Universal Interoperability

Start Synchronizing
your Systems Engineering toolchain

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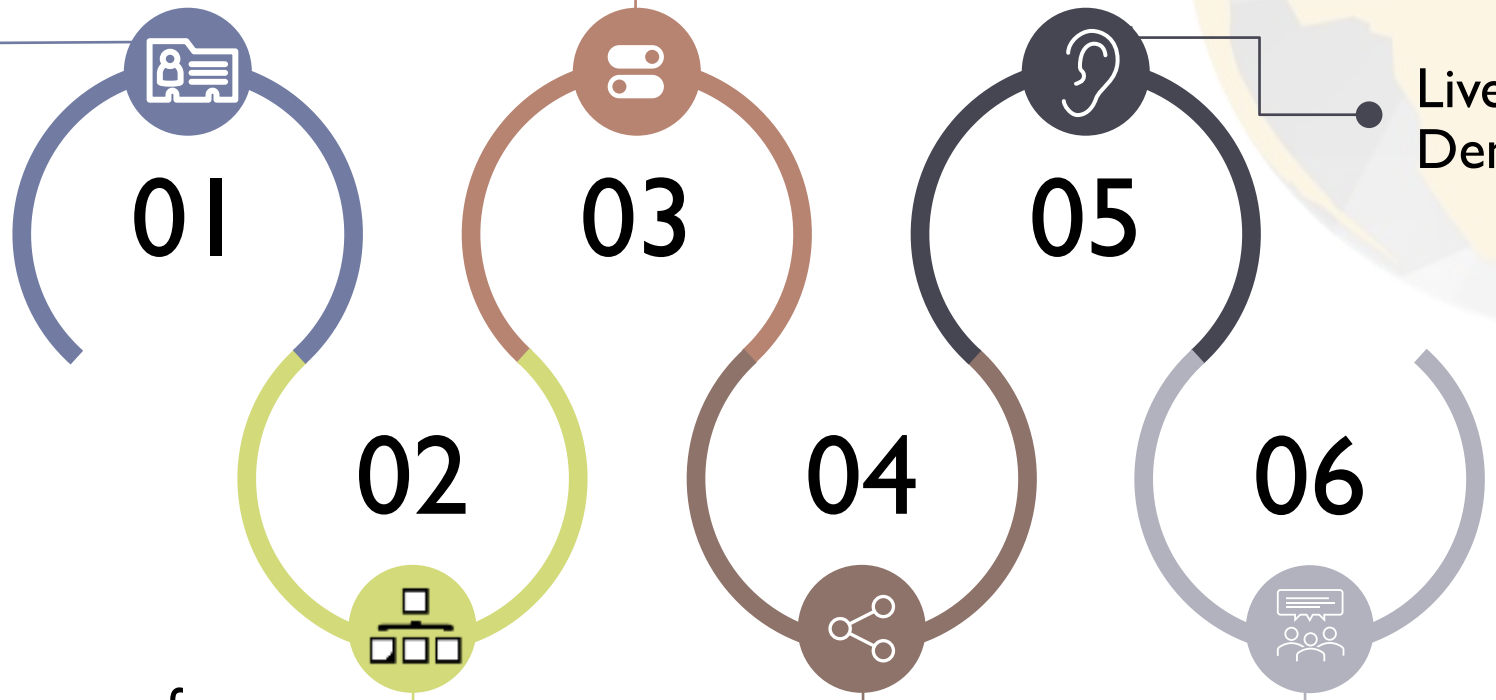
THE REUSE COMPANY

Agenda



Introduction to **The REUSE Company**

Synchronized Source of Truth: The path towards **tool interoperability**

Mechanisms for **Information exchange & data conversion**

Interoperability +Traceability : **digital thread**

Live Demo

Q&A Conclusion

The REUSE Company is a tool vendor specialized in the application of **semantic technologies** and artificial intelligence to improve the **digitalization of the Systems Engineering** processes.

- RQA – QUALITY Studio
- RAT – AUTHORING Tool
- KM – Knowledge Manager
- TRACEABILITY Studio
- V&V Studio
- REx – REQUIREMENTS Engineering Tool for MS Word
- SES ENGINEERING Studio

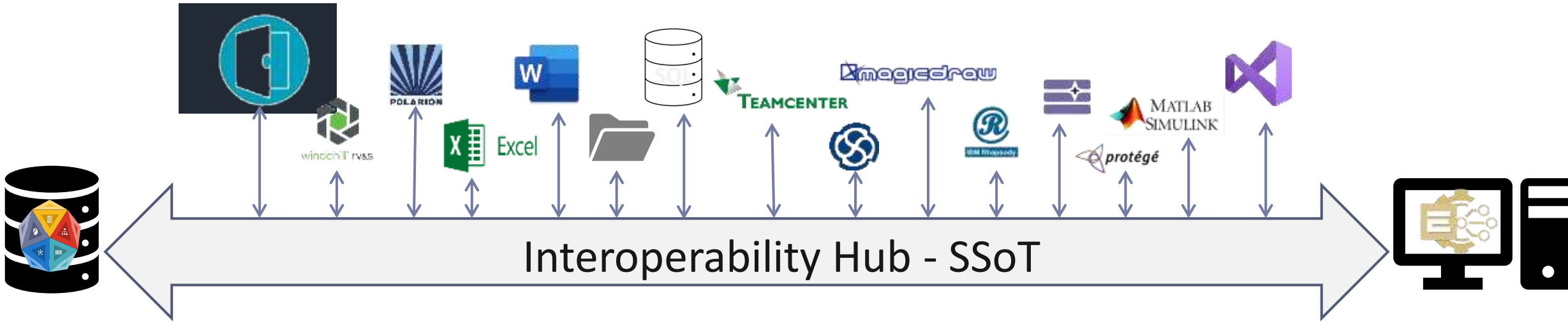
Ilyes Yousfi

- **Current position:** Senior Key Account Manager at The REUSE Company
- Master's degree from the University of Montreal (Canada) and the IMT Atlantique School of Engineering (France).
- Background in energy and mechanical engineering
- Involved in a research project around the environmental impacts of end-of-life management of aircrafts (2014)
- Consulting services to help industry actors leverage and digitalize Systems Engineering activities.
- Passionate about international projects and learning languages, Ilyes speaks 4 languages fluently: English, French, German and Spanish.

Synchronized Source of Truth

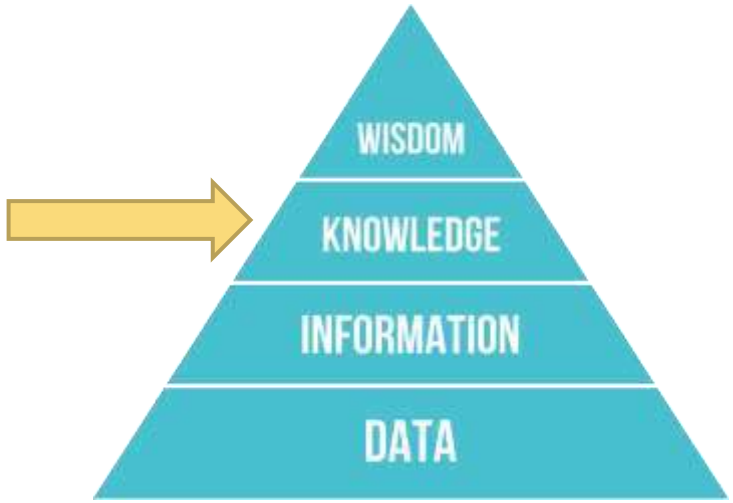
The path towards Tool Interoperability

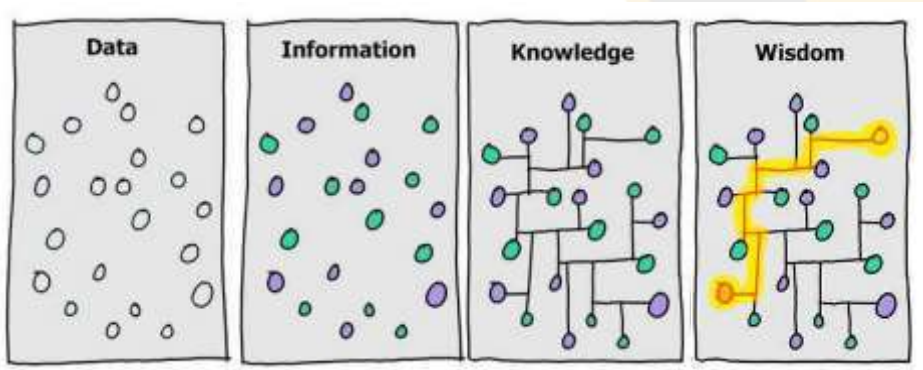
- SES ENGINEERING Studio implements the notion of ***Interoperability hub (SSoT – Synchronized Source of Truth)***:
  - No one-to-one connector: every tool connects to the hub. Destroying silos
  - No ***wipe-out*** approach: each individual source synchronized in SES remains the *Authoritative Source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



