



Traceability @ Scale

For Standards, By Standards

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Sodius

- A **product** company, selling directly and through OEM's
 - A **global company** with representation in France, Germany, and the U.S.
 - Specializing in **data integration** solutions with a goal to ease and accelerate collaboration processes
 - Expertise with ALM, MBSE, MBSW artifacts including **requirements**, architecture **models**, engineering models, software **development artifacts**
 - **Solutions Provider** to markets such as Defense, Aerospace & Automotive
 - **Custom Services** to extend and integrate our solutions
 - **Data Integration and OSLC** Experts
 - Strong integration and partnership with Willert Software Tools Team in Germany (SE and Embedded Software Experts)

Data Formats



Partners & OEM



Customers



(Some of) Our Standards

INTERNATIONAL
STANDARD

ISO
26262-1

First edition
2011-11-15

Road vehicles — Functional safety —

Part 1:
Vocabulary

Vehicles routiers — Sécurité fonctionnelle —
Partie 1: Vocabulaire

VDA QMC

Quality Management in the Automotive Industry

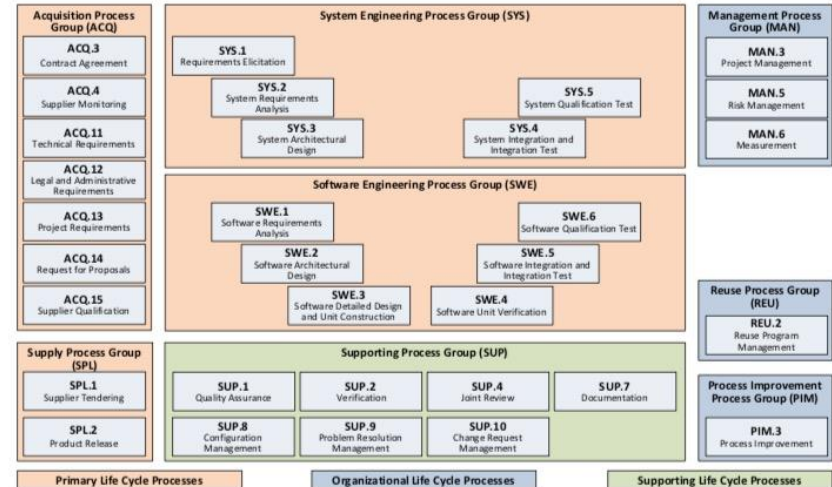
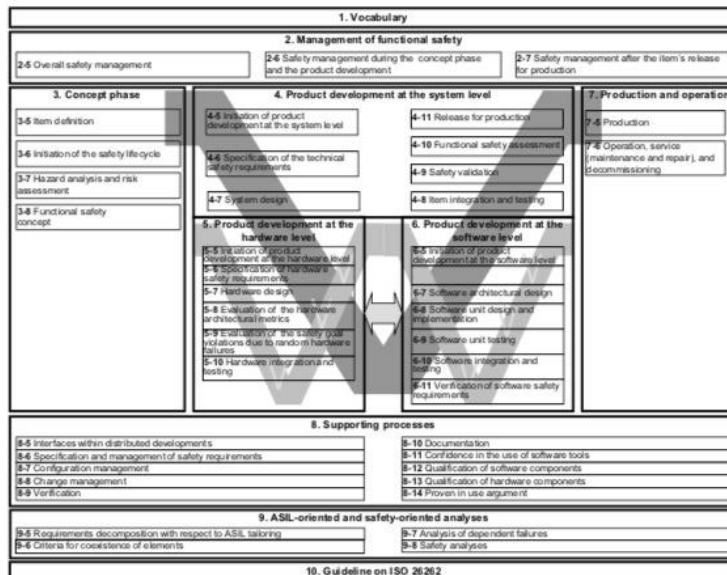
Automotive SPICE®

Process Reference Model

Process Assessment Model

Version 3.0

Title: Automotive SPICE Process Assessment / Reference Model
Author(s): VDA QMC Working Group 13 / Automotive SIG
Version: 3.0
Date: 2015-07-16



Traceability in the Standards

"Traceability refers to the existence of references or links between work products thereby further supporting coverage, impact analysis, requirements implementation status tracking etc."*

Traceability in Practice

- Excel has been the standard for cross-reference index

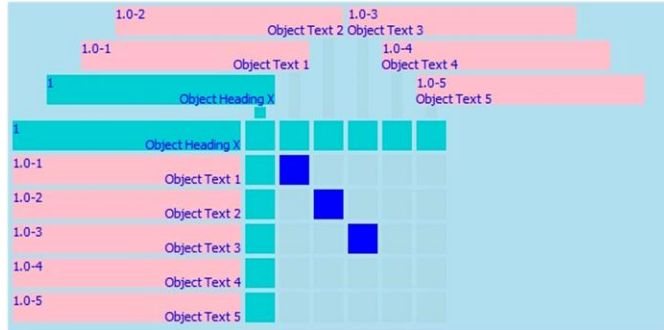
Test ID		Tst-1	Tst-2	Tst-3	Tst-4	Tst-5	Tst-6	Tst-7
Requirement ID	Covered							
Req-1	TRUE	x						
Req-2	TRUE		x			x		
Req-3	TRUE		x					x
Req-4	TRUE				x			
Req-5	TRUE		x				x	
Req-6	FALSE							
Req-7	TRUE			x				
Req-8	TRUE							x
Req-9	TRUE					x		
Req-10	FALSE							
Req-11	TRUE				x			x
Req-12	FALSE							
Req-13	TRUE		x					
Req-14	FALSE							
Req-15	TRUE			x				
Req-16	TRUE				x	x		
Req-17	TRUE			x				x

- Pros
 - Accessibility
 - Ease
 - Cross-tool
- Cons
 - Tedious & Error Prone
 - Difficult Link to source assets
 - Usefulness
 - Versioning & Scale

Traceability in Practice

- DOORS has been synonymous with traceability

ID	
MOD_1	<input checked="" type="checkbox"/> 1 Object Heading X
MOD_2	<input checked="" type="checkbox"/> Object Text 1
MOD_3	<input checked="" type="checkbox"/> Object Text 2
MOD_4	<input checked="" type="checkbox"/> Object Text 3
MOD_5	<input checked="" type="checkbox"/> Object Text 4
MOD_6	<input checked="" type="checkbox"/> Object Text 5



- Pros
 - Built for traceability
 - Unique object identification
 - Common usage
 - Some versioning
- Cons
 - Focus on a single tool
 - Barrier of entry

When Traceability is Failing



“We do the minimal that is necessary to pass the gate.”

