





# **COTS tool evolution specification document**

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synthesis of the new needs  
and mock-ups of the poc

# Summary

- 1. Context, introduction of the study**
- 2. Traceability and federation COTS cartography**
- 3. Summary of existing services**
- 4. New services needed**
- 5. Traceability metamodel**
- 6. S2C Dynamic consistency management PoC**
- 7. Mock-ups**

# 1. Consistency needs towards traceability

Needs:

## 1. Build consistency between heterogeneous SE/SA artefacts

- Formalize a traceability plan (strategy)
- Instanciate traceability matrices (according to plan)
  - Traceability links,
  - Model-based WP2 consistency links,
  - ....

## 2. Maintain consistency over time

- Detect change/evolution
- Understand change/evolution impact
  - **Technical impact analysis**
- Evaluation change/evolution impact / rework
  - **Engineering domain impact analysis**
- Update traceability matrices

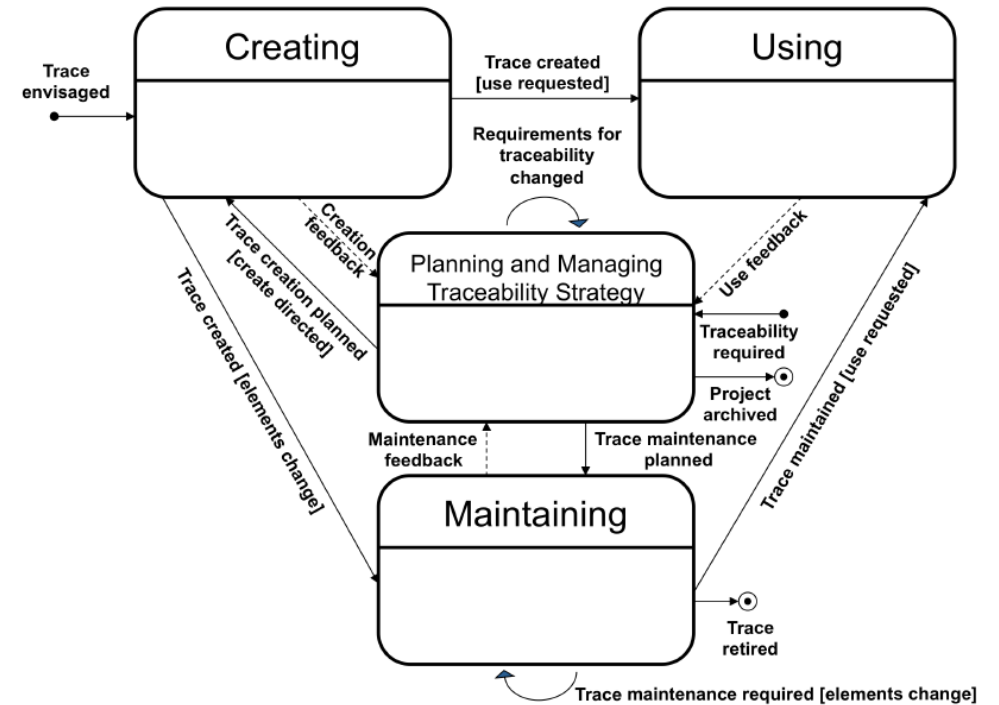


Fig. 3 A generic traceability process model

Fig from Gotel, O., Cleland-Huang, J., Hayes, J. H., Zisman, A., Egyed, A., Grünbacher, P., Dekhtyar, A., Antoniol, G., Maletic, J., & Mäder, P. (2012). Traceability Fundamentals. In *Software and Systems Traceability* (Vol. 9781447122, pp. 3–22). Springer London. [https://doi.org/10.1007/978-1-4471-2239-5\\_1](https://doi.org/10.1007/978-1-4471-2239-5_1)

## 2. Traceability and federation COTS cartography

- A cartography of traceability tools has been produced with an analysis of some COTS tools: Syndeia, SECollab, Reuse Company tool, Kovair.
- Implementation of the AIDA traceability plan on SECollab for analysis of the tool's capabilities.

The screenshot displays the 'Demo SESA Traceability' interface with several components:

- AC-3 Is VerifiedBy:** A pie chart showing 6 matches (0.8%) and 152 non-matches (99.2%).
- AC-4 tracedTo:** A pie chart showing 15 matches (100%).
- AC-5 Is VerifiedBy:** A pie chart showing 15 matches (100%).
- Match List:** A list of software functions (SF1-SF7) and failure conditions (FC01-FC06).
- SESA Traceability Matrices - UC Aida-:** A matrix showing the relationship between AIDA and various failure conditions.
- Traceability Matrix:** A detailed matrix showing the relationship between physical functions and failure conditions.

