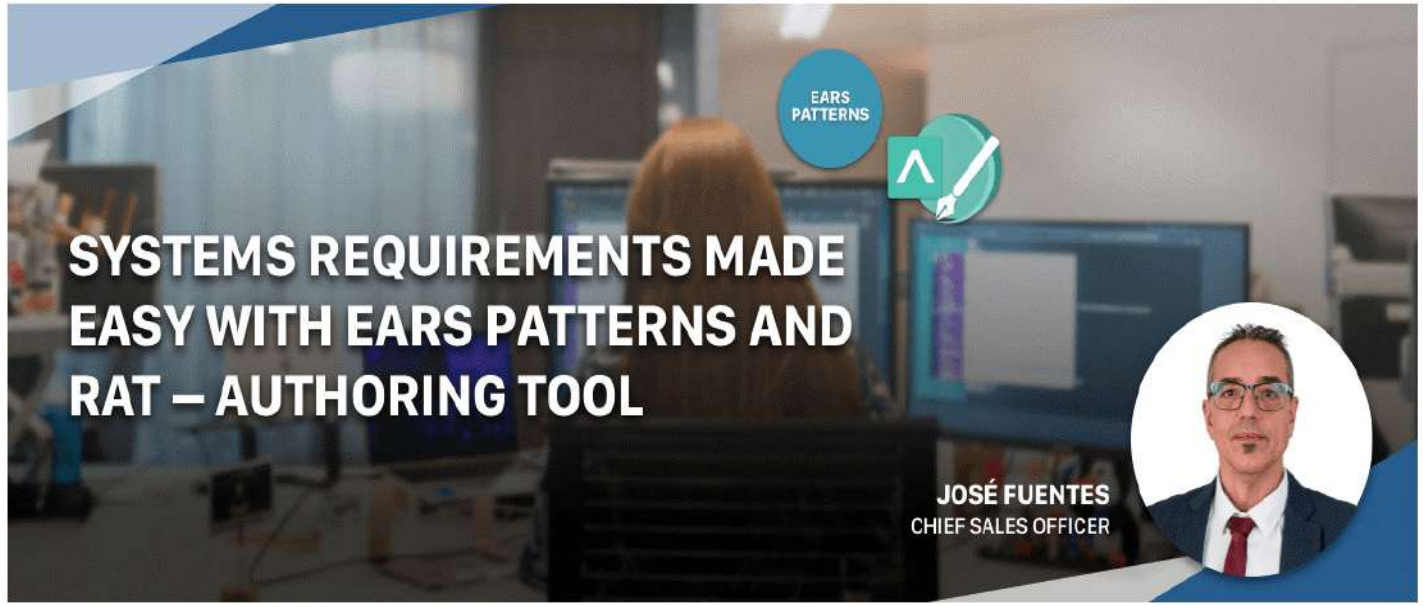
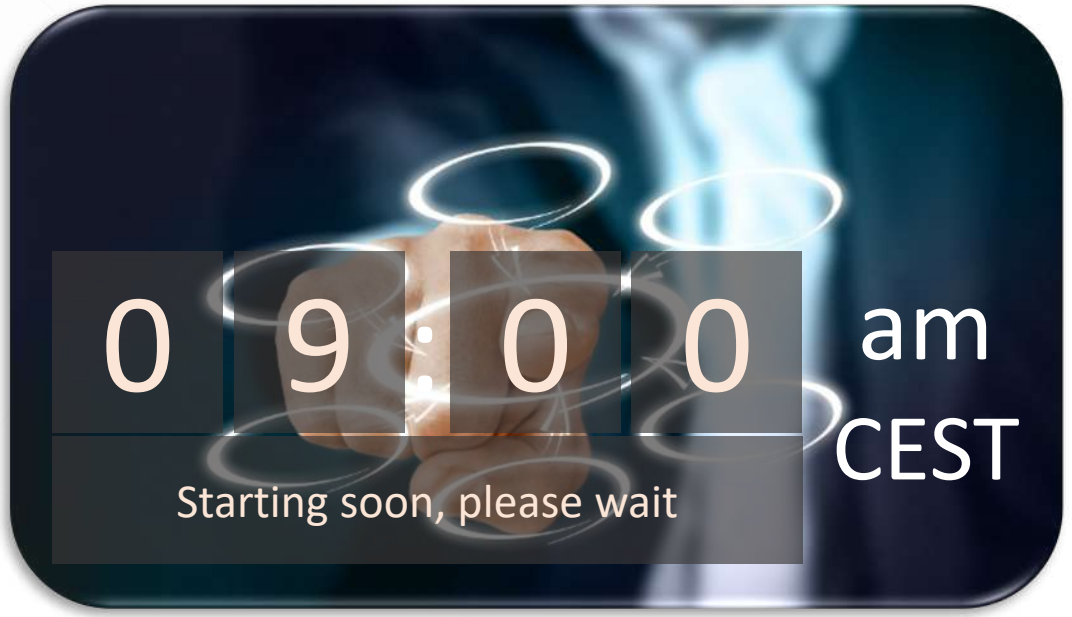




- Webinar rules:
  - You'll be muted all along the Webinar
  - There's a *Question* section to ask your questions or send your comments whenever you want
  - If you have any technical issue, please use the chat box (not the *Question*)
  - The Webinar will be recorded. A link to the recording will be sent to you in few days

SYSTEMS REQUIREMENTS MADE EASY:

WITH EARS PATTERNS AND THE RAT - AUTHORING TOOL

José M. Fuentes
The REUSE Company
Chief Operating Officer
jose.fuentes@reusecompany.com

THE REUSE COMPANY

CONTENTS

- Introduction to The REUSE Company and the speaker
- What is EARS
- Writing system requirements with RAT based on EARS patterns
- Live demo
- Q&A

ABOUT THE REUSE COMPANY (TRC)

01 The company was established in **1999**

As a spin-off of a University in Madrid

02 **System + Software Engineers**

Smart combination between Company staff and R&D from Academia

03 **Headquarters:**
Madrid (Spain)

International offices:
Miami (USA)
Stockholm (Sweden)
Tokyo (Japan) Delegation

04 To promote a **reusable**, **scalable** and global solution to a **smart** and **interoperable** Systems Engineering environment, by offering a **semantic knowledge centric** approach.

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 life cycle.

- **The Systems ENGINEERING Suite:**
  - RQA – QUALITY Studio
  - RAT – AUTHORING Tool
  - TRACEABILITY Studio
  - V&V Studio
  - KM – Knowledge Manager

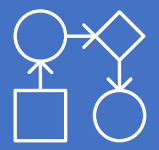
  - SES ENGINEERING Studio:
    - TMx
    - HUBx
    - REx
    - KMx
    - SLCMx

6

WHAT WE DO

01

01



SES TMP
TMX

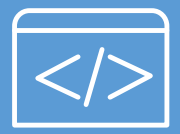
Technical Management Processes:
Quality
Traces
DMS
V&V

02

SES INTEROP
HUBX

Interoperability HUB
Connectivity to External Sources

03



SES REQ ENG
REX

SMART Requirements Engineering
Using MS Word as Tech Platform

04

SES SLCM
SLX

Knowledge and Information Management
Requirements reuse
Virtual Assistants
Search eng.
Ontologies
PLE

05

SES SLCM
SLX

System Lifecycle Management

WHO IS USING OUR TECHNOLOGY?

- Aerospace
- Defense
- Automotive
- Energy
- Healthcare
- Infrastructure
- Legal
- Software

THE PRESENTERS

José Fuentes

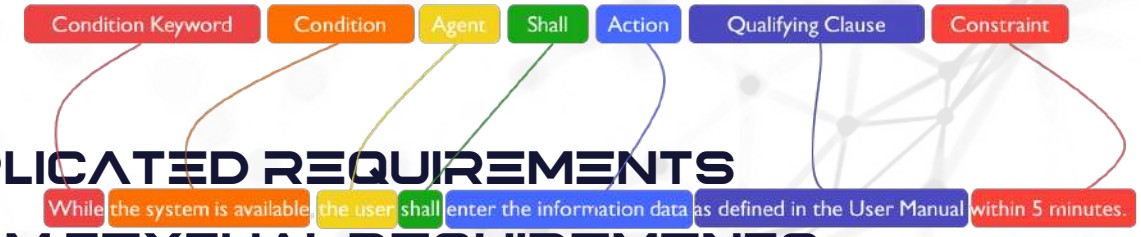
- **Current Position:** Chief Sales Manager of The REUSE Company
- Former Product Manager of RQA and the Systems Engineering Suite
- INCOSE CSEP Certified
- Graduated in the INCOSE Institute for Technical Leadership
- Member of the board of AEIS – The Spanish chapter of INCOSE
- Active contributor to the INCOSE Guide to Writing Requirements
- Other certifications: ITIL
- Other interests: Project Management, Business Analysis, Risk Management

EARS

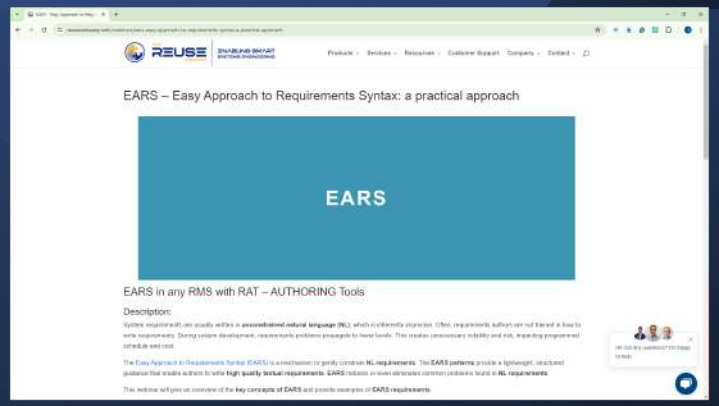
WHAT IS EARS

Requirements Patterns: What is a Pattern?

