

CAPELLA DAY MUNICH 2019



# Capella integration with RAT

## The Authoring Tools

José Fuentes - COO  
Wednesday, 02 October 2019

## Agenda

Introduction to  
**The REUSE  
Company**

01



03



05



How to **enhance** this  
collaboration

**Q&A**

02



**Textual and  
Model  
requirements**

04



The **RAT** plug-in  
for Capella







○ Providing a **knowledge centric** approach to leverage system engineering activities in our customers



contact@reusecompany.com



@reusecompany



Calle Margarita Salas, 16 2-D  
28919 – Leganés (Madrid)  
SPAIN



+34 912 172 596

## About The REUSE Company (TRC)



**01** The company was created in **1999**

As a spin-off of a local university in Madrid (Spain)

**02** **System + Software Engineers**

Smart combination between Company staff and R&D from Academia

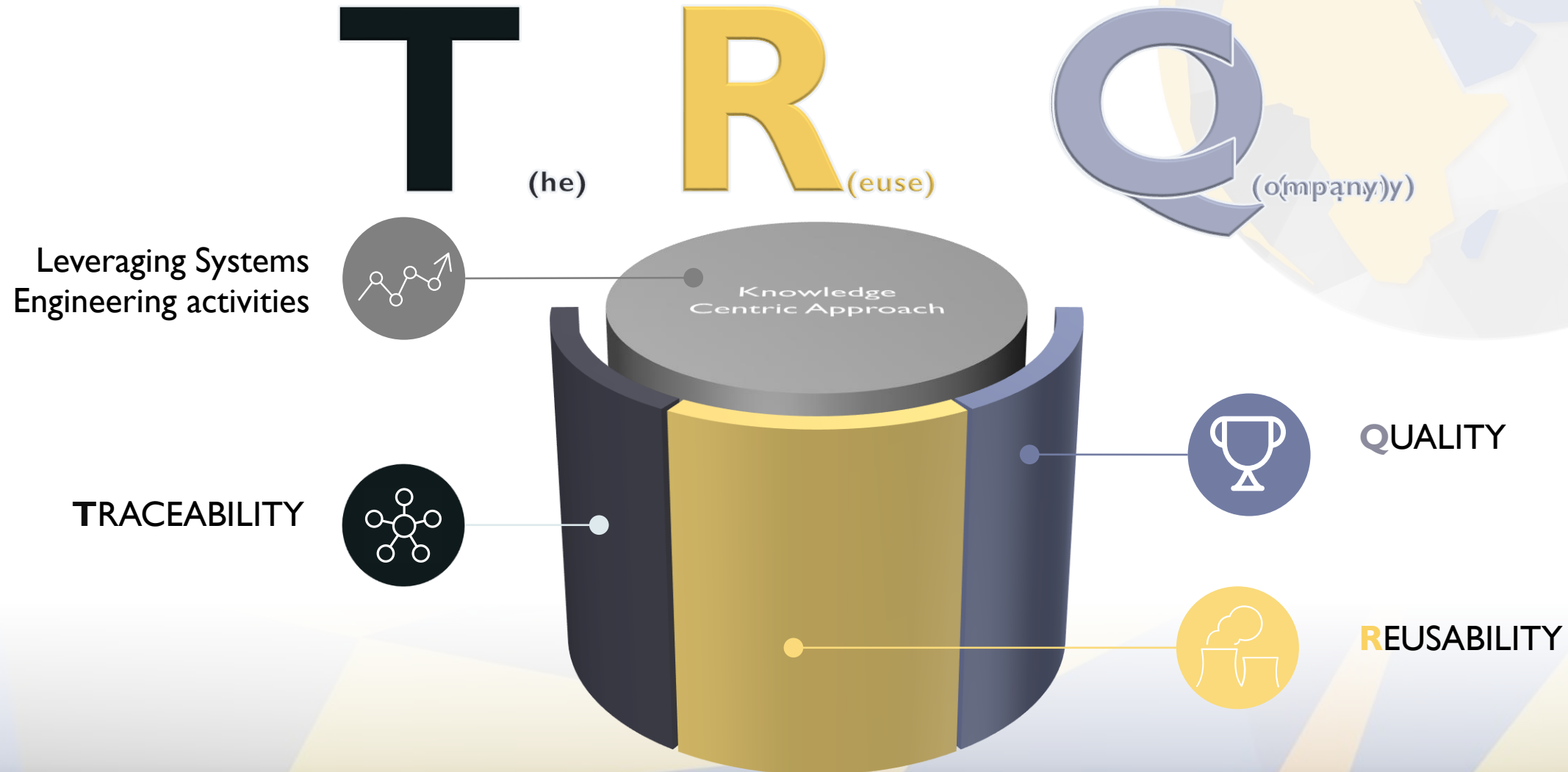
**03** **Head Quarters:** Madrid

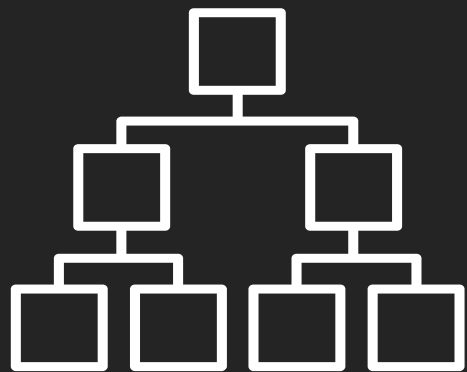
**International offices:**  
London (UK)  
Stockholm (Sweden)