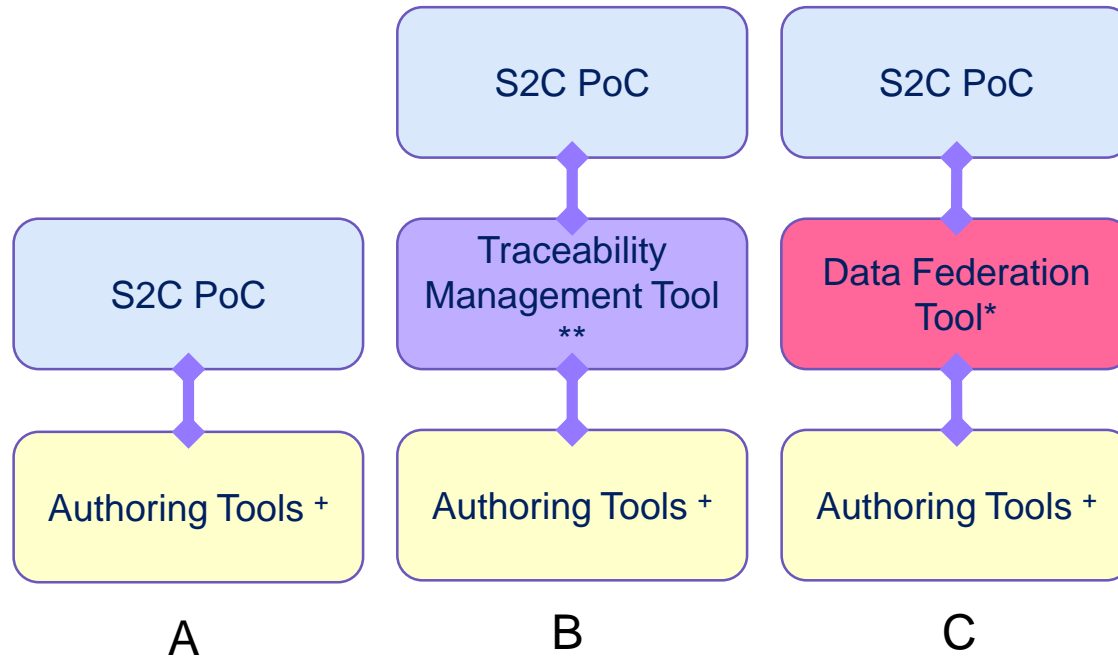
	FC01: Uncontrolled drone (dron...	FC02: Uncontrolled drone in an ...	FC03: Loss of drone capability (...	FC04: Loss of drone protection (...	FC05: Degradation of drone con...	FC06: Inspectivity (Row 7)
✓ AC-3 is VerifiedBy	6	4	4	2		
AIDA						
[SF1] Control drone propulsion	2	✓	✓			
[SF2] Control drone attitude and position	3	✓	✓	✓		
[SF3] Provide drone navigation data	3	✓	✓	✓		
[SF4] Control drone navigation	3	✓		✓	✓	
[SF6] Manage mission	2	✓		✓		
[SF7] Monitor drone control	3	✓	✓		✓	



These tools don't propose (yet) capabilities to analyze the impact of artefact evolutions  
=> objectives of the S2C POC

### 3. Summary of existing services

*Different possible tooling configurations:*



*Services from COTS:*

- Data Federation tool
  - Heterogeneous data integration (mapping)
  - Baseline management
  - Data evolution management (diff/merge)
  - Link evolution management (suspicious links)
- Traceability management tool
  - Traceability management
    - Customized plan,
    - Matrix edition
  - Navigation between traced items and traceability links,
    - Switch to Related Element
    - View Related Element Properties
  - Technical impact analysis
  - Produce customized reports and audits
    - Produce Export (Excel)

+ e.g. Excel, Capella, SimfiaNeo

\* e.g. syndeia, SECollab, System Traceability, ...

\*\* DOORS, rectify, ...

