

Proof of Concept (POC) for a dynamic consistency management (Operating Instructions)

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Summary

This document aims at presenting the operating instructions that concern the proof of concept tool build to manage change evolution and maintain consistency over time, referred to as dynamic consistency management.

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Evolutions

Version	Date	Modified §	Modification summary	Modified by
V1	31/03/2023	all	Creation of the Document	Stephen Creff

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1 Introduction

1.1 Purpose of document

This document aims at presenting the operating instructions that concern the proof of concept tool build to manage change evolution and maintain consistency over time, referred to as dynamic consistency management.

1.2 Referenced documents

1.2.1 S2C referenced documents

Title	Reference
POC Dynamic Consistency Management	NT-S085L01-047 ISX-S2C-DOC-471
S2C_Cotation_Impact_S03_2023	NT-S085L01-049 ISX-S2C-DOC-473

1.2.2 External referenced documents

Title	Reference

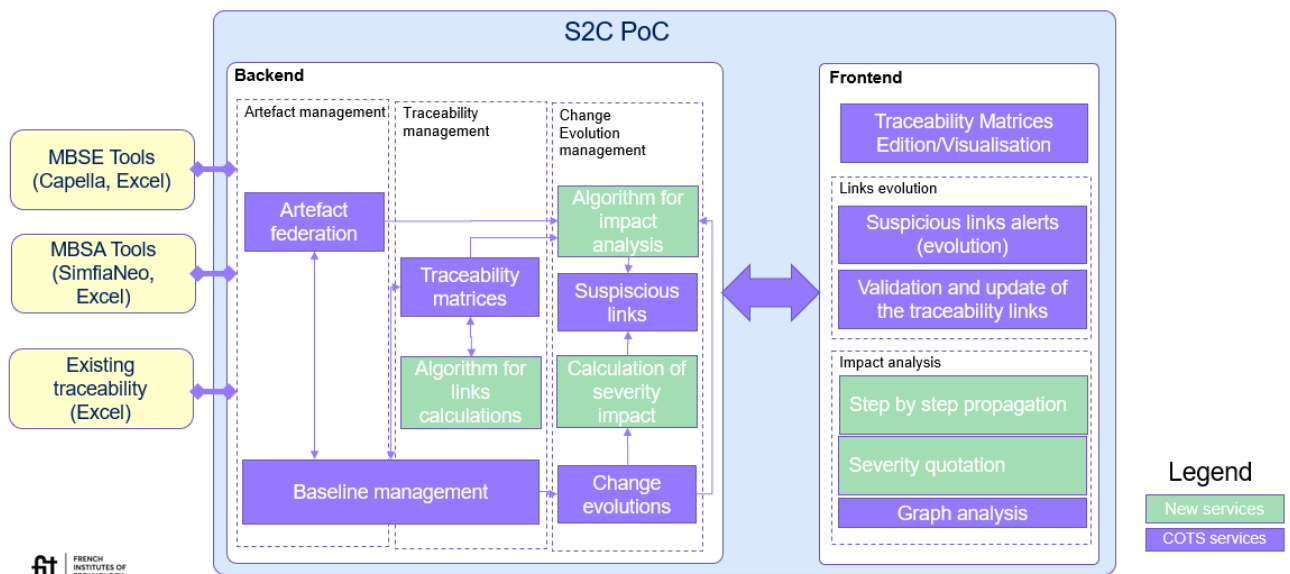
2 Overview of the POC Dynamic Consistency Management

This POC is a tooling demonstration of what can be done in terms of change and impact analysis of SE or SA artefacts, based on a traceability plan. This POC is intended to help the safety analyst in the impact analysis of his perimeter, when any inputs data has changed.

S2C Dynamic consistency management PoC

Additional services of the PoC (vs COTS) :

- Suggestion of traceability links when artefact change;
- Impact analysis;
- Severity quotation of the impact



PoC example, with Capella, SimfiaNeo and Excel for illustration purpose

Figure 1: PoC architecture overview

This POC offers some current services (in purple), already proposed by other COTS tools, but makes also a focus on new services (in green), not yet implemented in COTS:

- Suggestion of traceability links when artefact change;
- Impact analysis;
- Severity quotation of the impact

The POC proposes a traceability management service where traceability matrix can be performed and modified. It also proposes a first version of a links calculation algorithm, based on the analysis of the traceability matrix and the content of the previous baseline. It suggests new traceability links between artefacts when artefacts have changed. This algorithm is used to help the safety analyst in its analysis, during step by step propagation process (see frontend).

The service “change evolution management” is composed of different functionalities, as suspicious link or change evolution management, but proposes also a mechanism to calculate the impact severity of a change (minor, major, critical). This mechanism is displayed during the step by step propagation process. It is based on the decision trees available in deliverable “S2C_Cotation_Impact_S03_2023”.

The PoC home page is the one shown in Figure 2. On the left side is the main tab menu, the main initial page shows the use-cases management.

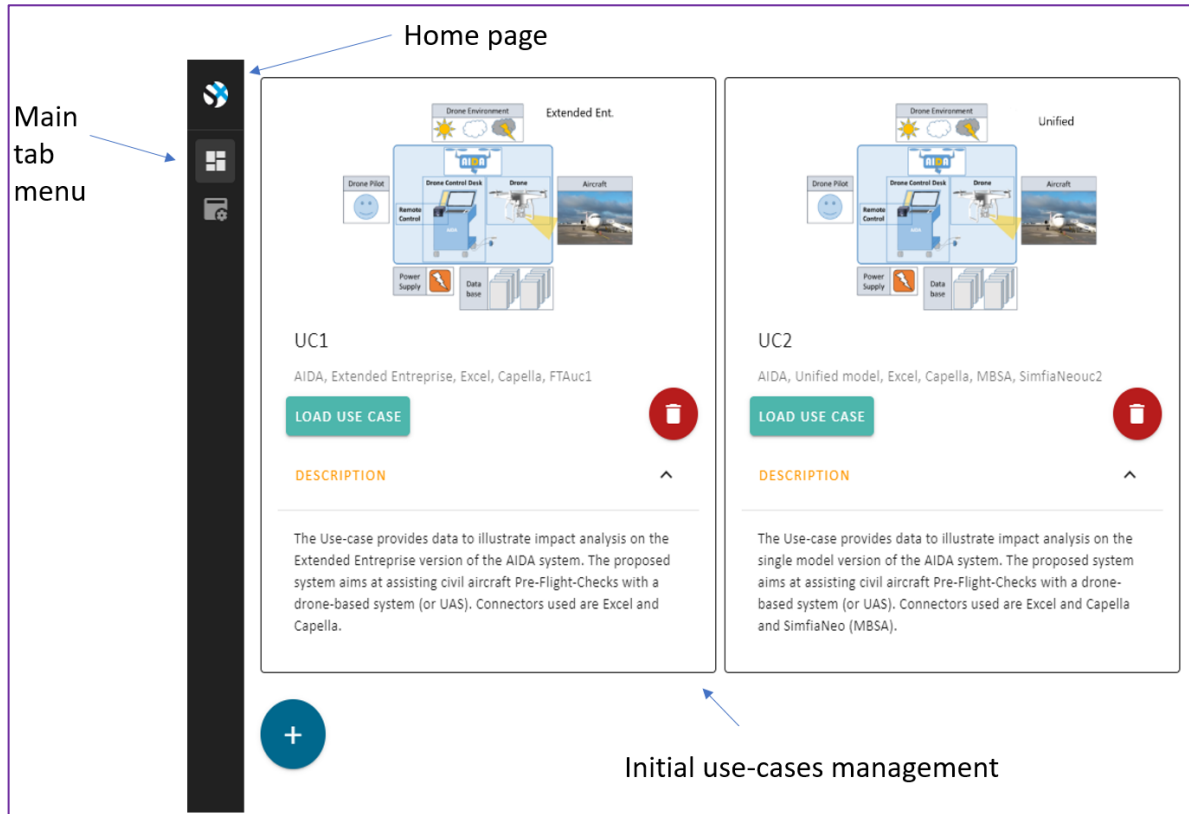


Figure 2: PoC home page

3 PoC Configuration

As illustrated in Figure 3, the tab menu on the left provides access to the “Configuration” set-up.

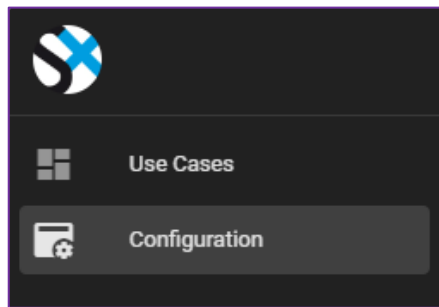


Figure 3: Configuration tab menu

3.1 Connectors configuration

Connectors have to be declared in the Front-end, the “Connectors” tab (cf. Figure 4, at the top) gives access to the connectors set-up. It defines the characteristics of the connectors in terms of identifier (name), description, type (direct push from tool, or import file), the application domain of the tool (systems engineering, or safety engineering).