- A requirements pattern represent the structure for a well-formed requirement
- Based on a series of sequential pattern slots:
  - Some are just "common" (meaningless) words: prepositions, determiners…
  - Some others can be mapped with elements in architecture / design: components, functions, interfaces, states…
- Requirements patterns enable consistency:
  - A consistent way to write requirements → an easier way to understand requirements
  - The identification of the key vocabulary elements → vocabulary consistency
- Can help reuse experience (the common structures) from previous projects
- Facilitate requirements reuse
- Facilitate the identification of duplicated requirements
- Enable the extraction of data from textual requirements



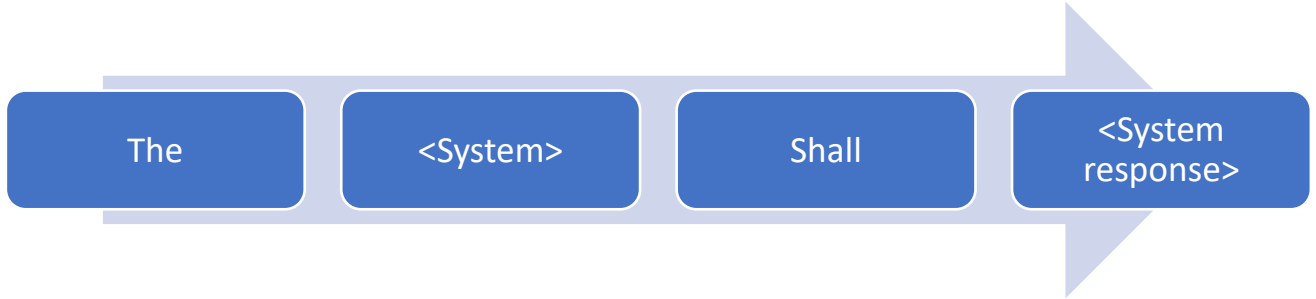
EARS PATTERNS



- Ubiquitous
- State-driven
- Event-driven
- Optional feature
- Unwanted behaviour
- Complex pattern

EARS PATTERNS

Ubiquitous



- The weight of the TW shall be less than 5 kg

State-driven

Event-driven

Optional feature

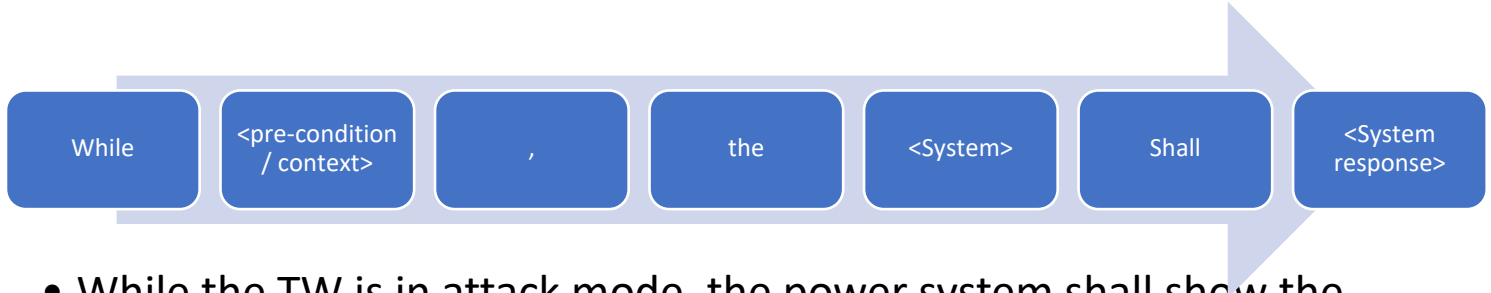
Unwanted behaviour

Complex pattern

EARS PATTERNS

Ubiquitous

State-driven



- While the TW is in attack mode, the power system shall show the temperature of the battle sensor

Event-driven

Optional feature

Unwanted behaviour

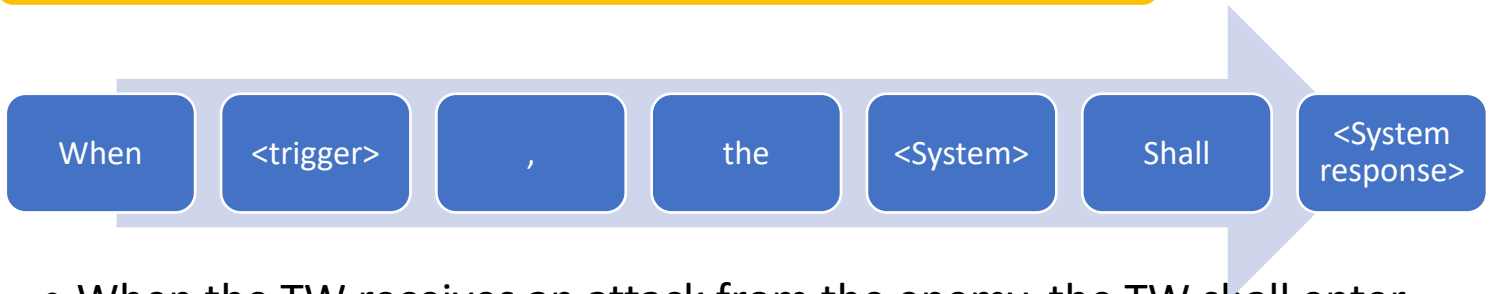
Complex pattern

EARS PATTERNS

Ubiquitous

State-driven

Event-driven



- When the TW receives an attack from the enemy, the TW shall enter into defense mode

Optional feature

Unwanted behaviour

Complex pattern

EARS PATTERNS

Ubiquitous

State-driven

Event-driven

Optional feature

Where | <feature> | , | the | <System> | Shall | <System response>

- Where the accessibility feature is activated, the TW shall read aloud all the messages shown in the main display

Unwanted behaviour

Complex pattern

EARS PATTERNS

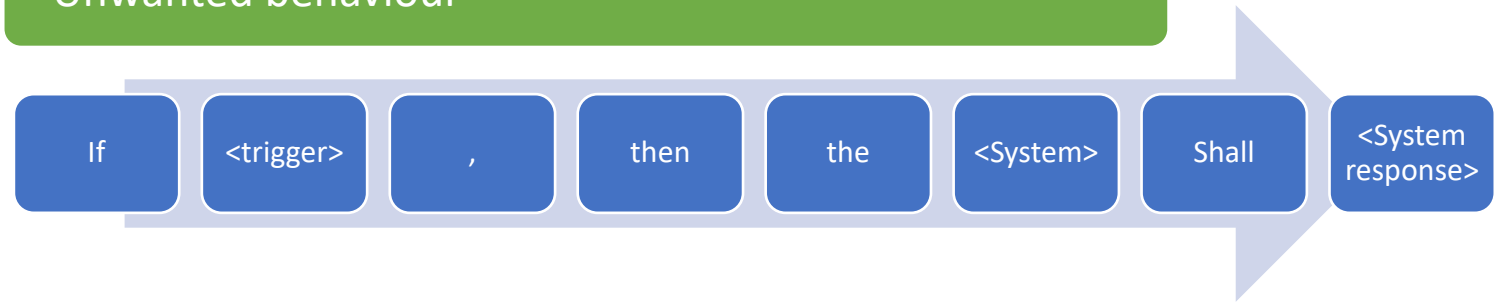
Ubiquitous

State-driven

Event-driven

Optional feature

Unwanted behaviour

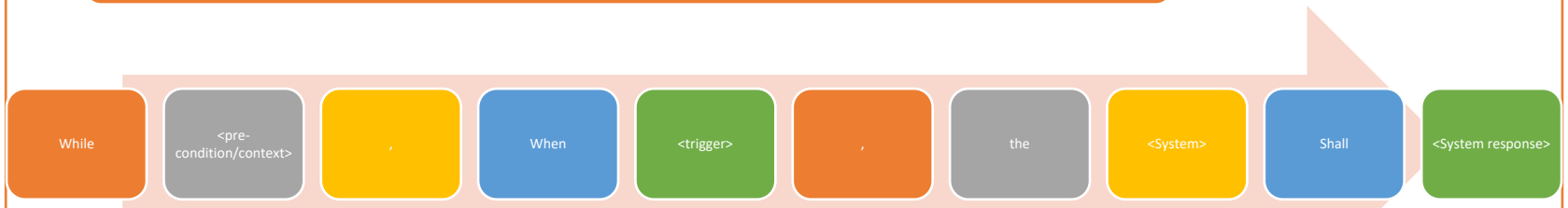


- If the operator enters an attack temperature lower than the ambient temperature, the TW shall show an error message in the main display