**04** Offering a **knowledge centric** approach to leverage system engineering activities in our customers

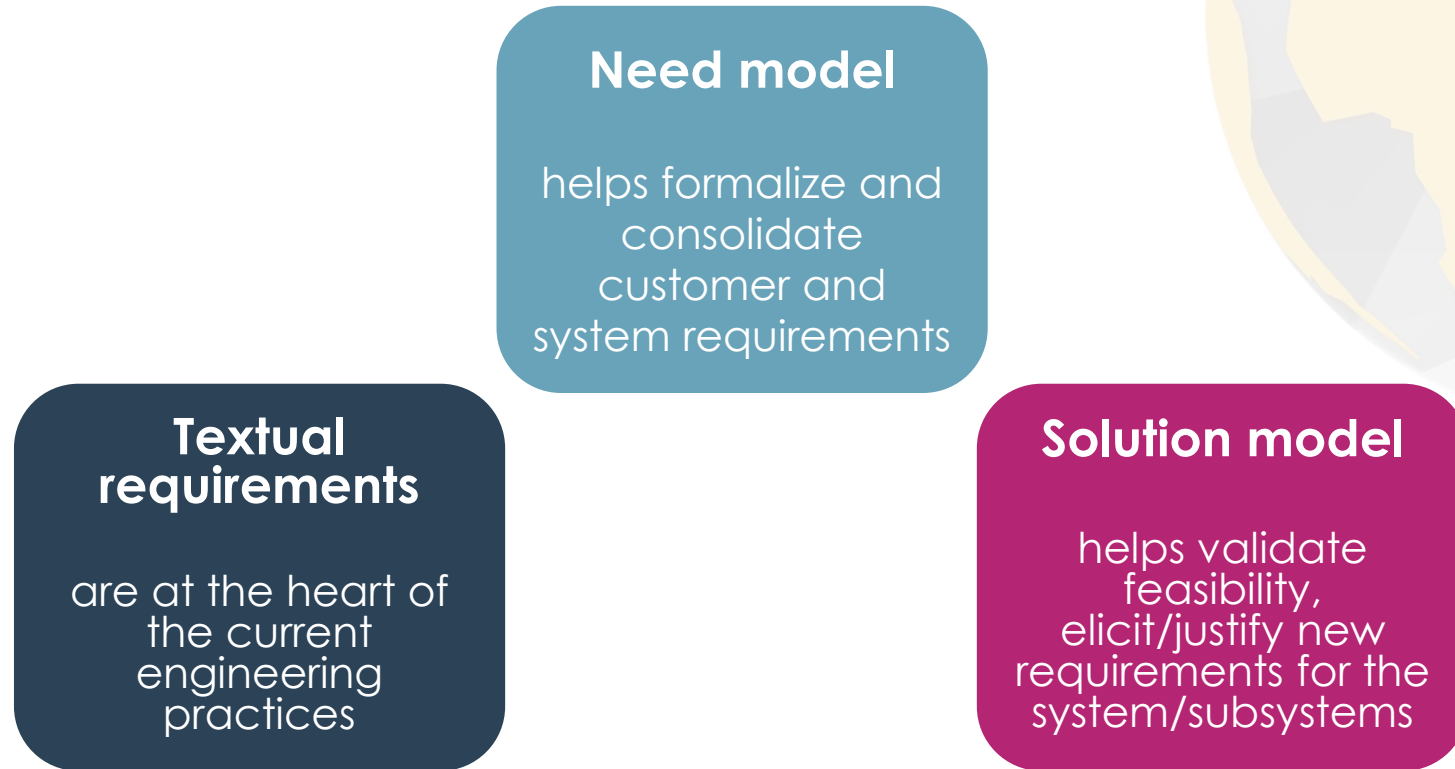


## The need to deal with models (2/2)





# **Textual and Model requirements**



# Textual requirements and model requirements

Models add rigor to need expression / solution description

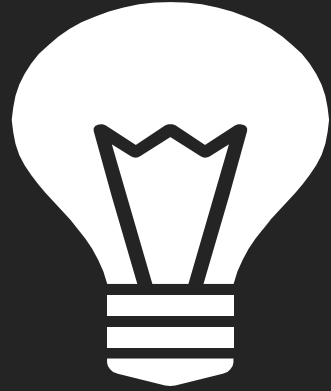
Models enable automated processing

A model requirement can formalize a textual requirement and explicit its effects and ramifications

Some expectations (environmental, regulations, etc. ) are easier to express with textual descriptions.

Some expectations on a model element at a given engineering level do not require a formal modeling (which is left to subsystem design)





# **Enhancing the Requirements and Models collaboration**

# Enhancing the Requirements and Models Collaboration

- Because communication is not always that easy:

**MY WIFE TOLD ME TO  
PUT THE PIE IN THE  
OVEN AT 120 DEGREES**



# Enhancing the Requirements and models collaboration

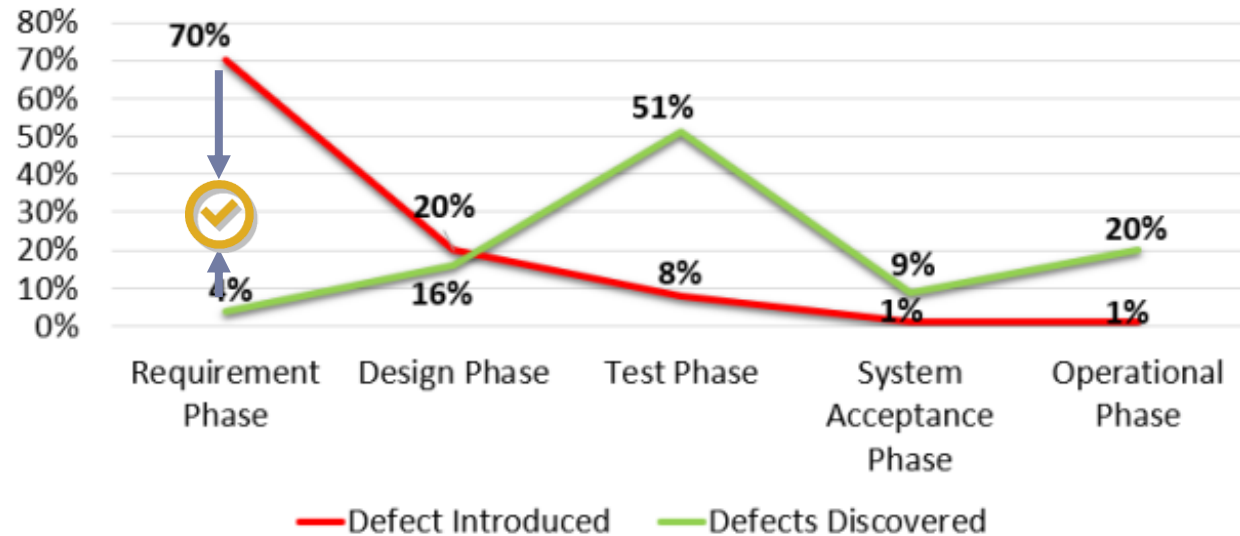
- All this looks great! But...
- ... the connection between requirements and models has to be consistent and robust
- Quality must be guaranteed at both sides



