

Analyzing system variability according to modes and states

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Stéphane Bonnet

In charge of Thales Corporate MBSE Coaching & Community
Capella Design Authority

stephane.bonnet@thalesgroup.com





Capella

Open Source Solution for Model-Based Systems Engineering

A result of the  **Clarity** collaborative project

THALES

altran

 **arianeGROUP**

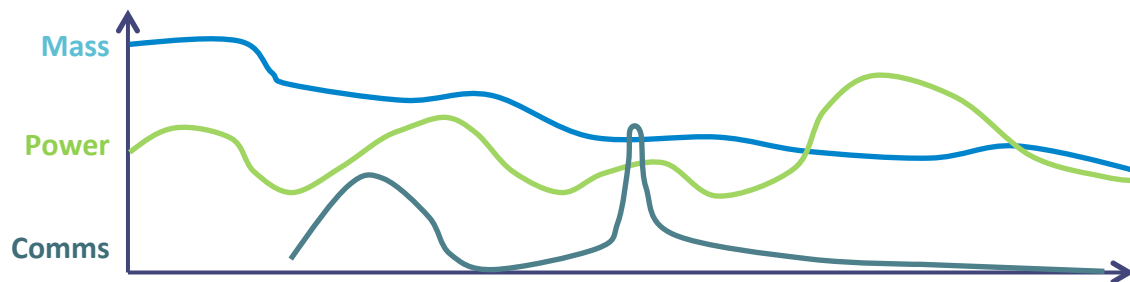
Mission	Phase 1	Phase 2	Phase 3	Phase 4
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System		Mode 1	Mode 2	Mode 3		Mode 4	Mod
Subsystems	1	Mode A	Mode B	Mode C	Mode A	Mode C	
	2	Mode X	Mode Y	Mode Z	Mode X	Mode Y	
	3	Mode I	Mode J	Mode I	Mode J	Mode I	

Similar table with states

Mission	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6
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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	ModeX	Mode Y	
	3	Mode I	Mode J	Mode I	Mode J	Mode I	Mode J



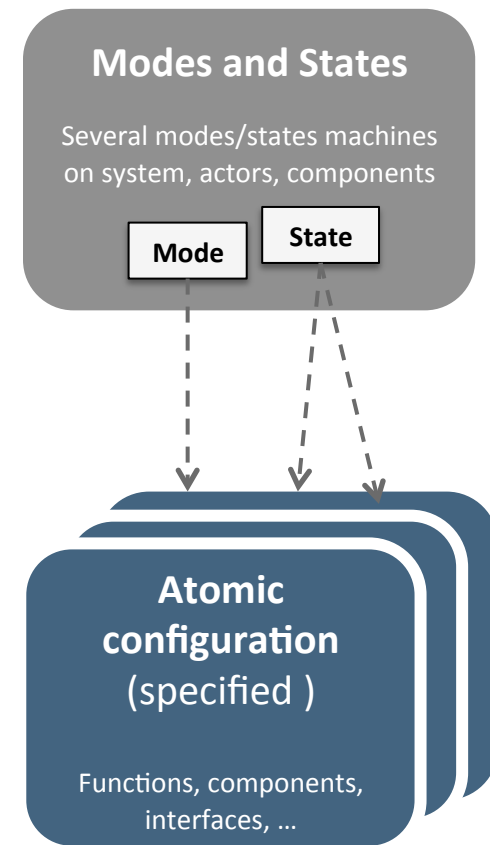
How are non-functional and parametric analyses correlated with modes and states?

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

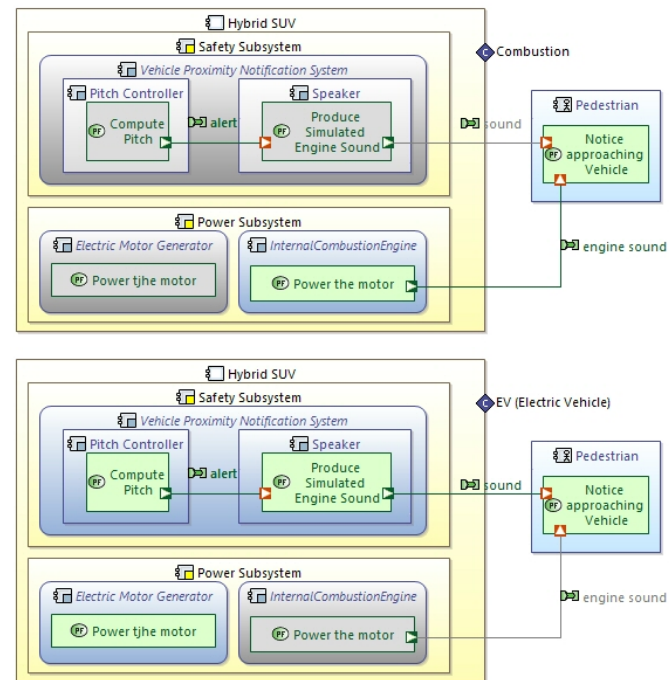
What is the **expected** / **actual** functional behavior in one particular combination of modes and states?