Synchronized Data to build Knowledge

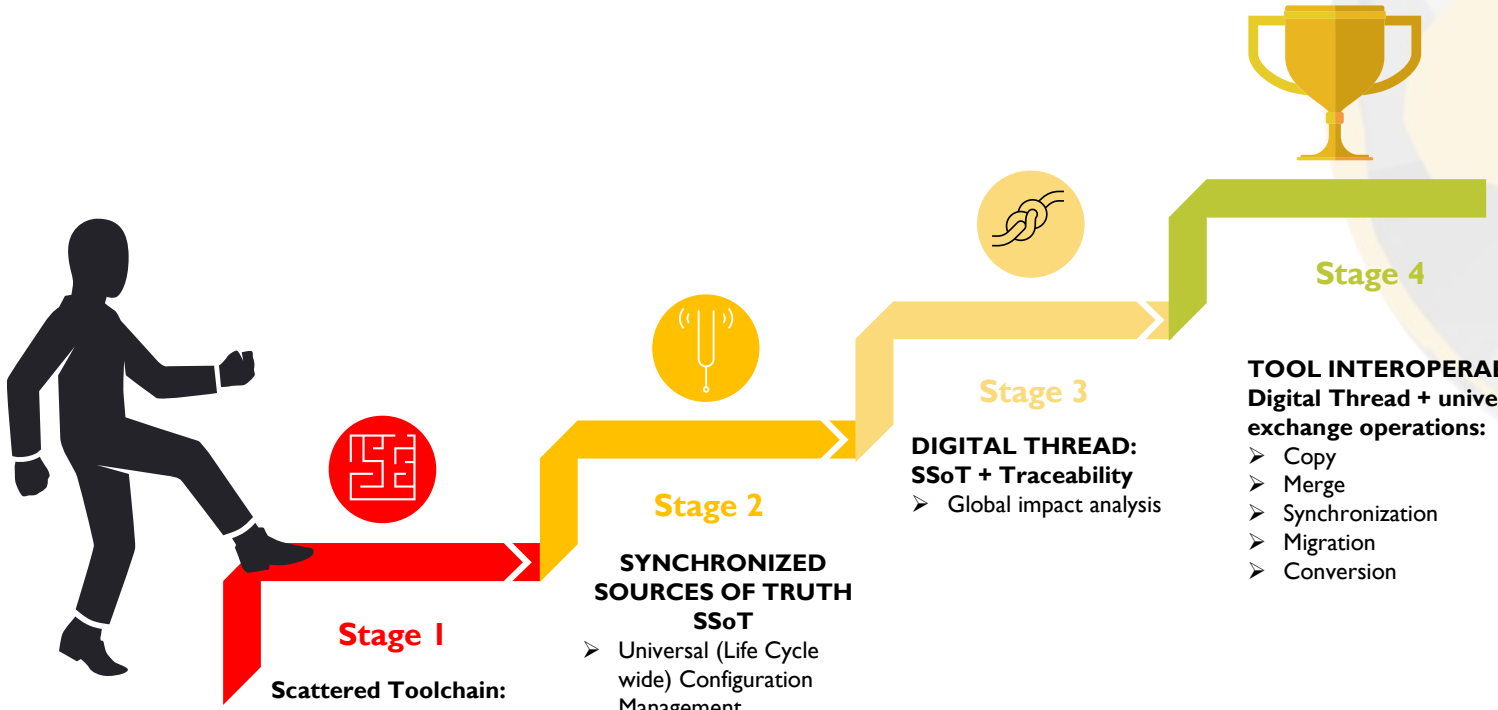
- Data -> Knowledge





Source: The[i]Factory

The path to universal tool interoperability



Stage 1

Scattered Toolchain:
Tool-centric approach

Stage 2

SYNCHRONIZED SOURCES OF TRUTH SSoT

- Universal (Life Cycle wide) Configuration Management

Stage 3

DIGITAL THREAD:
SSoT + Traceability

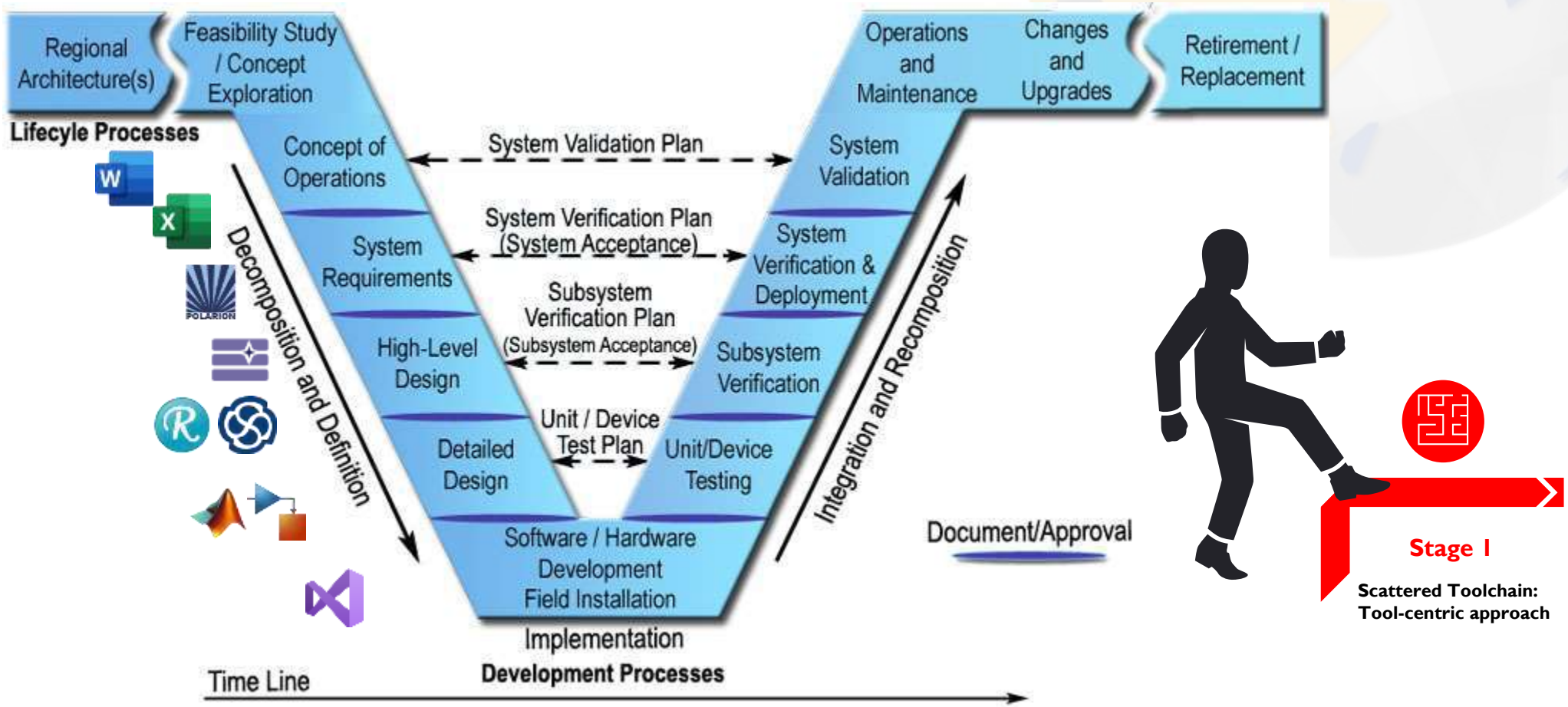
- Global impact analysis

Stage 4

TOOL INTEROPERABILITY:
Digital Thread + universal data exchange operations:

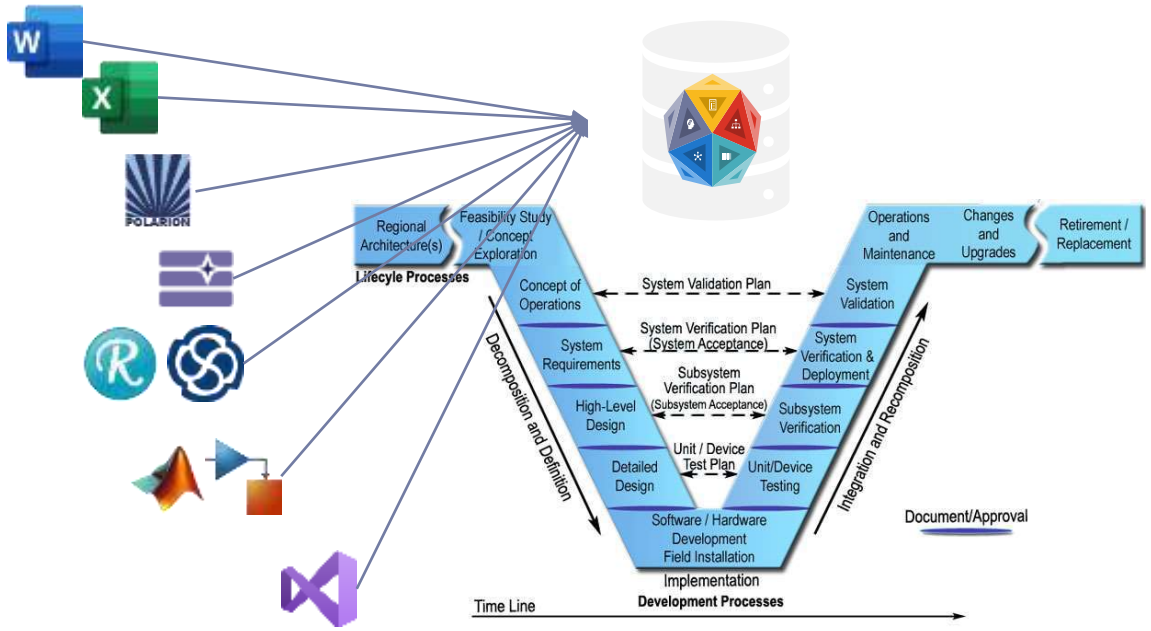
- Copy
- Merge
- Synchronization
- Migration
- Conversion

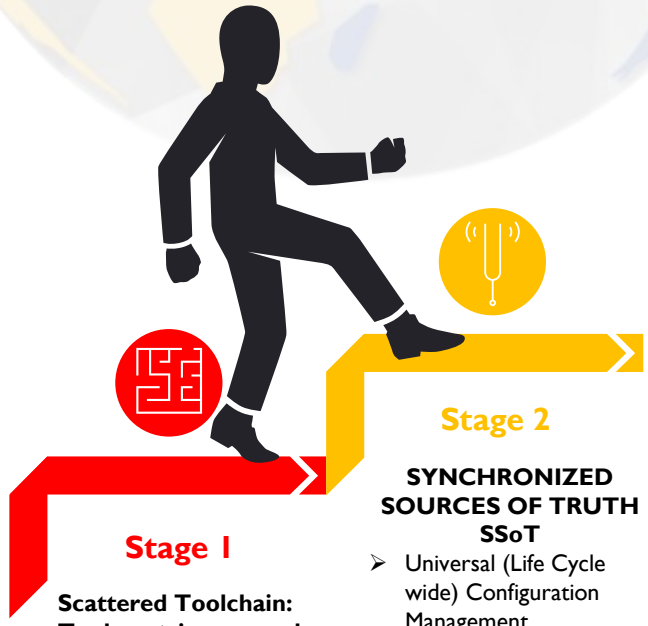
Stage 1: Scattered SE tool-chain : Tool-centric approach



Stage 2: Synchronized Sources of Truth

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





Change in Source

source

Source status

Updated

SES Repository status

Suggested action

Update **SES Repository** Content with **Source content**

Change in SES

source

Source status

Updated

SES Repository status

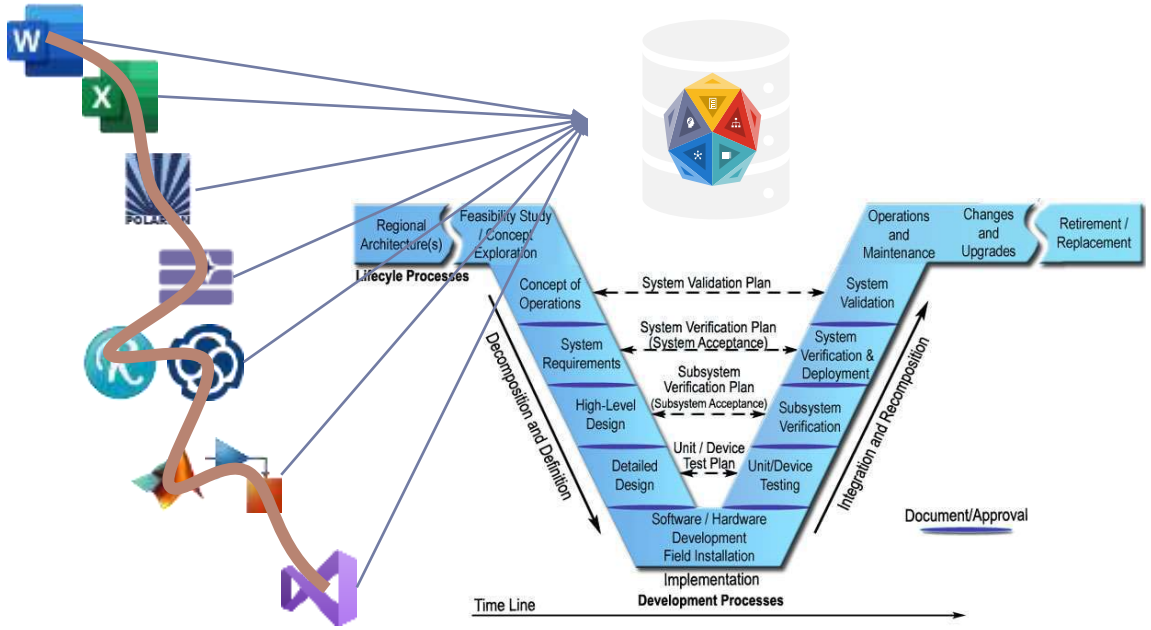
Suggested action

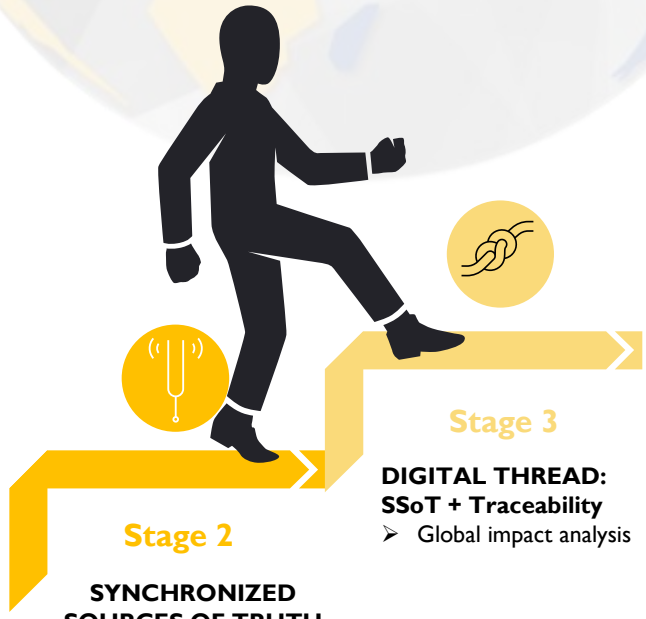
Save **SES Repository** Content **AND** Update **Source content**

Source & Repository synchronized!

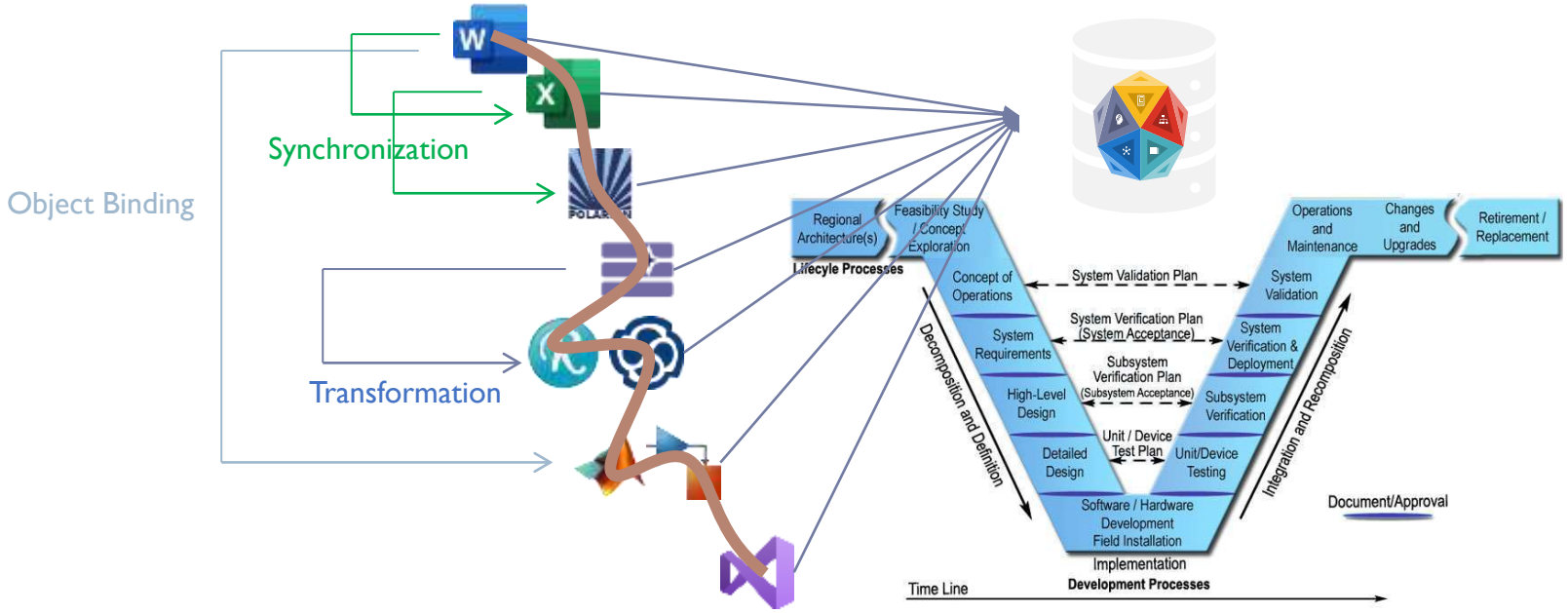
Loaded

Stage 3: Digital Thread
- End-to-end traceability
- Global Impact analysis and suspect links detection





