- 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

Controlling the values of Signals in your specifications:

How to connect your requirements documents with your project dictionary

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Chief Operating Officer
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THE REUSE COMPANY

- Introduction to The REUSE Company and the speaker
- What is a Signals?
- Example: Signals and messages in the automotive domain
- Signals and Messages as represented in KM
- How are signals involved in textual requirements?
- Live demo
- Q&A

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:
Stockholm (Sweden)
Tokyo (Japan) Delegation

2022:
Miami (USA)

04 Specialized in the application of **semantic technologies** and **artificial intelligence** to improve the **digitalization** of the **Systems Engineering life cycle** (**SysLCM**).

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

- SES ENGINEERING Studio

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

Signals and messages

What is a signal?

- https://www.merriam-webster.com/

signal 1 of 3 **noun**

sig·nal 'sig-nəl

1 : SIGN, INDICATION

2 a : an act, event, or watchword that has been agreed on as the o
action

b : something that incites to action

3 : something (such as a sound, gesture, or object) that co eys notice or warning

4 a : an object used to transmit or convey information beyond the range of human voice

b : the sound or image conveyed in telegraphy, telephony, radio, radar, or television

c : a detectable physical quantity or impulse (such as a voltage, current, or magnetic field strength) by which messages or information can be transmitted

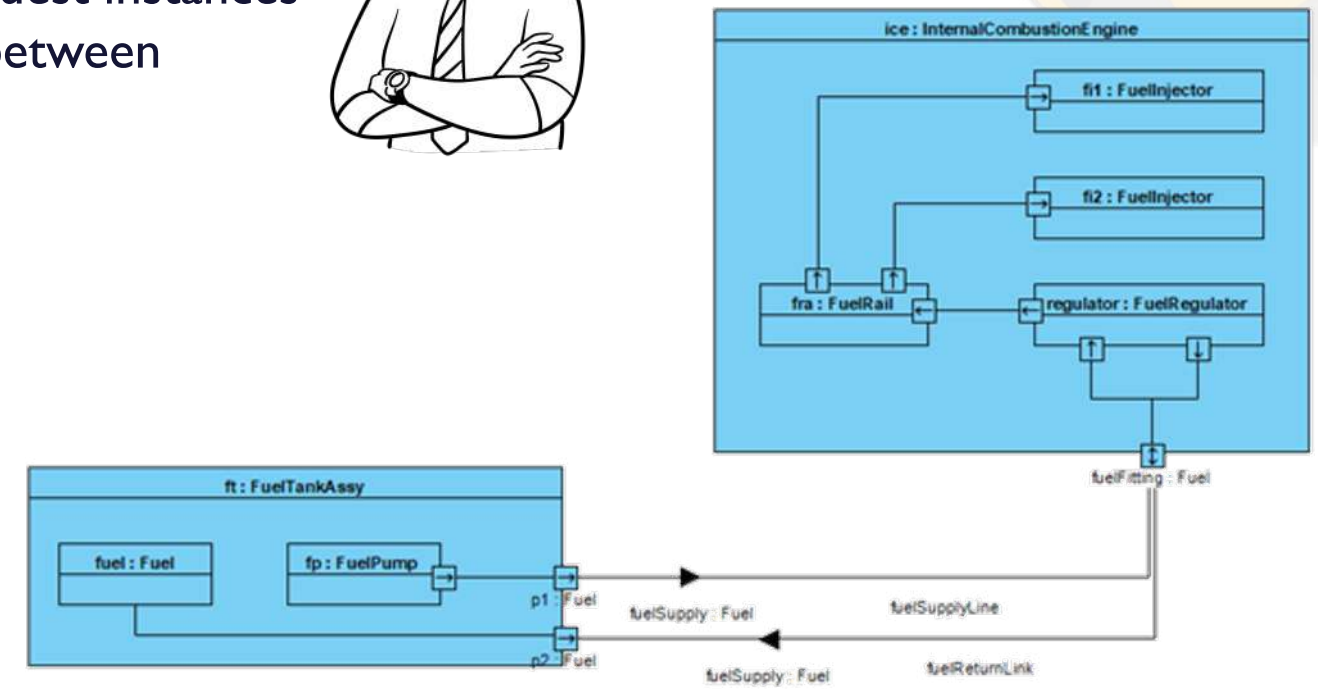
As part of a condition

In an interface between 2 components

What is a signal?

