PROSTEP
integrate the future

OSLC MBSE INTEGRATION

Successfully Integrating MBSE Data Using OSLC

April 2018, Schouten

Agenda

- About PROSTEP
- MBSE Integration Needs and Challenges
- What is OSLC and What Can it Do?
- Connecting PLM, ALM, SDM with OSLC
- Implemented Customer Solutions

Company Overview

A vendor neutral / independent engineering services and software company since 1993

OPENPDM® OPENDESC.COM® OPENDXM® GLOBAL X 3D PDF Pro PDF GENERATOR 3D

Over 24 years experience

with engineering interoperability, migration, intelligent documents, benchmarking, more

Approximately 250 employees and consultants

based from international locations throughout Europe and in North America

More than 500 Customers

that are leading companies across most industries

Shareholders

BOSCH Continental DAIMLER DELPHI OPEL SIEMENS Volkswagen ProSTEP iViP

infocenter@prostep.com / 8-PROSTEP01

PROSTEP - 100% PLM

Consulting and Solution Portfolio

Strategy	Concepts & Solution Architecture	Implementation of IT & Process	
PLM Implementation Strategy	**PLM Architecture & Processes** Benchmark & ROI-Analysis PLM Landscape & Complexity Management Product Structure and Variant Management	**PLM Migration & Integration** OPENPDM® OPENDXM® GLOBAL	– PLM System Selection – PLM Implementation – PLM Process Optimization
PLM for Digital Transformation	**PLM for IoT/I 4.0 Solutions** Digital Master / Digital Twin	**PLM Realization and Roll-out** Bill of Material & Change Management Variant & Configuration Management Digital Master / Digital Twin	– Digitalization – Industry 4.0 – IoT
	Model Based Enterprise 3D Master / Systems-Engineering	**Technical Data Package** Paper-less Processes 3D PDF	
PLM for Collaboration	**Cross-company PLM** PLM for Merger & Acquisitions PLM for Joint Ventures Partner & Supply Chain Integration	**PLM Collaboration** Automated PLM Data Supply PDM & CAx Data Exchange OPENPDM® OPENDXM® GLOBAL	– Merger & Acquisitions – Joint Venture – Project Consortia

PROSTEP Technology Partners

PROSTEP

Adobe
Altair
ANSYS
aras corp
AUTODESK
CONTACT SOFTWARE
CORETECHNOLOGIE
DASSAULT SYSTEMES
ESTECO
IBM
ILC
MSC SOFTWARE
ORACLE
PTC
SAP
SIEMENS PLM SOFTWARE SIEMENS
TECHSOFT 3D
T-Systems

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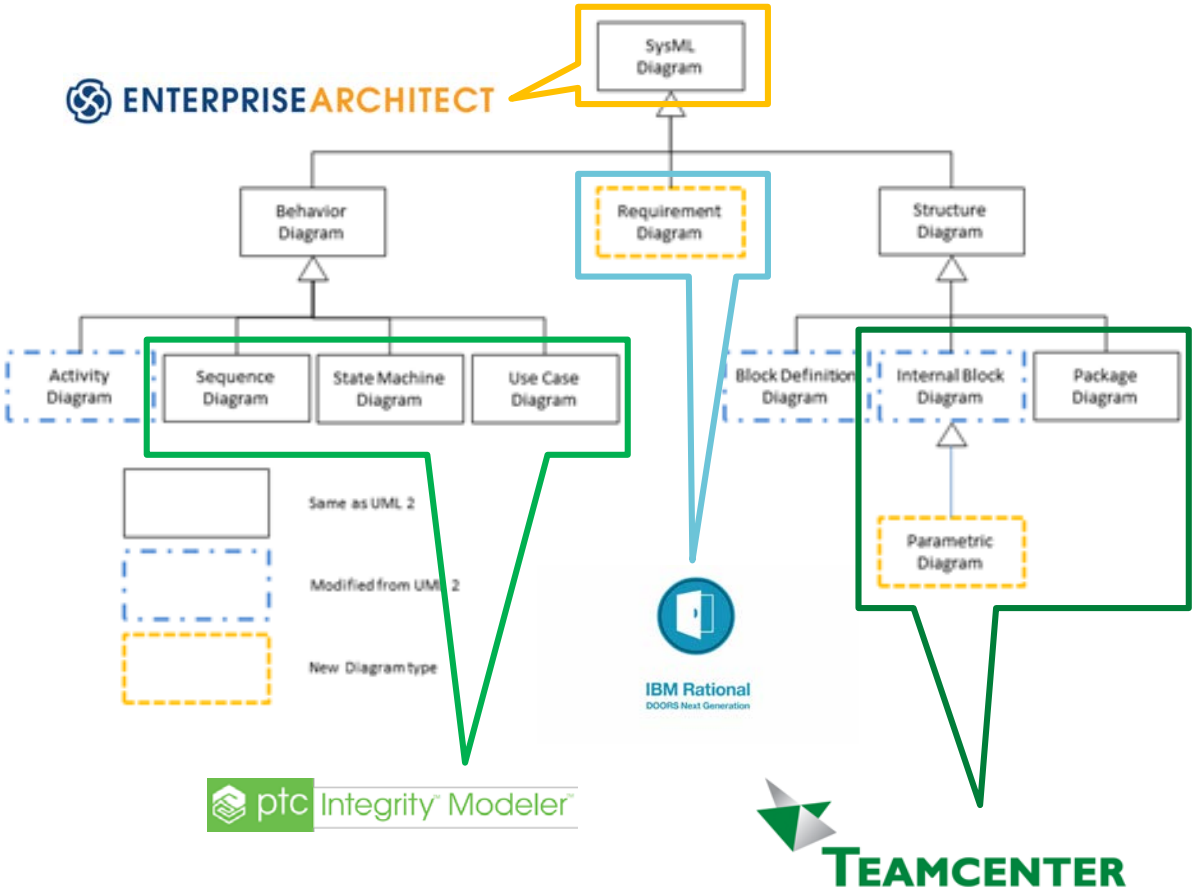
Concept Meets Reality