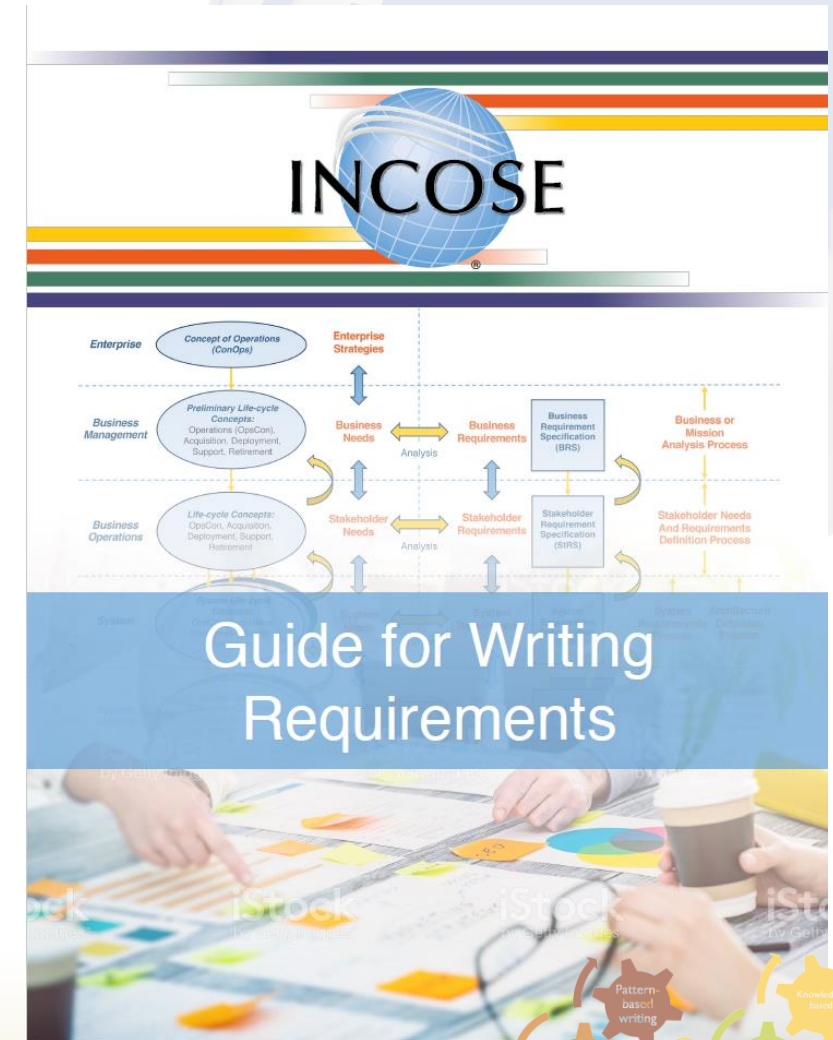
# Real-time quality analysis

## REQUIREMENTS are the reason for FAILURE

When errors are introduced vs. when they are discovered during the system life cycle



