

Analyzing system variability according to modes and states

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Open Source Solution for Model-Based Systems Engineering

A result of the  **Clarity** collaborative project

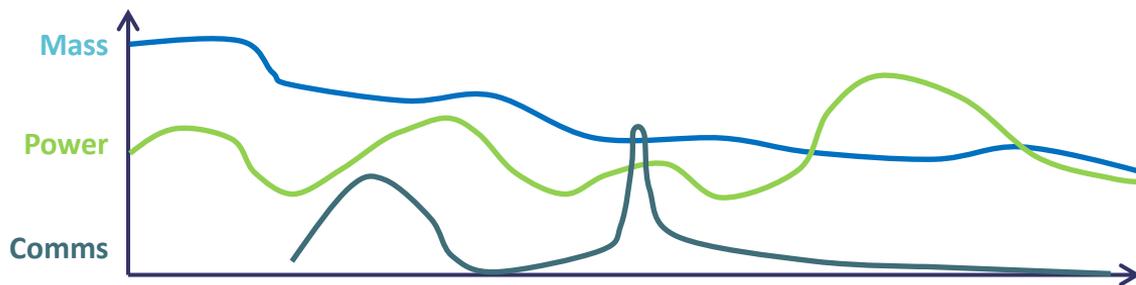
THALES
ALTRAN

Mission	Phase 1	Phase 2	Phase 3	Phase 4
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System		Mode 1	Mode 2	Mode 3	Mode 4	Mode 5
Subsystems	1	Mode A	Mode B	Mode C	Mode A	Mode C
	2	Mode X	Mode Y	Mode Z	Mode X	Mode Y
	3	Mode I	Mode J	Mode I	Mode J	Mode I

Mode combinations. Identical issue with states

Mission	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	
System	Mode 1	Mode 2	Mode 3	Mode 4	Mode 2	Mode 3	
Subsystems	1	Mode A	Mode B	Mode C	Mode A	Mode C	Mode A
	2	Mode X	Mode Y	Mode Z	Mode X	Mode Y	
	3	Mode I	Mode J	Mode I	Mode J	Mode I	Mode J



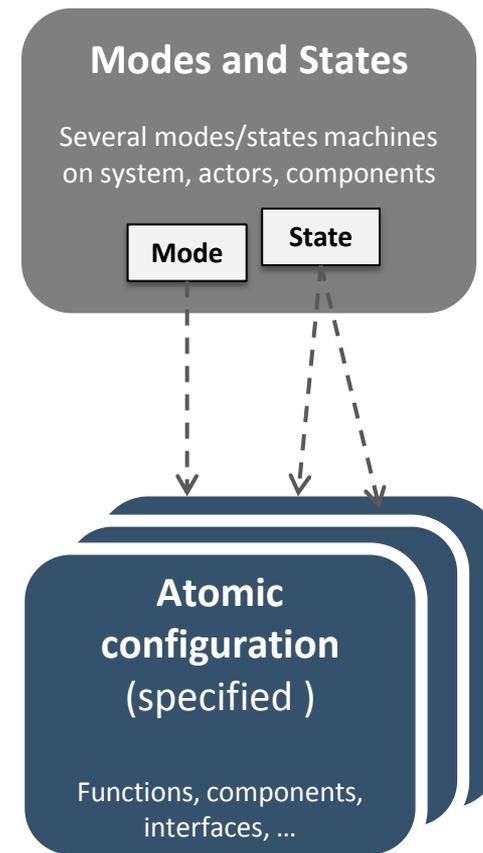
How are non-functional and parametric analyses correlated with modes and states?