Stage 4: Interoperability
- Information Exchange: Copy/Merge/Synchronize
- Object Binding

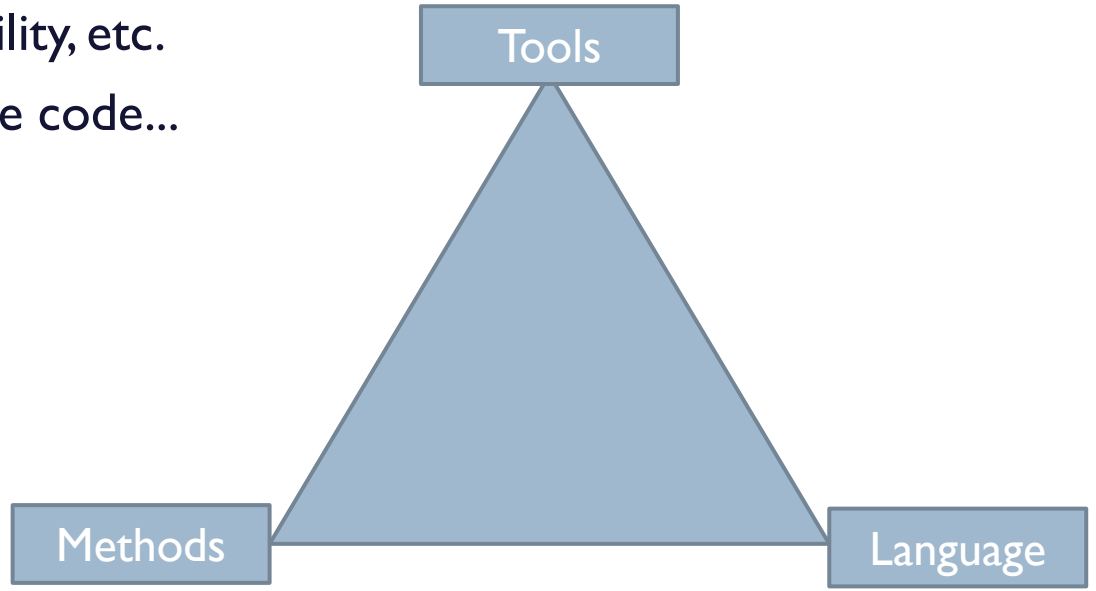


DIGITAL THREAD:
SSoT + Traceability
- Global impact analysis

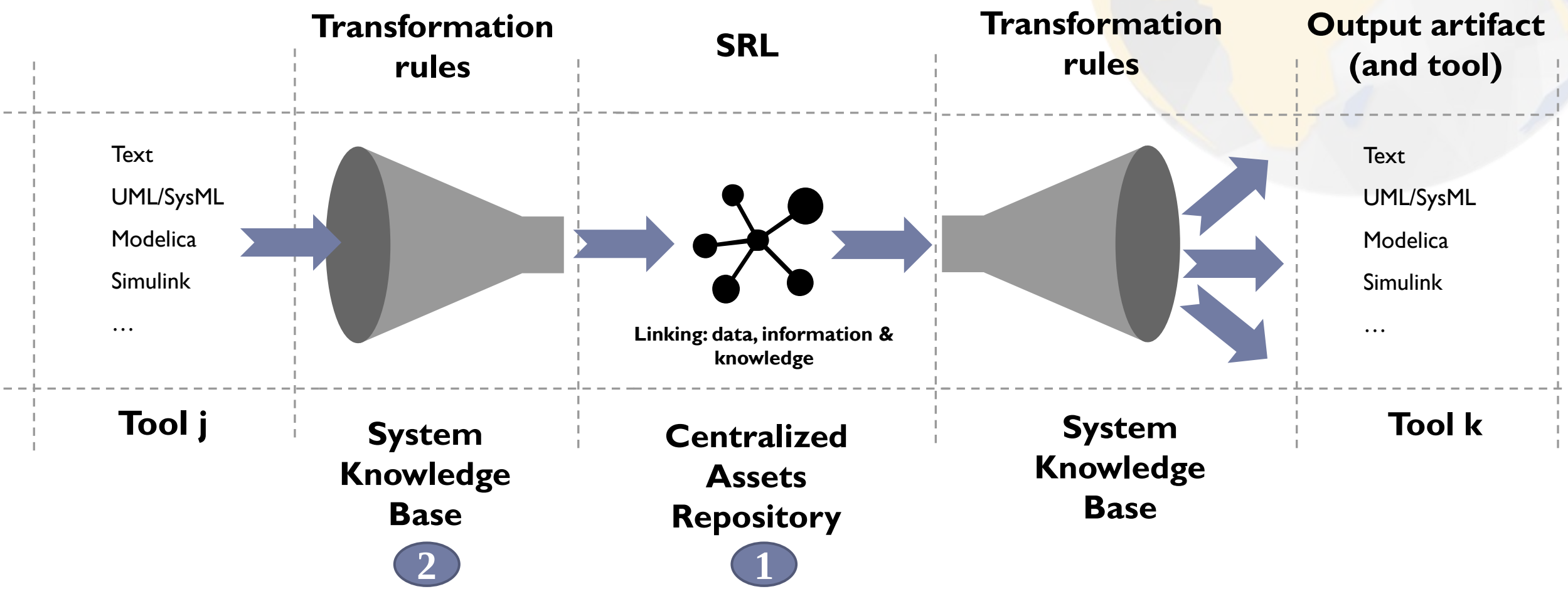
TOOL INTEROPERABILITY:
Digital Thread + universal data exchange operations:
- Copy
- Merge
- Synchronization
- Migration
- Conversion

- MBSE: 3 pillars : Tools-Methods-Language (T-M-L)
  - ...but there are other Tools, Methods, Language involved throughout the system life cycle.

- Need for a common representation framework that neutralizes those 3 pillars all over the life cycle, regardless of:
  - The **tool** used : PLM, ALM, Requirements Management, MS Office Suite...
  - The **method** used: Architecture frameworks, traceability, etc.
  - The **language** used: Natural language, SysML, software code...

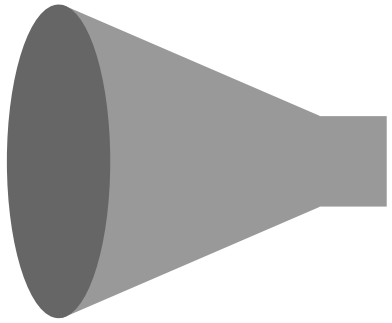


The hub's conveyor: a tool-neutral representation language

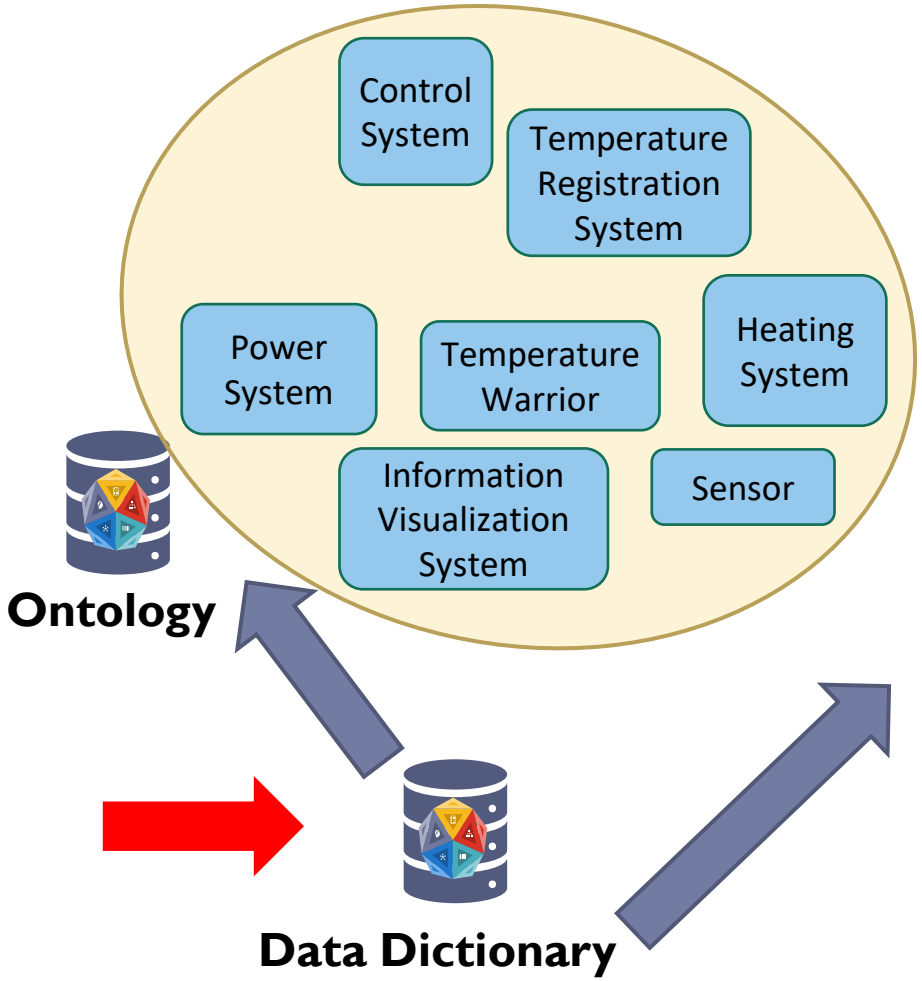


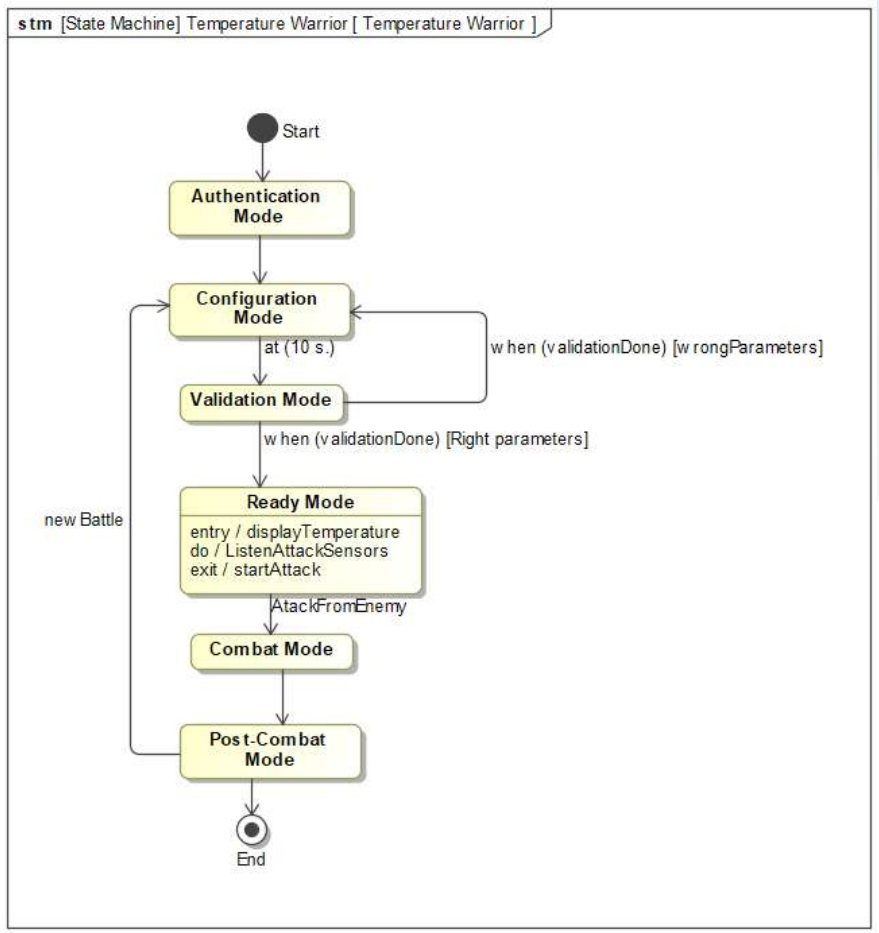
The hub's conveyor: work items...& knowledge!

