



WEBINARS 2019

Automatic Traceability Discovery for Systems Engineering

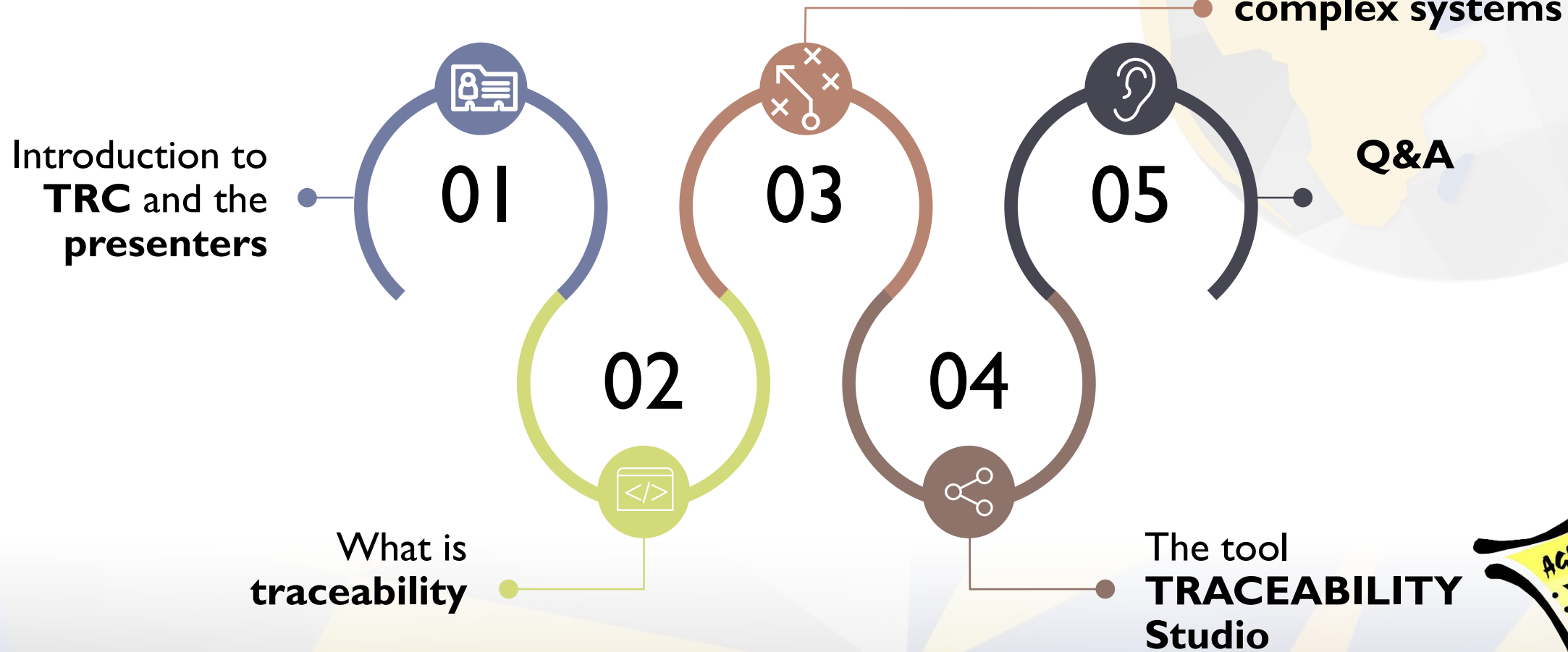
Monday, 13 May 2019

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



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SPAIN



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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

