

WEBINAR

Unifying Digital Threads: Capella and Interoperability to support a Synchronized Source of Truth

THURSDAY, APRIL 3rd 2025

Europe :

4 PM BST (London) - 5PM CEST (Paris)

North America :

8 AM PDT (San Francisco) - 11AM EDT (New York)



José Fuentes

Chief Sales Manager



Illyes Yousfi

Sales & Consulting Engineer



mbse-capella.org/

Capella



OBEO

CONTENTS



01

- **Digital Thread:** cope with complex systems development



02

- **Synchronized Source of Truth:** the foundations to build an extended digital thread
- *Use Cases #1 / #2*



03

- **Traceability and model-requirement consistency:** link your assets all across the life cycle
- *Use Cases #3 / #4*



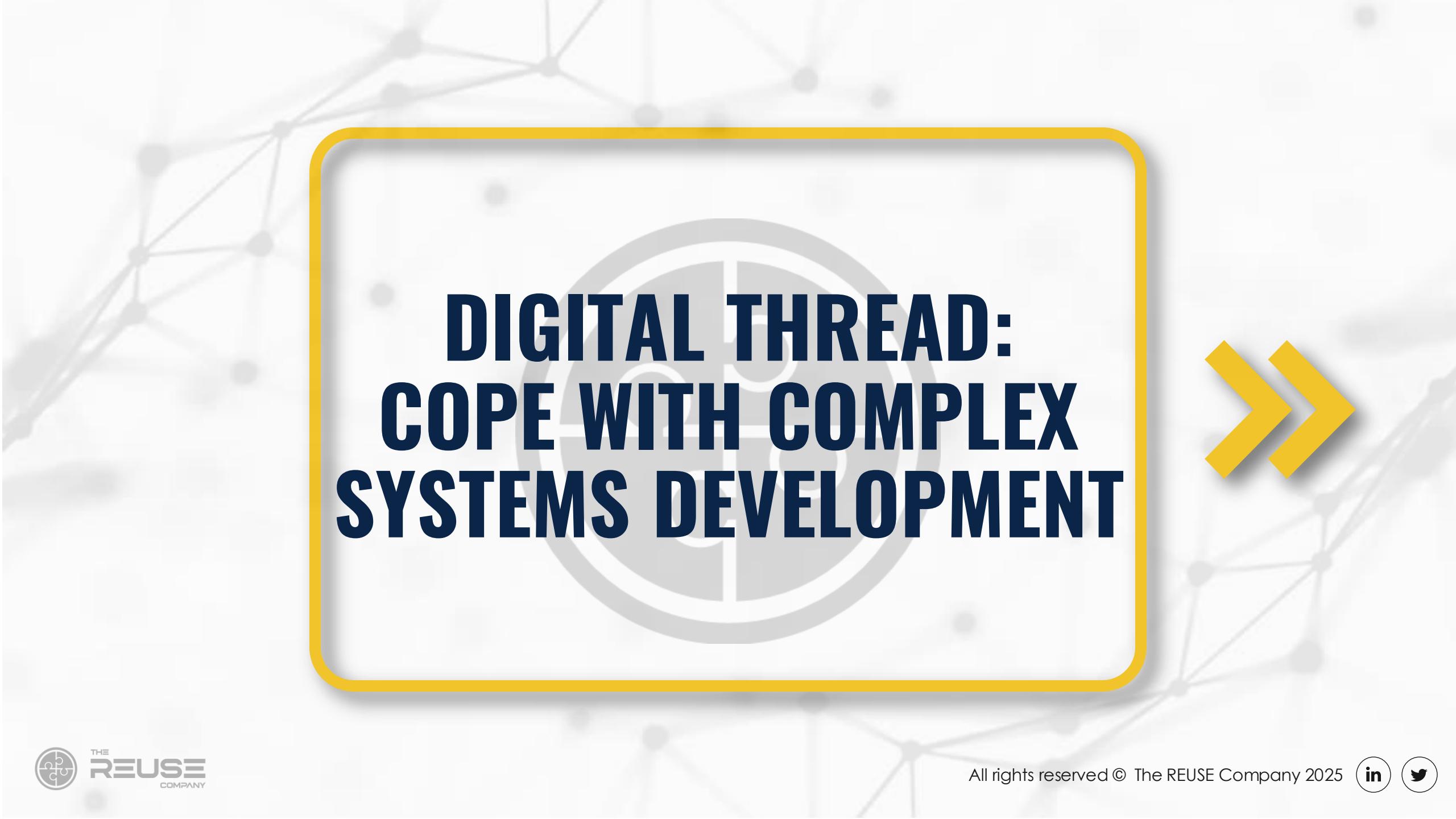
04

- **Model-requirement synchronization:** Unlocking Interoperability
- *Use Cases #5 / #6*



05

- Q&A
- Conclusion

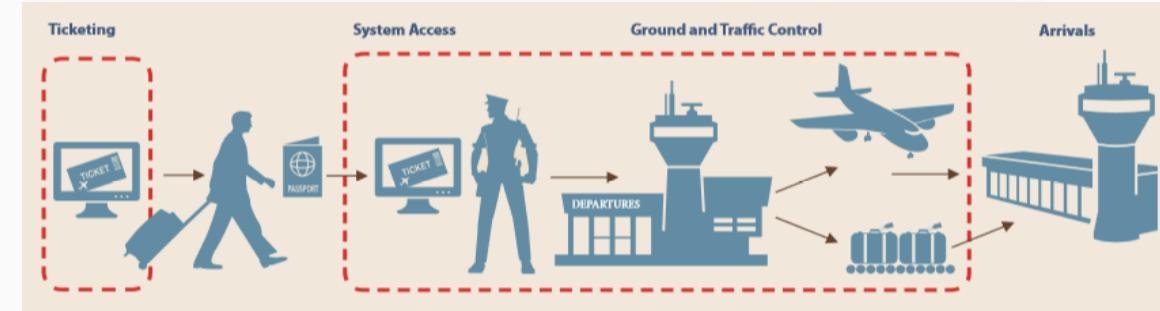


DIGITAL THREAD: COPE WITH COMPLEX SYSTEMS DEVELOPMENT



➤ Modern SE: Increasing complexity

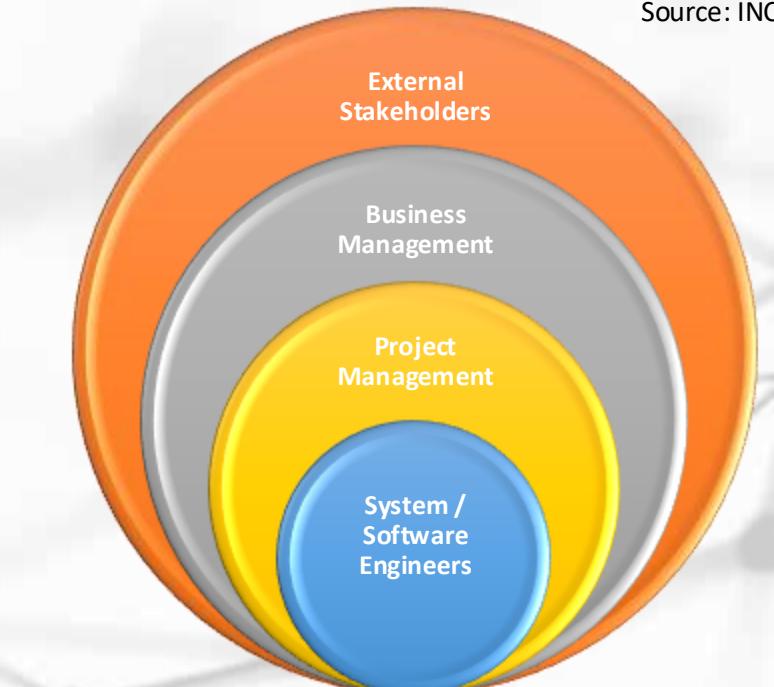
- Complex systems (Systems of Systems)



Source: INCOSE SE Vision 2020

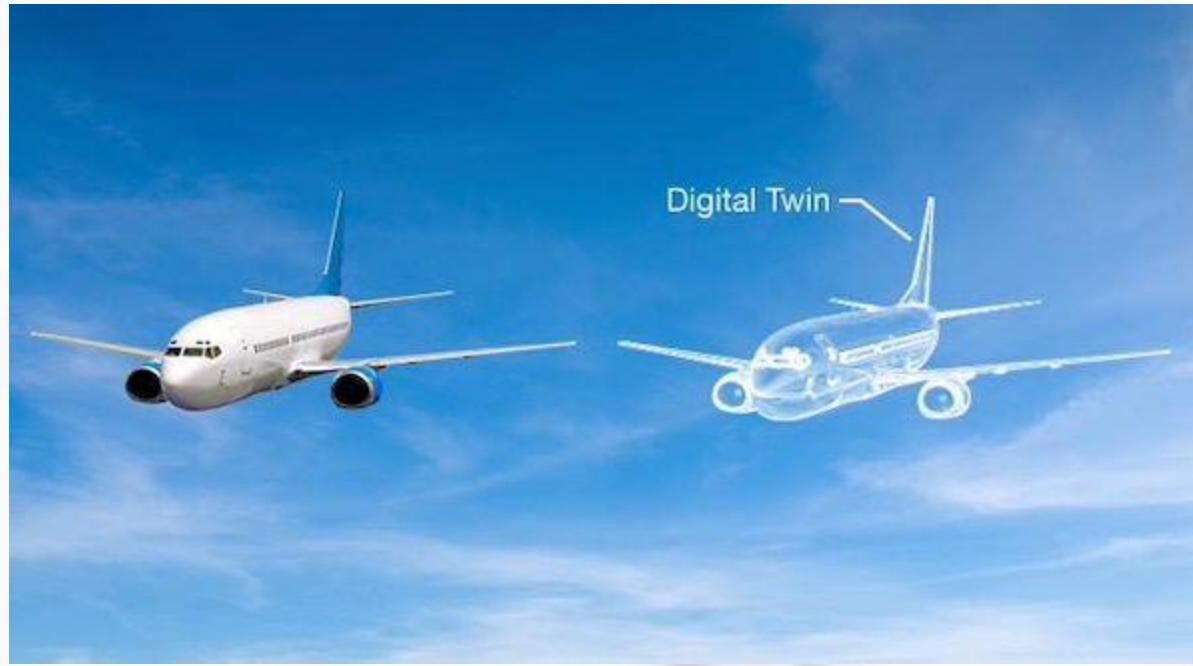
- Complex organizations

- Complex toolchains



➤ Digital Thread & Digital Twin

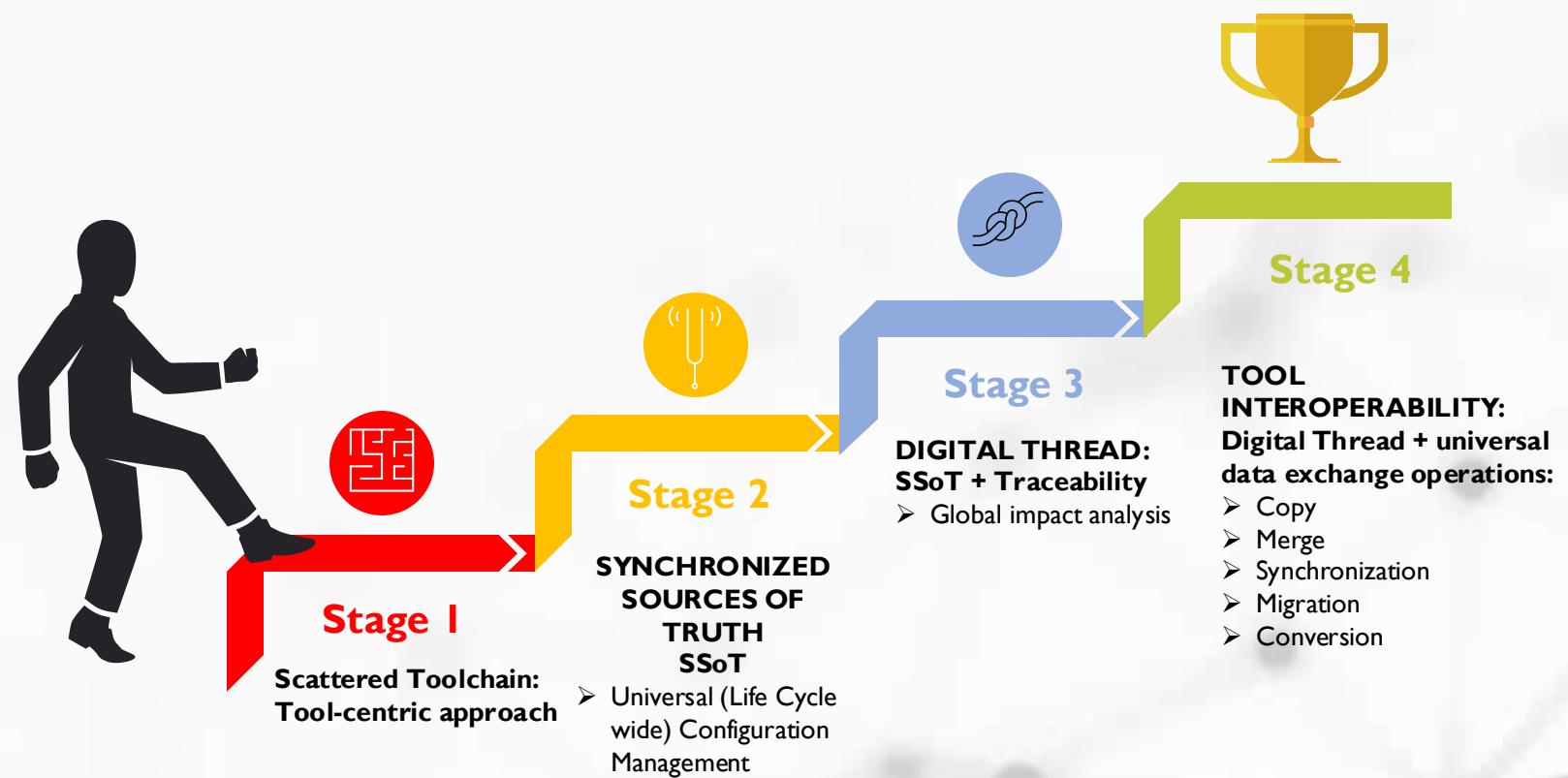
➤ Need to extend the digital thread beyond the physical world