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			

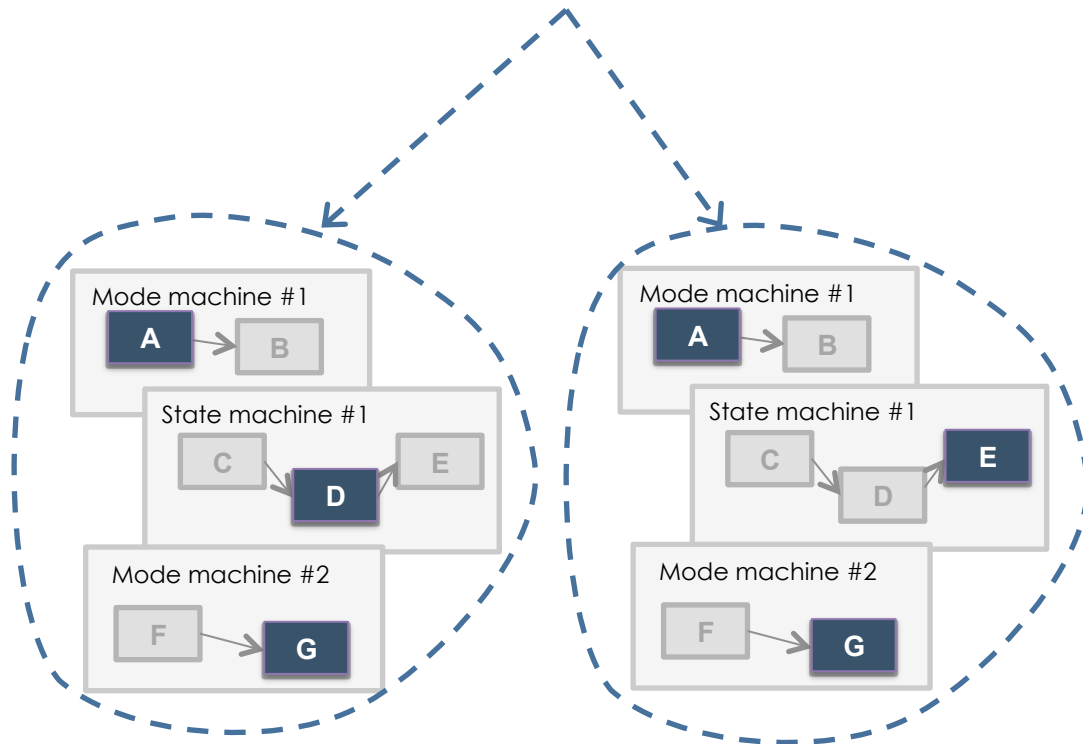


Relate atomic configurations
to specific modes and states

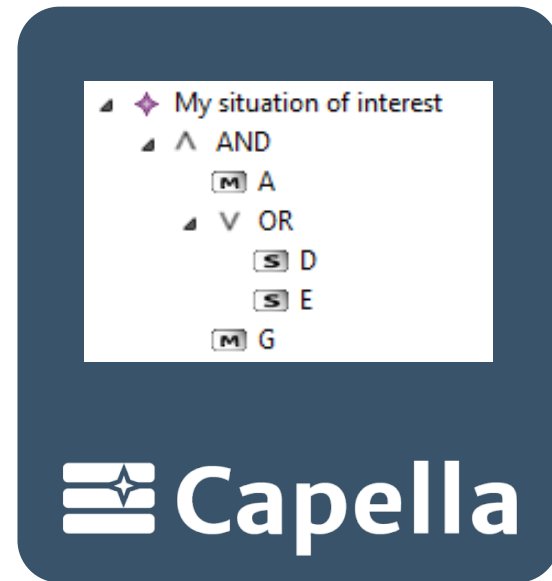
2

Identify situations of interest

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

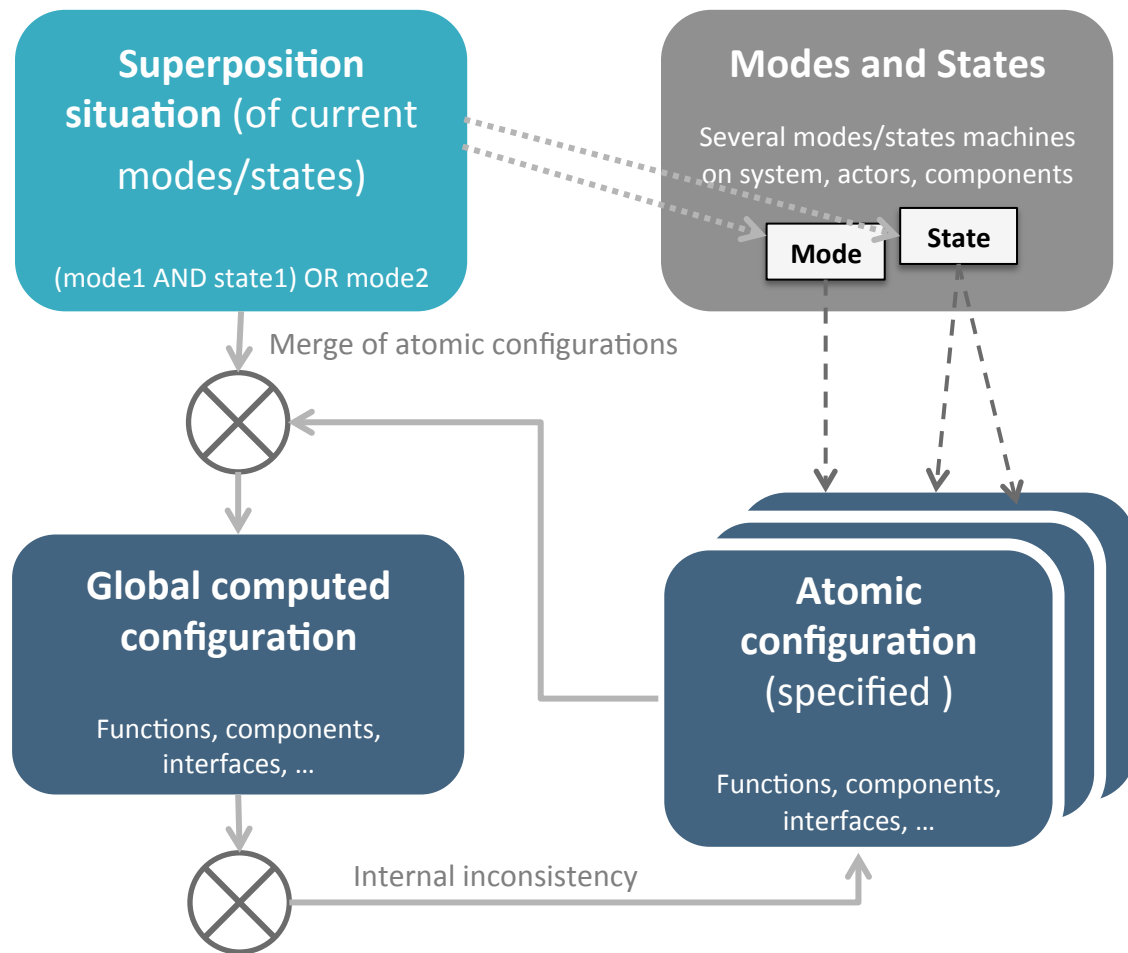


Current mode/state in the mode/state machine



3

Compute the global configuration
for this situation



Capella Project Explorer

Select a name to find
? = any character, * = any string
type filter text

- Logical Architecture
 - Logical Functions
 - Root Logical Function
 - FunctionalChain 1
 - LogicalFunction B1
 - LogicalFunction B2
 - LogicalFunction A1
 - LogicalFunction A2
 - LogicalFunction C1
 - power
 - position
 - Capabilities
 - Interfaces
 - Data
 - Logical Context
 - Logical System
 - Mission1
 - Phase1
 - Configuration 4
 - Situation I
 - Situation II
 - Compare Mission1 with Phase1**
 - StateMachine 1
 - Subsystem B : Subsystem B
 - Subsystem A : Subsystem A
 - Subsystem C : Subsystem C
 - Subsystem B
 - Subsystem A
 - Subsystem C

