

## ➤ 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



**José M. Fuentes**

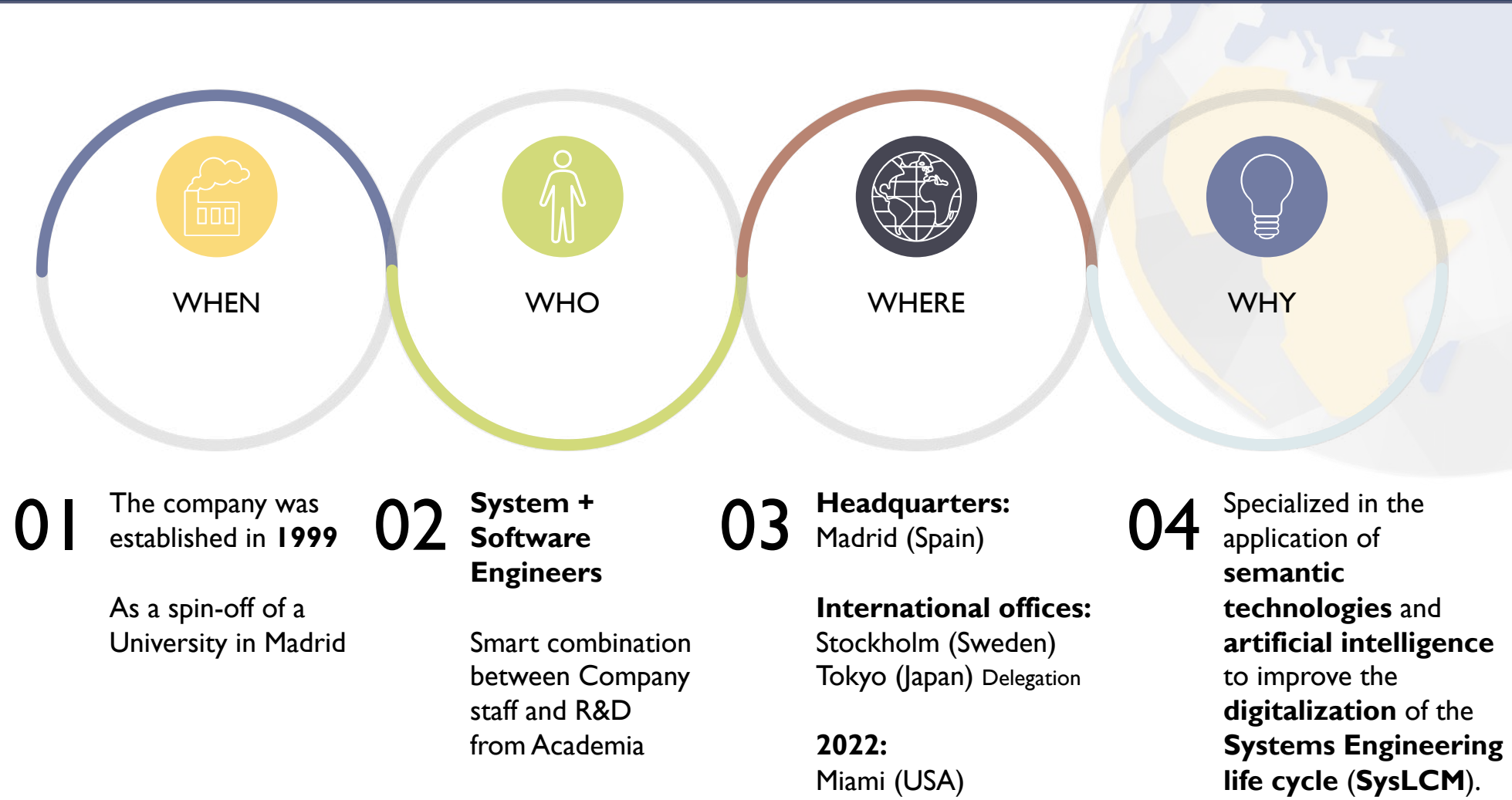
The REUSE Company  
Chief Operating Officer

*[jose.fuentes@reusecompany.com](mailto:jose.fuentes@reusecompany.com)*



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





## > The Systems **ENGINEERING** Suite:

- > RQA – QUALITY Studio
- > RAT – AUTHORIZING 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



➤ <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 coeys 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