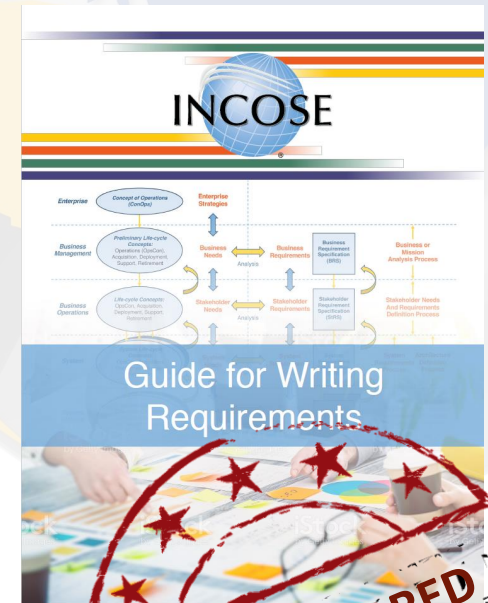
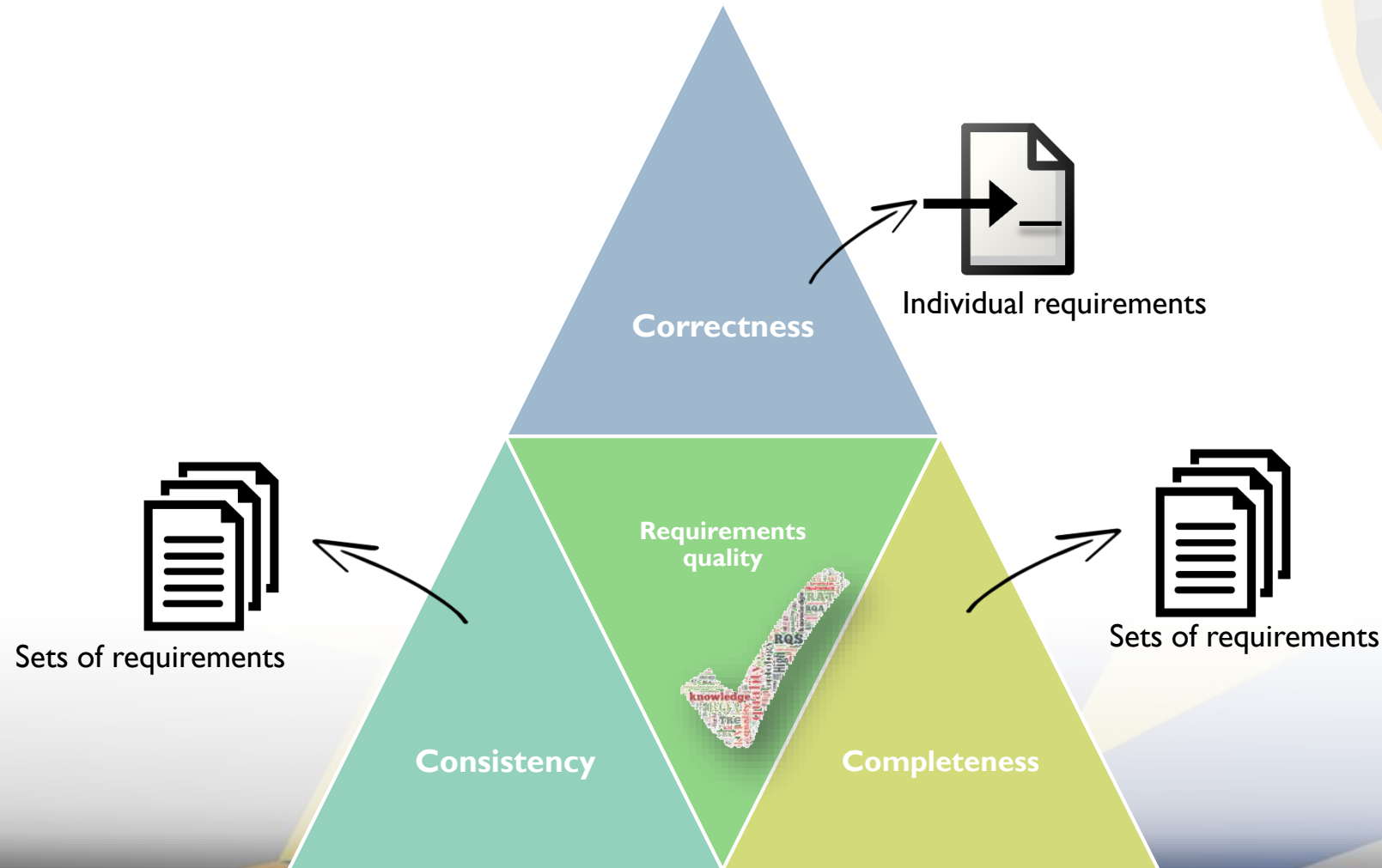
Source: IBM Business research 2017





# Real-time quality analysis: CCC Approach

➤ CCC – Correctness, Consistency and Completeness



# Real-time quality analysis

The screenshot displays the 'RAT Plugin for Capella' window, which is used for real-time quality analysis of requirements. The interface includes a text editor for the requirement, a list of quality metrics, and a summary of the analysis results.

**Requirement Text:** The Aircraft should be designed to perform the interaction very quickly

**Quality Metrics Summary:**

Metric	Value
R02 Precision - Passive voice (Avoid)	1
R02 Precision - TRC - Imperative mode (Enf...)	0
R05 Precision - Imprecise quantifiers (Avoid)	1
R11 Concision - Superfluous infinitives (Av...	1
R13 Non Ambiguity - TRC - Ambiguous se...	0
R44 Uniformity Of Language - Style guide (...)	0
R33 Abstraction Level - Solution vocabulary	1

**Other quality elements:**

Metric	Correctness	Value	Summary	Mandatory	Weight
R02 Precision - Passive voice (A...	★ ★ ★	1	Avoid passive voice in your requirements	<input type="checkbox"/>	1
R02 Precision - TRC - Imperativ...	★ ★ ★	0	At least one imperative verb must be involved	<input type="checkbox"/>	1
R05 Precision - Imprecise quant...	★ ★ ★	1	Avoid imprecise quantifiers	<input type="checkbox"/>	1
R11 Concision - Superfluous inf...	★ ★ ★	1	Avoid superfluous infinitives	<input type="checkbox"/>	1
R13 Non Ambiguity - TRC - Am...	★ ★ ★	1	Ambiguous sentences must be avoided	<input type="checkbox"/>	1
R44 Uniformity Of Language - ...	★ ★ ★	0	The structure of the requirement must follow one of th...	<input type="checkbox"/>	1
R33 Abstraction Level - Solutio...	★ ★ ★	1	Sentences and words close to design must be avoided	<input type="checkbox"/>	1
R01 Precision - Indefinite article...	★ ★ ★	0	N/A	<input type="checkbox"/>	1