Research and innovation in our DNA. Public projects

Research and Innovation in our DNA

Spin-off of Carlos III University of Madrid

TRC's headquarter is in the Legatec Technology Park of the University

≈10% of revenues are devoted to R&D

TRC is actively involved in several large EU research projects



Past

ARTEMIS CRYSTAL
Requirements
Engineering



AMASS
Assurance and Certification of CPS

REVaMP²

Current

Celtic+: IoD



Celtic-Plus
Smart Connected World



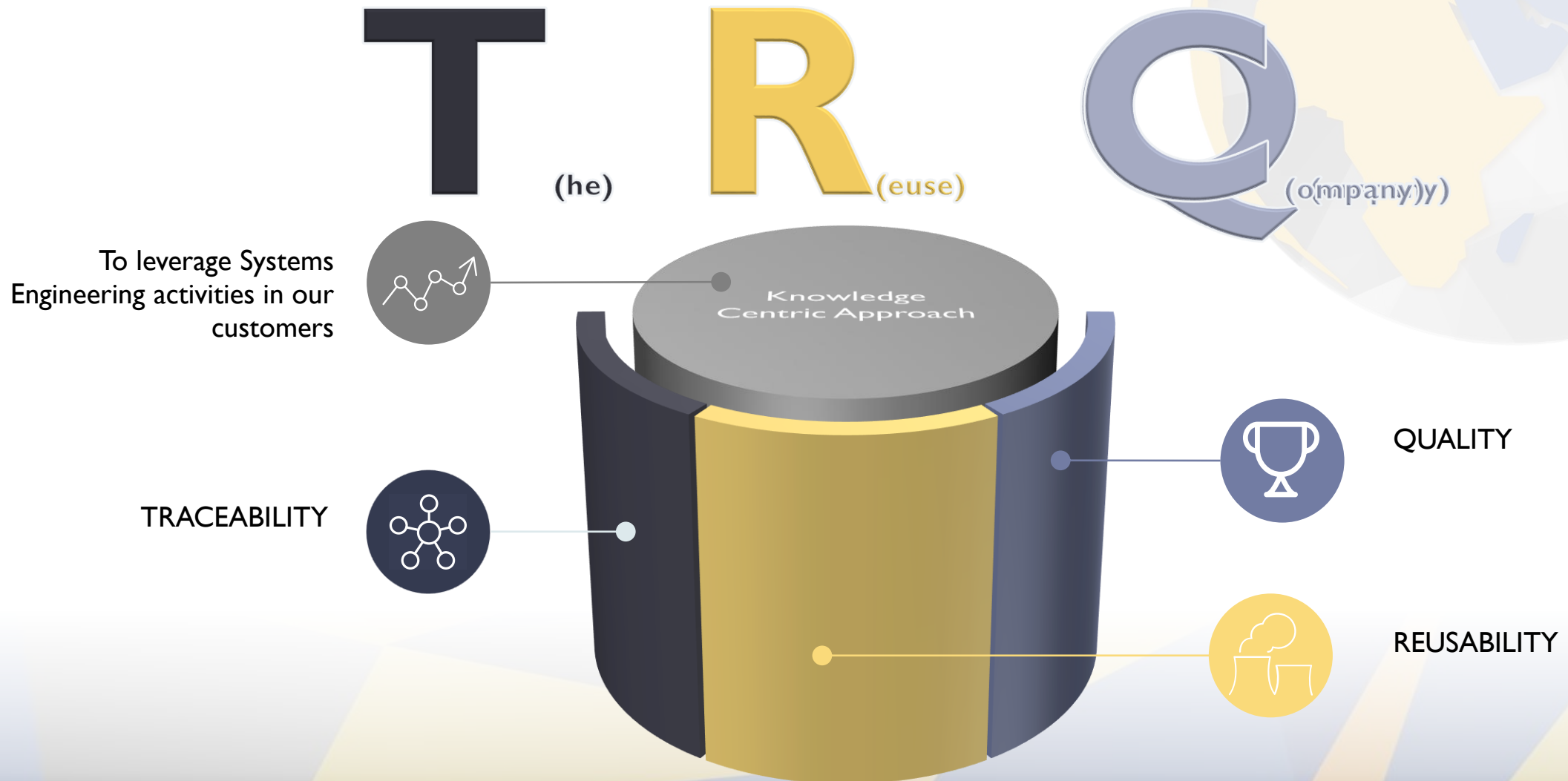
ITEA3

Future






ITEA3: EMBRACE
ArrowHead
New Control



ECSEL JU



Who is using our technology?

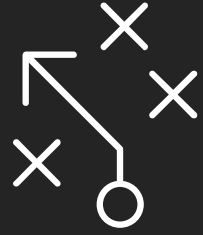
| | |
|---|-----------------------|
|  | Aerospace and defense |
|  | Energy |
|  | Automotive |
|  | Healthcare |
|  | Other industries |



José Fuentes



- Current position: Chief Operating Officer at The REUSE Company
- Product manager of the Systems Engineering Suite tools during the last 5 years.
- INCOSE CSEP Certified
- Member of the board of AEIS – the Spanish chapter of INCOSE
- Active contributor to the INCOSE Guide for Writing Requirements



What is Traceability

What is traceability?

- The capacity to find where a product was made
- What raw material and added components were used
- How it was produced
- Where it was stored
- How it has been released
- All along the logistic chain
- ...
- From beginning to end