Enabling MBSE

- Data is mastered in multiple sources
- One solution is not desired or preferable
- MBSE needs the impact of system changes across multiple sources
- The manual maintenance of traceability is a huge time investment in the process.
- Integration is the solution to providing complete and comprehensive information



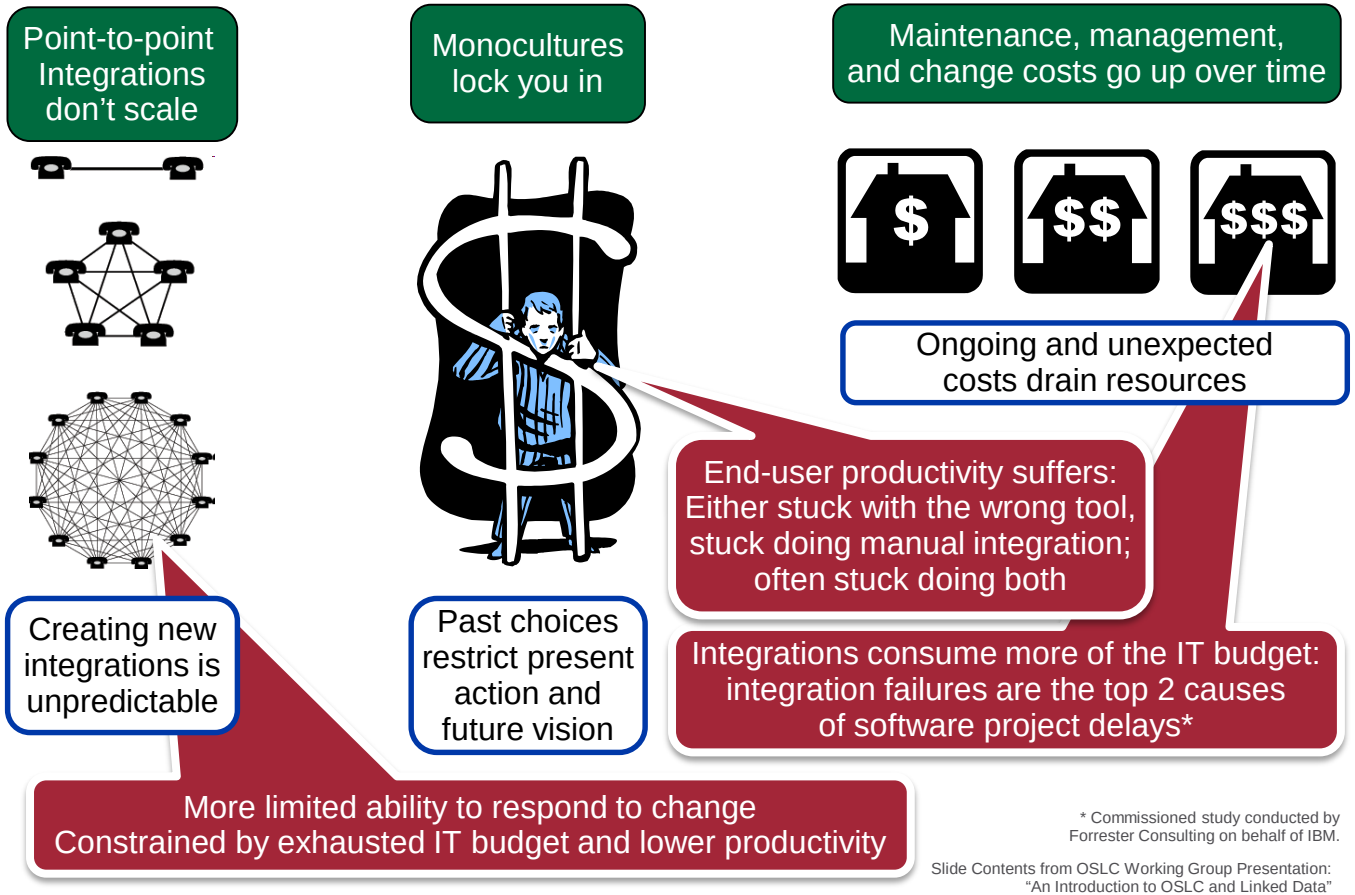
Integration Solves a Lot of Challenges

A Business Case

- Efficiency from Modern Engineering Practices
  - Traceability in Systems Engineering (MBSE)
  - Configuration Lifecycle Management
  - Digital Twin / Digital Thread / Digital Master
- Manual integration of data can be quantified by the operation of synchronization
  - Speed that the data is available
  - Time the manual process takes for the data to be synchronized
  - Accuracy of the duplicated data and costs of failures (wrong production revision?)