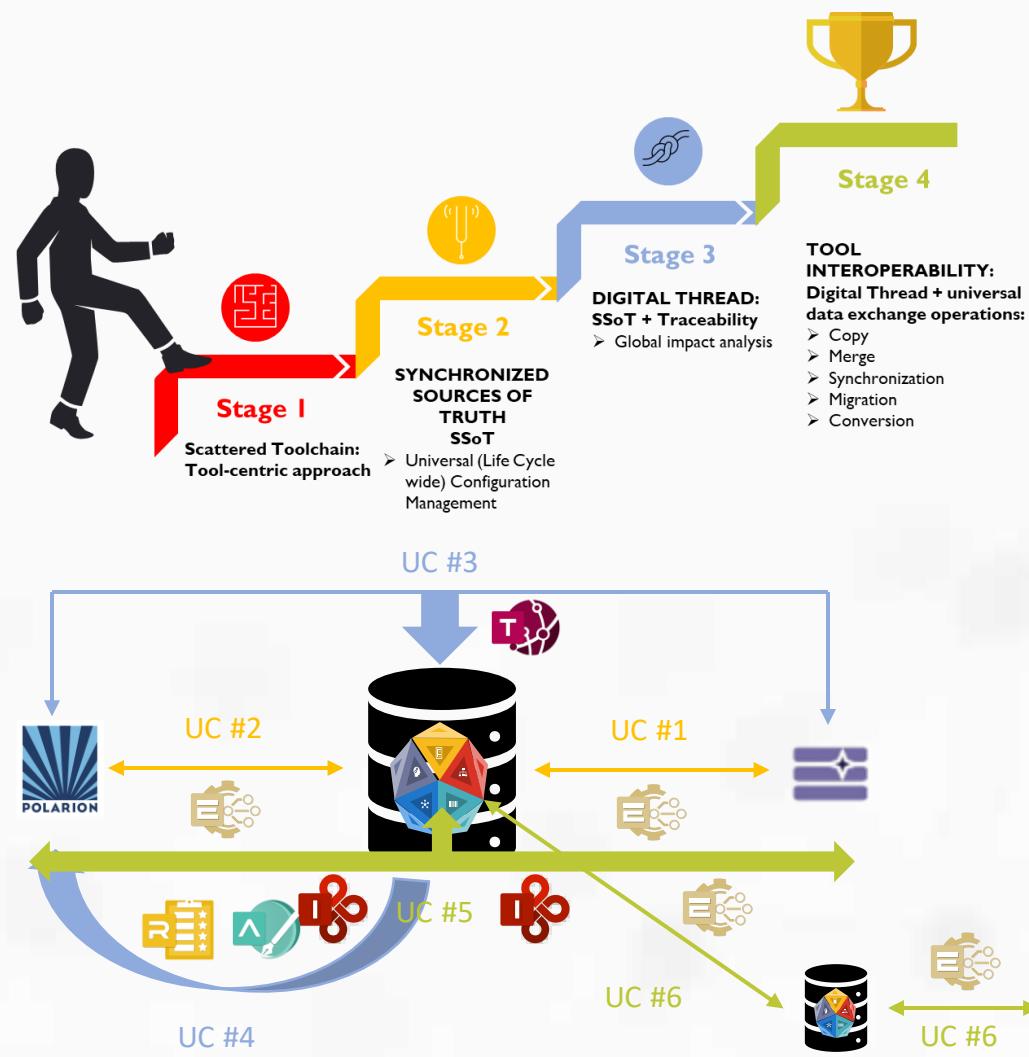


[This Photo](#) by Unknown Author is licensed under [CC BY-SA](#)

- Consequences of complex systems development
 - Multiplication of heterogeneous tools that need to be interconnected
 - Iterative processes reinforcing the challenge of change impact analysis with an extended spectrum
 - **Digital Thread for Enhanced Knowledge management** that helps anticipate :
 - Potential changes & their related **risks**
 - Make **proactive** decisions
 - **Maximize** the Opportunity / Risk ratio

➤ Path to reach an extended / universal digital thread



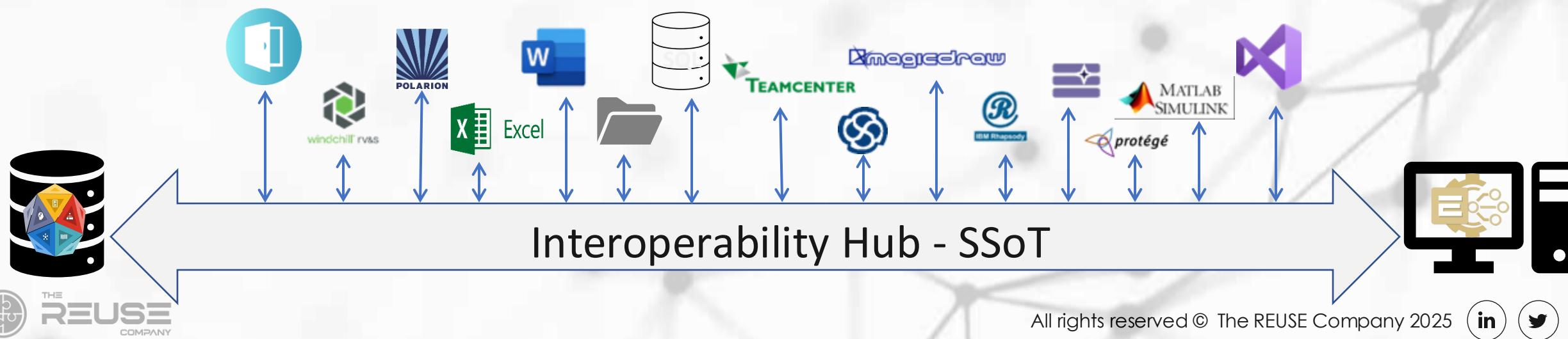


- Use case #1: Connection to Capella model
- Use case #2: Connection to Polarion project
- Use case #3: Traceability Capella – Polarion
- Use case #4: Model-based requirements engineering (model-req consistency)
- Use case #5: Model-req synchronization
- Use case #6: Remote connection

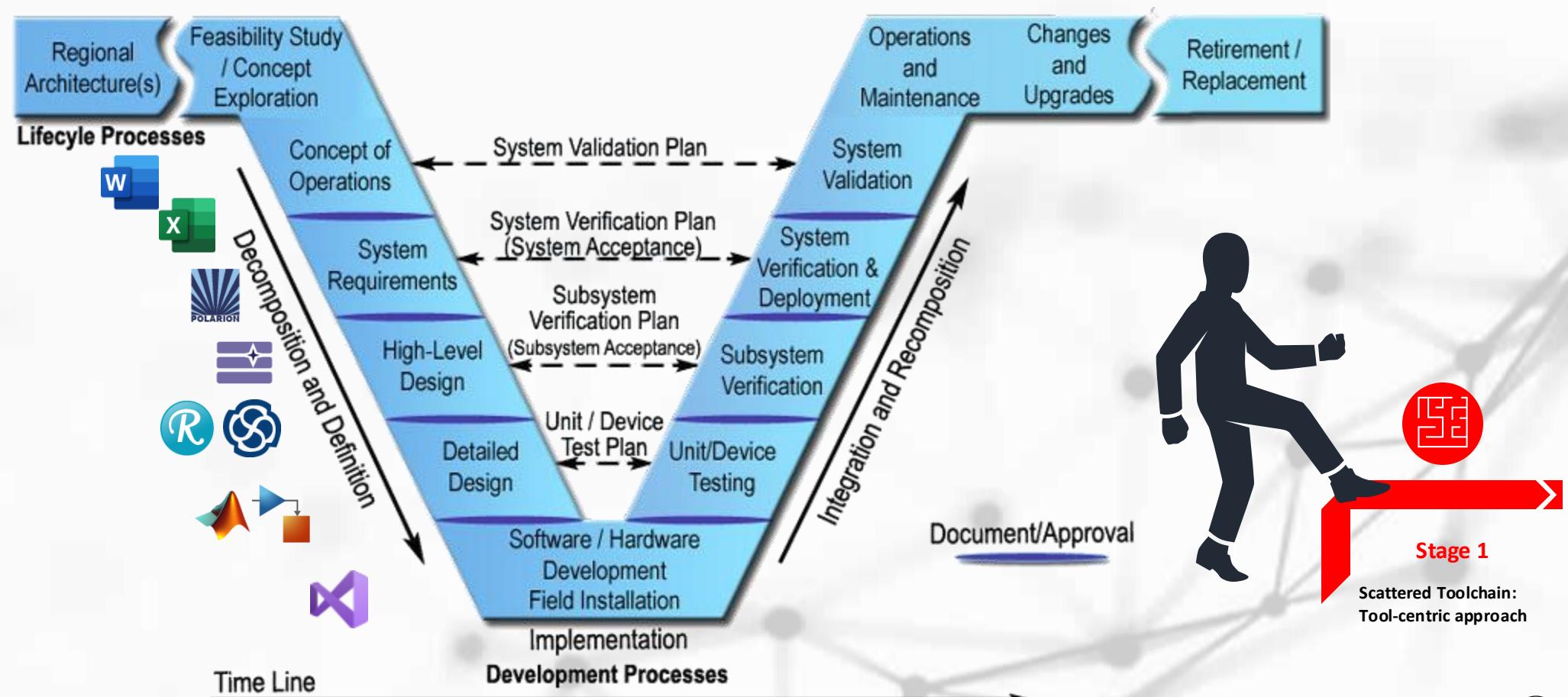
SYNCHRONIZED SOURCE OF TRUTH: THE FOUNDATIONS OF THE DIGITAL THREAD



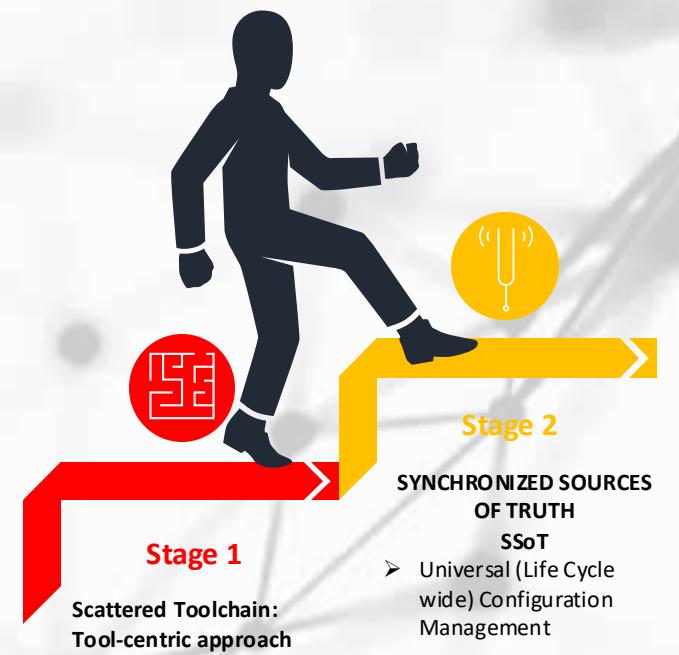
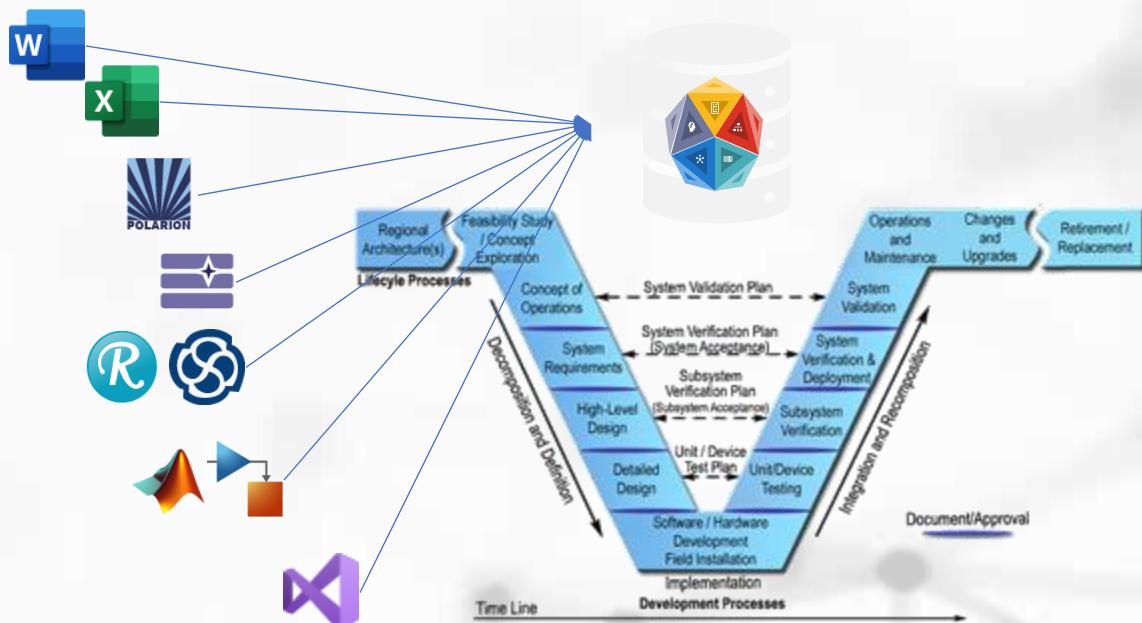
- SES ENGINEERING Studio implements the notion of Interoperability hub (SSoT – Synchronized Source of Truth):
 - No one-to-one connector: every tool connects to the hub. Destroying silos
 - No wipe-out approach: each individual source synchronized in SES remains the Authoritative Source of Truth (ASoT)
 - Source tools from many different disciplines: textual, modelling, code editor, testing....