Basic approach

Sample traceability matrix

| Requirement Identifiers | Reqs Tested | REQ1 UC 1.1 | REQ1 UC 1.2 | REQ1 UC 1.3 | REQ1 UC 2.1 | REQ1 UC 2.2 | REQ1 UC 2.3.1 | REQ1 UC 2.3.2 | REQ1 UC 2.3.3 | REQ1 UC 2.4 | REQ1 UC 3.1 | REQ1 UC 3.2 | REQ1 TECH 1.1 | REQ1 TECH 1.2 | REQ1 TECH 1.3 |
|-------------------------|-------------|-------------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|-------------|-------------|-------------|---------------|---------------|---------------|
| Test Cases | 321 | 3 | 2 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 3 | 1 | 1 | 1 |
| Tested Implicitly | 77 | | | | | | | | | | | | | | |
| 1.1.1 | 1 | x | | | | | | | | | | | | | |
| 1.1.2 | 2 | | x | x | | | | | | | | | | | |
| 1.1.3 | 2 | x | | | | | | | | | | | x | | |
| 1.1.4 | 1 | | | x | | | | | | | | | | | |
| 1.1.5 | 2 | x | | | | | | | | | | | | x | |
| 1.1.6 | 1 | | x | | | | | | | | | | | | |
| 1.1.7 | 1 | | | x | | | | | | | | | | | |
| 1.2.1 | 2 | | | | x | | x | | | | | | | | |
| 1.2.2 | 2 | | | | | x | | x | | | | | | | |
| 1.2.3 | 2 | | | | | | | | x | x | | | | | |
| 1.3.1 | 1 | | | | | | | | | | x | | | | |
| 1.3.2 | 1 | | | | | | | | | | x | | | | |
| 1.3.3 | 1 | | | | | | | | | | | x | | | |
| 1.3.4 | 1 | | | | | | | | | | | x | | | |
| 1.3.5 | 1 | | | | | | | | | | | x | | | |
| etc.... | | | | | | | | | | | | | | | |
| 5.6.2 | 1 | | | | | | | | | | | | | | x |

What is traceability?



Might be good as a first step



Allows you to check completeness of tests



Ensures that implementation meets specification



Enough for some projects (e.g. SW)



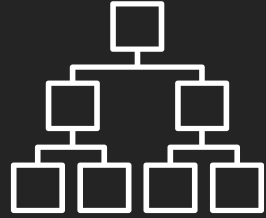
Not enough in complex projects



No support to req. decomposition or design



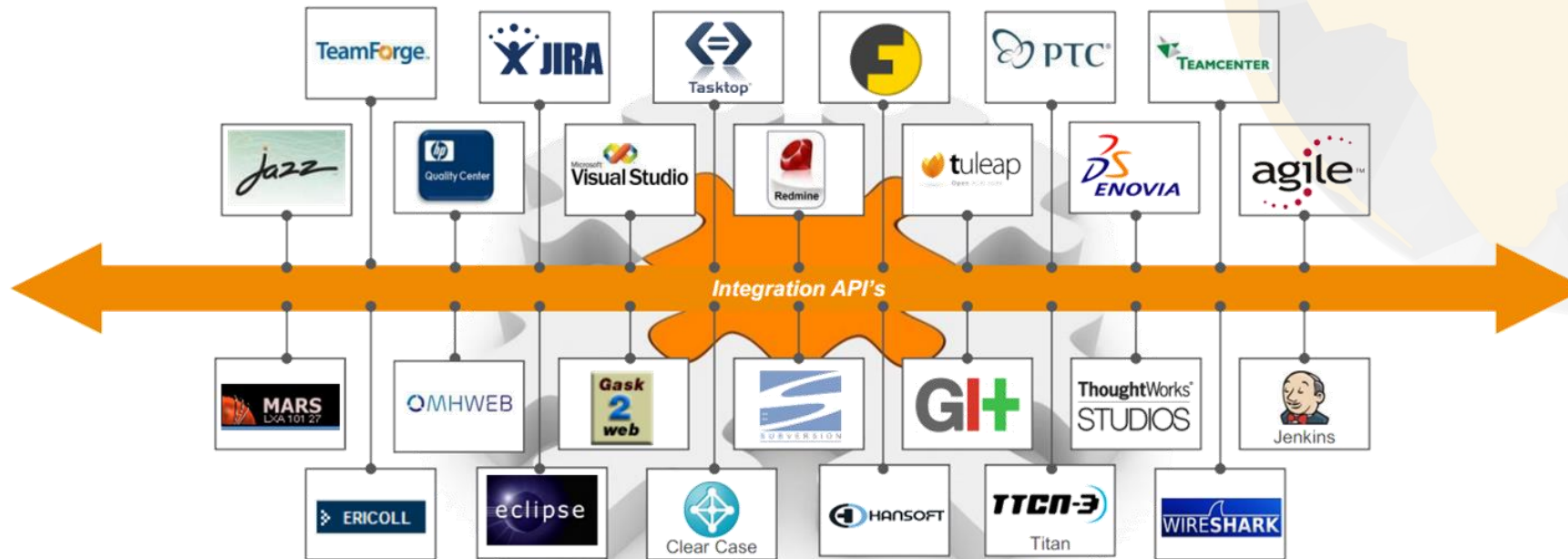
Doesn't satisfy standards like: DO-174, DO-254, ISO26262...