- SysML Glossary:

> A signal is a specification of type of send request instances communicated between objects.



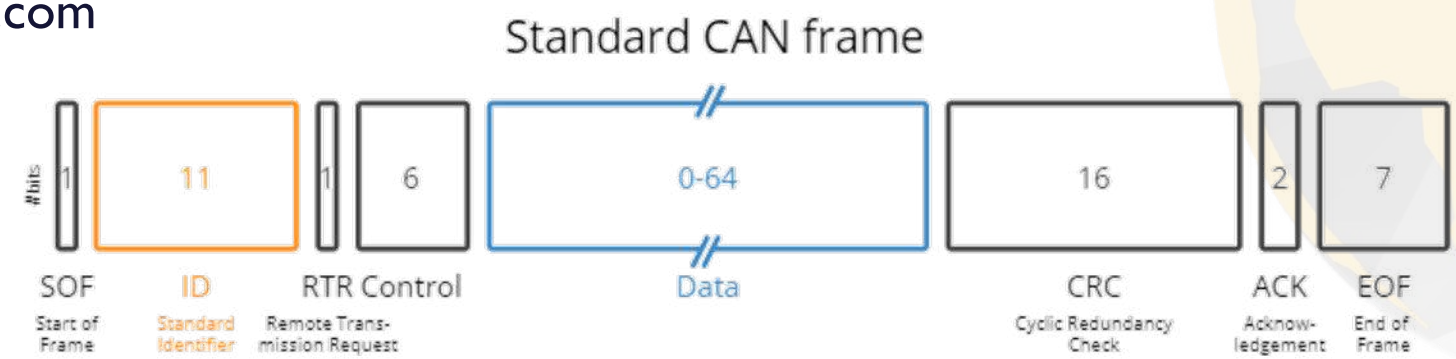
Signals and messages

in the automotive domain

- Source: Wikipedia

- A **Controller Area Network** (**CAN bus**) is a robust vehicle bus standard designed to allow microcontrollers and devices to communicate with each other's applications without a host computer. It is a message-based protocol, designed originally for multiplex electrical wiring within automobiles to save on copper, but it can also be used in many other contexts. For each device, the data in a frame is transmitted serially but in such a way that if more than one device transmits at the same time, the highest priority device can continue while the others back off. Frames are received by all devices, including by the transmitting device.