Mission	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	
System	Mode 1	Mode 2	Mode 3	Mode 4	Mode 2	Mode 3	
Subsystems	1	Mode A	Mode B	Mode C	Mode A	Mode C	Mode A
	2	Mode X	Mode Y	Mode Z	Mode X	Mode Y	Mode Y
	3	Mode I	Mode J	Mode I	Mode J	Mode I	Mode J

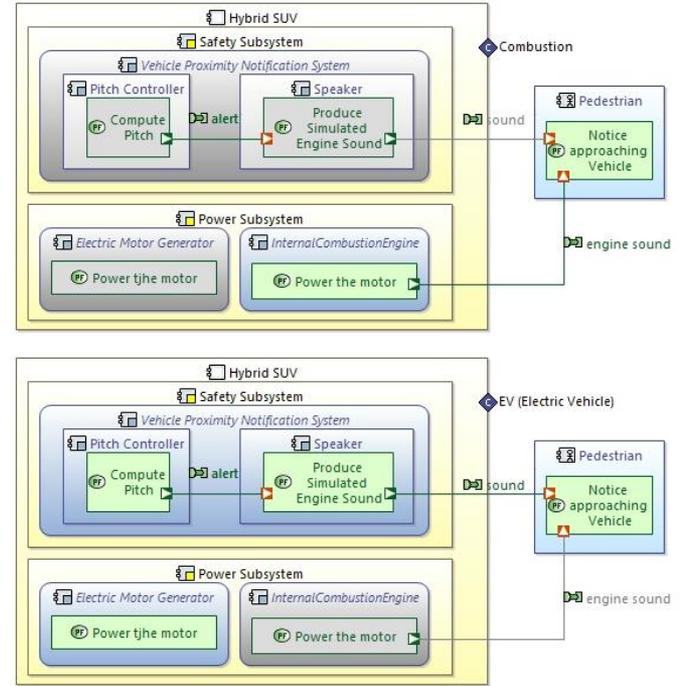
What is the **expected** / **actual** functional behavior in one particular combination of modes and states?

1

Capture atomic configurations



	EV ...	Hybrid	Combustion
safe vehicle approach			
safe pedestrian encounter in combustion configuration	X		
safe pedestrian encounter in EV configuration			X
Hybrid SUV			
Safety BCs			
Vehicle Proximity Notification System		X	X
Speaker			
Produce Simulated Engine Sound			
sound			
alert			
Pitch Controller			
bus			
Compute Pitch			
BrakeAssist			
Airbags			
Power Subsystem			
Power BCs			
Transmission			
PowerControlUnit			
InternalCombustionEngine	X		
FuelTankAssembly	X		
ElectricalPowerController			
Electric Motor Generator			X
Differential			
BatteryPack			