Traceability in complex S.E. projects

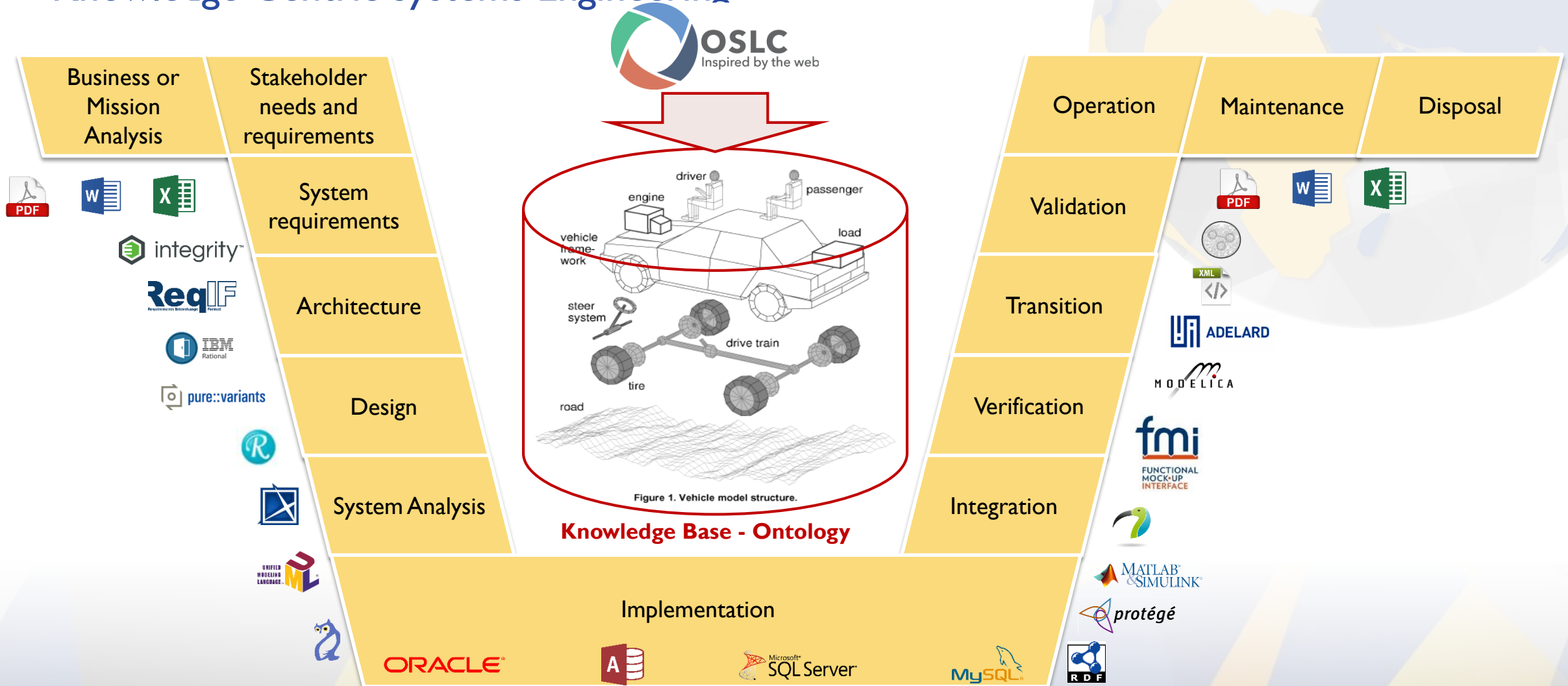
Complex ecosystems

Mats Berglund (Ericsson) <http://www.ices.kth.se/upload/events/13/84404189f85d41a6a7d1cafd0db4ee80.pdf>



- Multiple **domains**
 - Different **types of artifacts**
- Need of **intra-operability**
 - Intra-domain
- Need of **interoperability**
 - Inter-domain

Knowledge Centric Systems Engineering



Traceability in large projects



Traceability

- Project quality:
 - Are all the requirements properly tested?
 - Completeness:
 - Have we considered every high level requirement?
 - Have we created all the expected work products following requirements
- Scope management (project control):
 - Gold plating / scope creep
- Visibility:
 - Impact analysis
- Collaboration:
 - Among different roles: requirements manager, architects, designers, testers and... above all, Project manager

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Visibility

- Traceability provides visibility in large projects:

Traceability

Guys, I need a project status report, please?