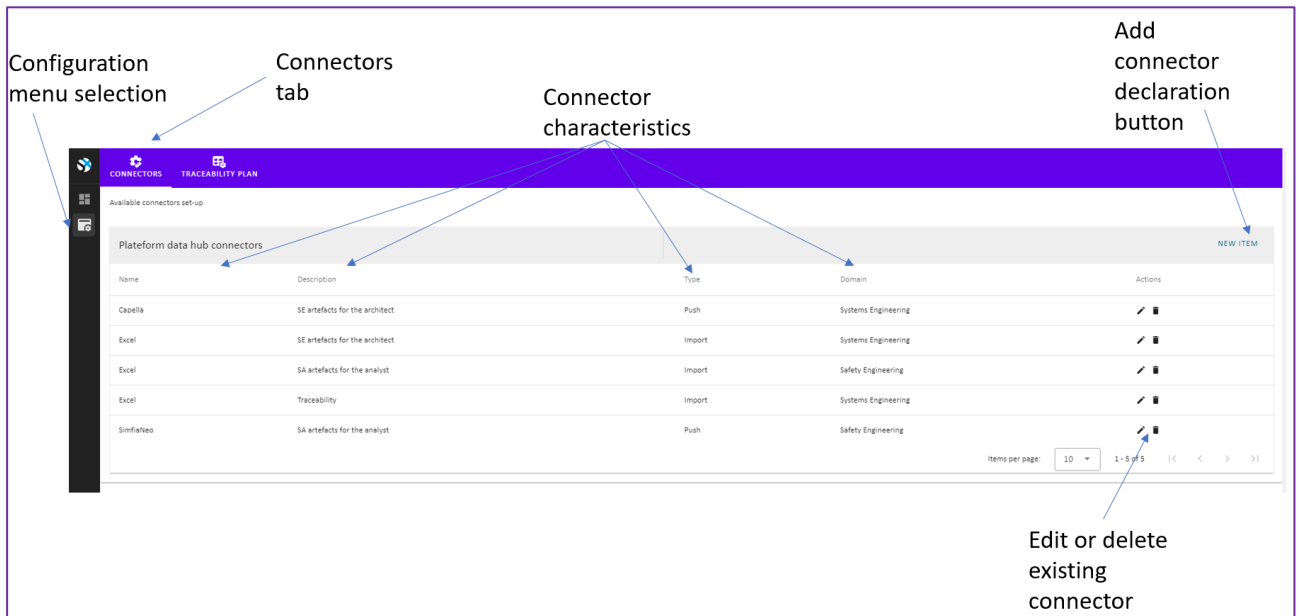


Figure 4: PoC connectors configuration view

3.2 Traceability plan and matrices configuration

Matrices have to be declared in the Front-end, the "Traceability plan" tab (cf. Figure 5, at the top) gives access to the matrices set-up. It defines the characteristics of the matrices in terms of identifier (name), type of link, source artefact type and domain, target artefact type and domain.

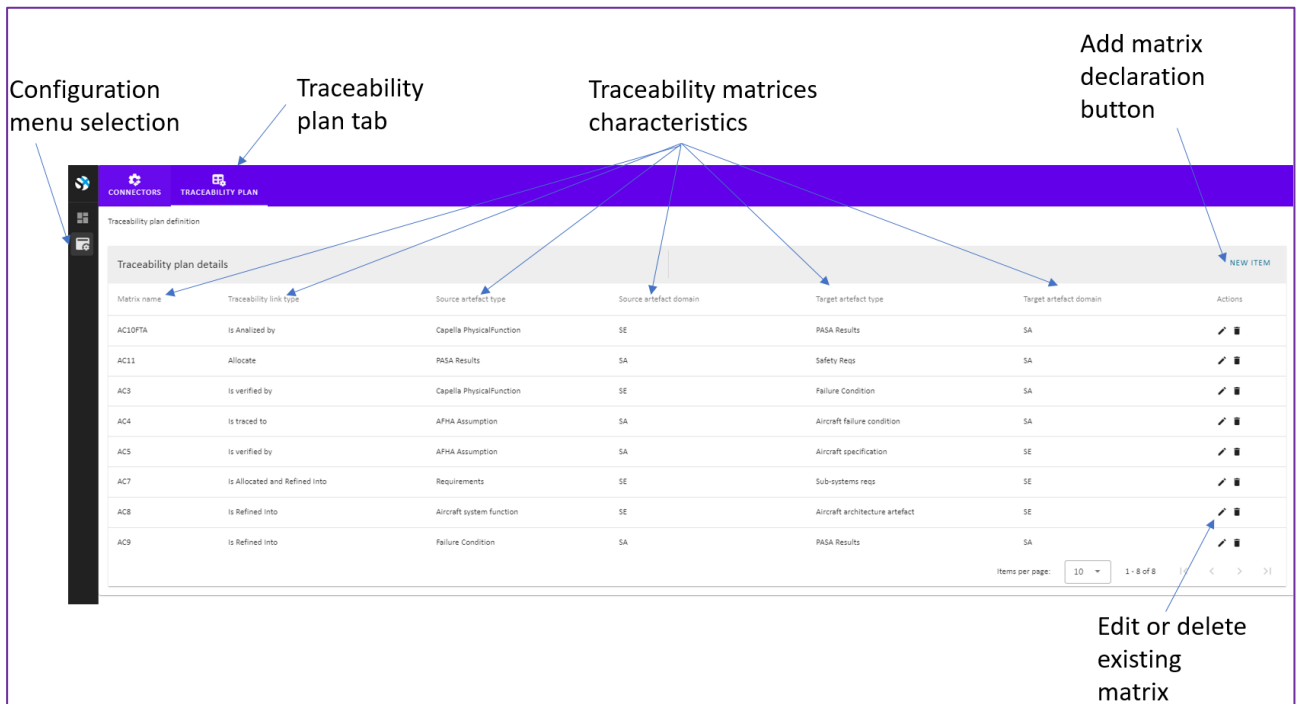


Figure 5: PoC matrices configuration view

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4 Use-case management

Use-case represent a set-up of data on an application case study (e.g. AIDA in Figure 6), on a given traceability plan, with selected connectors. The actions for the management of the use-cases are shown in the figure below.

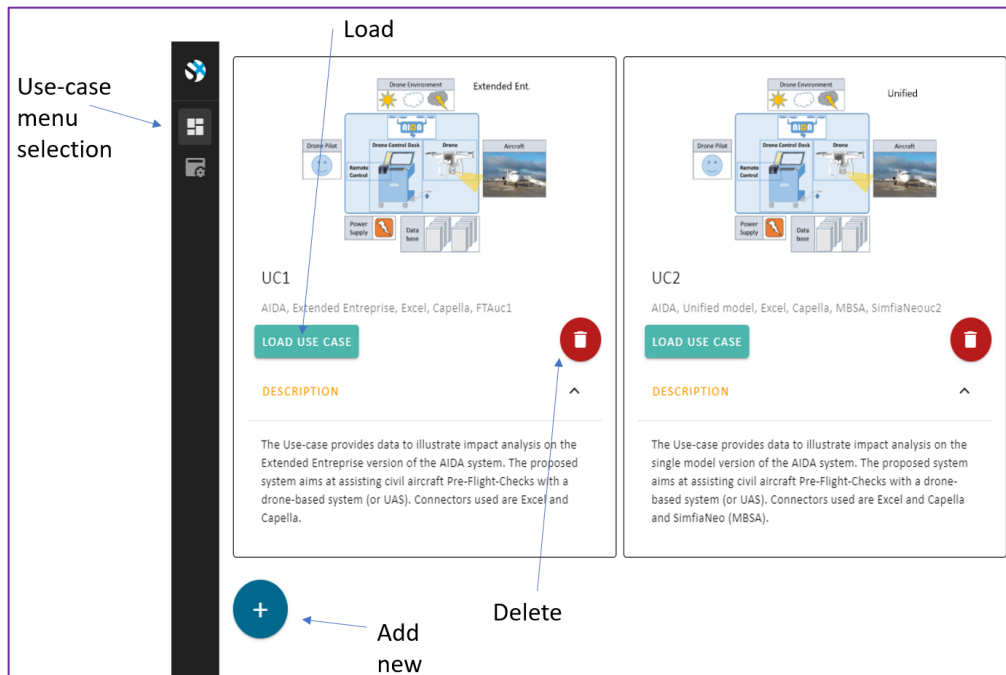


Figure 6: PoC Use-cases management view

5 Baseline management

Artefacts from SE, SA and traceability are managed in baselines, for each use-case, it may exist several baselines corresponding to different iterations of the data of the use-case. The baseline menu is available after loading a use-case.

Baselines can be added, deleted in the view shown in Figure 7. Only one baseline can be manipulated at a time (selected with the load button). The baselines characteristics are: id, name, status (validated, not – i.e. inconsistent state).

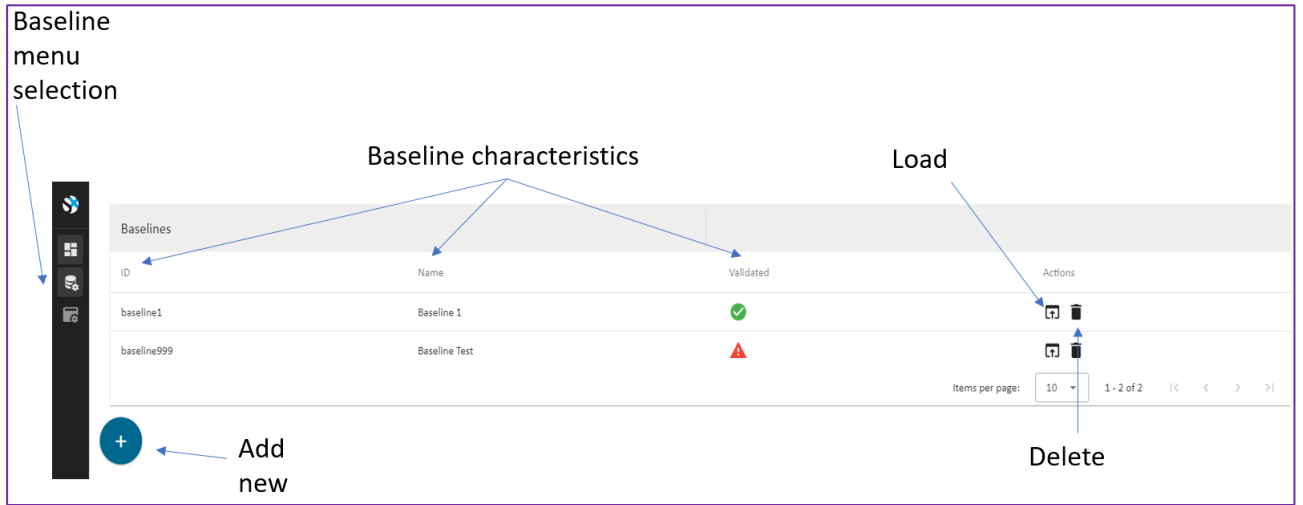


Figure 7: PoC Baseline management view

6 Authoring tool connectors

Authoring tools in the SE or SA domains have additional functionalities to push or export data for the PoC. This section illustrates the Eclipse services available with examples from the Capella connector.

6.1 Artefact management and communication to the PoC

Following an Eclipse implementation approach, a pop-up menu is available with a right-click on the modeling elements you want to push to the PoC platform, or export to an intermediate Excel or Json file format. The category in the menu is “S2C”, as shown in Figure 8. When selecting a modeling element, this element, and all sub-elements of the same type are considered by the push/export actions; e.g. in the example the root physical function and all sub-functions are selected.