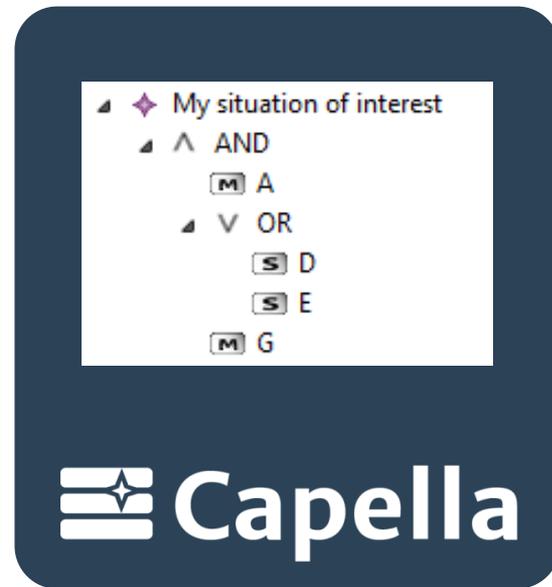
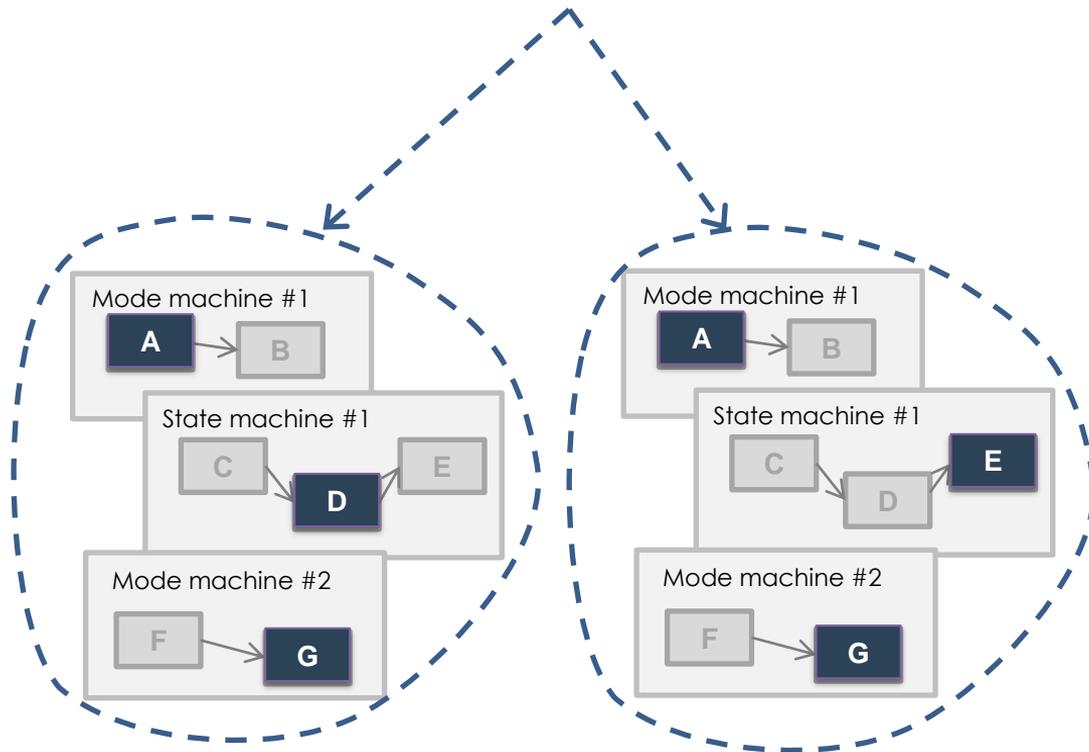


Relate atomic configurations to specific modes and states