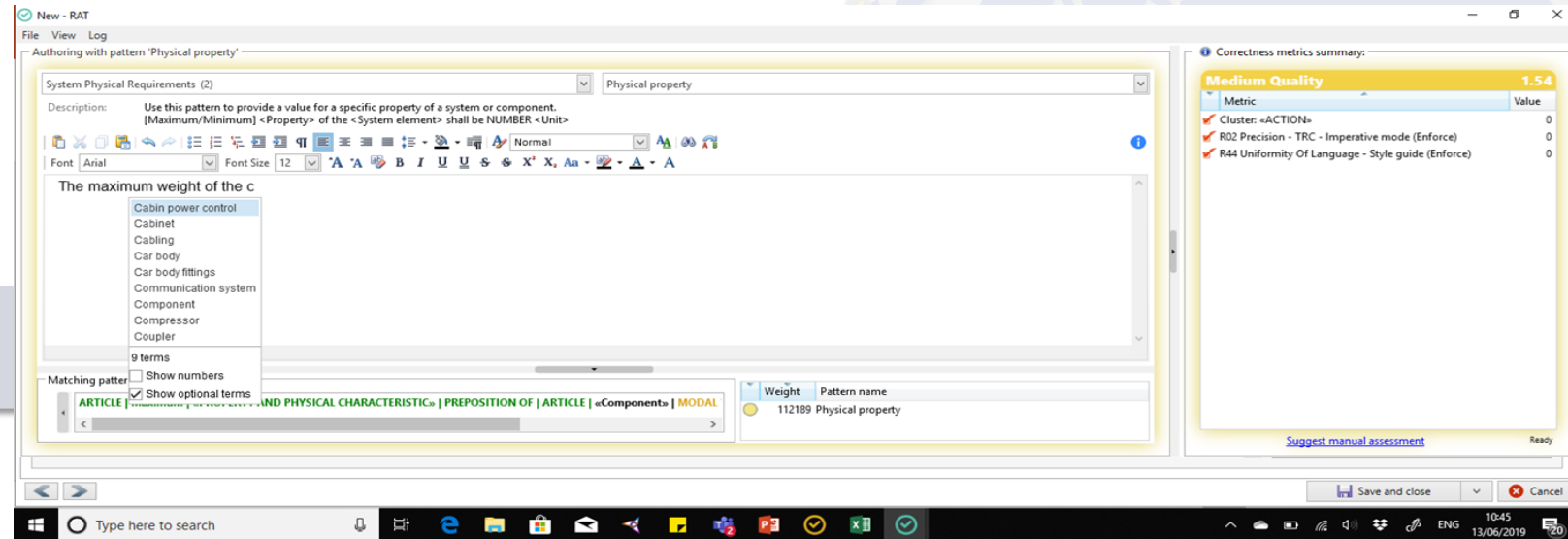
The interface also includes a 'Correctness metrics summary' panel on the right, which shows the overall quality score of 2.03 and a 'Low Quality' status. A 'Suggest manual assessment' button is available at the bottom of this panel.

# Pattern-based writing

When / After  
/ If ...

[Condition]

<Subject>



<Entity>

Shall

Have

a/NUMBER

<Entity>

The

<Property>

Of

<Entity>

Shall be

<Value>

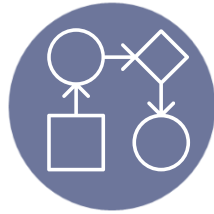


# Improved consistency

**Requirements-  
models**

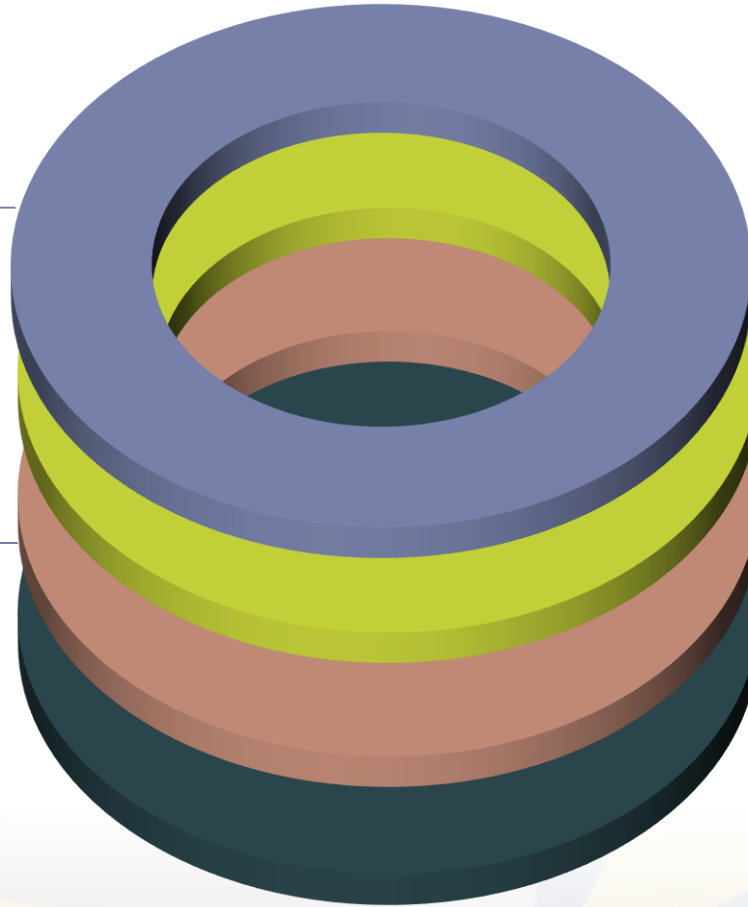
**Consistency**

e.g. allocation of  
properties



**Naming  
consistency**

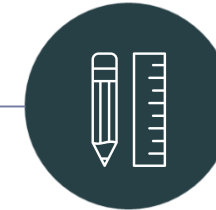
Among models elements  
and elements in textual  
requirements



**Consistency  
Among  
requirements:**  
e.g. overlapping



**Pattern-based  
writing**





# Improved consistency

### RAT plugin for Rhapsody - Settings

Model Content    More settings

Available Model Content:

Drag a column head

Use	Model Scope	Element
<input checked="" type="checkbox"/>	OperationalAnalysis	Activity
<input checked="" type="checkbox"/>	OperationalAnalysis	Actor
<input checked="" type="checkbox"/>	OperationalAnalysis	Entity
<input checked="" type="checkbox"/>	OperationalAnalysis	Capability
<input checked="" type="checkbox"/>	OperationalAnalysis	Operation
<input checked="" type="checkbox"/>	OperationalAnalysis	Operation
<input checked="" type="checkbox"/>	OperationalAnalysis	Operation
<input checked="" type="checkbox"/>	SystemAnalysis	Function
<input checked="" type="checkbox"/>	SystemAnalysis	Actor
<input checked="" type="checkbox"/>	SystemAnalysis	Component
<input checked="" type="checkbox"/>	SystemAnalysis	Function
<input checked="" type="checkbox"/>	SystemAnalysis	Function
<input checked="" type="checkbox"/>	SystemAnalysis	Port
<input checked="" type="checkbox"/>	SystemAnalysis	Capability

runtime-EclipseApplication - platform:/resource/In-Flight%20Entertainment%20System/In-Flight%20Entertainment%20System.aird/[MCB] Capabilities Context - Capella