Validation Problems

Problems encountered during validation

Reason:
Diagnosis of Compare Mission1 with Phase1

OK << Details

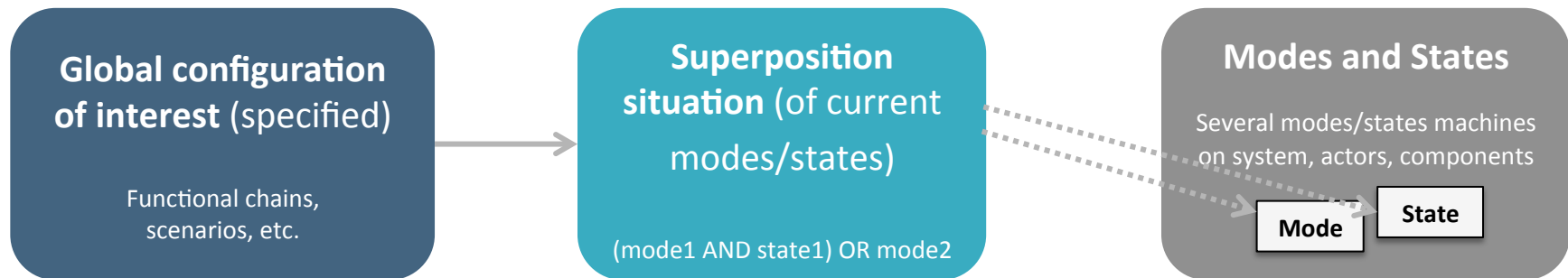
- For the Compare Mission1 with Phase1 : The LogicalFunction A1 not exist in the Phase1.
- For the Compare Mission1 with Phase1 : The LogicalFunction B1 not exist in the Phase1.
- For the Compare Mission1 with Phase1 : The LogicalFunction B2 not exist in the Phase1.
- For the Compare Mission1 with Phase1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

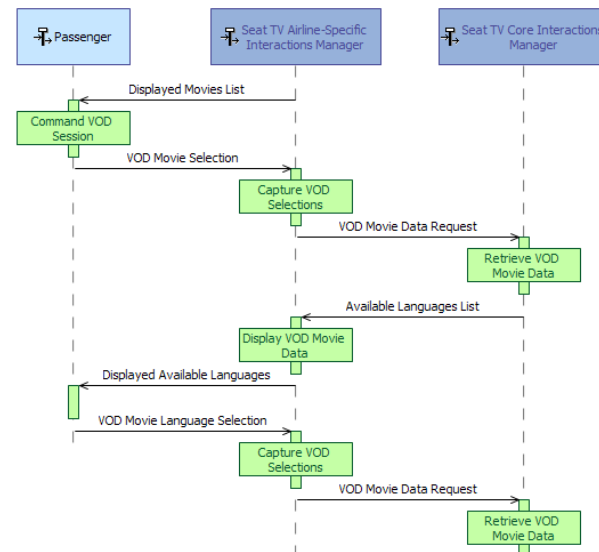
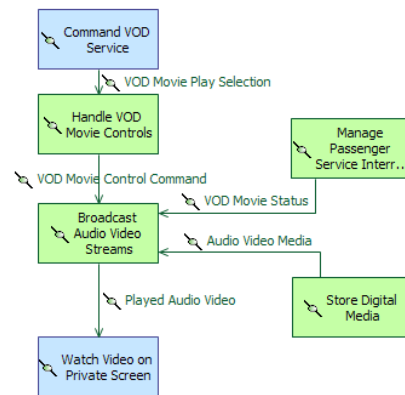
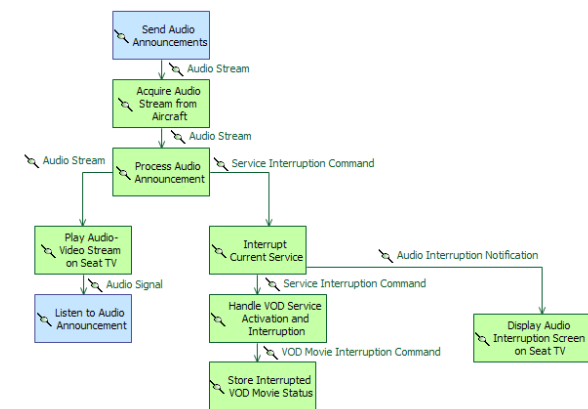
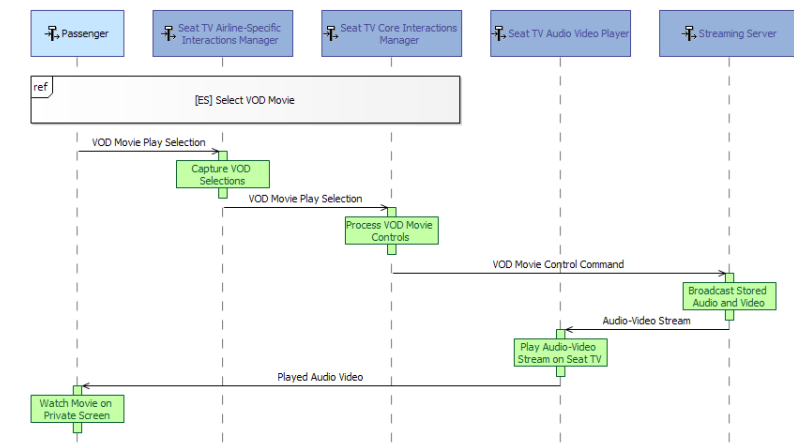
Properties Information Semantic Browser Model requests interpreter Viewpoint Manager Error Log