Complex pattern

EARS PATTERNS

- Ubiquitous
- State-driven
- Event-driven
- Optional feature
- Unwanted behaviour
- Complex pattern

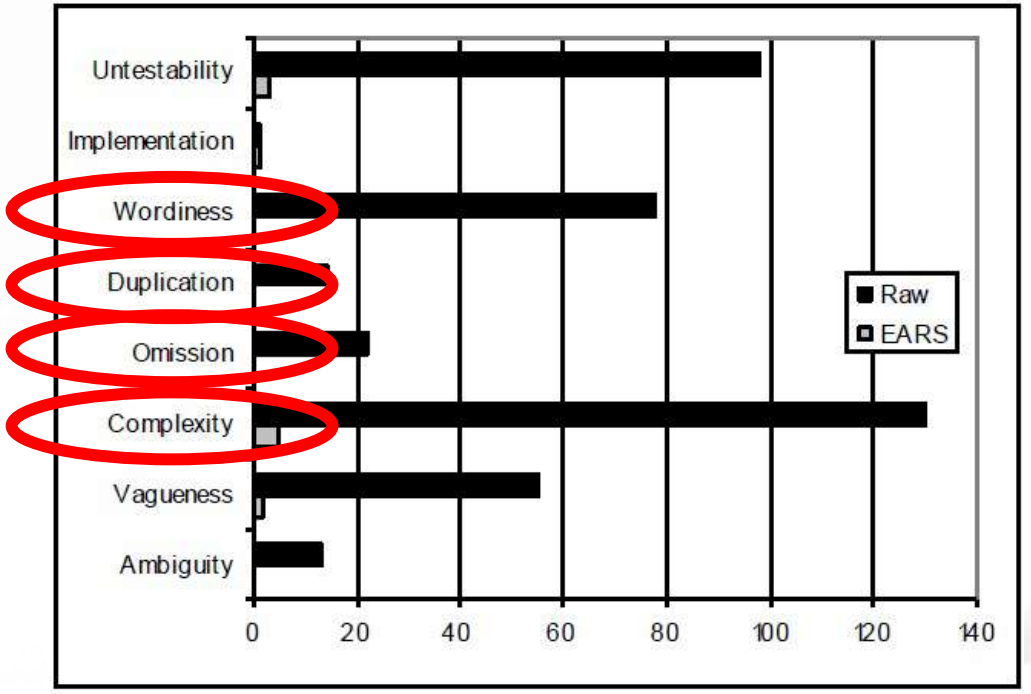


- While the TW is in attack mode, when the temperature sensor reaches the maximum limit established, the TW shall enter into idle mode

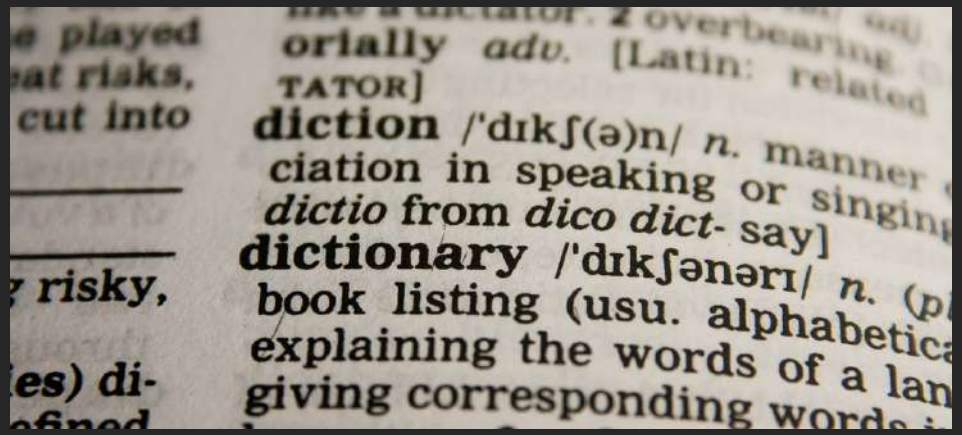
TYPICAL ISSUES FOUND IN REQUIREMENTS

- EARS HAS DEMONSTRATED AN IMPROVEMENT IN REGARDS TO THE MOST COMMON REQUIREMENTS FLAWS:
  - Some are fully removed
  - Others are minimized
  - Additional rules/metrics can help to fully avoid

While using EARS, when the author finds problems, the authoring tool shall implement assistance to the author, in order to improve efficiency

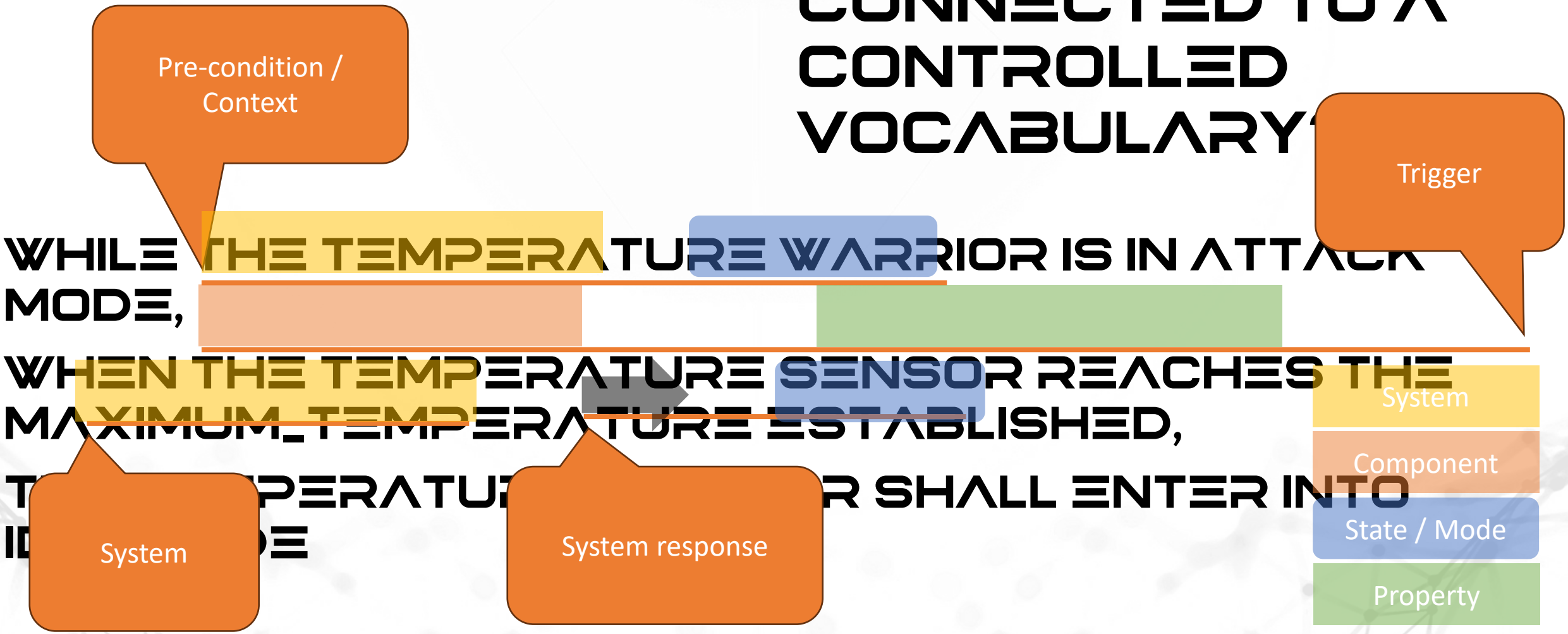


BIG EARS
(The Return of "Easy Approach to Requirements Syntax")
By A. Mavin & P. Wilkinson
RE10



EARS TO A PROJECT DATA DICTIONARY

ARE THE PATTERNS CONNECTED TO A CONTROLLED VOCABULARY?



PATTERNS CONNECTED TO A CONTROLLED VOCABULARY? YES, AND WHERE TO FIND IT?