File Edit Diagram Navigate Search Project Run RAT Window Help

\*Capella Project Explorer

Select a name to find  
type filter text

Editing 7e401d1c-86d3-48b1-8a77-4485b1fa7965 - RAT Plugin for Capella

File Suggestions View Log

### RAT Plugin for Capella

By The REUSE Company

Authoring with pattern 'Stakeholder Functional Requirement'

01 - System Functionality (6)

Stakeholder Functional Requirement

The Aircraft should be designed to perform the interaction very quickly

Correctness metrics summary:

**Low Quality 2.03**

Metric	Value
R02 Precision - Passive voice (Avoid)	1
R02 Precision - TRC - Imperative mode (Enf...	0
R05 Precision - Imprecise quantifiers (Avoid)	1
R11 Concision - Superfluous infinitives (Av...	1
<b>R13 Non Ambiguity - TRC - Ambiguous se...</b>	<b>1</b>
R44 Uniformity Of Language - Style guide (...)	0
R33 Abstraction Level - Solution vocabulary	1

[Suggest manual assessment](#) Ready

Matching patterns elements:

Example	Source	Weight	Pattern name
manager of the vehicle shall be able to accelerate the accelerometer	Ontology		

Other quality elements:

Correctness    Syntactic information    Formal representation    Patterns information

Metric	Correctness	Value	Summary	Mandatory	Weight
R02 Precision - Passive voice (A...	★ ★ ★	1	Avoid passive voice in your requirements	<input type="checkbox"/>	1
R02 Precision - TRC - Imperativ...	★ ★ ★	0	At least one imperative verb must be involved	<input type="checkbox"/>	1
R05 Precision - Imprecise quant...	★ ★ ★	1	Avoid imprecise quantifiers	<input type="checkbox"/>	1
R11 Concision - Superfluous inf...	★ ★ ★	1	Avoid superfluous infinitives	<input type="checkbox"/>	1
<b>R13 Non Ambiguity - TRC - Am...</b>	<b>★ ★ ★</b>	<b>1</b>	<b>Ambiguous sentences must be avoided</b>	<input checked="" type="checkbox"/>	<b>1</b>
R44 Uniformity Of Language - ...	★ ★ ★	0	The structure of the requirement must follow one of th...	<input type="checkbox"/>	1
R33 Abstraction Level - Solutio...	★ ★ ★	1	Sentences and words close to design must be avoided	<input type="checkbox"/>	1
R01 Precision - Indefinite article...	★ ★ ★	0	N/A	<input type="checkbox"/>	1

[Save and close](#) [Cancel](#)

613M of 1216M

# Knowledge-based writing

## 05 Reasoning

A combination of rules, tasks and groups to infer information from valuable assets

## 04 Formalization

Representation of assets semantic through SRL – System Representation Language



## 01

## Vocabulary

Controlled Organizational and Project Vocabulary for a common understanding among stakeholders

## 02

## SCM/Architectures

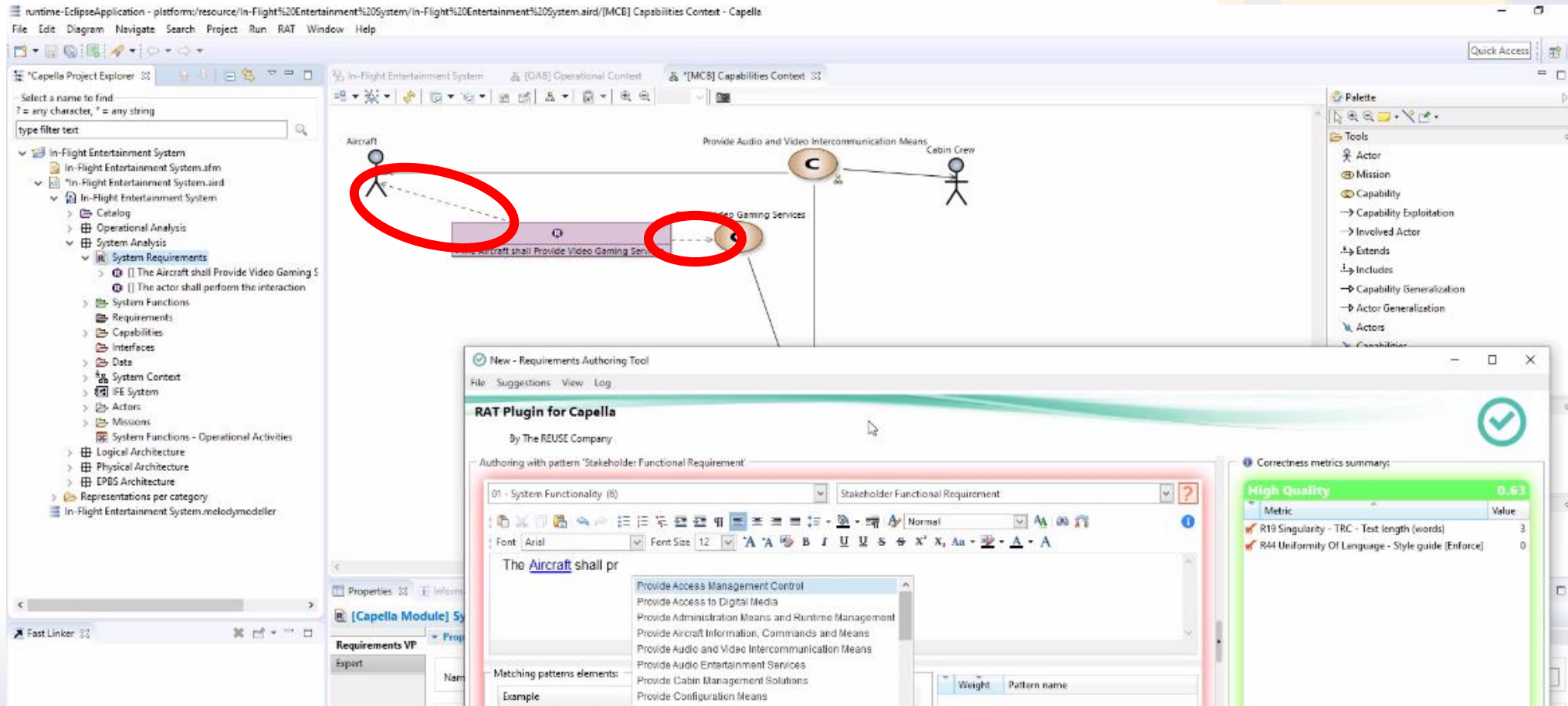
Recreate and capture the system architectures represented in views and models. Stablish relationships among system and system elements