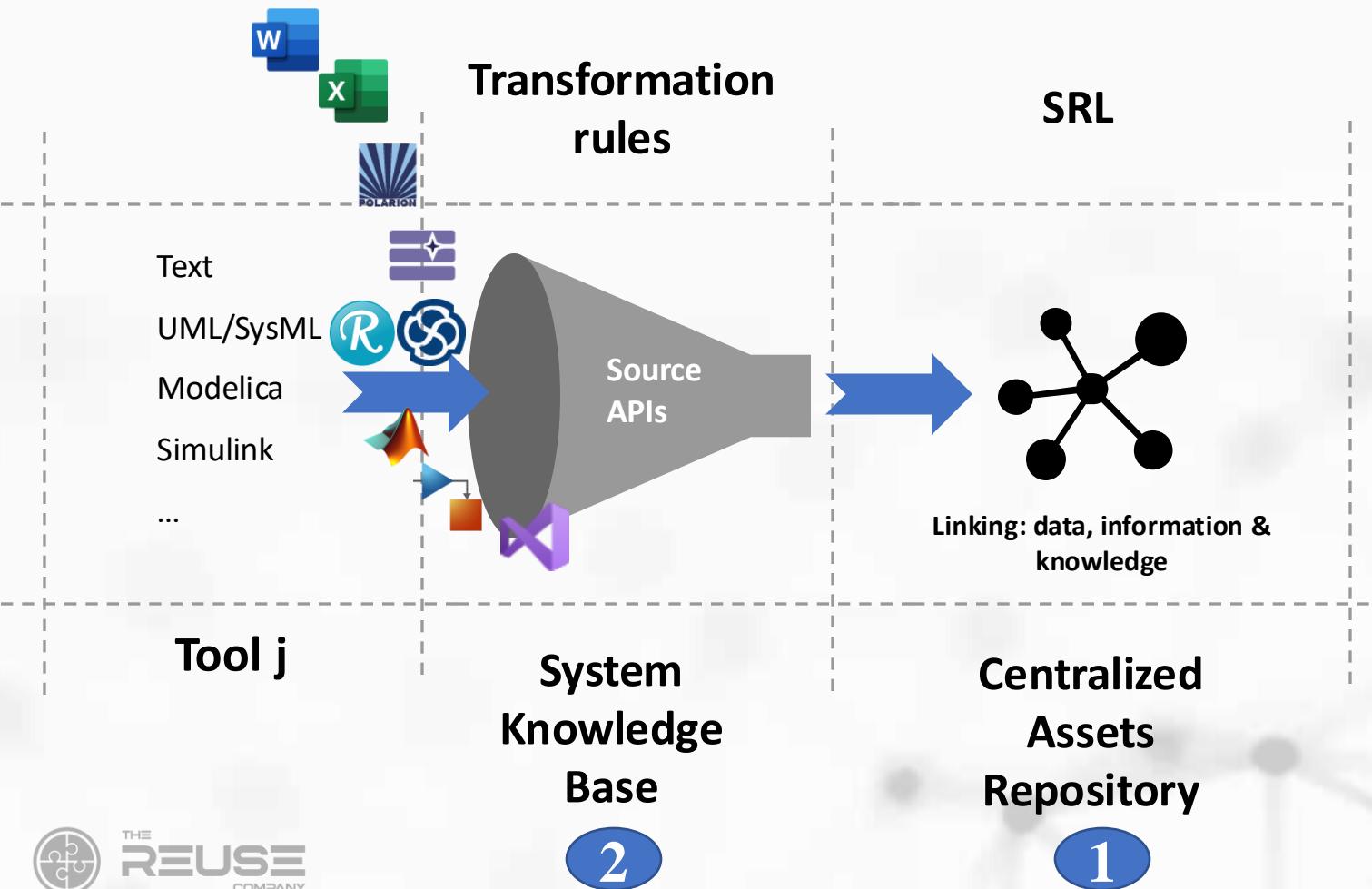
From Stage 1: Scattered SE tool-chain : Tool-centric approach...



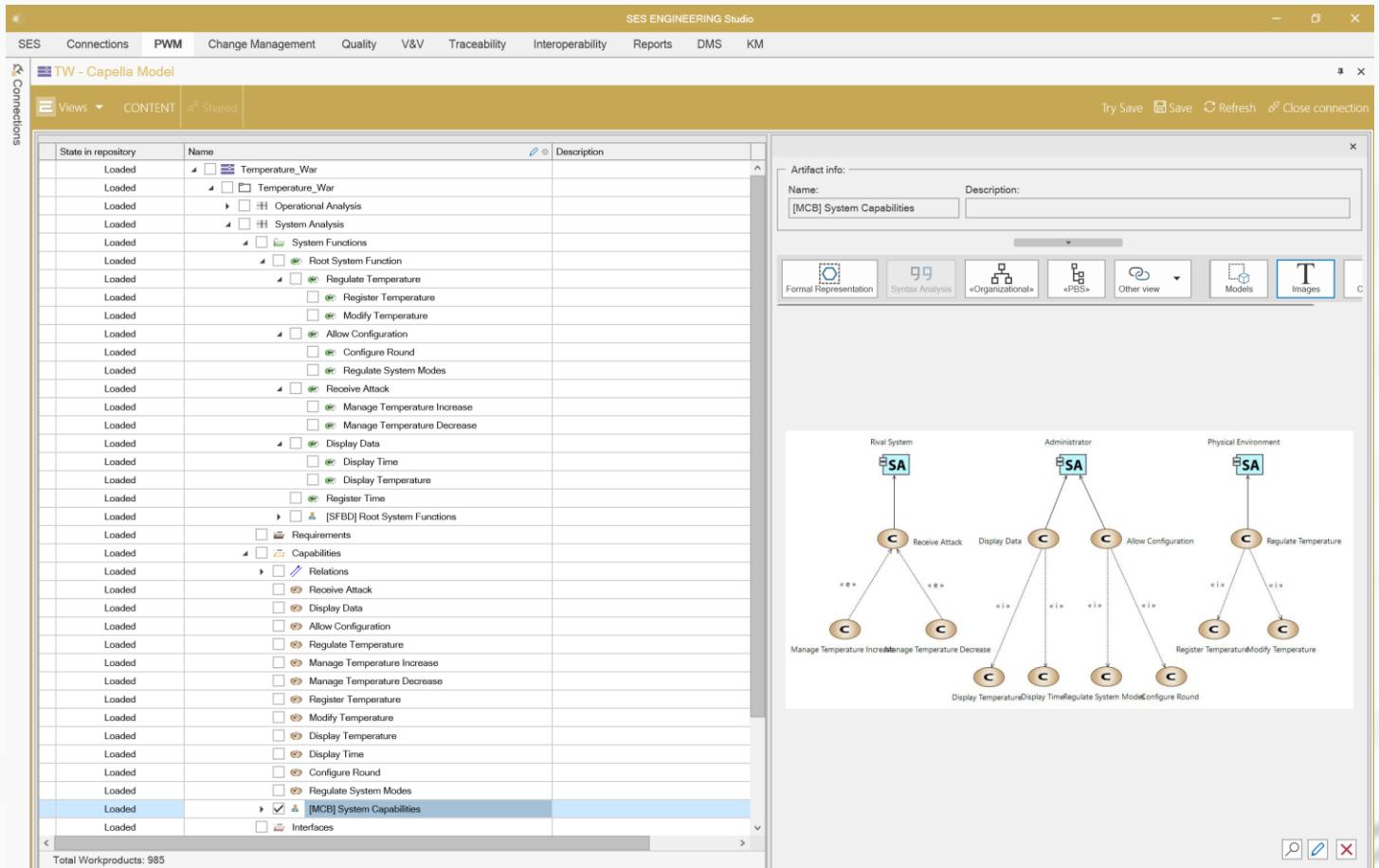
- ...To Stage 2: Synchronized Sources of Truth**
- Universal configuration management for all the assets.
 - Back-up copy

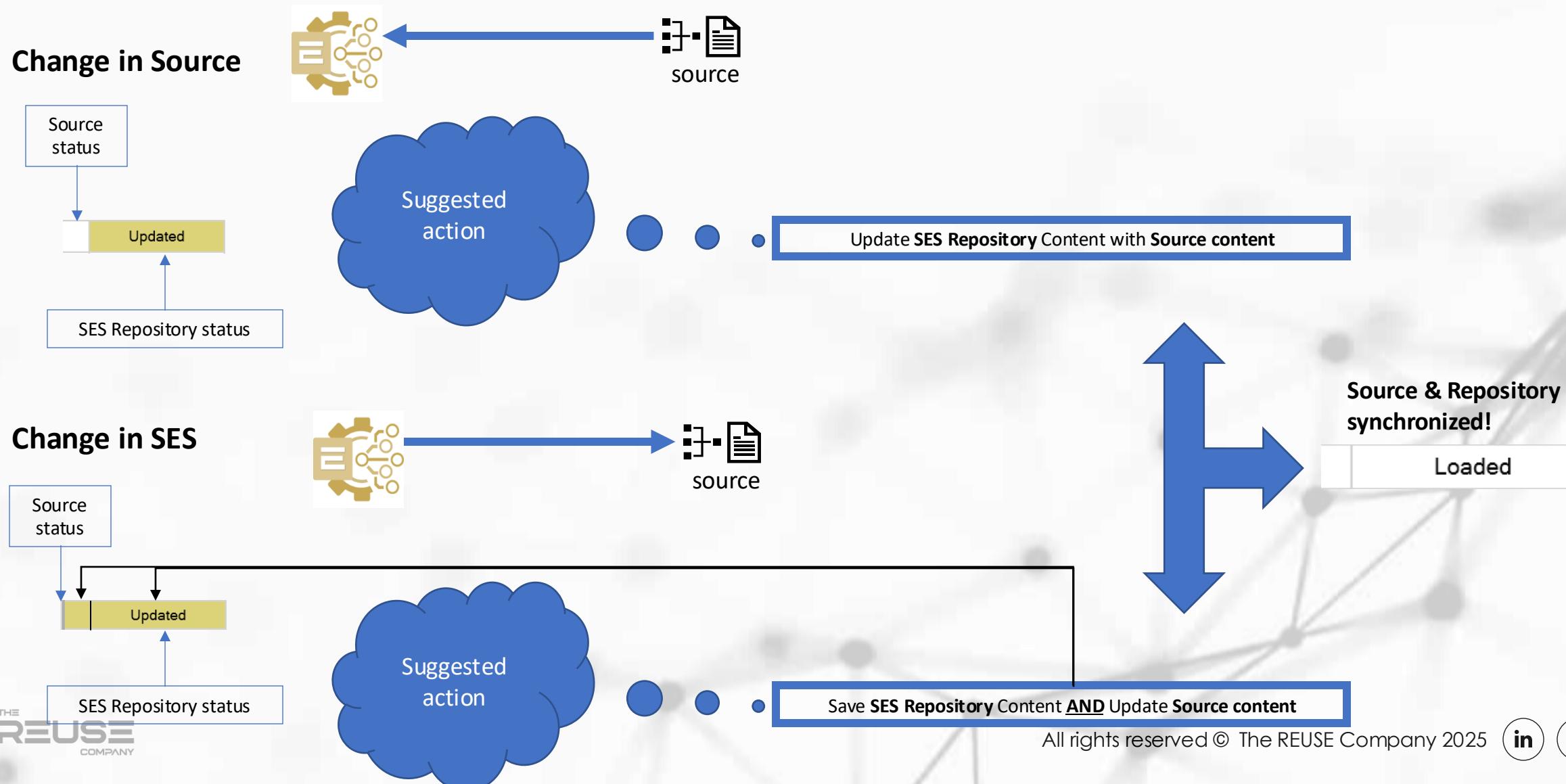


➤ The concept of universal connector

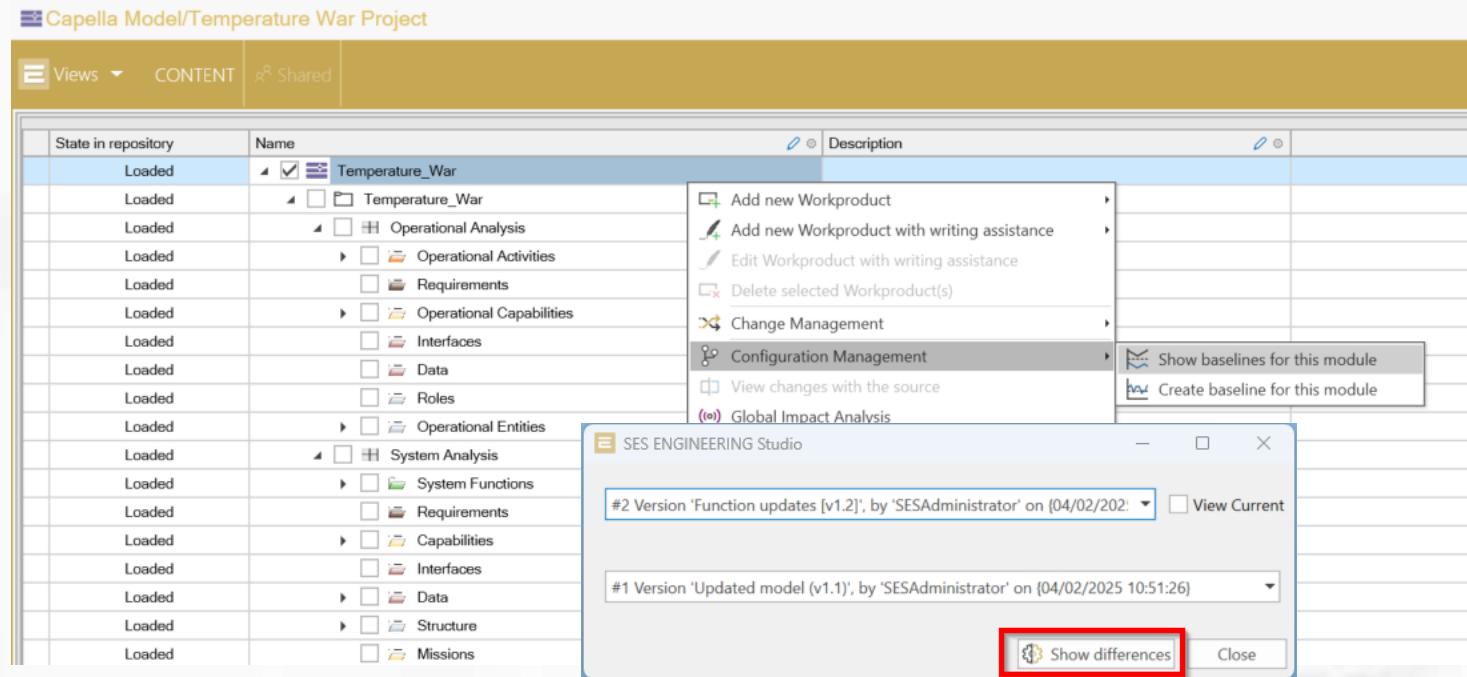


➤ The concept of universal connector: Capella (v7.0 also supported!)





- Universal Configuration Management:
 - Object versions
 - Project baselines



Differences

#1 Version: 'Updated model (v1.1)' Author: 'SESAdministrator' Date: 3/31/2025 3:53:14 PM

Change	Name	Traces	Description
None	▶ □ Operational Activities		
None	□ Requirements		
None	▶ □ Operational Capabilities		
None	□ Interfaces		
None	□ Data		
None	□ Roles		
None	▶ □ Operational Entities		
None	▶ □ System Analysis		
None	▶ □ System Functions		
None	□ Requirements		
None	▶ □ Capabilities		
None	□ Interfaces		
None	▶ □ Data		
None	▶ □ Structure		
None	□ Missions		
None	◀ □ Logical Architecture		
None	◀ □ Logical Functions		
None	◀ □ Root Logical Function		
None	▶ □ Receive Attack		
None	□ Register Time		
None	□ Register Temperature		
None	▶ □ Modify Temperature	(to)	
None	□ Supply Power		
None	▶ □ Regulate System Modes	(to)	
None	▶ □ Configure Round	(to)	
None	◀ □ Display Data		
Updated	□ Display Time		
Updated	✓ □ Display Temperature		
None	▶ □ [LFBD] FBS		
None	□ Requirements		
None	□ Capabilities		
None	□ Interfaces		
Total Workproducts: 160			
<input type="checkbox"/> Change	<input type="checkbox"/> Not contains	<input checked="" type="checkbox"/> None	

View changes for this element

- View quality diff
- View traces diff
- Select all rows
- Unselect all rows

Artifact 'CAPELLA://D:\IYOUSFI\TRC\Programs\Capella 7.0\capella\workspace\Temperature_War\Temperature_War.aird//389073eb-c870-430b-9f46-e27f2547e2f6' - version history

Artifact 'CAPELLA://D:\IYOUSFI\TRC\Programs\Capella 7.0\capella\workspace\Temperature_War\Temperature_War.aird//389073eb-c870-430b-9f46-e27f2547e2f6' - version history

CAPELLA://D:\IYOUSFI\TRC\Programs\Capella 7.0\capella\w... CAPELLA://D:\IYOUSFI\TRC\Programs\Capella 7.0\capella\w...