System

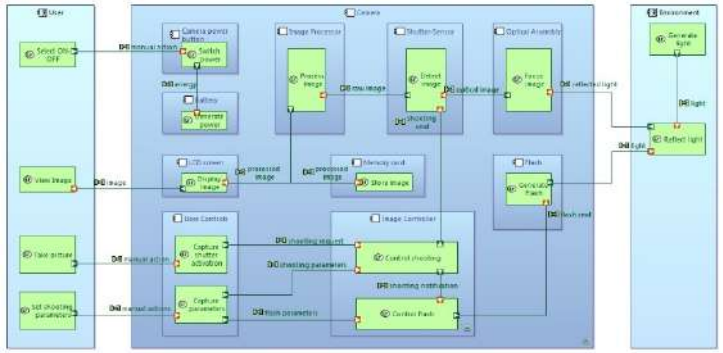
Component

State / Mode

Property

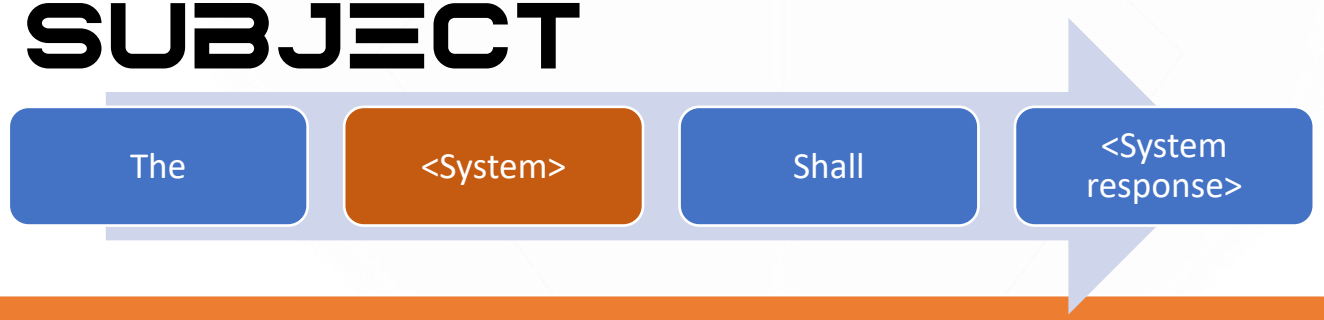
Action

Native REUSE Ontology



Your preferred MBSE tool

SYSTEM NAME / REQUIREMENTS MAIN SUBJECT



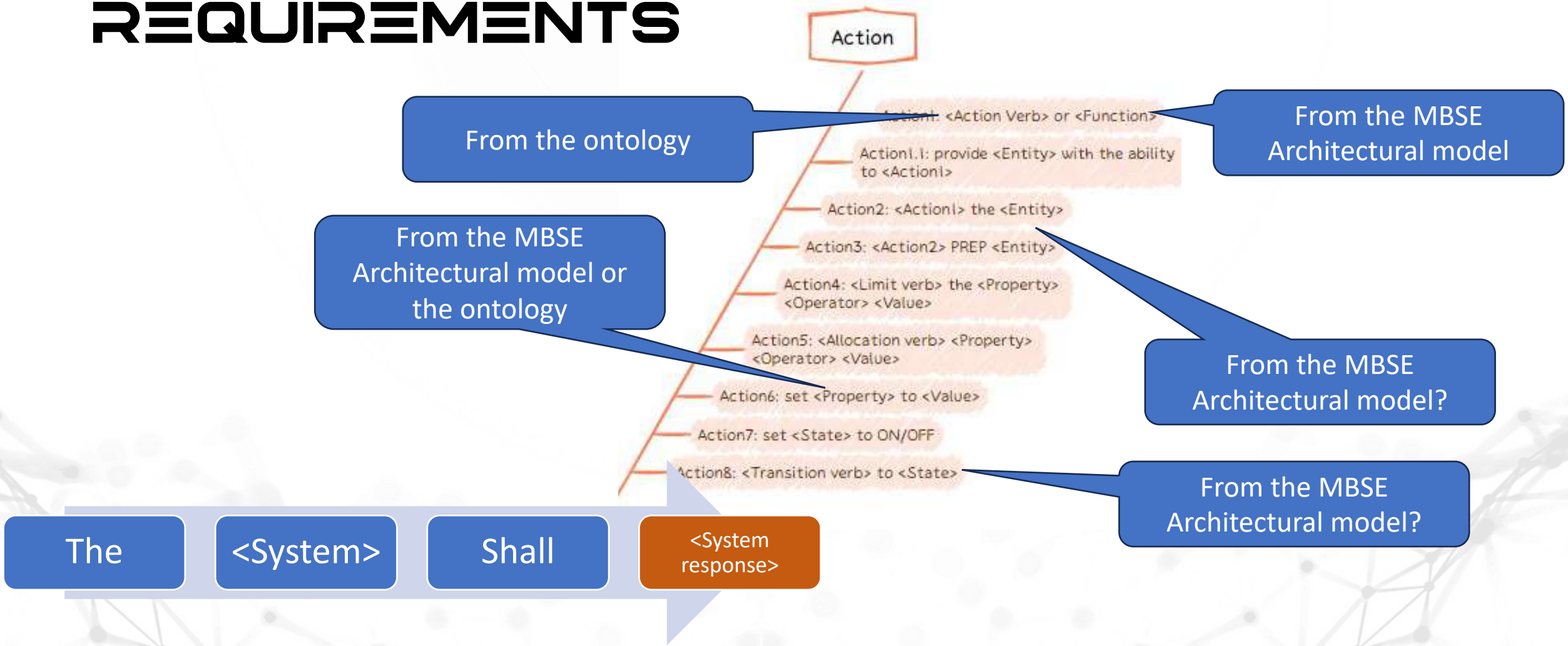
Stakeholder Requirements

- Actors
- Stakeholders

System Requirements

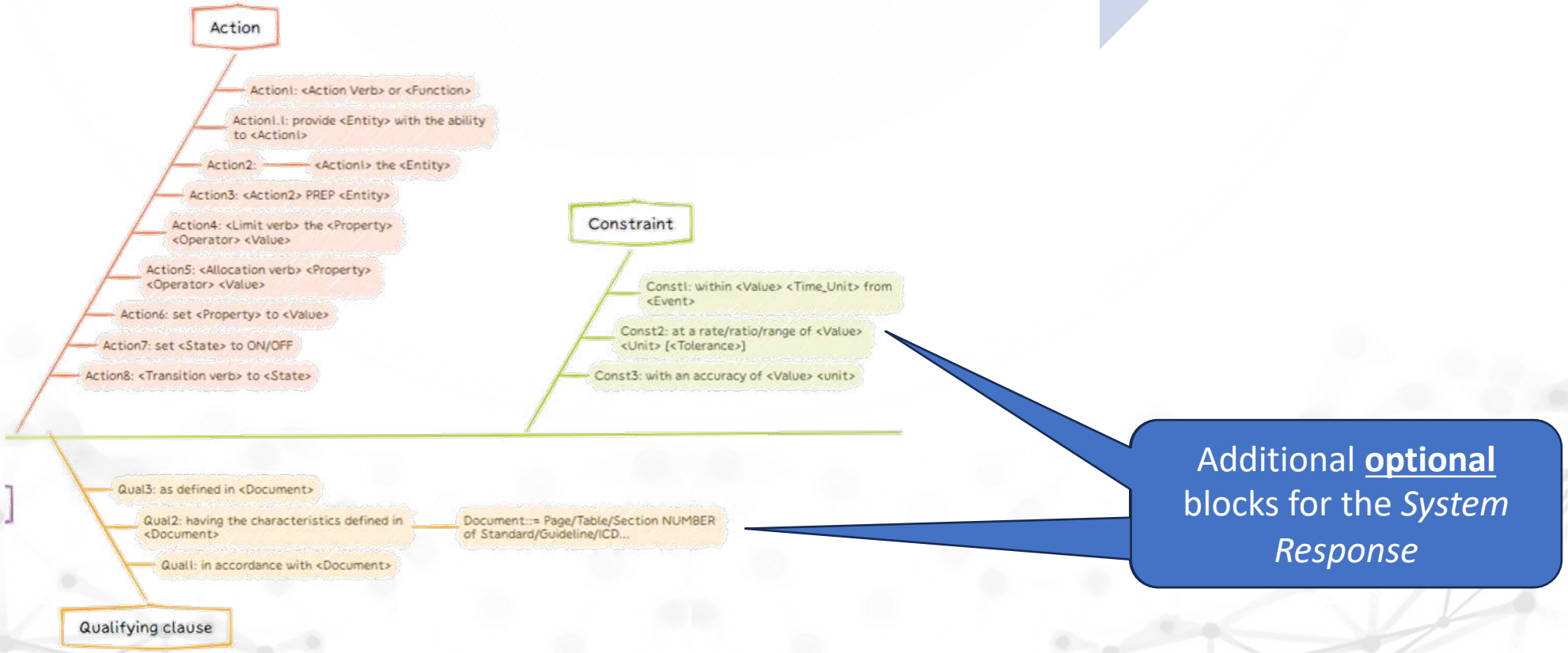
- System names
- Subsystem names
- Component names