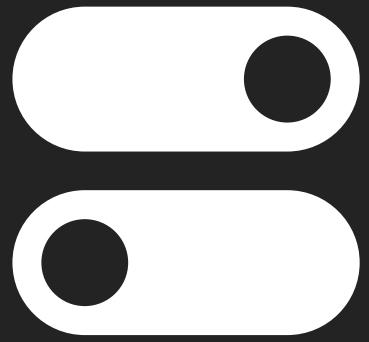
Transformation rules



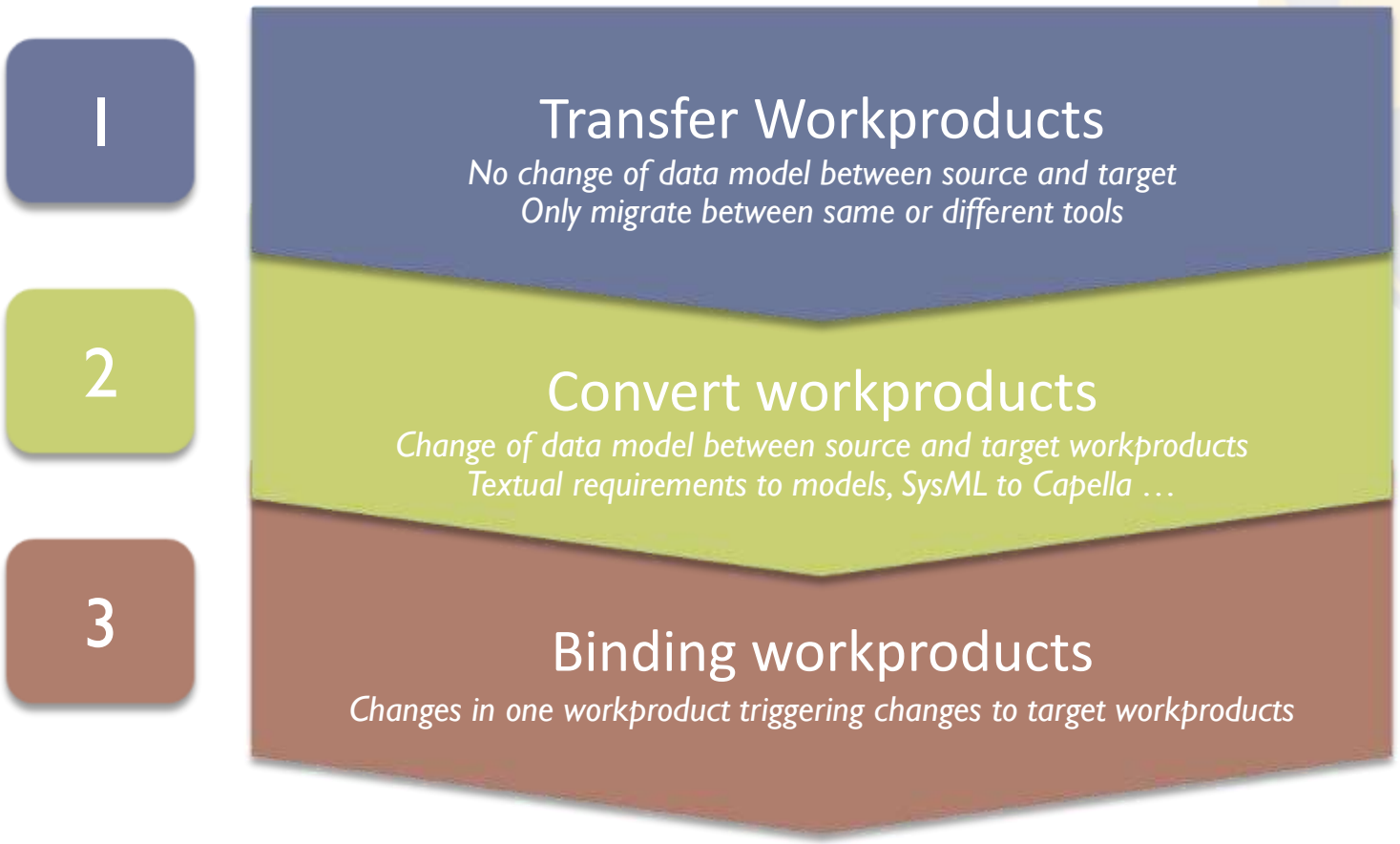
System Knowledge Base







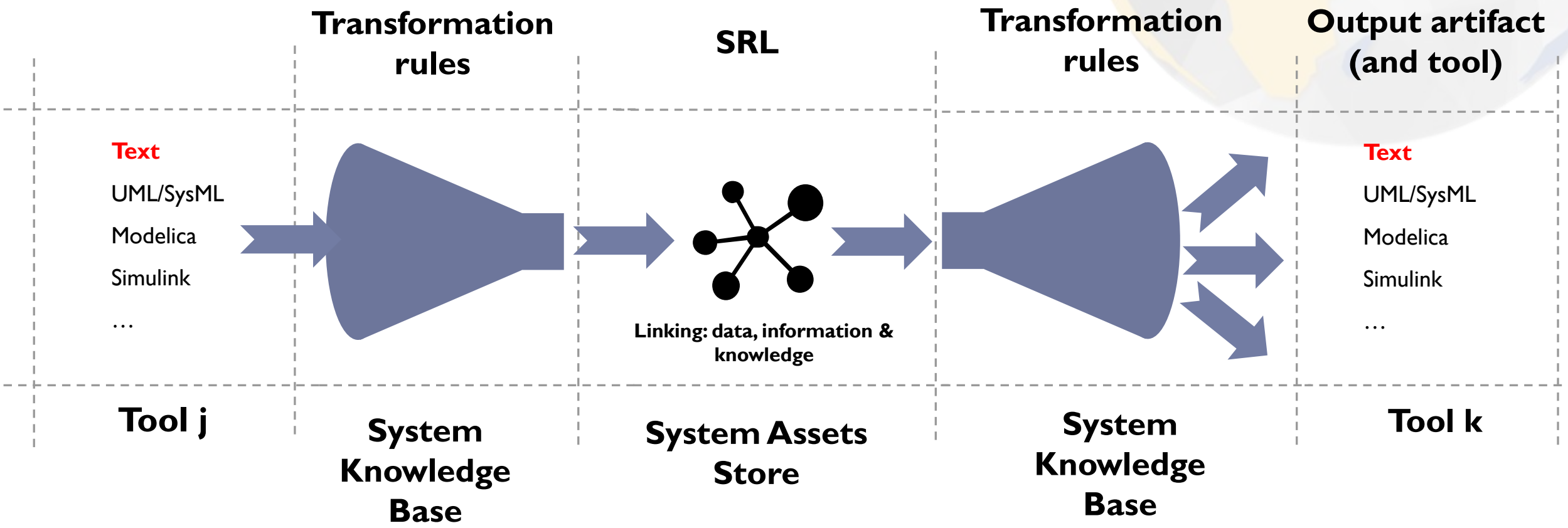
Mechanisms for Exchange

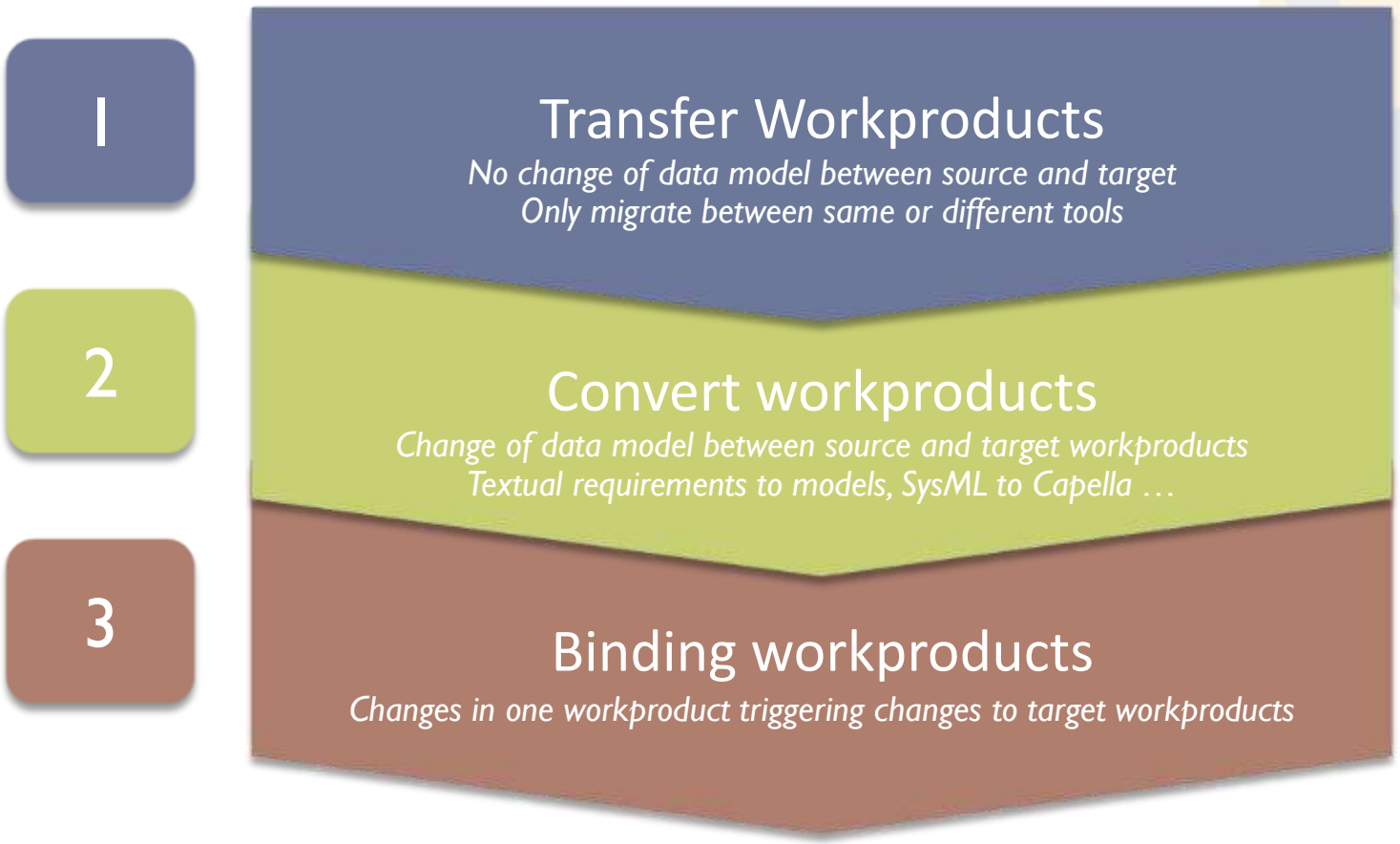


I

Transfer Workproducts

No change of data model between source and target
Only migrate between same or different tools

