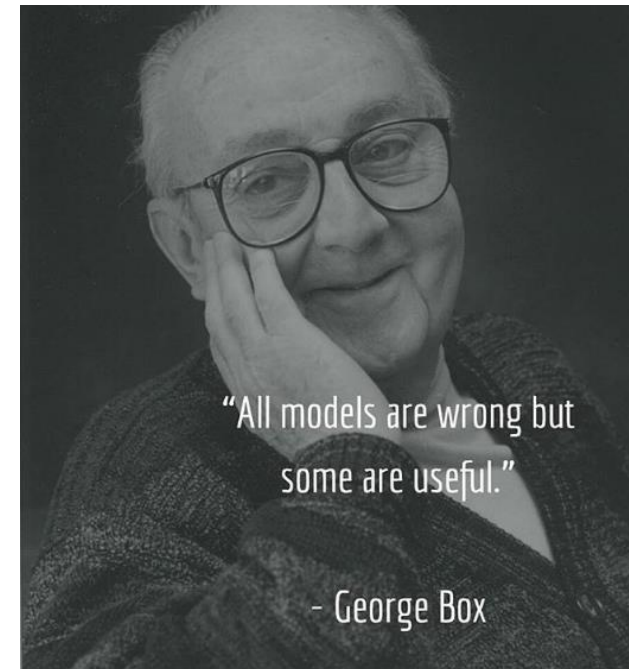
Then you have a chance to achieve MBSE!



- Each Model (and even each diagram) must have a clear objective and a defined audience



- A is a good model of B is A can provide satisfactory answers to predefined questions about B (Douglas. T. Ross)



Web Sites:

- www.polarsys.org/capella/index.html
- www.obeo.fr/en/capella-professional-offer
- www.prfc.fr/en



Books