Message	Level	Rule id	Rule s
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4

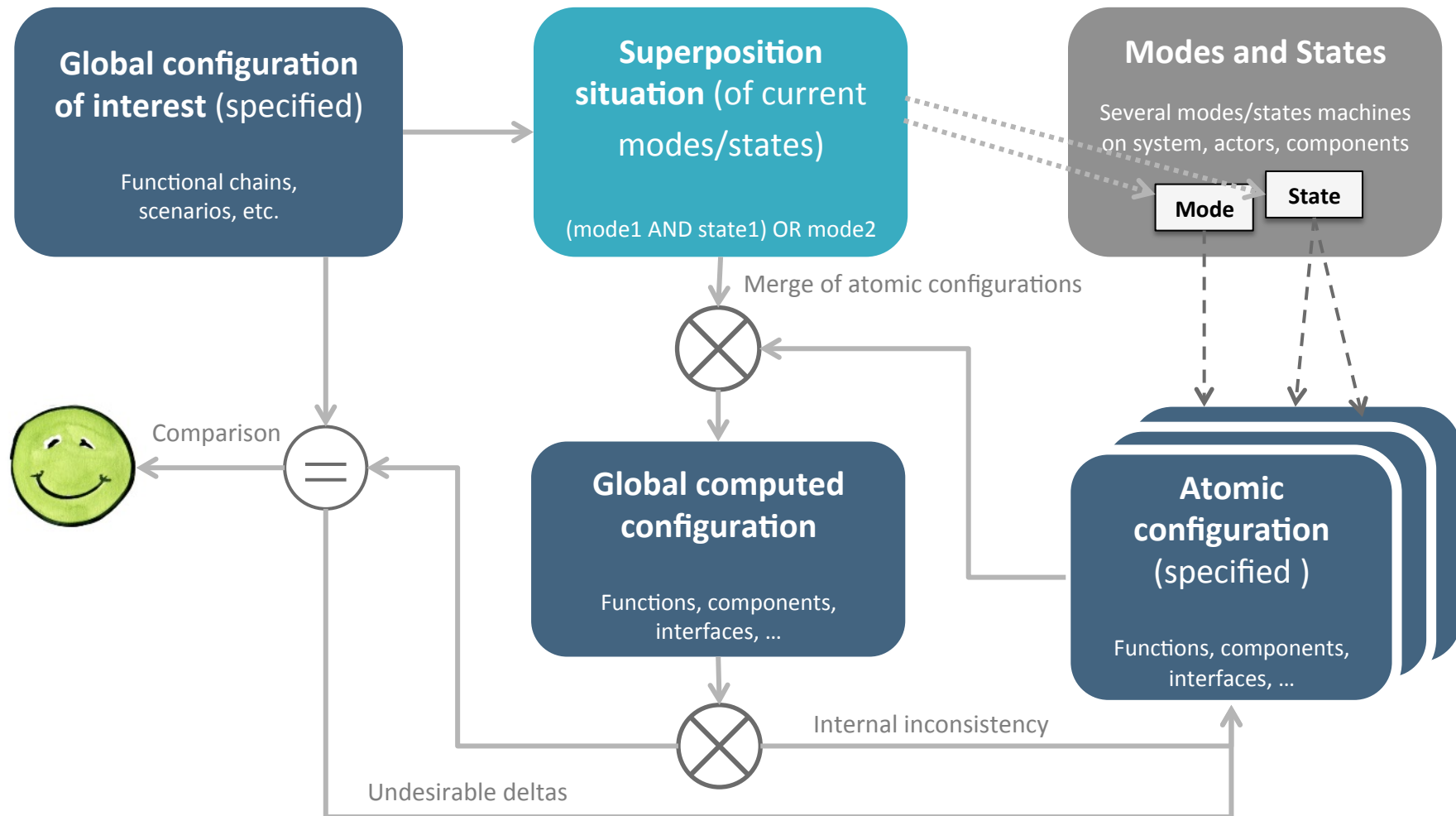
Specify what is expected in term of functional content for this situation