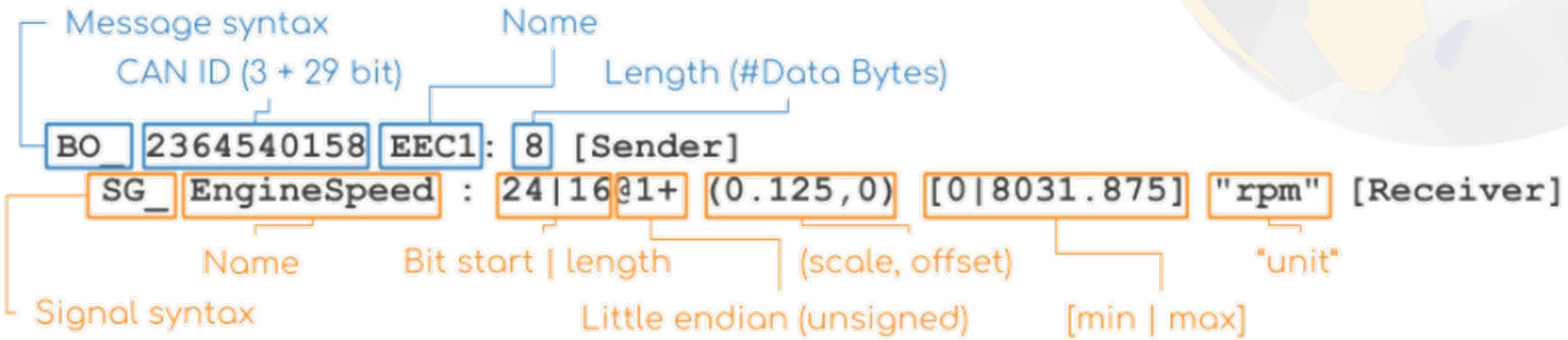
- csselectronics.com



The 8 CAN bus protocol message fields

- **SOF:** The Start of Frame is a 'dominant 0' to tell the other nodes that a CAN node intends to talk
- **ID:** The ID is the frame identifier - lower values have higher priority
- **RTR:** The Remote Transmission Request indicates whether a node sends data or requests dedicated data from another node
- **Control:** The Control contains the Identifier Extension Bit (IDE) which is a 'dominant 0' for 11-bit. It also contains the 4 bit Data Length Code (DLC) that specifies the length of the data bytes to be transmitted (0 to 8 bytes)
- **Data:** The Data contains the data bytes aka payload, which includes CAN signals that can be extracted and decoded for information
- **CRC:** The Cyclic Redundancy Check is used to ensure data integrity
- **ACK:** The ACK slot indicates if the node has acknowledged and received the data correctly
- **EOF:** The EOF marks the end of the CAN frame