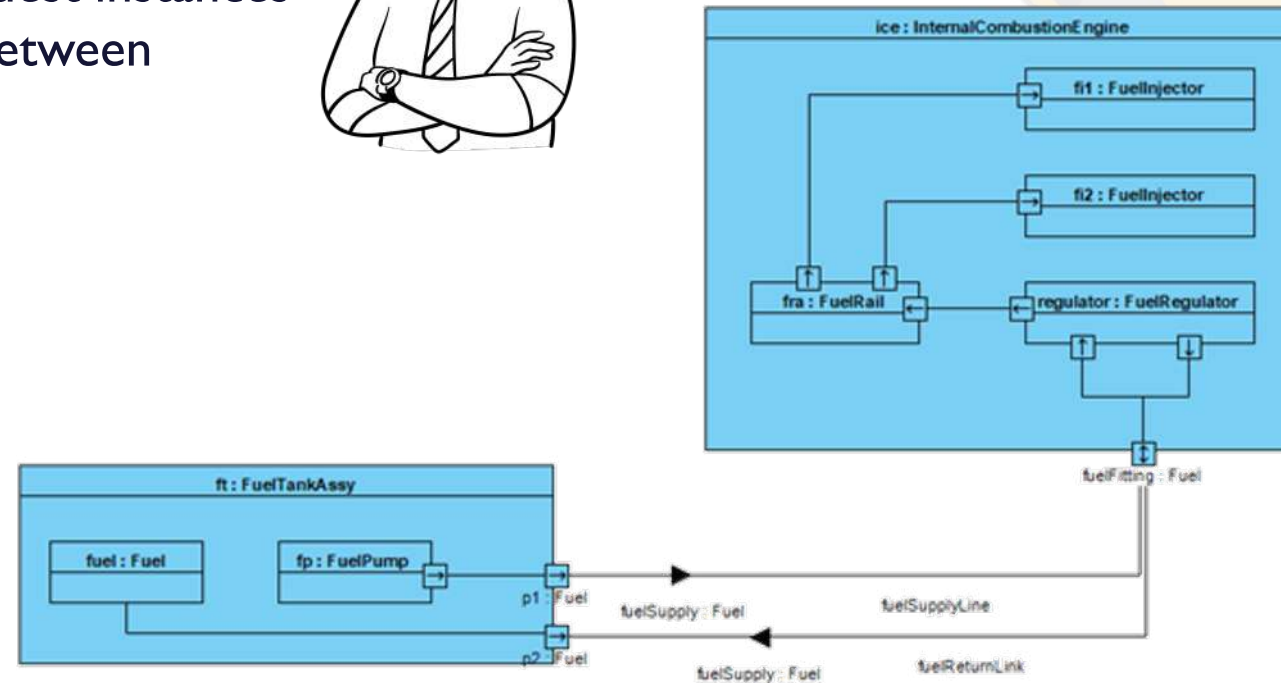
In an interface  
between 2  
components