“Creating the traceability is easy, maintaining accurate information is difficult.”

“We have a special group that just maintains this information.”

“The most important part of traceability? That it can be labeled ‘done’.”

“I never use the index because I can’t trust that it’s been updated correctly”

Our Objective



- Make Traceability a First Order Engineering Practice
 - Make it valuable to the engineer and the organization
 - Easier to create
 - Easier to maintain
 - Easier to answer engineering questions
 - Make it visible to the organization
 - As an asset
 - As a metric of quality
 - As a visual to understand
 - As a demonstration of compliance

Traceability @ Scale

- Simple Definition
 - Assets & Relationship Perform Roles
 - Named Relationship Between Assets
 - Traceability is valid for a configuration
- Success when
 - Unified Environments/Boundary Free
 - Managed Configuration of Assets
 - Accessible to create, leverage, review, and report

Visualizing Traceability

The screenshot shows a web browser window displaying a requirements management application. The browser's address bar shows a URL starting with 'robertbaillic31e:8080/secollab/web/clm/design/7e3746a8-888e-4b91-8ed2-f71120b8a900?oslc_config.context=http%3A%2F%2Frobertbaillic3...'. The application's navigation bar includes 'ABS System', 'Dashboard', 'Designs', 'Reviews', and 'Activities'. The main content area is titled 'Design ABS Requirements' and features two panels:

- Properties Panel:** Contains metadata for the 'ABS Requirements' artifact.
 - Description:** ABS Requirements is based on V2.0 Baselines of 2 modules :
 - Stakeholder Requirements
 - System Requirements
 - Tool:** DOORS
 - Created:** by Unknown_305506 on 9/26/2018, 9:45:22 AM
 - Modified:** by Unknown_305506 on 9/27/2018, 5:02:29 AM
- Design content Panel:** Lists the components of the design content:
 - Stakeholder Requirements
 - System Requirements
- Collaboration links Panel:** Includes an '+ Add' button and a message: 'There is currently no link on this artifact'.

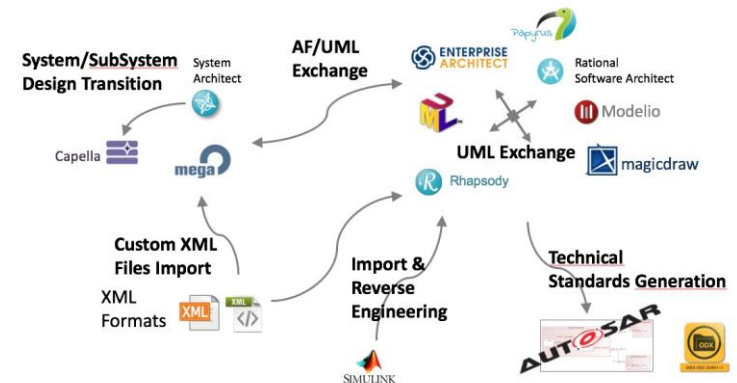
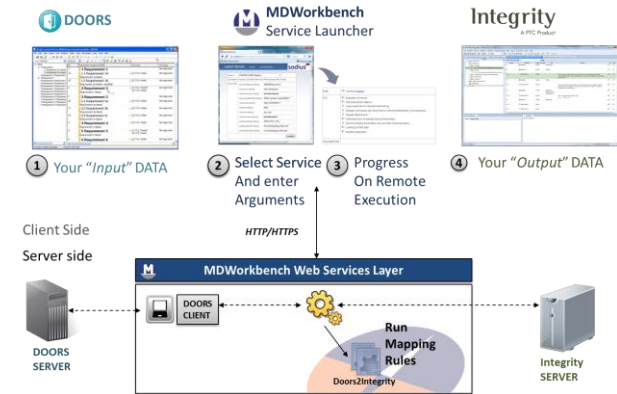
The bottom right corner of the application window displays the copyright notice: '© Copyright by sodius'.



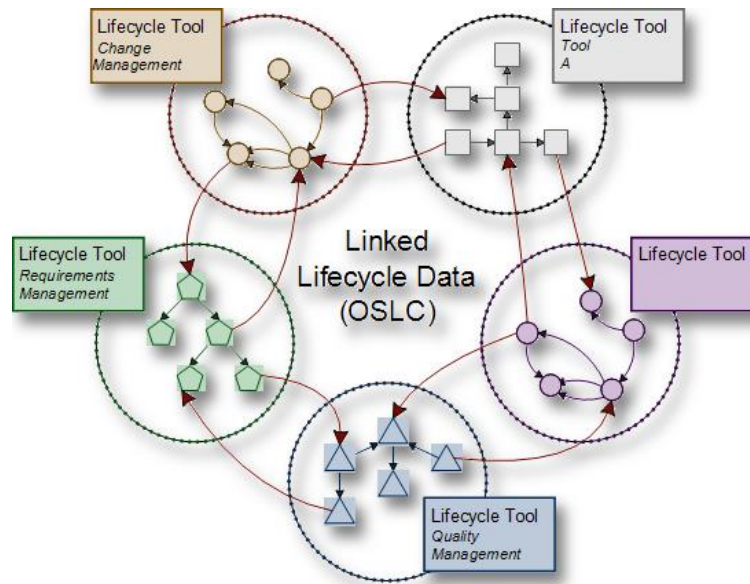
Visibility and Accessibility

Accessing Data

- For nearly 20 years SODIUS has been providing data accessors and converters
 - Providing OEMs products (IBM, NoMagic, Ansys, Jama, etc.)
 - For many large organizations, we support both tool connectors DOORS, UML, SA, MEGA, MATLAB Simulink, RTC, DNG, Jama, PTC Integrity, etc. and custom integrations