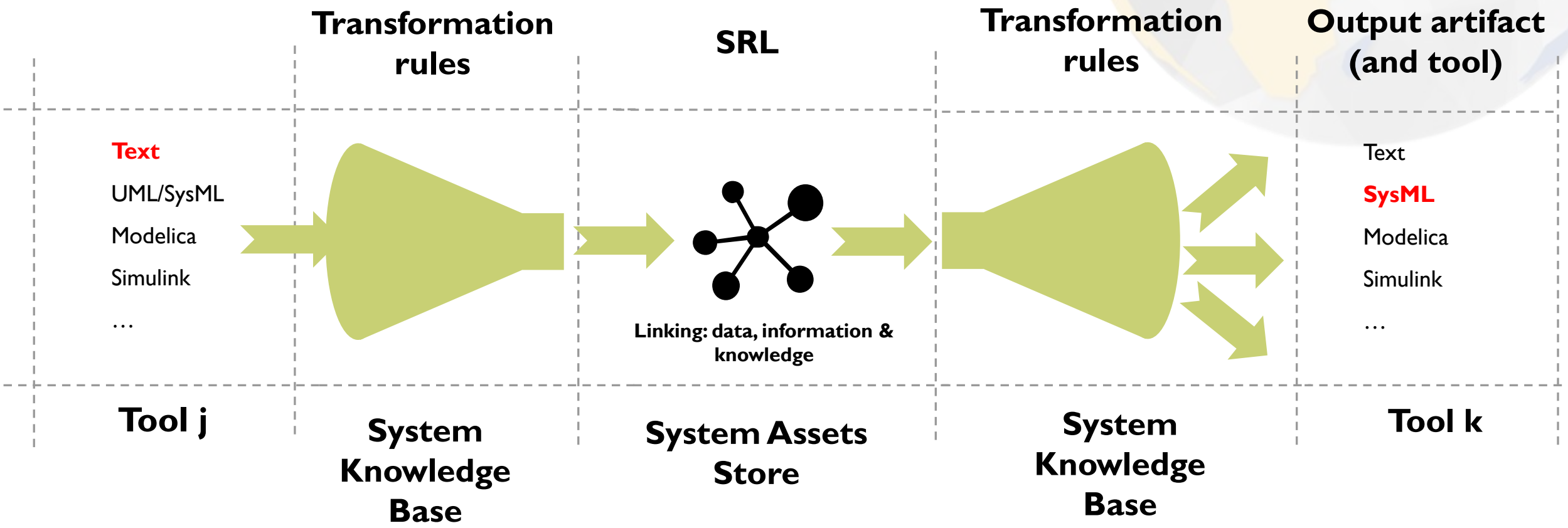


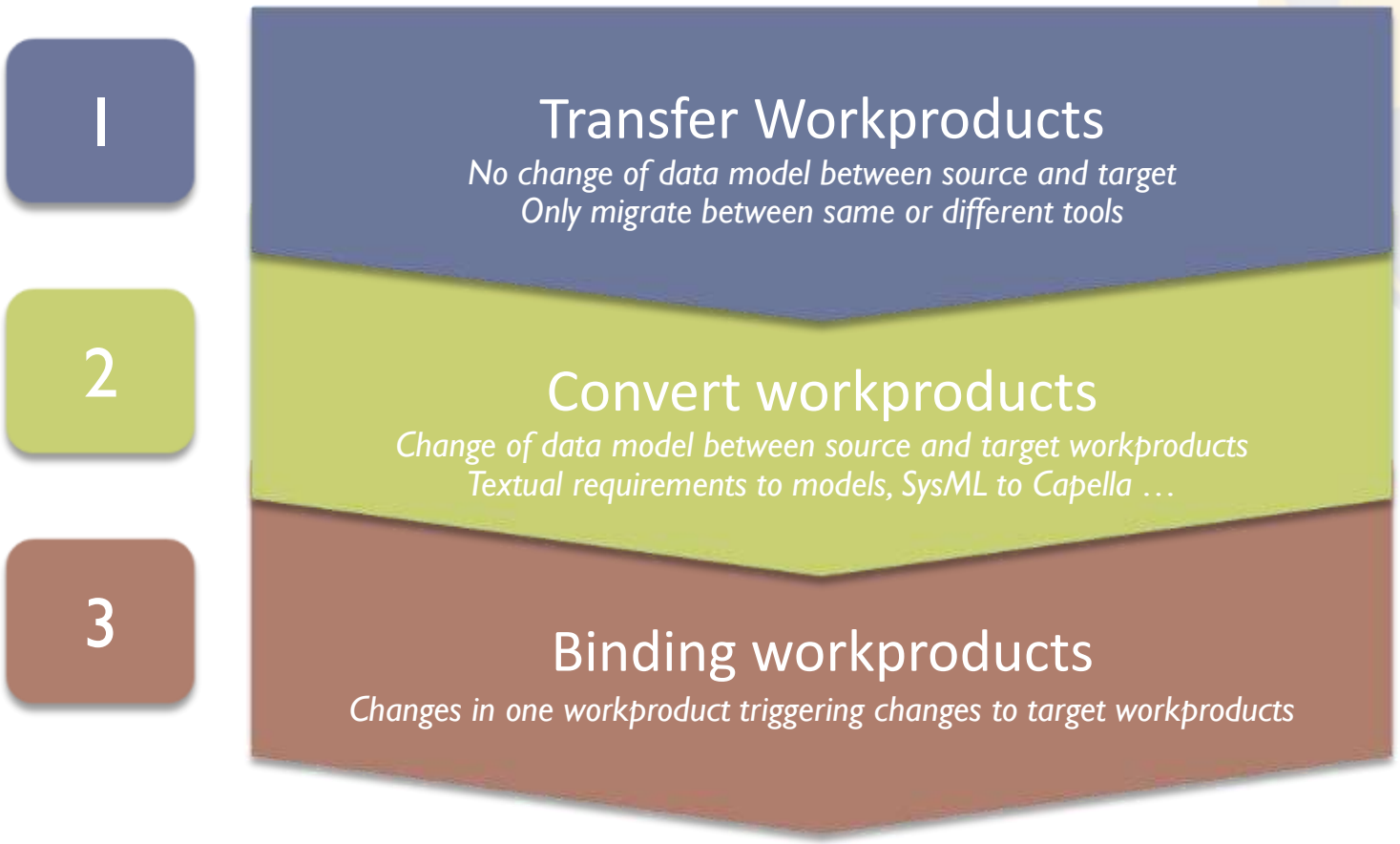


2

Convert workproducts

Change of data model between source and target workproducts
Textual requirements to models, SysML to Capella …

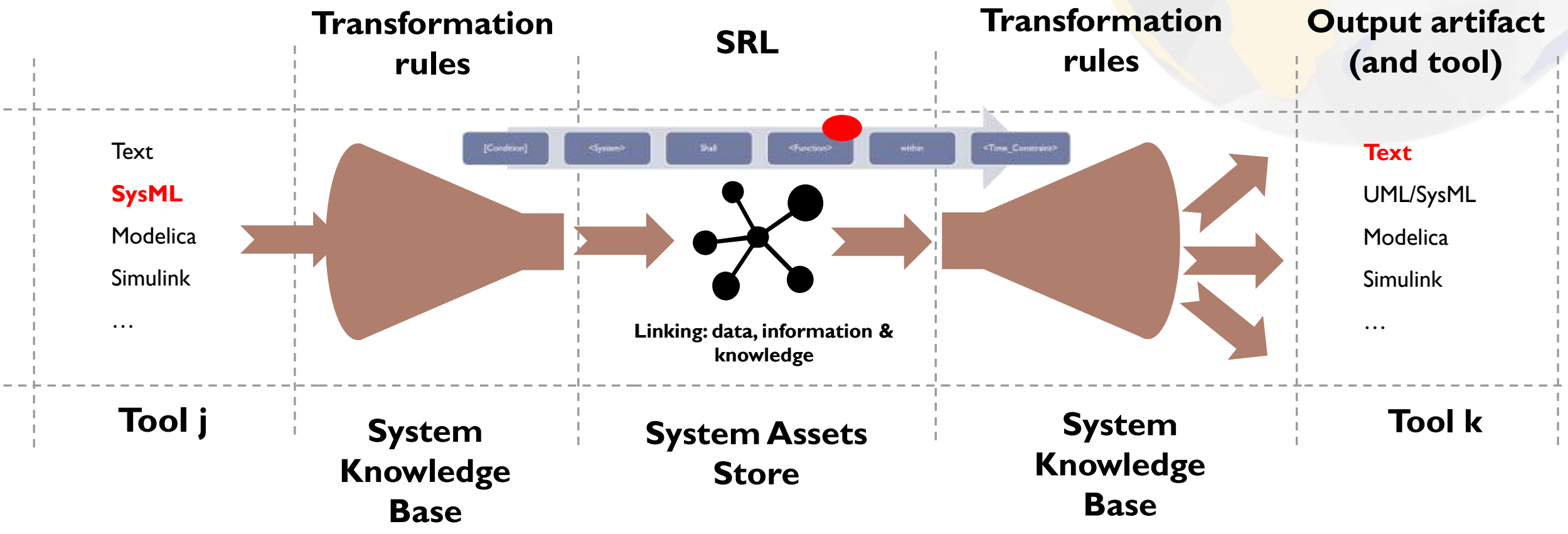




3

Binding workproducts

Changes in one workproduct triggering changes to target workproducts



3

Binding workproducts

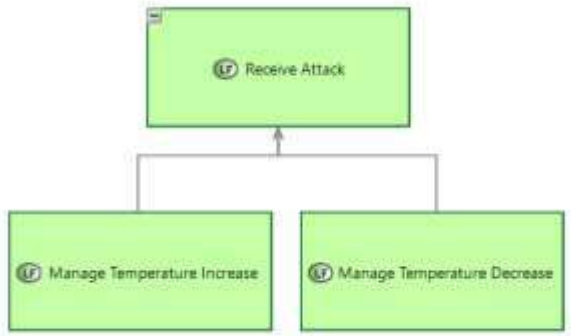
Changes in one workproduct triggering changes to target workproducts

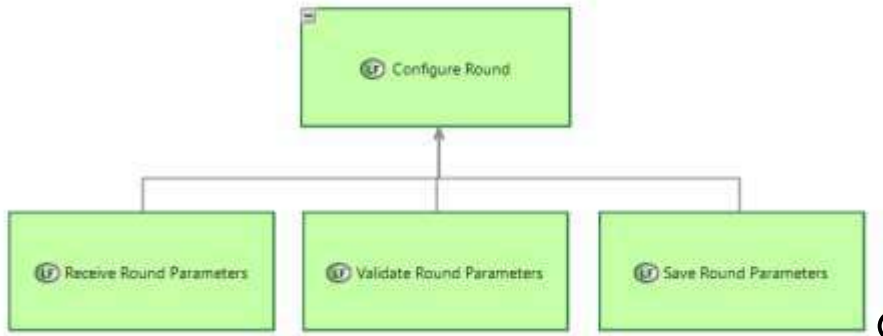
[Condition] | <System> | Shall | <Function> | within | <Time_Constraint>

Object-level Interoperability:

If **<Function>** changes in the Model;

- **<Function>** is updated in all the textual items bound to the model function.



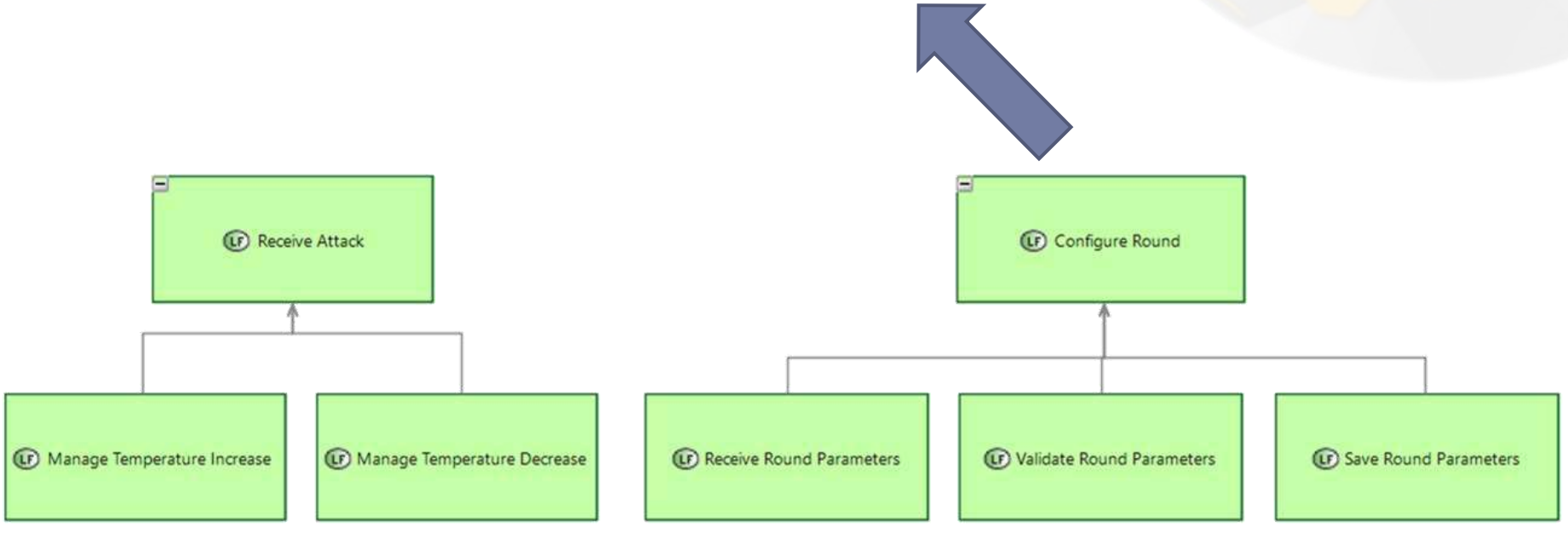


3

Binding workproducts

Changes in one workproduct triggering changes to target workproducts

While in Ready Mode, The Temperature Warrior shall **Configure Round** during 15 seconds.

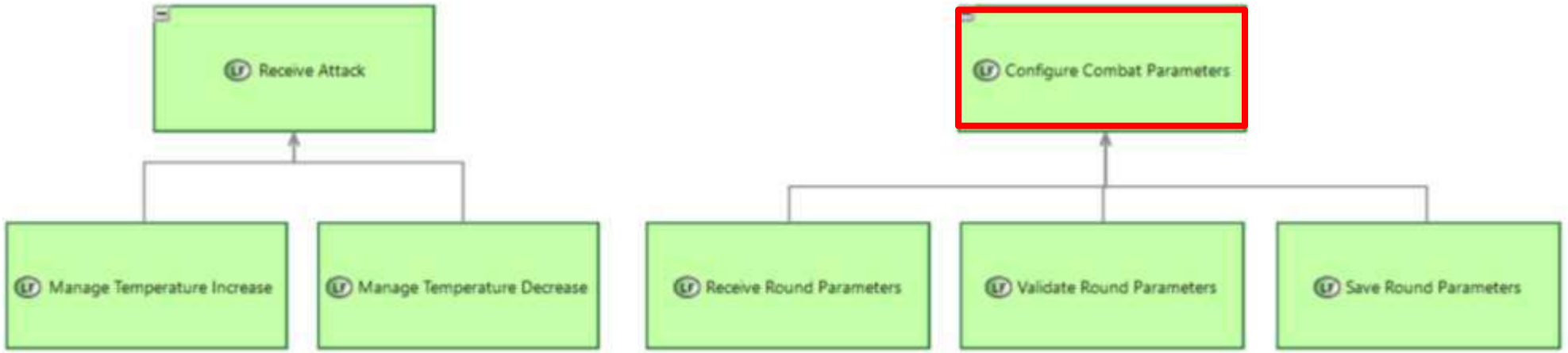


3

Binding workproducts

Changes in one workproduct triggering changes to target workproducts

While in Ready Mode, The Temperature Warrior shall **Configure Combat Parameters** during 15 seconds.