- Elimination of software licenses for integrated systems
  - Data is available in the primary system of that user and additional license not needed
  - Duplicate functionality only needs to be utilized in one system
  - Integration can enable migration and eliminate other system entirely
- Consolidation, Quality, Training, Maintenance, Support and Knowledge
  - Less utilization of different systems means less overhead

Integration Comes With Challenges

- **Point-to-point solutions** do not scale and typically become unmanageable
- **Full centralization** is neither feasible nor desirable
- **Data Duplication** comes with data model compatibility issues, data mastery issues and synchronization processing time.
- **Remastering** data means duplication.
- **MBSE only requires reference** not data mastery!



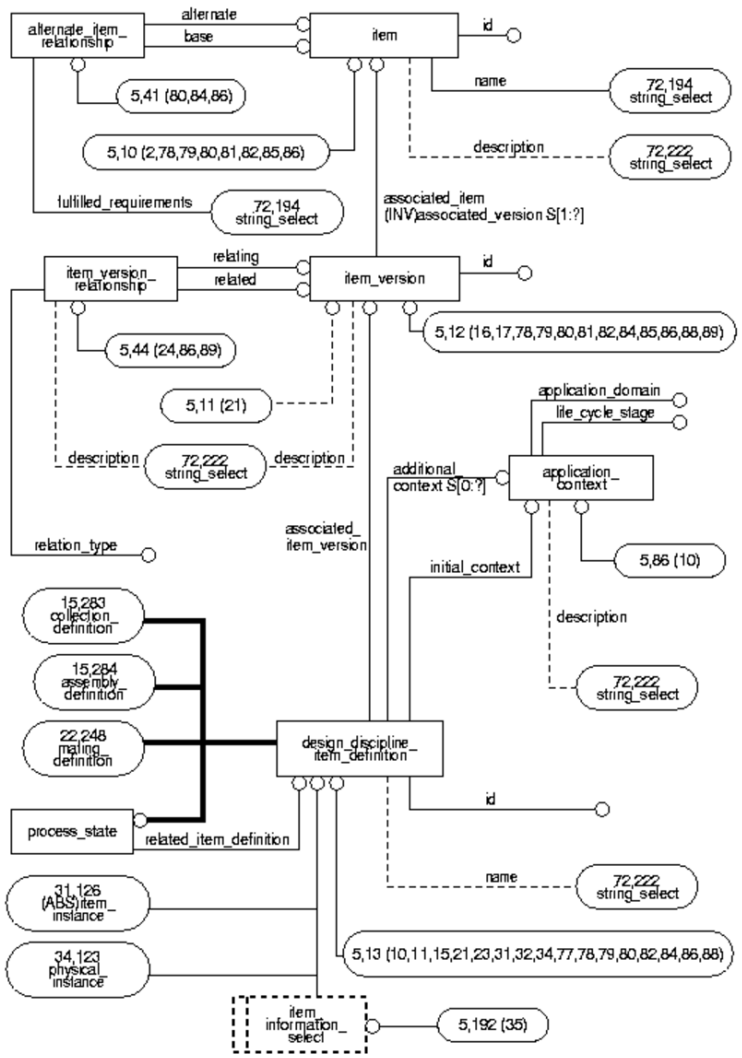
* Commissioned study conducted by Forrester Consulting on behalf of IBM.