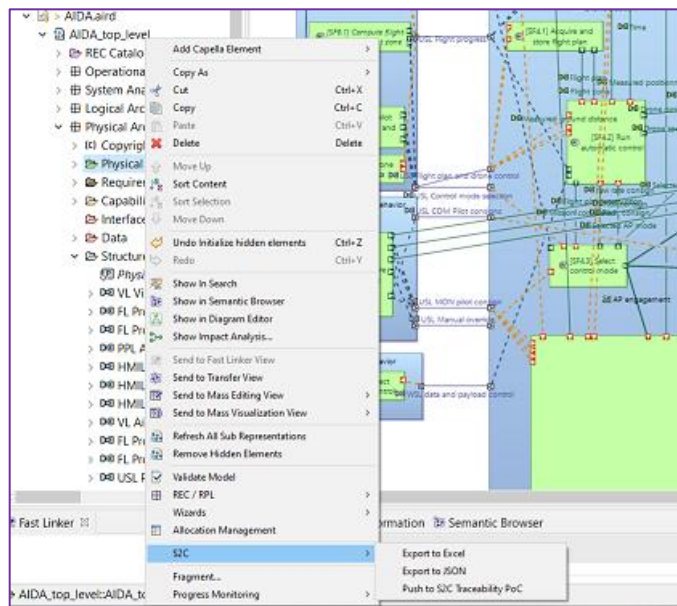


Figure 8: Capella modeling element management

In the case of an export, the destination file must be defined, cf. Figure 9. For both export or push, additional information must be completed (not available natively in the tool), cf. Figure 10, which author information you want to add, the systemic level (aircraft manufacturer, system provider, or item provider), the baseline id concerned with the action.

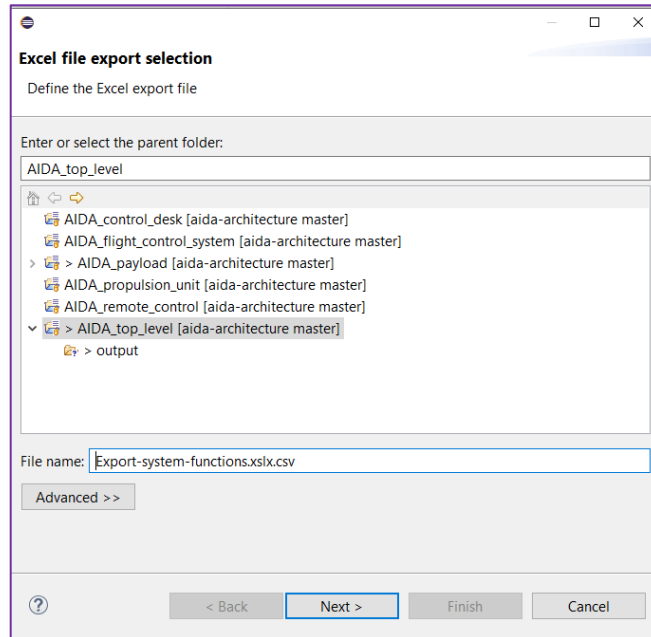


Figure 9: Capella wizard export file selection

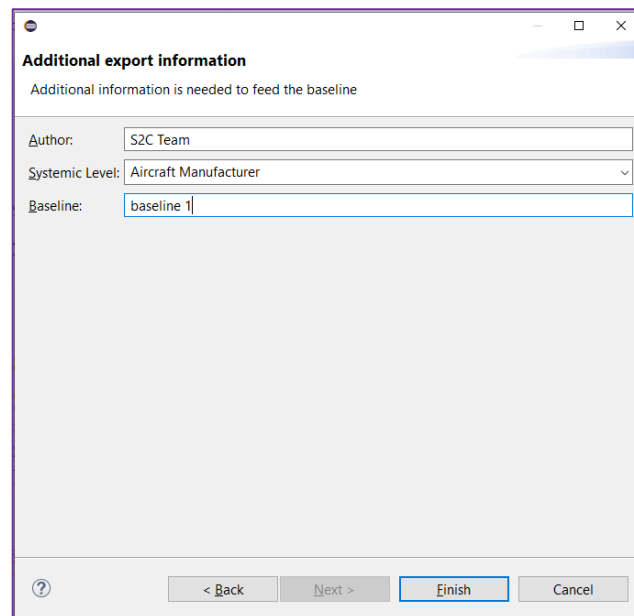


Figure 10: Capella wizard information edition

6.2 Change evolution management and communication to the PoC

For change evolution management, the PoC relies on configuration management tools included in the authoring tools; i.e. for Eclipse based tools like Capella and SimfiaNeo, on Git and EMF – Diff/Merge mechanisms.

Once the modification is done and management with Git, EMF Diff/Merge is called via the “Compare With” menu as described in Figure 11. The configuration details of EMF Diff/Merge can stay to default, as shown in Figure 12.

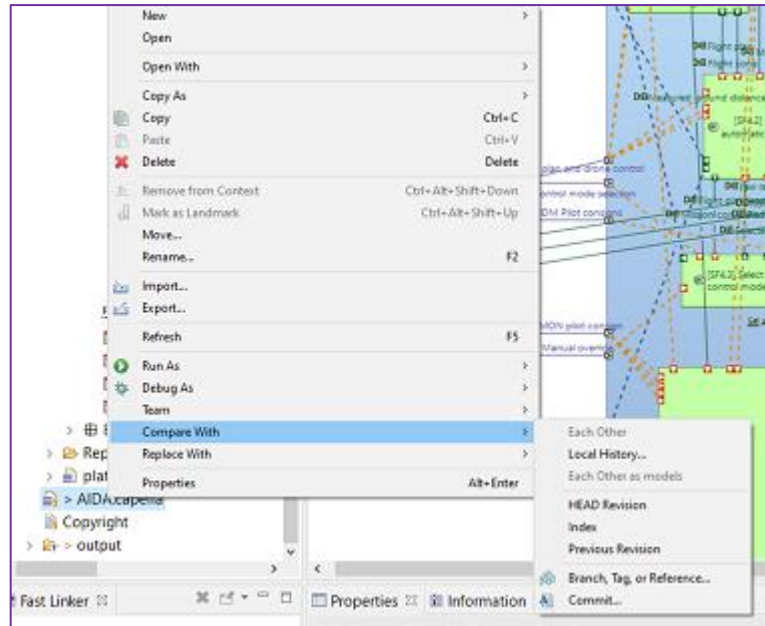


Figure 11: Eclipse “Compare with” menu

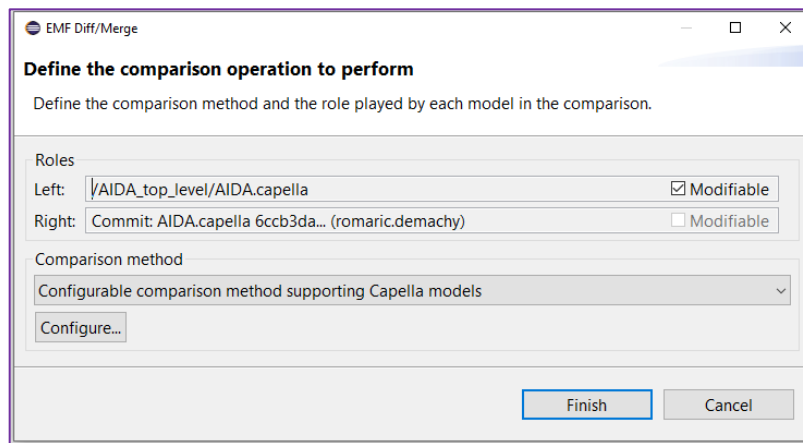


Figure 12: Eclipse “Compare with” configuration details

The classical model diff/merge editor opens, and shows the old version on the right, the new version on the middle, as represented in Figure 13.

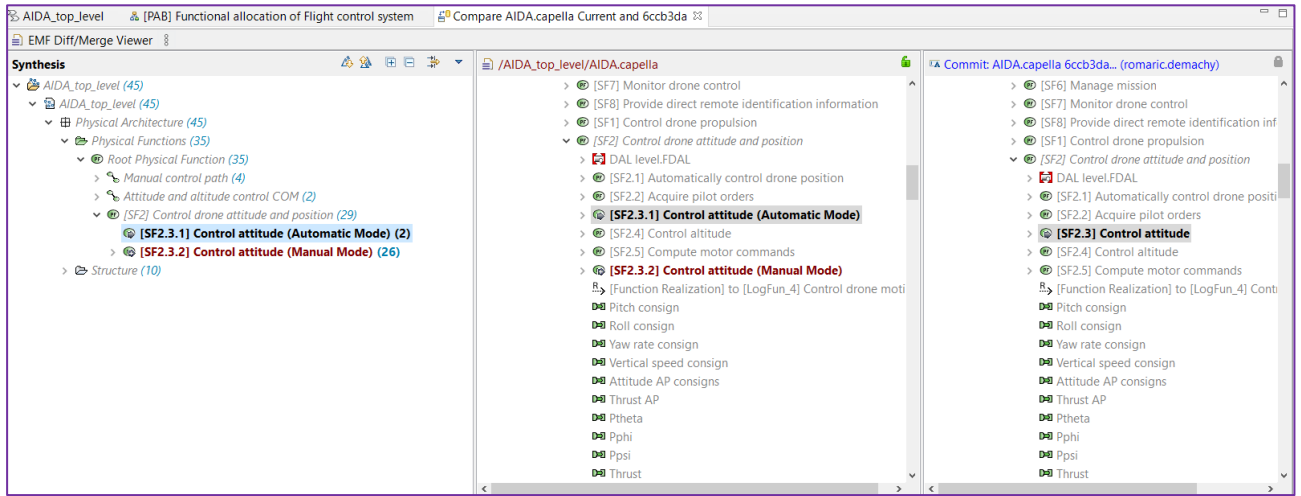


Figure 13: Eclipse “Compare with” editor

A right-click on a diff in the editor provides access to the S2C PoC menu to push the modification captured with Git, as shown in Figure 14

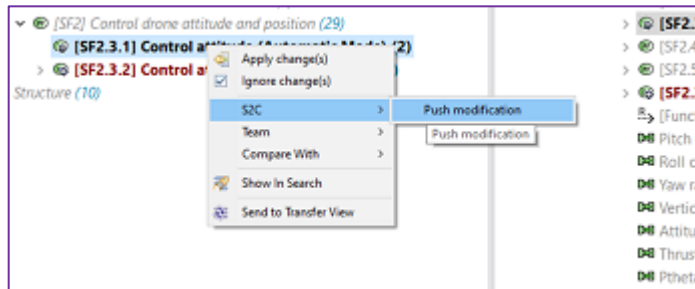


Figure 14: Push from Eclipse “Compare with” editor

7 PoC Dashboards

As illustrated in Figure 15 Figure 3, once the use-case selected and baseline loaded, the tab menu on the left provides access to the “Dashboards” view. Figure 16 shows the different tabs available: domain artefacts overview (SE and SA considered in the use-case), traceability matrices according to the traceability plan, and the impact analysis services.