Standard for Integration

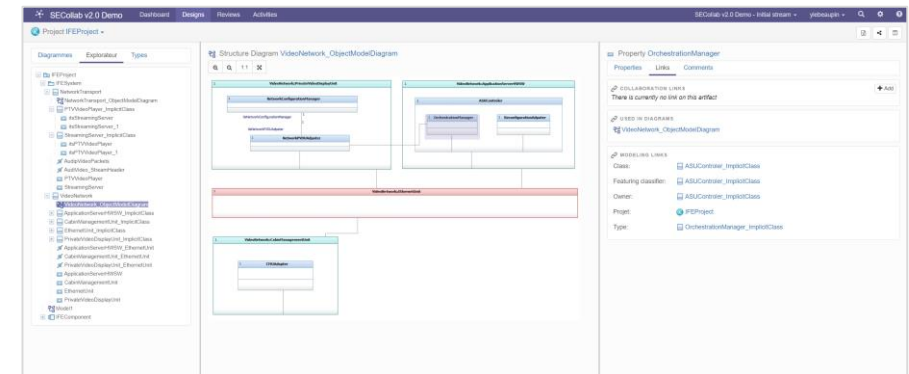
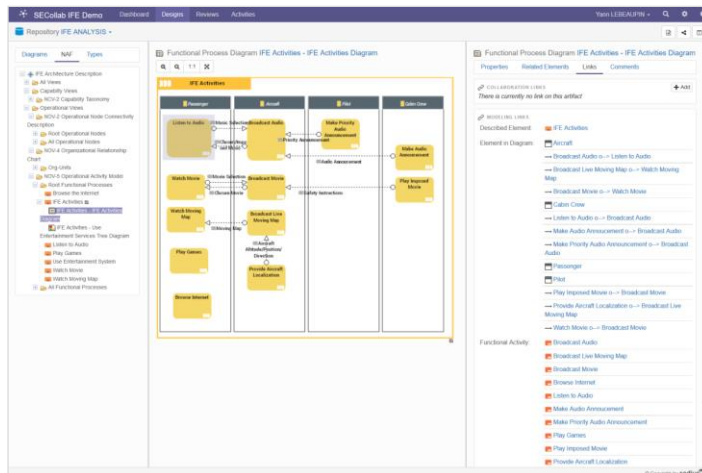
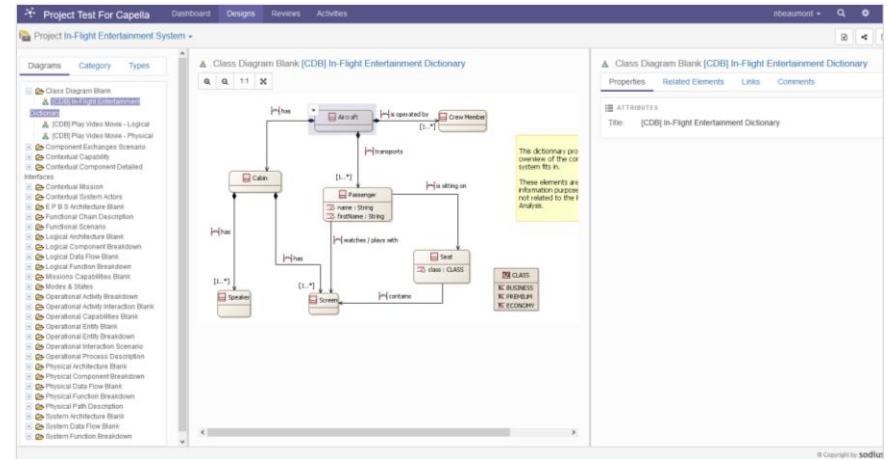
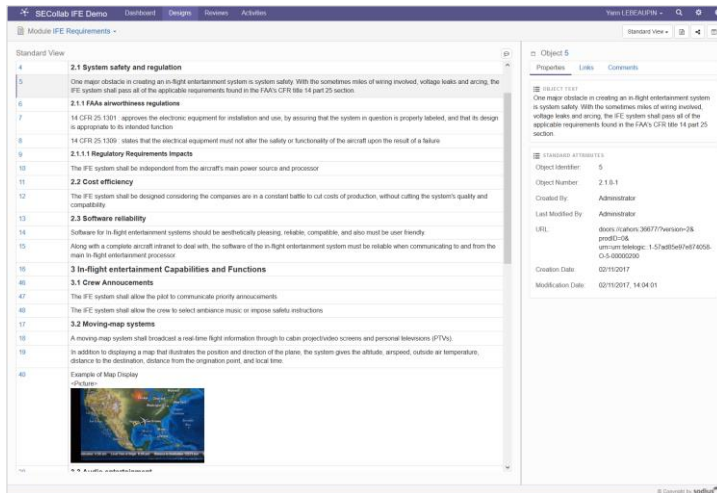


OSLC (Open Services for Lifecycle Collaboration)

- Web technologies
- Framework to *link* information between repositories
- Graph of relationships between artifacts
- Industry standard for describing assets

Projecting your Engineering Data

- Eliminating the boundaries to access and visualize your engineering data
- One (web) platform to access your Engineering data