Name: Last modification date (repo): Last modification user (repo): Name: Last modification date (repo): Last modification user (repo):

Display Temperature 3/31/2025 3:53:14 PM SESAdministrator Display Ambient Te... 4/2/2025 11:03:08 AM SESAdministrator

Content:

Label Format

Search

Content:

Label Format

Search

NEW Summary = Room Temperature where the battle occurs

Show only elements with changes (new, deleted, updated) Compare metadata Compare properties

HasChanges

HasChanges

Close

Updated

Display Battle Time

✓ □ Display Ambient Temperature

None

▶ □ Receive Attack

None

□ Register Time

None

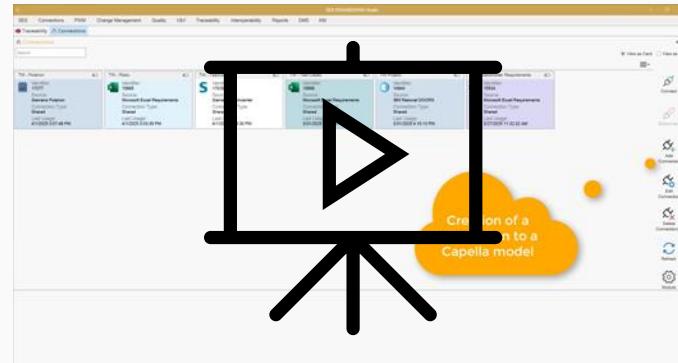
▶ □ [LFBD] FBS

Total Workproducts: 157

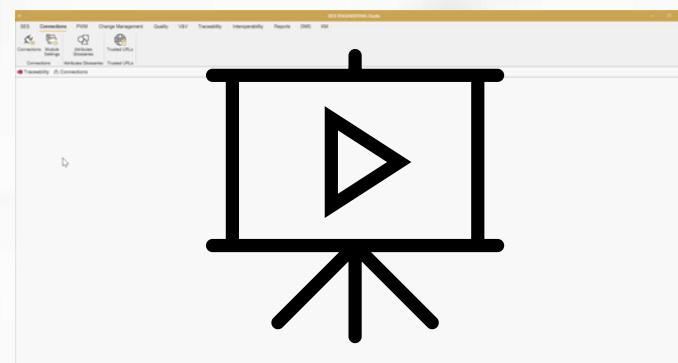
Change Not contains None

Close

➤ Use case #1: Connection to a Capella model (v7.0)



➤ Use case #2: Connection to an ALM Tool project (SIEMENS Polarion)

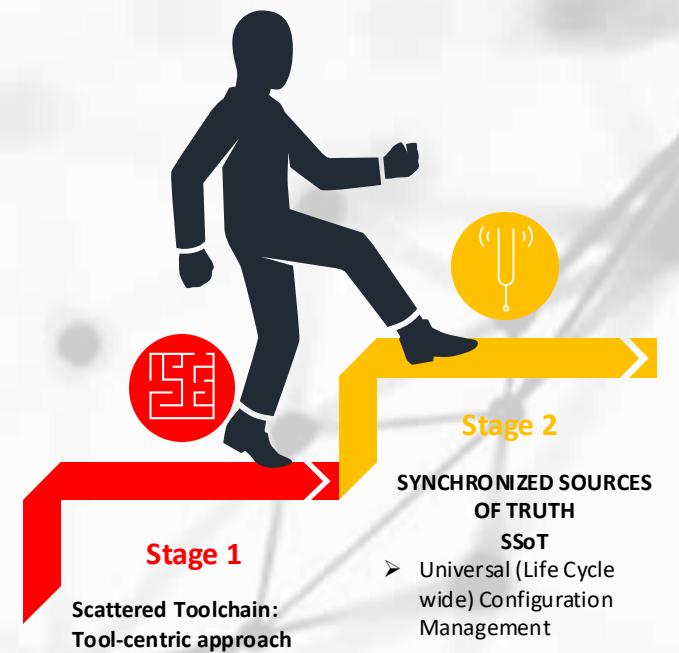
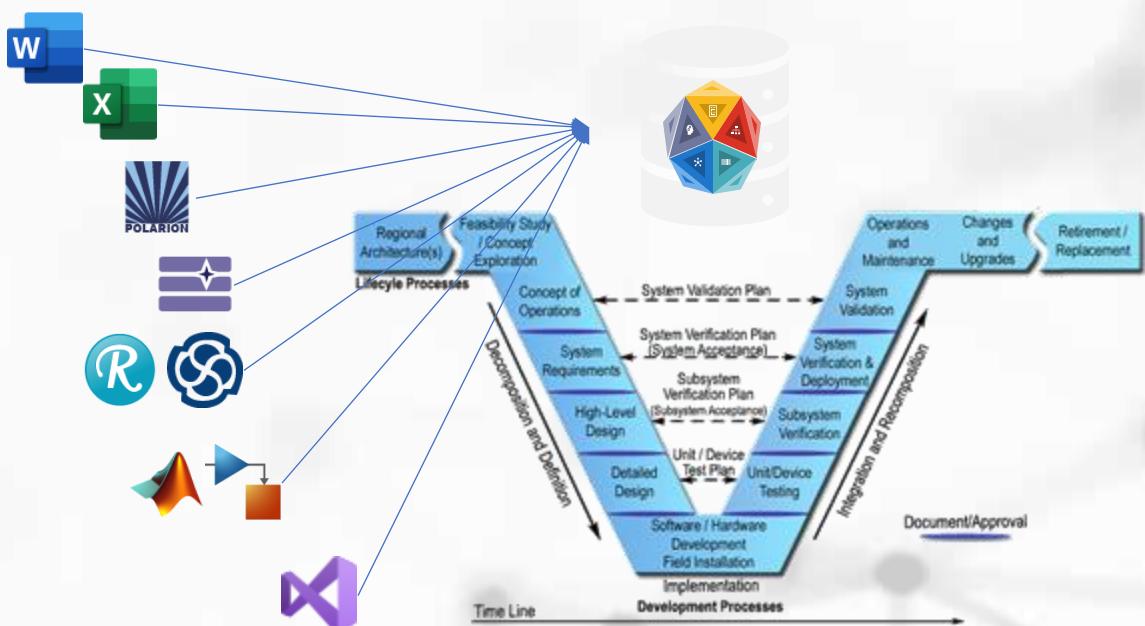


EXTENDED TRACEABILITY: ENSURE MODEL-REQUIREMENT CONSISTENCY



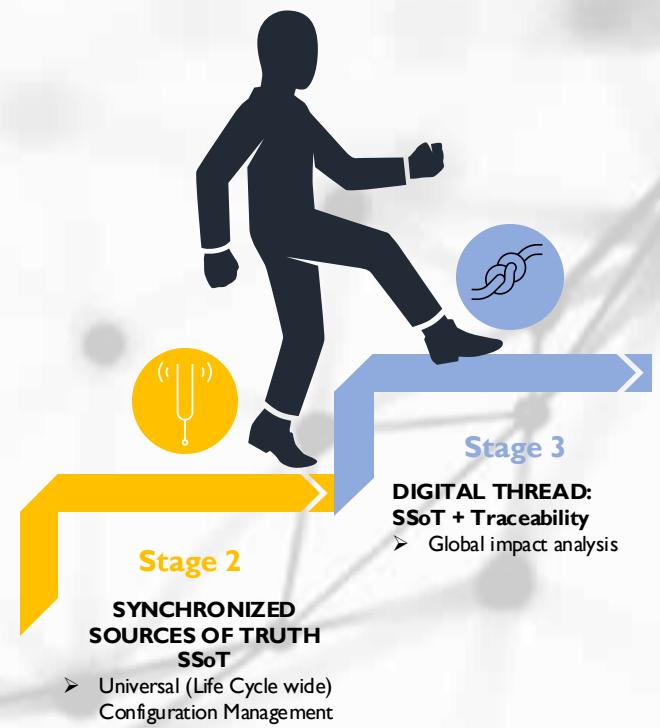
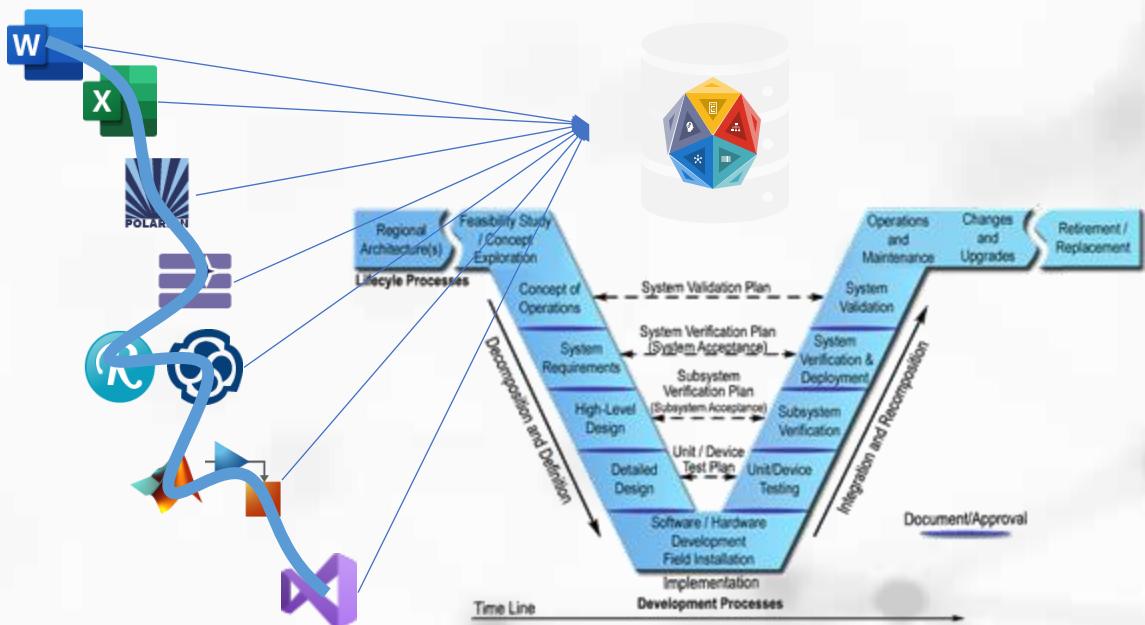
From Stage 2: Synchronized Sources of Truth

- Universal configuration management for all the assets.
- Back-up copy
-



...To Stage 3: Digital Thread

- End-to-end traceability
- Global Impact analysis and suspect links detection



SES ENGINEERING Studio

Traceability Modules:

Traceability Project: "Temperature War"

Identifier	Name	Description	Trace types	Security	Traces	Evaluat...
17000	Logical Model -> System Requirements		Realizes		606	Loaded
15857	Stakeholder Requirements -> System R...		Derives		29	Loaded
16996	System Requirements -> Control Syste...		Allocates Der		16	Loaded
16997	System Requirements -> Management...		Allocates Der		41	Loaded
16998	System Requirements -> Power System...		Allocates Der		24	Loaded
17023	System Requirements -> Risks	Threatens			1	Loaded
16999	System Requirements -> Temperature R...		Allocates Der		29	Loaded
17024	System Requirements -> Test Cases	Verifies			1	Loaded

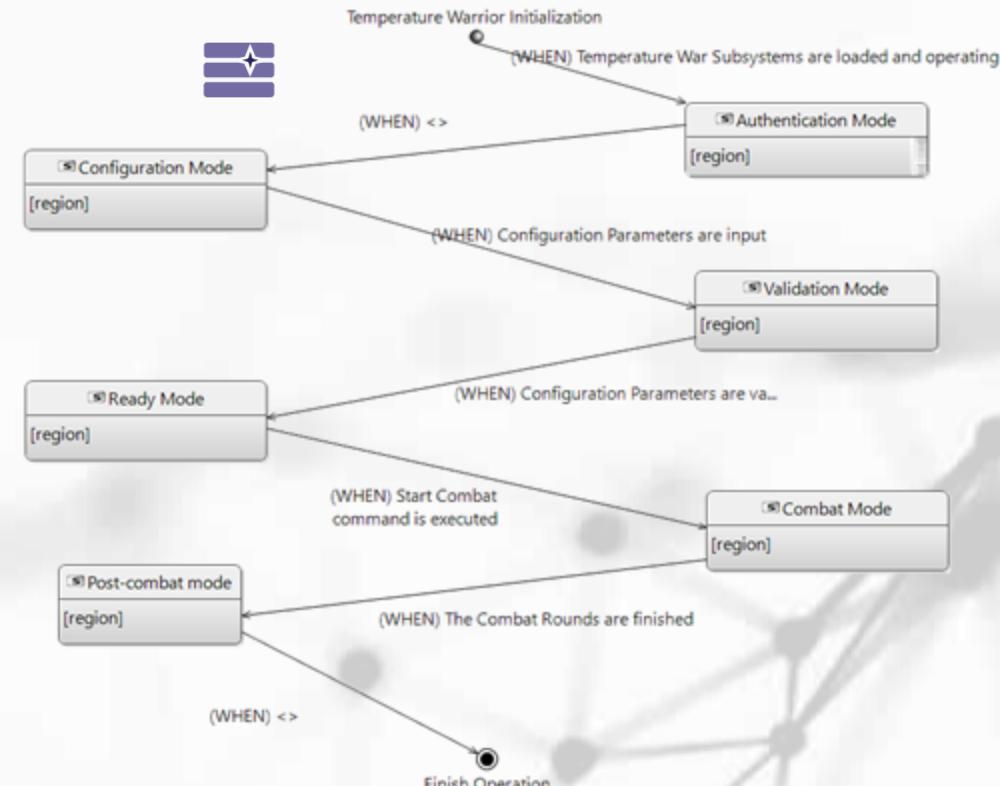
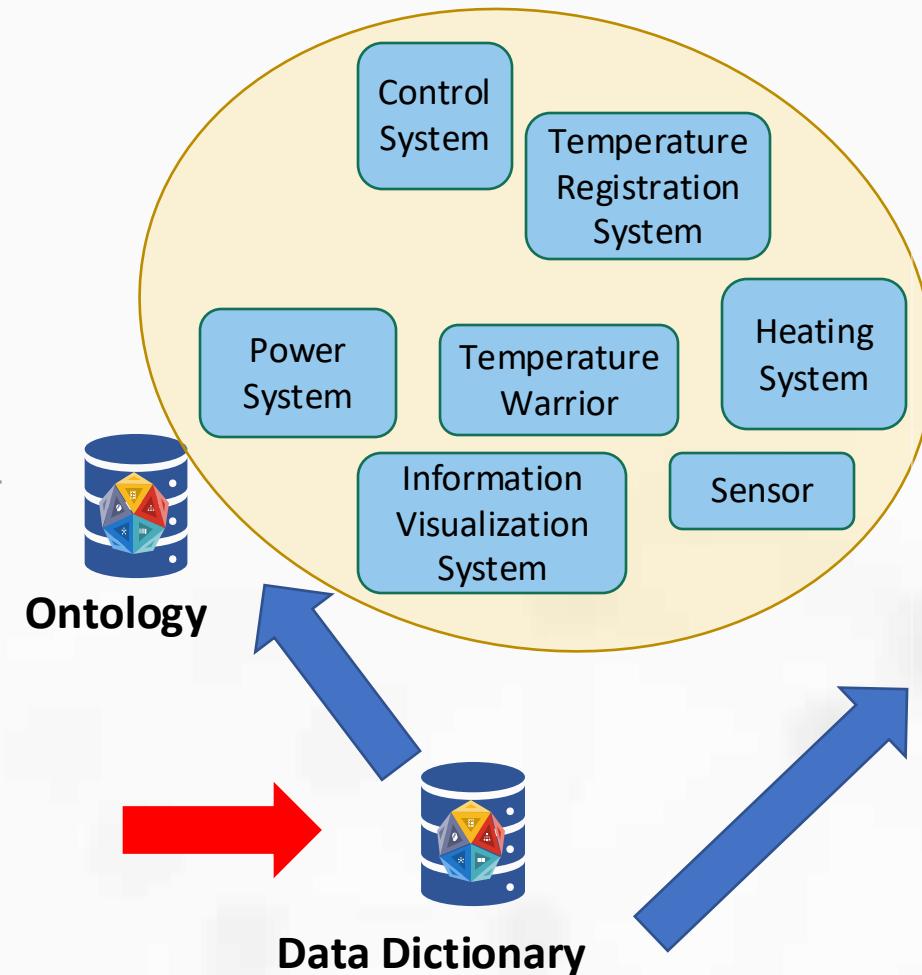
Module Map:

```

graph TD
    TSYS[TSysTC] --- TWRIS[Risks]
    TSYS --- TWTM[Temperature War]
    TSYS --- TWP[Power System]
    TSYS --- TWTCS[Control System]
    TSYS --- TWTMS[Management System]
    TWRIS --- TWTM
    TWRIS --- TWP
    TWRIS --- TWTCS
    TWRIS --- TWTMS
    TWTM --- TWTCS
    TWTM --- TWTMS
    TWP --- TWTCS
    TWP --- TWTMS
    TWTCS --- TWTMS
  