SYSTEM RESPONSE: FUNCTIONAL REQUIREMENTS



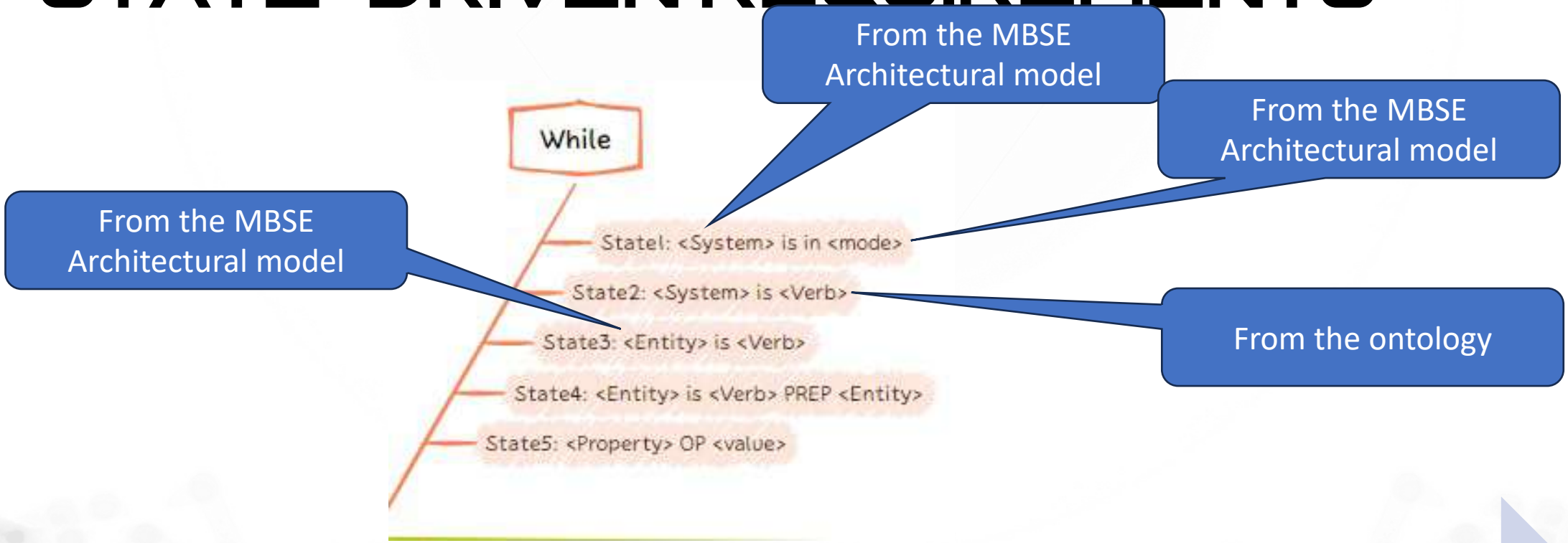
SYSTEM RESPONSE: OPTIONAL BLOCKS

The | <System> | Shall | <System response> | [Qualifying clause] | [Constraint]