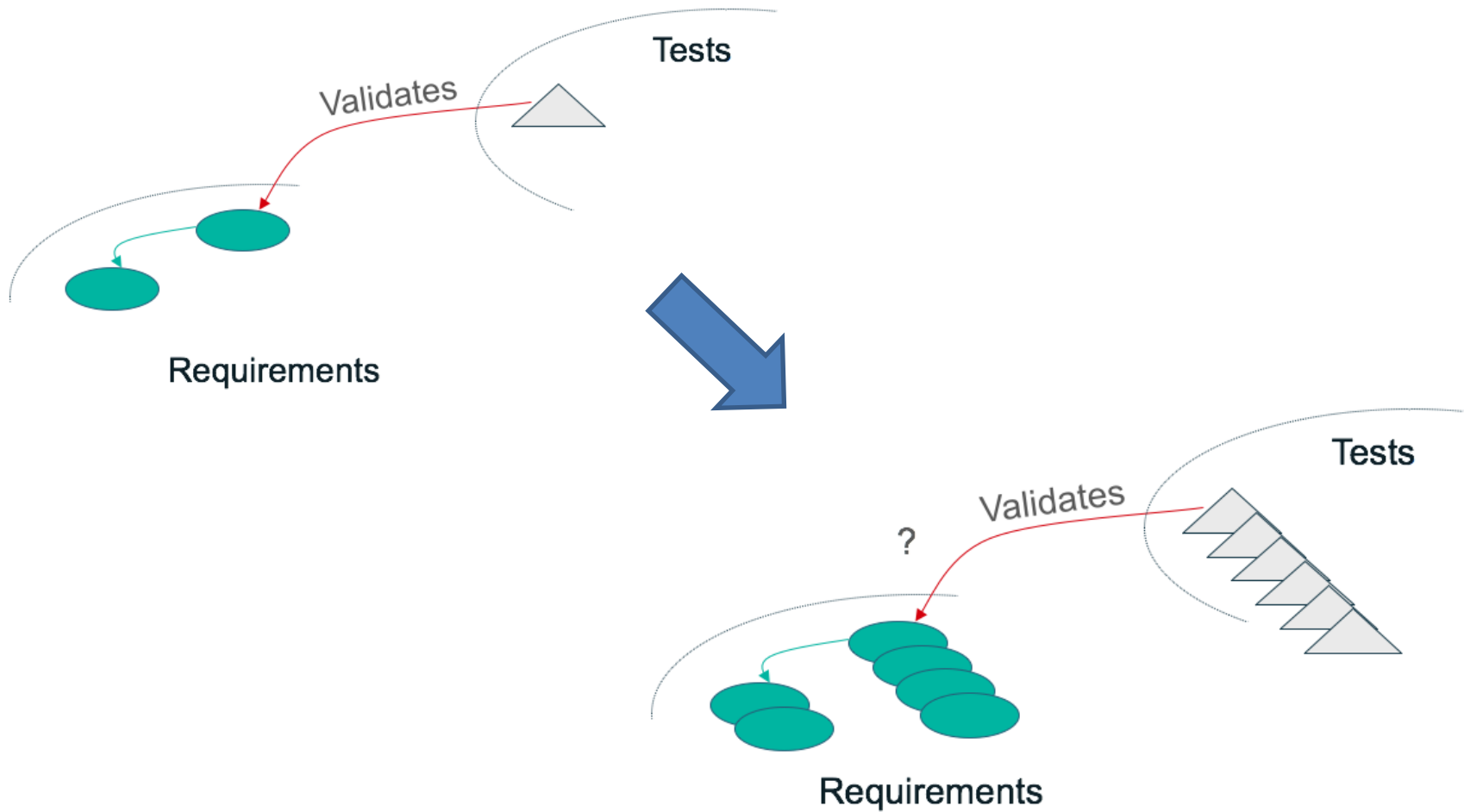
Configurations

Configurations – Context of Engineering

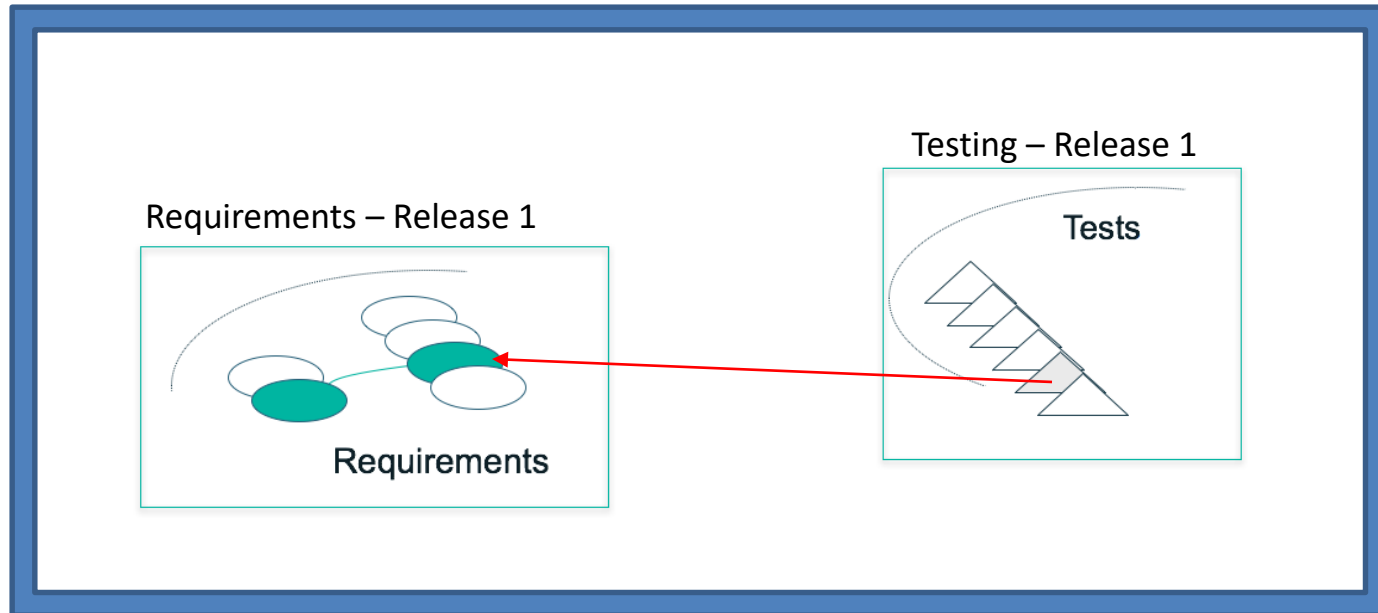
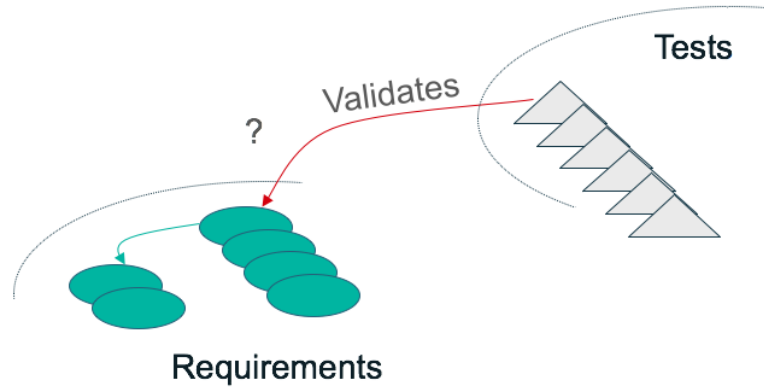
Context is imperative in an engineering process.

Context is required for reviewing engineering assets.