# 4. New services needed

## Services:

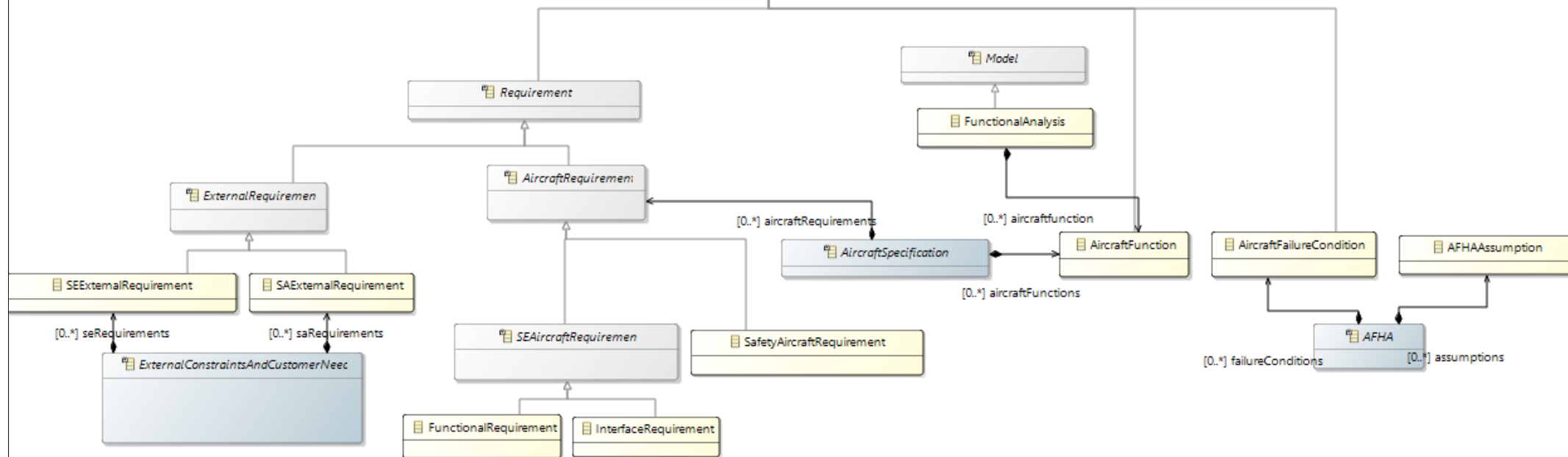
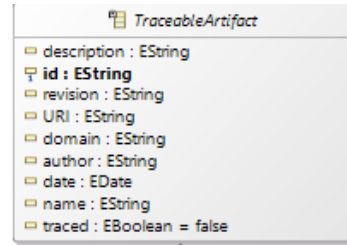
- Data Federation tool
  - Heterogeneous data integration (mapping)
  - Baseline management
  - Data evolution management (diff/merge)
  - Link evolution management (suspicious links) ← Not in every COTS
- Traceability management tool
  - Traceability management
    - Customized plan,
    - Matrix edition
  - Navigation between traced items and traceability links, ← Not in every COTS
    - Switch to Related Element
    - View Related Element Properties
  - Technical impact analysis
  - Produce customized reports and audits
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## New Services needed:

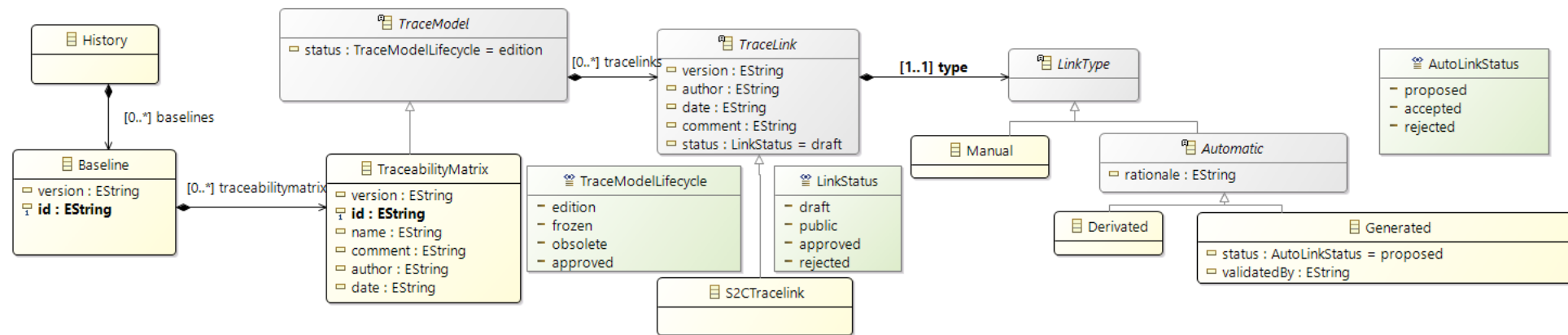
- Impact analysis and Product inconsistency alerts
- Domain-based impact analysis
- Impact analysis reports that can be generated on predefined rules
- Traceability management services
  - Query
  - Visualize
  - Analyze
- Creation of traceability matrix reports
- Produce customized reports and audits
- Suggestion of traceability links when artefact change;
- Severity quotation of the impact

