

# S2C Project Presentation LOT2 - Introduction to SSR



Référence IRT Saint Exupéry: NT-S085L02T00-040

Référence IRT System X : ISX-S2C-DOC-458

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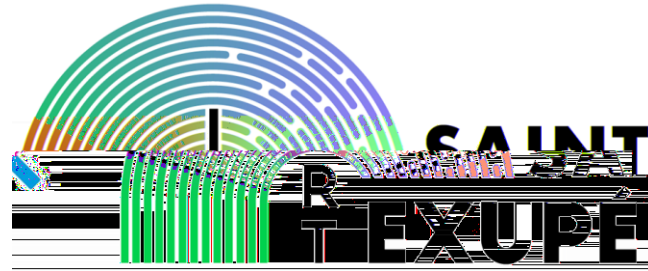
<i>Author(s)</i>	<i>Function(s) &amp; name(s)</i>	<i>IRTs Team</i>	<i>S. Guilmeau</i>
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<i>Checker(s)</i>	<i>Function(s) &amp; name(s)</i>	<i>Head Of project IRT Saint Exupéry</i>	<i>J. Perrin</i>
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<i>Approver</i>	<i>Function &amp; name</i>	<i>Head Of Discipline</i>	<i>J. Baclet</i>
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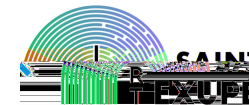
# S2C

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## System & Safety Continuity

- Method for consistency between MBSE and MBSA –
  - **Structural Scope Review (SSR)** -

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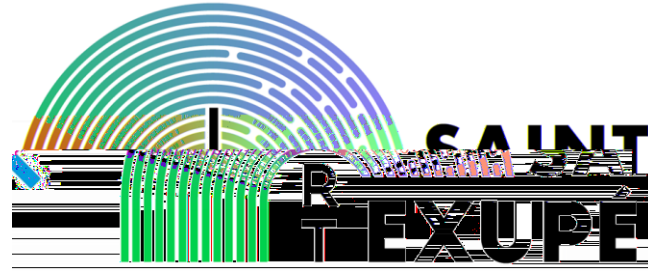
**Problem positioning by example**

**Narrowing the situation**

**Method and Tools consequences**

**Example**

**Returns of experience**

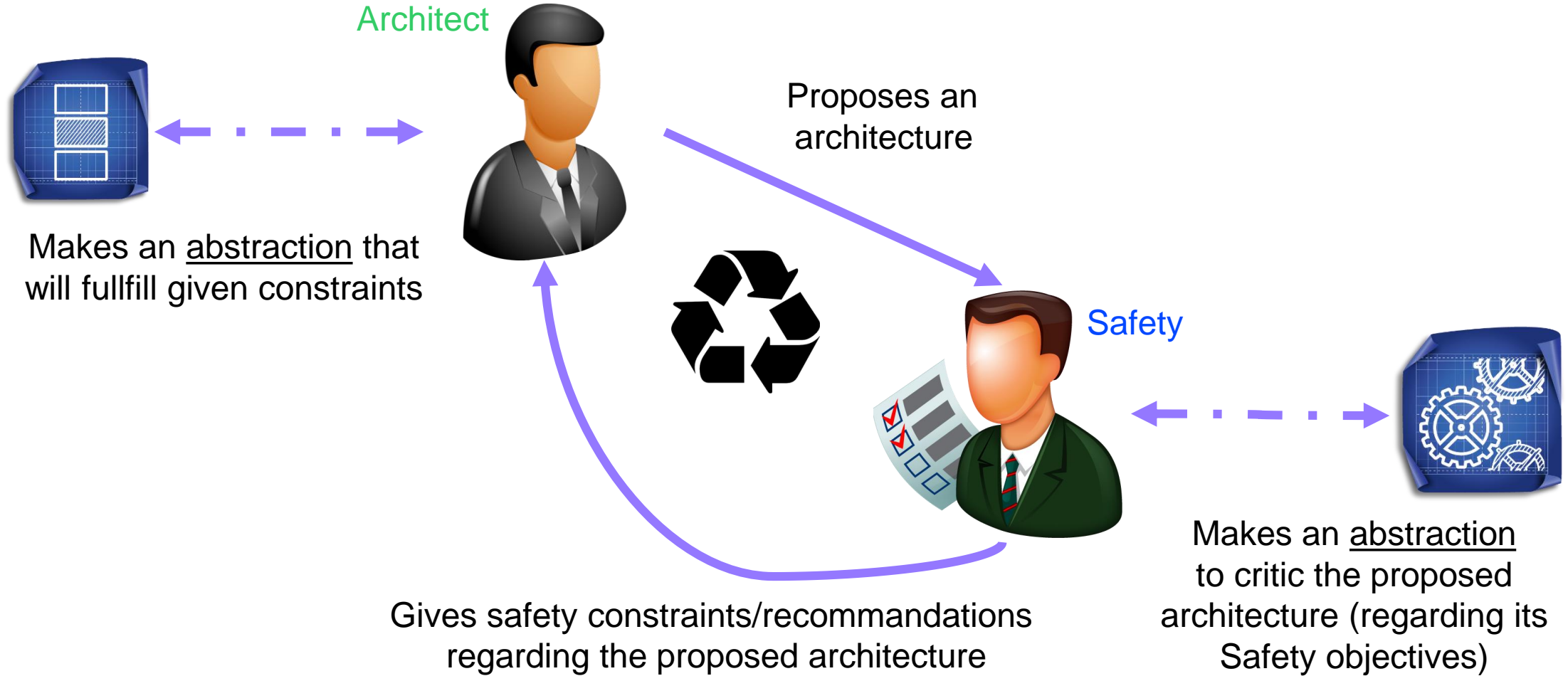


# Method for consistency between MBSE and MBSA

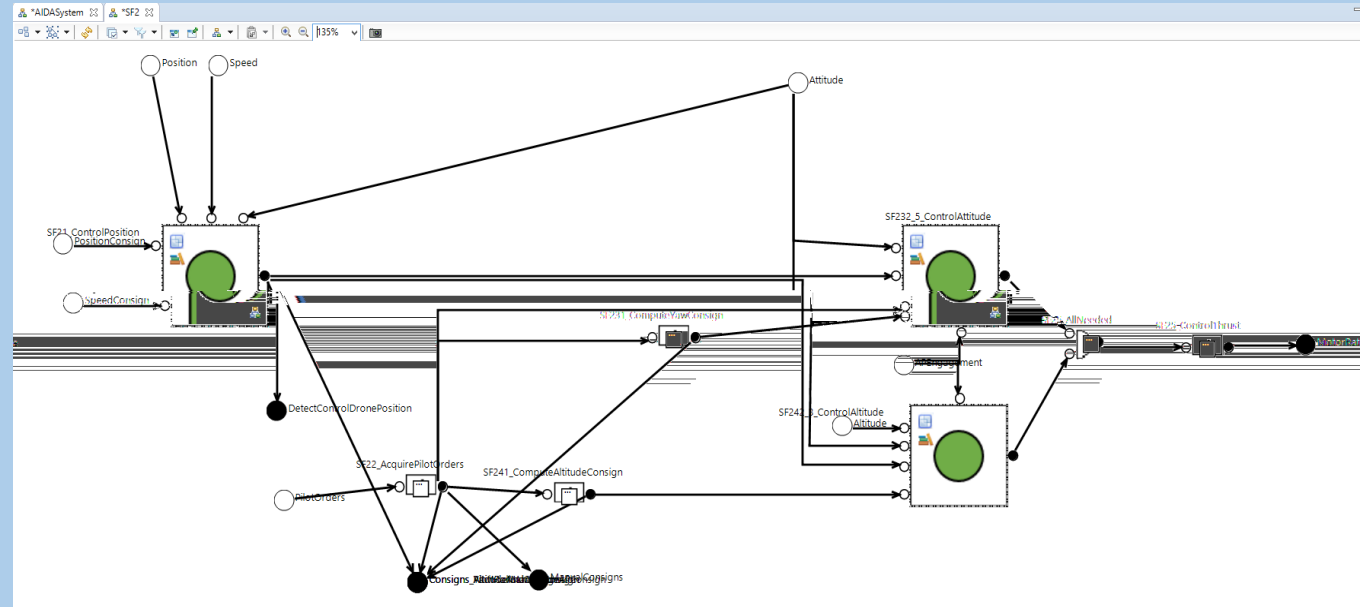
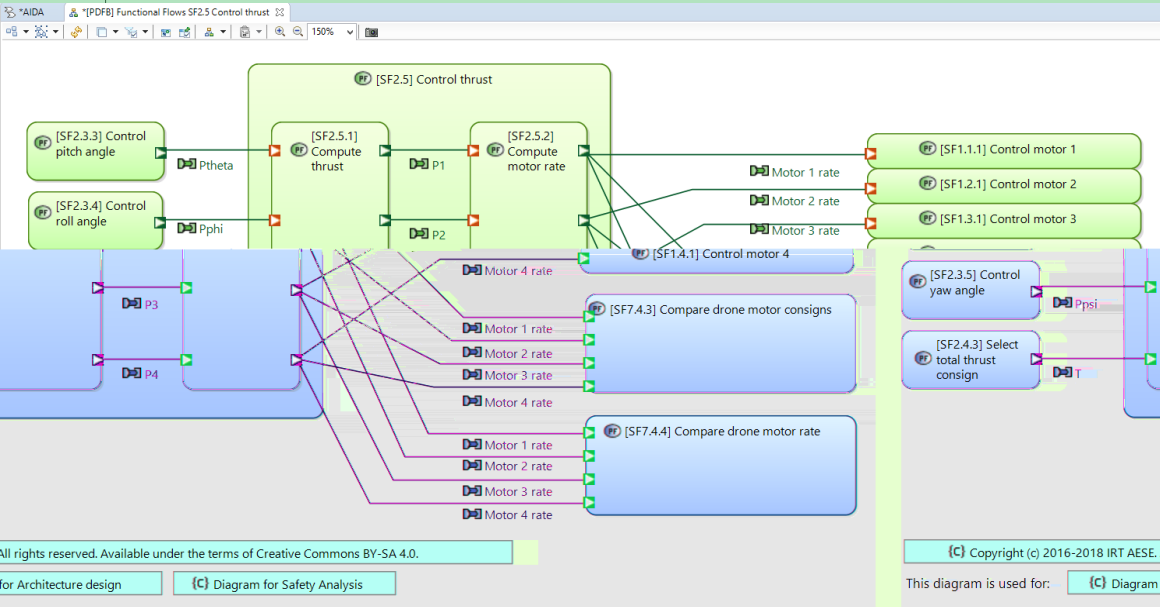
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# Problem positioning by (very dummy) example

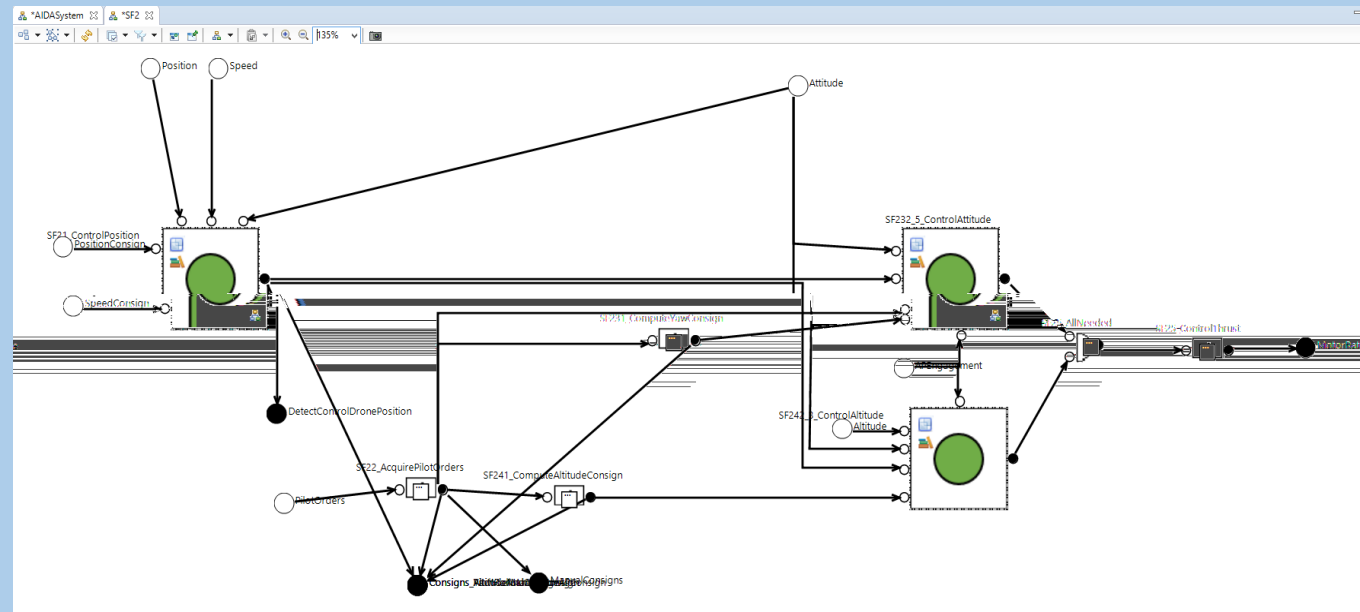
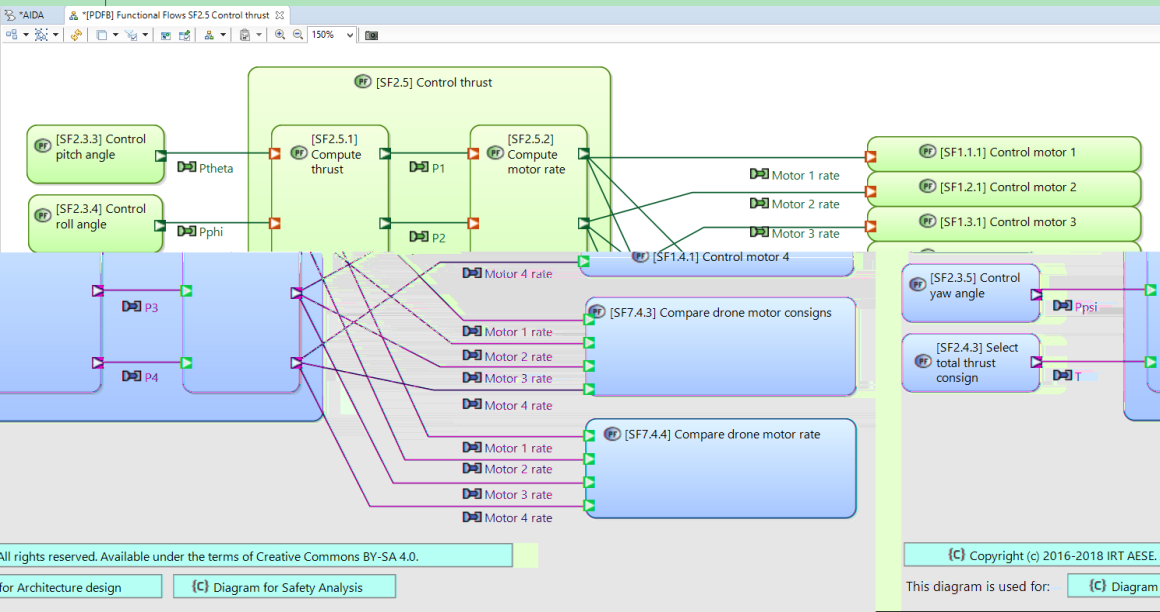
# What occurs... at (very very) high level



# What occurs ... at abstraction level

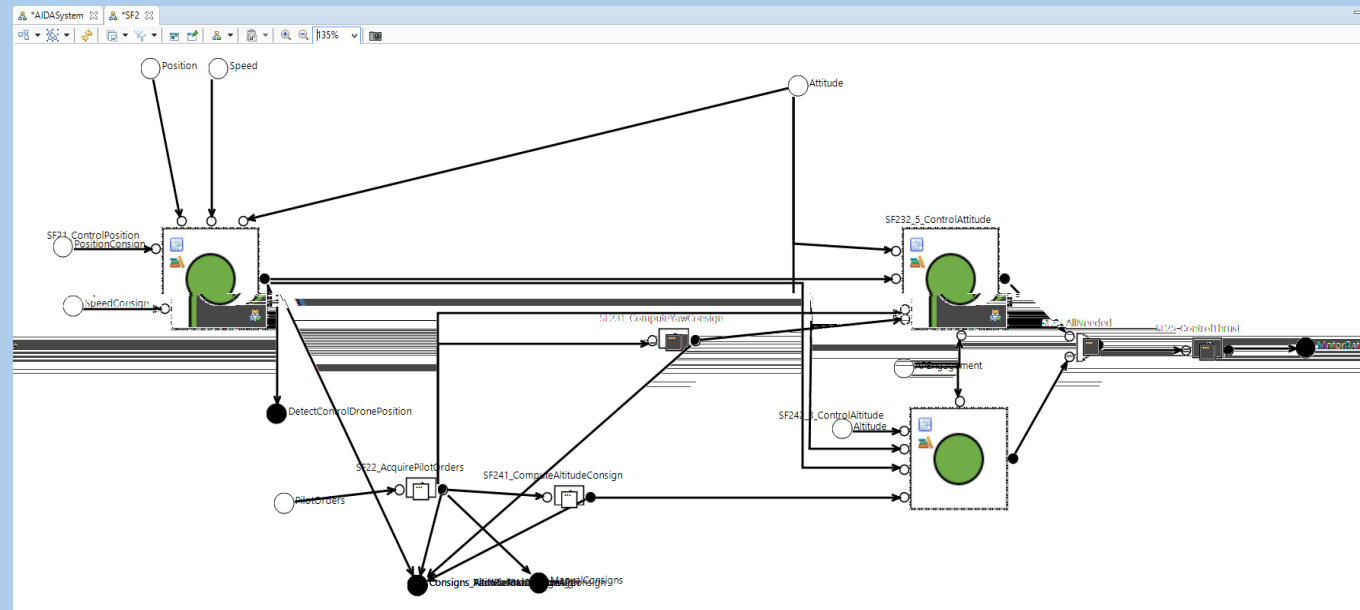
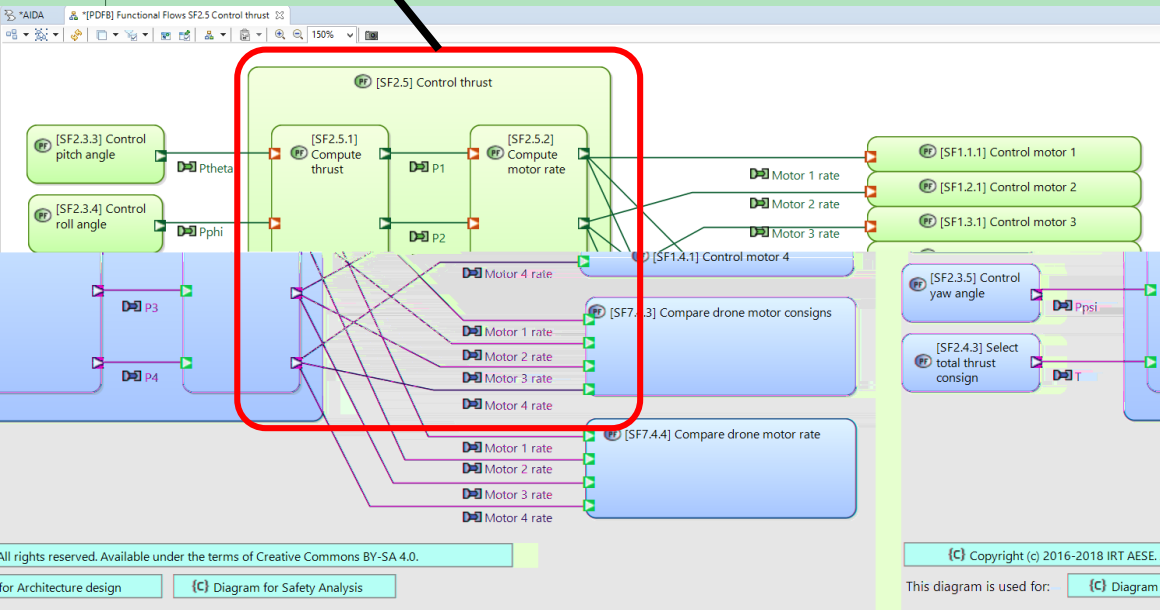