```

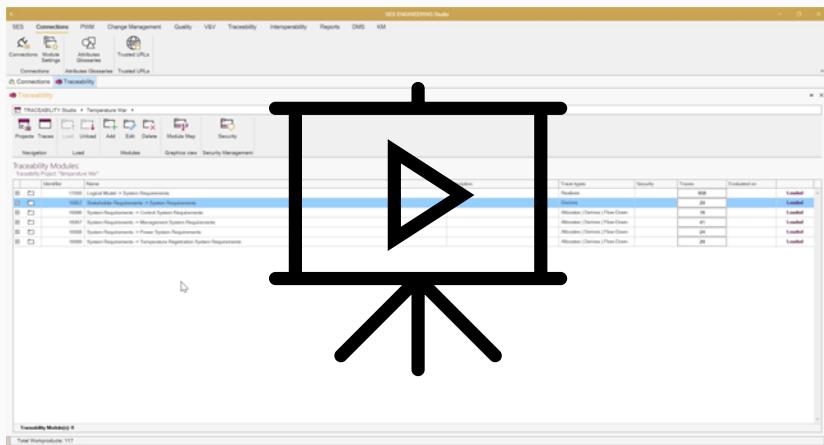
The Module Map displays a network of interconnected nodes representing different system components. The central node is 'TSysTC' (Logical Model). It connects to 'Risks' (Stakeholder Requirements), 'Temperature War' (System Requirements), 'Power System' (Power System), 'Control System...', 'Management S...', and 'Temperature R...' (Temperature Requirements). 'Risks' connects to 'Temperature War'. 'Temperature War' connects to 'Power System', 'Control System...', 'Management S...', and 'Temperature R...'. 'Power System' connects to 'Control System...' and 'Management S...'. 'Control System...' and 'Management S...' connect to each other.

Transformation rules



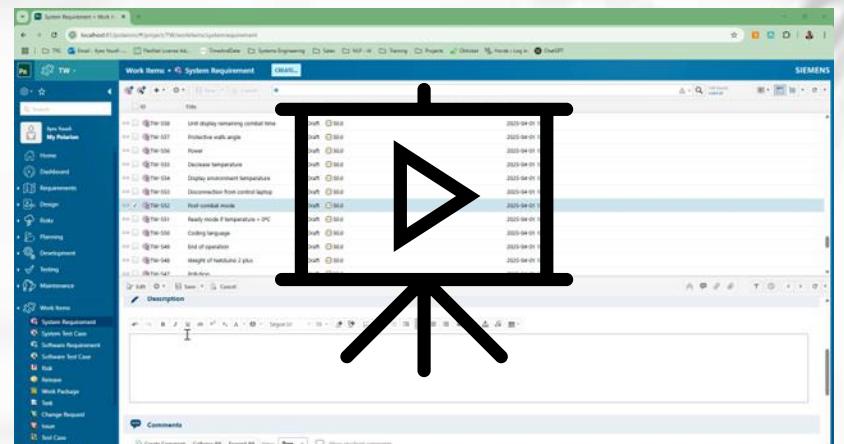
➤ Use case #3: Polarion – Capella traceability

- Semantic traceability
- Changes in Source / Target and suspect links



➤ Use case #4: Requirement-model consistency

- Requirements authoring assisted by models elements (DOORS / Capella) with RAT
- Completeness check before / after changes

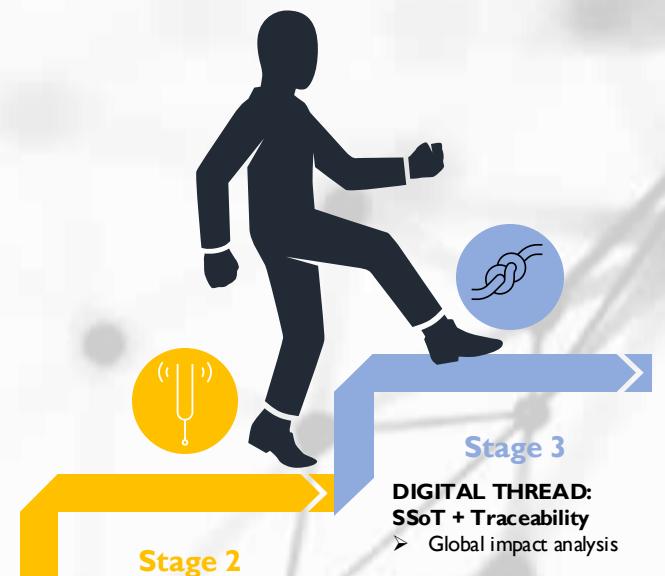
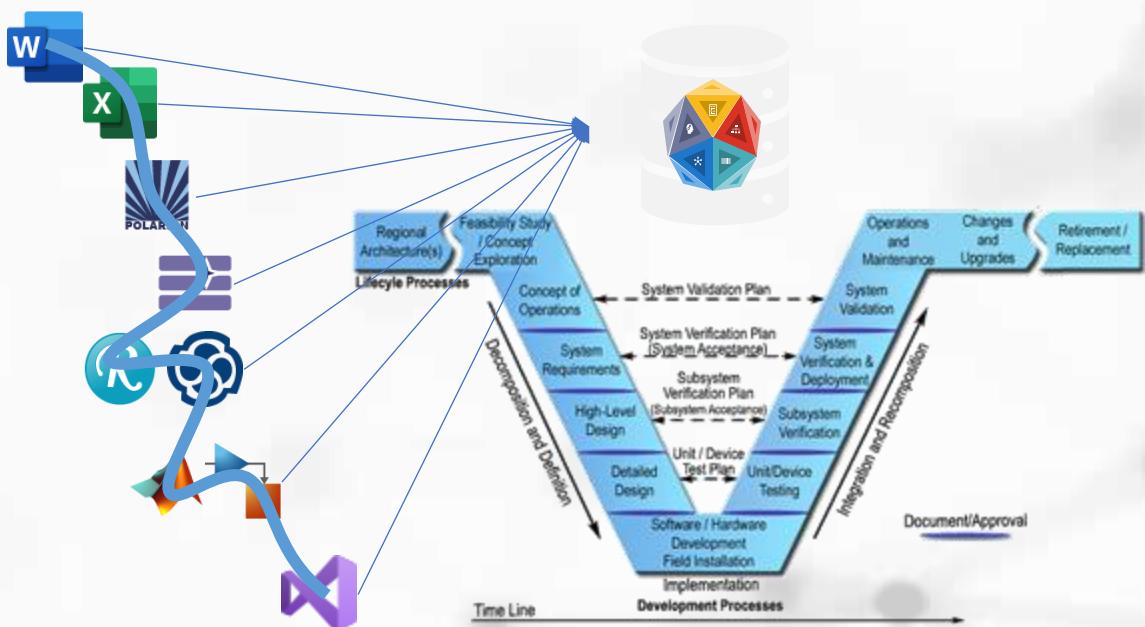


MODEL-REQUIREMENT CONSISTENCY: UNLOCKING INTEROPERABILITY



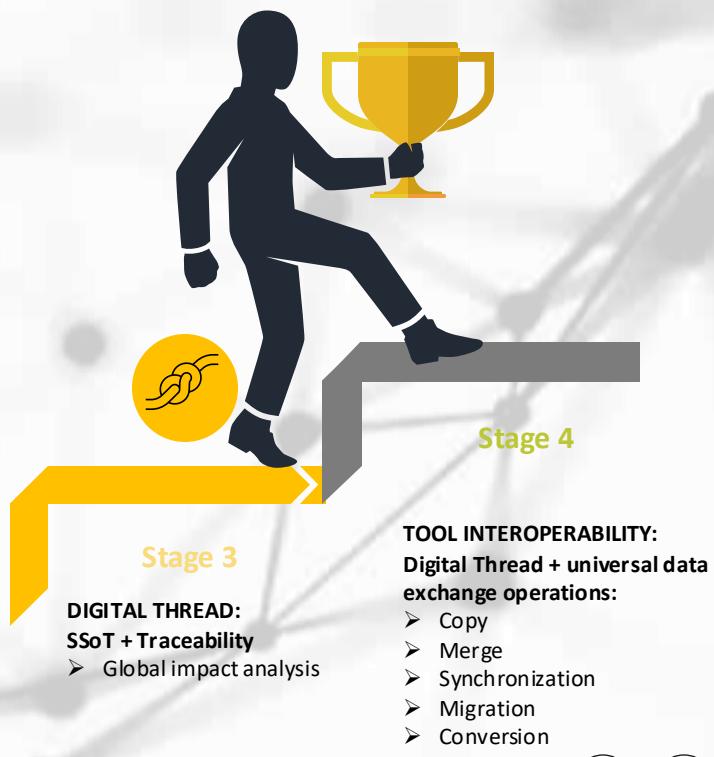
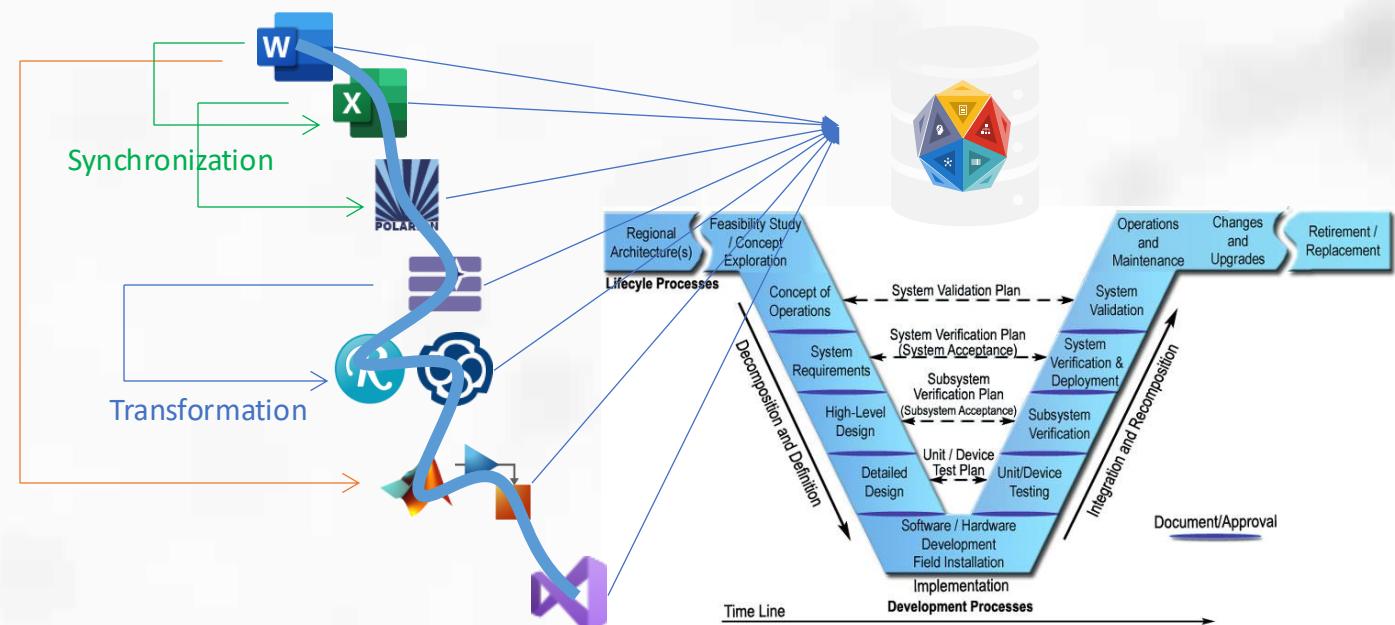
From Stage 3: Digital Thread

- End-to-end traceability
- Global Impact analysis and suspect links detection
- ...