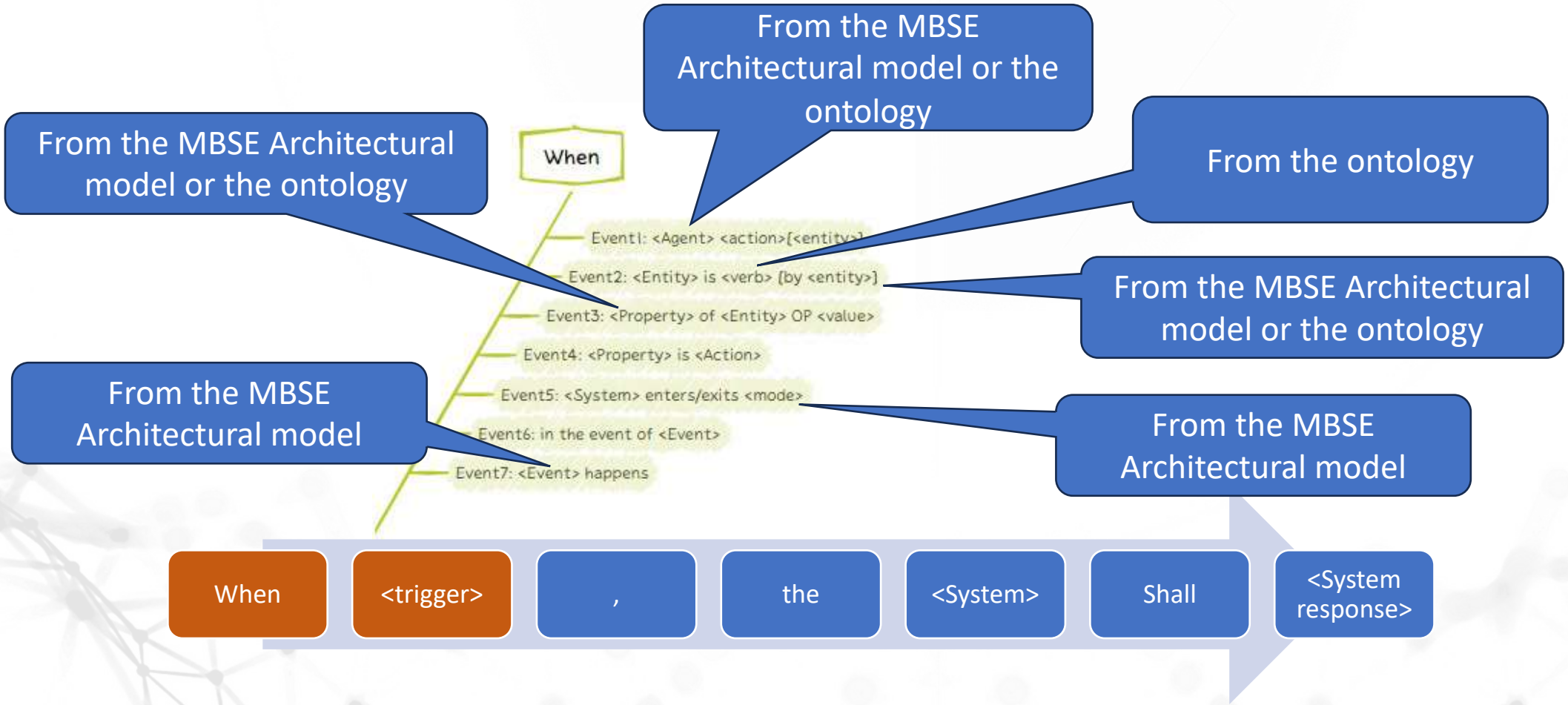


Additional **optional** blocks for the *System Response*

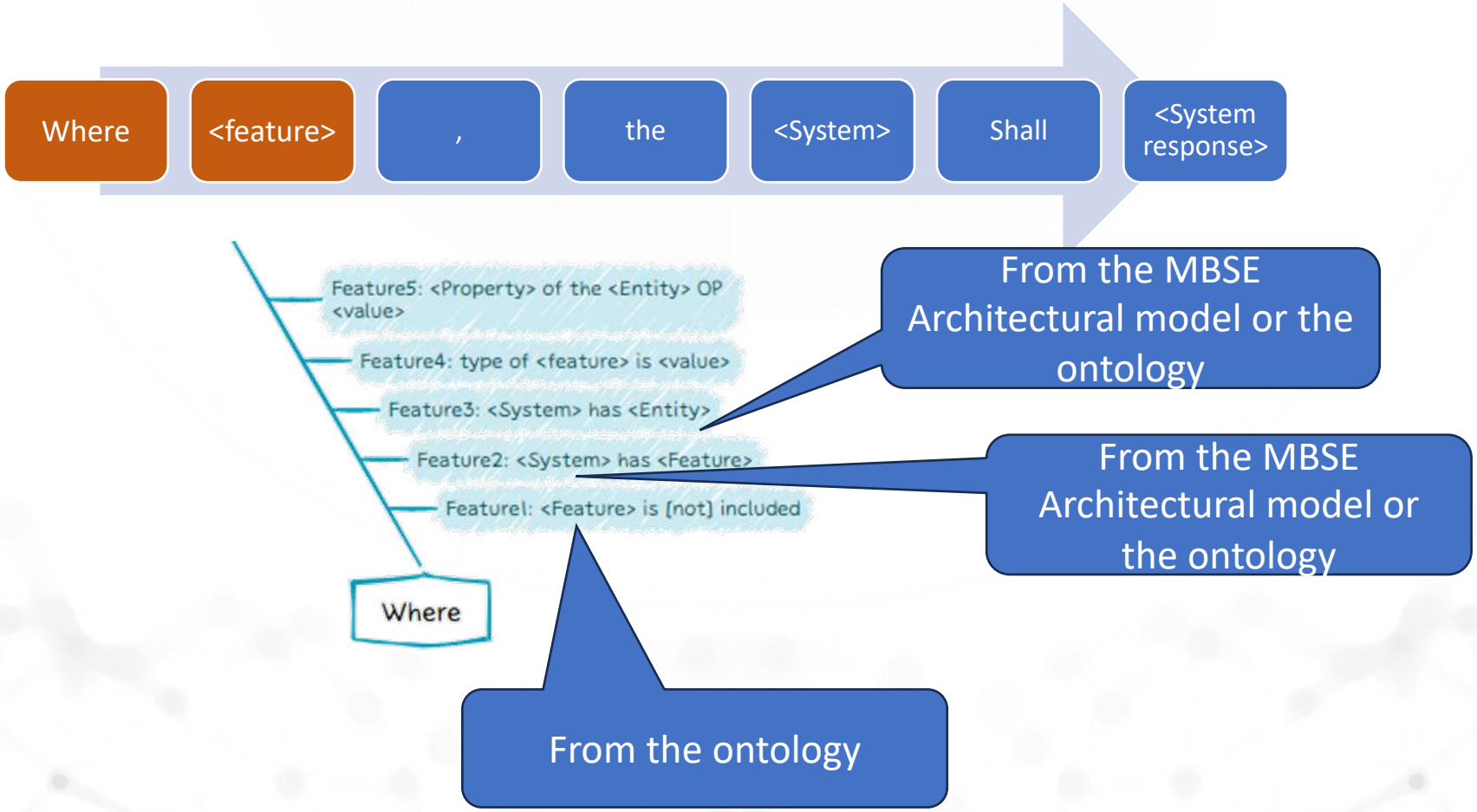
STATE-DRIVEN REQUIREMENTS



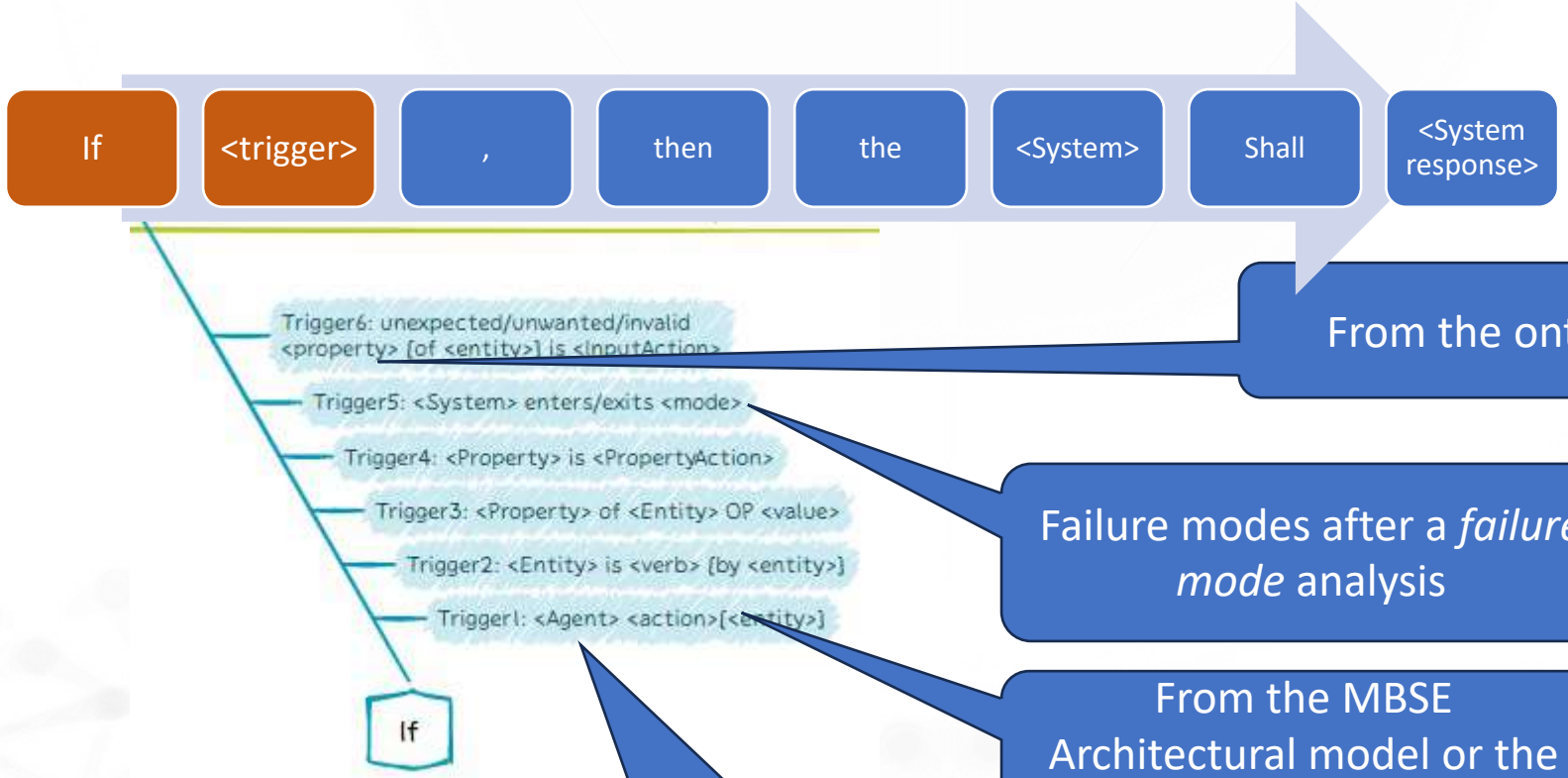
EVENT-DRIVEN REQUIREMENTS



OPTIONAL FEATURE REQUIREMENTS



UNWANTED BEHAVIOUR REQUIREMENTS



From the ontology?

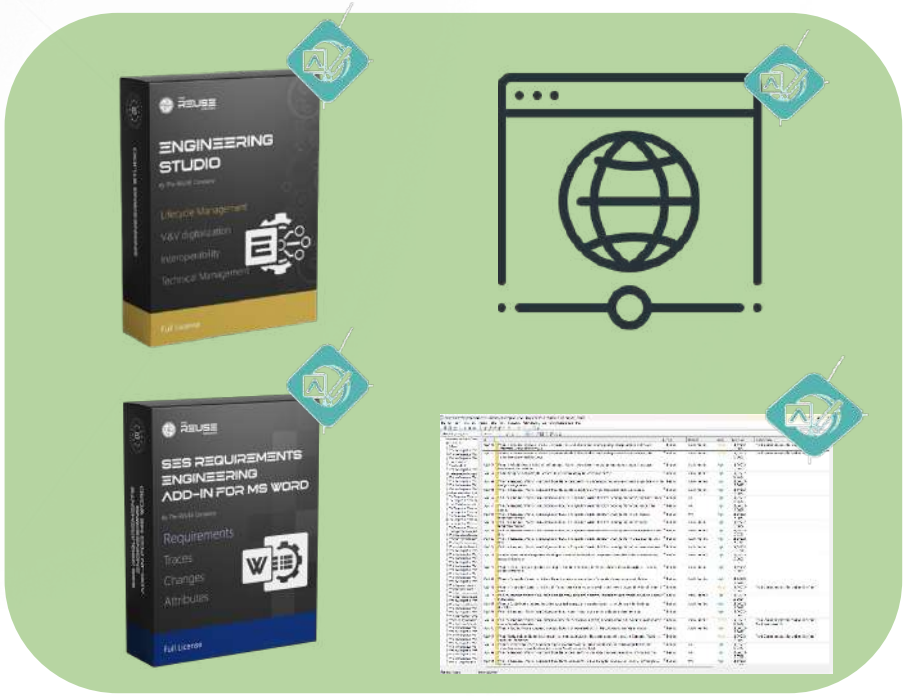
Failure modes after a *failure mode* analysis

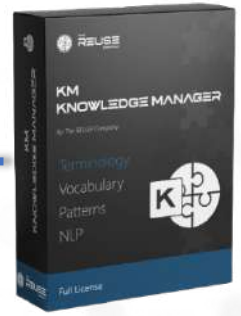
From the MBSE Architectural model or the ontology

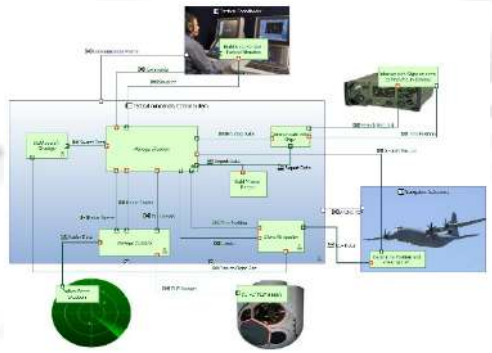
From the MBSE Architectural model?