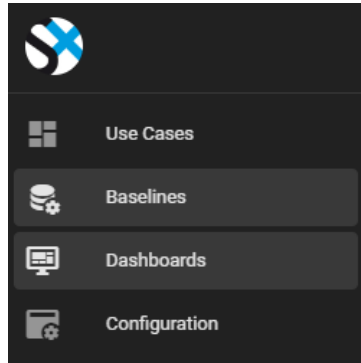
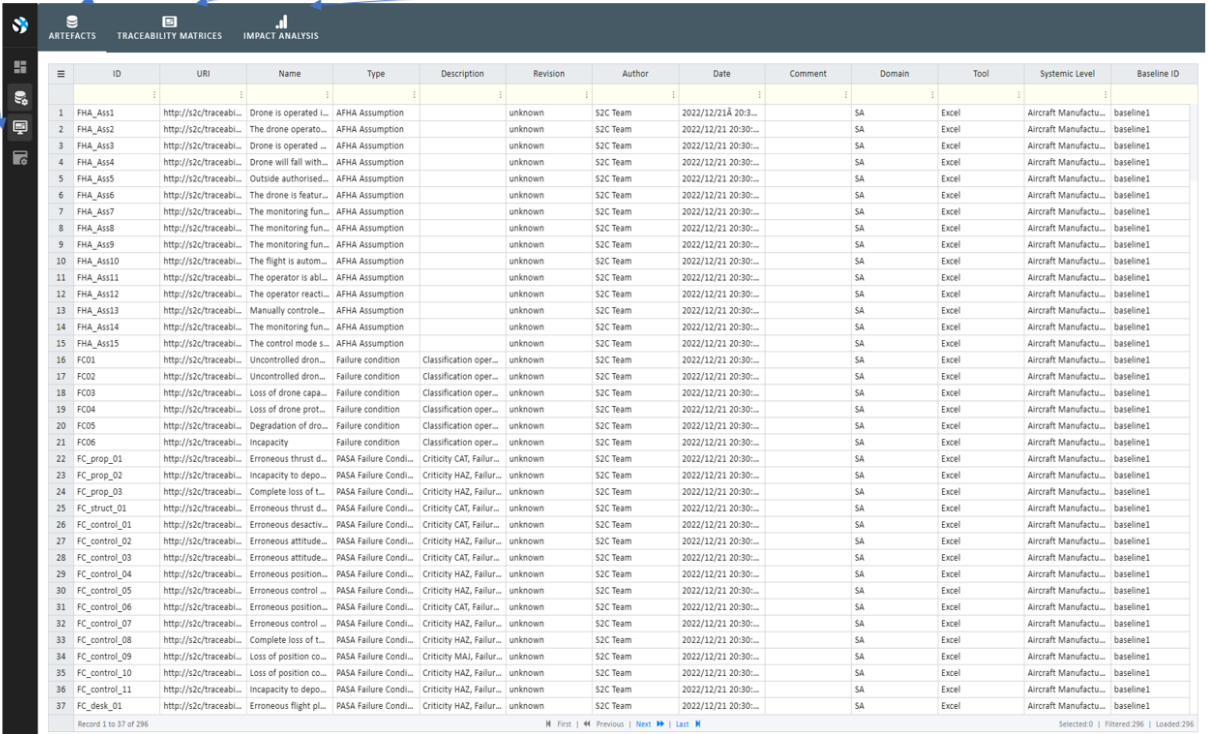


Figure 15: Dashboards tab menu

Dashboards menu selection
Artefacts overview
Traceability matrices
Impact analysis services



ID	URI	Name	Type	Description	Revision	Author	Date	Comment	Domain	Tool	Systemic Level	Baseline ID
1	FHA_Ass1	Drone is operated L...	AFHA Assumption		unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufactu...	baseline1
2	FHA_Ass2	The drone operato...	AFHA Assumption		unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufactu...	baseline1
3	FHA_Ass3	Drone is operated ...	AFHA Assumption		unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufactu...	baseline1
4	FHA_Ass4	Drone will fall with...	AFHA Assumption		unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufactu...	baseline1
5	FHA_Ass5	Outside authorised...	AFHA Assumption		unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufactu...	baseline1
6	FHA_Ass6	The drone is featur...	AFHA Assumption		unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufactu...	baseline1
7	FHA_Ass7	The monitoring fun...	AFHA Assumption		unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufactu...	baseline1
8	FHA_Ass8	The monitoring fun...	AFHA Assumption		unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufactu...	baseline1
9	FHA_Ass9	The monitoring fun...	AFHA Assumption		unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufactu...	baseline1
10	FHA_Ass10	The flight is autom...	AFHA Assumption		unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufactu...	baseline1
11	FHA_Ass11	The operator is abl...	AFHA Assumption		unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufactu...	baseline1
12	FHA_Ass12	The operator reacti...	AFHA Assumption		unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufactu...	baseline1
13	FHA_Ass13	Manually controle...	AFHA Assumption		unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufactu...	baseline1
14	FHA_Ass14	The monitoring fun...	AFHA Assumption		unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufactu...	baseline1
15	FHA_Ass15	The control mode s...	AFHA Assumption		unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufactu...	baseline1
16	FC01	Uncontrolled dron...	Failure condition	Classification oper...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufactu...	baseline1
17	FC02	Uncontrolled dron...	Failure condition	Classification oper...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufactu...	baseline1
18	FC03	Loss of drone capa...	Failure condition	Classification oper...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufactu...	baseline1
19	FC04	Loss of drone prot...	Failure condition	Classification oper...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufactu...	baseline1
20	FC05	Degradation of dro...	Failure condition	Classification oper...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufactu...	baseline1
21	FC06	Incapacity	Failure condition	Classification oper...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufactu...	baseline1
22	FC_prop_01	Erroneous thrust d...	PASA Failure Condi...	Criticality CAT, Failur...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufactu...	baseline1
23	FC_prop_02	Incapacity to depo...	PASA Failure Condi...	Criticality HAZ, Failur...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufactu...	baseline1
24	FC_prop_03	Complete loss of t...	PASA Failure Condi...	Criticality CAT, Failur...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufactu...	baseline1
25	FC_struct_01	Erroneous thrust d...	PASA Failure Condi...	Criticality CAT, Failur...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufactu...	baseline1
26	FC_control_01	Erroneous desactiv...	PASA Failure Condi...	Criticality CAT, Failur...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufactu...	baseline1
27	FC_control_02	Erroneous attitude...	PASA Failure Condi...	Criticality HAZ, Failur...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufactu...	baseline1
28	FC_control_03	Erroneous attitude...	PASA Failure Condi...	Criticality CAT, Failur...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufactu...	baseline1
29	FC_control_04	Erroneous position...	PASA Failure Condi...	Criticality HAZ, Failur...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufactu...	baseline1
30	FC_control_05	Erroneous control ...	PASA Failure Condi...	Criticality CAT, Failur...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufactu...	baseline1
31	FC_control_06	Erroneous position...	PASA Failure Condi...	Criticality CAT, Failur...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufactu...	baseline1
32	FC_control_07	Erroneous control ...	PASA Failure Condi...	Criticality HAZ, Failur...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufactu...	baseline1
33	FC_control_08	Complete loss of t...	PASA Failure Condi...	Criticality HAZ, Failur...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufactu...	baseline1
34	FC_control_09	Loss of position co...	PASA Failure Condi...	Criticality HAZ, Failur...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufactu...	baseline1
35	FC_control_10	Loss of position co...	PASA Failure Condi...	Criticality HAZ, Failur...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufactu...	baseline1
36	FC_control_11	Incapacity to depo...	PASA Failure Condi...	Criticality HAZ, Failur...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufactu...	baseline1
37	FC_desk_01	Erroneous flight pl...	PASA Failure Condi...	Criticality HAZ, Failur...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufactu...	baseline1

Figure 16: Dashboards view

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7.1 Artefacts view

Artefacts are presented in a table, with Excel like manipulation functions (sort, filter, ...), describing all the artefact properties: id, uri, name, type, description, revision, author, date, comment, domain, tool, systemic level and baseline id. Figure 17 shows a filtering on the type of artefact by taping a label. Figure 18 shows the filter wizard applied on the tool property (here only Capella and Excel data have been connected to the PoC).