## ➤ SysML Glossary:



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



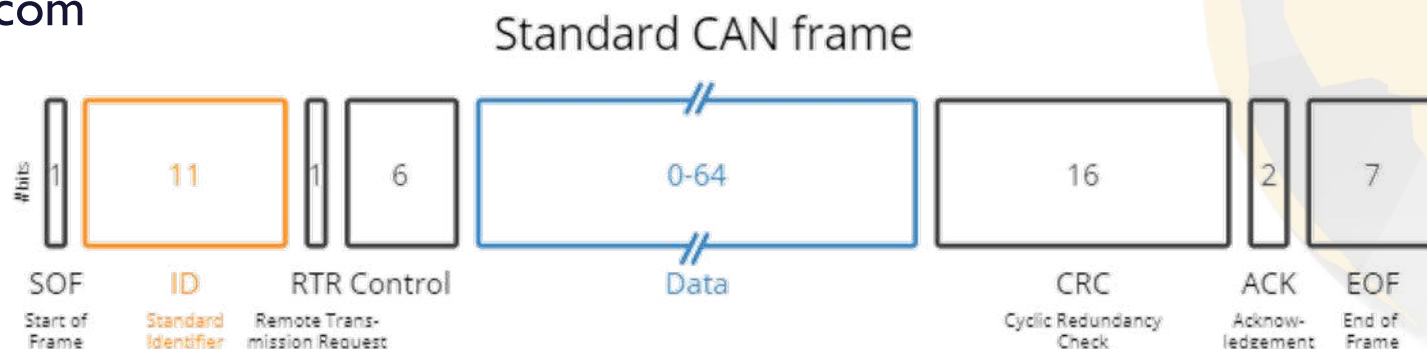


**Signals and  
messages  
in the  
automotive  
domain**



- 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

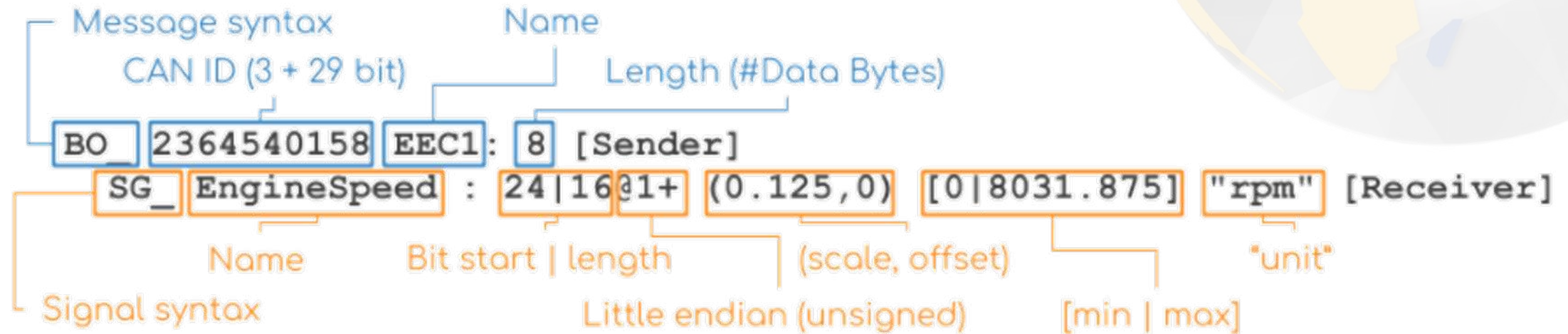


### The 8 CAN bus protocol message fields

- **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**

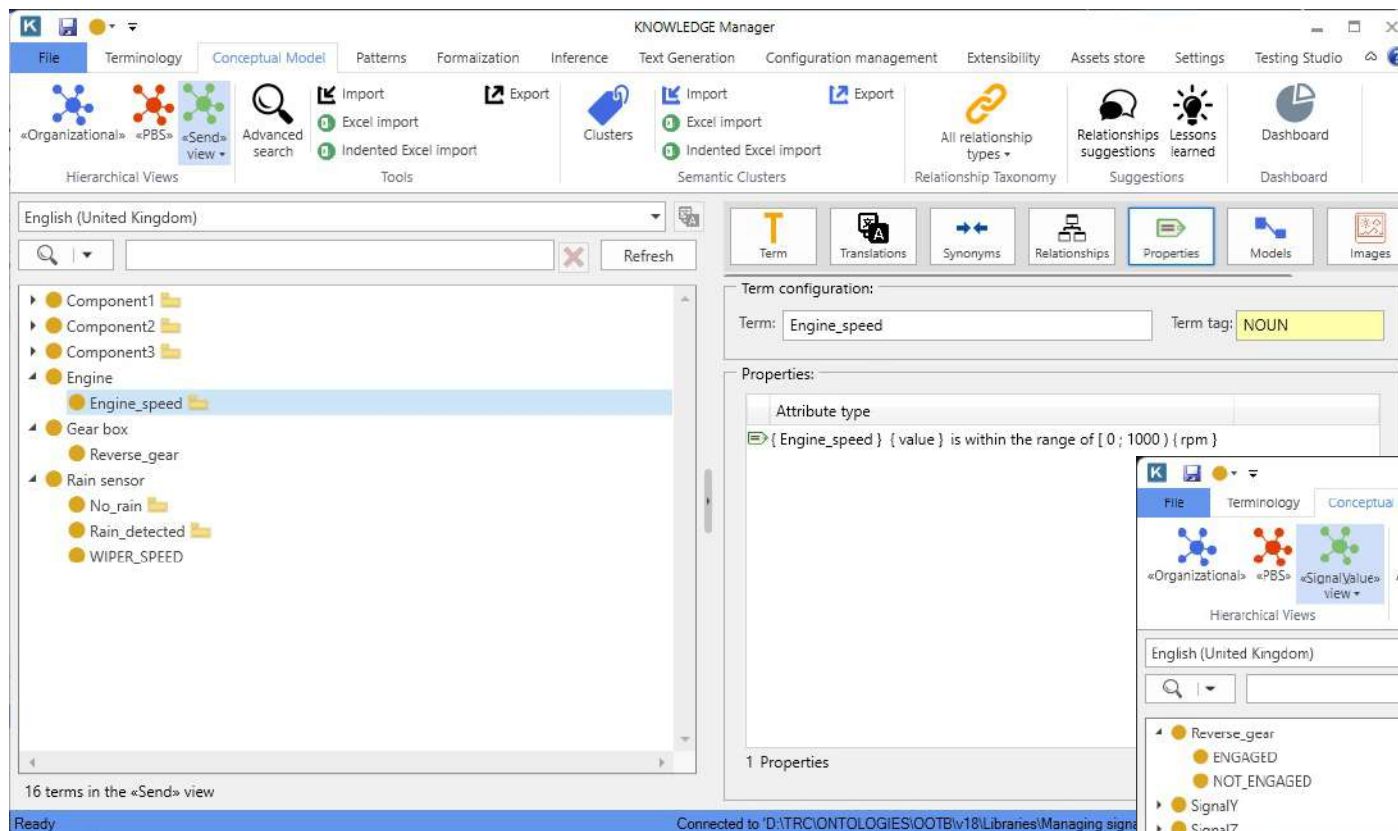


|                                |  |
|--------------------------------|--|
| Messages and Signals:          | Represented as Clusters  |
|                                | Actual Signals and Messages are the content of the vocabulary, within the corresponding cluster        |
| Signals contained in messages: | As a <i>composition</i> 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)        |