EARS AND THE RAT - AUTHORING TOOL

HOW TO DEPLOY RAT







RAT: 2 FLAVOURS OF THE EARS PATTERNS

- **OPEN EARS**
  - Free text for the different EARS blocks
  - Only the keywords are forced: *while*, *when*, *if*, *where*
  - And the *shall*
  - Some optional metrics are available to control what is written into each block (see next slide)

- **GUIDED EARS**
  - Each block includes a series of possible *sub patterns*
  - The elements of the sub patterns are connected to a controlled vocabulary

RAT 2: FLAVOURS OF THE EARS PATTERNS

- **OPEN EARS**
  - More flexible
  - Easier to implement
  - Do not require domain specific dictionaries
  - Better during the first stages ✓

- **GUIDED EARS**
  - More strict
  - Enables a consistent development of both requirements and architecture
  - Better for mature teams and domains ✓

Rules to “control” the Open EARS

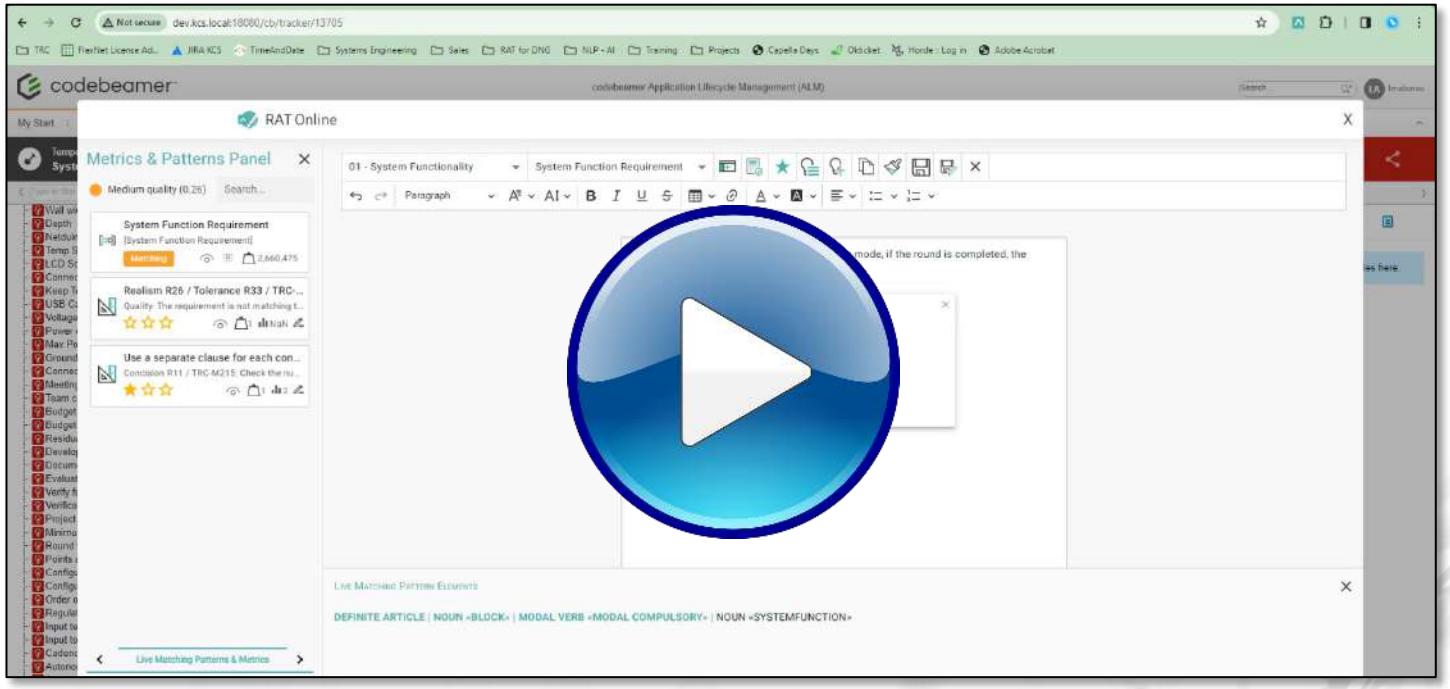
- FOR THE ‹SYSTEM›
  - IT MUST BE A SYSTEM OR COMPONENT FROM THE ARCHITECTURE
- FOR THE ‹SYSTEM RESPONSE›
  - IT MUST INCLUDE EITHER AN ‹ACTION› FROM THE ONTOLOGY, OR A *FUNCTION* FROM MBSE
  - ONE AND ONLY ONE SHALL
  - INCLUDE THE NAME OF AN ENTITY FROM DICTIONARY
- FOR THE WHILE ‹CONTEXT›
  - IN ‹COMPLEX REQUIREMENTS› ALWAYS THE FIRST KEYWORD
  - NAME, AT LEAST, ONE ENTITY
  - NO MODAL VERB ALLOWED
  - CONTROLLED LENGTH
- FOR THE *WHEN* AND *IF*
  - NEVER *WHEN* AND *IF* IN THE SAME REQUIREMENT
  - NAME, AT LEAST, ONE ENTITY
  - NO MODAL VERB ALLOWED
  - NO EARS KEYWORD ALLOWED
  - CONTROLLED LENGTH

DEMO

DEMO

Steps:

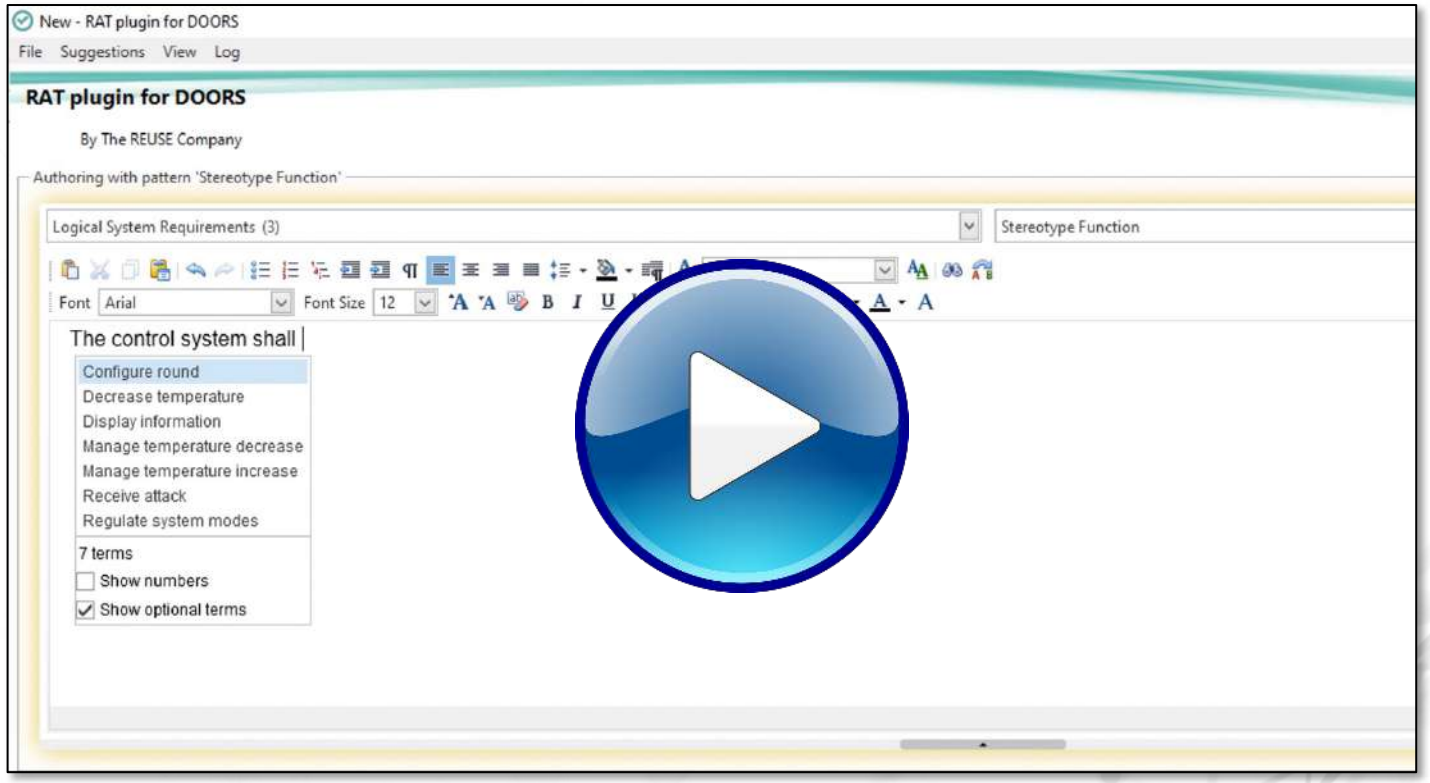
1. Open Codebeamer
2. Create a new requirement
3. Select an open-EARS pattern
4. Check additional metrics for EARS



DEMO

Steps:

1. Open a requirements document in IBM DOORS
2. Create a new requirement with RAT – AUTHORING Tool
3. Select guided-EARS pattern
4. Check EARS rules in real-time
5. Check patterns completeness in the SES ENGINEERING Studio




Q&A

NEXT WEBINAR

Extended Interoperability :

Connecting Tools all over the System Life Cycle (even to other organizations)

Dates:
Tuesday, June 18, 2024, 5:00 PM CET (Madrid)/ 5:00 PM JST (Tokyo)/ 7:00 PM AEDT (Sydney)

Tuesday, June 18, 2024, 9:00 AM CET (Madrid)/ 8:00 AM PST (Los Angeles)/11:00 AM EST (Detroit)

In systems theory, interoperability between tools digitalizing the ISO 15288 standard processes is the trigger to support the automatization of the development life cycle, enabling a complete digital thread.
In this webinar we will see how SES ENGINEERING Studio, following this theory, enables interoperability and sharing of information between peers, tiers, OEM, or even clients.