2

Identify situations of interest

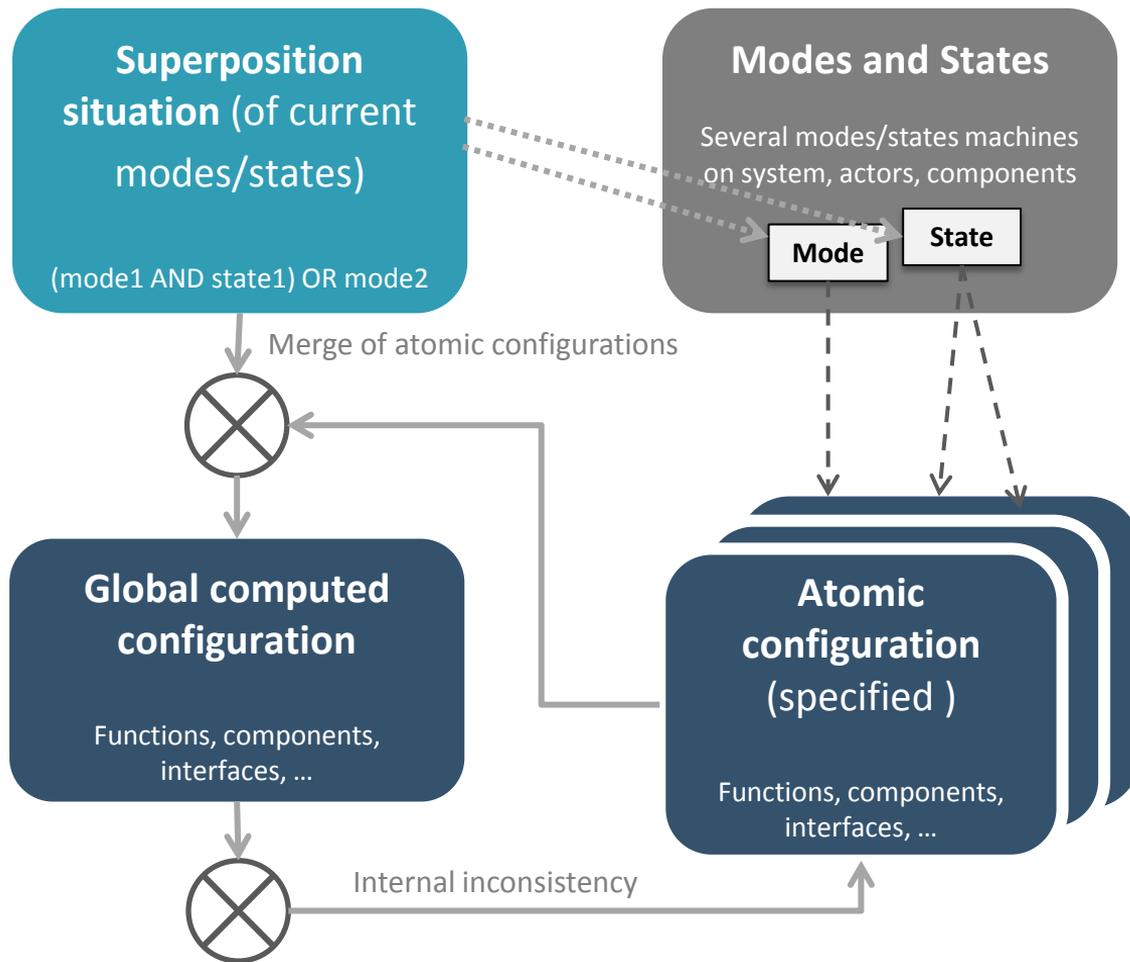
SITUATION: Mode A AND (State D or State E) AND Mode G