ID	URI	Name	Type	Description	Revision	Author	Date	Comment	Domain	Tool	Systemic Level	Baseline ID	
1	FC01	http://s2c/traceabi...	Uncontrolled dron...	Failure condition	Classification oper...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufacto...	baseline1
2	FC02	http://s2c/traceabi...	Uncontrolled dron...	Failure condition	Classification oper...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufacto...	baseline1
3	FC03	http://s2c/traceabi...	Loss of drone capa...	Failure condition	Classification oper...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufacto...	baseline1
4	FC04	http://s2c/traceabi...	Loss of drone prot...	Failure condition	Classification oper...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufacto...	baseline1
5	FC05	http://s2c/traceabi...	Degradation of dro...	Failure condition	Classification oper...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufacto...	baseline1
6	FC06	http://s2c/traceabi...	Incapacity	Failure condition	Classification oper...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufacto...	baseline1
7	FC_prop_01	http://s2c/traceabi...	Erroneous thrust d...	PASA Failure Condi...	Criticality CAT, Fallur...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufacto...	baseline1
8	FC_prop_02	http://s2c/traceabi...	Incapacity to depo...	PASA Failure Condi...	Criticality HAZ, Fallur...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufacto...	baseline1
9	FC_prop_03	http://s2c/traceabi...	Complete loss of t...	PASA Failure Condi...	Criticality HAZ, Fallur...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufacto...	baseline1
10	FC_struct_01	http://s2c/traceabi...	Erroneous thrust d...	PASA Failure Condi...	Criticality CAT, Fallur...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufacto...	baseline1
11	FC_control_01	http://s2c/traceabi...	Erroneous desactiv...	PASA Failure Condi...	Criticality CAT, Fallur...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufacto...	baseline1
12	FC_control_02	http://s2c/traceabi...	Erroneous attitude...	PASA Failure Condi...	Criticality HAZ, Fallur...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufacto...	baseline1
13	FC_control_03	http://s2c/traceabi...	Erroneous attitude...	PASA Failure Condi...	Criticality CAT, Fallur...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufacto...	baseline1
14	FC_control_04	http://s2c/traceabi...	Erroneous position...	PASA Failure Condi...	Criticality HAZ, Fallur...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufacto...	baseline1
15	FC_control_05	http://s2c/traceabi...	Erroneous control ...	PASA Failure Condi...	Criticality HAZ, Fallur...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufacto...	baseline1
16	FC_control_06	http://s2c/traceabi...	Erroneous position...	PASA Failure Condi...	Criticality CAT, Fallur...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufacto...	baseline1
17	FC_control_07	http://s2c/traceabi...	Erroneous control ...	PASA Failure Condi...	Criticality HAZ, Fallur...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufacto...	baseline1
18	FC_control_08	http://s2c/traceabi...	Complete loss of L...	PASA Failure Condi...	Criticality HAZ, Fallur...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufacto...	baseline1
19	FC_control_09	http://s2c/traceabi...	Loss of position co...	PASA Failure Condi...	Criticality MAJ, Fallur...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufacto...	baseline1
20	FC_control_10	http://s2c/traceabi...	Loss of position co...	PASA Failure Condi...	Criticality HAZ, Fallur...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufacto...	baseline1
21	FC_control_11	http://s2c/traceabi...	Incapacity to depo...	PASA Failure Condi...	Criticality HAZ, Fallur...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufacto...	baseline1
22	FC_desk_01	http://s2c/traceabi...	Erroneous flight pl...	PASA Failure Condi...	Criticality HAZ, Fallur...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufacto...	baseline1
23	FC_desk_02	http://s2c/traceabi...	Erroneous pilot co...	PASA Failure Condi...	Criticality HAZ, Fallur...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufacto...	baseline1
24	FC_desk_03	http://s2c/traceabi...	Erroneous pilot co...	PASA Failure Condi...	Criticality HAZ, Fallur...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufacto...	baseline1
25	FC_desk_04	http://s2c/traceabi...	Erroneous or loss o...	PASA Failure Condi...	Criticality HAZ, Fallur...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufacto...	baseline1
26	FC_desk_05	http://s2c/traceabi...	Loss of Flight plan ...	PASA Failure Condi...	Criticality MAJ, Fallur...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufacto...	baseline1
27	FC_desk_06	http://s2c/traceabi...	Loss of pilot consi...	PASA Failure Condi...	Criticality MAJ, Fallur...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufacto...	baseline1
28	FC_remote_01	http://s2c/traceabi...	Erroneous flight pl...	PASA Failure Condi...	Criticality HAZ, Fallur...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufacto...	baseline1
29	FC_remote_02	http://s2c/traceabi...	Loss of manual ove...	PASA Failure Condi...	Criticality HAZ, Fallur...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufacto...	baseline1
30	FC_remote_03	http://s2c/traceabi...	Erroneous pilot co...	PASA Failure Condi...	Criticality CAT, Fallur...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufacto...	baseline1
31	FC_remote_04	http://s2c/traceabi...	Loss of pilot consi...	PASA Failure Condi...	Criticality MAJ, Fallur...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufacto...	baseline1
32	FC_remote_05	http://s2c/traceabi...	Loss of pilot consi...	PASA Failure Condi...	Criticality HAZ, Fallur...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufacto...	baseline1
33	FC_remote_06	http://s2c/traceabi...	Erroneous manual ...	PASA Failure Condi...	Criticality HAZ, Fallur...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel	Aircraft Manufacto...	baseline1

Figure 17: Artefact table with filtering by name on type

Description	Revision	Author	Date	Comment	Domain	Tool
...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel
...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel
...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel
...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel
...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel
...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel
...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel
...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel
...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel
...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel
...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel
...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel
...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel
...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel
...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel
...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel
...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel
...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel
...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel
...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel
...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel
...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel
...	unknown	S2C Team	2022/12/21 20:30...		SA	Excel

Sorting And Filtering

Sort Ascending Sort Descending

Custom Filter

Capella

Excel

Apply

Figure 18: Artefact table custom filter wizard on tool

7.2 Traceability matrices view

As shown in Figure 19, the traceability matrices view provides details on the matrices. The matrix selection is accessible via tabs (AC3 to AC11 in the Figure). For each matrix, a card provides insights on it: name, details available when activating the detail button (cf. Figure 20). The view provides the following indicators: number of traceability link, number of source artefacts, number of target artefacts. The initial representation of the matrix is a table (with source and target).

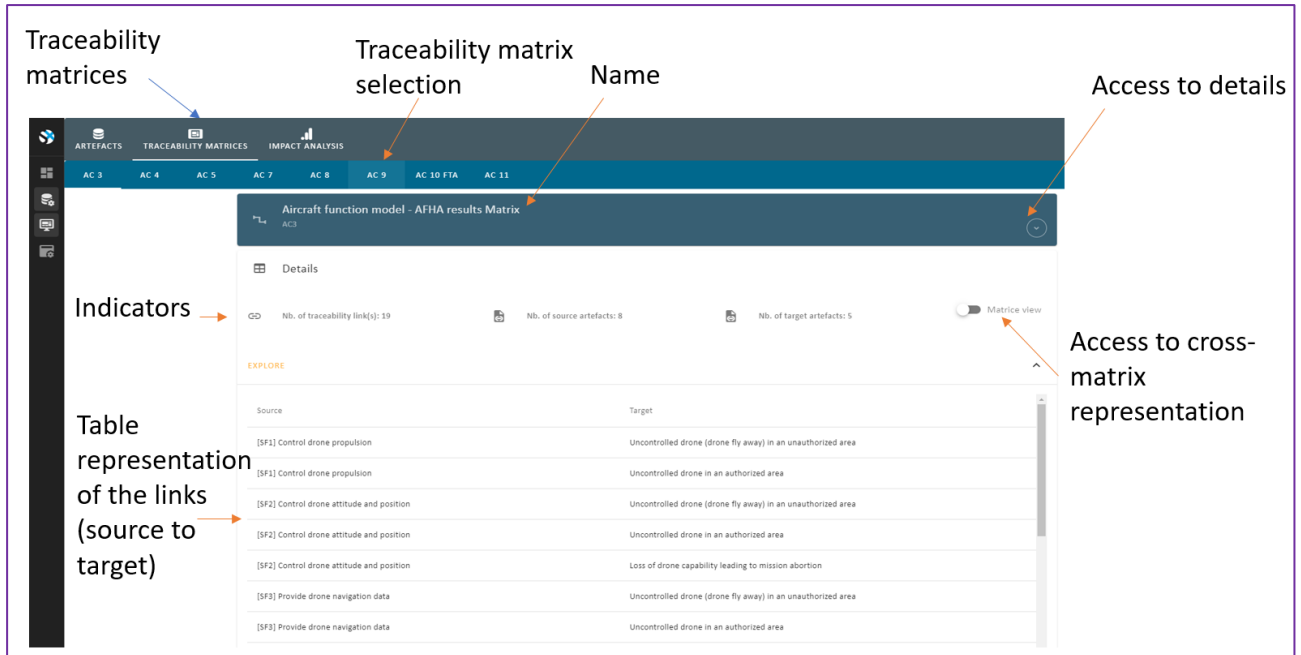


Figure 19: Traceability matrices view

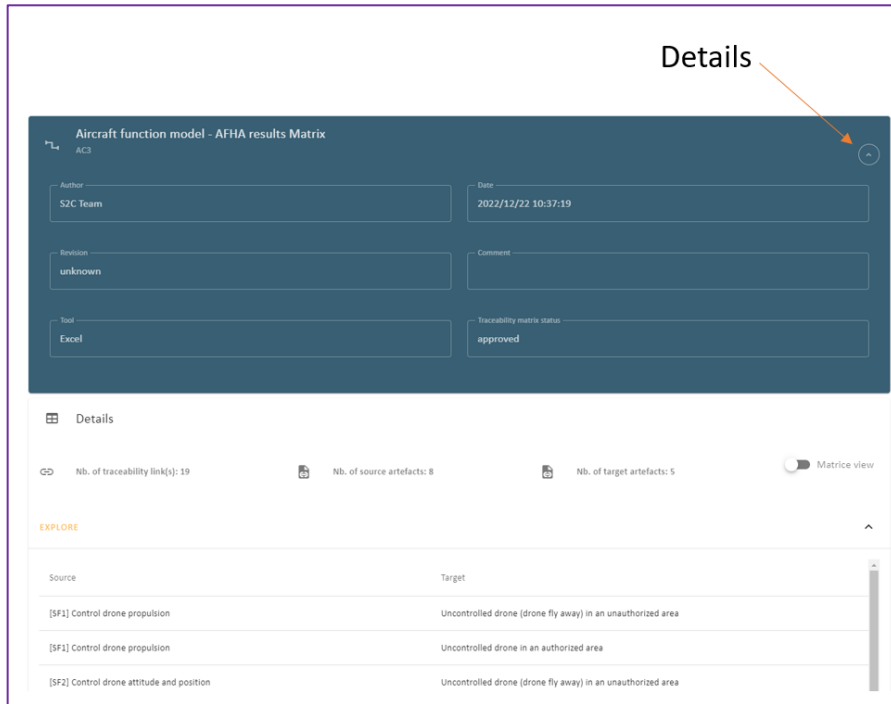


Figure 20: Traceability matrix details view

A cross table representation of the matrix is also be activated, cf. Figure 21. Hovering with the mouse makes details appear in superposition: about the artefact, cf. Figure 22; or about the link, cf. Figure 23.