Q&A

CONTACT INFORMATION

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@ReuseCompany

https://www.linkedin.com/in/josemiguelfuentes/

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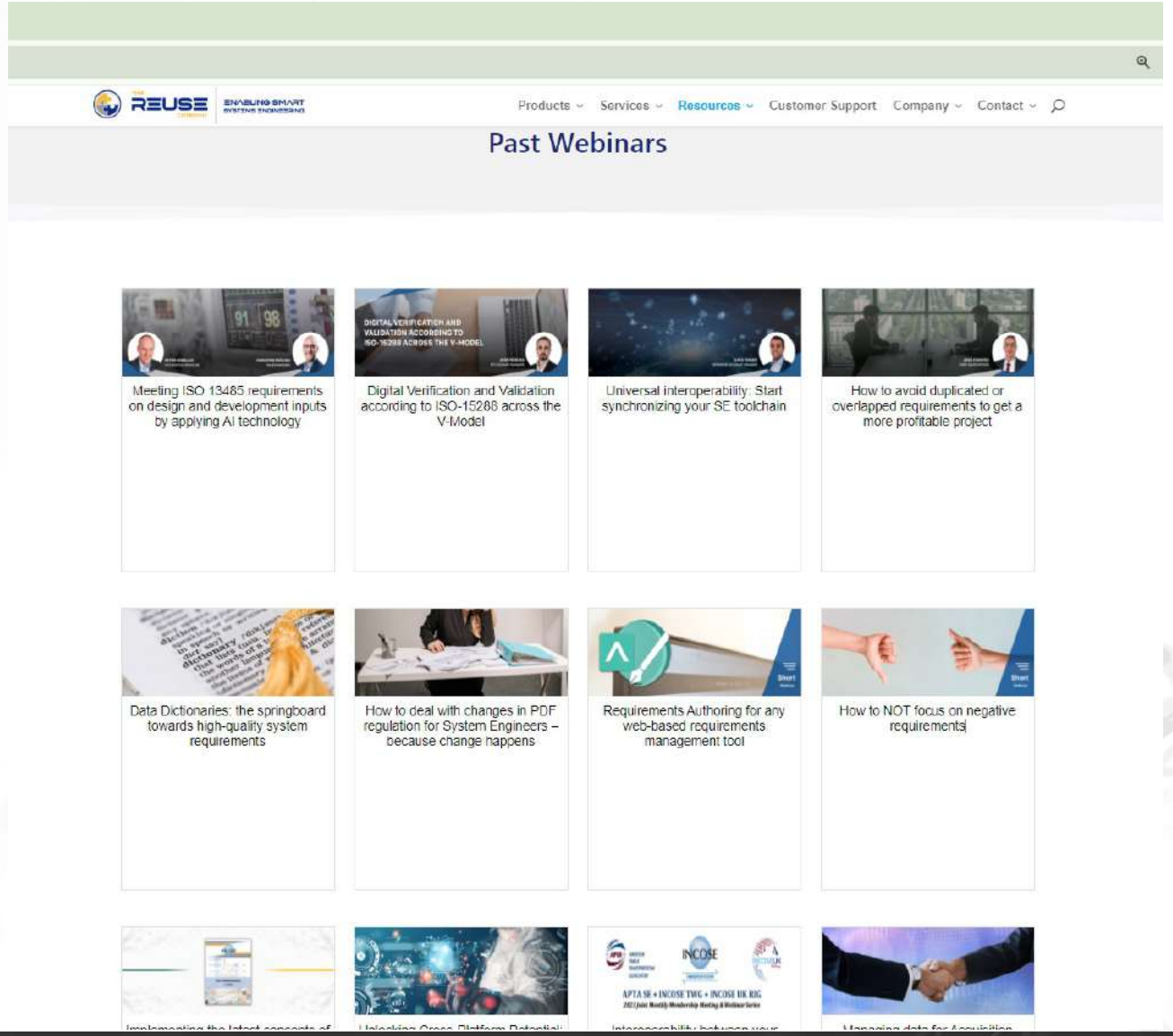
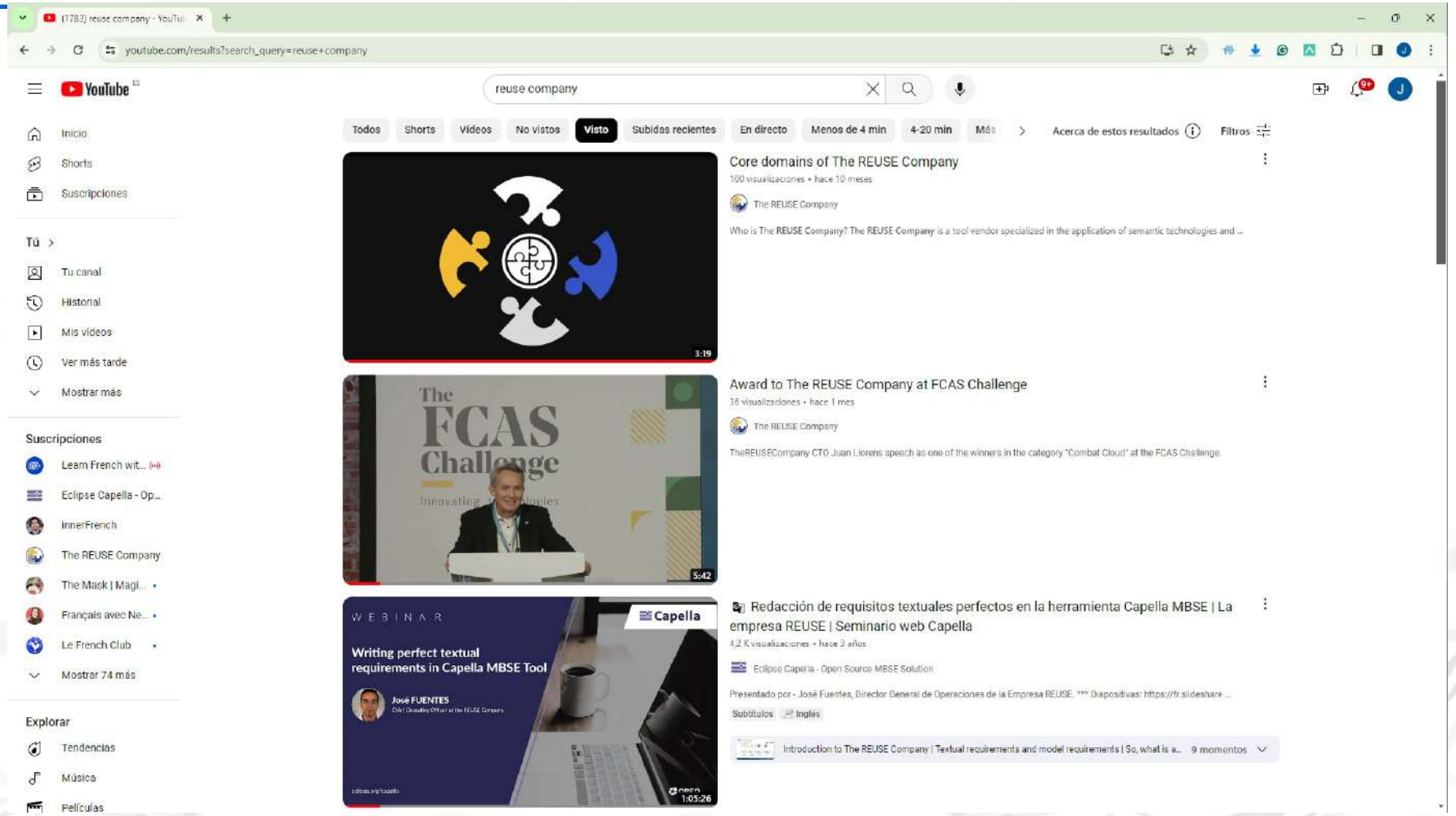
  - Support Forum



THE REUSE COMPANY IN YOUTUBE:

Systems Requirements made easy with EARS patterns and RAT – AUTHORING Tool

HTTPS://WWW.YOUTUBE.COM/USER/THEREUSECOMPANY



THE REUSE COMPANY