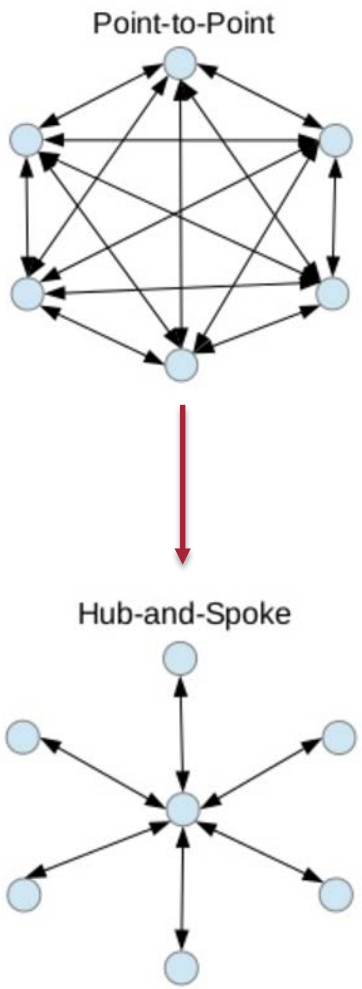
Slide Contents from OSLC Working Group Presentation: "An Introduction to OSLC and Linked Data"

Standards Enable Integration at a Cost

Hub-and-Spoke vs Point-to-Point

- **Point-to-Point Integration** at MBSE scale **is unmaintainable**
- Standards are introduced to have a "**neutral format**" to read from and write to
- Many need to **pre-define all semantics beforehand** in a **closed world approach** (like STEP 10303 AP 214)
- **Traditional standards** everything is known ahead of time.
- **OSLC** allows for a standard **simplified** interface (mix of both)





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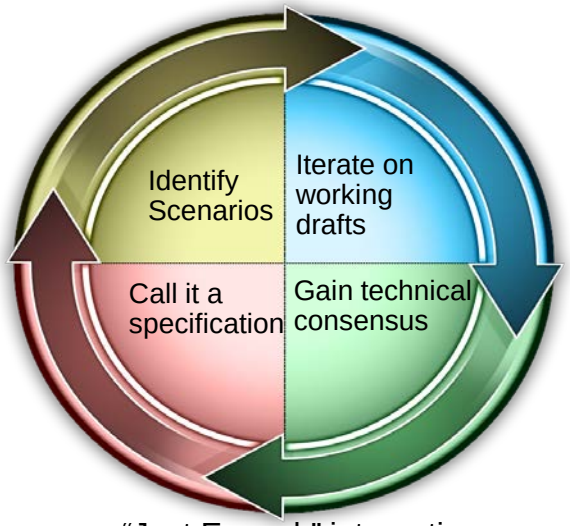
Model the Internet for “Just Enough” Integration

OSLC

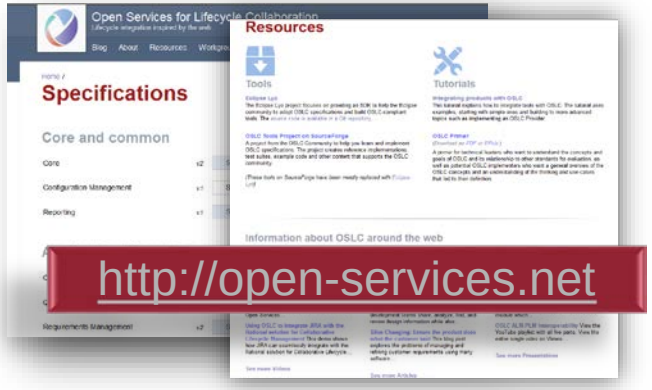
- Open Services for Livecycle Collaboration
- Open Standard, Open Community
- Proposed by IBM et. al. in 2008
- Motivated by Rational Team Concert (RTC)
- Data is stored at single location and simply linked. No replication!
- Emerging standard for Tool integrations in ALM domain
- Loosely Coupled
- Semantic Web Linked Data
- Based on Architecture of Web – HTTP, RDF

- RDF (Resource Description Framework)
- JSON / XML for transfer
- REST Service for requests
- OAuth for authorisation
- UI Integration

- Slim Data model
  - Granular to one attribute at a time
- Enhanced Data models available for Change- and Document Management
- Easy to define your own data types



“Just Enough” integration



Slide Contents from OSLC Working Group Presentation:
“An Introduction to OSLC and Linked Data”