# 5. S2C Traceability metamodel

Enhanced data model (cf. Visual Paradigm model) in a metamodel



## Traceability metamodel

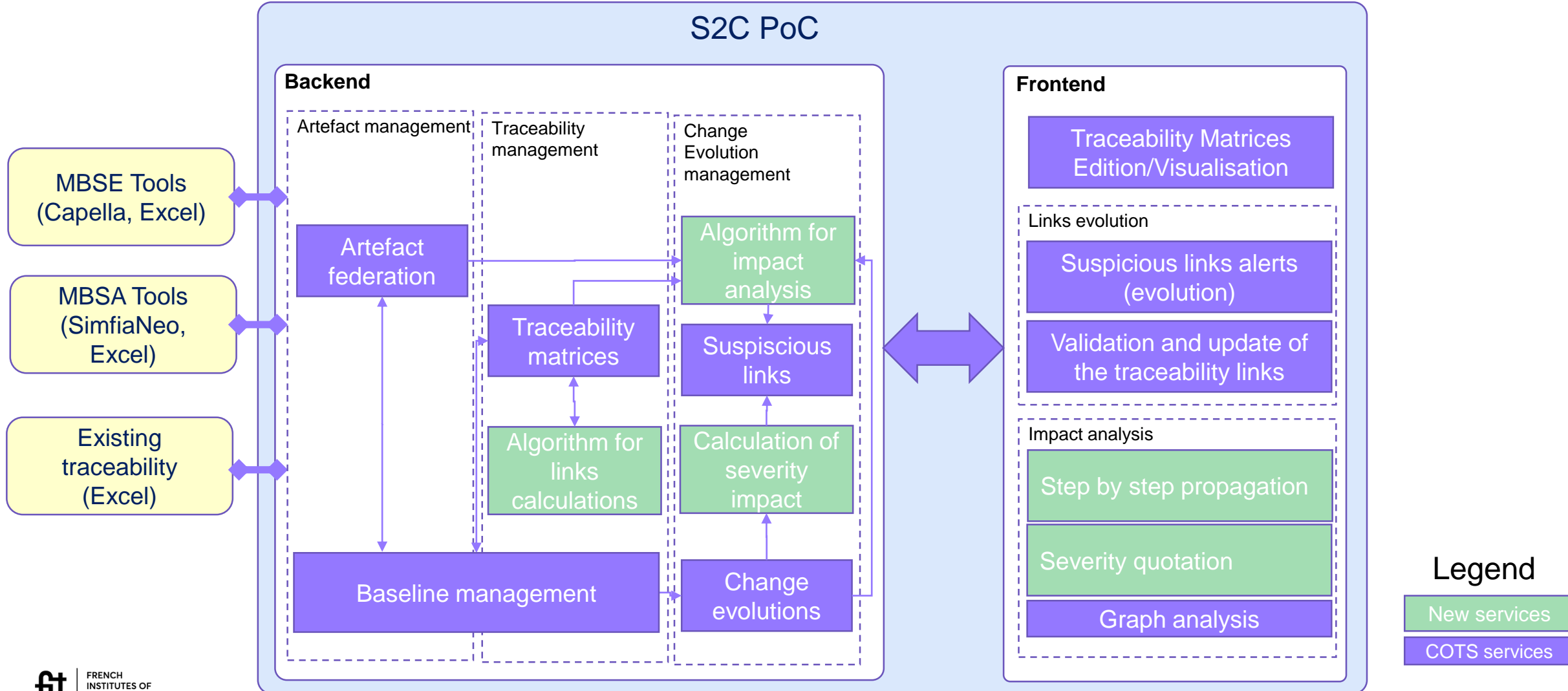




# 6. S2C Dynamic consistency management PoC

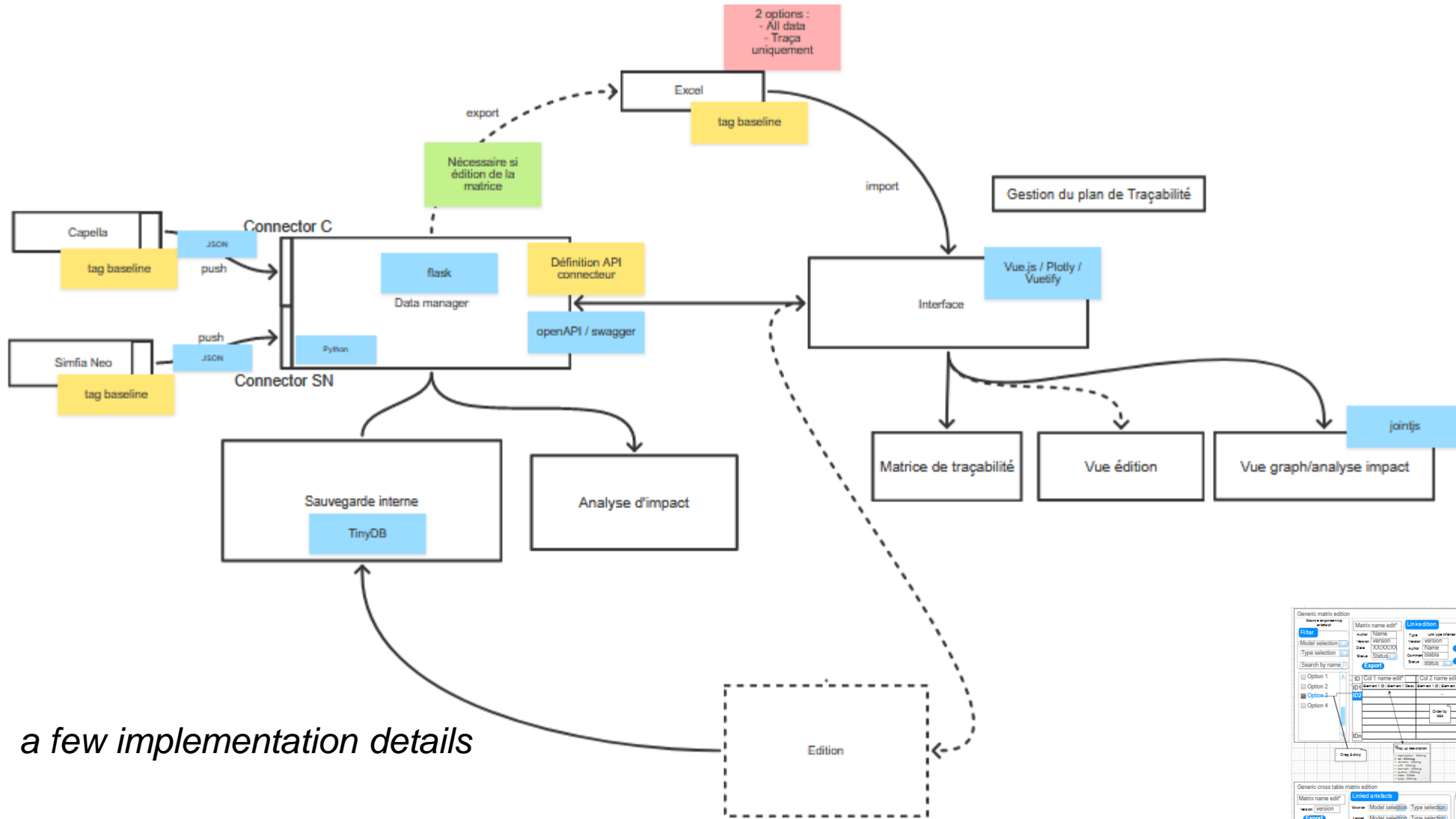
Additional services of the PoC (vs COTS) :