# What occurs ... at abstraction level



SF2.5 and its context seen from SE

# What occurs ... at abstraction level



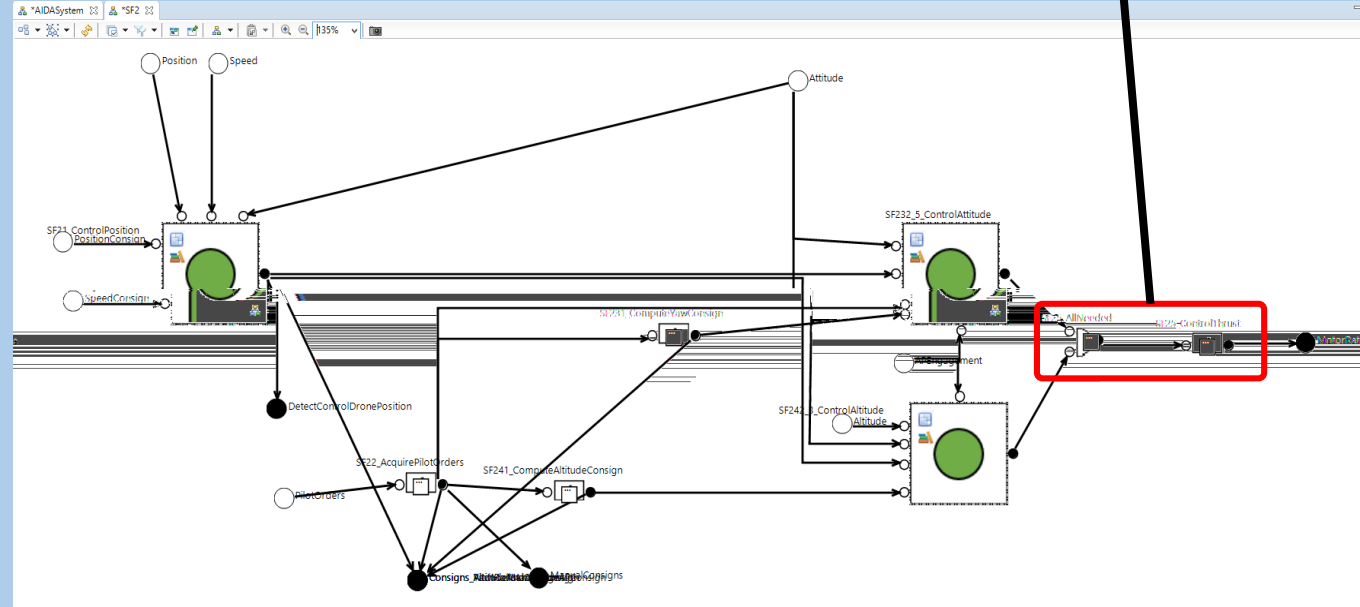
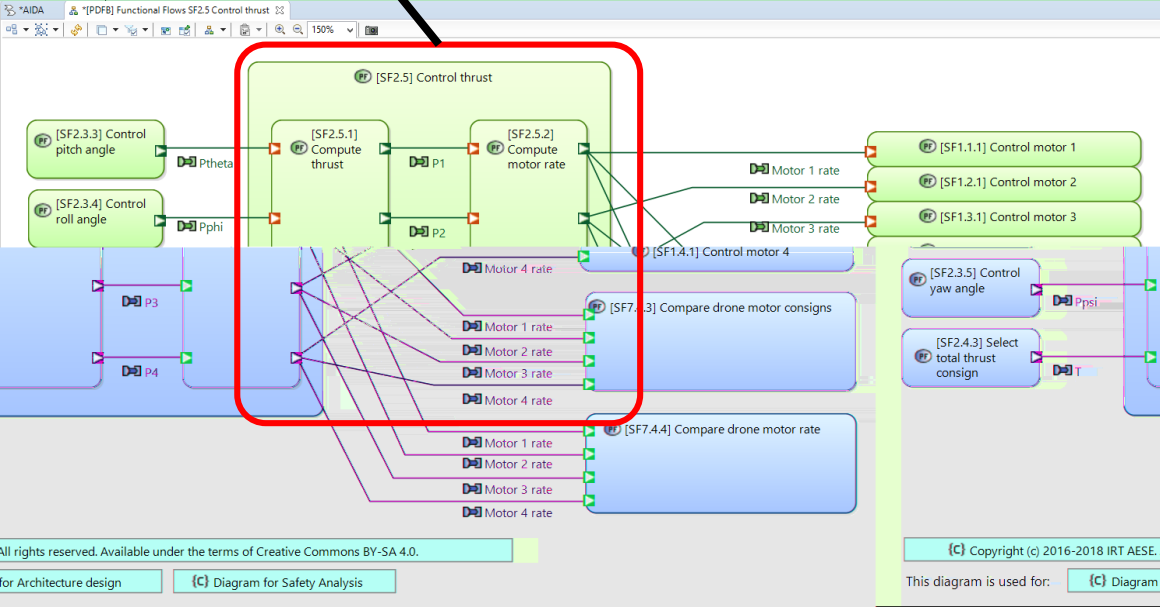
Representation differs



SF2.5 and its context seen from SE

# What occurs ... at abstraction level

SF2.5 and its context seen from SA



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 for Architecture design (C) Diagram for Safety Analysis   
 This diagram is used for: (C) Diagram

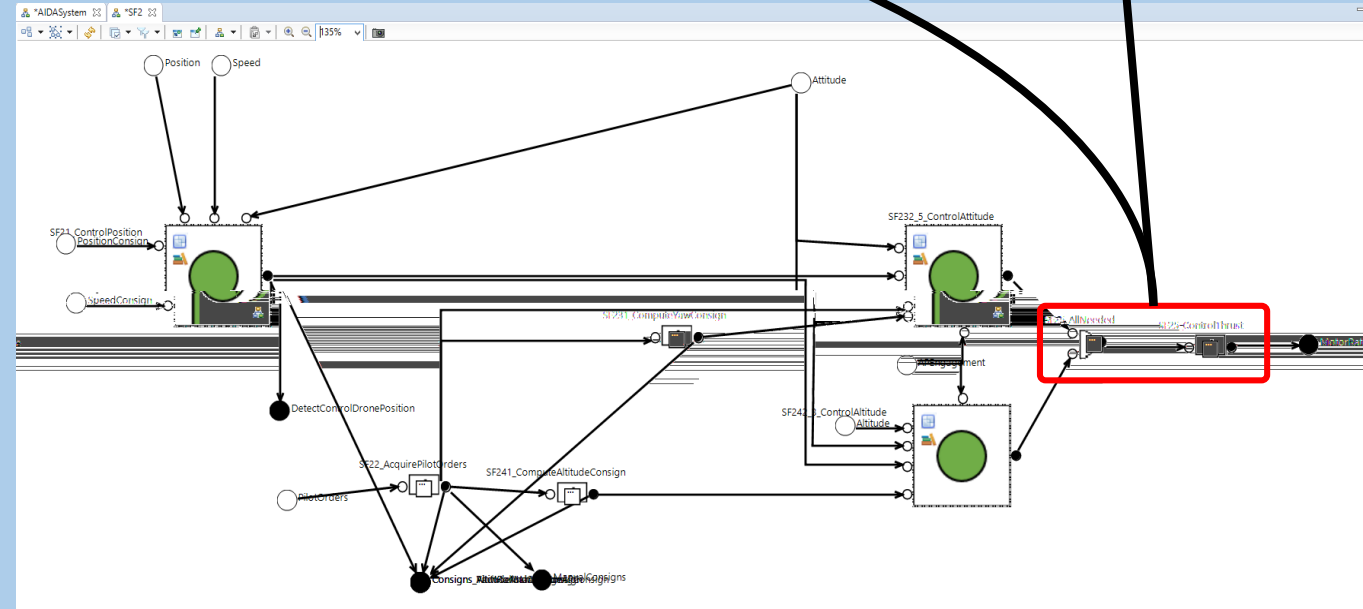
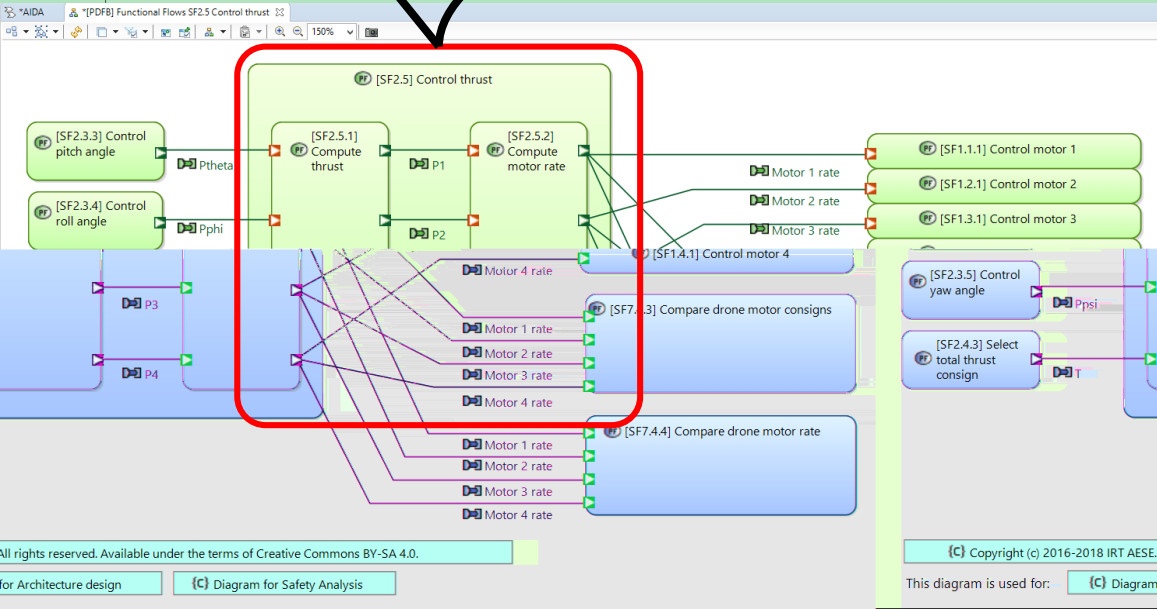
Representation differs

SF2.5 and its context seen from SE

# What occurs ... at abstraction level

SF2.5 and its context seen from SA

Refinement and interface differ



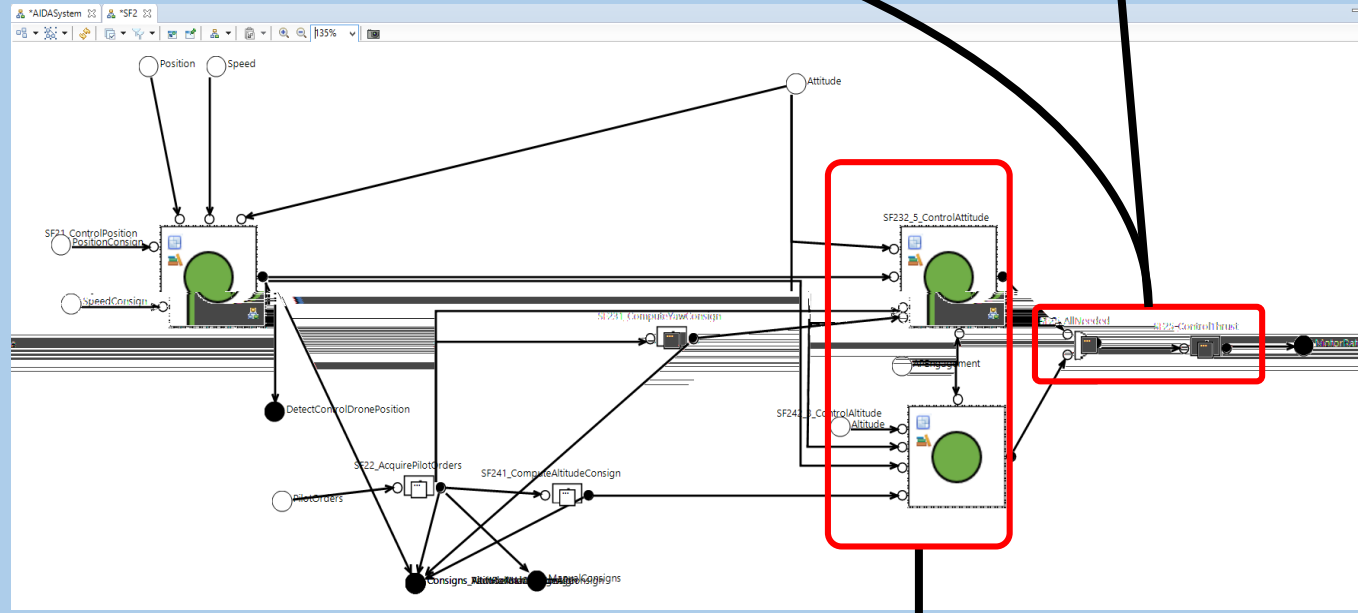
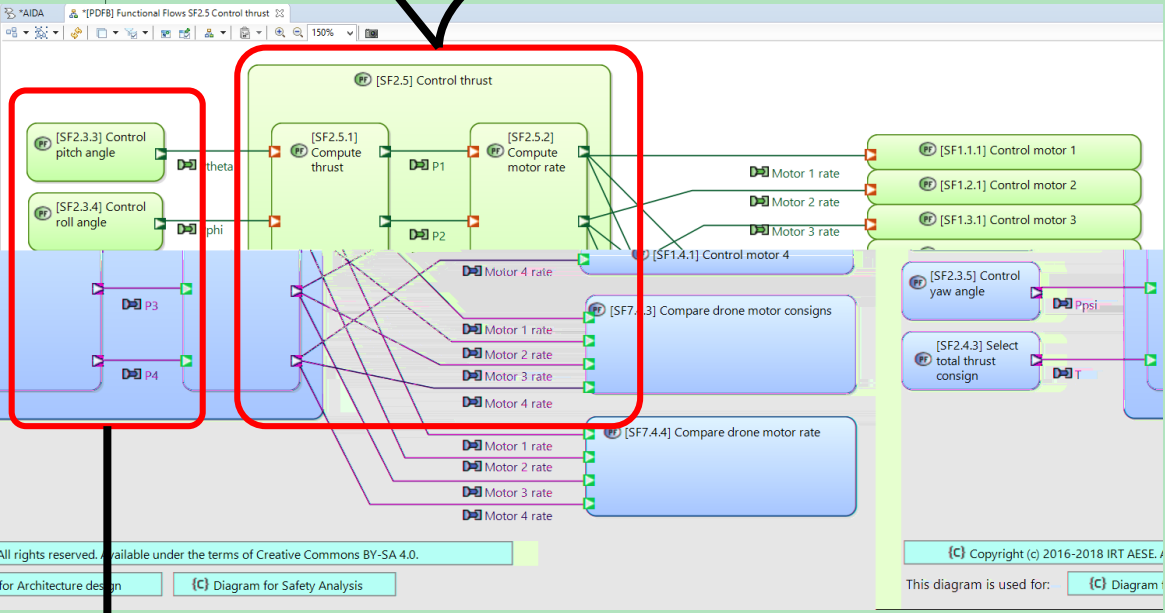
Representation differs

SF2.5 and its context seen from SE

# What occurs ... at abstraction level

SF2.5 and its context seen from SA

Refinement and interface differ



Context differs

Representation differs

SF2.5 and its context seen from SE

# What occurs ... at abstraction level

SF2.5 and its context seen from SA

Refinement and interface differ

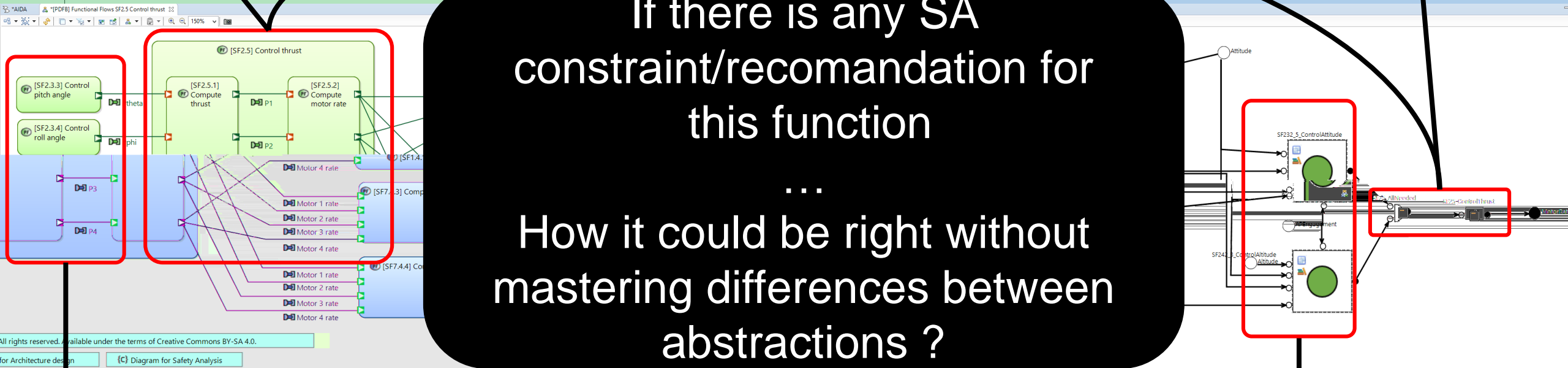
If there is any SA constraint/recomandation for this function

...

How it could be right without mastering differences between abstractions ?