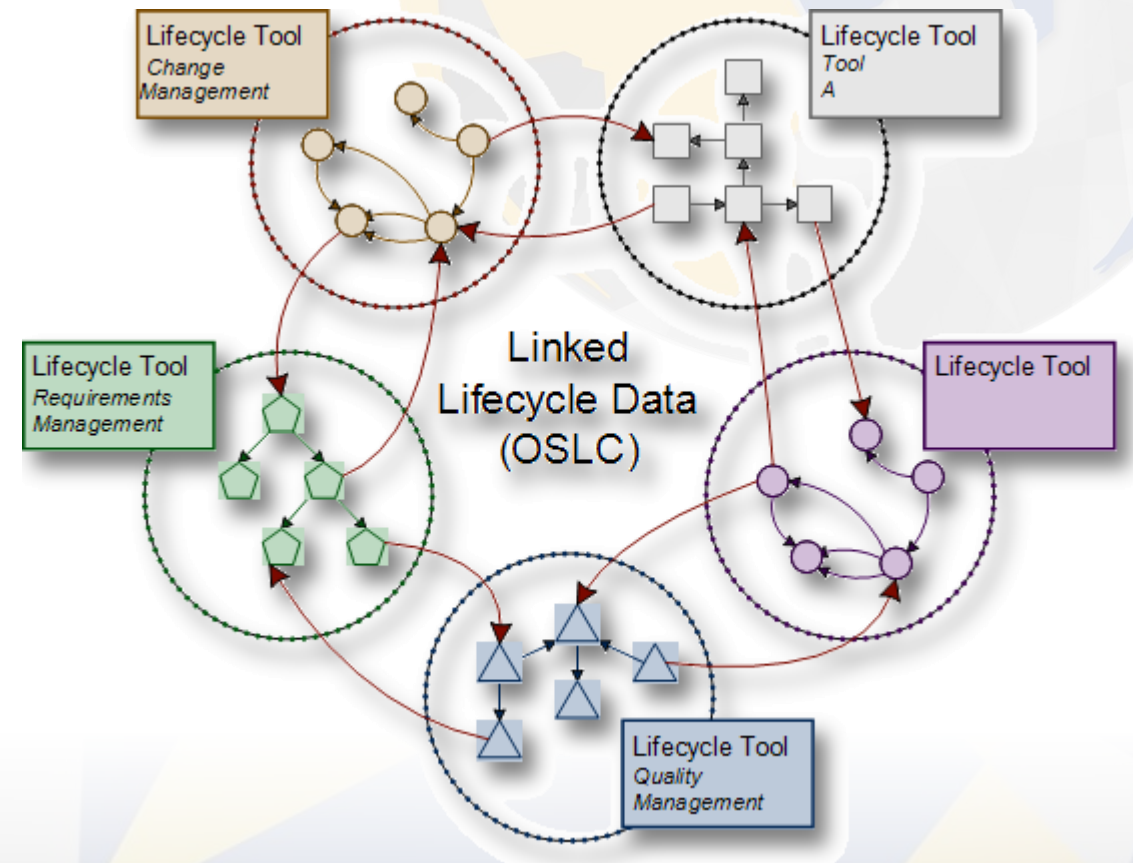
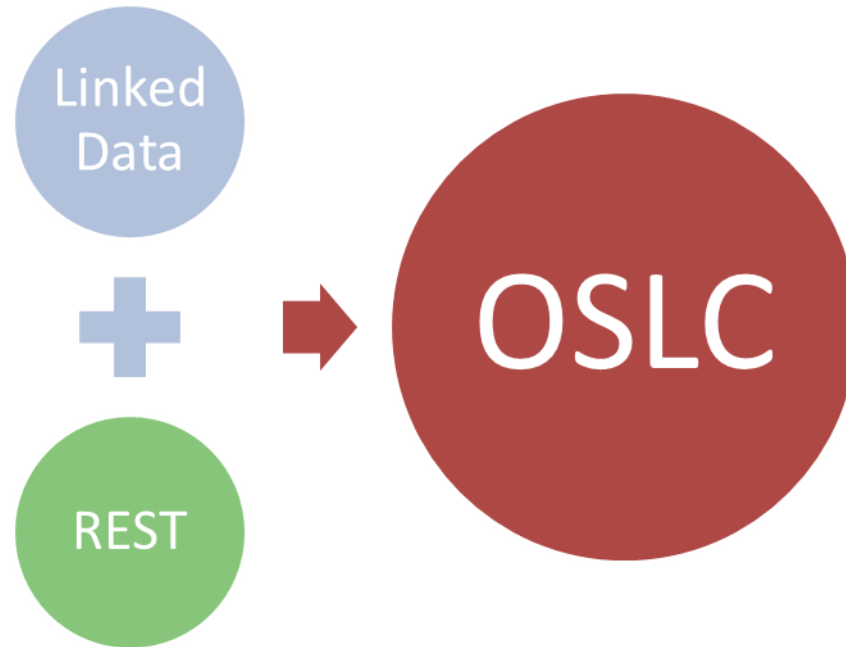
Sure! We're 90% done!!

90% of the times we give the same answer!!