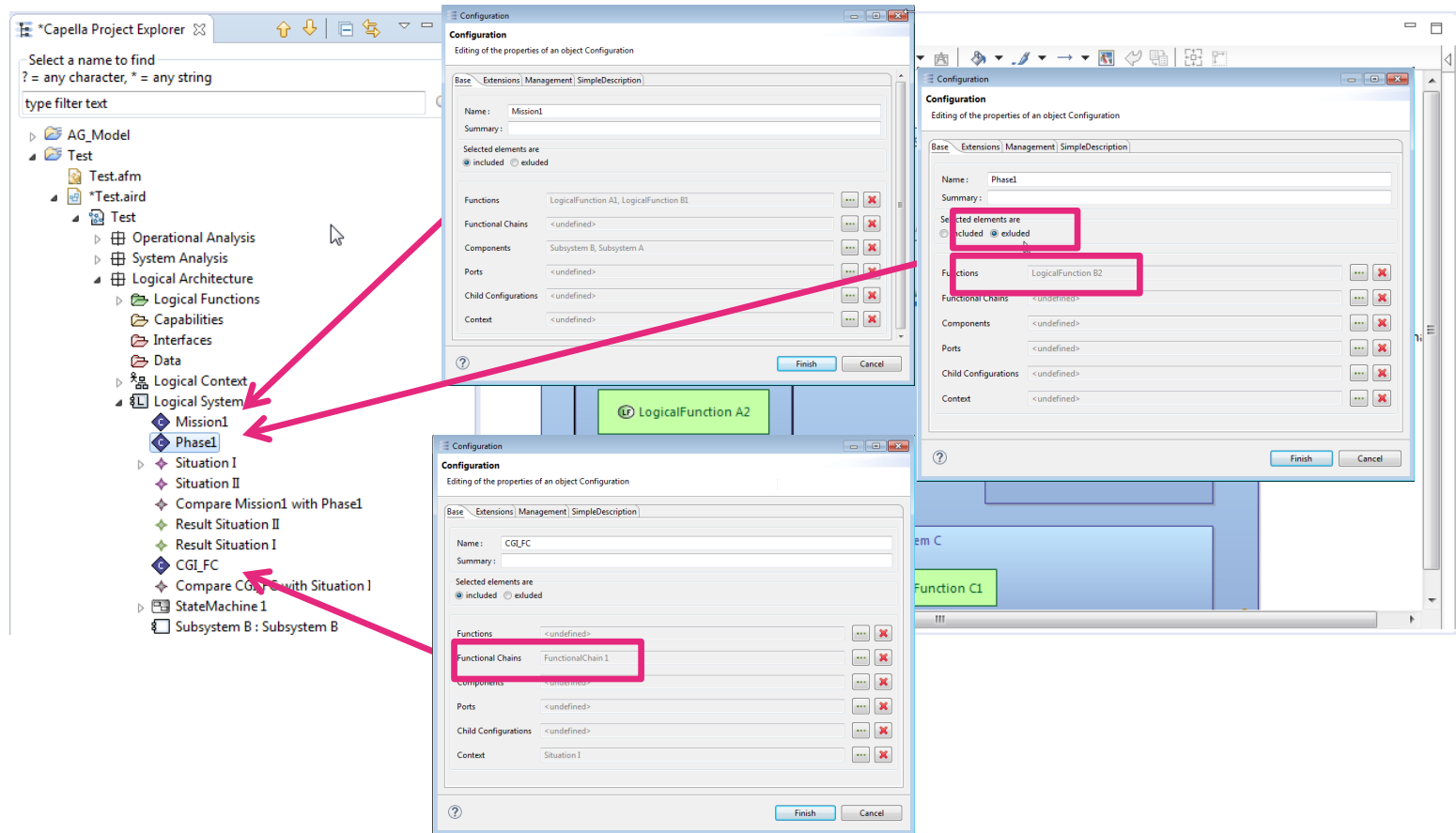


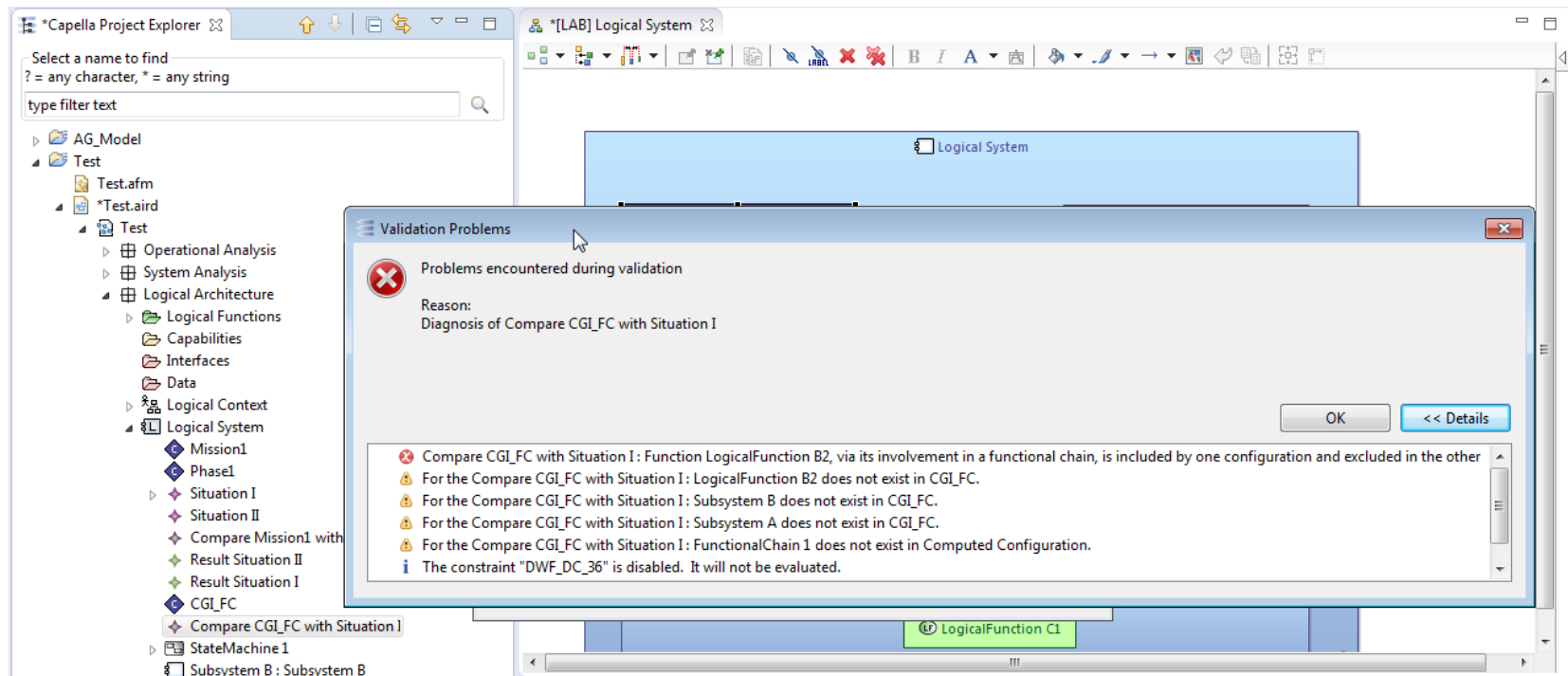


5

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