Linking with Versions



Simplistic View



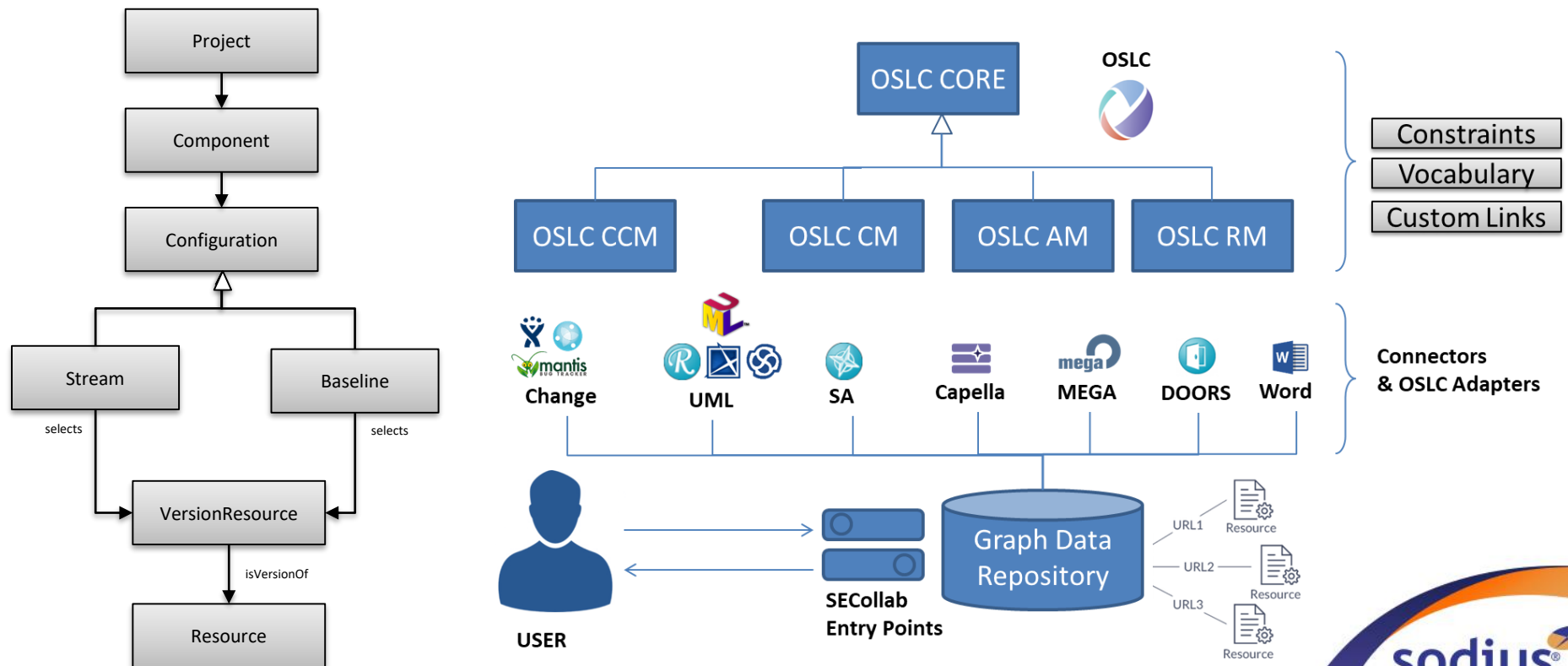
Release 1

Configurations in Practice

- Allow us to speak to a consistent set of artifacts
 - In a working state (as a stream)
 - In a static state (as a baseline)
 - As a collection across many domains
- Represent the common elements of the engineering process
 - Gate reviews
 - Releases

OSLC & Configuration Management

- A configuration management solution across the set of disconnected engineering tools to manage evolutions of each design artifact in relation to the overall project.
 - Instead of manually mapping and communicating individual artifact versions, the target is a common baseline linking together the individual design artifact versions and OSLC native support (Consumer & Provider).





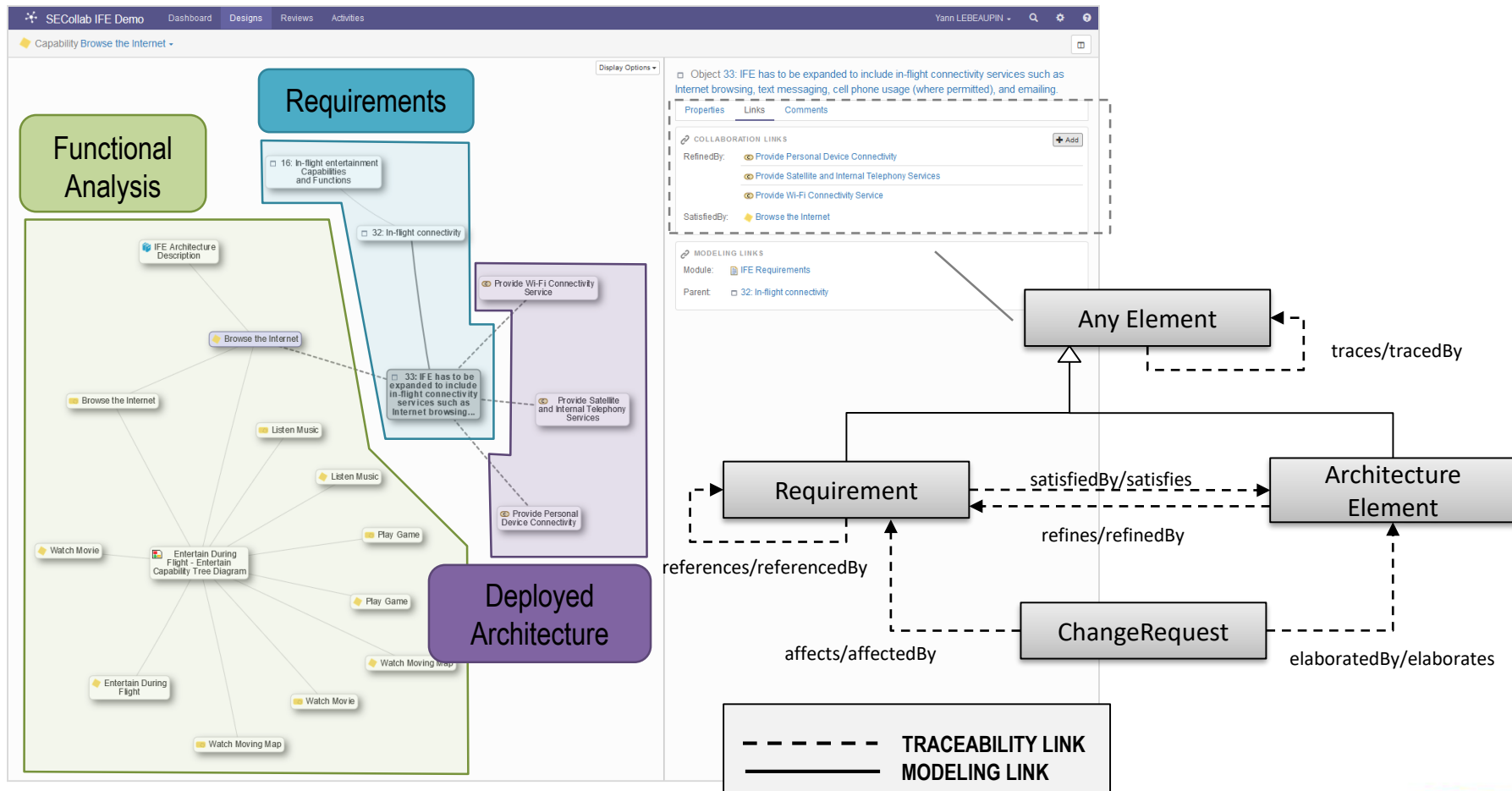
Trace @ Scale

Achieving Traceability

- Traceability shows
 - An impactful relationship between two objects
 - A role description
 - A need to assert consistency/validity across the relationship
- Traceability @ Scale means
 - Support for managing large numbers of relationships
 - Support for classifying allowable relationships
 - Support for navigating these relationships