Context differs

Representation differs



# Conclusion (little more formatted)

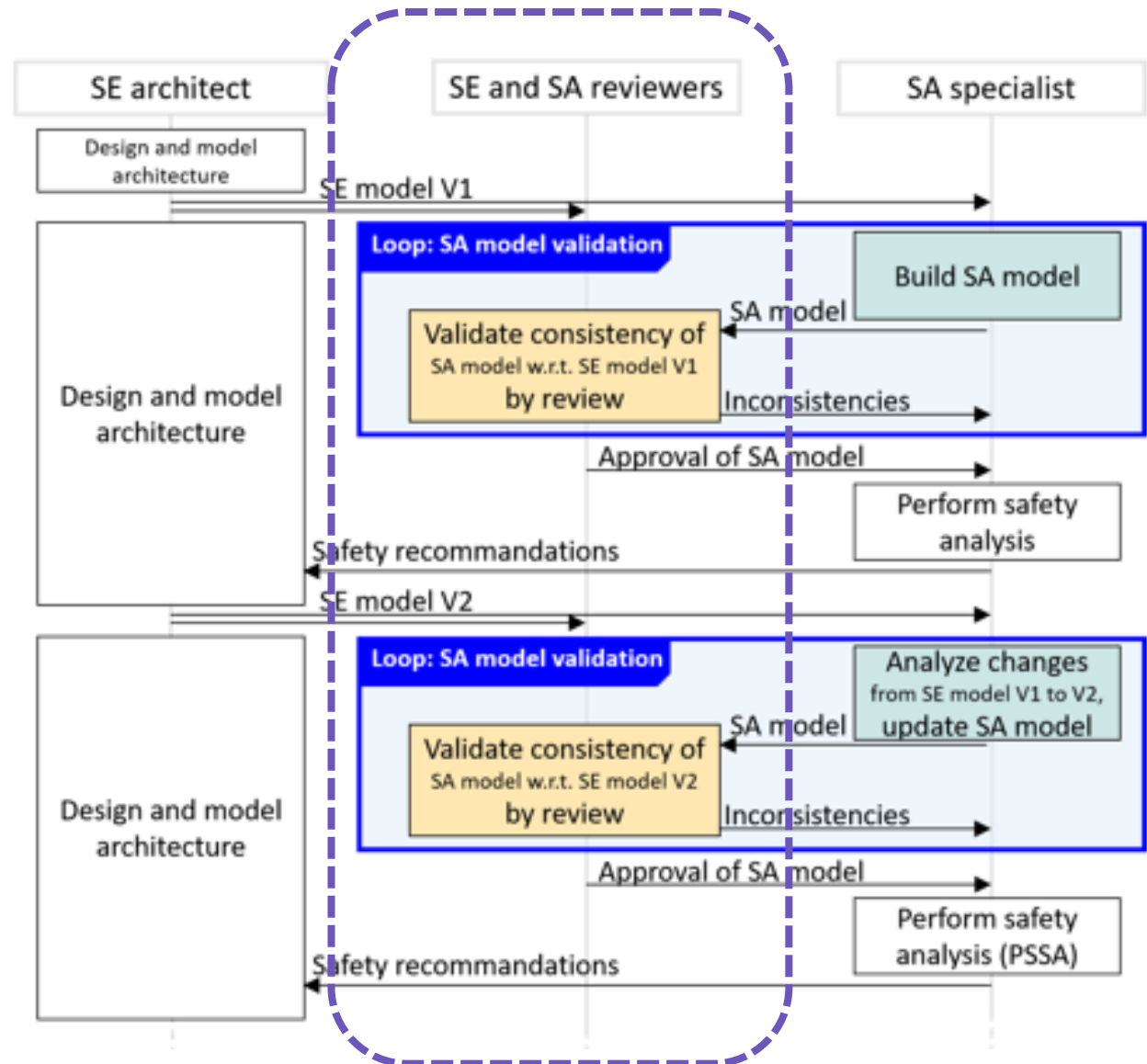


p  
a  
g  
e  
  
5  
6

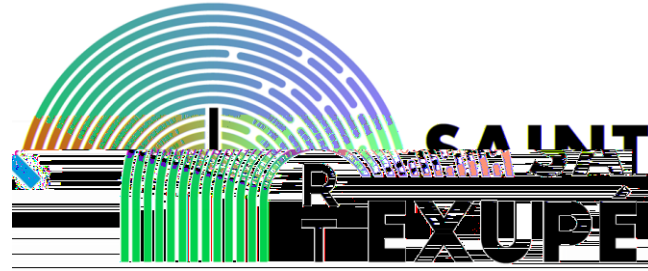
As SA recommendations are based upon « an abstraction » a confrontation with SE one is mandatory to avoid wrong (or absent) constraints/recommendation over proposed architecture to satisfy Safety Objectives.

The abstraction confrontation is call: « SE and SA review »

NB: This occurs despite iterations (or eventually interruptions of SA process) when SE baseline changes during the development process.



13/09/2022



# Method for consistency between MBSE and MBSA

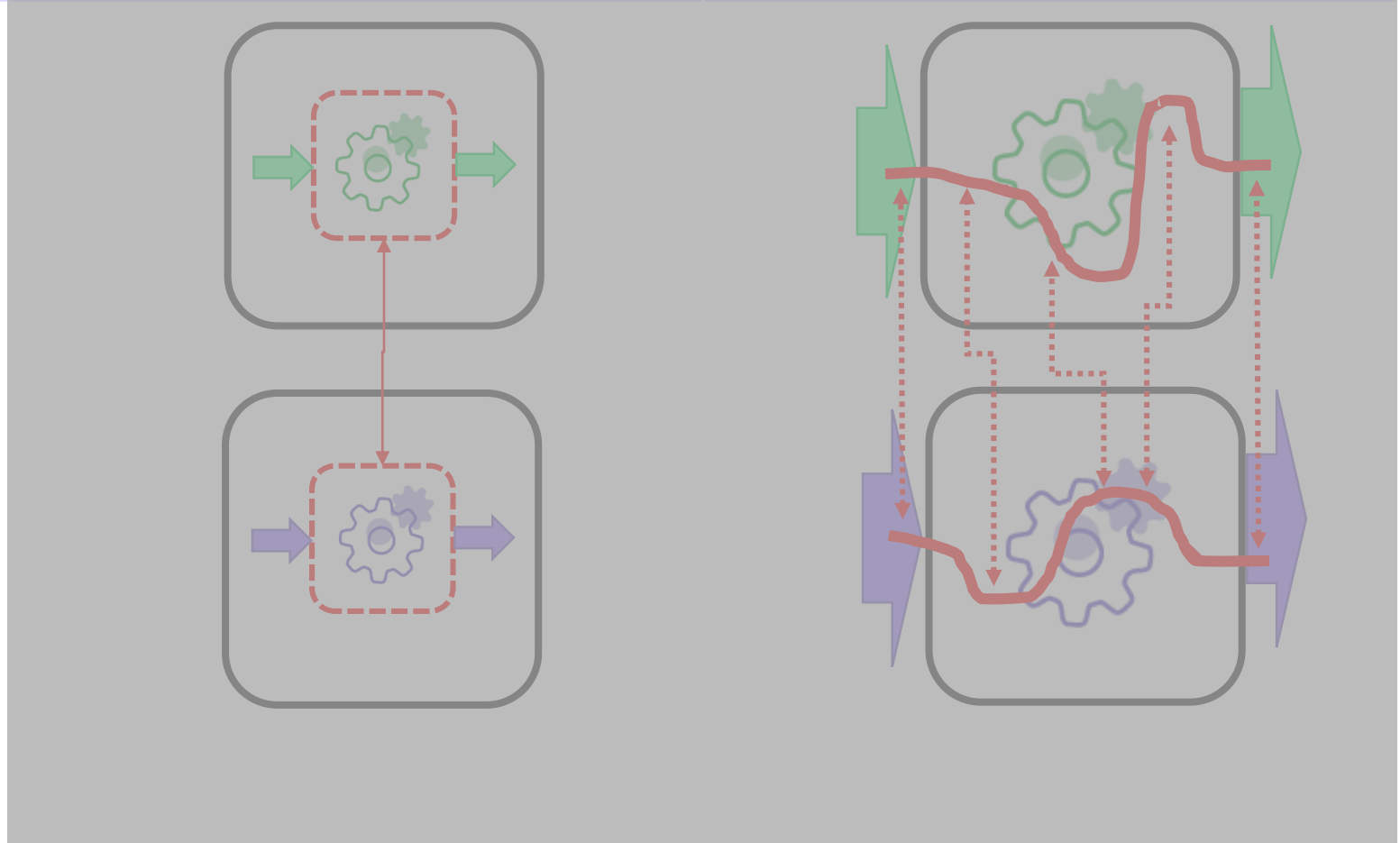
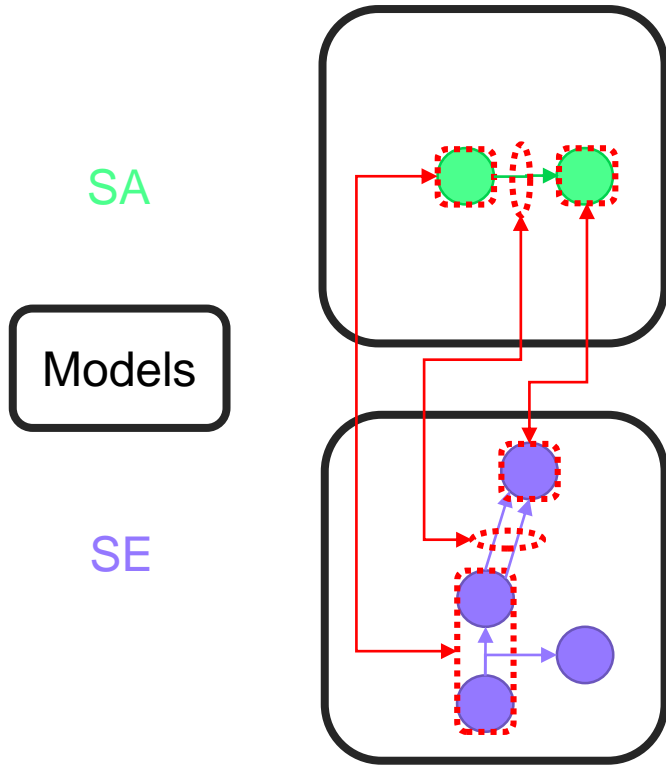
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# Narrowing the situation

# Proposed approach : high level view



Structural Scoped Review	Behavioral Scope Review	Behavioral Cross Checks
Structure and IO	Behavior and IO	Behavior and IO
Scoped	Scoped	End to end
Static analysis	Static analysis	Dynamic Observation



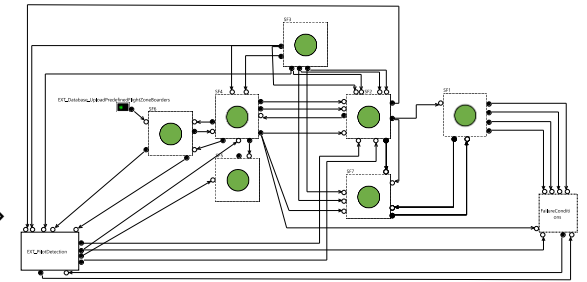
## Remind the problem :



SE one  
(CAPELLA)

**Are both models  
consistent at  
structure and interface  
levels with a scoped  
perspective?**

SA one  
(AR)

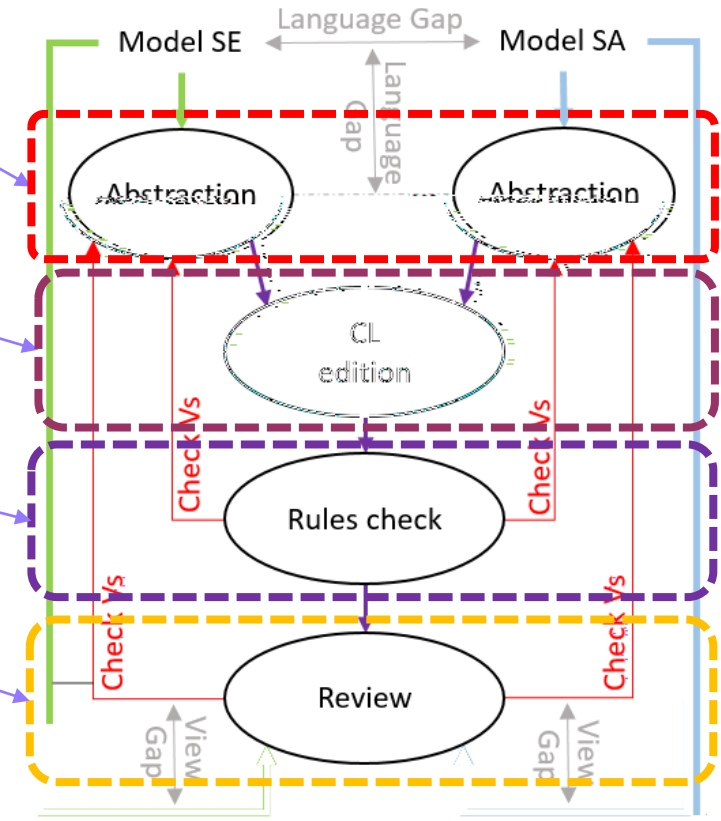


## Method

- Abstract both functional models to get their artefacts
- Define structural link (**CLFx**) over functions regarding method rules and capture: justifications, hypothesis etc.
- Define links interfaces (**CLfly**) flow regarding method rules and capture: justifications, hypothesis etc
- Check inconsistency between previous definitions
- Feed SExSA review about captures

## PoC

- Toolled process
- Coverage of the model

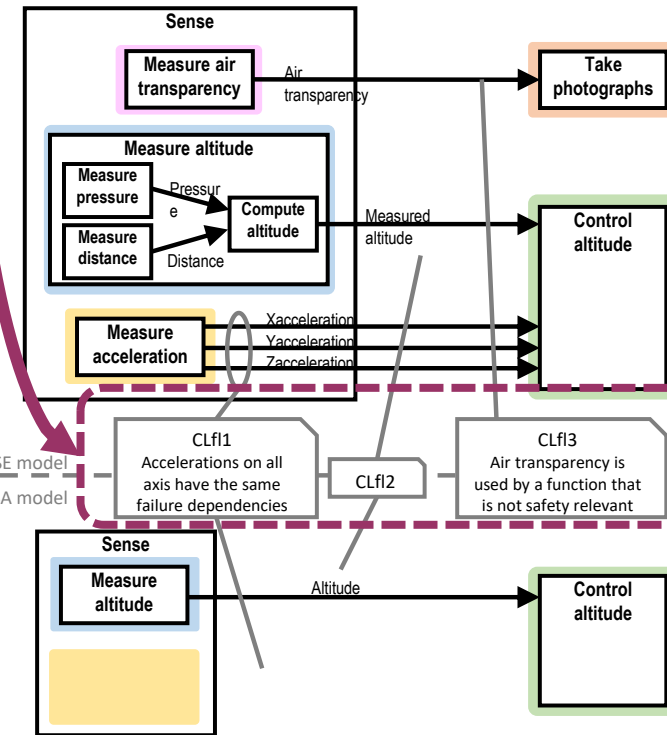
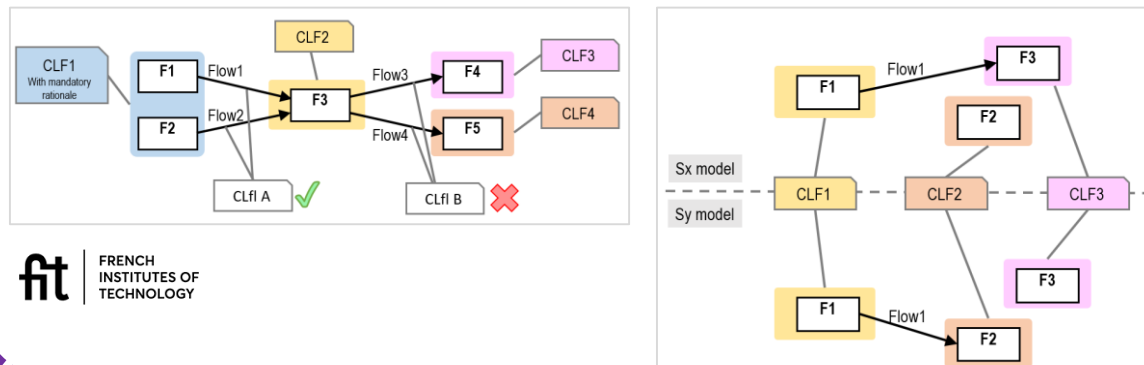
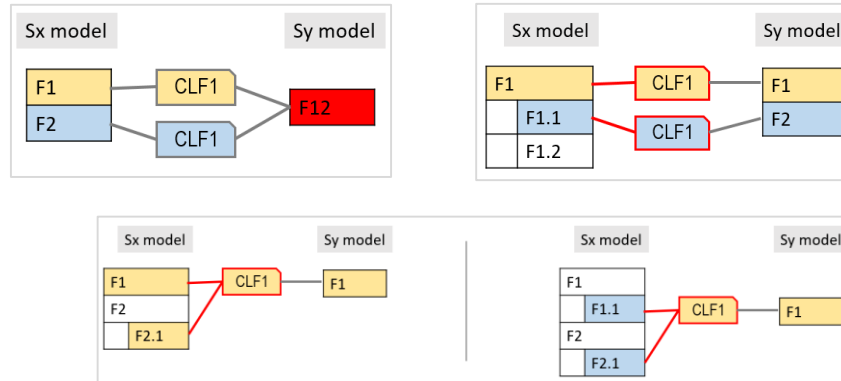
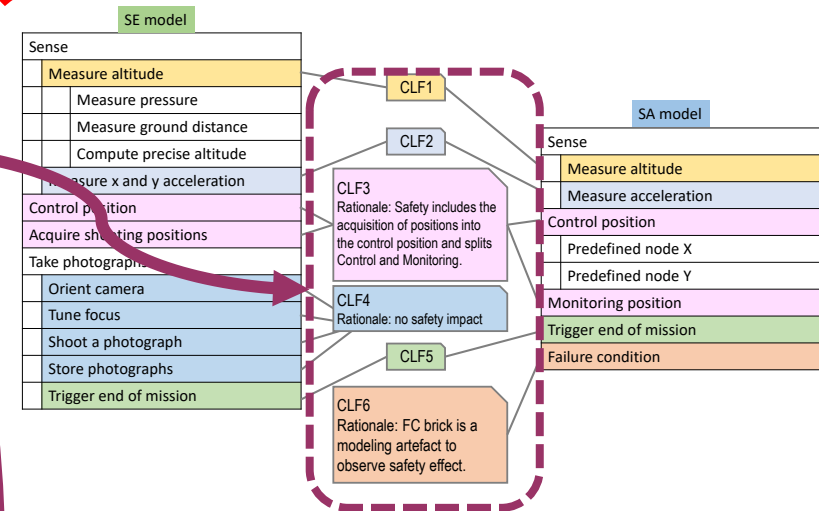


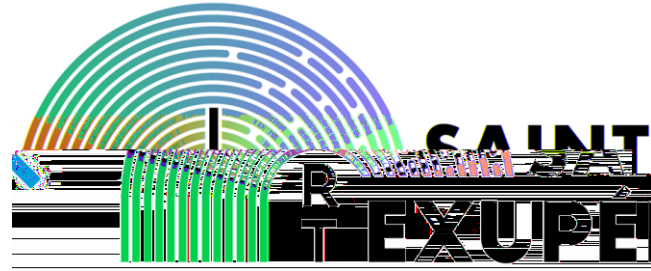


# SSR : high level processus vs Examples

page 10

- Abstract both functional models to get their artefacts (structure and interfaces)
- Define structural link (CLFx) over functions (hierarchical or leaf) regarding method rules and capture: justifications, hypothesis etc.
- Define interfaces links (CLfly) regarding method rules and capture: justifications, hypothesis etc.
- Check gaps between previous definitions
- Feed SExSA review about captures