## 03

## Patterns

Represent requirements similarities and enable formal representation, automatic recognition and aid authors

# Accessibility



# Accessibility

runtime-EclipseApplication - platform:/resource/In-Flight%20Entertainment%20System/In-Flight%20Entertainment%20System.aird/[MCB] Capabilities Context - Capella

File Edit Diagram Navigate Search Project Run RAT Window Help

Capella Project Explorer

Select a name to find  
? = any character, \* = any string  
type filter text

- In-Flight Entertainment System
  - In-Flight Entertainment System.afm
  - In-Flight Entertainment System.aird
    - Catalog
    - Operational Analysis
    - System Analysis
      - System Requirements
        - The Aircraft shall Provide Video Gaming Services
        - The actor shall perform the interaction
        - The Aircraft shall Provide Access Management Control
        - The Aircraft shall perform TBD
        - The Aircraft should be designed to perform the interact
      - System Functions
        - Requirements
        - Capabilities
        - Interfaces
        - Data
        - System Context
        - IFE System
        - Actors
        - Missions
      - System Functions - Operational Activities
      - Logical Architecture
      - Physical Architecture
      - EPBS Architecture
      - Representations per category

In-Flight Entertainment System.melodymodeller

- In-Flight Entertainment System.melodymodeller
  - Requirement\_Process\_Model
    - Base.reqif
    - HLR.xlsx
    - IRD.xlsx
    - IRD 1-2.xlsx
    - IRD-external.xlsx
    - Requirement\_Process\_Model.afm
    - Requirement\_Process\_Model.aird
      - Requirement\_Process\_Model
        - Representations per category
        - Requirement\_Process\_Model.melodymodeller
        - SRD.xlsx
        - TS-LC1.xlsx
        - TS-LC2.xlsx

Sample System

- Sample System.afm
- Sample System.aird

RAT Plugin for Capella

File Authoring

System Requirements

Specification selector

Simple view  
Quality view  
Full view

New Edit Remove

View Workproducts

Drag a column header here to group by that column

	C.	ID	Workproduct name	Correctness	Score	M...	Correctnes...	Iss...
		e907837e...	The Aircraft shall Provide Video Gaming Services	★★★★	0.31	0	13/09/201...	N/A
		f84a0ed5...	The actor shall perform the interaction	★★★★	0.31	0	13/09/201...	N/A
		954257a4...	The Aircraft shall Provide Access Management Control	★★★★	0.31	0	16/07/201...	N/A
		72397322...	The Aircraft shall perform TBD	★★★★	0.31	0	13/09/201...	N/A
		7e401d1c...	The Aircraft should be designed to perform the interaction very quickly	★★★	2.03	0	13/09/201...	N/A