Transversal Traceability

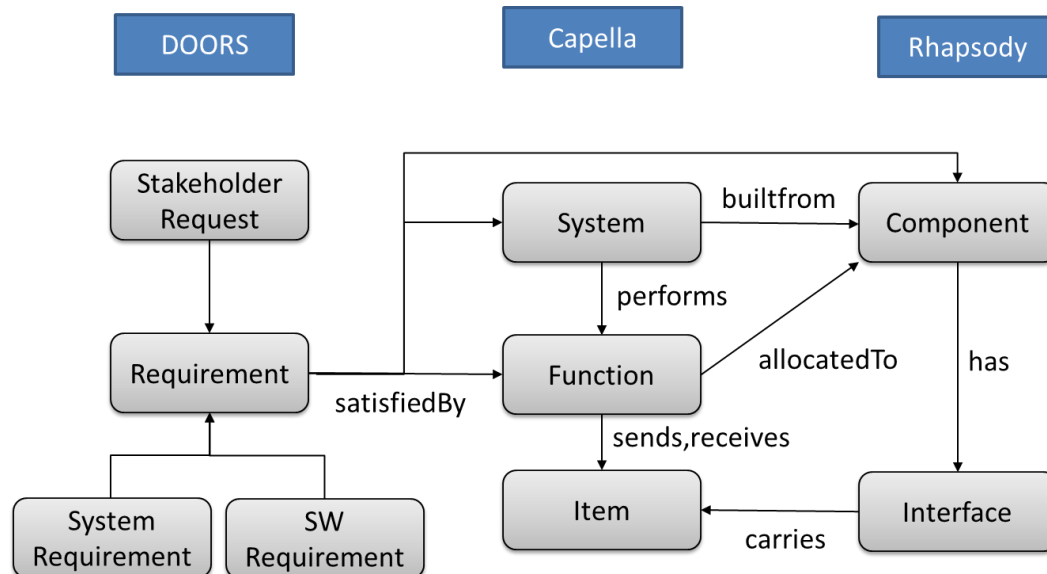
By using your semantics to describe the information coming from the engineering tools, any version of design or requirement element can be linked to any other element whether or not it is originated in the same application.



Our Traceability Model

- Evolutions of the traceability model to define a **transversal architecture model** above the various (and heterogenous) data coming from the published tools
 - Type will be define by an Alias Name and a filter request
 - Links will be constrained by those new Types
- For example, a **SystemRequirement** will be defined by :
 - Its generic type = Requirement (OSLC RM)
 - A constraint “**System Requirement Constraint**”
 - TOOL=DOORS
 - METATYPE=OBJECT
 - PROPERTY LIST
 - attrType = “ArchitectureRelevant”

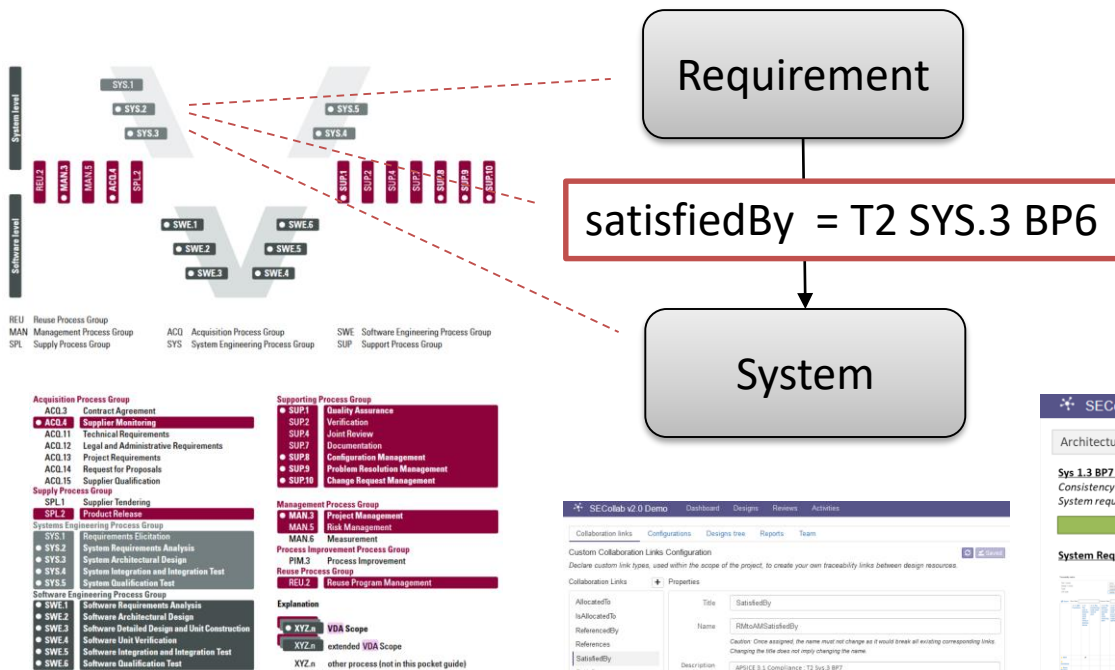
With this mechanism, a same data can be considered under several aspects (architecture, safety,etc...) and a single concept can match data coming from several tools



Custom Traceability Model

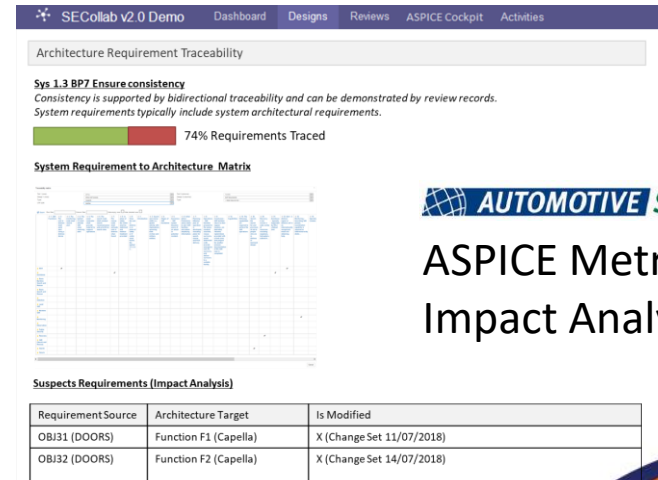
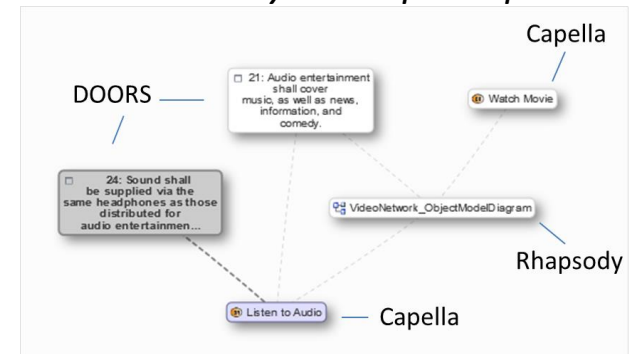
Application to Standards Traceability