Current mode/state in the mode/state machine

3

Compute the global configuration
for this situation



The screenshot displays the Capella Project Explorer on the left, showing a tree view of a Logical System. The tree includes Logical Functions (Root, B1, B2, A1, A2, C1), Capabilities (power, position), Interfaces, Data, Logical Context, and Logical System. Under Logical System, there are Mission1, Phase1, Configuration 4, Situation I, Situation II, Compare Mission1 with Phase1, StateMachine1, and three Subsystem instances (B, A, C). A yellow arrow points from the 'Compare Mission1 with Phase1' node to the Validation Problems dialog box.

The Validation Problems dialog box is titled "Validation Problems" and contains the following text:

Problems encountered during validation

Reason:
Diagnosis of Compare Mission1 with Phase1

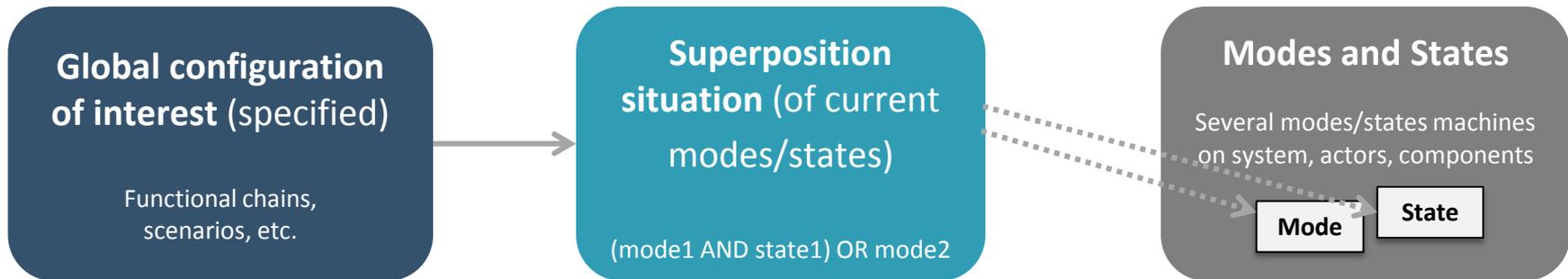
OK << Details

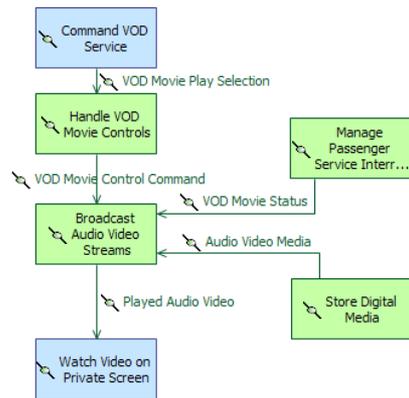
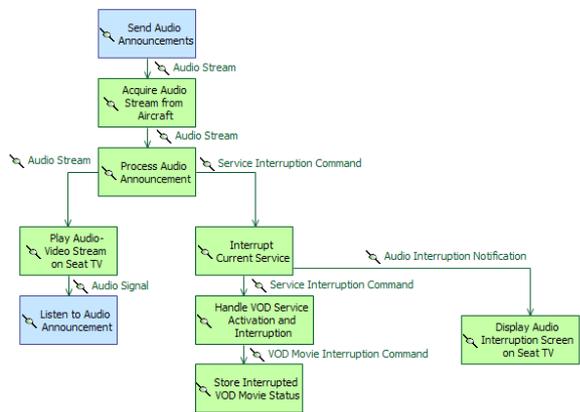
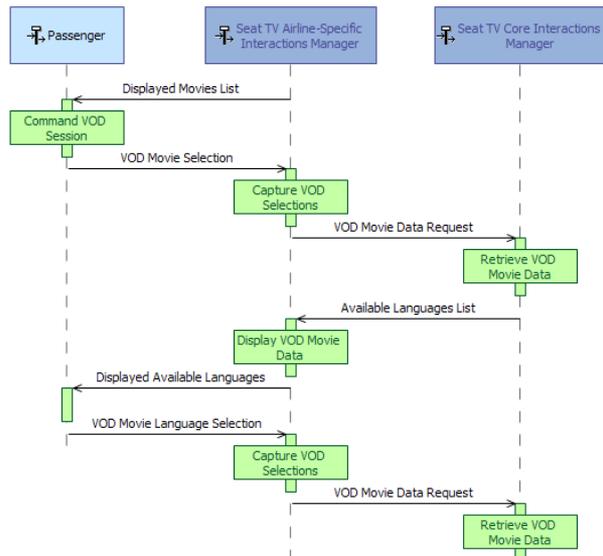
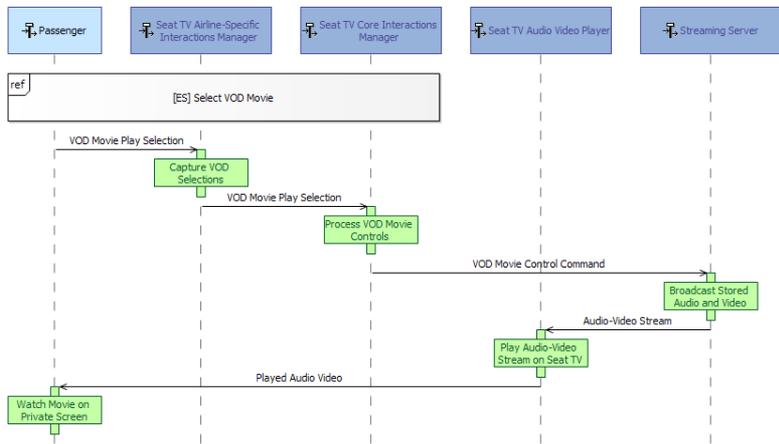
For the Compare Mission1 with Phase1 : The LogicalFunction A1 not exist in the Phase1.
For the Compare Mission1 with Phase1 : The LogicalFunction B1 not exist in the Phase1.
For the Compare Mission1 with Phase1 : The LogicalFunction B2 not exist in the Phase1.
For the Compare Mission1 with Phase1 : The Subsystem A not exist in the Phase1.
For the Compare Mission1 with Phase1 : The Subsystem C not exist in the Mission1.