...To Stage 4: Extended Interoperability

- Information Exchange: Copy/Merge/Synchronize
- Object Binding



THE PILLARS OF THE

Interoperability
HUB

Digital thread
without frontiers

1

2

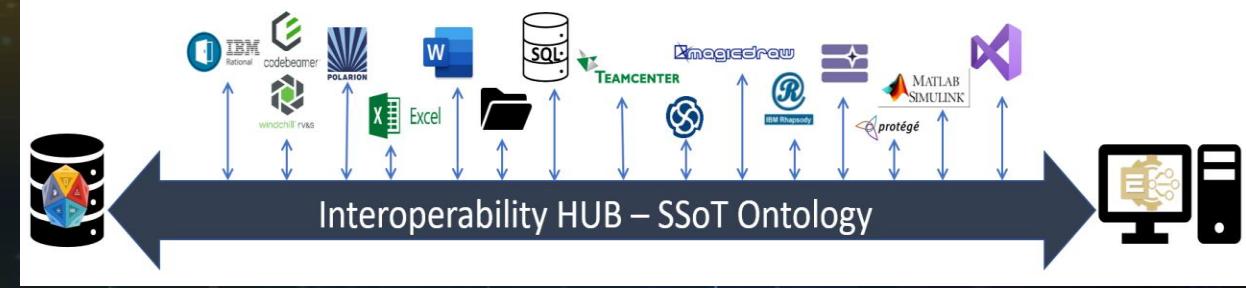
3

4

5

Connectivity

+50 tools: RMS, MBSE, ALM, PLM tools, PDF, MS Office...
Semantic parsing of unstructured sources



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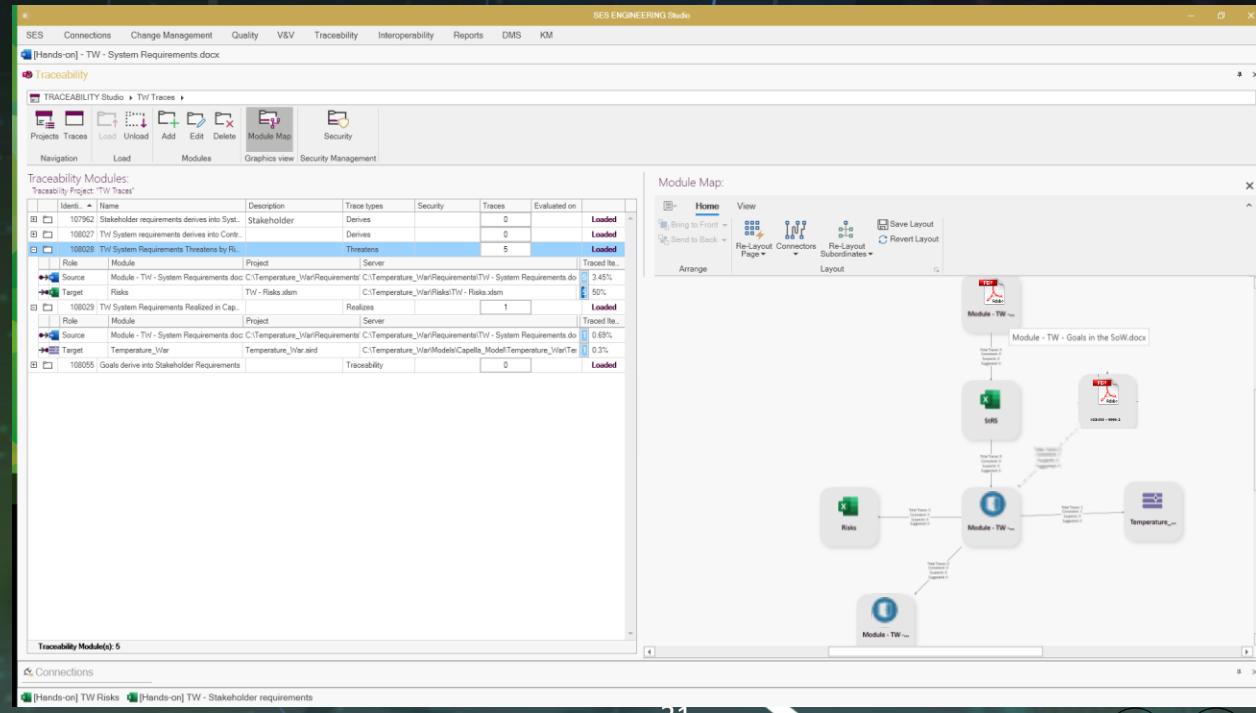
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Connectivity

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Semantic parsing of unstructured sources

Semantic traceability

Traces into heterogeneous environment
Automatic detection/suggestion of traces



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Connectivity

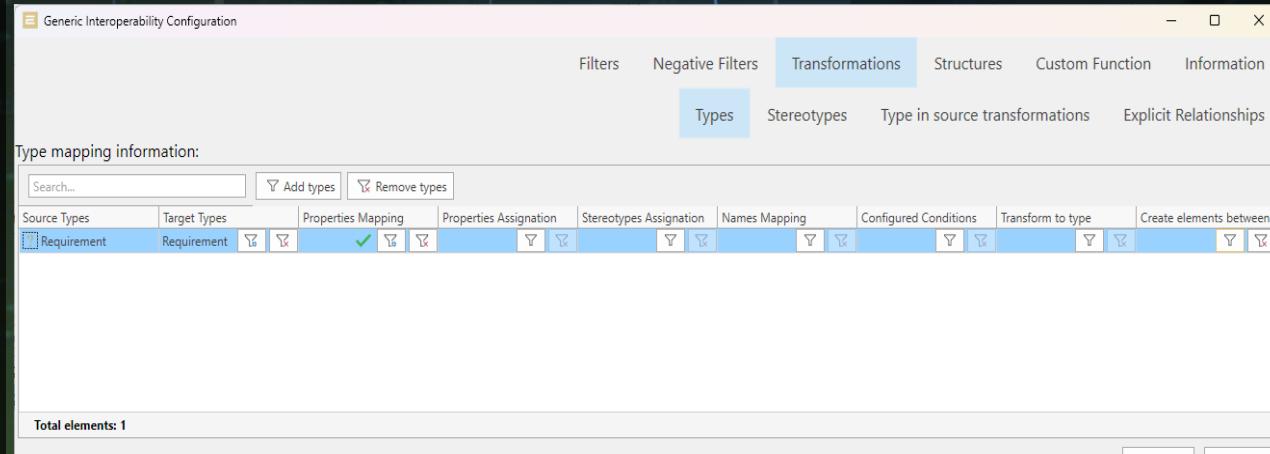
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Transfer Work products

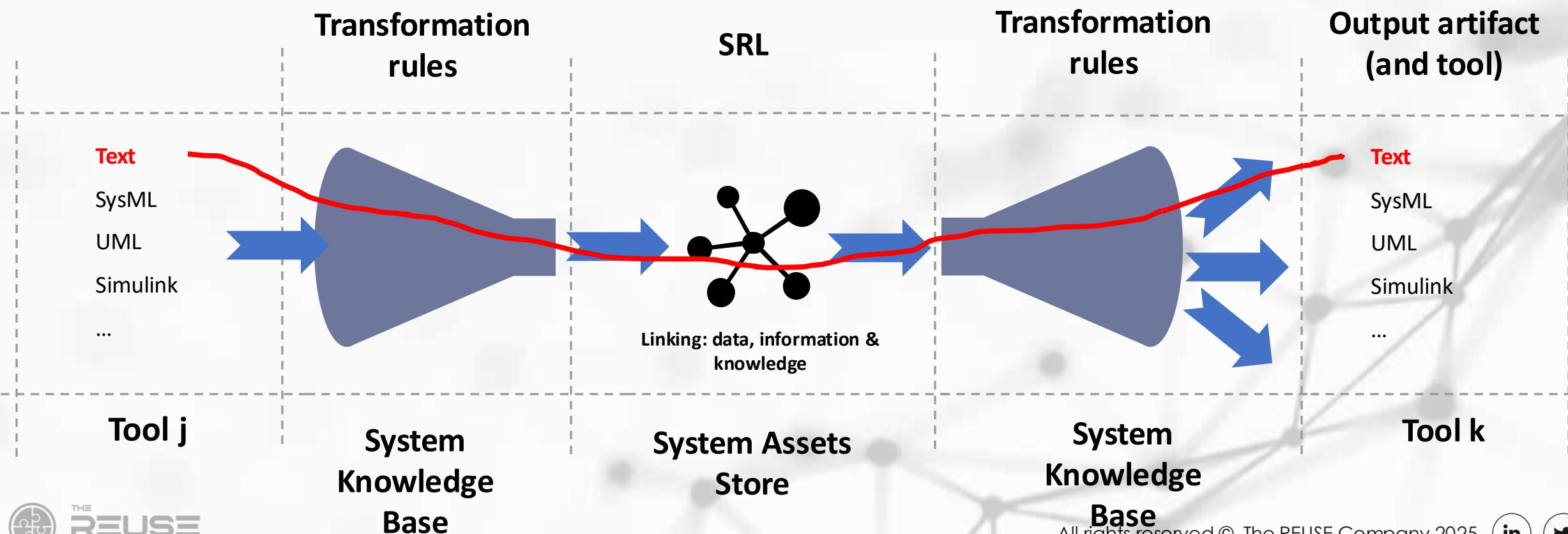
No change of metamodel between source and target
Just moving among different tools



3

Transfer Work products*No change of metamodel between source and target
Just moving among different tools***Transfer:**

- Copy
- Merge
- Synchronize



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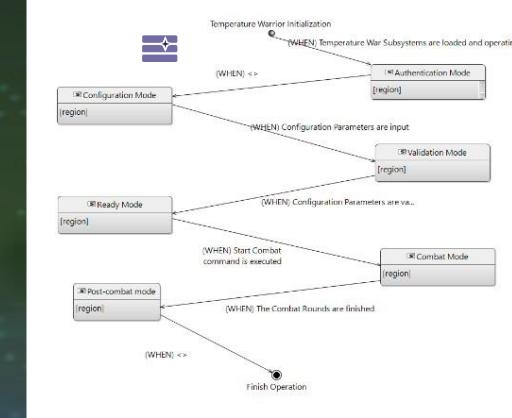
Traces into heterogeneous environment
Automatic detection/suggestion of traces

Copying/Moving/Synchronizing Work products

No change of metamodel between source and target
Just moving among different tools

Transforming work products

Change of metamodel between source and target work products
Textual requirements to models, SysML to Capella...



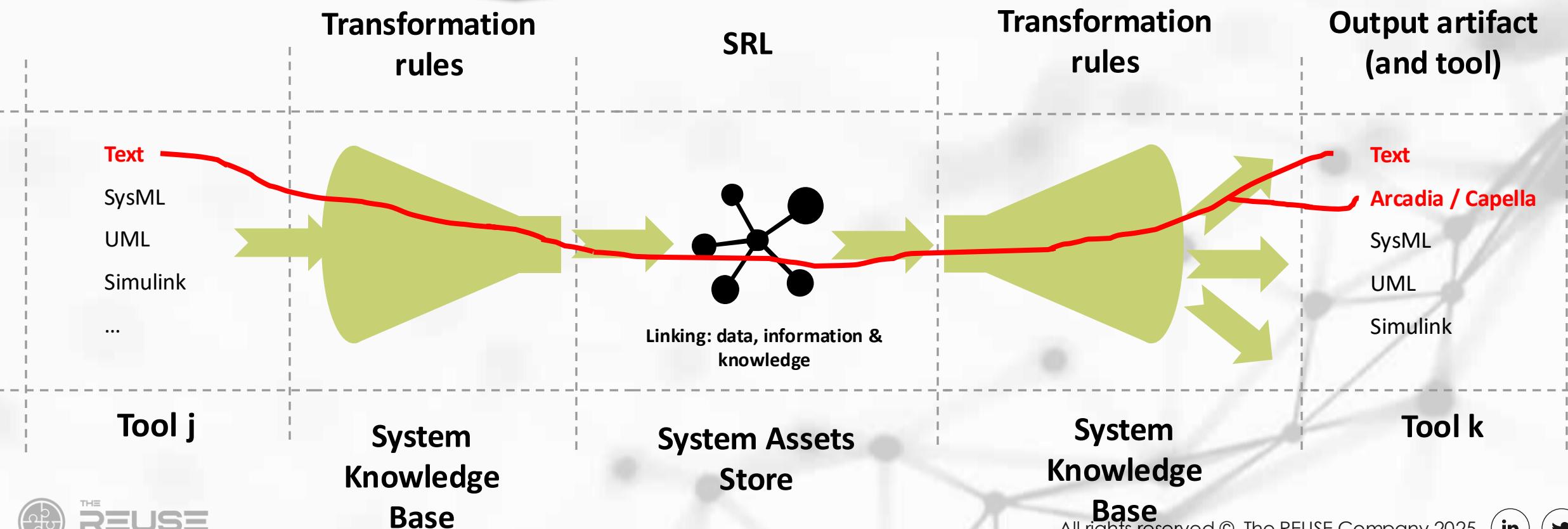
	Priority	Due Date	Summary
Syst1	High	18/01/2024	The Temperature Warner shall have a Ready Mode.
Syst2	High	18/01/2024	The Temperature Warner shall have a Validation Mode.
Syst3	High	18/01/2024	The Temperature Warner shall have a Combat Mode.
Syst4	High	18/01/2024	The Temperature Warner shall have a Configurable Mode.
Syst5	High	18/01/2024	The Temperature Warner shall have a Authentication Mode.
Syst6	High	18/01/2024	The Temperature Warner shall have a State.
Syst7	High	18/01/2024	The Temperature Warner shall have a Transition.
Syst8	High	18/01/2024	The Temperature Warner shall have an Activity.
Syst9	High	18/01/2024	The Temperature Warner shall have a Trigger.
Syst10	Medium	18/01/2024	Avoid misspelling "Temperature".
Syst11	Medium	18/01/2024	Avoid misspelling "Temperature".
Syst12	Medium	18/01/2024	Avoid misspelling "Temperature".
Syst13	Medium	18/01/2024	Avoid misspelling "Temperature".
Syst14	Medium	18/01/2024	Avoid misspelling "Temperature".
Syst15	Low	18/01/2024	Use a separate clause for each condition: "when", "while", "unless", "until", "since", "as soon as", "as long as", "as far as", "as soon as possible", "as long as possible", "as far as possible".

4

Transforming work products
Change of metamodel between source and target work products
Textual requirements to models, SysML to Capella...