- csselectronics.com: DBC files



Signals represented into a

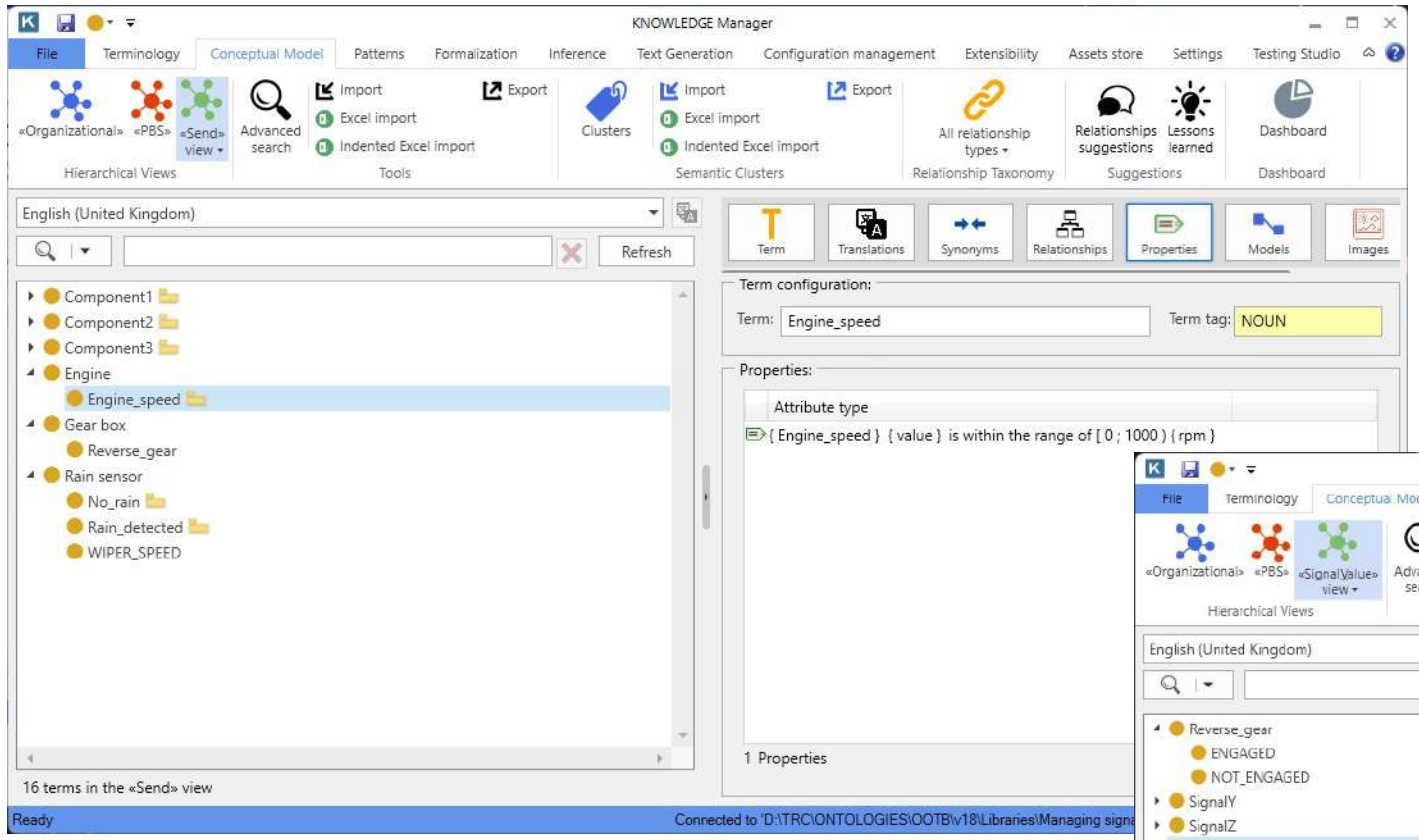
project dictionary

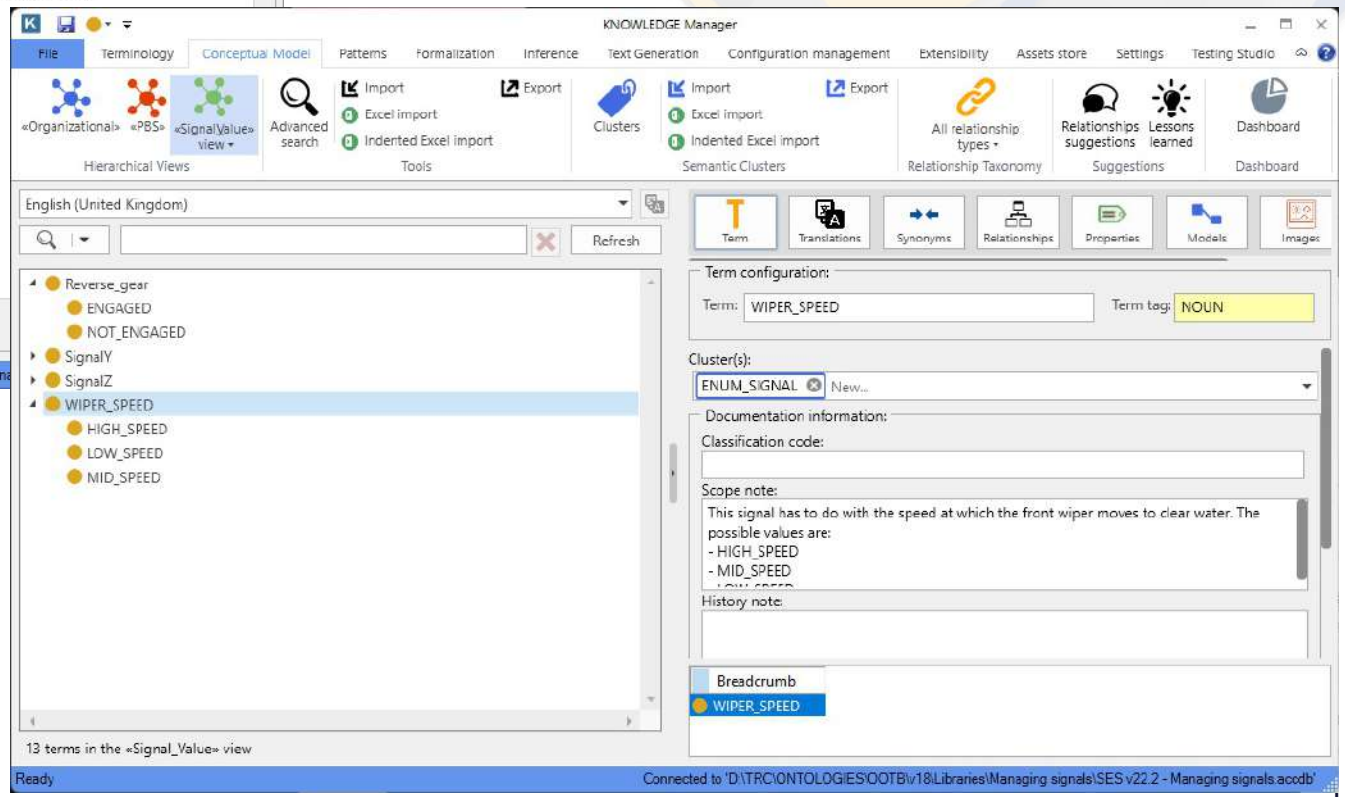
Signals represented into a project dictionary