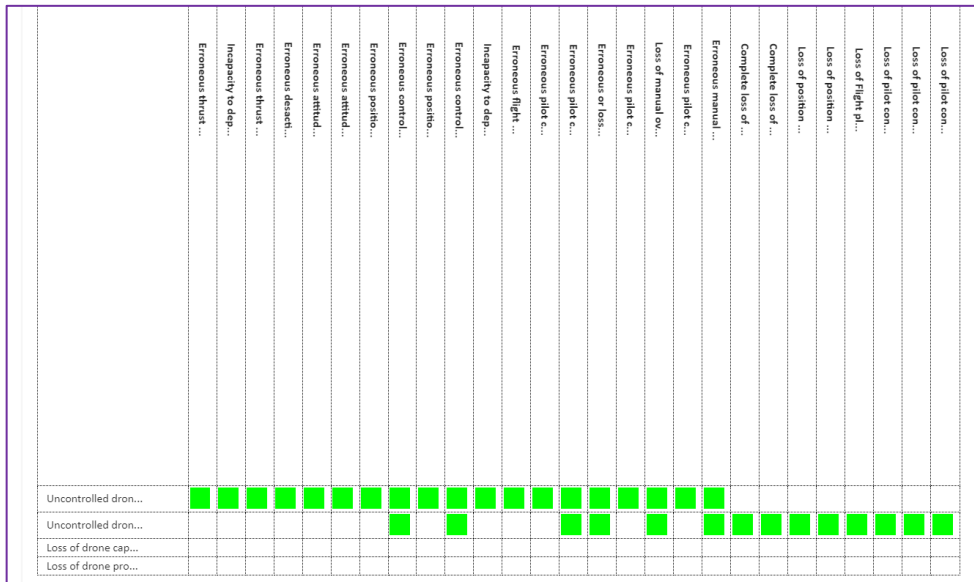


Figure 21: Traceability matrix cross-table representation

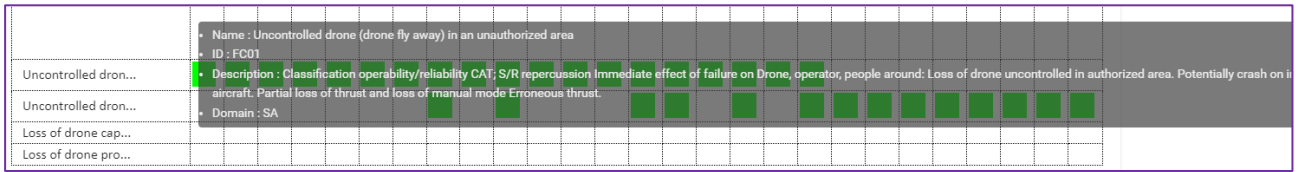


Figure 22: Traceability matrix cross-table representation – artefact details overlay

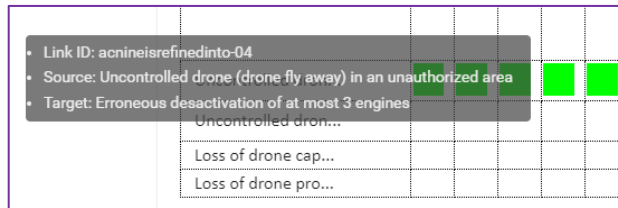


Figure 23: Traceability matrix cross-table representation – link details overlay

7.3 Change evolution notification

When an artefact evolves and is pushed to the current baseline, a notification appears in the platform, as shown in Figure 24. Indications on the matrices impacted is also provided (in the example AC8 and AC 10 FTA).

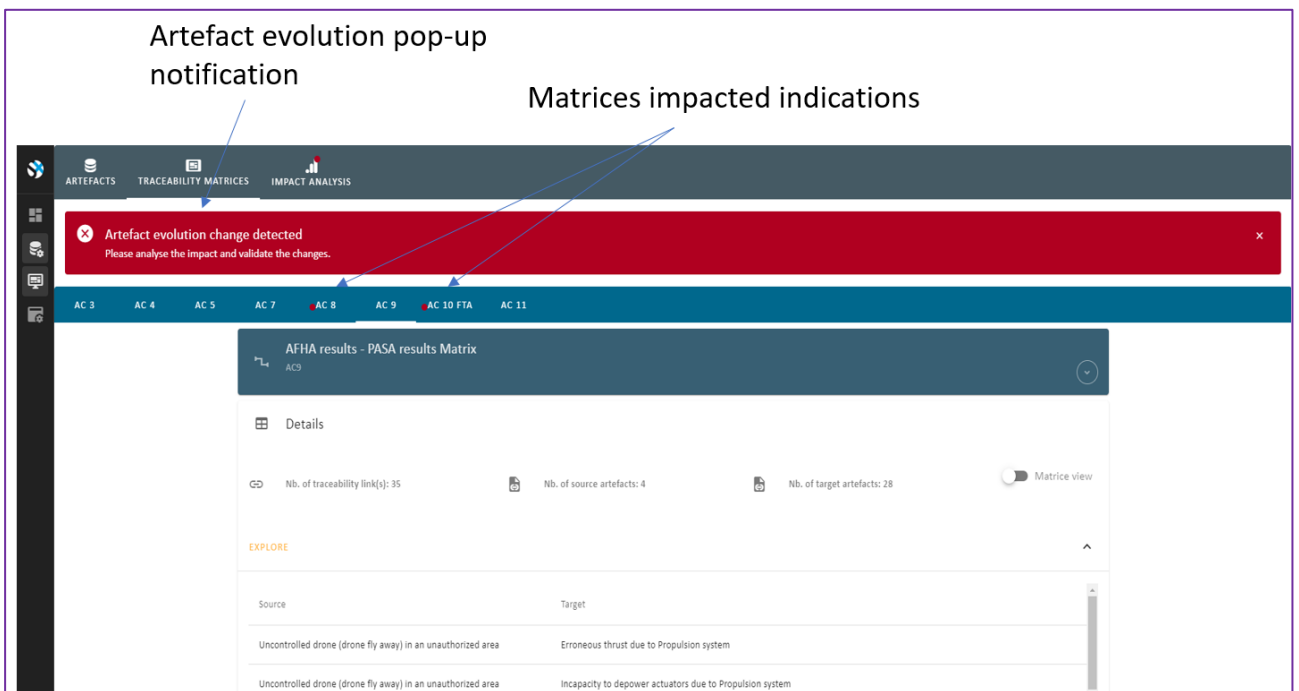


Figure 24: Change evolution notification and indications

7.4 Impact analysis view

Figure 25 introduce the impact analysis view (top tab access), that provides three modules (inside vertical tabs):

- Artefacts’ evolutions details;
- Impact analysis;
- Impact resolution.

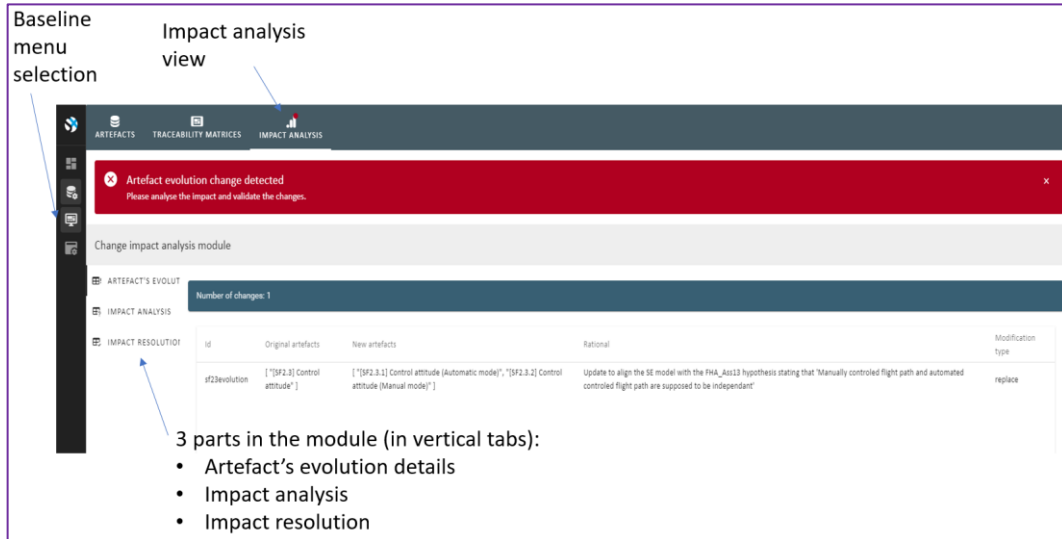


Figure 25: Impact analysis view

7.4.1 Details of the artefact’s evolution view

The first module is the artefact’s evolution view (cf. Figure 26), it provides information on the number of evolutions detected, and the detailed list of the evolutions. The properties reported are the following:

- Id of the change evolution;
- Artefact(s) modified (origin) in the current baseline
- New artefact(s) proposed by the evolution
- Rational behind this change,
- Kind of evolution (delete, replace, new)

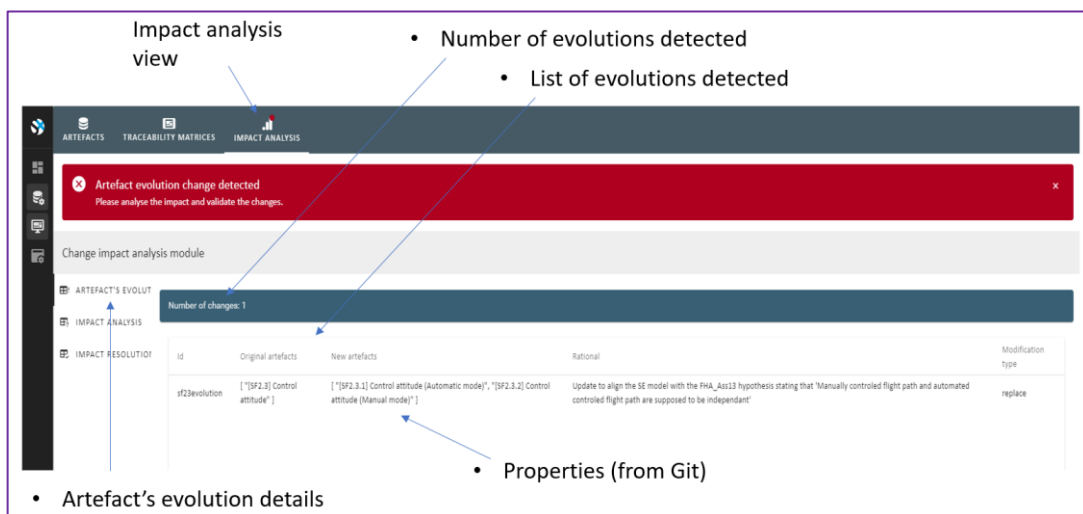


Figure 26: Impact analysis view – artefact’s evolution module

7.4.2 Details of the impact analysis view

The second module is the impact analysis provided to understand the relations between artefacts that are connected through traceability links. Figure 27 introduces the module.