Transformation Use Case #1:

- Requirements synchronization between Req Mgmt Tool & MBSE tool (“zig-zag”)



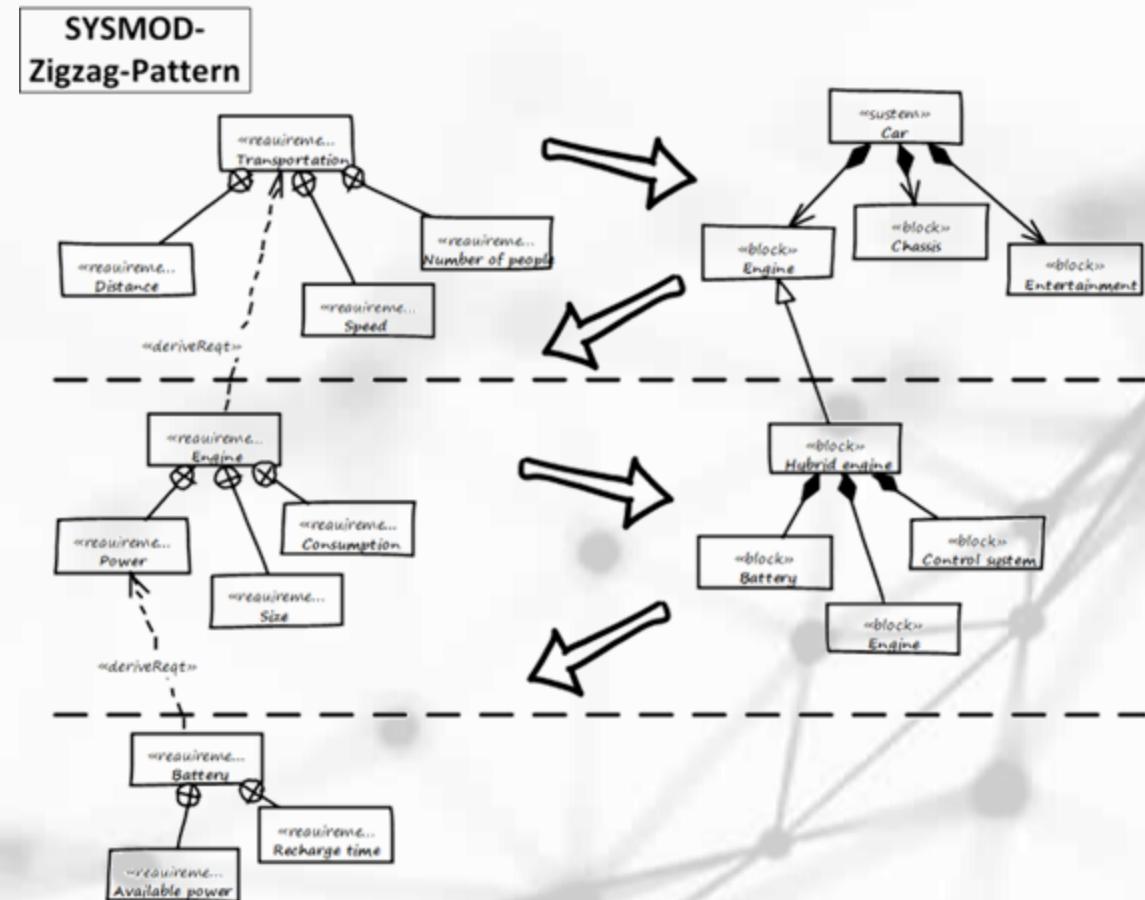
➤ Zig-zag model : The Requirements – MBSE Trade-off

Source:

<https://mbse4u.com/2012/03/26/the-sysmod-zigzag-pattern/>

Link to our latest webinar about the zig-zag pattern:

MBSE zig-zag pattern: A theoretical and practical approach



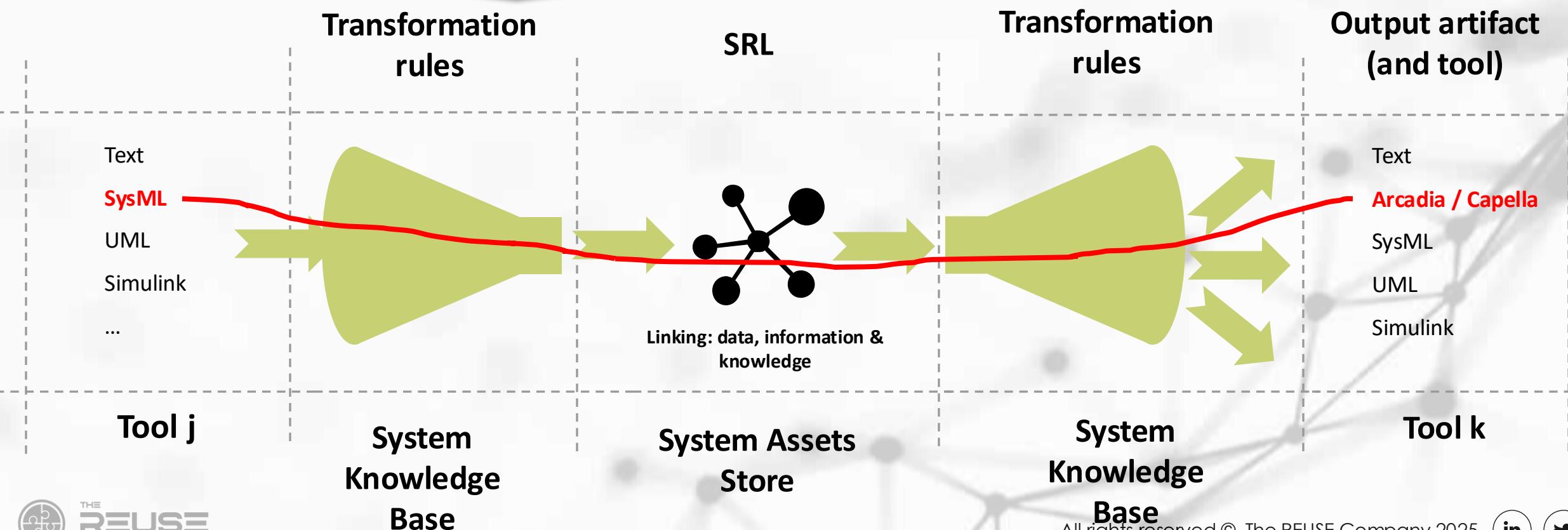
4

Transforming work products

*Change of metamodel between source and target work products
Textual requirements to models, SysML to Capella...*

Transformation Use Case #2:

- Model conversion between MBSE Tools



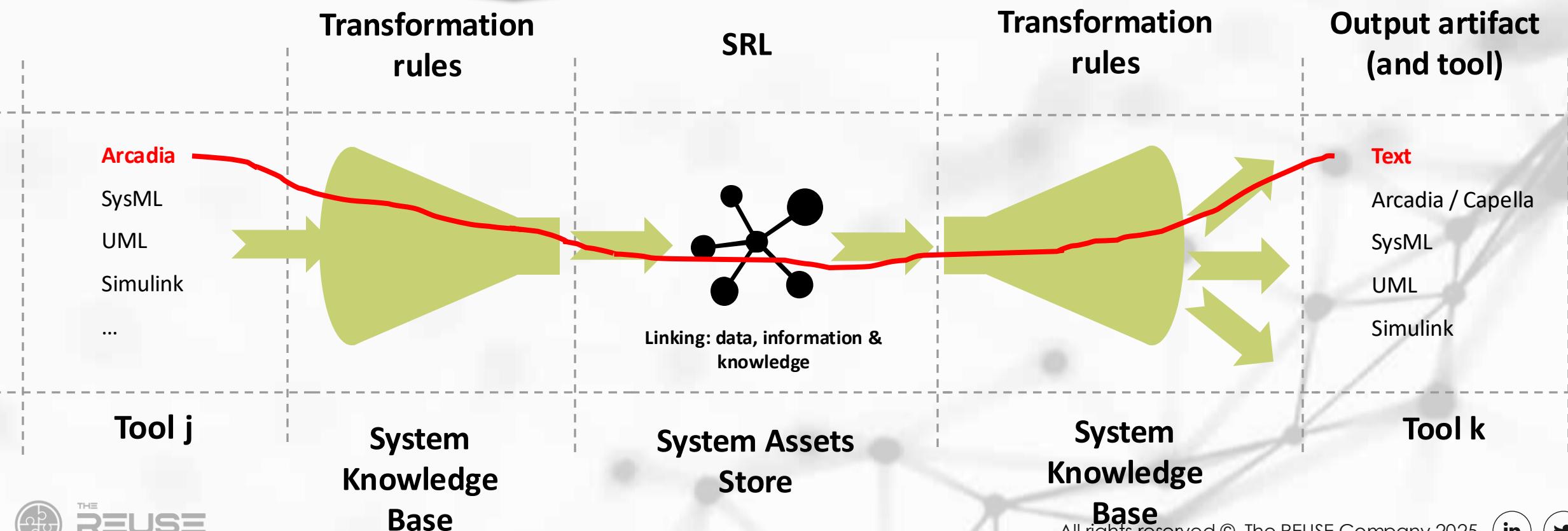
4

Transforming work products

*Change of metamodel between source and target work products
Textual requirements to models, SysML to Capella...*

Transformation Use Case #3:

- Generation of requirements from models



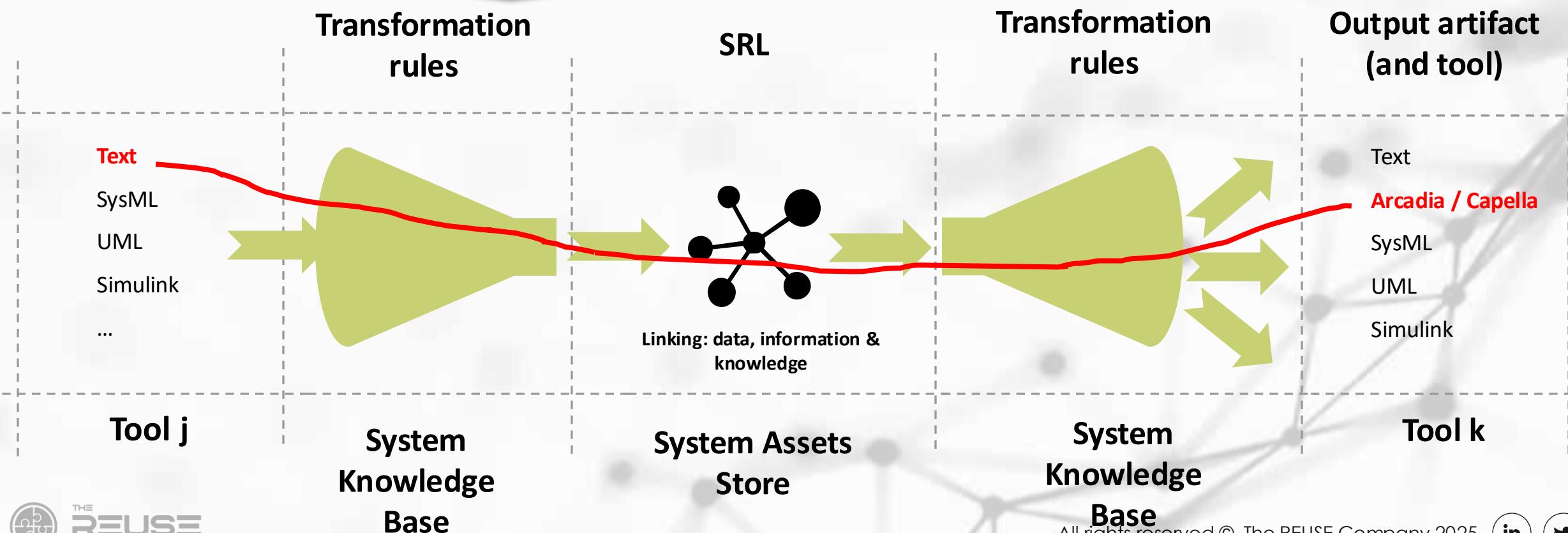
4

Transforming work products

*Change of metamodel between source and target work products
Textual requirements to models, SysML to Capella...*

Transformation Use Case #4:

- Generation of models from requirements



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Connectivity

+50 tools: RMS, MBSE, ALM, PLM tools, PDF, MS Office...
Semantic parsing of unstructured sources.

Semantic traceability

Traces into heterogeneous environment
Automatic detection/suggestion of traces.

Copying/Moving/Synchronizing Work products

No change of metamodel between source and target
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Transforming work products

Change of metamodel between source and target work products
Textual requirements to models, SysML to Capella...

Remote connectivity

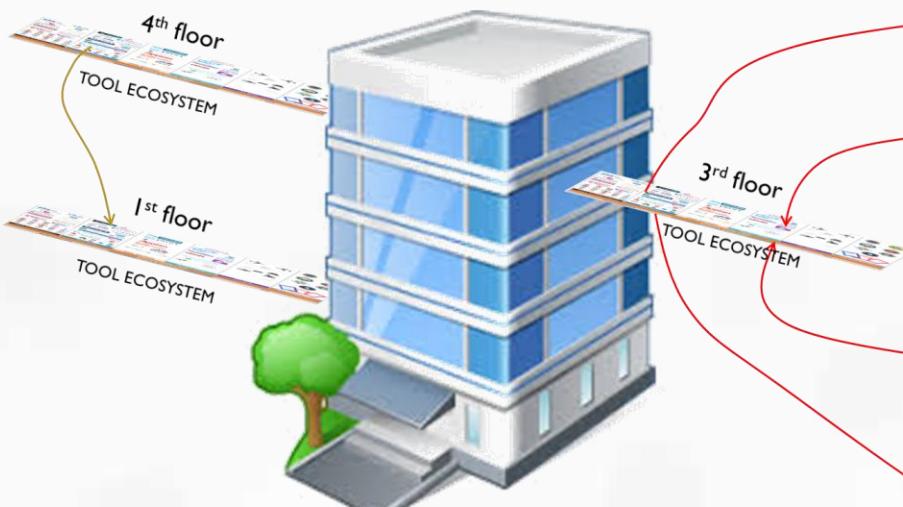
Collaborative access to the content of a repository even from an external infrastructure.

5

Remote connectivity

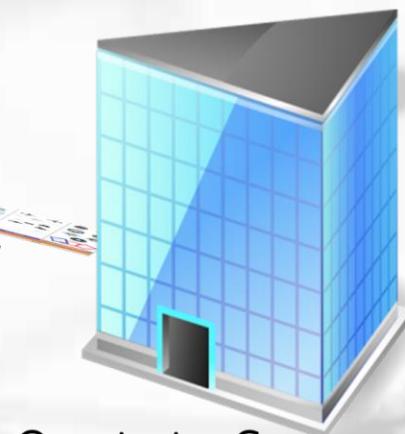
Collaborative access to the content of a repository even from an external infrastructure.