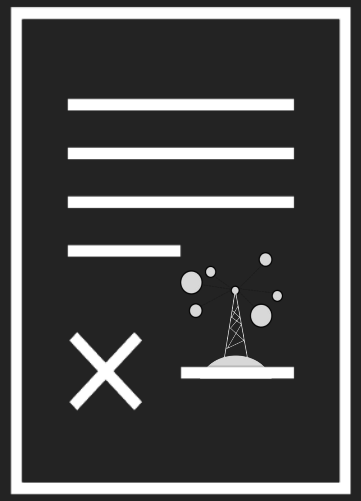
Messages and Signals:	Represented as Clusters
	Actual Signals and Messages are the content of the vocabulary, within the corresponding cluster
Signals contained in messages:	As a *composition* relationship
Properties of the signals:	*Min* and *Max* values as metaproperties of the signal entity
	Units as a RSHP between the signal and the entry of the vocabulary representing the <Measurement unit>
Senders and Receivers	Represented as Clusters
	Actual Signals and Messages are the content of the vocabulary, within the corresponding cluster
RSHP between:	Senders and the messages/signals that can eventually be sent from this component (sender)
	Receivers and the messages/signals that can eventually be received by this component (receiver)

15

Signals represented into a project dictionary







Signals in Textual Requirements

SysR-01: When the rain sensor detects drops of rain, the rain sensor shall set *rain_detected* to 0x01 and set WIPER_SPEED = LOW_SPEED **Action**

Can the *rain sensor* send the signal *rain_detected?*

Is 0x01 in the range for *rain_detected*?

Is LOW_SPEED a right value?

Condition

SysR-02: While (*reverse_gear* = *ENGAGED*) and (the *rain_detected* = 0x01 and the *engine_speed* is above 2 km/h), the Wiper control system shall start the rear window wiper