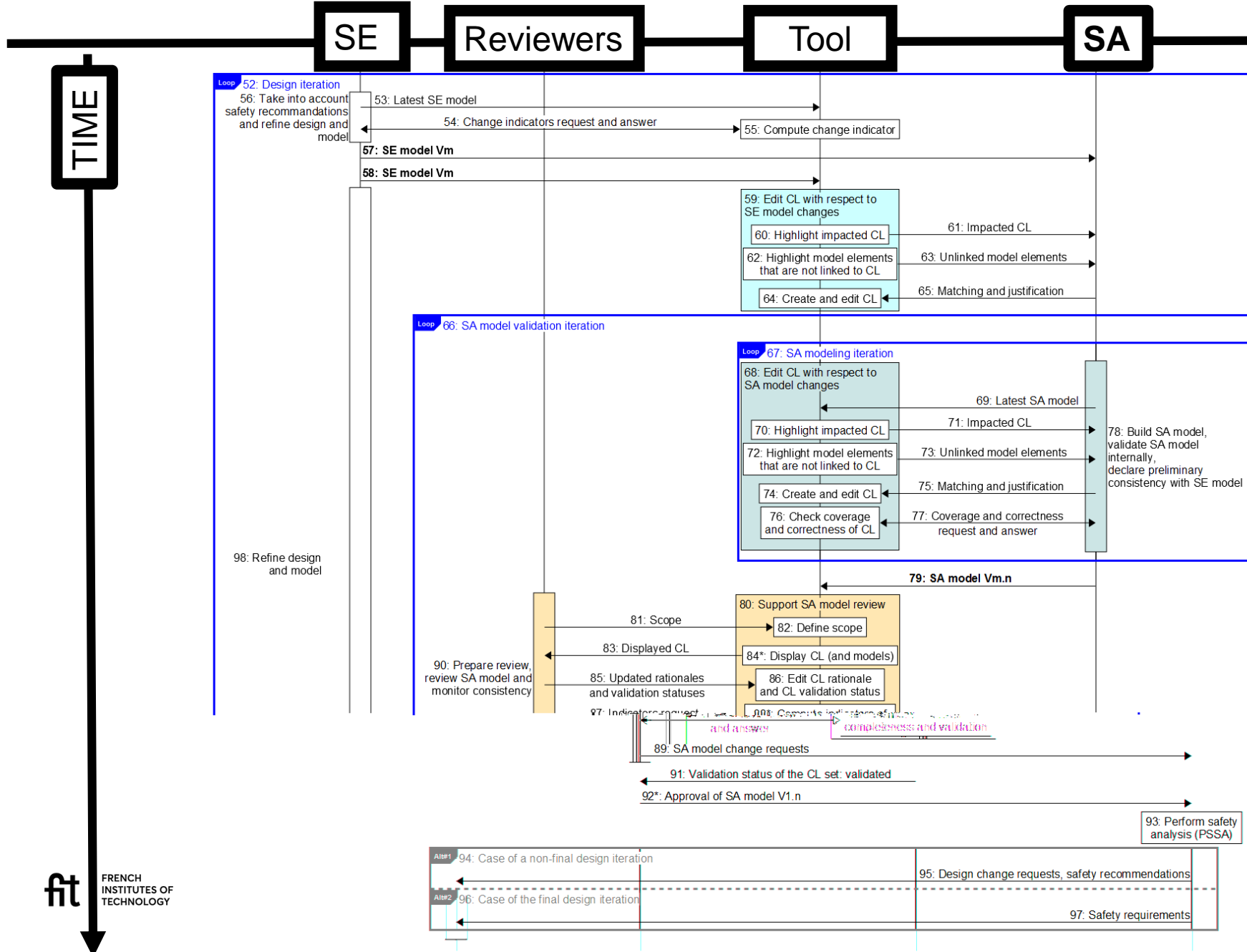
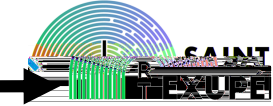


# Method for consistency between MBSE and MBSA

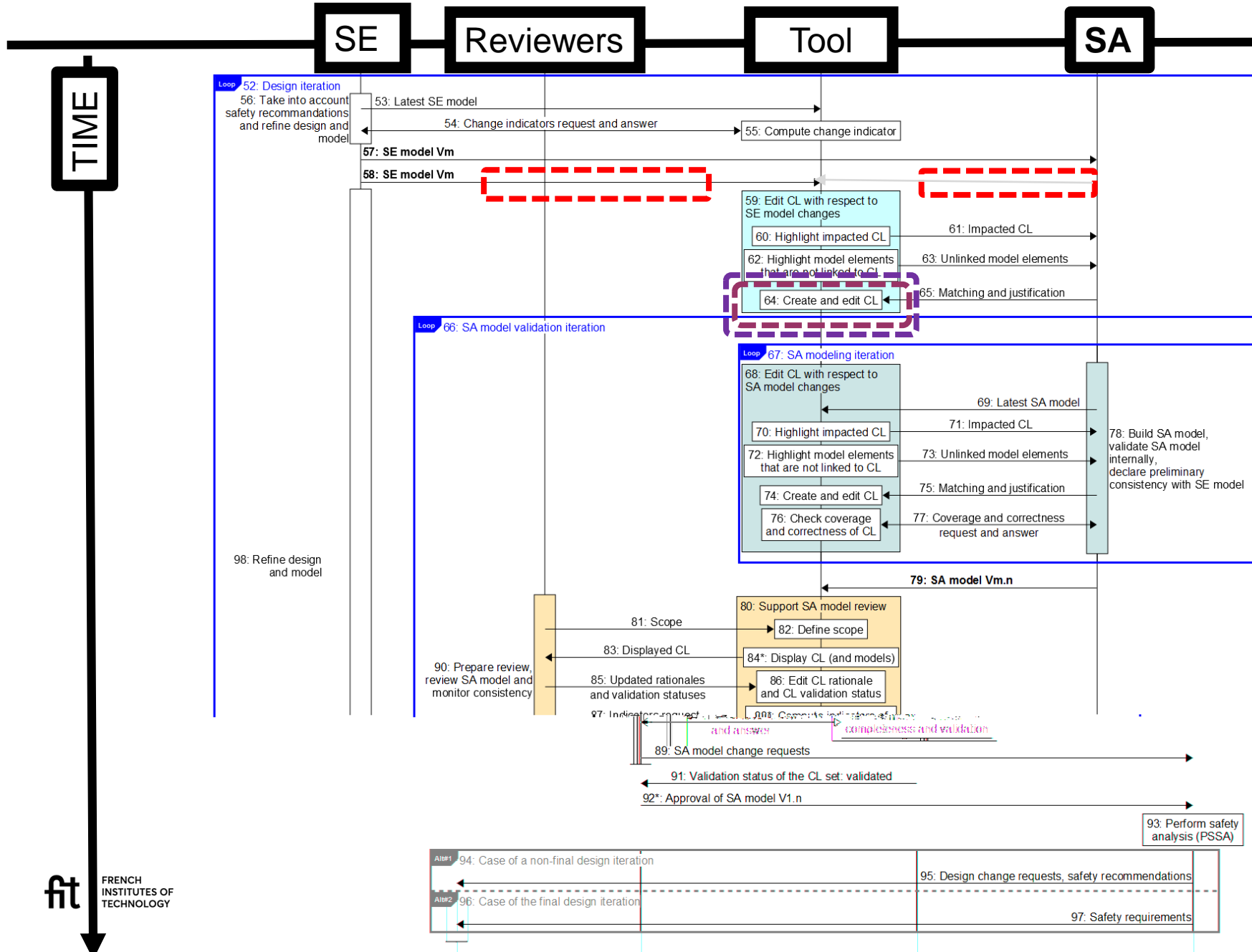
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## M&T consequences

# SSR : Low level processus

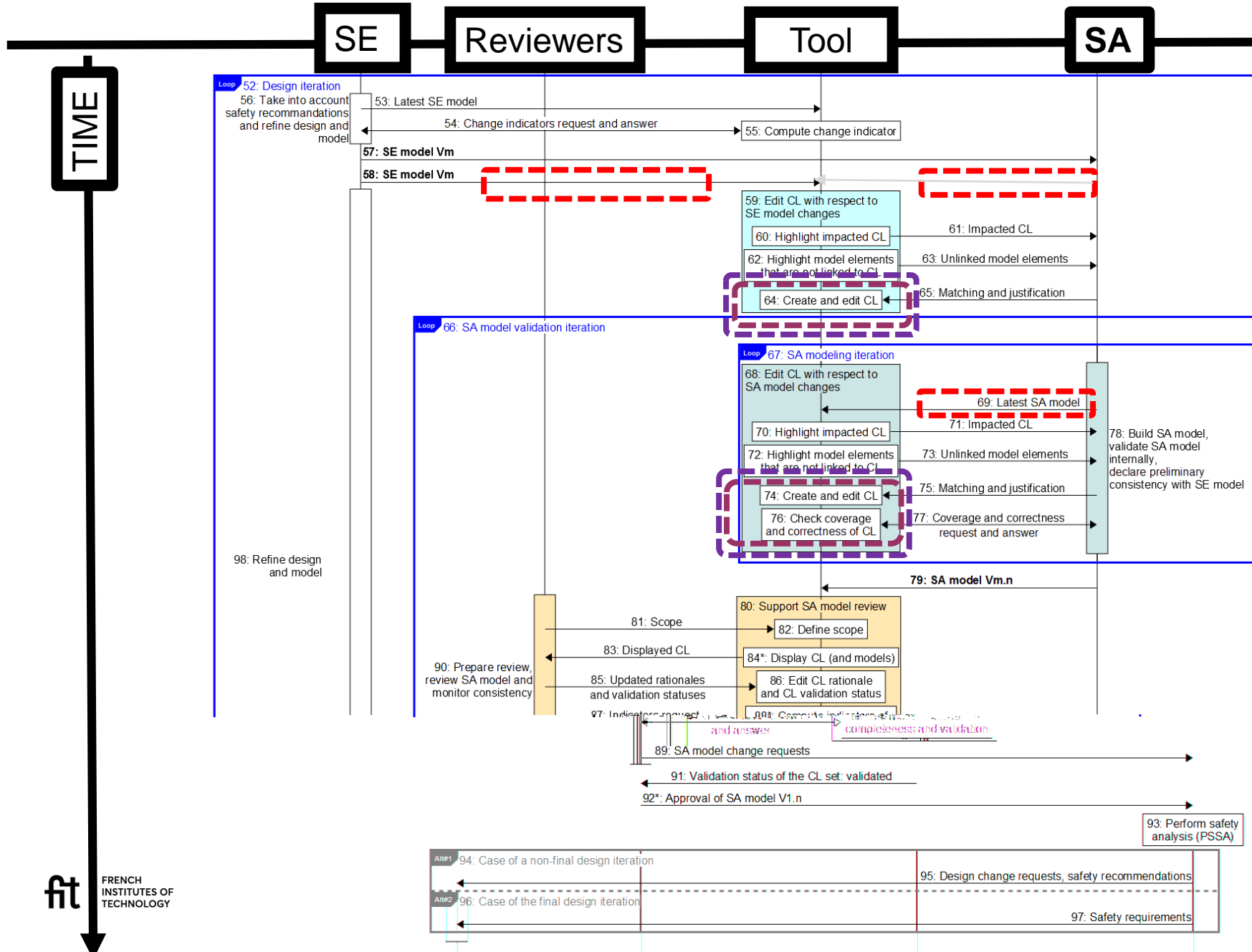


# SSR : Low level processus



SE baseline changed, so ...  
What's new ?  
(SA realign concialiable CLs)

# SSR : Low level processus

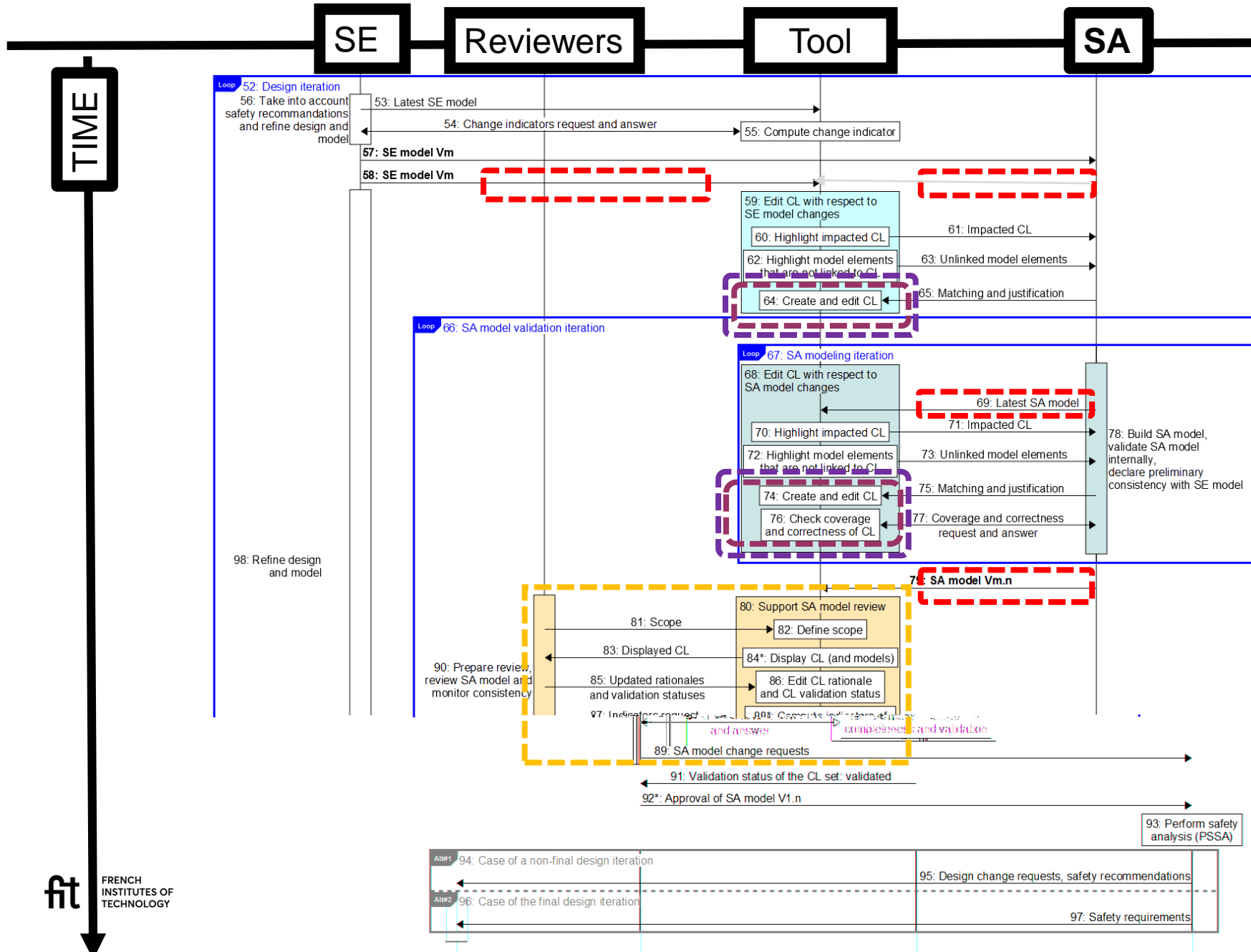


SE baseline changed, so ...  
What's new ?  
(SA realign concialiable CLs)

Unconciliable CLs means  
a SA model realignment,  
so, its recommandations too  
(SA creates/corrects CL too)

TIME

# SSR : Low level processus

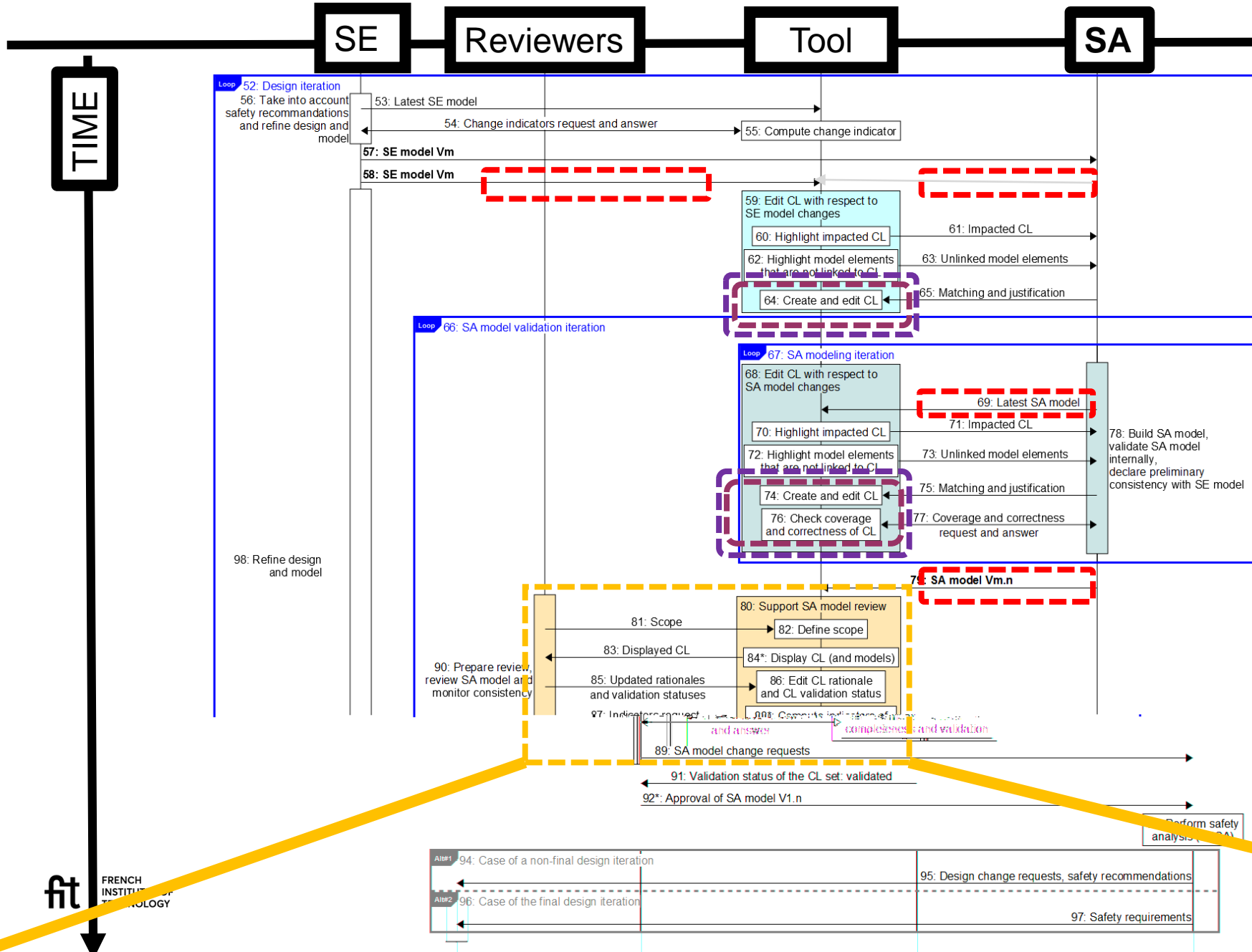


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SExSA review abstractions  
to agreed that  
recommandations are right  
(CI rationnelle ans status  
updated)

# SSR : Low level processus



SE baseline changed, so ...  
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updated)

# Review tool zonal overview

Consistency  
links tabular  
zone

Check Erros  
tabular zone

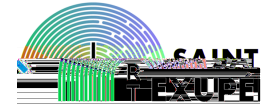
The screenshot shows a web browser window with the URL localhost:8081. The browser has two tabs: 'CL set - Version E' and 'MBSE model - Version 4.2'. The main content area is divided into three distinct zones:

- SE zone:** A green hatched area on the right side of the top half of the screen.
- SA zone:** A blue hatched area on the right side of the bottom half of the screen.
- Baselines of CL set, SE and SA model:** A yellow hatched area in the center, containing a red-bordered text box with the same text. This area is connected to the 'CL set' tab and the 'MBSE model' tab by red lines.