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

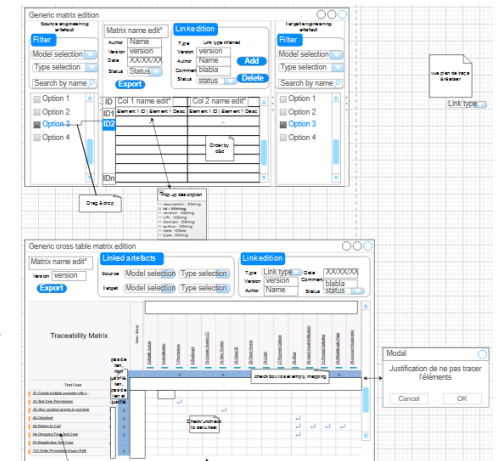


PoC example, with Capella, SimfiaNeo and Excel for illustration purpose

# 6. S2C Dynamic consistency management PoC



*a few implementation details*



*Mock-ups, e.g.*

# 7. Matrix edition mock-up

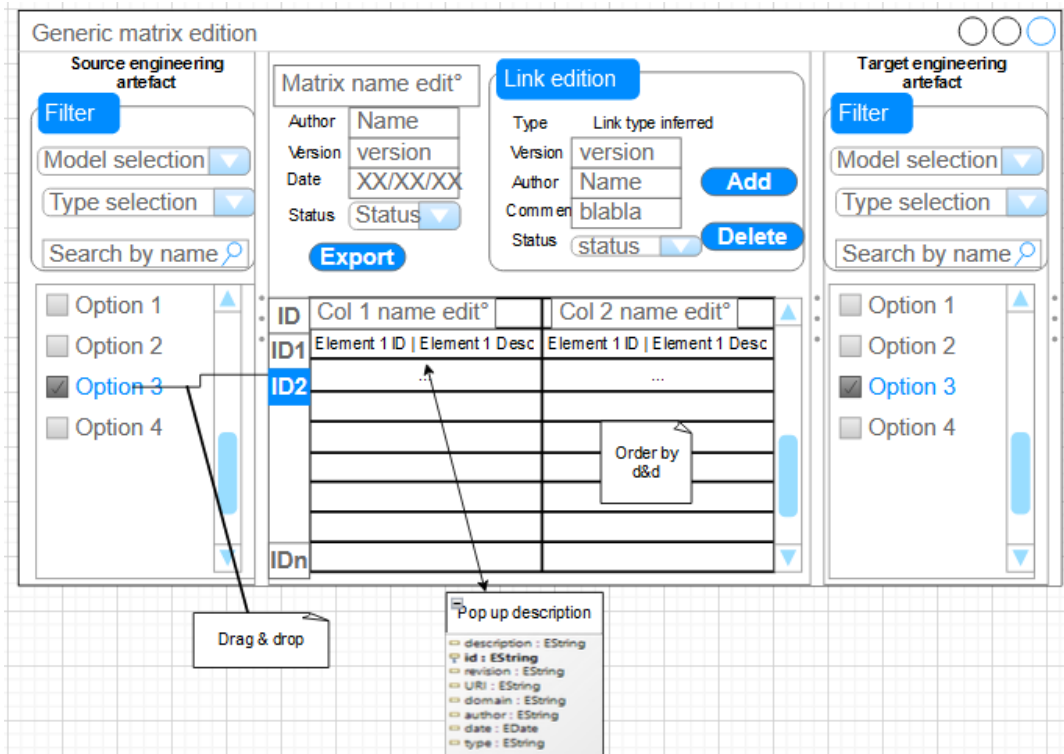
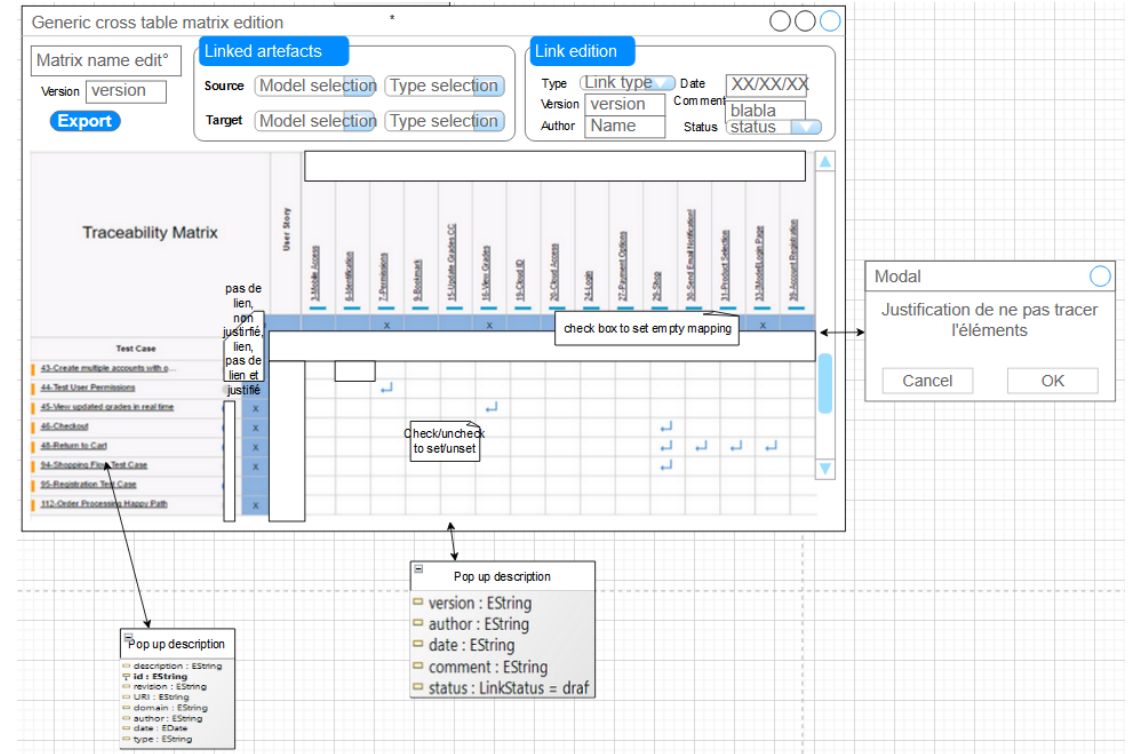