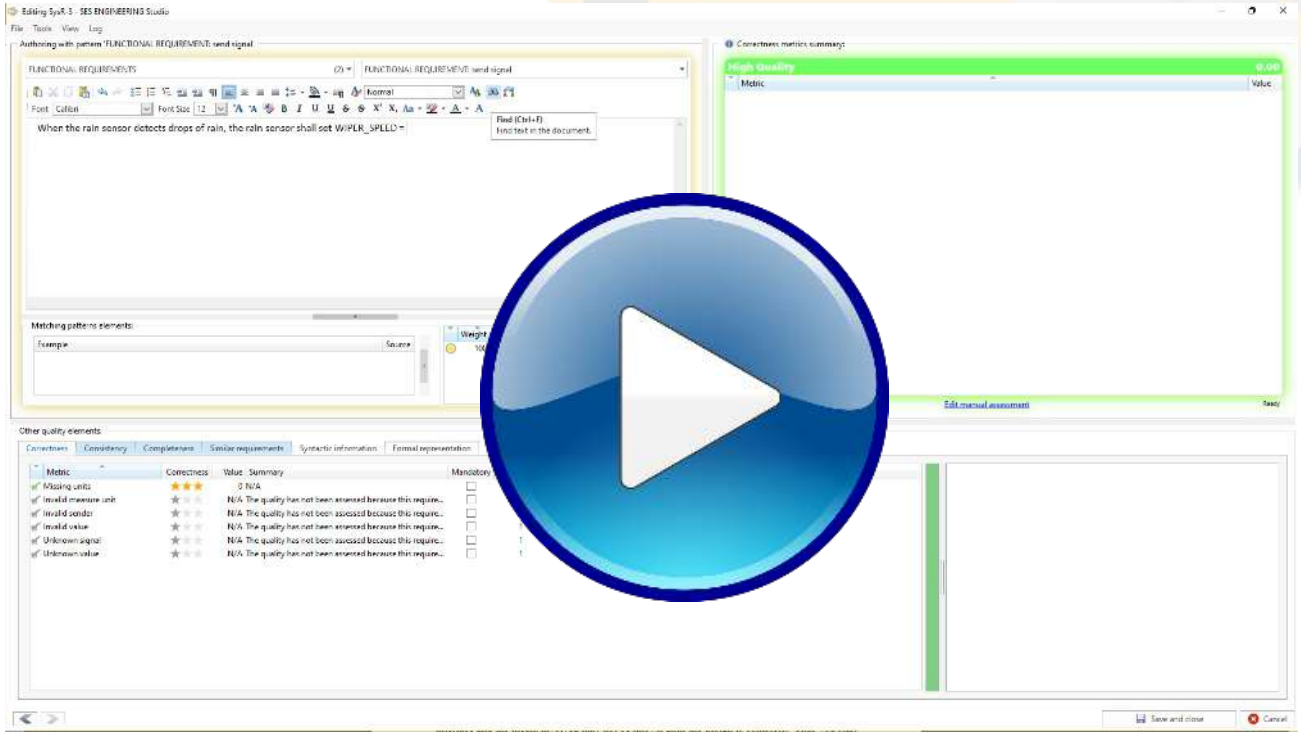
Is *km/h* the right unit for *engine speed*?

Demonstration

Demo

Steps:

1. Show info about signals in an Excel sheet
2. Import this info into KM - KNOWLEDGE Manager
3. Check signal-based rules in SES ENGINEERING Studio
4. Open a requirements specification using signals
5. Analyze conformance with the selected rules
6. Fix some of the requirements
7. Write a new requirement using the RAT – Requirements Authoring Tool




Q&A

- **Systems Engineering Rigor needs an Interoperability Framework**
  - *Digital threads don't simply exist, they need a managed environment that understands a product's requirements and how those requirements form the basis of the digital product definition and how it transforms over time.*
  - *The REUSE Company is providing an interoperability solution to the difficult systems engineering challenges of keeping system requirements and other data elements readily available when making the best decisions.*
  - *This webinar, co-hosted by CIMdata and co-presented by Craig Brown, digs deeper into the problem description and connects it with the SES ENGINEERING Studio solution.*