- Once we have the traceability model, it will be possible to documents the link types to trace the Standard links



Compliance Standard

ASPICE Query in Graph Explorer

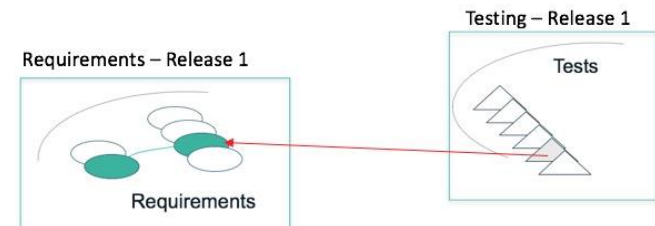
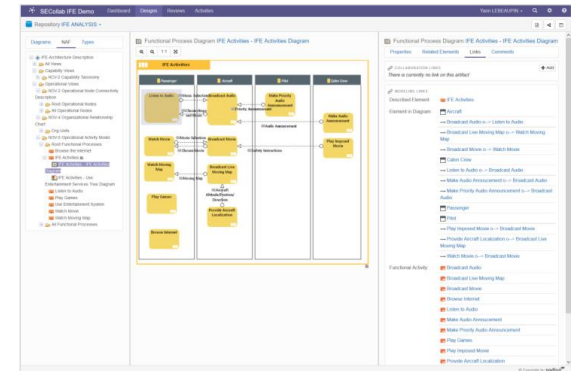


AUTOMOTIVE SPICE®

ASPICE Metrics and Impact Analysis

Performing Traceability @ Scale

- We need accessibility
 - Provide **visibility to assets**
 - See the project assets without special tooling
 - See attributes and diagrams
 - Enable **navigation of assets**
 - See the native relationships (modeling links)
 - See the cross domain relationships (transversal traceability links)
- We need configurations
 - Provides a **unified context**
 - Establish the working (or static) set of elements
 - Provide the selected versions of the assets in the configuration
 - Enables a **logical way to operate**
 - For engineers to assemble work
 - For configuration management to align work
 - While **enabling flow in each domain of work**
 - Managing their own assets
 - Setting their relationships
- We need supports
 - Provide the **relationship constraints**
 - Filter the sources and targets
 - Provide flexible identification
 - Provide the **reports & metrics**
 - Show compliance & coverage status
 - Show trends and progressions

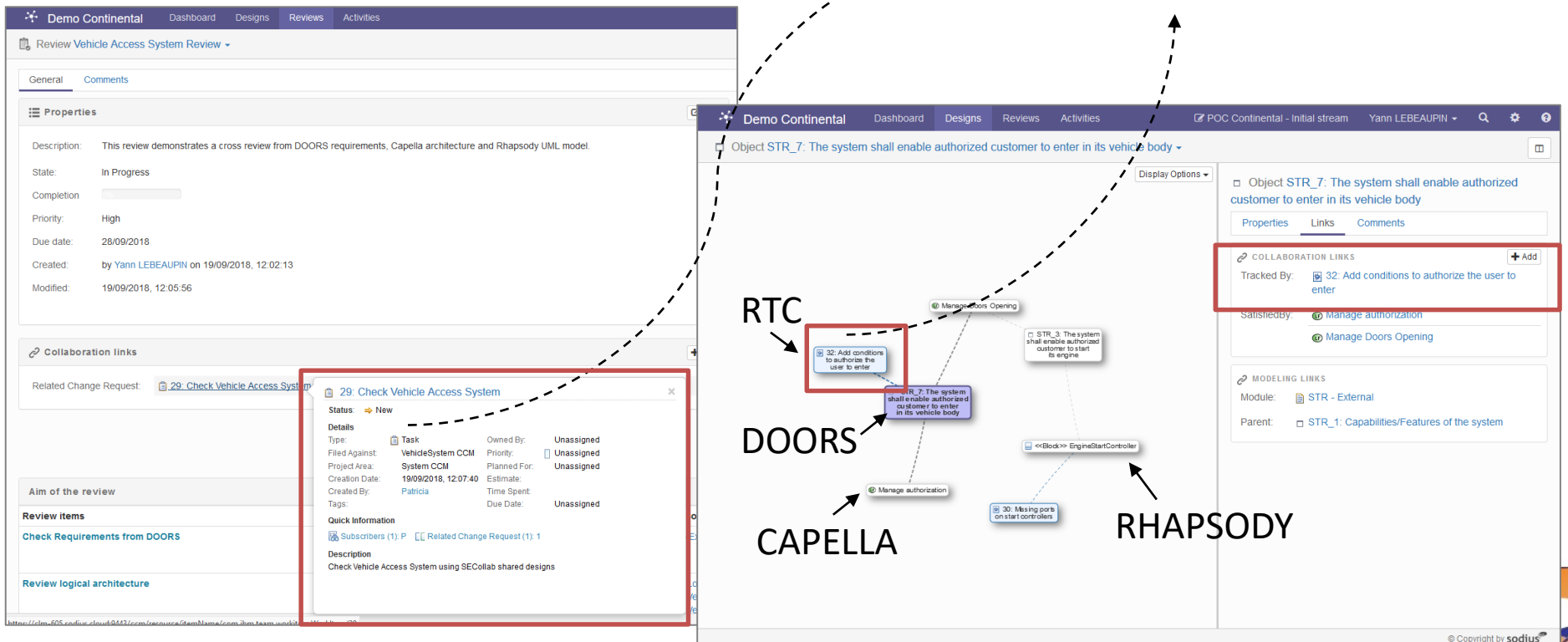




A Quick Review

Collaboration Links

- Collaboration links create connections to the change management workflow
 - Triggers to the modification of assets
 - Connections to the process flow (link back to Stages)
 - All driven by OSLC



Reviews

- Standards mandate
Review of assets
 - Must be done for a set of static assets
 - May span several tools
 - Require capturing findings
 - Must trigger actions
 - Must record results



Review & Comment Diagrams and resources

The **review manager** defines the review content with objectives, list of resources and contributors).