Table visu



Cross-Table visu

# 7. Matrix visualisation mock-up

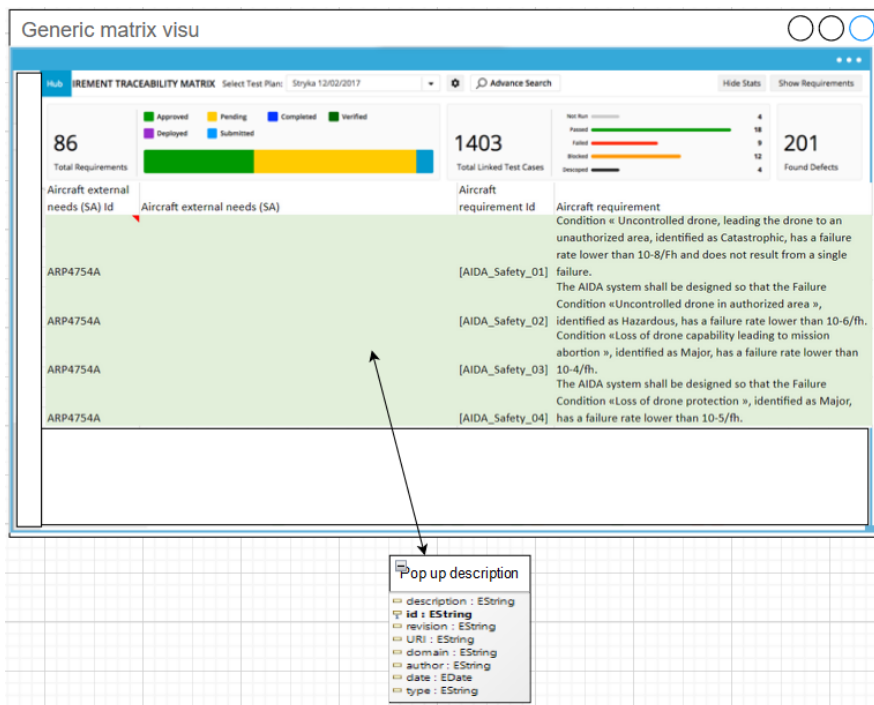