- **Dates:** January the 17th , 2023


Q&A

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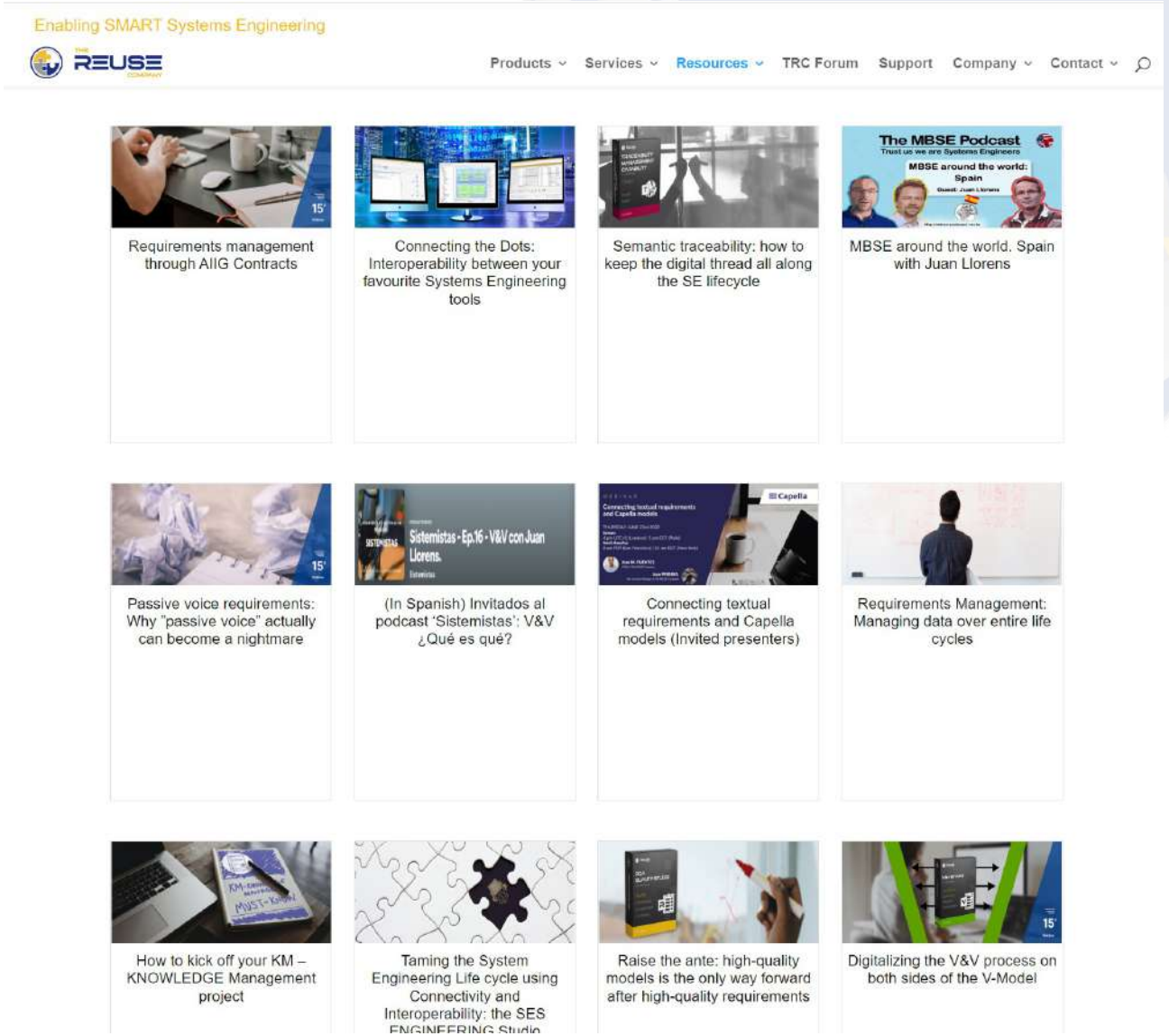
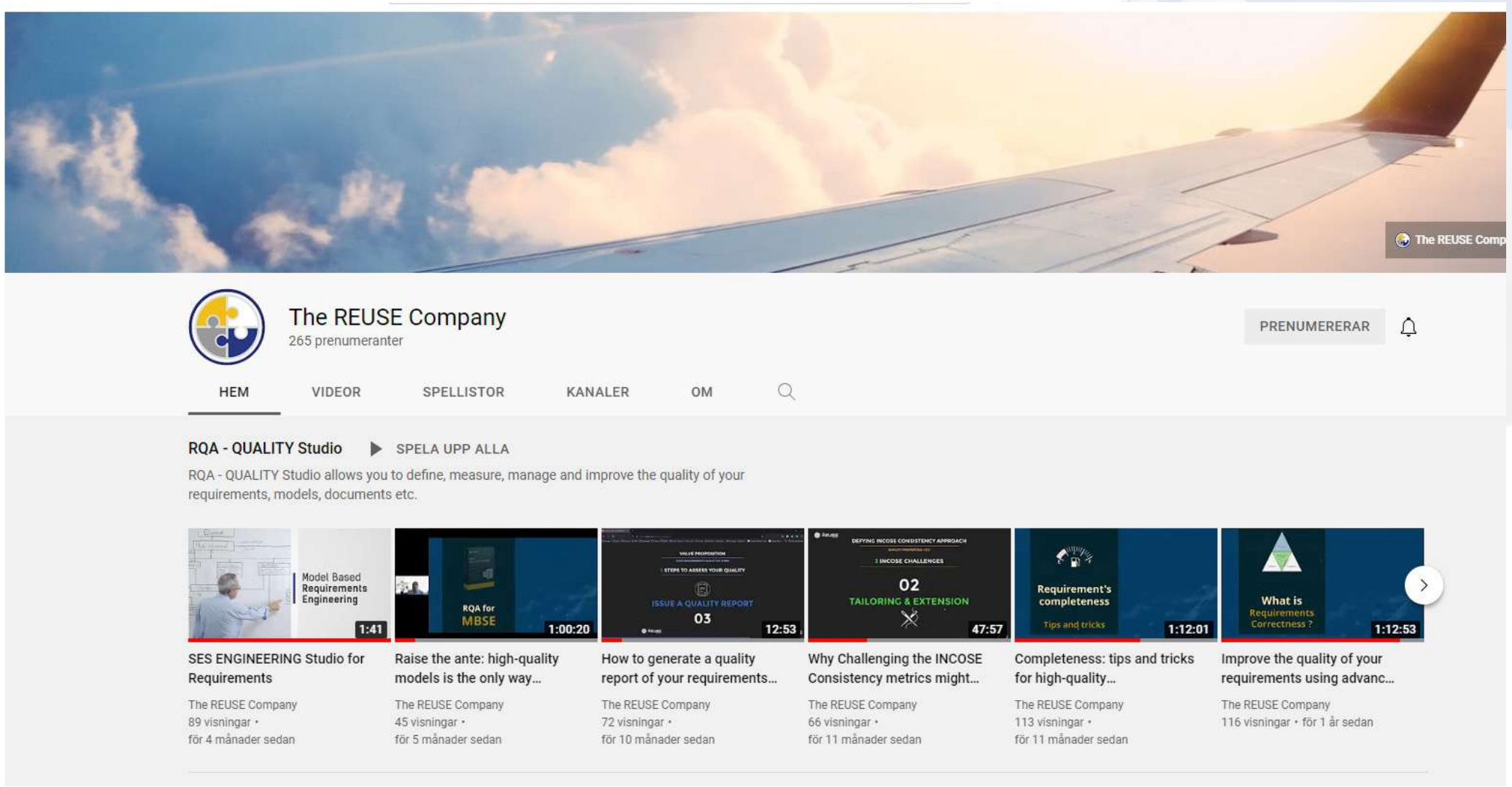
- www.reusecompany.com
  - Resources -> Webinars (15' and 1hr)
  - Services
  - Support Forum





The REUSE Company in Youtube: https://www.youtube.com/user/TheREUSECompany

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