The background shows a Logical System diagram with Subsystem A and Subsystem B connected by a line labeled CE_AB. The interface includes a search bar at the top left, a toolbar, and a bottom panel with tabs for Properties, Information, Semantic Browser, Model requests interpreter, Viewpoint Manager, and Error Log.

4

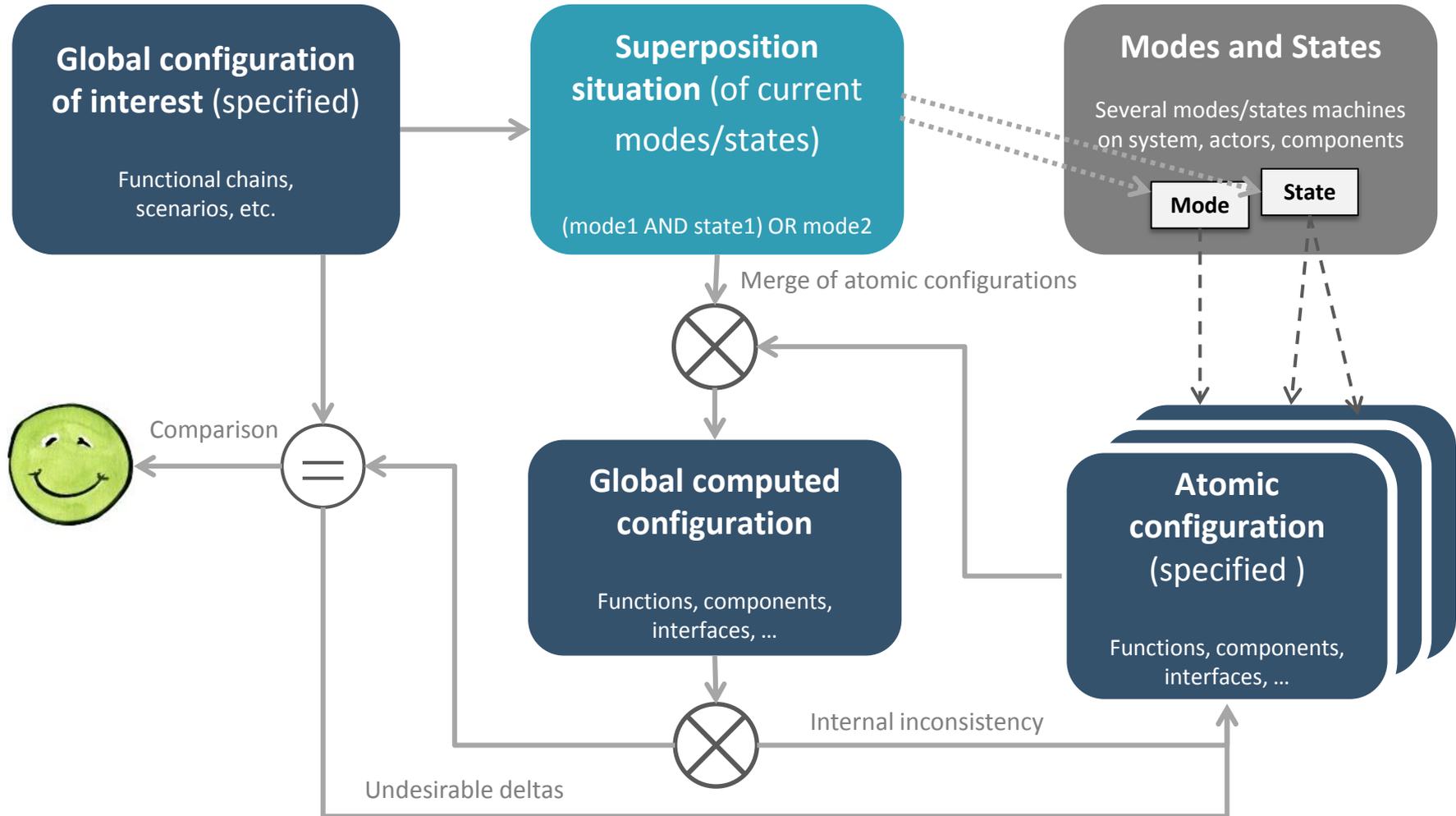
Specify what is expected in term of functional content for this situation