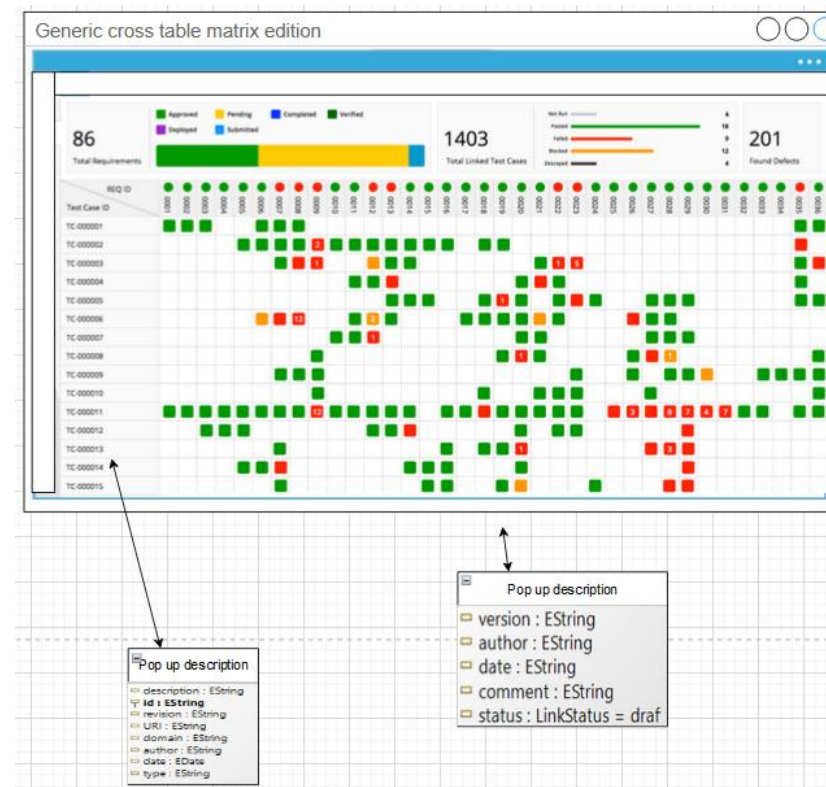
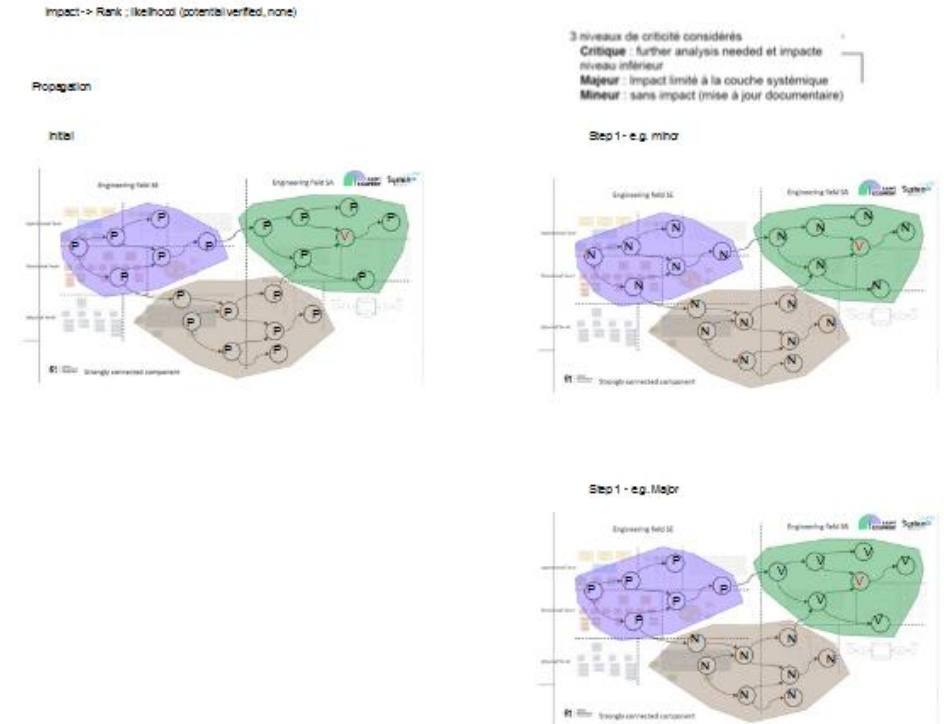
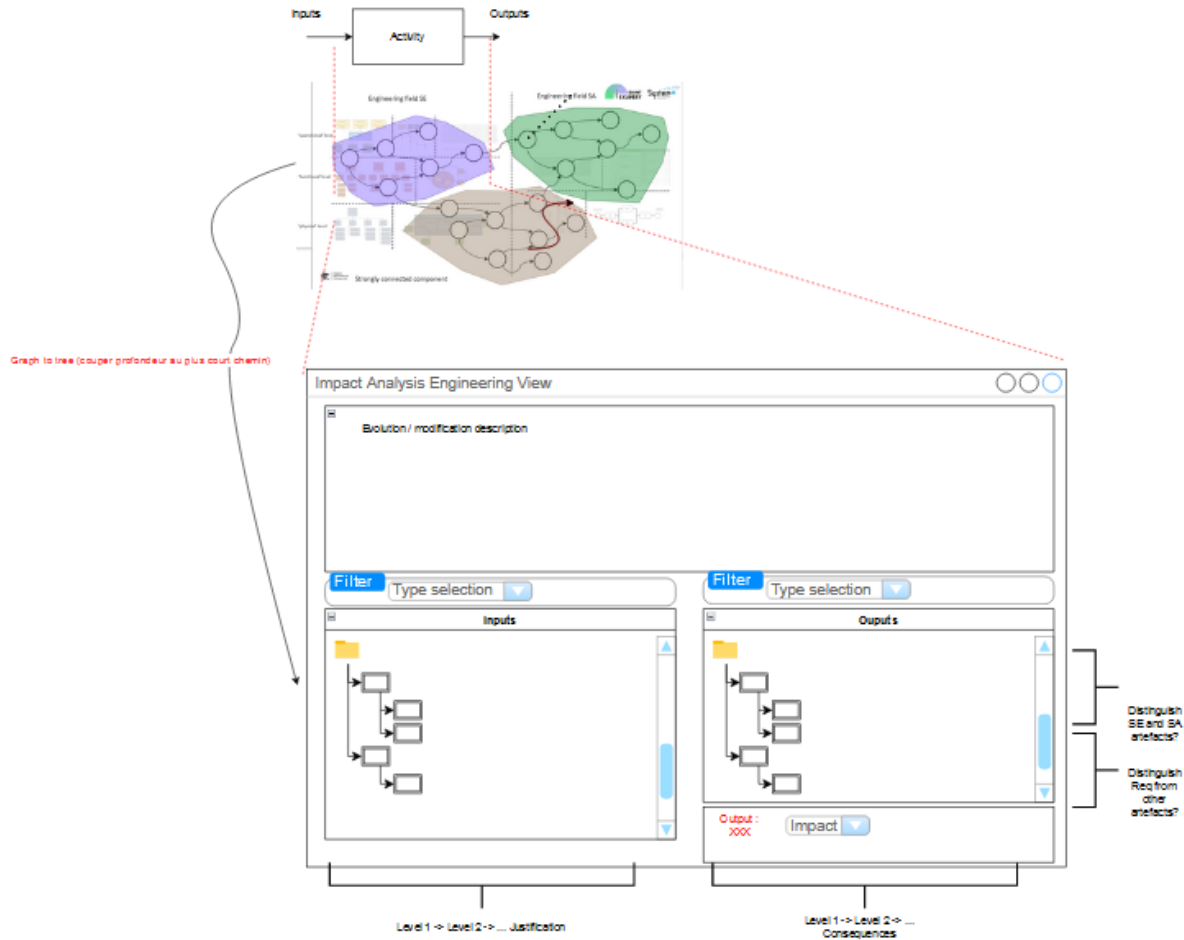