On the left side of the browser window, there are two yellow brackets pointing to the yellow hatched area, and two purple brackets pointing to the bottom-left corner of the browser window.

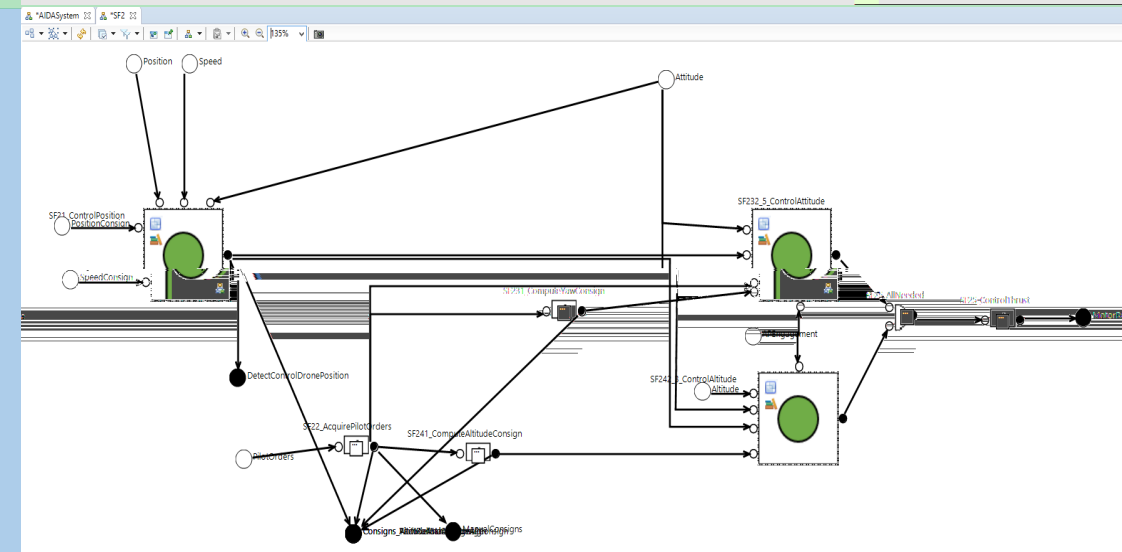
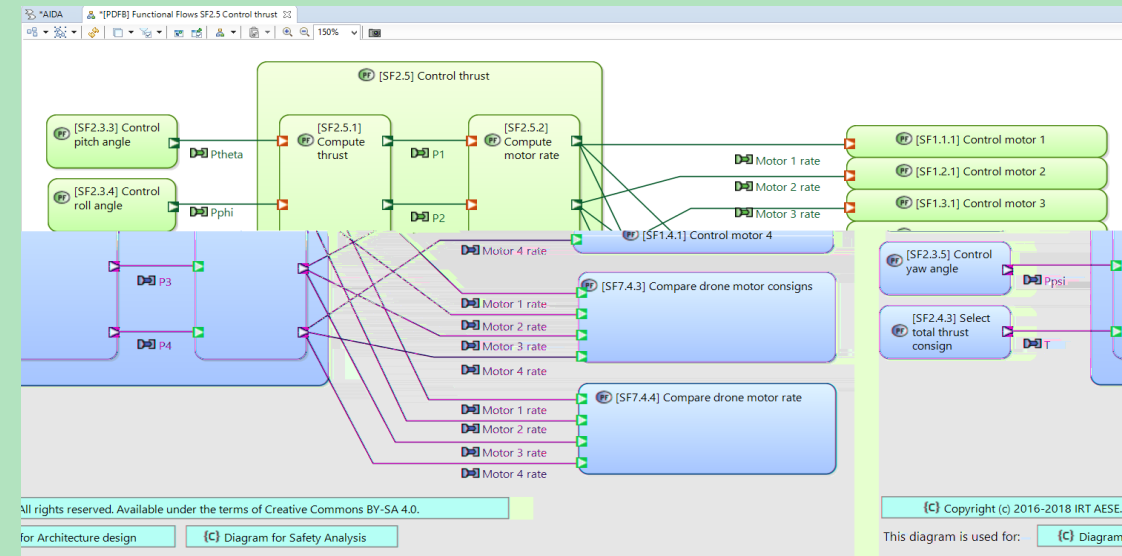


# SE&SA zones overview



# SE&SA zones overview

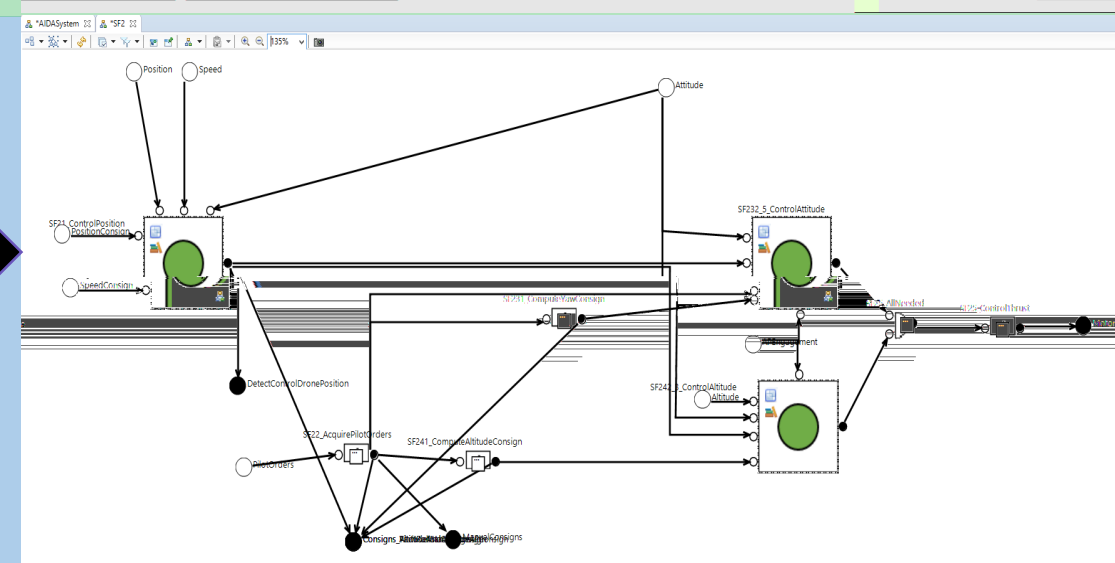
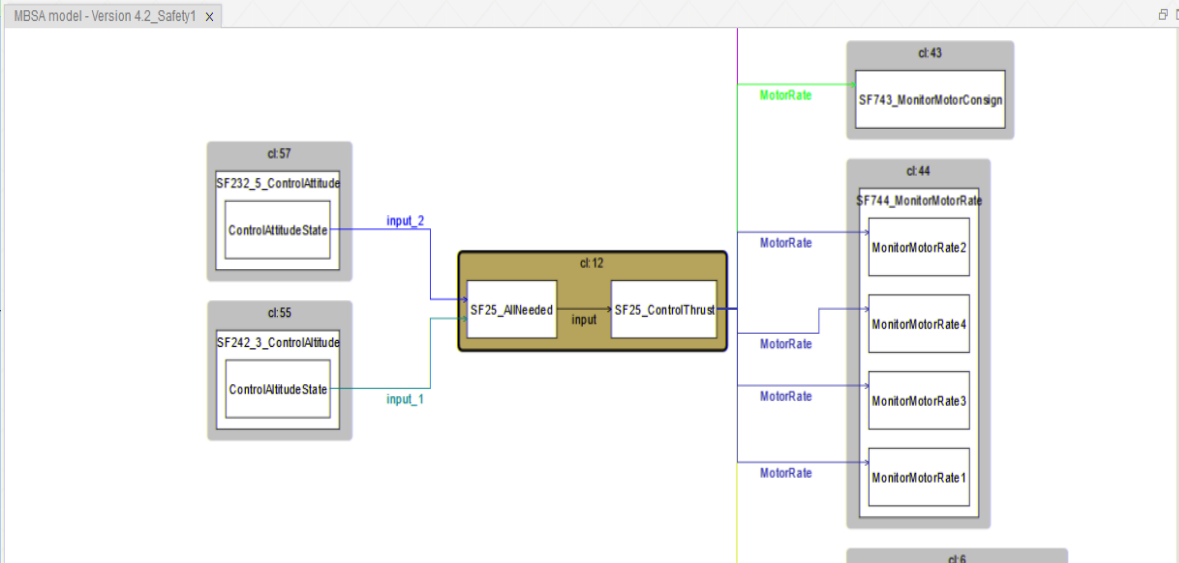
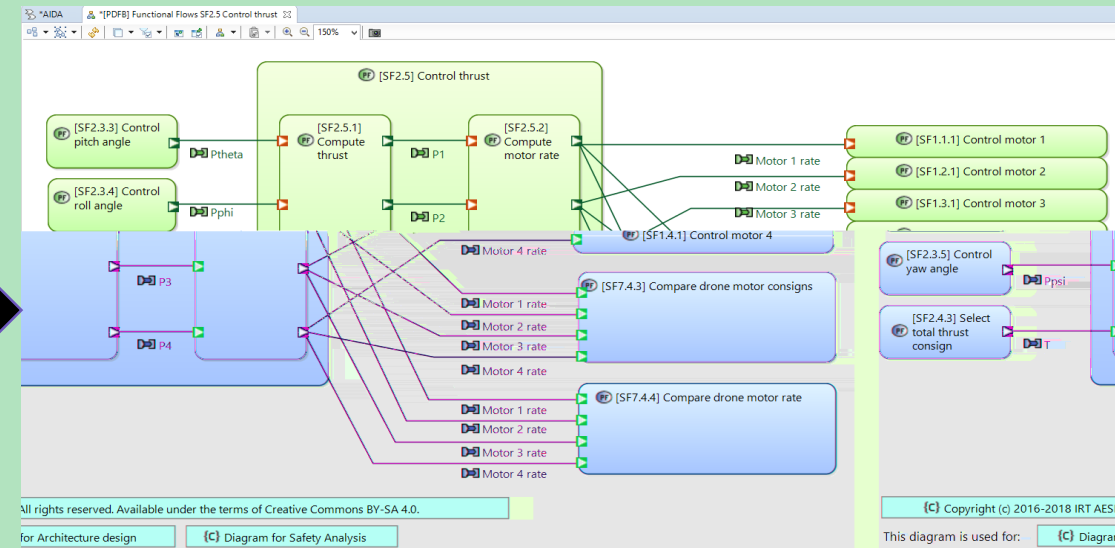
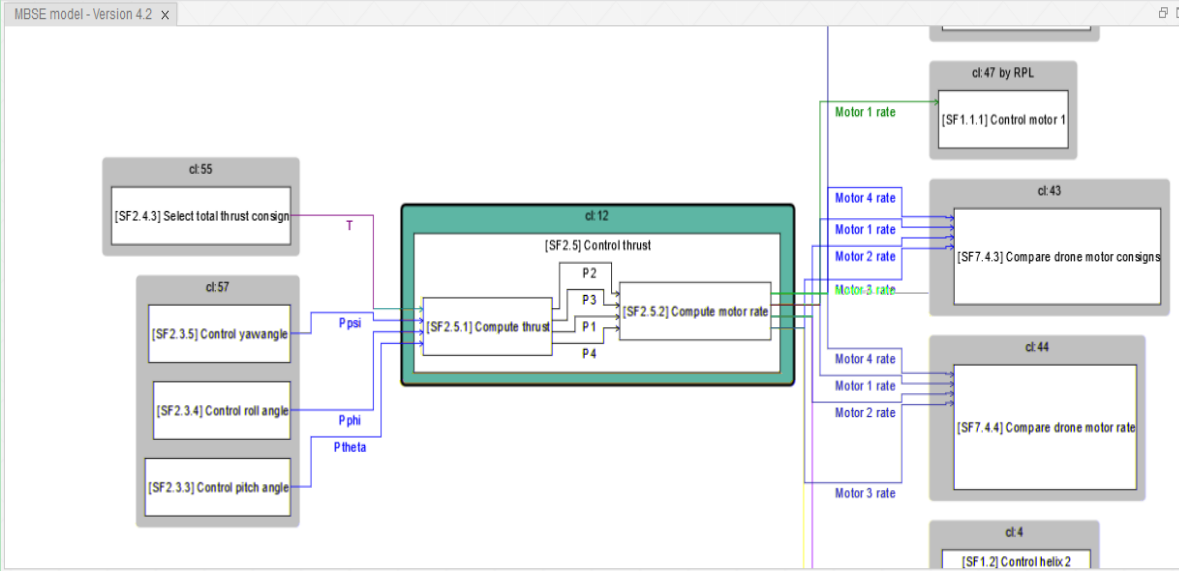
From SE and SA models ...



# SE&SA zones overview

... representations are automatically made, contextualized and centered on the CL function to be reviewed

From SE and SA models ...



# Review tool zonal overview

Consistency  
links tabular  
zone

Check Erros  
tabular zone

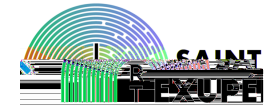
The screenshot shows a web browser window with the following elements:

- Browser tabs: "S2C - Consistency Management To...", "CL set - Version E x", and "MBSE model - Version 4.2 x".
- Address bar: "localhost:8081".
- Content area: A large yellow hatched rectangle (top) and a large purple hatched rectangle (bottom). A central white box with a red border contains the text "Baselines of CL set, SE and SA model".
- Right sidebar: A green hatched rectangle (top) and a blue hatched rectangle (bottom).
- Bottom tabs: "MBSA model - Version 4.2\_Safety1 x".

SE zone

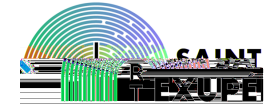
SA zone

# Tabular zone overview



CL set - Version E x			id	Cardinality	Status	SE elements	Rationale		
▶	☰	☐	cl:1	0-1	✓		Safety modeling artefact. Must be review...	■	63
▶	☰	↗	cl:1.1	0-*	✓		thrust1		
▶	☰	↗	cl:1.2	0-*	✓		thrust2		
▶	☰	↗	cl:1.3	0-*	✓		thrust3		
▶	☰	↗	cl:1.4	0-*	✓		thrust4		
▶	☰	↗	cl:1.5	0-*	✓				
▶	☰	↗	cl:1.6	0-*	✓				
▶	☰	↗	cl:1.7	0-*	✓				
▶	☰	☐	cl:12	1-m	✓	[SF2.5] Control thrust	contains REC	■	63
▶	☰	↗	cl:12.1	n-1	✓	Ppsi,Pphi,Ptheta	Same dysfunctional status	■	
▶	☰	↗	cl:12.2	1-1	✓	T		■	
▶	☰	☐	cl:14	1-1	✓	[SF3.1] Compute drone attitude			63
▶	☰	↗	cl:14.1	*-0	✓	Acceleration,North direction,Rate	Physical stimuli, cannot have dysfunction...		
▶	☰	↗	cl:14.2	*-0	✓	Pitch consign,Roll consign	See Requirement T92		
▶	☰	☐	cl:15	1-1	✓	[SF3.2] Compute drone altitude			63
▶	☰	↗	cl:15.1	n-1	✓	Drone yaw,Drone roll,Drone pitch	Attitude gathering		
▶	☰	↗	cl:15.2	*-0	✓	Pressure,Ground distance	Physical stimuli, cannot have dysfunction...		
▶	☰	☐	cl:17	1-1	✓	[SF3.3.1] Film ground			63
▶	☰	↗	cl:17.2	1-0	✓	Vertical sight	Physical stimuli, cannot have dysfunction...		
▶	☰	☐	cl:18	1-m	✓	[SF3.3.2] Compute ground speed			63
▶	☰	↗	cl:18.1	1-1	✓	Video flux			
▶	☰	↗	cl:18.2	1-1	✓	Ground altitude			
▶	☰	☐	cl:19	1-1	✓	[SF3.4] Compute drone position and time			63
▶	☰	↗	cl:19.1	1-0	✓	Positioning signal	Physical stimuli, cannot have dysfunction...		
▶	☰	☐	cl:21	1-1	✓	[SF4.1] Acquire and store flight plan			63
▶	☰	↗	cl:21.2	n-1	✓	Flight plan,Flight zone	Gathering of flight plan and flight zone		
▶	☰	☐	cl:24	1-1	✓	[SF4.3.1] Select drone control mode			63
▶	☰	↗	cl:24.1	1-1	✓	Mission completed	See Requirement T89		
▶	☰	↗	cl:24.2	1-1	✓	Pilot control mode			
▶	☰	↗	cl:24.4	n-1	✓	Vertical speed consign,Yaw rate consign...	Same dysfunctional status		
▶	☰	☐	cl:25	1-1	✓	[SF4.3.2] Passivate engagement oscillat...			63
▶	☰	↗	cl:25.1	1-1	✓	Selected control mode			
▶	☰	☐	cl:26	1-1	✓	[SF4.3.3] Indicate control mode			63
▶	☰	↗	cl:26.1	1-0	✓	Selected AP mode	See Safety Hypothesis T80		
▶	☰	↗	cl:26.2	1-1	✓	AP assessment			

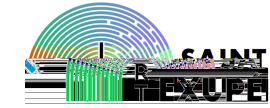
# Tabular zone overview



CL set - Version E x									
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▶	≡	↗	cl:1.1	0-*	✓		thrust1		
▶	≡	↗	cl:1.2	0-*	✓		thrust2		
▶	≡	↗	cl:1.3	0-*	✓		thrust3		
▶	≡	↗	cl:1.4	0-*	✓		thrust4		
▶	≡	↗	cl:1.5	0-*	✓				
▶	≡	↗	cl:1.6	0-*	✓				
▶	≡	↗	cl:1.7	0-*	✓				
▶	≡	□	cl:12	1-m	✓	[SF2.5] Control thrust	contains REC	■	63
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▶	≡	↗	cl:12.2	1-1	✓	T		■	
▶	≡	□	cl:14	1-1	✓	[SF3.1] Compute drone attitude			63
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▶	≡	↗	cl:14.2	*-0	✓	Pitch consign,Roll consign	See Requirement T92		
▶	≡	□	cl:15	1-1	✓	[SF3.2] Compute drone altitude			63
▶	≡	↗	cl:15.1	n-1	✓	Drone yaw,Drone roll,Drone pitch	Attitude gathering		
▶	≡	↗	cl:15.2	*-0	✓	Pressure,Ground distance	Physical stimuli, cannot have dysfunction...		
▶	≡	□	cl:17	1-1	✓	[SF3.3.1] Film ground			63
▶	≡	↗	cl:17.2	1-0	✓	Vertical sight	Physical stimuli, cannot have dysfunction...		
▶	≡	□	cl:18	1-m	✓	[SF3.3.2] Compute ground speed			63
▶	≡	↗	cl:18.1	1-1	✓	Video flux			
▶	≡	↗	cl:18.2	1-1	✓	Ground altitude			
▶	≡	□	cl:19	1-1	✓	[SF3.4] Compute drone position and time			63
▶	≡	↗	cl:19.1	1-0	✓	Positioning signal	Physical stimuli, cannot have dysfunction...		
▶	≡	□	cl:21	1-1	✓	[SF4.1] Acquire and store flight plan			63
▶	≡	↗	cl:21.2	n-1	✓	Flight plan,Flight zone	Gathering of flight plan and flight zone		
▶	≡	□	cl:24	1-1	✓	[SF4.3.1] Select drone control mode			63
▶	≡	↗	cl:24.1	1-1	✓	Mission completed	See Requirement T89		
▶	≡	↗	cl:24.2	1-1	✓	Pilot control mode			
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▶	≡	↗	cl:25.1	1-1	✓	Selected control mode			
▶	≡	□	cl:26	1-1	✓	[SF4.3.3] Indicate control mode			63
▶	≡	↗	cl:26.1	1-0	✓	Selected AP mode	See Safety Hypothesis T80		
▶	≡	↗	cl:26.2	1-1	✓	AP assessment			