This module provides a graph representation of the artefacts (neighbors) related to a given artefact. The given artefact has to be selected, into a matrix context (traceability matrix selection), as either a source element or target element of this matrix. The Figure 28 shows the selection of the artefact from a list of target elements in the AC8 matrix.

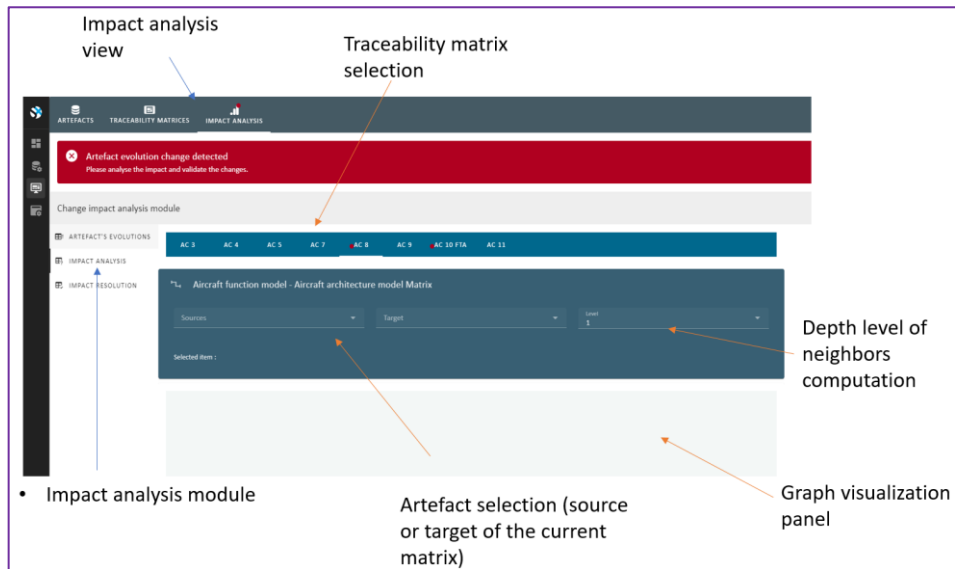


Figure 27: Impact analysis view – impact analysis module overview

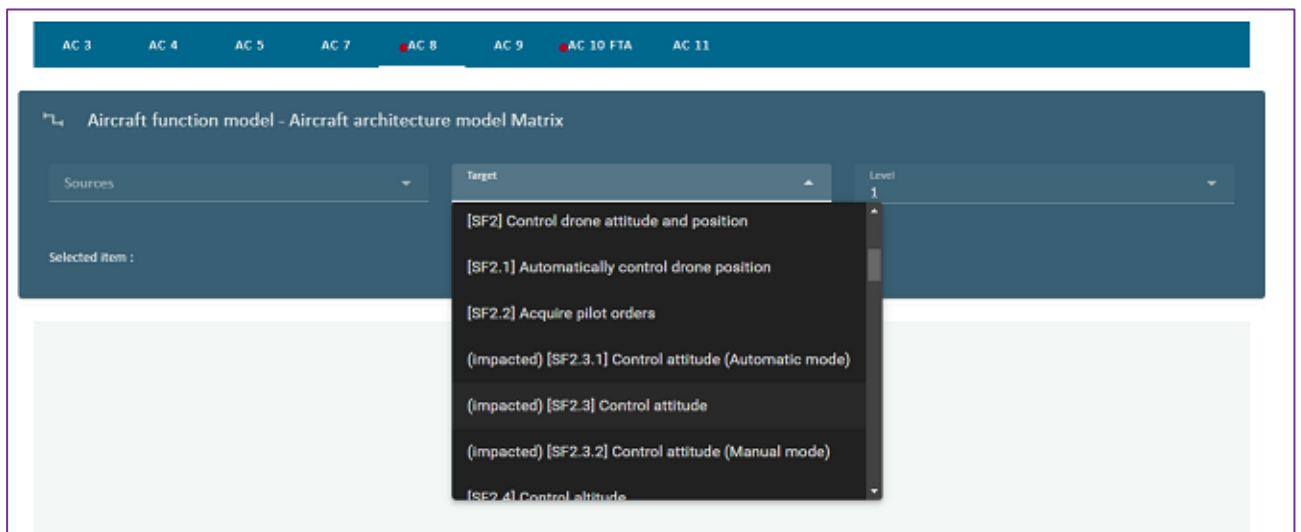


Figure 28: Impact analysis view – selection of the artefact

Figure 29 shows the result of the graph computation, with a depth of 1. With a deeper depth, Figure 30 shows the paths highlighted between two artefacts, to understand the different possibilities the elements are related to each other.

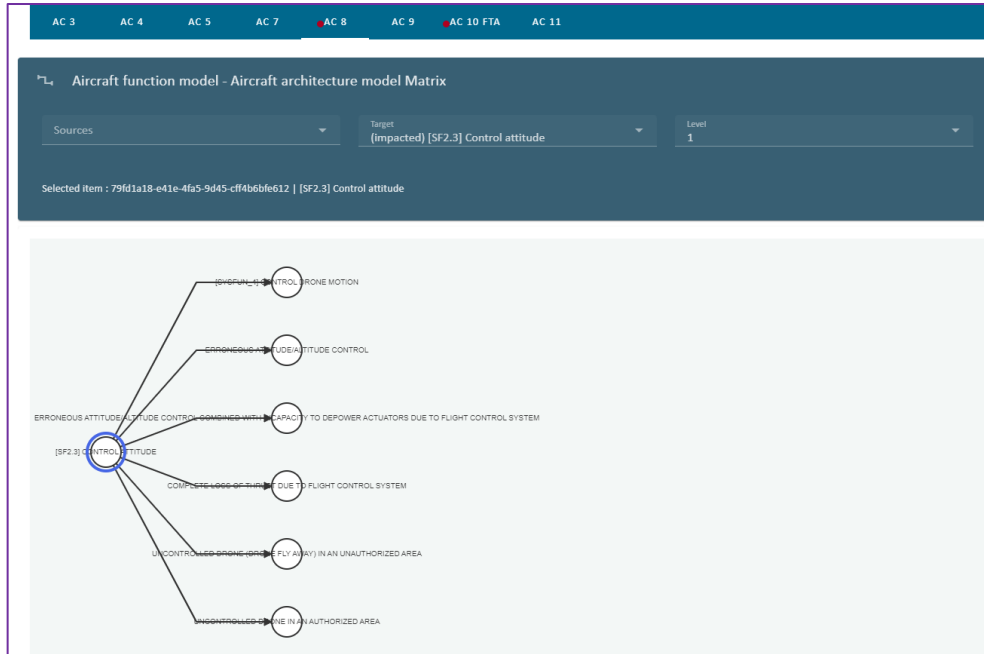


Figure 29: Impact analysis view – result of the graph computation

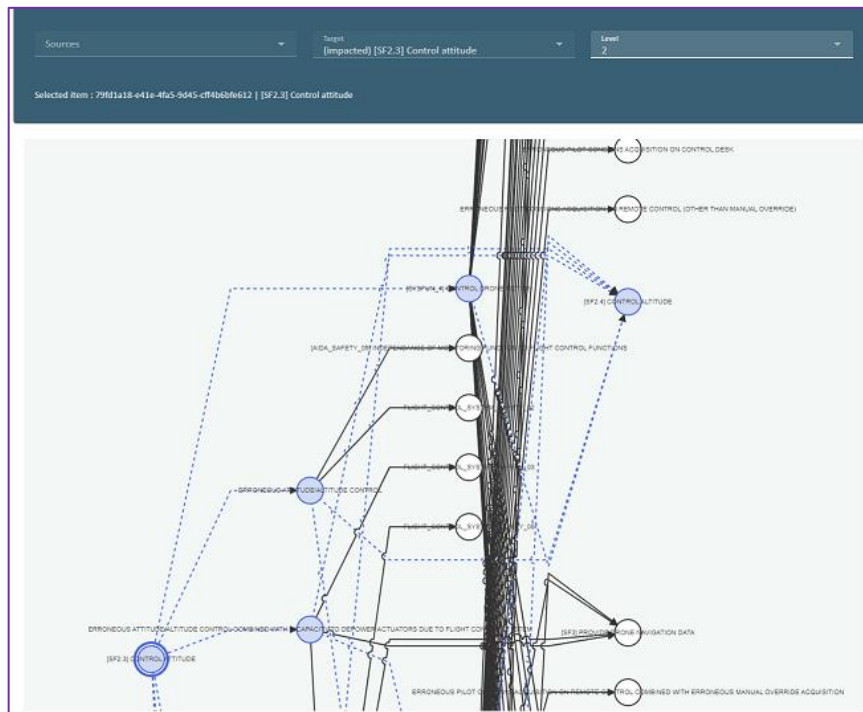


Figure 30: Impact analysis view – result of the graph computation – path details

A vertical line or highlighting indicates, if necessary, an update of the text compared to the previous version This document is the property of the S2C Project Participants : l'IRT Saint Exupéry, et de l'IRT SystemX, IRT, CNRS, Safran Tech, Safran HE, Safran LS, Safran Aerosystems, Airbus Defence & Space, Dassault Aviation, Thales AVS, Thales SA, Liebherr, LGM, APSYS, Samares Engineering, DGA, ONERA, .SupMeca.

7.4.3 Details of the impact resolution view

The third module is the impact resolution, cf. Figure 31. For each matrix, the links (existing link(s) evolving to suspect – in red in the Figure, and new generated links – in orange in the Figure) are represented. An action button (“show impacted”) is available to filter on these links only. For each link, action buttons are available to accept the suggestion (“validate”) or reject the suggestion (“reject”). An additional action is available to propagate the impact (more details are provided later on).