OSLC Linked Data Solution

OSLC's Simple Solution

Architecture of the Web

Standard Interfaces

Linked Data

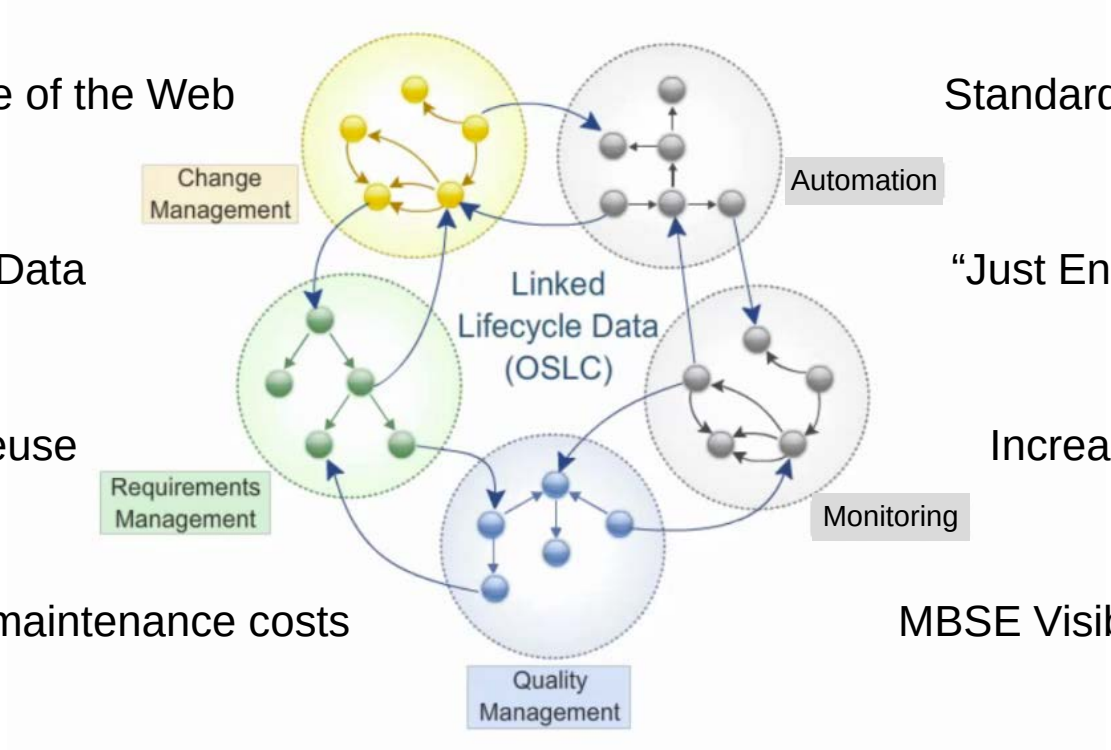
"Just Enough" integration

Increased reuse

Increased traceability

Decreased maintenance costs

MBSE Visibility



OSLC is an <u>open</u> and <u>scalable</u> approach to lifecycle integration.
It <u>simplifies</u> key integration scenarios across <u>heterogeneous</u> tools