# Tabular zone overview



			id	Cardinality	Status	SE elements	Rationale		
▶	≡	□	cl:1	0-1	✓		Safety modeling artefact. Must be review...	■	63
▶	≡	↗	cl:1.1	0-*	✓		thrust1		
▶	≡	↗	cl:1.2	0-*	✓		thrust2		
▶	≡	↗	cl:1.3	0-*	✓		thrust3		
▶	≡	↗	cl:1.4	0-*	✓		thrust4		
▶	≡	↗	cl:1.5	0-*	✓				
▶	≡	↗	cl:1.6	0-*	✓				
▶	≡	↗	cl:1.7	0-*	✓				
▶	≡	□	cl:12	1-m	✓	[SF2.5] Control thrust	contains REC	■	63
▶	≡	↗	cl:12.1	n-1	✓	Ppsi,Pphi,Ptheta	Same dysfunctional status	■	
▶	≡	↗	cl:12.2	1-1	✓	T		■	
▶	≡	□	cl:14	1-1	✓	[SF3.1] Compute drone attitude			63
▶	≡	↗	cl:14.1	*-0	✓	Acceleration,North direction,Rate	Physical stimuli, cannot have dysfunction...		
▶	≡	↗	cl:14.2	*-0	✓	Pitch consign,Roll consign	See Requirement T92		
▶	≡	□	cl:15	1-1	✓	[SF3.2] Compute drone altitude			63
▶	≡	↗	cl:15.1	n-1	✓	Drone yaw,Drone roll,Drone pitch	Attitude gathering		
▶	≡	↗	cl:15.2	*-0	✓	Pressure,Ground distance	Physical stimuli, cannot have dysfunction...		
▶	≡	□	cl:17	1-1	✓	[SF3.3.1] Film ground			63
▶	≡	↗	cl:17.2	1-0	✓	Vertical sight	Physical stimuli, cannot have dysfunction...		
▶	≡	□	cl:18	1-m	✓	[SF3.3.2] Compute ground speed			63
▶	≡	↗	cl:18.1	1-1	✓	Video flux			
▶	≡	↗	cl:18.2	1-1	✓	Ground altitude			
▶	≡	□	cl:19	1-1	✓	[SF3.4] Compute drone position and time			63
▶	≡	↗	cl:19.1	1-0	✓	Positioning signal	Physical stimuli, cannot have dysfunction...		
▶	≡	□	cl:21	1-1	✓	[SF4.1] Acquire and store flight plan			63
▶	≡	↗	cl:21.2	n-1	✓	Flight plan,Flight zone	Gathering of flight plan and flight zone		
▶	≡	□	cl:24	1-1	✓	[SF4.3.1] Select drone control mode			63
▶	≡	↗	cl:24.1	1-1	✓	Mission completed	See Requirement T89		
▶	≡	↗	cl:24.2	1-1	✓	Pilot control mode			
▶	≡	↗	cl:24.4	n-1	✓	Vertical speed consign,Yaw rate consign...	Same dysfunctional status		
▶	≡	□	cl:25	1-1	✓	[SF4.3.2] Passivate engagement oscillat...			63
▶	≡	↗	cl:25.1	1-1	✓	Selected control mode			
▶	≡	□	cl:26	1-1	✓	[SF4.3.3] Indicate control mode			63
▶	≡	↗	cl:26.1	1-0	✓	Selected AP mode	See Safety Hypothesis T80		
▶	≡	↗	cl:26.2	1-1	✓	AP assessment			

Type  
CL flow

Type  
CL function type

Identity  
Unique for a CL

Free editable field  
Rationale for a CL

Enum editable field  
Status of a CL



# Tabular zone overview

Actions to manage large number of CL

Type  
CL flow

Type  
CL function type

Identity  
Unique for a CL

Free editable field  
Rationale for a CL

Enum editable field  
Status of a CL

		id	Cardinality	Status	SE elements	Rationale		
▶	☐	cl:1	0-1	✓		Safety modeling artefact. Must be review...	63	^
▶	↗	cl:1.1	0-*	✓		thrust1		
▶	↗	cl:1.2	0-*	✓		thrust2		
▶	↗	cl:1.3	0-*	✓		thrust3		
▶	↗	cl:1.4	0-*	✓		thrust4		
▶	↗	cl:1.5	0-*	✓				
▶	↗	cl:1.6	0-*	✓				
▶	☐	cl:1.7	0-*	✓				
▶	☐	cl:12	1-m	✓	[SF2.5] Control thrust	contains REC	63	
▶	↗	cl:12.1	n-1	✓	Ppsi,Pphi,Ptheta	Same dysfunctional status	63	
▶	↗	cl:12.2	1-1	✓	T		63	
▶	☐	cl:14	1-1	✓	[SF3.1] Compute drone attitude		63	
▶	↗	cl:14.1	*-0	✓	Acceleration,North direction,Rate	Physical stimuli, cannot have dysfunction...		
▶	↗	cl:14.2	*-0	✓	Pitch consign,Roll consign	See Requirement T92		
▶	☐	cl:15	1-1	✓	[SF3.2] Compute drone altitude		63	
▶	↗	cl:15.1	n-1	✓	Drone yaw,Drone roll,Drone pitch	Attitude gathering		
▶	↗	cl:15.2	*-0	✓	Pressure,Ground distance	Physical stimuli, cannot have dysfunction...		
▶	☐	cl:17	1-1	✓	[SF3.3.1] Film ground		63	
▶	☐	cl:17.2	1-0	✓	Vertical sight	Physical stimuli, cannot have dysfunction...		
▶	☐	cl:18	1-m	✓	[SF3.3.2] Compute ground speed		63	
▶	↗	cl:18.1	1-1	✓	Video flux			
▶	↗	cl:18.2	1-1	✓	Ground altitude			
▶	☐	cl:19	1-1	✓	[SF3.4] Compute drone position and time		63	
▶	↗	cl:19.1	1-0	✓	Positioning signal	Physical stimuli, cannot have dysfunction...		
▶	☐	cl:21	1-1	✓	[SF4.1] Acquire and store flight plan		63	
▶	↗	cl:21.2	n-1	✓	Flight plan,Flight zone	Gathering of flight plan and flight zone		
▶	☐	cl:24	1-1	✓	[SF4.3.1] Select drone control mode		63	
▶	↗	cl:24.1	1-1	✓	Mission completed	See Requirement T89		
▶	↗	cl:24.2	1-1	✓	Pilot control mode			
▶	↗	cl:24.4	n-1	✓	Vertical speed consign,Yaw rate consign...	Same dysfunctional status		
▶	☐	cl:25	1-1	✓	[SF4.3.2] Passivate engagement oscillat...		63	
▶	☐	cl:25.1	1-1	✓	Selected control mode			
▶	☐	cl:26	1-1	✓	[SF4.3.3] Indicate control mode		63	
▶	↗	cl:26.1	1-0	✓	Selected AP mode	See Safety Hypothesis T80		
▶	↗	cl:26.2	1-1	✓	AP assessment			



# Tabular zone overview

**Get details on a CL**  
**Sort/resize/switch for each column**

**Tag Bookmark**  
**editable field**

**Actions to manage large number of CL**

	id	Cardinality	Status	SE elements	Rationale	
<input type="checkbox"/>	cl:1	0-1	✓		Safety modeling artefact. Must be review...	63
<input type="checkbox"/>	cl:1.1	0-*	✓		thrust1	
<input type="checkbox"/>	cl:1.2	0-*	✓		thrust2	
<input type="checkbox"/>	cl:1.3	0-*	✓		thrust3	
<input type="checkbox"/>	cl:1.4	0-*	✓		thrust4	
<input type="checkbox"/>	cl:1.5	0-*	✓			
<input type="checkbox"/>	cl:1.6	0-*	✓			
<input type="checkbox"/>	cl:1.7	0-*	✓			
<input type="checkbox"/>	cl:12	1-m	✓	[SF2.5] Control thrust	contains REC	63
<input type="checkbox"/>	cl:12.1	n-1	✓	Ppsi,Pphi,Ptheta	Same dysfunctional status	63
<input type="checkbox"/>	cl:12.2	1-1	✓	T		
<input type="checkbox"/>	cl:14	1-1	✓	[SF3.1] Compute drone attitude		63
<input type="checkbox"/>	cl:14.1	*-0	✓	Acceleration,North direction,Rate	Physical stimuli, cannot have dysfunction...	
<input type="checkbox"/>	cl:14.2	*-0	✓	Pitch consign,Roll consign	See Requirement T92	
<input type="checkbox"/>	cl:15	1-1	✓	[SF3.2] Compute drone altitude		63
<input type="checkbox"/>	cl:15.1	n-1	✓	Drone yaw,Drone roll,Drone pitch	Attitude gathering	
<input type="checkbox"/>	cl:15.2	*-0	✓	Pressure,Ground distance	Physical stimuli, cannot have dysfunction...	
<input type="checkbox"/>	cl:17	1-1	✓	[SF3.3.1] Film ground		63
<input type="checkbox"/>	cl:17.2	1-0	✓	Vertical sight	Physical stimuli, cannot have dysfunction...	
<input type="checkbox"/>	cl:18	1-m	✓	[SF3.3.2] Compute ground speed		63
<input type="checkbox"/>	cl:18.1	1-1	✓	Video flux		
<input type="checkbox"/>	cl:18.2	1-1	✓	Ground altitude		
<input type="checkbox"/>	cl:19	1-1	✓	[SF3.4] Compute drone position and time		63
<input type="checkbox"/>	cl:19.1	1-0	✓	Positioning signal	Physical stimuli, cannot have dysfunction...	
<input type="checkbox"/>	cl:21	1-1	✓	[SF4.1] Acquire and store flight plan		63
<input type="checkbox"/>	cl:21.2	n-1	✓	Flight plan,Flight zone	Gathering of flight plan and flight zone	
<input type="checkbox"/>	cl:24	1-1	✓	[SF4.3.1] Select drone control mode		63
<input type="checkbox"/>	cl:24.1	1-1	✓	Mission completed	See Requirement T89	
<input type="checkbox"/>	cl:24.2	1-1	✓	Pilot control mode		
<input type="checkbox"/>	cl:24.4	n-1	✓	Vertical speed consign,Yaw rate consign...	Same dysfunctional status	
<input type="checkbox"/>	cl:25	1-1	✓	[SF4.3.2] Passivate engagement oscillat...		63
<input type="checkbox"/>	cl:25.1	1-1	✓	Selected control mode		
<input type="checkbox"/>	cl:26	1-1	✓	[SF4.3.3] Indicate control mode		63
<input type="checkbox"/>	cl:26.1	1-0	✓	Selected AP mode	See Safety Hypothesis T80	
<input type="checkbox"/>	cl:26.2	1-1	✓	AP assessment		63

**Type**  
**CL flow**

**Type**  
**CL function type**

**Identity**  
**Unique for a CL**

**Free editable field**  
**Rationale for a CL**

**Enum editable field**  
**Status of a CL**

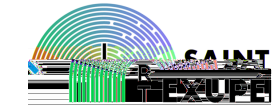
**Selection**  
**of CL function**  
**for cross checks**  
**of SE and SA**  
**models**

**Quick filtering**  
**based upon**  
**text content**

**Advanced filtering**  
**regarding needs**



# Tabular zone overview



Get details on a CL

Type  
CL flow

Type  
CL function type

Identity  
Unique for a CL

Free editable field  
Rationale for a CL

Enum editable field  
Status of a CL

		id	Cardinality	Status	SE elements	Rationale		
<input type="checkbox"/>	≡	□	cl:1	0-1	✓		Safety modeling artefact. Must be review...	63
▶	≡	↗	cl:1.1	0-*	✓	thrust1		
▶	≡	↗	cl:1.2	0-*	✓	thrust2		
▶	≡	↗	cl:1.3	0-*	✓	thrust3		
▶	≡	↗	cl:1.4	0-*	✓	thrust4		
▶	≡	↗	cl:1.5	0-*	✓			
▶	≡	↗	cl:1.6	0-*	✓			
▶	≡	↗	cl:1.7	0-*	✓			
▶	≡	□	cl:12	1-m	✓	[SF2.5] Control thrust	contains REC	63
▶	≡	↗	cl:12.1	n-1	✓	Ppsi,Pphi,Ptheta	Same dysfunctional status	63
▶	≡	↗	cl:12.2	1-1	✓	T		63
▶	≡	□	cl:14	1-1	✓	[SF3.1] Compute drone attitude		63
▶	≡	↗	cl:14.1	*-0	✓	Acceleration,North direction,Rate	Physical stimuli, cannot have dysfunction...	
▶	≡	↗	cl:14.2	*-0	✓	Pitch consign,Roll consign	See Requirement T92	
▶	≡	□	cl:15	1-1	✓	[SF3.2] Compute drone altitude		63
▶	≡	↗	cl:15.1	n-1	✓	Drone yaw,Drone roll,Drone pitch	Attitude gathering	
▶	≡	↗	cl:15.2	*-0	✓	Pressure,Ground distance	Physical stimuli, cannot have dysfunction...	
▶	≡	□	cl:17	1-1	✓	[SF3.3.1] Film ground		63
▶	≡	□	cl:17.2	1-0	✓	Vertical sight	Physical stimuli, cannot have dysfunction...	
▶	≡	□	cl:18	1-m	✓	[SF3.3.2] Compute ground speed		63
▶	≡	↗	cl:18.1	1-1	✓	Video flux		
▶	≡	↗	cl:18.2	1-1	✓	Ground altitude		
▶	≡	□	cl:19	1-1	✓	[SF3.4] Compute drone position and time		63
▶	≡	↗	cl:19.1	1-0	✓	Positioning signal	Physical stimuli, cannot have dysfunction...	
▶	≡	□	cl:21	1-1	✓	[SF4.1] Acquire and store flight plan		63
▶	≡	↗	cl:21.2	n-1	✓	Flight plan,Flight zone	Gathering of flight plan and flight zone	
▶	≡	□	cl:24	1-1	✓	[SF4.3.1] Select drone control mode		63
▶	≡	↗	cl:24.1	1-1	✓	Mission completed	See Requirement T89	
▶	≡	↗	cl:24.2	1-1	✓	Pilot control mode		
▶	≡	↗	cl:24.4	n-1	✓	Vertical speed consign,Yaw rate consign...	Same dysfunctional status	
▶	≡	□	cl:25	1-1	✓	[SF4.3.2] Passivate engagement oscillat...		63
▶	≡	↗	cl:25.1	1-1	✓	Selected control mode		
▶	≡	□	cl:26	1-1	✓	[SF4.3.3] Indicate control mode		63
▶	≡	↗	cl:26.1	1-0	✓	Selected AP mode	See Safety Hypothesis T80	
▶	≡	↗	cl:26.2	1-1	✓	AP assessment		

# Review tool overview

## when a CL is selected



The screenshot displays a software review tool interface. On the left, a table lists Configuration Elements (CLs) with their IDs, cardinalities, statuses, and associated elements. A green arrow points to the selected CL, 'cl:12'. The main area shows a block diagram of the 'MBSE model - Version 4.2' with 'cl:12' highlighted in green. Below it, a detailed view of 'cl:12' shows its internal structure, including a stateful function 'SF25\_ControlThrust' and its connections to other CLs like 'cl:57', 'cl:55', 'cl:43', and 'cl:44'.

id	Cardina...	Status	SE elements	Rationale
cl:12	1-*	✓	[SF2.5] Control thrust	contains REC
cl:12.1	*-1	✓	Ppsi,Pphi,Ptheta	Same dysfunctional status
cl:12.2	1-1	✓	T	
cl:4	1-1	✓	[SF1.2] Control helix 2	Internal synchro by RPL (...)
cl:43	1-1	✓	[SF7.4.3] Compare dron...	
cl:43.2	*-1	✓	Motor 2 rate, Motor 1 rate, ...	Same dysfunctional status
cl:44	1-1	✓	[SF7.4.4] Compare dron ...	regenerates change requ...
cl:44.1	0-1	✓	Motor 2 rate, Motor 4 rate, ...	
cl:47.1	1-1	✓	Motor 1 rate	
cl:47.1b	1-1	✓	Motor 2 rate	
cl:47.1d	1-1	✓	Motor 4 rate	
cl:5	1-1	✓	[SF1.3] Control helix 3	Internal synchro by RPL (...)
cl:55	*-1	✓	[SF2.4.2] Compute total t...	
cl:57	*-1	✓	[SF2.3.2] Select attitude ...	In Safety model, we gath...
cl:8	1-1	✓	[SF1.4] Control helix 4	Internal synchro by RPL (...)

# Review tool overview

## when a CL is selected



id	Cardina...	Status	SE elements	Rationale
cl:12	1-*	✓	[SF2.5] Control thrust	contains REC
cl:12.1	*-1	✓	Ppsi,Pphi,Ptheta	Same dysfunctional status
cl:12.2	1-1	✓	T	
cl:4	1-1	✓	[SF1.2] Control helix 2	Internal synchro by RPL (...)
cl:43	1-1	✓	[SF7.4.3] Compare dron...	
cl:43.2	*-1	✓	Motor 2 rate, Motor 1 rate, ...	Same dysfunctional status
cl:44	1-1	✓	[SF7.4.4] Compare dron ...	regenerates change requ...
cl:44.1	1-1	✓	Motor 2 rate, Motor 4 rate, ...	
cl:47.1	1-1	✓	Motor 1 rate	
cl:47.1b	1-1	✓	Motor 2 rate	
cl:47.1d	1-1	✓	Motor 4 rate	
cl:5	1-1	✓	[SF1.3] Control helix 3	Internal synchro by RPL (...)
cl:55	*-1	✓	[SF2.4.2] Compute total t...	
cl:57	*-1	✓	[SF2.3.2] Select attitude ...	In Safety model, we gath...
cl:8	1-1	✓	[SF1.4] Control helix 4	Internal synchro by RPL (...)