Folks, we need
TRACEABILITY
Studio!!

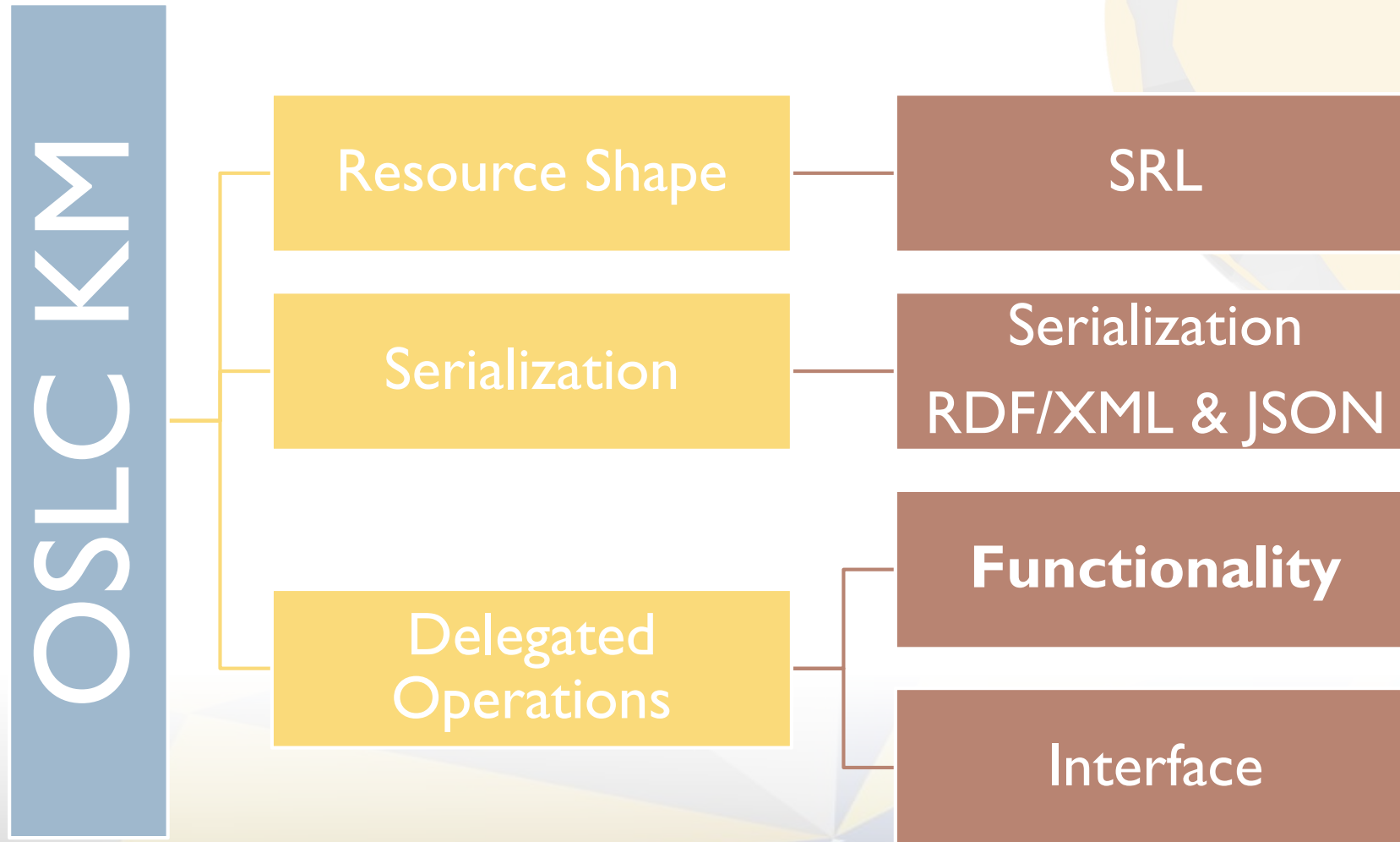


Open Services for Lifecycle Collaboration (OSLC)



Source: http://upload.wikimedia.org/wikipedia/en/7/7e/OSLC_diagram.png

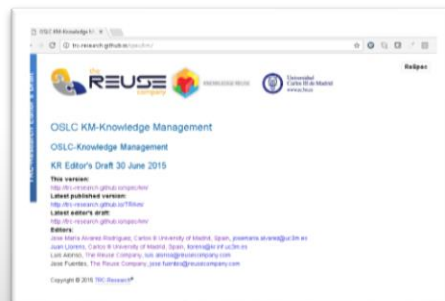
The approach...