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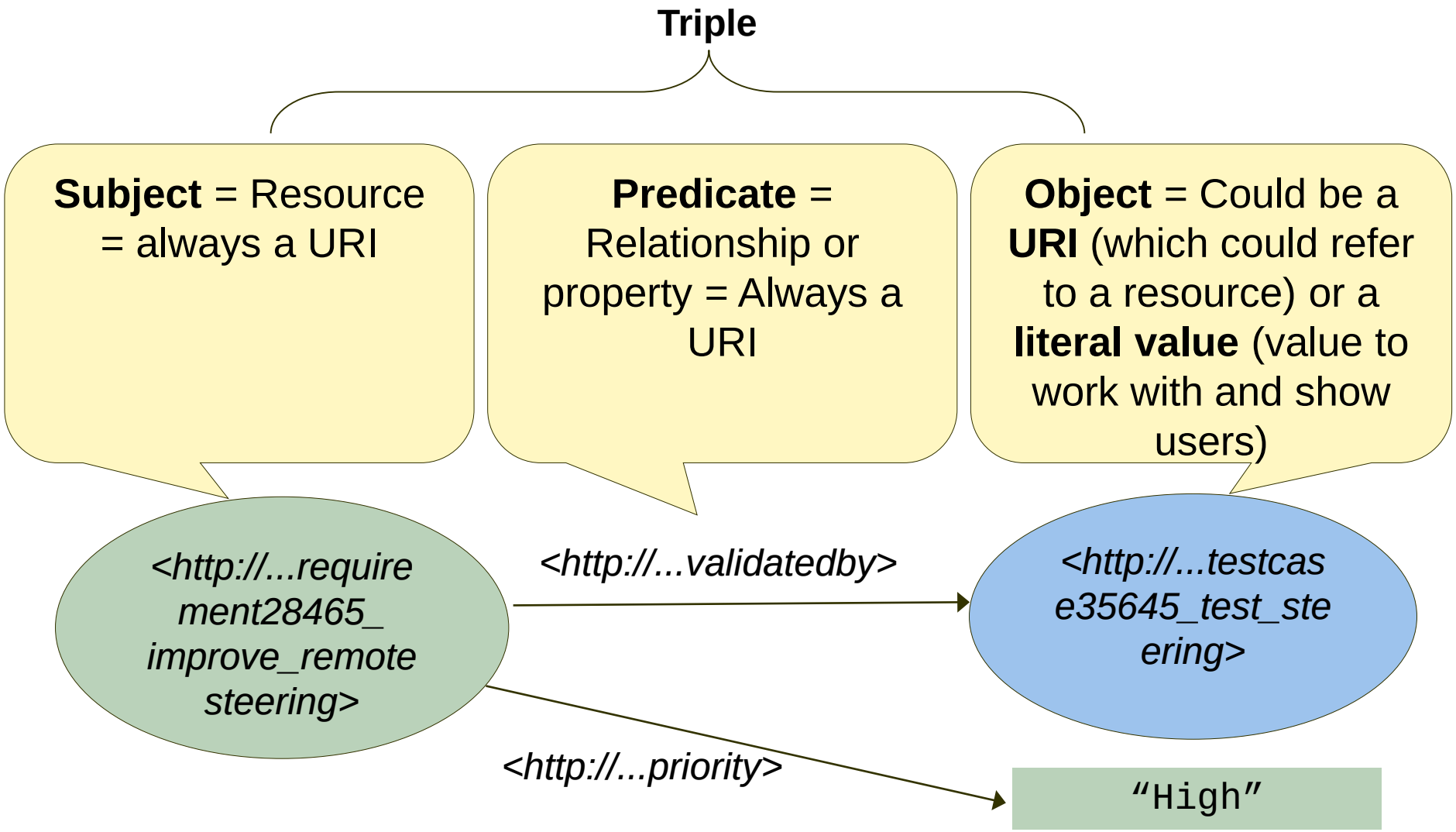
Everything is Represented as an RDF Triple

Subject – Predicate - Object



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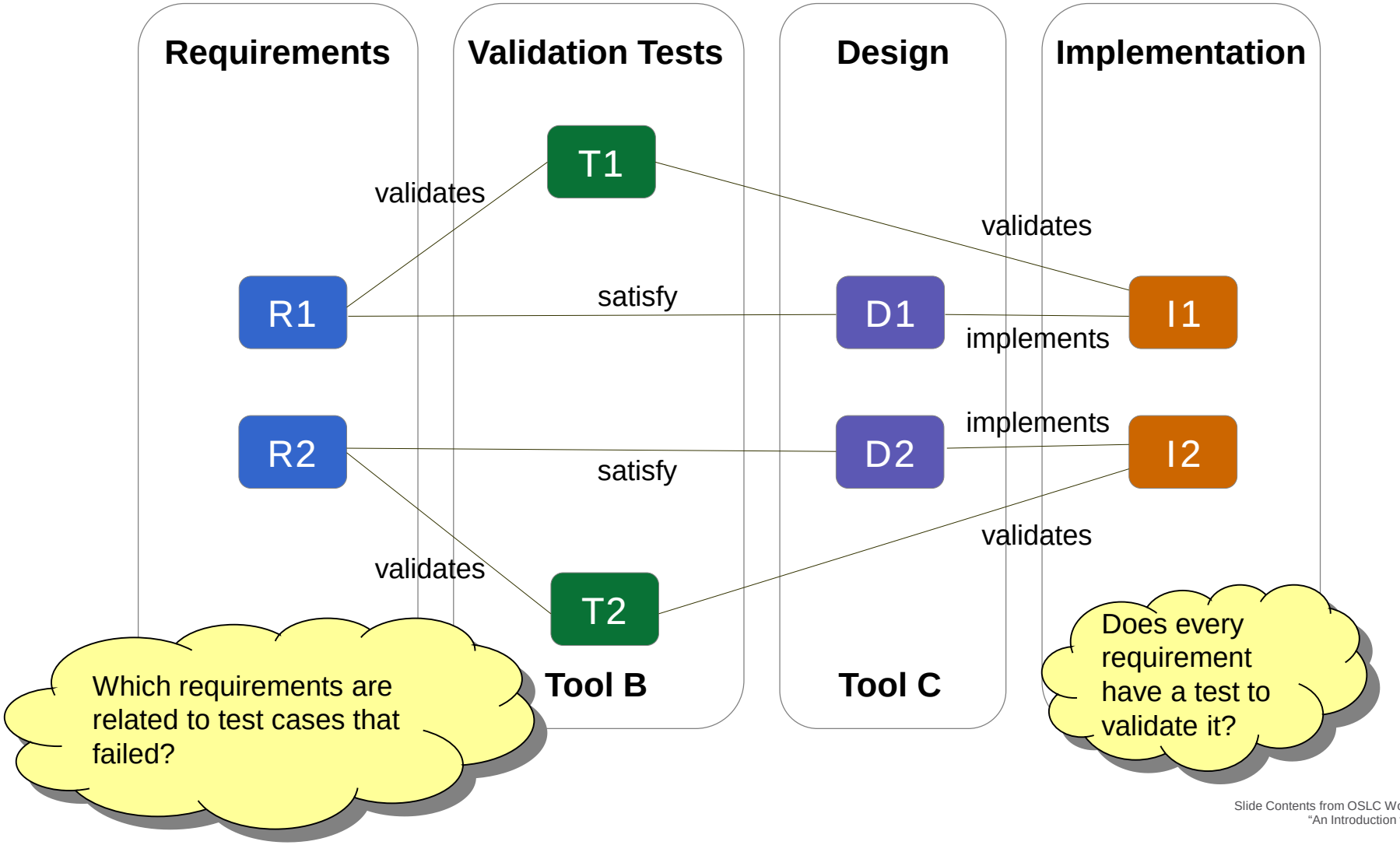
Use Actual Data for MBSE, Not Just Words