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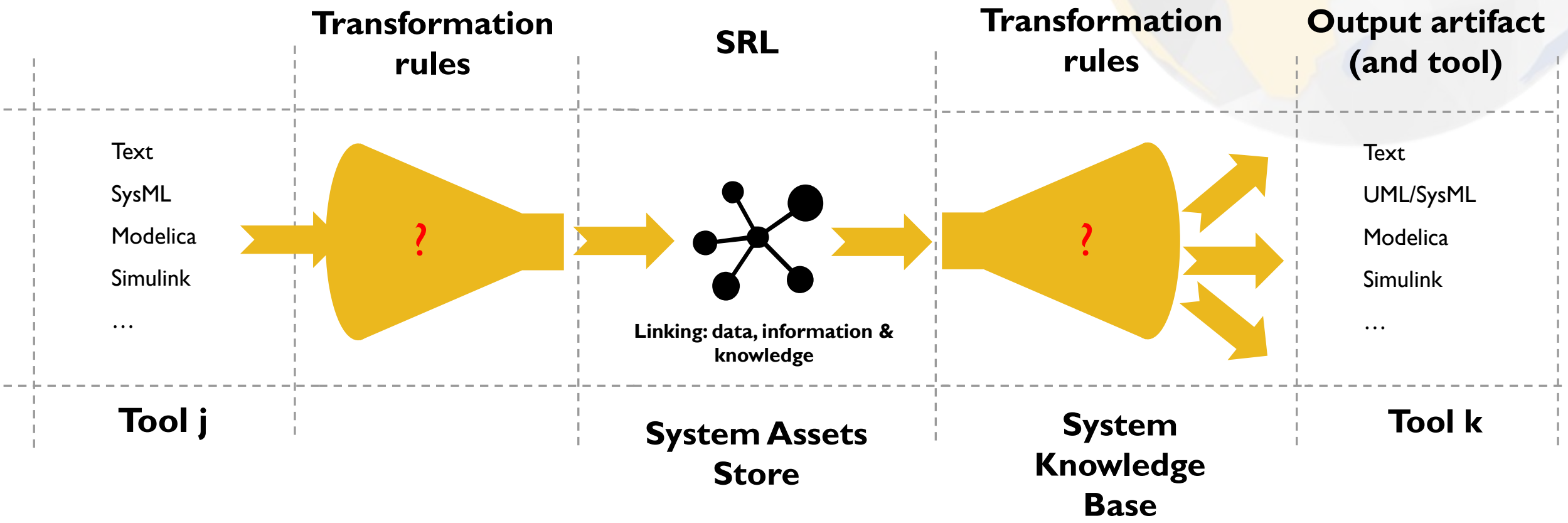
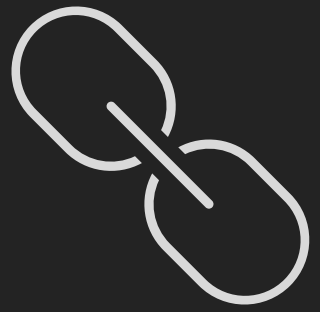
Custom Interoperability

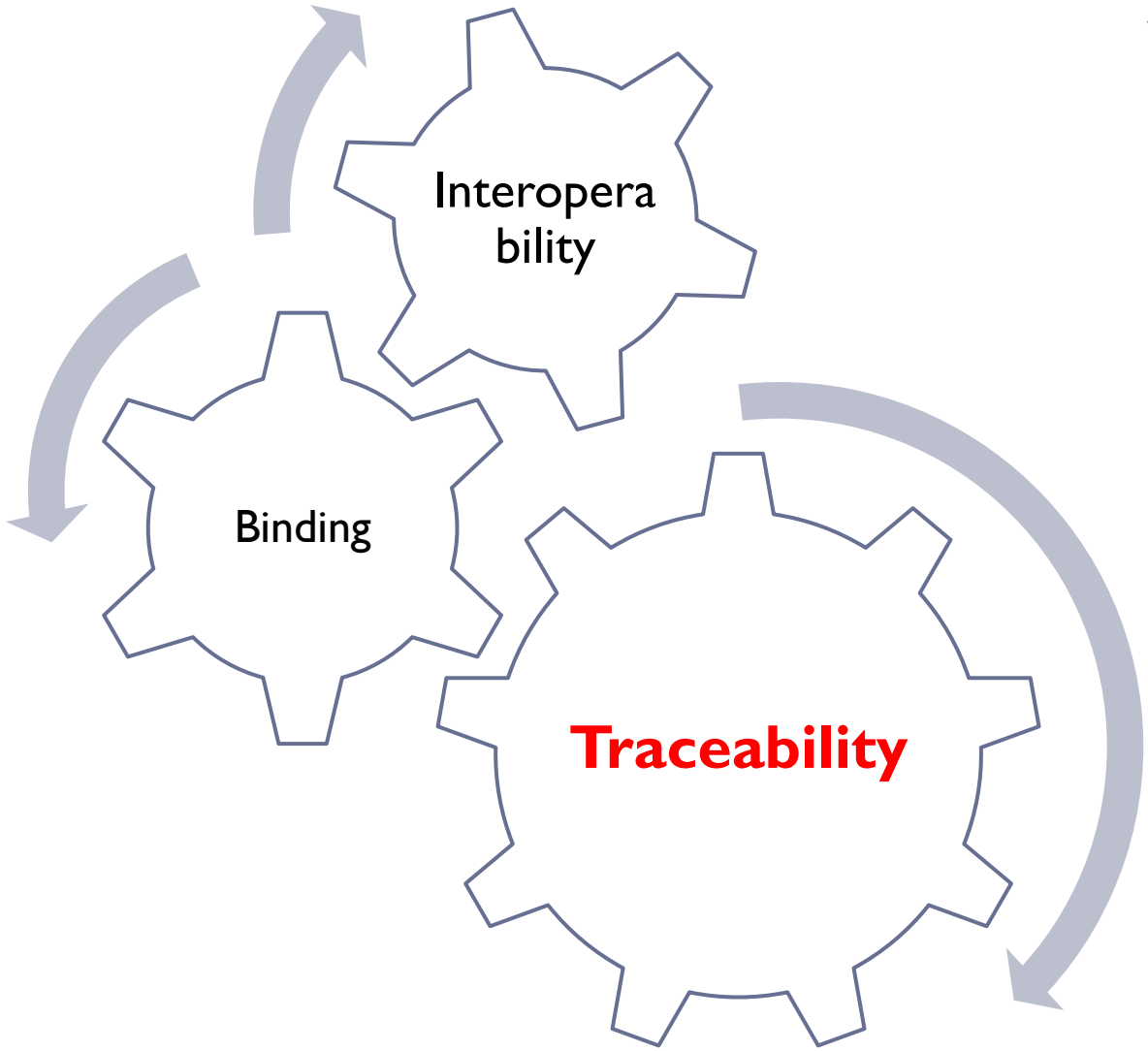
C# source code operation / transformation using the exchange data model (SRL – System Representation Language)





Interoperability + Traceability

The digital thread

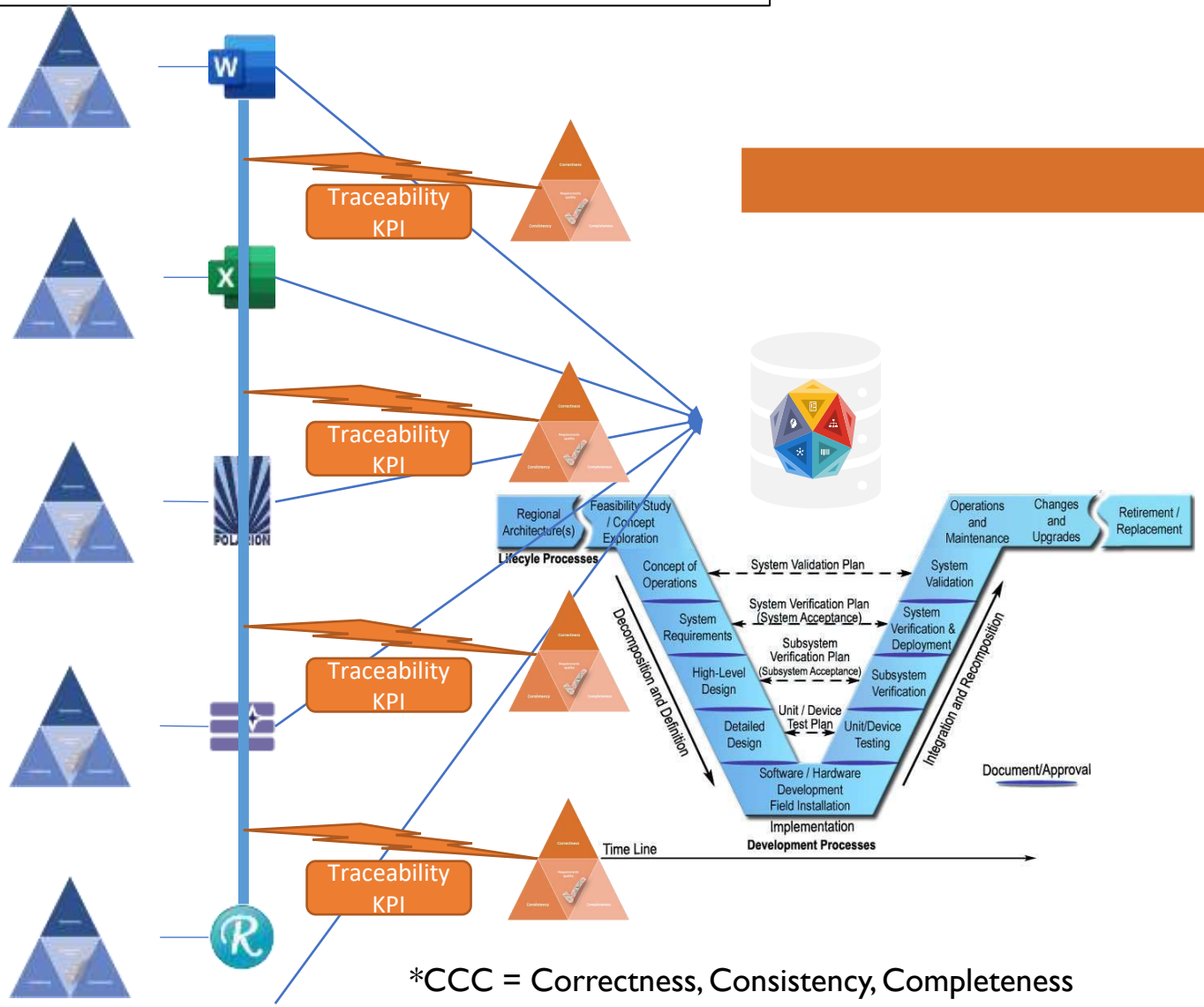


Want to learn more about this topic?

- **Tool-neutral**
- **Powered by semantic algorithms**
- **Fuelled with synchronized project data dictionary (knowledge domain)**