Interoperability between
departments of same organization



Organization A

Interoperability between different
organizations:
OEM-Tier
Collaborative Development
etc



Organization C

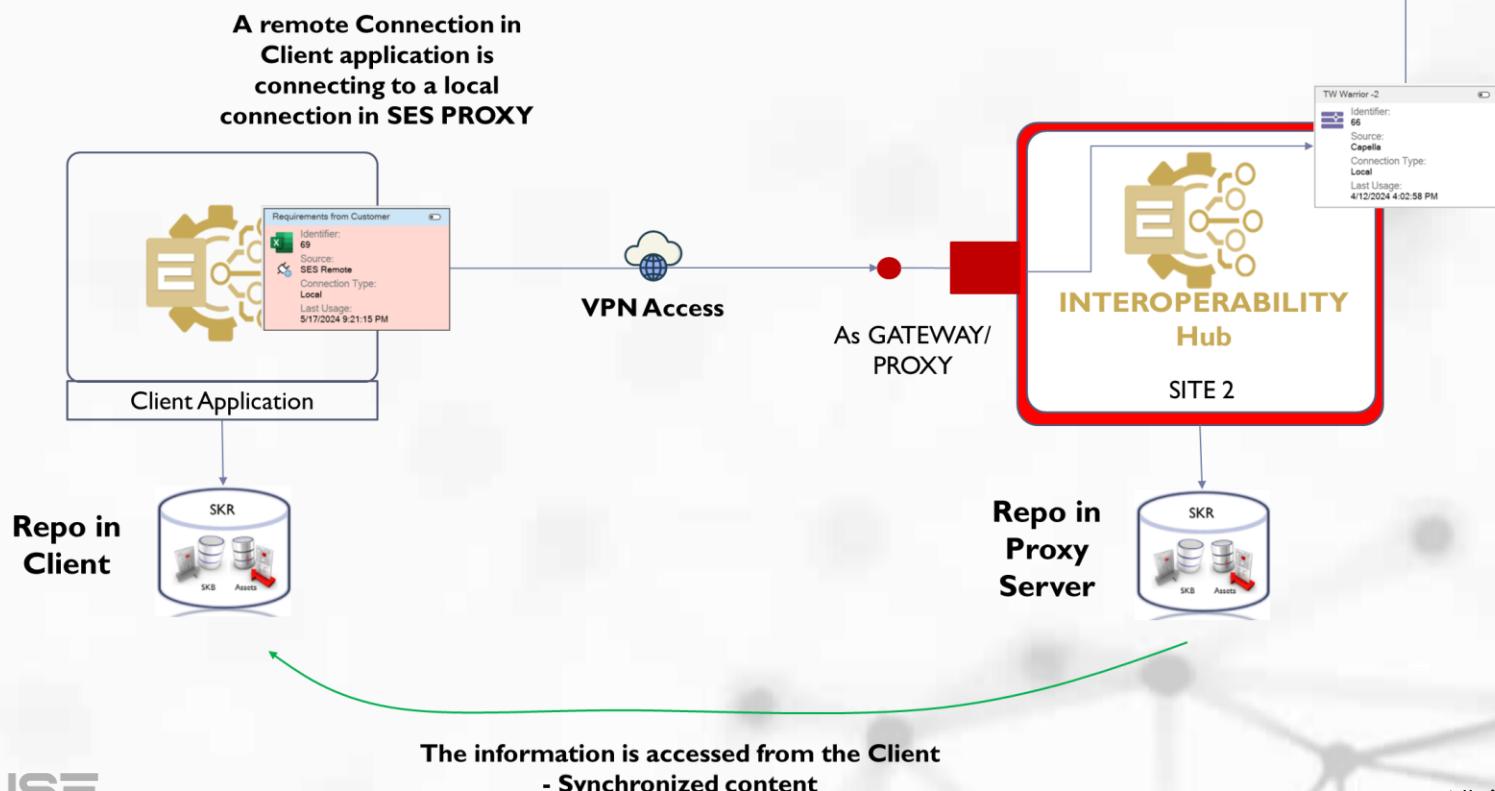


Organization B

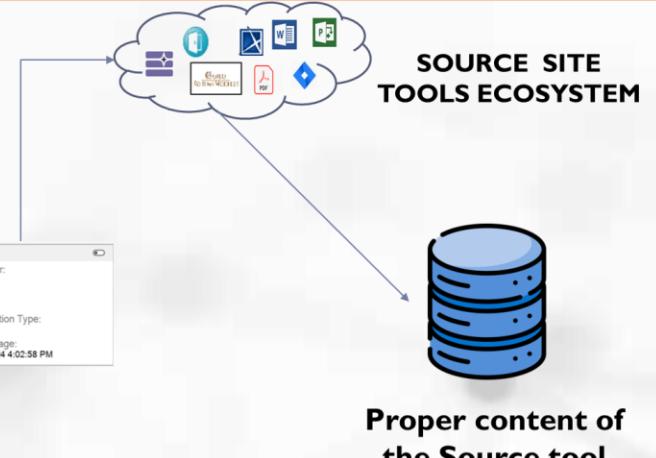
5

Remote connectivity

Collaborative access to the content of a repository even from an external infrastructure.



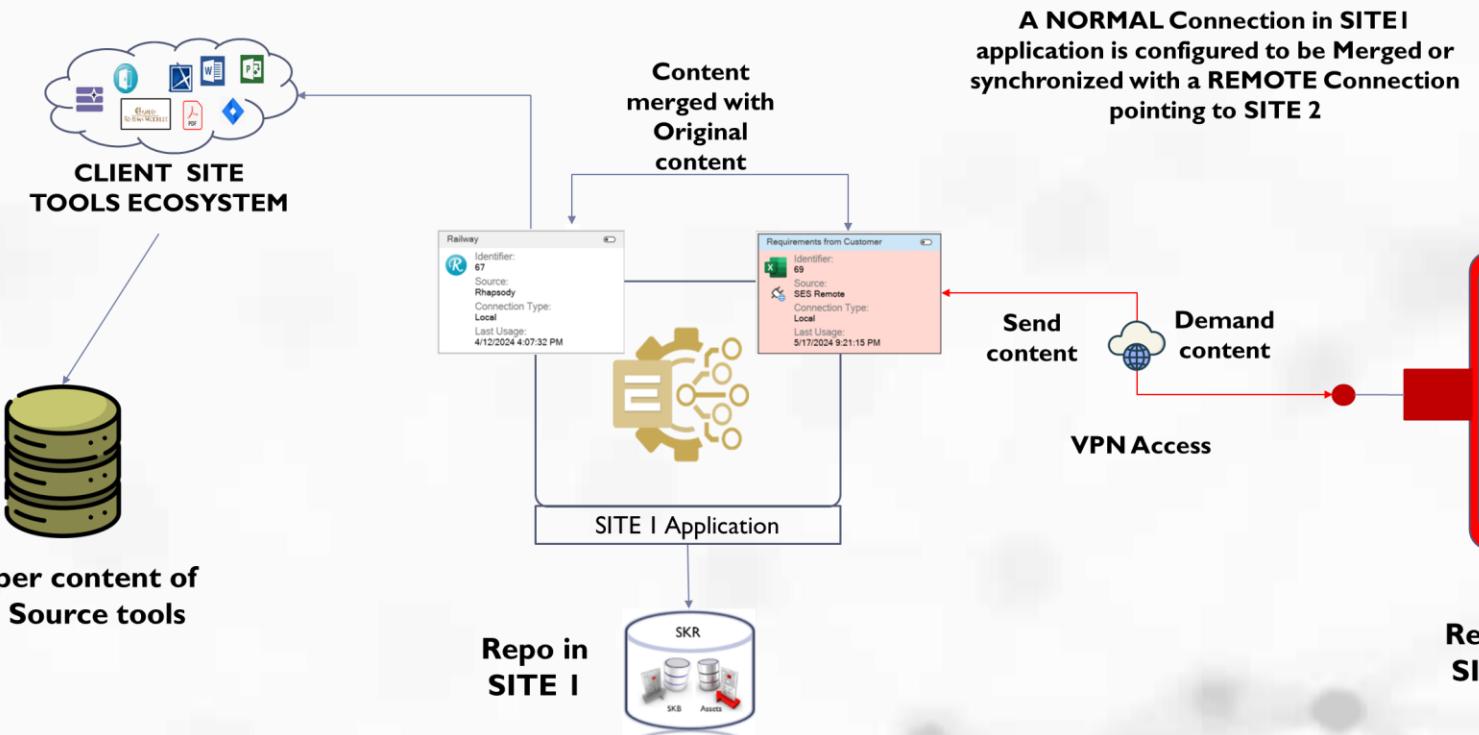
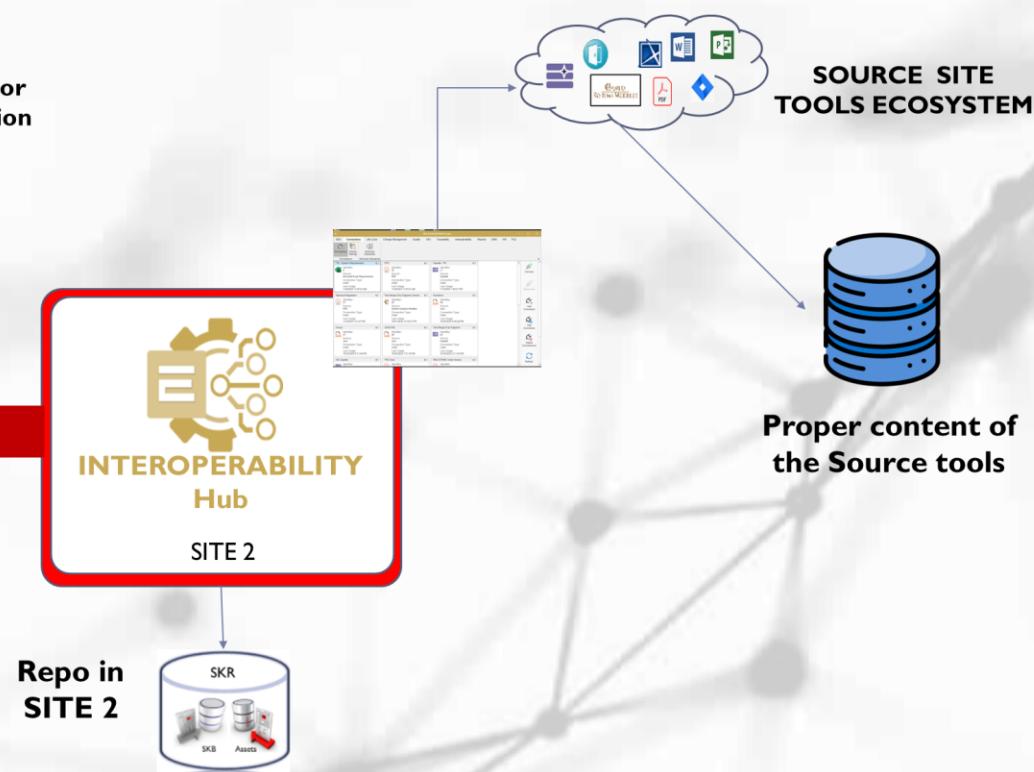
USE CASE 1: REMOTE ACCESS



5

Remote connectivity

Collaborative access to the content of a repository even from an external infrastructure.

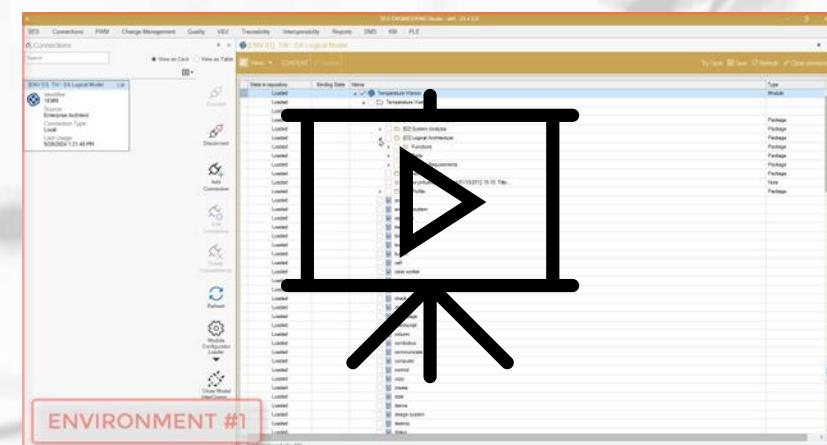
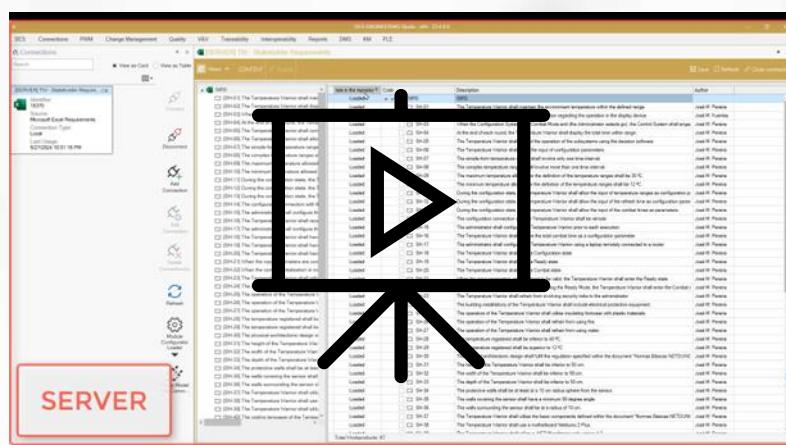
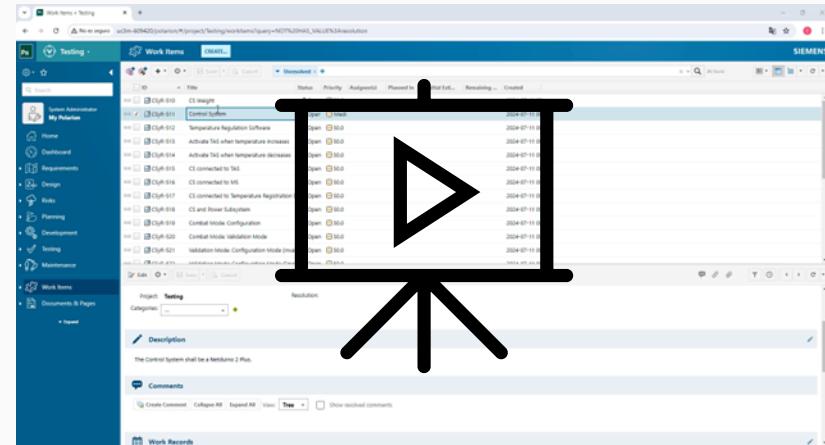
USE CASE 2: COLLABORATIVE
(MERGE/SYNC) WORK

➤ Use case #5: Zig-zag (Polarion <-> Capella)

- Requirements pushed into the model
- Modification and synchronization from model to Polarion

➤ Use case #6: SES Remote connector

- 6.1 – Remote access
- 6.2 – Collaboration between separate repositories (merge/synchronize)





THE REUSE COMPANY
ENABLING SMART SYSTEMS ENGINEERING

Software Tools for Digitalizing the Systems Life Cycle Management

Inter-connecting the complete Tools Ecosystem of your organization
Enabling digital support to all the Technical Management processes (ISO 15288) for the engineering items of your tools ecosystem
Integrating document centric (Documentation), knowledge driven (Reuse) and model-based (MBSE) approaches in one Hub

Systems Engineering Tools and Solutions for System Life cycle Management based on Connectivity, Interoperability and Reuse

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Illyes Yousfi

Senior Consulting Engineer

illyes.yousfi@reusecompany.com

+34 627 08 66 01





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