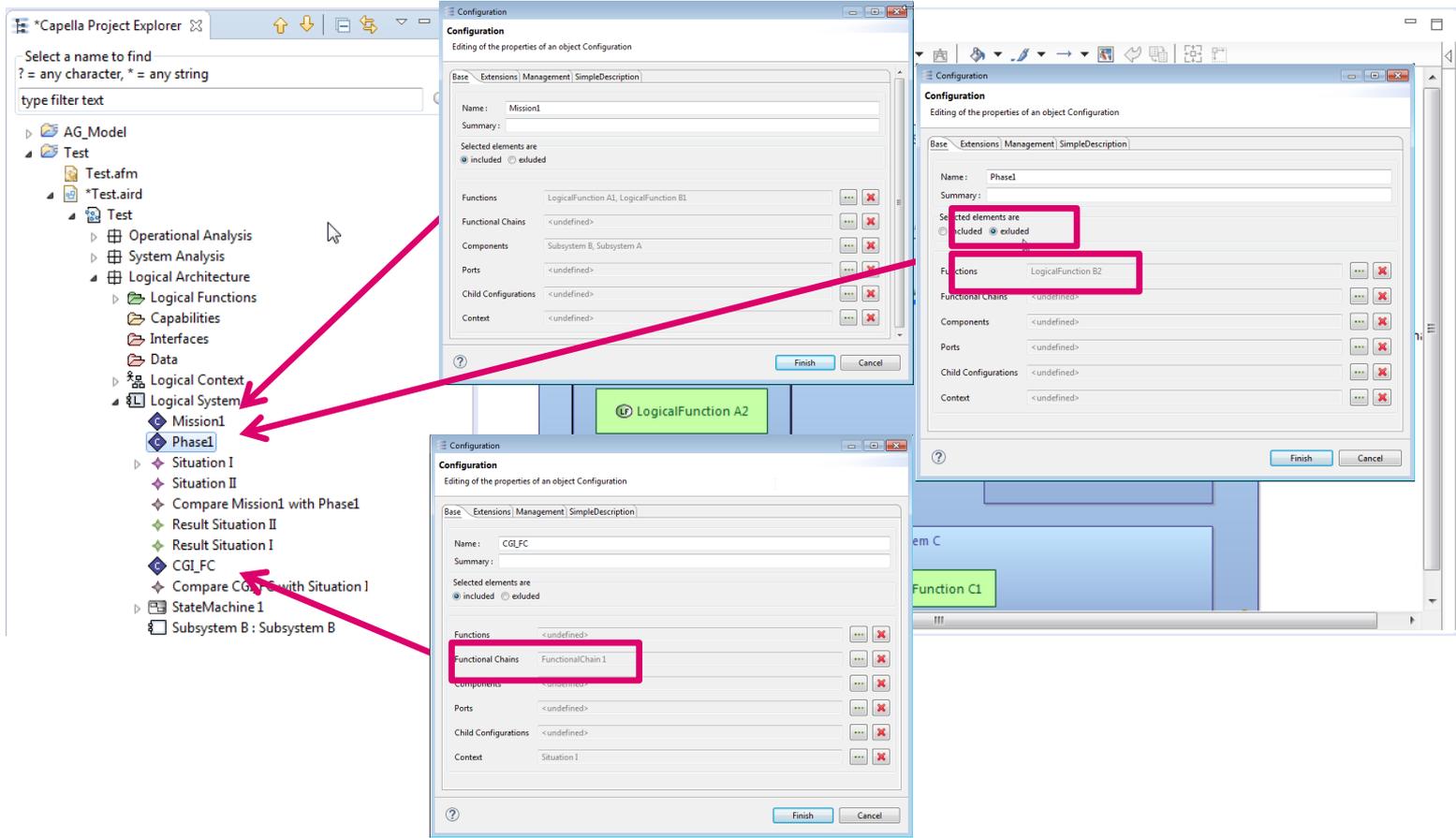


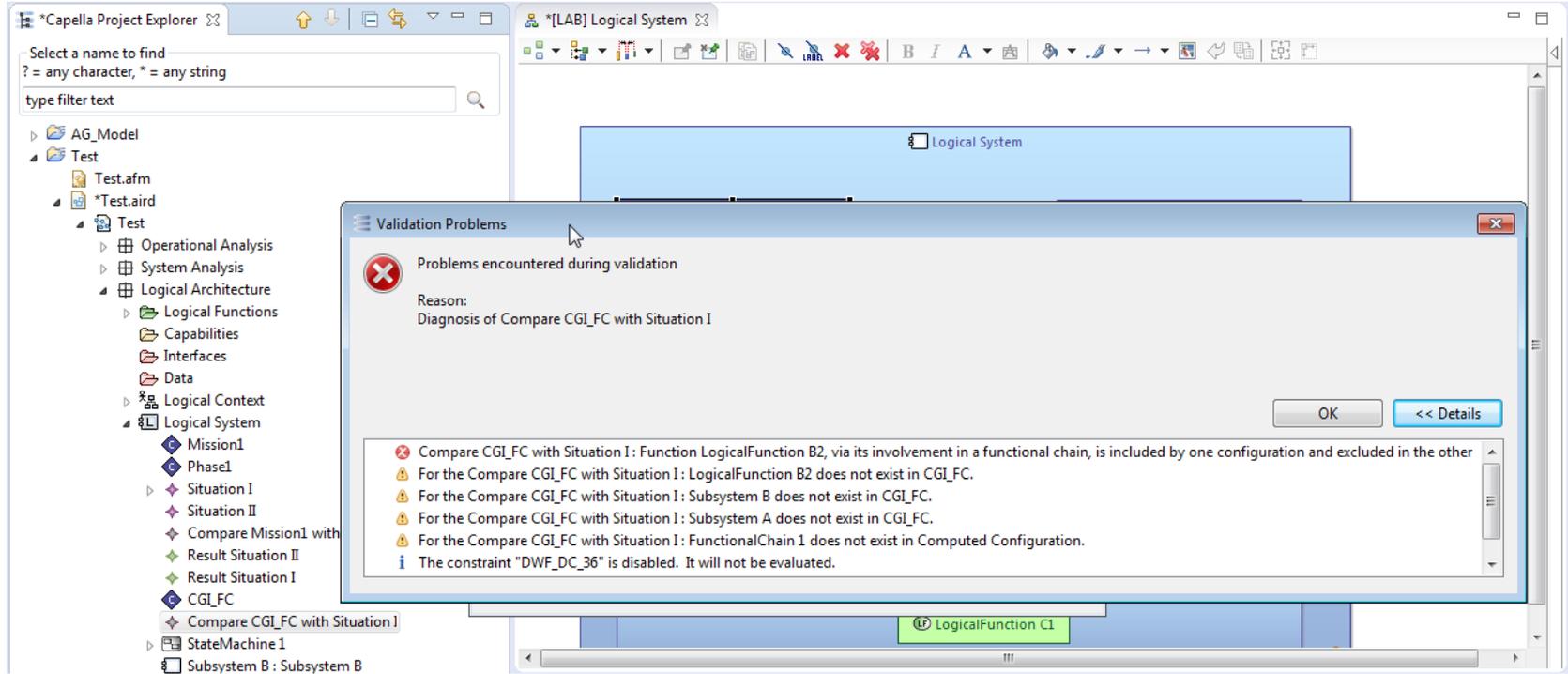


5

Compare expected vs computed







Live demos on the booth!



Thank You! Questions?

Capella website:

<http://www.polarsys.org/capella/>

LinkedIn 

<https://www.linkedin.com/groups/8605600>

Twitter 

https://twitter.com/capella_arcadia

Arcadia forum:

<https://polarsys.org/forums/index.php/f/12/>

Capella forum:

<https://polarsys.org/forums/index.php/f/13/>

IFE model & doc.:

<http://www.polarsys.org/capella/start.html>

www.thalesgroup.com