SRL

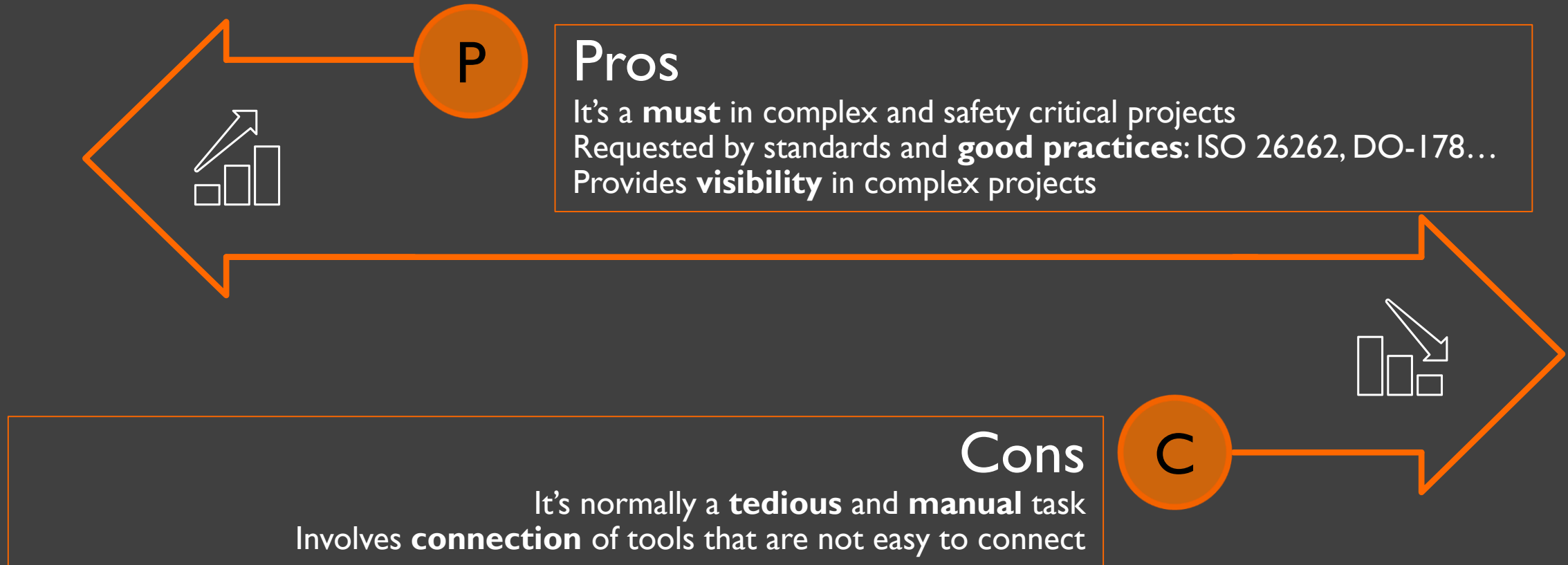
System Representation Language

New **Domain**
New **Resource Shape**



<http://trc-research.github.io/spec/km/>

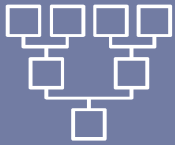
Traceability in complex projects





Main capabilities of the **TRACEABILITY Studio**

Connections



Connection to data sources

- Connection to multiple types of sources
- Graphical definition of a project map

→ Click Here

Traceability



Traceability management

- Management of types of traces
- Management of traces
- Impact analysis
- Graphical representation of work items

→ Click Here

Semantics



Semantic approach

- Automatic suggested links
- Suspect links management

→ Click Here

Reporting



Our qualifications

- OOTB reports
- Custom reports in MS Word

→ Click Here



TRC WEBINARS 2019 TRACEABILITY Studio in the SES Suite

KCSE areas and tools



Knowledge Management

Capture, creation, **representation**, and **exchange of knowledge** across targeted groups of **stakeholders**



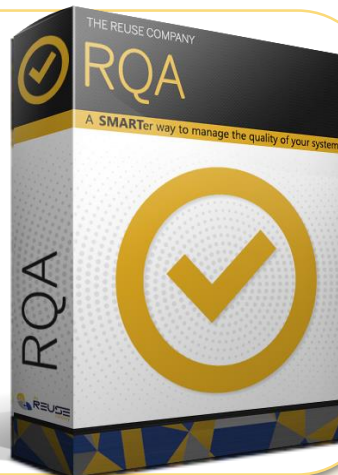
Traceability

Supports **traces** among heterogeneous work items, including: **impact** analysis, trace **discovery**, custom **reporting**...



Quality Analysis

Automatic analysis of the **quality** for the items in the left-hand side of the “V”



V&V

Support to the **Verification and Validation** processes according to **ISO15288** and **INCOSE Handbook**



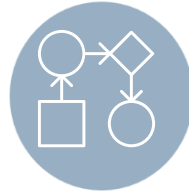
Today



VI8.x

- Beta version of the product

2Q19



VI8.3

- First version of the product

1Q20



v20

- Better integration with the SES Suite and MS Office
- Multi-column traceability matrices
 - More semantics
- Integration with other tools (requirements, testing, modeling...)