Traceability discovery + suspect links = Consistency + Completeness

Document centric CCC* vs. Data-centric CCC*



Traceability KPI

Completeness:
- % traced elements

Correctness:
- link type by traceability link

Consistency:
- % Suspect links

*CCC = Correctness, Consistency, Completeness

Source: INCOSE Systems Engineering Handbook, Ed. 4

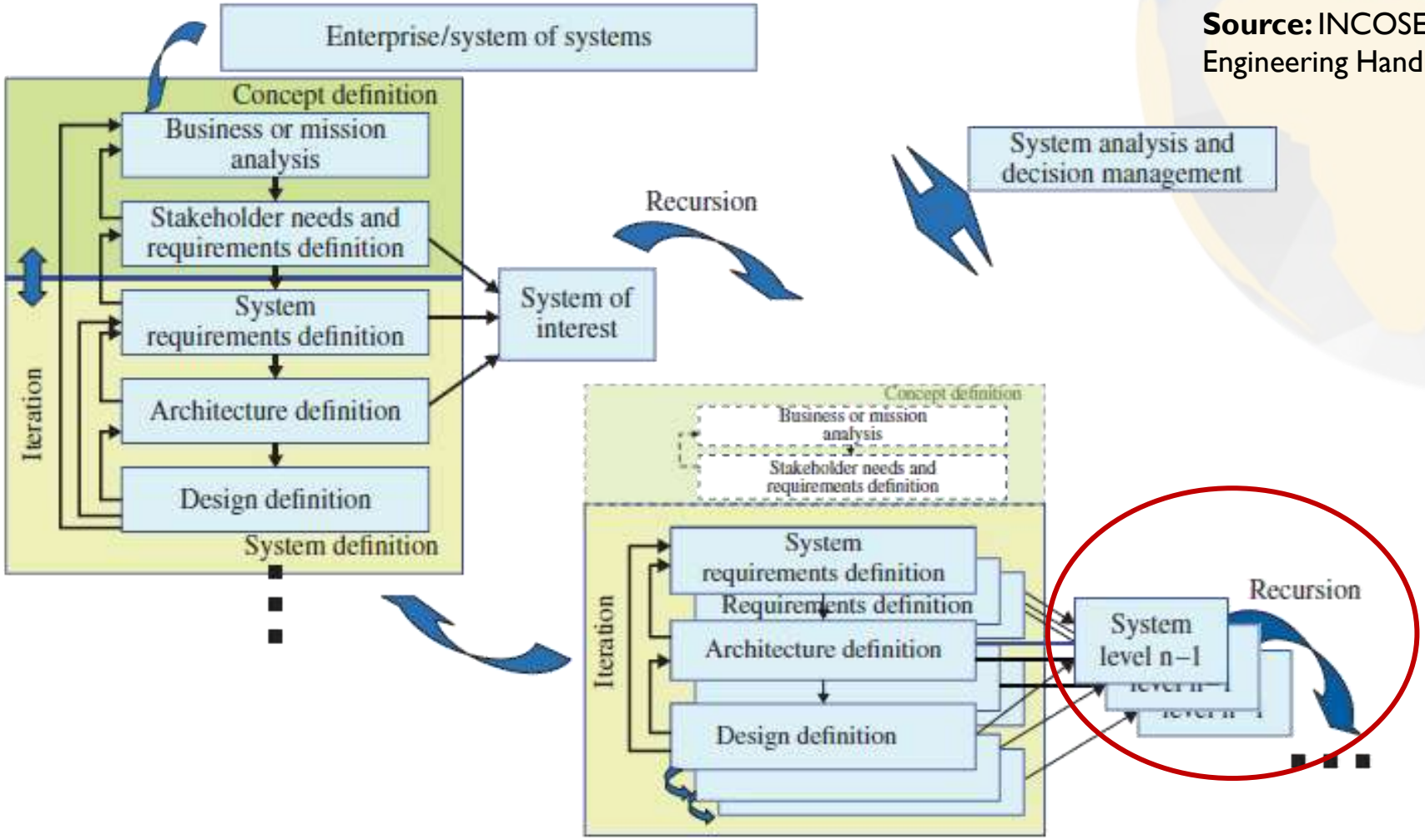


FIGURE 3.5 Iteration and recursion. Reprinted with permission from Garry Roedler. All other rights reserved.

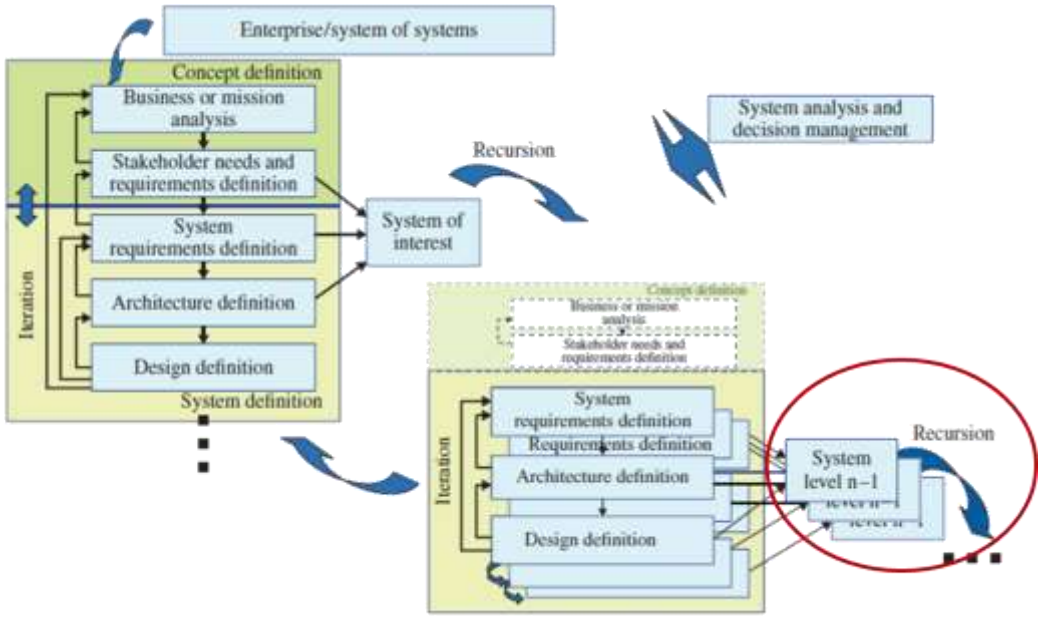


FIGURE 3.5 Iteration and recursion. Reprinted with permission from Garry Roedler. All other rights reserved.