The screenshot displays the 'Review Manager' interface with the following structure:

- Aim of the review** (Header bar with '+ Add' and 'Sort' buttons)
- Review items** (Table with 4 columns: Review items, Completion, Review resources, Contributors)

Item 1: Check Capabilities

- Review items:** Check MEGA capabilities are linked to a DOORS Requirements
- Completion:** 27%
- Review resources:**
 - ☐ Browse the Internet
 - ☐ Entertain During Flight
 - ☒ IFE Capability
 - ☒ IFE Requirements
 - ☐ Impose Safety Instructions
 - ☐ Listen Music
 - ☐ Make Audio Announcement
 - ☒ Perform Flight On-Board Announcements
 - ☐ Play Game
 - ☐ Watch Movie
 - ☐ Watch Moving Map
- Contributors:** Yann LEBEAUPIN

Callout: Define Review Objectives (points to the 'Check Capabilities' row)

Callout: Define Contributors (points to the 'Contributors' column)

Item 2: Review preliminary operational analysis in MEGA and Capella design

- Review items:** Review MEGA operational activities with Capella detailed design
- Completion:** 0%
- Review resources:**
 - ☐ [OABD] All Activities
 - ☒ IFE Activities - Use Entertainment Services Tree Diagram
- Contributors:** François-Régis JAUNATRE, Sébastien BOUCARD

Item 3: Check Operational Capabilities

- Review items:** Capella Operational Capabilities have to be traced to MEGA analysis
- Completion:** 0%
- Review resources:**
 - ☒ Browse Internet
 - ☒ Entertain During Flight
 - ☒ Implement a Commercial Strategy
 - ☒ Listen to Audio
 - ☒ Make Audio Announcement
 - ☒ Make Priority Audio Announcement
 - ☒ Perform Flight On-Board Announcements
 - ☒ Play Games
 - ☒ Play Imposed Movie
 - ☒ Provide Aircraft Localization
 - ☒ Watch Movie
 - ☒ Watch Moving Map
- Contributors:** Sébastien BOUCARD

Callout: Define list of Resources (reading path of the review) (points to the 'Check Operational Capabilities' row)

Review & Comment Diagrams and resources

The **team** can **review a set of artifacts at once**, to ensure consistency across the team and across deliverables.

The screenshot displays the 'Demo SE-Collab' application interface. The top navigation bar includes 'Dashboard', 'Designs', 'Reviews', and 'Activities'. The main workspace is titled 'Operational Node Structure Diagram Monitoring Node'. On the left, a UML diagram is shown with a 'Monitoring Node' containing a ':Detection' node and a 'Tracking Service' node. A context menu is open over the 'Monitoring Node', offering options for 'Outline Weight', 'Outline Color', 'Background Color', and 'Delete'. On the right, the 'Comments' panel is active, showing a list of comments related to the 'Review SAR project' in progress. The comments are ordered by date, with the most recent at the top. An arrow points from the 'Background Color' option in the context menu to a comment by Valérie, and another arrow points from the 'Comments' panel to a comment by Yann.

Comments:

- 3. Valérie: Are the input contents are exhaustivly listed ?
Reply - Edit - Stop annotating - More - 15/12/2015 17:23:54 - edited
- 2. Sébastien: Tracking Service is emitted by Detection node
Reply - 15/12/2015 17:13:50
- 1. Yann: Monitoring Node has not output ports ?
Reply - 15/12/2015 17:03:42 - edited
- 1.1. Valérie: SAR Alert is emitted through "Tracking Services" message
Reply - Edit - More - 15/12/2015 17:22:37

Add **Graphical Annotations** on Diagrams

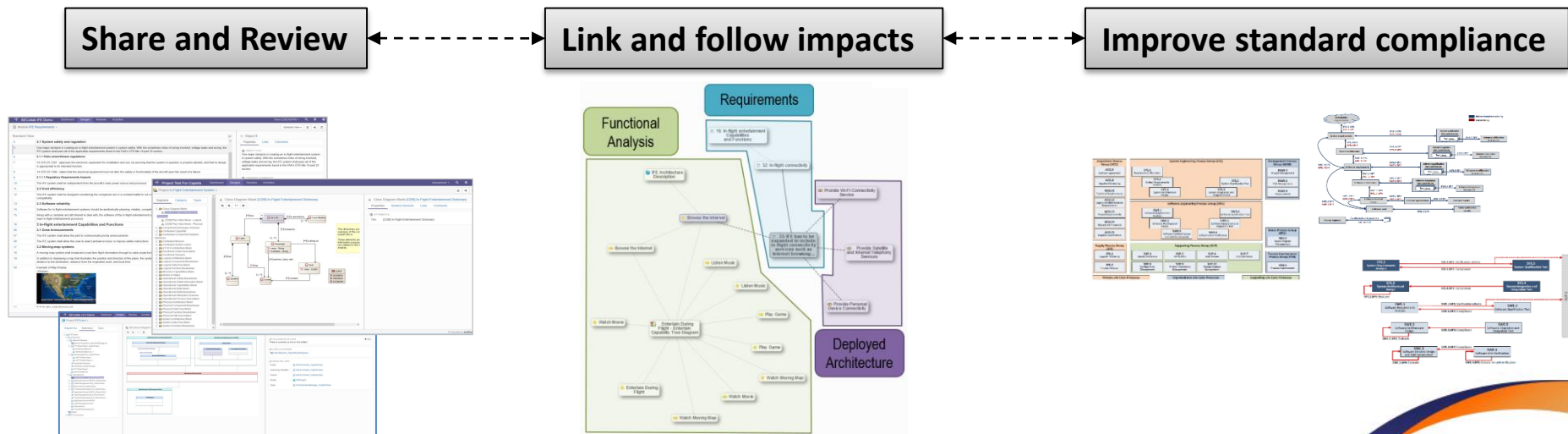
Comment in context with **Collaborative Discussions** on Design items



Final Thoughts

Value of Connected Engineering

- We want to link processes and data across teams to have in a **Connected Engineering** approach:
 - Using a **transversal configuration of connected engineering data** providing a **unified context** to engineering activities
 - And providing
 - **early detection of problems trough technical collaborative reviews**
 - **end-to-end traceability**
 - **help coordinating change processes**
 - **support for compliance processes**



Sodius Portfolio based on OSLC



RDF repository handling
multi-model workspaces



Traceability and linking
capabilities



Reviews across
heterogeneous data



Extensible set of tool
connectors



ALM/PLM Corporate
Repository Interfaces





Contact us

To get more information about our
automation & interoperability solutions...

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Robert Baillargeon

rbailargeon@sodius.com