Integrating Data in Different Silos



Slide Contents from OSLC Working Group Presentation:
"An Introduction to OSLC and Linked Data"

How Does OSLC Work?

1. Discovery of capabilities

2. HTTP C.R.U.D. for resources

3. Standard resource representations

4. Querying for resources

5. Delegated UI for Create and Select

6. UI Previews for Resource Links

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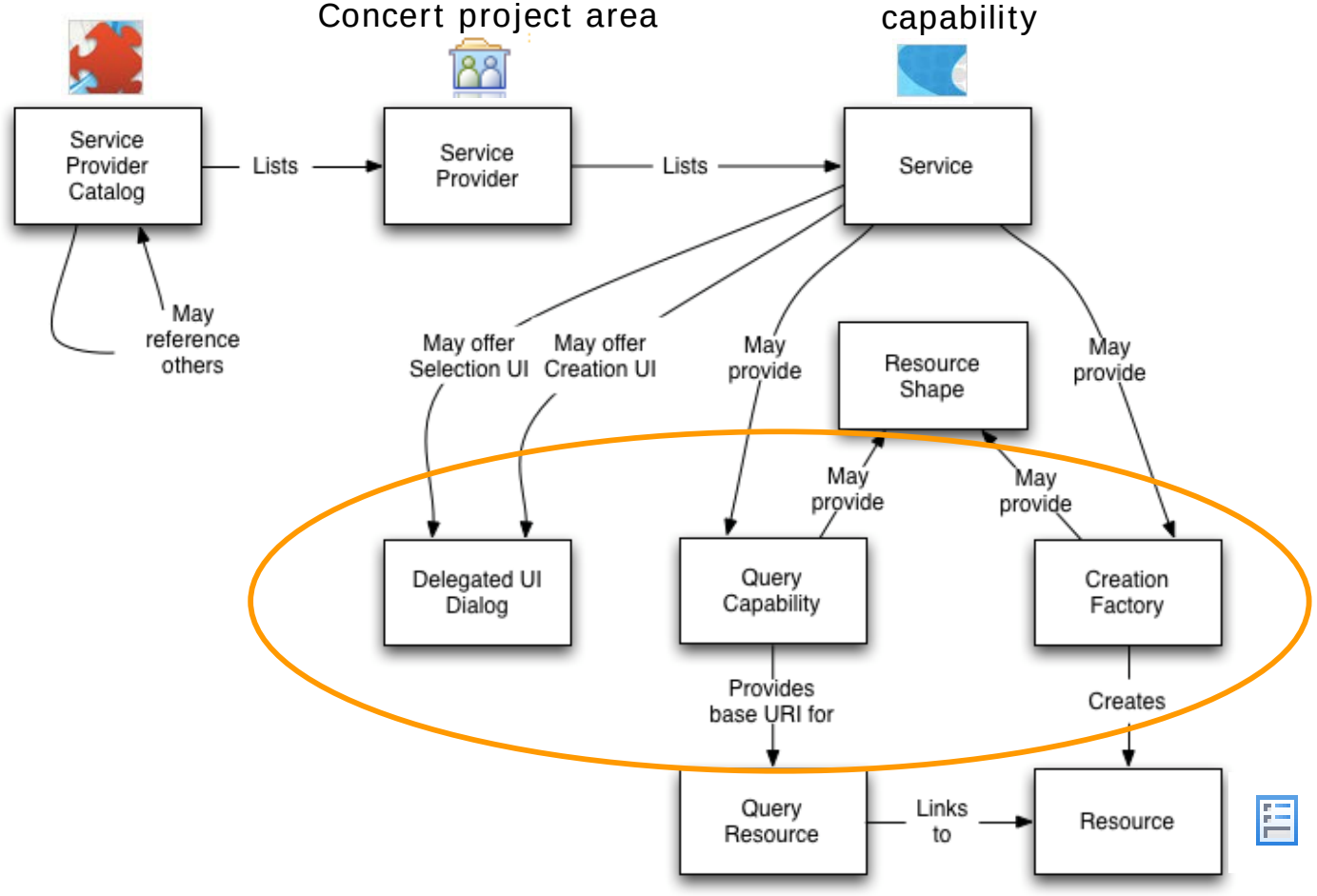
1. Discovery of Capabilities