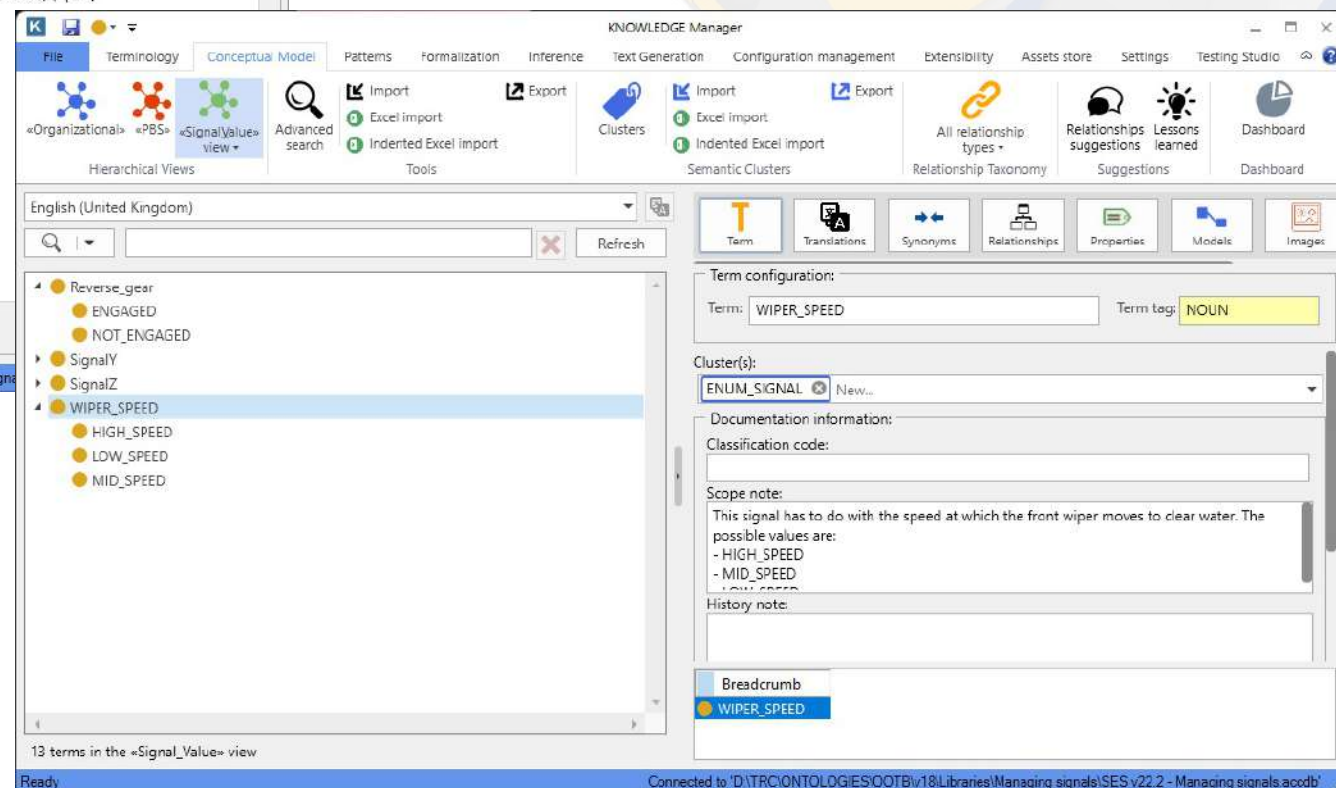


KM – KNOWLEDGE  
MANAGER  
Project  
dictionary

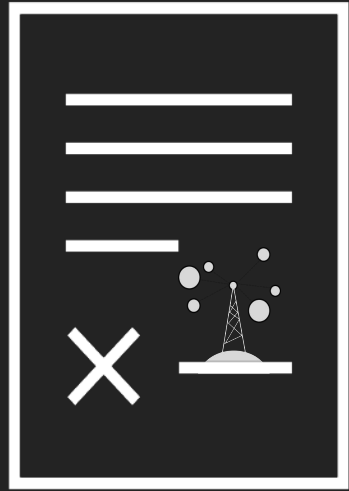




The screenshot shows the KNOWLEDGE Manager interface with the 'Send' view selected. The left pane displays a hierarchical tree structure of terms, including 'Component1', 'Component2', 'Component3', 'Engine', 'Gear box', 'Reverse gear', 'Rain sensor', 'No rain', 'Rain detected', and 'WIPER\_SPEED'. The right pane shows the 'Term configuration' for 'Engine\_speed' with a 'Term tag' of 'NOUN'. The 'Properties' section shows an attribute type: '{ Engine\_speed } { value } is within the range of [ 0 ; 1000 ] { rpm }'. The status bar at the bottom indicates 'Ready' and 'Connected to 'D:\TRC\ONTOLOGIES\OOTB\18\Libraries\Managing signals'.



The screenshot shows the KNOWLEDGE Manager interface with the 'SignalValue' view selected. The left pane displays a hierarchical tree structure of terms, including 'Reverse gear', 'ENGAGED', 'NOT\_ENGAGED', 'SignalY', 'SignalZ', 'WIPER\_SPEED', 'HIGH\_SPEED', 'LOW\_SPEED', and 'MID\_SPEED'. The right pane shows the 'Term configuration' for 'WIPER\_SPEED' with a 'Term tag' of 'NOUN'. The 'Cluster(s)' section shows 'ENUM\_SIGNAL' with a 'New...' button. The 'Documentation information' section shows a 'Classification code' and a 'Scope note' that reads: 'This signal has to do with the speed at which the front wiper moves to clear water. The possible values are: - HIGH\_SPEED - MID\_SPEED - LOW\_SPEED'. The status bar at the bottom indicates 'Ready' and 'Connected to 'D:\TRC\ONTOLOGIES\OOTB\18\Libraries\Managing signals\SES v22.2 - Managing signals.acod'.