Table visu



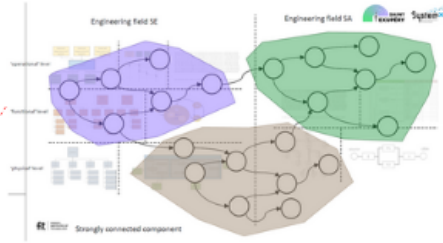
# 7. Impact analysis – for a given domain (SE or SA)



Impact analysis propagation

## Impact analysis representation

# 7. Impact analysis – inter-domains (SE or SA)



Impact Analysis Engineering View

Kind of view: Graph view (selected)

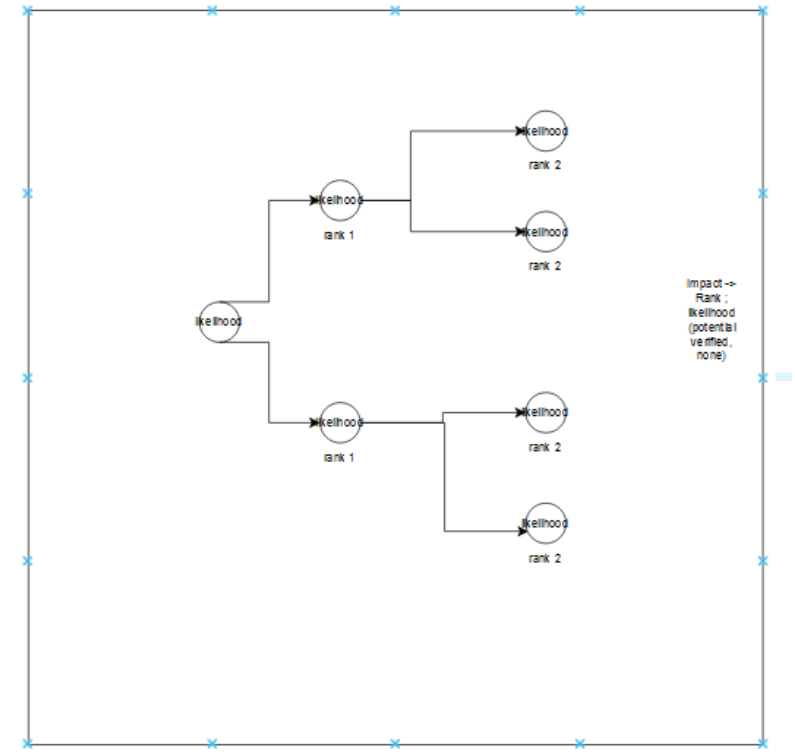
Path(s) view: Input "Name": Output "Name": Show

Focus on "Name": Rank 2 Show

Output Type

Typed / agnostic (node)

### Impact analysis representation into graph



### Likelihood propagation