# Review tool overview when a CL is selected



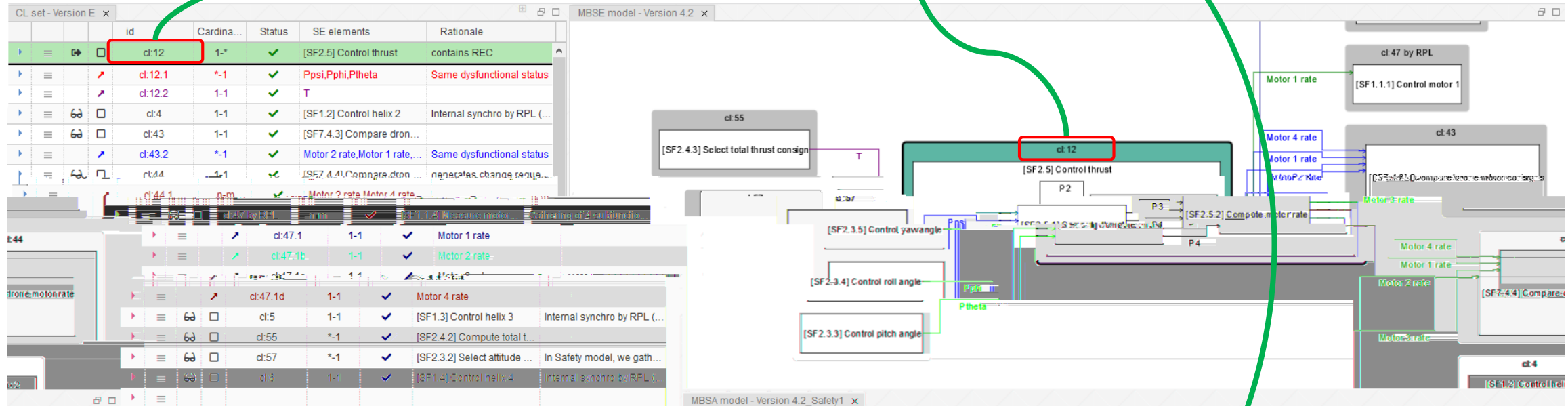
CL function being  
selected (focus is in  
green)

The screenshot displays a software review tool interface. On the left, a table lists various Control Lists (CLs) with columns for ID, Cardinality, Status, SE elements, and Rationale. The CL 'cl:12' is highlighted in green. On the right, a detailed diagram shows the internal structure of the selected CL function, including sub-functions like '[SF2.5] Control thrust' and '[SF2.3.5] Control yawangle', and their interactions with other CLs and data flows.

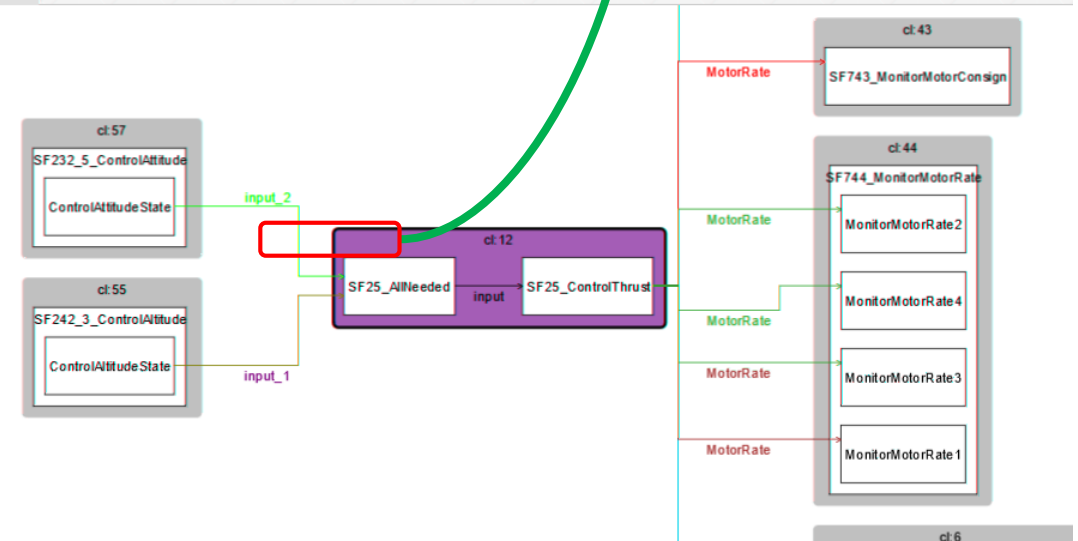
id	Cardina...	Status	SE elements	Rationale
cl:12	1-*	✓	[SF2.5] Control thrust	contains REC
cl:12.1	*-1	✓	Ppsi,Pphi,Ptheta	Same dysfunctional status
cl:12.2	1-1	✓	T	
cl:4	1-1	✓	[SF1.2] Control helix 2	Internal synchro by RPL (...)
cl:43	1-1	✓	[SF7.4.3] Compare dron...	
cl:43.2	*-1	✓	Motor 2 rate, Motor 1 rate, ...	Same dysfunctional status
cl:44	1-1	✓	[SF7.4.4] Compare dron ...	regenerates change reques...
cl:44.1	n-m	✓	Motor 2 rate, Motor 4 rate, ...	
cl:47.1	1-1	✓	Motor 1 rate	
cl:47.1b	1-1	✓	Motor 2 rate	
cl:47.1d	1-1	✓	Motor 4 rate	
cl:5	1-1	✓	[SF1.3] Control helix 3	Internal synchro by RPL (...)
cl:55	*-1	✓	[SF2.4.2] Compute total t...	
cl:57	*-1	✓	[SF2.3.2] Select attitude ...	In Safety model, we gath...
cl:8	1-1	✓	[SF1.4] Control helix 4	Internal synchro by RPL (...)

# Review tool overview when a CL is selected

CL function being selected (focus is in green)



Regarding the CL selected, zones are adapted:



# Review tool overview when a CL is selected



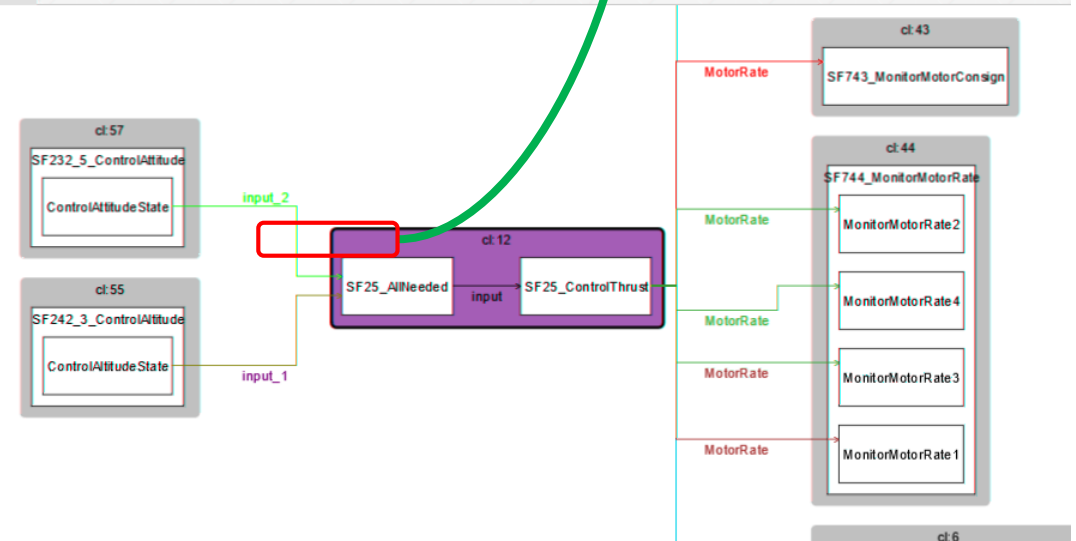
CL function being selected (focus is in green)

The interface displays a table of CLs (Control Logic) and a detailed block diagram of the selected CL (cl:12). The table lists various CLs with their IDs, cardinalities, statuses, and rationales. The selected CL, cl:12, is highlighted in green in the table and in the diagram. The diagram shows the internal structure of cl:12, including sub-functions like [SF2.5] Control thrust, [SF2.3.5] Control yaw angle, [SF2.3.4] Control roll angle, and [SF2.3.3] Control pitch angle. It also shows connections to other CLs like cl:47 by RPL, cl:43, and cl:4.

id	Cardina...	Status	SE elements	Rationale
cl:12	1-*	✓	[SF2.5] Control thrust	contains REC
cl:12.1	*-1	✓	Ppsi,Pphi,Ptheta	Same dysfunctional status
cl:12.2	1-1	✓	T	
cl:4	1-1	✓	[SF1.2] Control helix 2	Internal synchro by RPL (...)
cl:43	1-1	✓	[SF7.4.3] Compare dron...	
cl:43.2	*-1	✓	Motor 2 rate, Motor 1 rate, ...	Same dysfunctional status
cl:44	1-1	✓	[SF7.4.4] Compare dron ...	regenerates change requ...
cl:47.1	1-1	✓	Motor 1 rate	
cl:47.1b	1-1	✓	Motor 2 rate	
cl:47.1d	1-1	✓	Motor 4 rate	
cl:5	1-1	✓	[SF1.3] Control helix 3	Internal synchro by RPL (...)
cl:55	*-1	✓	[SF2.4.2] Compute total t...	
cl:57	*-1	✓	[SF2.3.2] Select attitude ...	In Safety model, we gath...
cl:8	1-1	✓	[SF1.4] Control helix 4	Internal synchro by RPL (...)

Regarding the CL selected, zones are adapted:  
\* The tabular one shows related CLs

id	Cardina...	Status	SE elements	Rationale
cl:12	1-*	✓	[SF2.5] Control thrust	contains REC
cl:12.1	*-1	✓	Ppsi,Pphi,Ptheta	Same dysfunctional status
cl:12.2	1-1	✓	T	
cl:4	1-1	✓	[SF1.2] Control helix 2	Internal synchro by RPL (...)
cl:43	1-1	✓	[SF7.4.3] Compare dron...	
cl:43.2	*-1	✓	Motor 2 rate, Motor 1 rate, ...	Same dysfunctional status
cl:44	1-1	✓	[SF7.4.4] Compare dron ...	regenerates change requ...
cl:47.1	1-1	✓	Motor 1 rate	
cl:47.1b	1-1	✓	Motor 2 rate	
cl:47.1d	1-1	✓	Motor 4 rate	
cl:5	1-1	✓	[SF1.3] Control helix 3	Internal synchro by RPL (...)
cl:55	*-1	✓	[SF2.4.2] Compute total t...	
cl:57	*-1	✓	[SF2.3.2] Select attitude ...	In Safety model, we gath...
cl:8	1-1	✓	[SF1.4] Control helix 4	Internal synchro by RPL (...)



# Review tool overview when a CL is selected

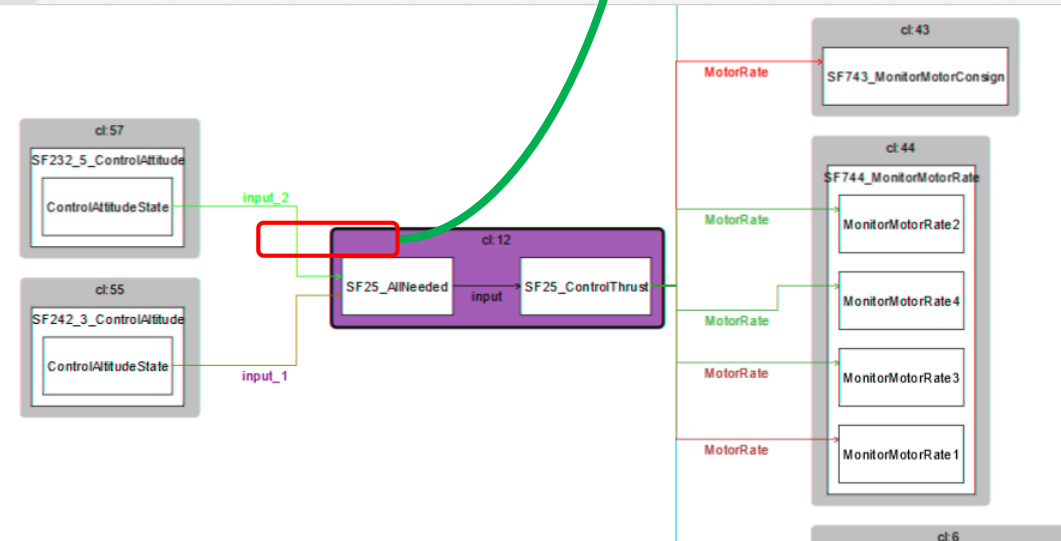


CL function being selected (focus is in green)

The screenshot displays the review tool interface. On the left, a table lists various CLs (Control Logic) with columns for ID, Cardinality, Status, SE elements, and Rationale. The CL 'cl:12' is highlighted in green. On the right, a detailed diagram shows the internal structure of 'cl:12', including sub-functions like '[SF2.5] Control thrust' and '[SF2.3.5] Control yawangle', and their interactions with other CLs and data flows.

id	Cardina...	Status	SE elements	Rationale
cl:12	1-*	✓	[SF2.5] Control thrust	contains REC
cl:12.1	*-1	✓	Ppsi,Pphi,Ptheta	Same dysfunctional status
cl:12.2	1-1	✓	T	
cl:4	1-1	✓	[SF1.2] Control helix 2	Internal synchro by RPL (...)
cl:43	1-1	✓	[SF7.4.3] Compare dron...	
cl:43.2	*-1	✓	Motor 2 rate, Motor 1 rate, ...	Same dysfunctional status
cl:44	1-1	✓	[SF7.4.4] Compare dron ...	regenerates change reques...
cl:47.1	1-1	✓	Motor 1 rate	
cl:47.1b	1-1	✓	Motor 2 rate	
cl:47.1d	1-1	✓	Motor 4 rate	
cl:5	1-1	✓	[SF1.3] Control helix 3	Internal synchro by RPL (...)
cl:55	*-1	✓	[SF2.4.2] Compute total t...	
cl:57	*-1	✓	[SF2.3.2] Select attitude ...	In Safety model, we gath...
cl:8	1-1	✓	[SF1.4] Control helix 4	Internal synchro by RPL (...)

- Regarding the CL selected, zones are adapted:
- \* The tabular one shows related CLs
  - \* The SE and SA ones show related model items:
    - input and output flows,
    - neighbors functions
    - sub fonctions





# Review tool overview when a CL is selected

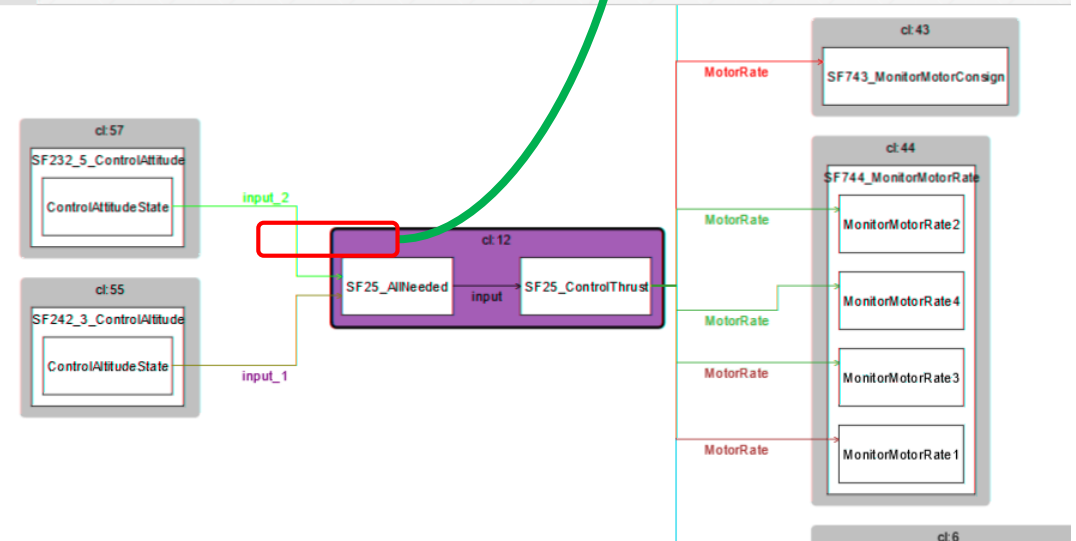
CL function being selected (focus is in green)

Seamlessly adapt the representation to ease the review

The screenshot shows a software review tool interface. On the left, a table lists various Control Logic (CL) items. The table has columns for 'id', 'Cardina...', 'Status', 'SE elements', and 'Rationale'. The row for 'cl:12' is highlighted in green. A red box highlights the 'id' column for 'cl:12'. A green arrow points from this box to a detailed diagram of the 'cl:12' function. The diagram shows a central box for '[SF2.5] Control thrust' with various inputs and outputs. A red box highlights the 'cl:12' box in the diagram. A black arrow points from the table to the diagram.

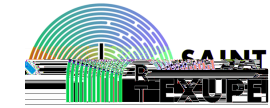
id	Cardina...	Status	SE elements	Rationale
cl:12	1-*	✓	[SF2.5] Control thrust	contains REC
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cl:4	1-1	✓	[SF1.2] Control helix 2	Internal synchro by RPL (...)
cl:43	1-1	✓	[SF7.4.3] Compare dron...	
cl:43.2	*-1	✓	Motor 2 rate, Motor 1 rate,...	Same dysfunctional status
cl:44	1-1	✓	[SF7.4.4] Compare dron ...	regenerates change reques...
cl:47.1	1-1	✓	Motor 1 rate	
cl:47.1b	1-1	✓	Motor 2 rate	
cl:47.1d	1-1	✓	Motor 4 rate	
cl:5	1-1	✓	[SF1.3] Control helix 3	Internal synchro by RPL (...)
cl:55	*-1	✓	[SF2.4.2] Compute total t...	
cl:57	*-1	✓	[SF2.3.2] Select attitude ...	In Safety model, we gath...
cl:8	1-1	✓	[SF1.4] Control helix 4	Internal synchro by RPL (...)