Interoperability

Traceability

Object Binding

Synchronize Baselines

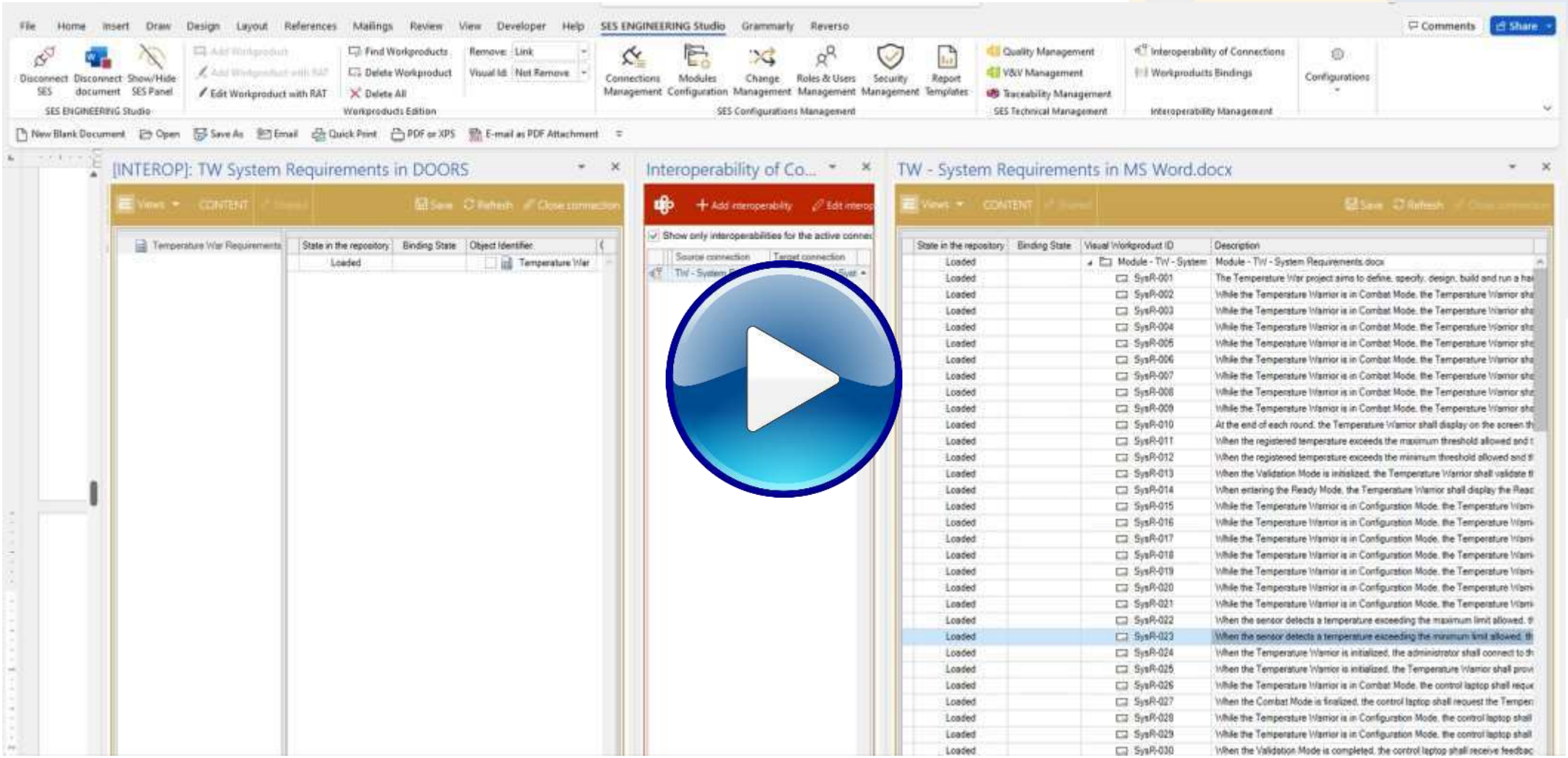
Traceability: suspect links analysis

Content Update

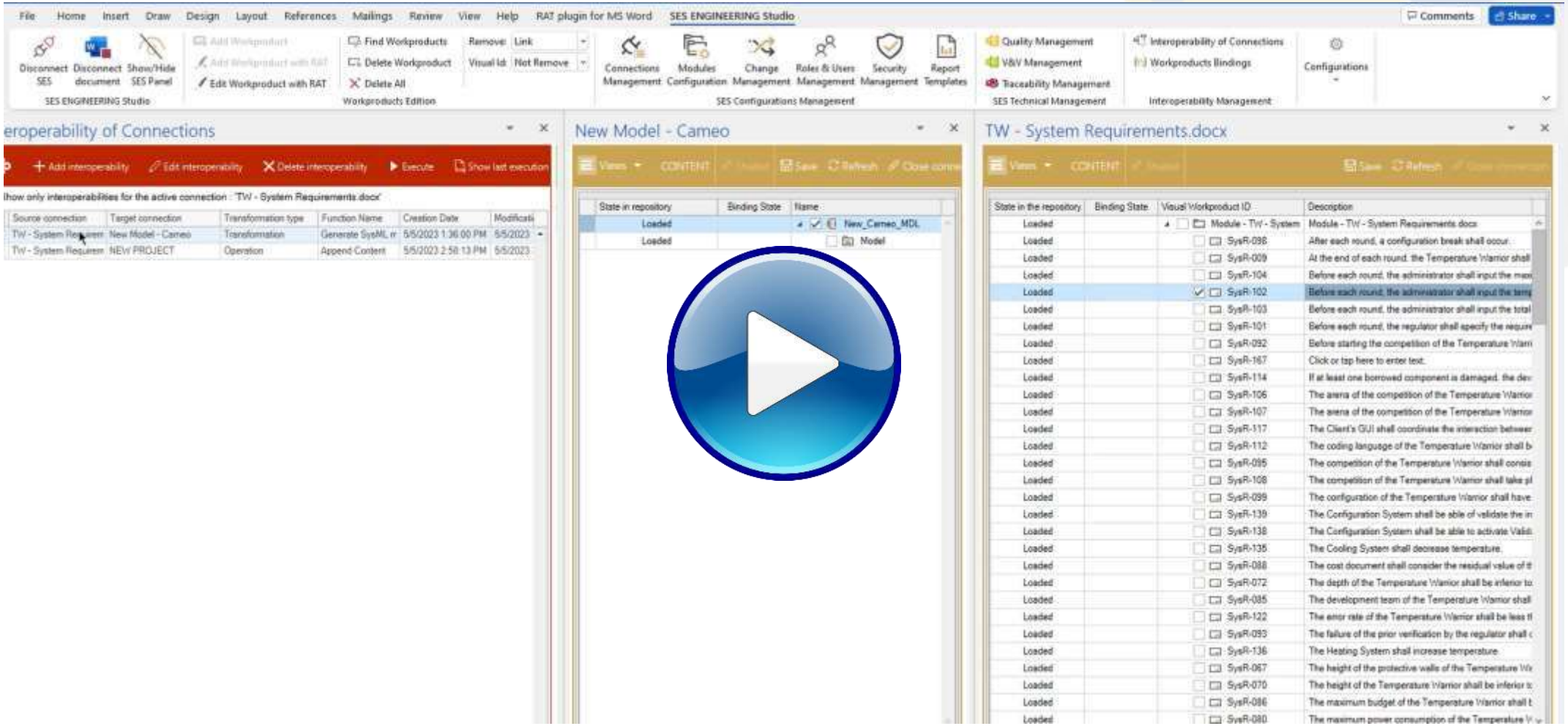
Live Demo

Interoperability

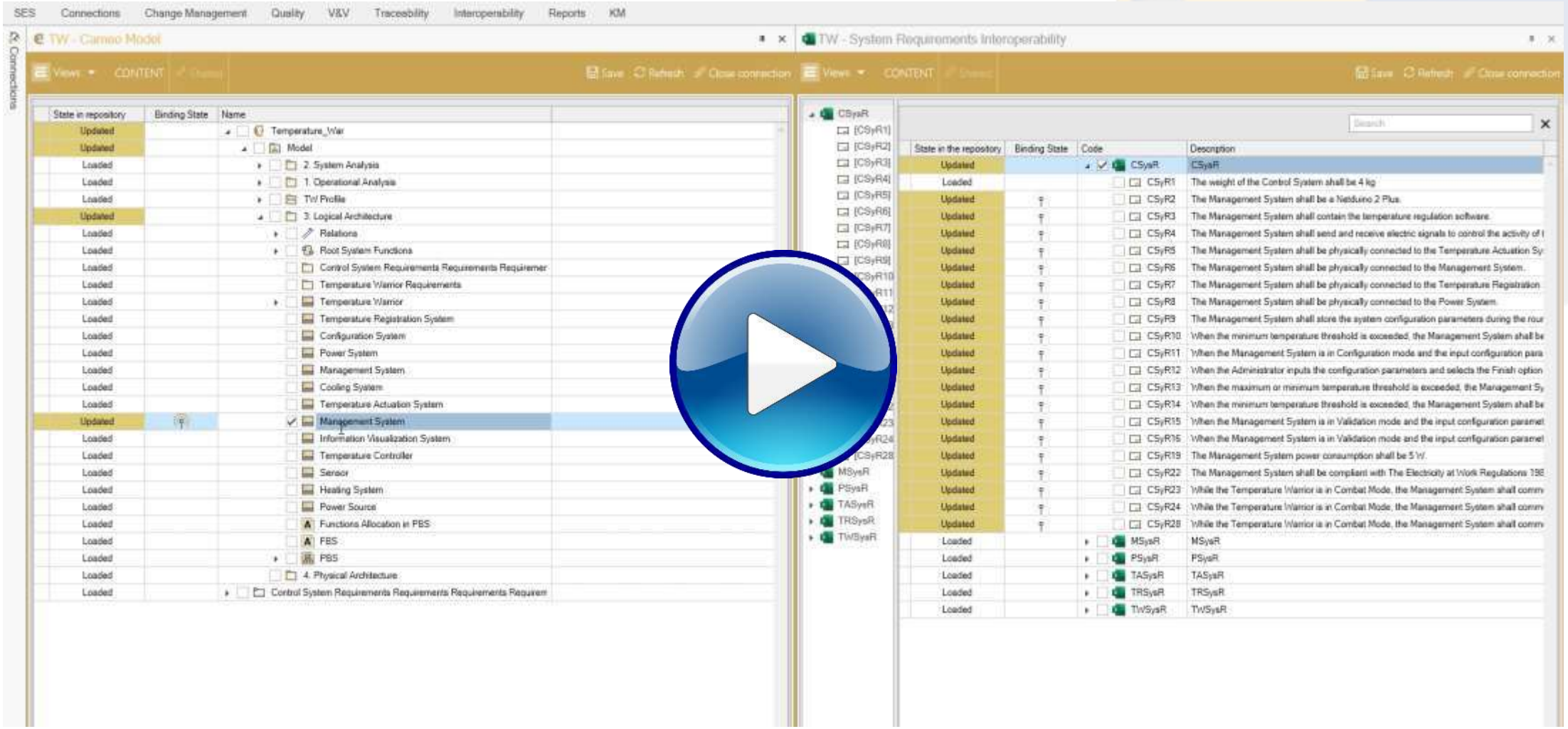
#1: Data Exchange between tools (synchronization)



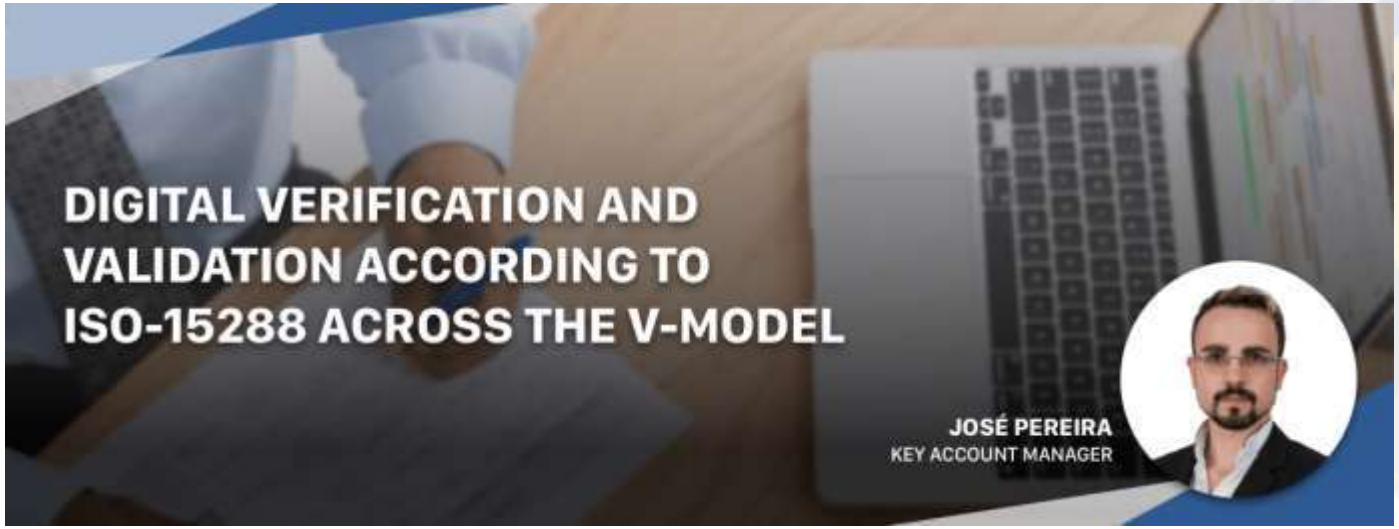
#2: Transformation between tool languages (model conversion)



#3:Traced Objects binding & roundtrip editing




Q
A



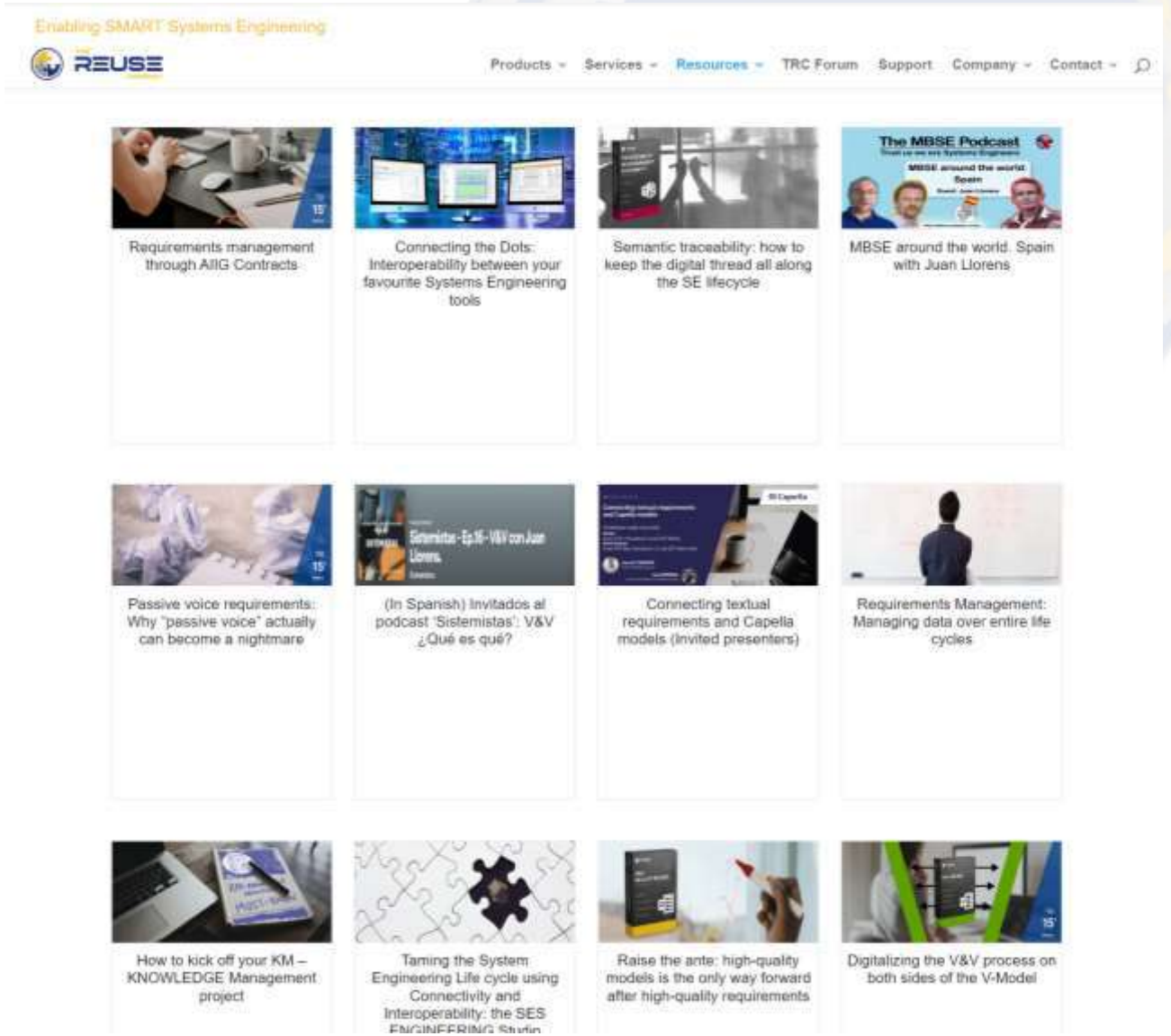
Learn about the V&V Management Capabilities within SES ENGINEERING Studio

- *Digitalize and monitor your V&V activities in compliance with ISO-15288 standard*
- *Centralize the V&V actions of your system development life cycle using the connectivity of SES ENGINEERING Studio (interoperability hub).*
- *Produce V&V reports and dashboards*
- ***Dates:** February 13 & 15, 2024*

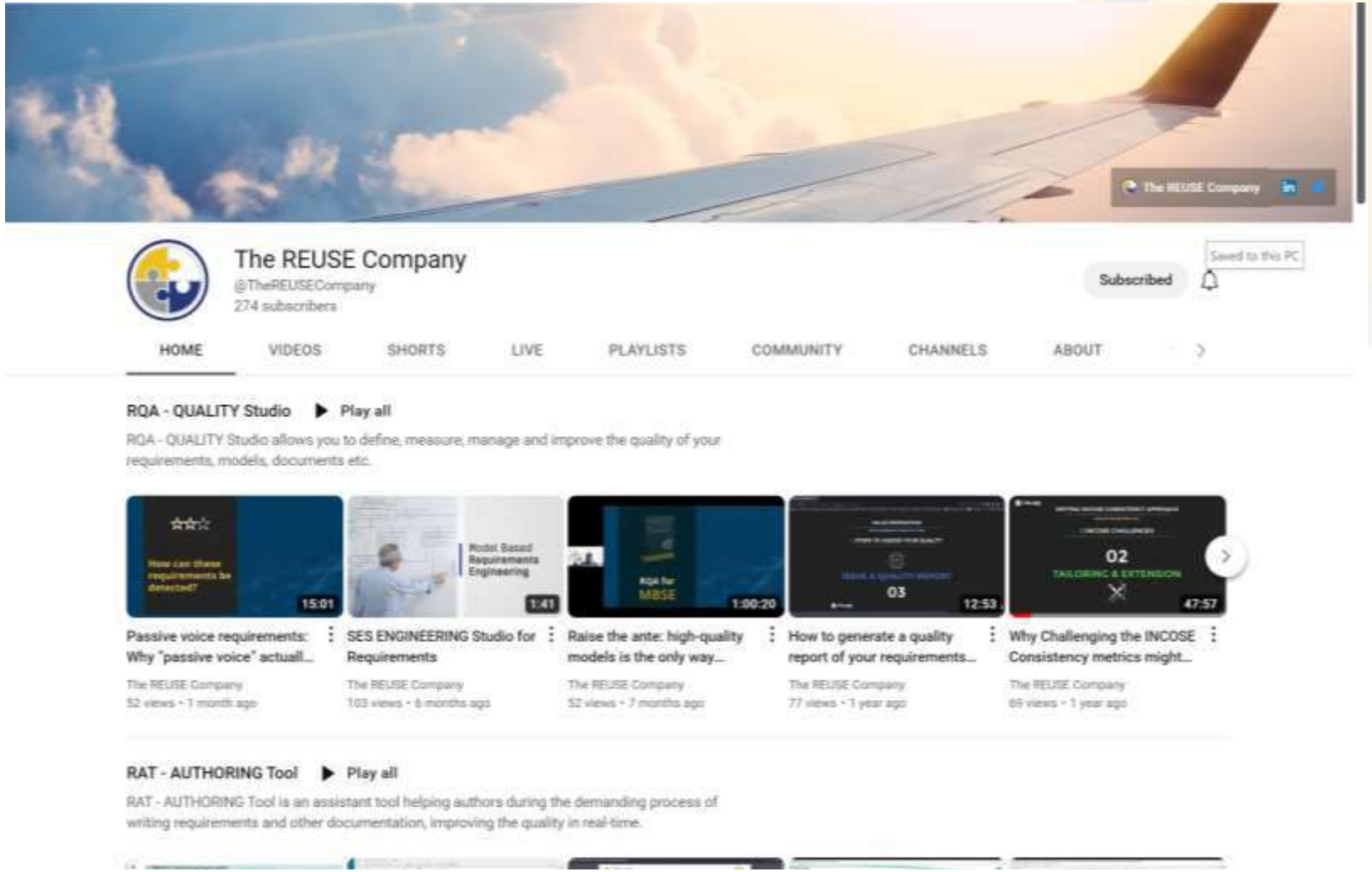
Link to register : https://www.reusecompany.com/webinars/digital-verification-and-validation-according-to-iso-15288-across-the-v-model


Q
A

- www.reusecompany.com
  - Information about the Systems Engineering Suite
  - Resources (Webinars, handbooks)
  - Request for demo
  - Support Forum



- Subscribe to our Youtube channel to follow our latest content!
  https://www.youtube.com/user/TheREUSECompany



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