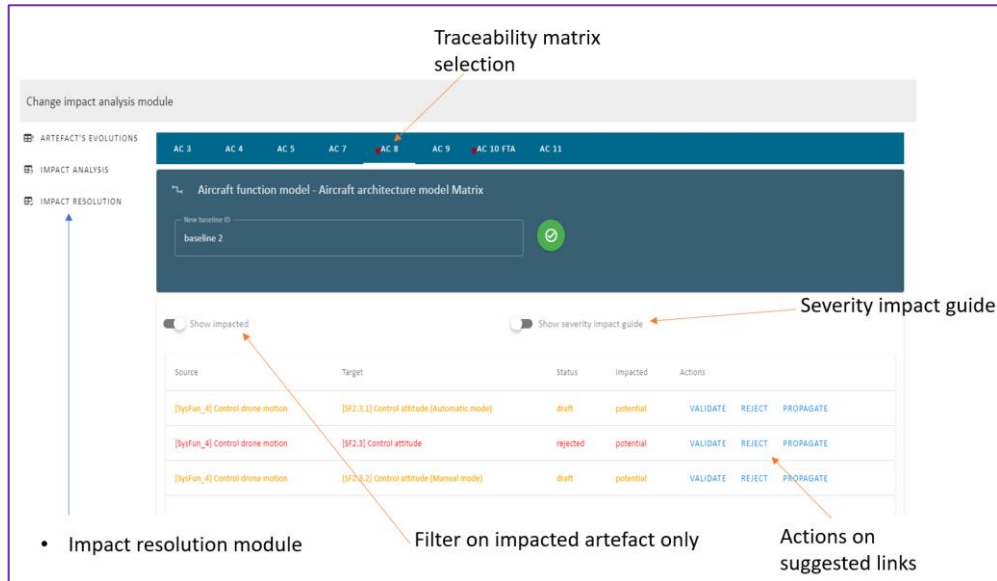


Figure 31: Impact resolution view

The reject action deletes the link (that will not appear in the view anymore), the validate changes the link status to approved and changes the color as represented in Figure 32.

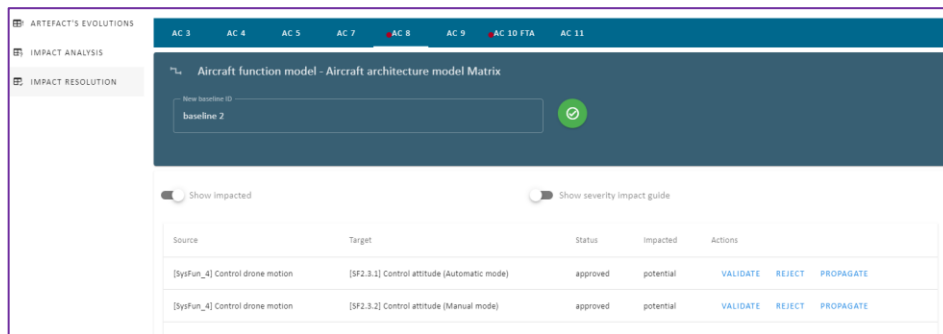


Figure 32: Impact resolution view after resolution

The severity impact guide is available in the PoC (cf. Figure 33), via the “show severity impact guide” button in Figure 31. We refer to document ISX-S2C-DOC-473 “S2C_Cotation_Impact_S03_2023” for more details. This document presents the different decision trees produced to guide the safety analyst in his analysis of the impact induced by different possible triggering (and change) event. The decision tree lists the questions the safety analyst has to ask to well evaluate the impact of the considered evolution.

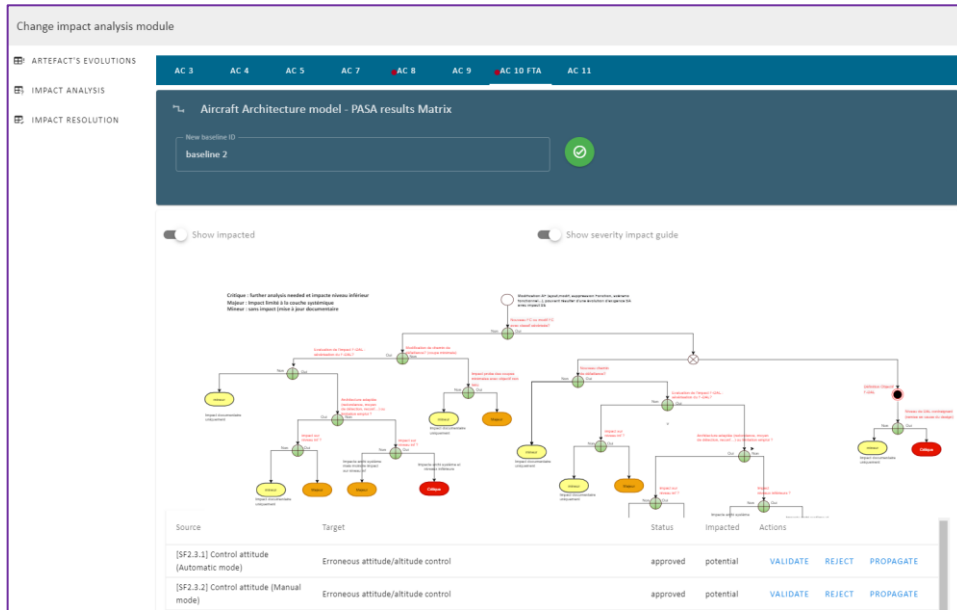


Figure 33: Impact resolution view - severity impact guide

The guide helps understand the impact of the change on the safety analyst environment, that may (if wanted) propagate the impact to his/her nearest environment. As described in Figure 31, for each outgoing artefact of a traceability link, a propagate button is available, giving access to the menu described in Figure 34. A list of potential impacted artefacts is shown, and a possibility to check the propagate checkbox and save button is provided.

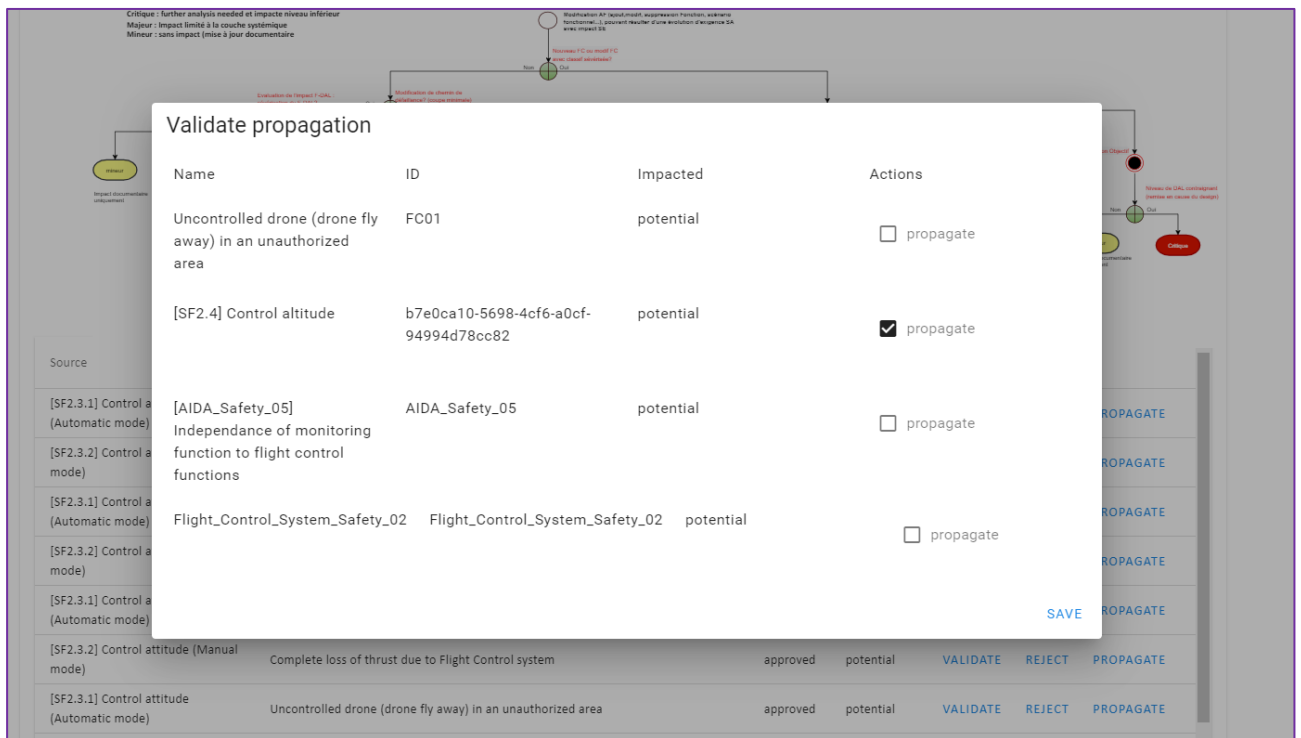


Figure 34: Impact resolution view – propagation menu

Figure 35 shows a result of a propagation, making appear the artefact and related links as potentially impacted.

Source	Target	Status	Impacted	Actions
[SF2.3.1] Control attitude (Automatic mode)	Erroneous attitude/altitude control	approved	potential	VALIDATE REJECT PROPAGATE
[SF2.3.2] Control attitude (Manual mode)	Erroneous attitude/altitude control	approved	potential	VALIDATE REJECT PROPAGATE
[SF2.4] Control altitude	Erroneous attitude/altitude control	approved	potential	VALIDATE REJECT PROPAGATE
[SF2.3.1] Control attitude	Erroneous attitude/altitude control combined with incapacity to depower actuators	approved	potential	VALIDATE REJECT PROPAGATE

Figure 35: Impact resolution view – result after propagation

7.4.4 Validation and update of the baseline

Figure 36 makes a focus on the definition of the new baseline id (on the left), and validation button (in green).

AC 3 AC 4 AC 5 AC 7 AC 8 AC 9 AC 10 FTA AC 11

Aircraft Architecture model - PASA results Matrix

New baseline ID: ✔

Figure 36: Impact resolution view – update to new baseline