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# Review tool overview

## when a CL is selected



CL set - Version E x MBSE model - Version 4.2 x

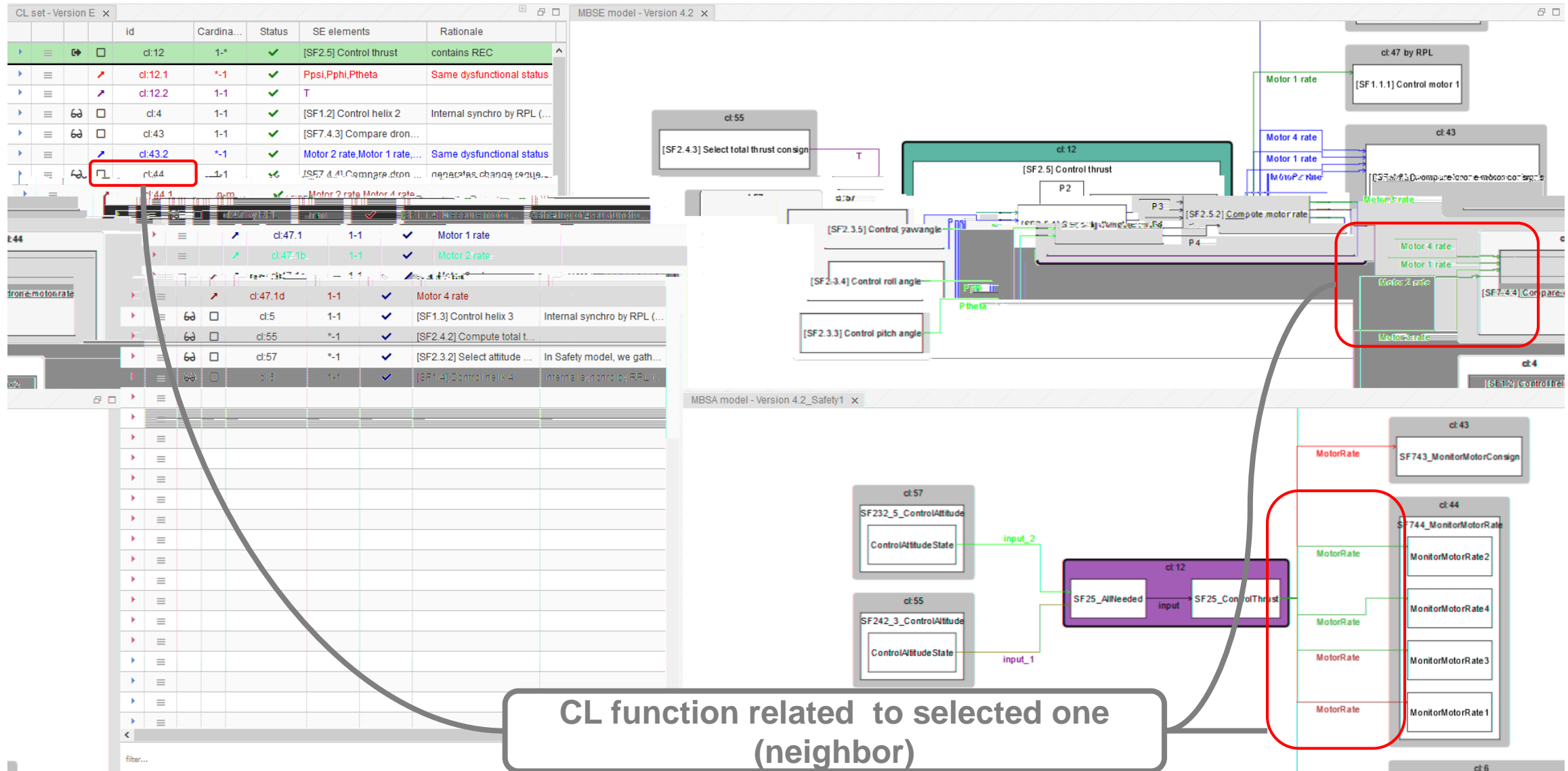
id	Cardina...	Status	SE elements	Rationale
cl:12	1-*	✓	[SF2.5] Control thrust	contains REC
cl:12.1	*-1	✓	Ppsi,Pphi,Ptheta	Same dysfunctional status
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cl:4	1-1	✓	[SF1.2] Control helix 2	Internal synchro by RPL (...)
cl:43	1-1	✓	[SF7.4.3] Compare dron...	
cl:43.2	*-1	✓	Motor 2 rate, Motor 1 rate,...	Same dysfunctional status
cl:44	1-1	✓	[SF7.4.4] Compare dron ...	regenerates change requ...
cl:44.1	1-1	✓	Motor 2 rate, Motor 4 rate,...	
cl:47.1	1-1	✓	Motor 1 rate	
cl:47.1b	1-1	✓	Motor 2 rate	
cl:47.1d	1-1	✓	Motor 4 rate	
cl:5	1-1	✓	[SF1.3] Control helix 3	Internal synchro by RPL (...)
cl:55	*-1	✓	[SF2.4.2] Compute total t...	
cl:57	*-1	✓	[SF2.3.2] Select attitude ...	In Safety model, we gath...
cl:8	1-1	✓	[SF1.4] Control helix 4	Internal synchro by RPL (...)

MBSE model - Version 4.2 x

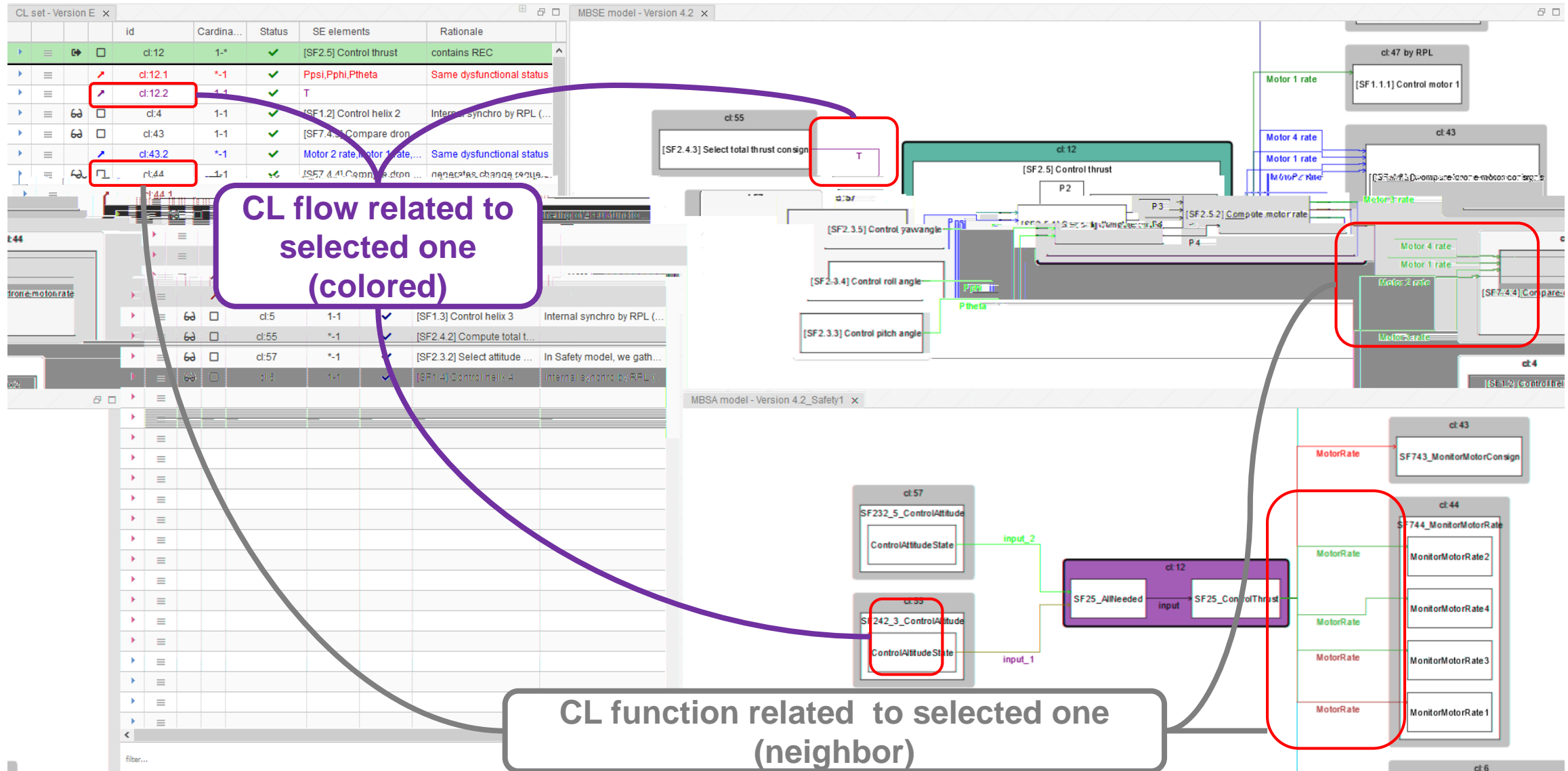
MBSA model - Version 4.2\_Safety1 x

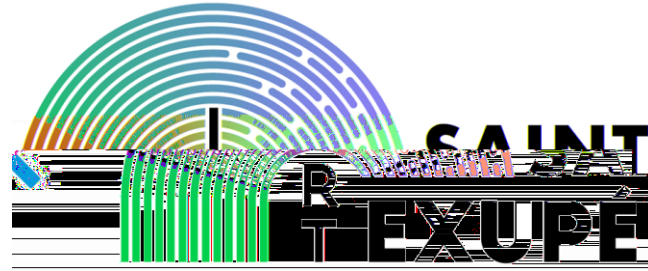
# Review tool overview

## when a CL is selected



# Review tool overview when a CL is selected





# Method for consistency between MBSE and MBSA

## - Example

# Seeing Some Principles

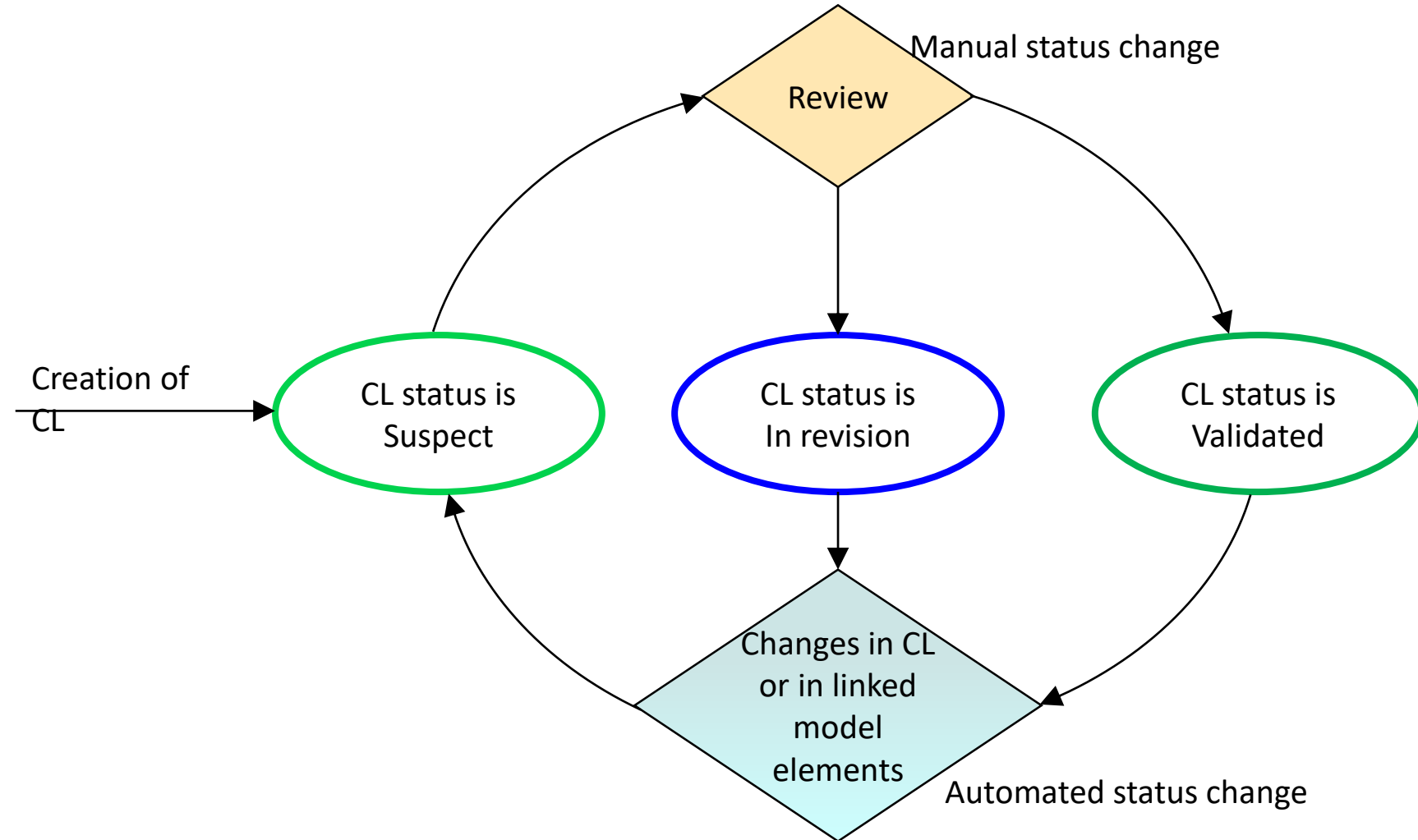


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The here after video will show how a review is done

In this context remember:

- Errors are corrected (i.e. no CL check trig)
- SA tagged the CL status she had changed to mark them suspects before review
- Review aim to change the state from suspect to validated regarding the following state diagram



id	Cardinality	Status	SE elements	Rationale
▶	≡			
▶	≡			
▶	≡			
▶	≡			
▶	≡			
▶	≡			
▶	≡			
▶	≡			
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### 1 Credential Info

Team:  Password:

Enter the team name here Enter a valid password

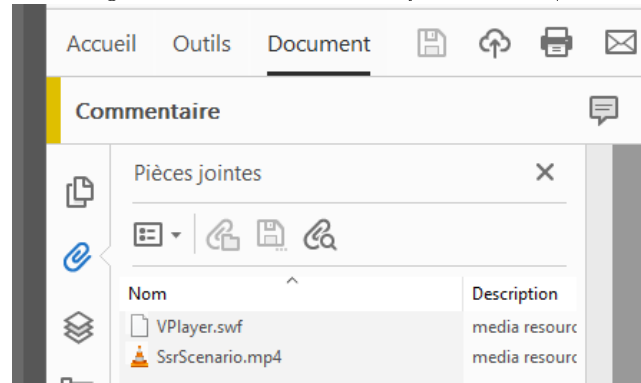
---

### 2 Server Info

Hostname:  Port:

Enter a valid hostname Enter a valid port

Get Video from PDF using attachement services of your reader (here above with Acrobat):





# A little bit of context before to start



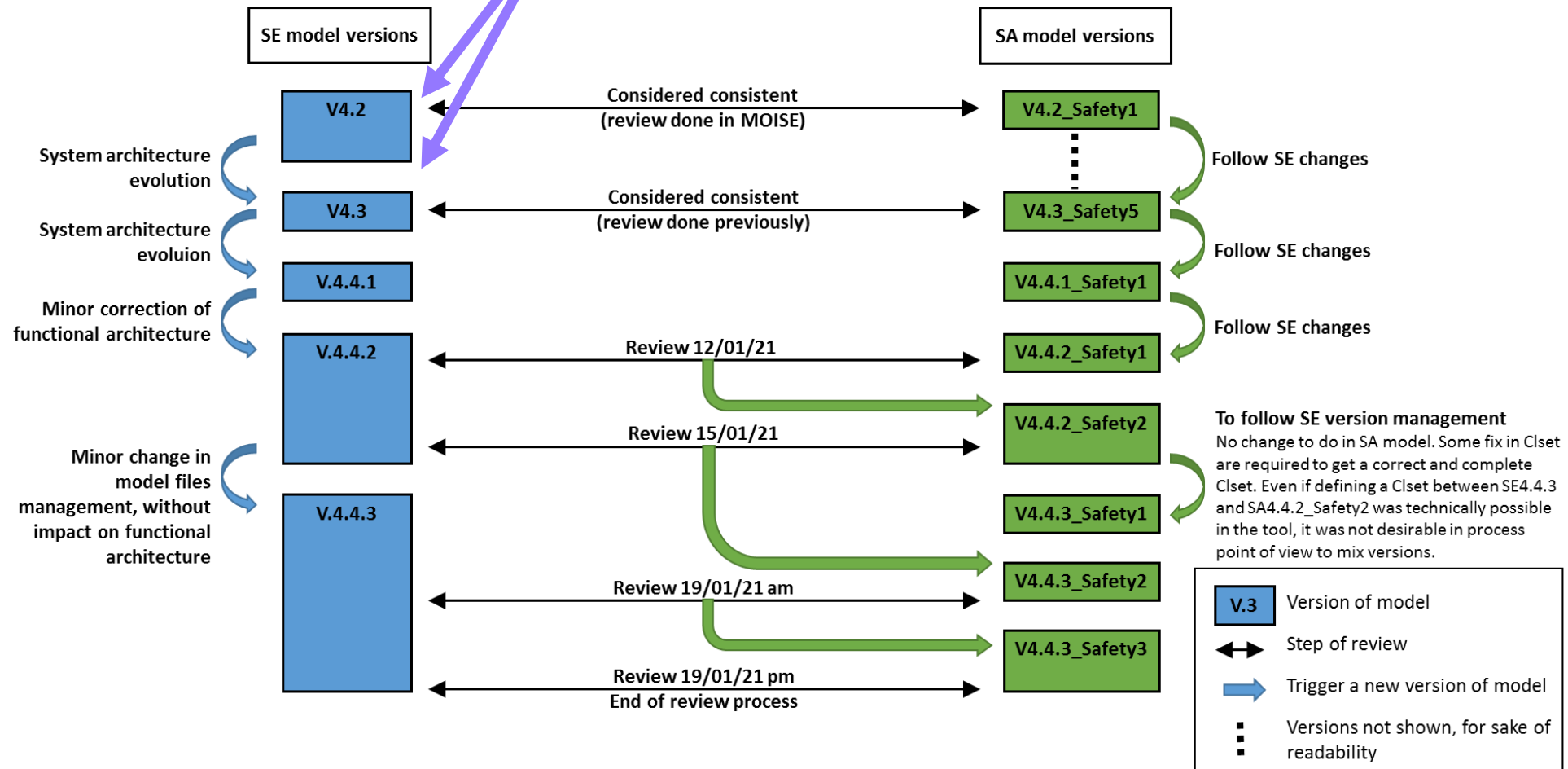
Page 21

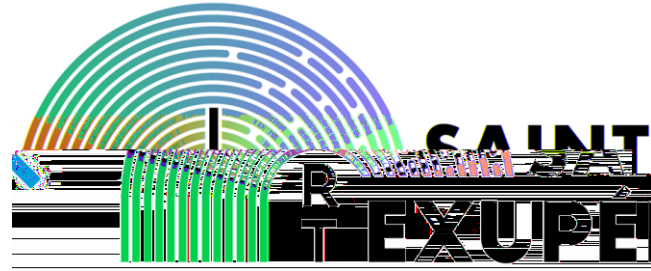
## During dev. of AIDA

SE baselined several versions and SA make some too, in order to converge to the review

## To show some error and their management

So we will focus here and there



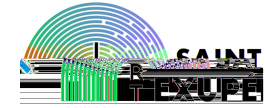


# Method for consistency between MBSE and MBSA

-

# Returns of experience

# What We Learn...



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## **CL are a curative way of doing model transformation from SE to SA**

CL can be seen as a configuration for SE Model transformation to SA Model.

## **A total freedom in SA model can jeopardize the proof of all**

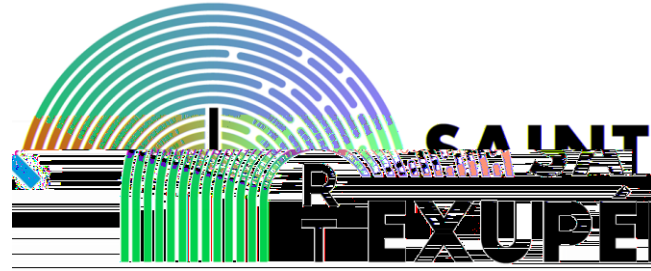
To respect CL checks the SA model can not be done as SA please.

## **Not having treated physical level hide subtle situations not handle**

CI are design for the fonctionnal level not for the physical level which is more complex and have corner cases that are not handle.

## **Absence of behavior hide many other problem in consistency**

As we limit ourselves to structures and interfaces, the proof that behaviors describe in delimited each perimeter by CL is not reached.



# Method for consistency between MBSE and MBSA

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## Side advantage

# Additional result: Consistency review between 2 SE models defined with different SE languages