Total Workproducts: 5

✓ Show rich text format

Custom report Short specification quality rep

Quality database type SQLServerNative: Server 'localhost\sqlxp

Name: System Requirements

Type: <undefined>

Correctness

Score  
2.03

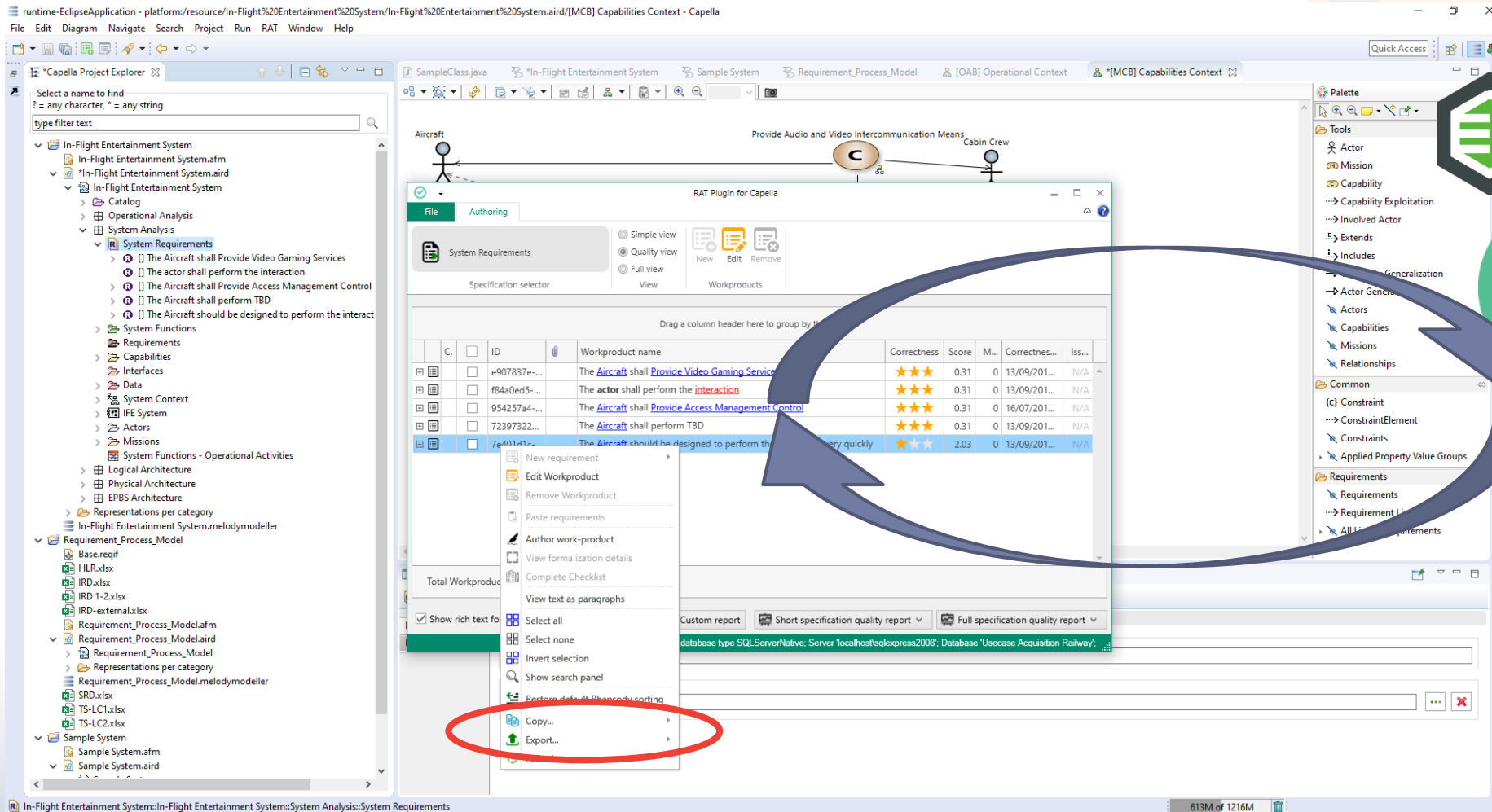
Date:  
13/09/2019 12:51:10

Summary:

- Avoid passive voice in your requirements: - Be Designnbe designed(x1)
- At least one imperative verb must be involved
- Avoid imprecise quantifiers: - Very(x1)very(x1)
- Avoid superfluous infinitives: - Be designed to(x1);be designed to(x1)
- Ambiguous sentences must be avoided: - Quickly;quickly(x1)
- Sentences and words close to design must be avoided: - Design(x1);designed(x1)
- The structure of the requirement must follow one of the patterns



# Requirements roundtrip



integrity™



**OSLC**  
Inspired by the web



## ... and more



# **The RAT**

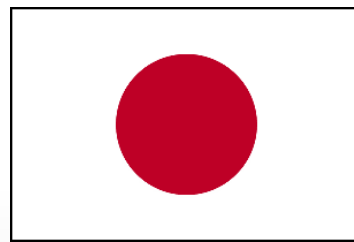
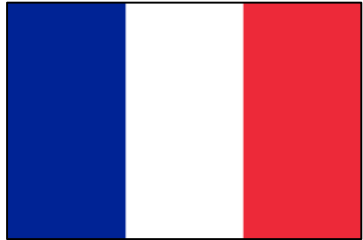
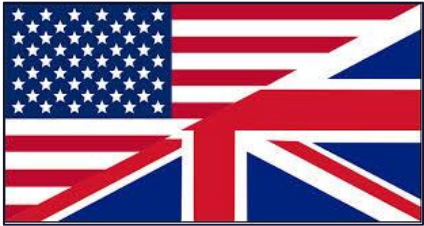
## **Plugin for**

## **Capella**

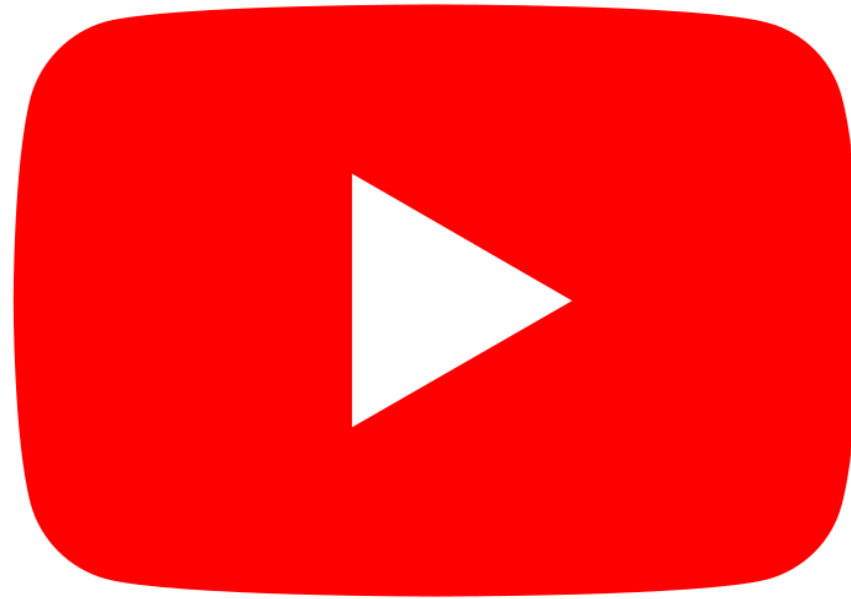


# The TRC Quality Suite: supported languages

- The TRC Quality Suite is highly dependent of the language of the requirements
- Languages supported so far:



## RAT plugin for Capella: Demo





## Contact information



José M. Fuentes



jose.fuentes@reusecompany.com



+34 912 17 25 96



@ReuseCompany



<https://www.linkedin.com/in/josemiguel Fuentes/>





the  
**REUSE**  
company