# 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

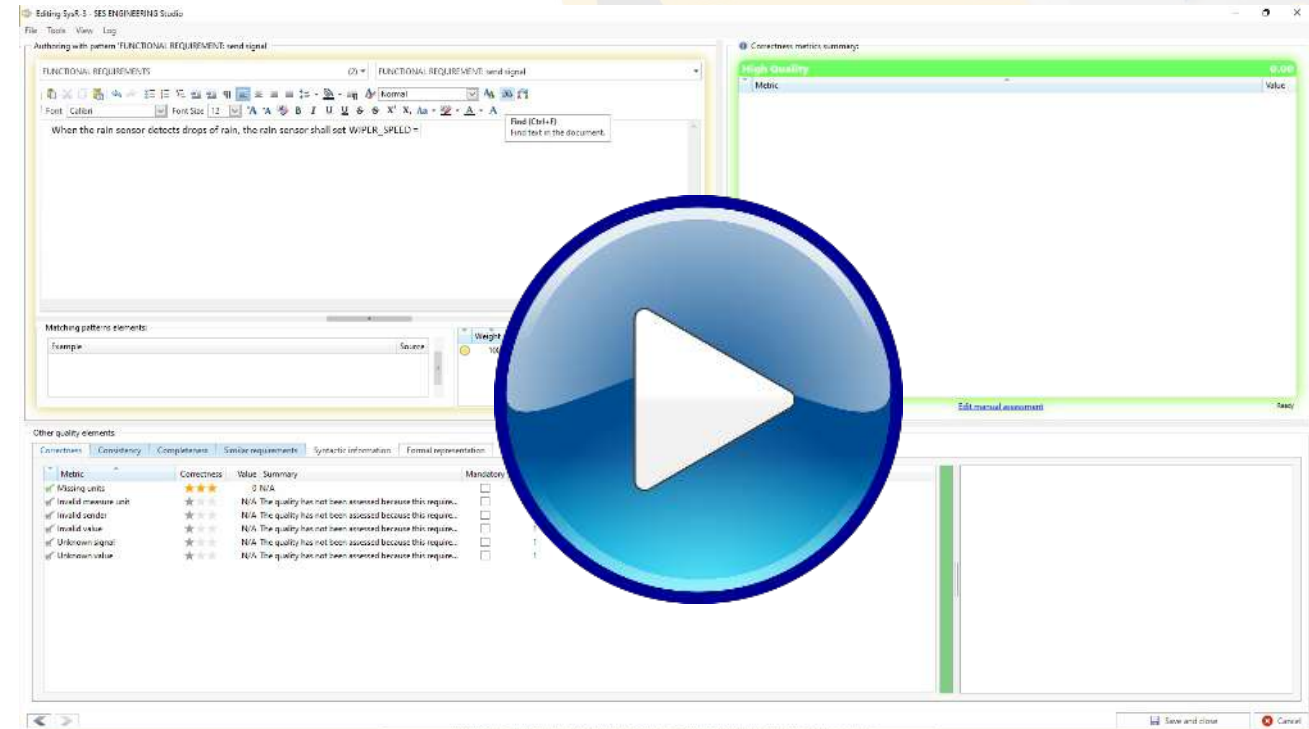
Is km/h the right unit for *engine\_speed*?



**Demonstration**

## 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









## ➤ **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 17<sup>th</sup> , 2023







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Guest: Juan Llorens

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**Connecting textual requirements and Capella models**

**Requirements Management: Managing data over entire life cycles**


**How to kick off your KM – KNOWLEDGE Management project**


**Taming the System Engineering Life cycle using Connectivity and Interoperability: the SES ENGINEERING Studio**

**Raise the ante: high-quality models is the only way forward after high-quality requirements**


**Digitalizing the V&V process on both sides of the V-Model**














**The REUSE Company**  
265 prenumeranter

PRENUMERERAR 

HEM VIDEOR SPELLISTOR KANALER OM 

**RQA - QUALITY Studio** ▶ SPELA UPP ALLA

RQA - QUALITY Studio allows you to define, measure, manage and improve the quality of your requirements, models, documents etc.

|   |  |  |   |   |  |
|---|--|--|---|---|--|
|  <p>Model Based Requirements Engineering<br/>1:41</p> |  <p>RQA for MBSE<br/>1:00:20</p>                  |  <p>How to generate a quality report of your requirements...<br/>12:53</p> |  <p>Why Challenging the INCOSE Consistency metrics might...<br/>47:57</p> |  <p>Completeness: tips and tricks for high-quality...<br/>1:12:01</p> |  <p>Improve the quality of your requirements using advanc...<br/>1:12:53</p> |
| <p><b>SES ENGINEERING Studio for Requirements</b></p> <p>The REUSE Company<br/>89 visningar • för 4 månader sedan</p>                   | <p><b>Raise the ante: high-quality models is the only way...</b></p> <p>The REUSE Company<br/>45 visningar • för 5 månader sedan</p> | <p><b>How to generate a quality report of your requirements...</b></p> <p>The REUSE Company<br/>72 visningar • för 10 månader sedan</p>                        | <p><b>Why Challenging the INCOSE Consistency metrics might...</b></p> <p>The REUSE Company<br/>66 visningar • för 11 månader sedan</p>                        | <p><b>Completeness: tips and tricks for high-quality...</b></p> <p>The REUSE Company<br/>113 visningar • för 11 månader sedan</p>                         | <p><b>Improve the quality of your requirements using advanc...</b></p> <p>The REUSE Company<br/>116 visningar • för 1 år sedan</p>                               |

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



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