Beyond



Beyond

- Source code traceability
- Much more



The screenshot displays the TRACEABILITY Studio interface. On the left, a table lists modules for the 'Railway Traceability Project'.

| Identifier | Name | Description | Traces | Last evaluation |
|------------|---|-------------|--------|-----------------|
| 1012 | Derives | | 10 | |
| 1013 | Risks threatening system requirements | | 374 | |
| 1014 | Risks threatening component requireme... | | 55 | |
| 1015 | Test cases verify system requirements | | 23 | |
| 1016 | Simulink model specifies component req... | | 378 | |
| 1017 | Rhapsody model (Rolling Stock Compon... | | 17 | |

Below the table, it states 'Number of modules: 6'.

The main workspace shows a traceability diagram with nodes representing different models and their relationships. A large blue play button is overlaid on the diagram. The diagram includes nodes such as 'Railway project - Risk module', 'CoRS', 'Railway project - Test definition mod...', 'SusO00Feignoroll', and 'rolling_stock_components'. Relationships are labeled with terms like 'Derives', 'Risks threatening component requirements', and 'Simulink model specifies component requirements'.

At the bottom right, a status bar indicates 'Connected to: Riga Quality Analyzer v17.1 (English)' and a progress bar shows '81%'.



Thank you!

A word cloud featuring the phrase "Thank You" in numerous languages and scripts. The central text is "THANK YOU" in large, bold, black capital letters. Surrounding it are various translations and expressions of gratitude, including:

- English:** THANK, YOU, GRACIAS, ARIGATO, SHUKURIA, MERCI, BOLZIN, DANKSCHEEN, SUKSAMA, EKHMET, PALDIES, GOZAIMASHITA, EFCHARISTO, KOMPASUMNIDA, MAAKE, LAH, MERASTAWHY, GAEJTHO, AGUYJE, FAKAUE, TAVTAPUCH, MEDAWAGSE, BAUKA, JUSPAXAR, MINMONCHAR, MAKETAU, UNALCHEESH, HUI, YUSPAGARATAM, MAITEKA, WADEEJA, DHANYADAAD, ANHIA, ATTO, CHALTU, YAQHANYELAY, VUSPAGARATAM, HUI, SPASIBO, DENKAUJA, NENACHALHYA, HATUR, GUI, EKOJU, SIKOMO, TINGKI, SHUKRIA, BIYAN.
- Hindi:** धन्यवाद, शुक्रिया, तशककुर अतु, ग्राहिया, मेरिस्तवाय, गैज्थो, अगुयजे, फाकाए, तवतपुच, मेदावागसे, बांका, जस्पखर, मिनमोन्चार, मकेताउ, उनाल्चेेश, हुई, यस्पगरातम, माइटेका, वादेईजा, धन्यादाद, अन्हिया, अट्टो, चाल्तु, याक्हानेलाय, वुस्पगरातम, हुई, स्पसिबो, देन्काऊजा, नेनाचलह्या, हातुर, गुई, एकोजू, सिकोमो, तिंग्की, शुकुरिया, बीयान.
- Urdu:** شکریہ, دیکھتے ہیں, شکریہ, دیکھتے ہیں, شکریہ, دیکھتے ہیں.
- Other:** DANKSCHEEN, SUKSAMA, EKHMET, PALDIES, GOZAIMASHITA, EFCHARISTO, KOMPASUMNIDA, MAAKE, LAH, MERASTAWHY, GAEJTHO, AGUYJE, FAKAUE, TAVTAPUCH, MEDAWAGSE, BAUKA, JUSPAXAR, MINMONCHAR, MAKETAU, UNALCHEESH, HUI, YUSPAGARATAM, MAITEKA, WADEEJA, DHANYADAAD, ANHIA, ATTO, CHALTU, YAQHANYELAY, VUSPAGARATAM, HUI, SPASIBO, DENKAUJA, NENACHALHYA, HATUR, GUI, EKOJU, SIKOMO, TINGKI, SHUKRIA, BIYAN.

A small map of India is visible in the top right corner.

Next webinar

> Topic:

- > **A practical way to implement ISO 15288 V&V processes: The VERIFICATION Studio**
- > The Verification and Validation processes of the ISO 15288 describe in a general way how to perform V&V for a complex system. However, the standard also suggests the need to apply V&V not only to the right side of the V-Model but also to the requirements, architecture and design processes outcomes, along the left side of the V-Model. The webinar will show how you can use the Verification Studio to implement an integral and complete V&V approach for all kinds of work-products and components.

> Dates:

- > May 28th and 30th, 2019





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Thank you





the
REUSE
company