example: IBM Rational Team Concert

example: IBM Rational Team Concert project area

example: Change Management capability



example: work item (bug, defect, enhancement request)

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2. HTTP CRUD for Resources

- OSLC allows manipulation of resources using standard HTTP C.R.U.D

	HTTP	SQL
Create	= POST	= INSERT
Request	= GET	= SELECT
Update	= PUT	= UPDATE
Delete	= DELETE	= DELETE

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3. Standard Resource Representations

```
<http://example.com/TestCases/1> a oslc_qm:TestCase ;
        oslc_qm:validatesRequirement <http://example.com/Requirements/1>
```

Turtle

```
{
        "rdf:about": "http:\/\/example.com\/TestCases\/1",
        "rdf:type": [ {
                "rdf:resource": "http:\/\/open-services.net\/ns\/qm#TestPlan"
        } ],
        "oslc_qm:validatesRequirement": {
                "rdf:resource": "http:\/\/example.com\/Requirements\/1"
        }
```

JSON

```
<oslc_qm:TestCase rdf:about="http://example.com/TestCases/1">
        <oslc_qm:validatesRequirement rdf:resource="http://example.com/Requirements/1"/>
</oslc_qm:TestCase>
```

RDF/XML

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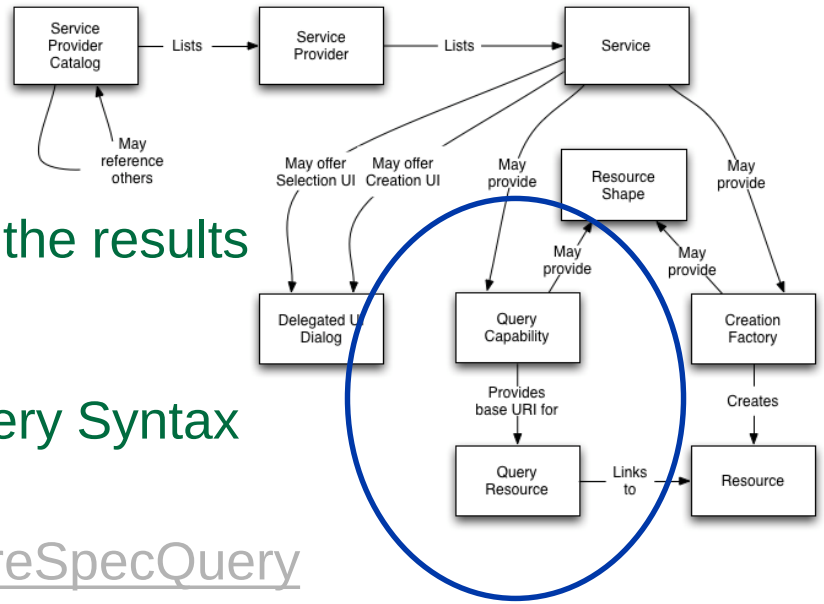
4. Query for Representations

- Query capability has base URI
- Clients form query URI and HTTP GET the results
- OSLC services MAY support OSLC Query Syntax
  - » http://open-services.net/bin/view/Main/OSLCCoreSpecQuery




```
http://example.com/bugs?oslc.where=
  cm:severity="high" and dcterms:created>"2017-04-01"
```

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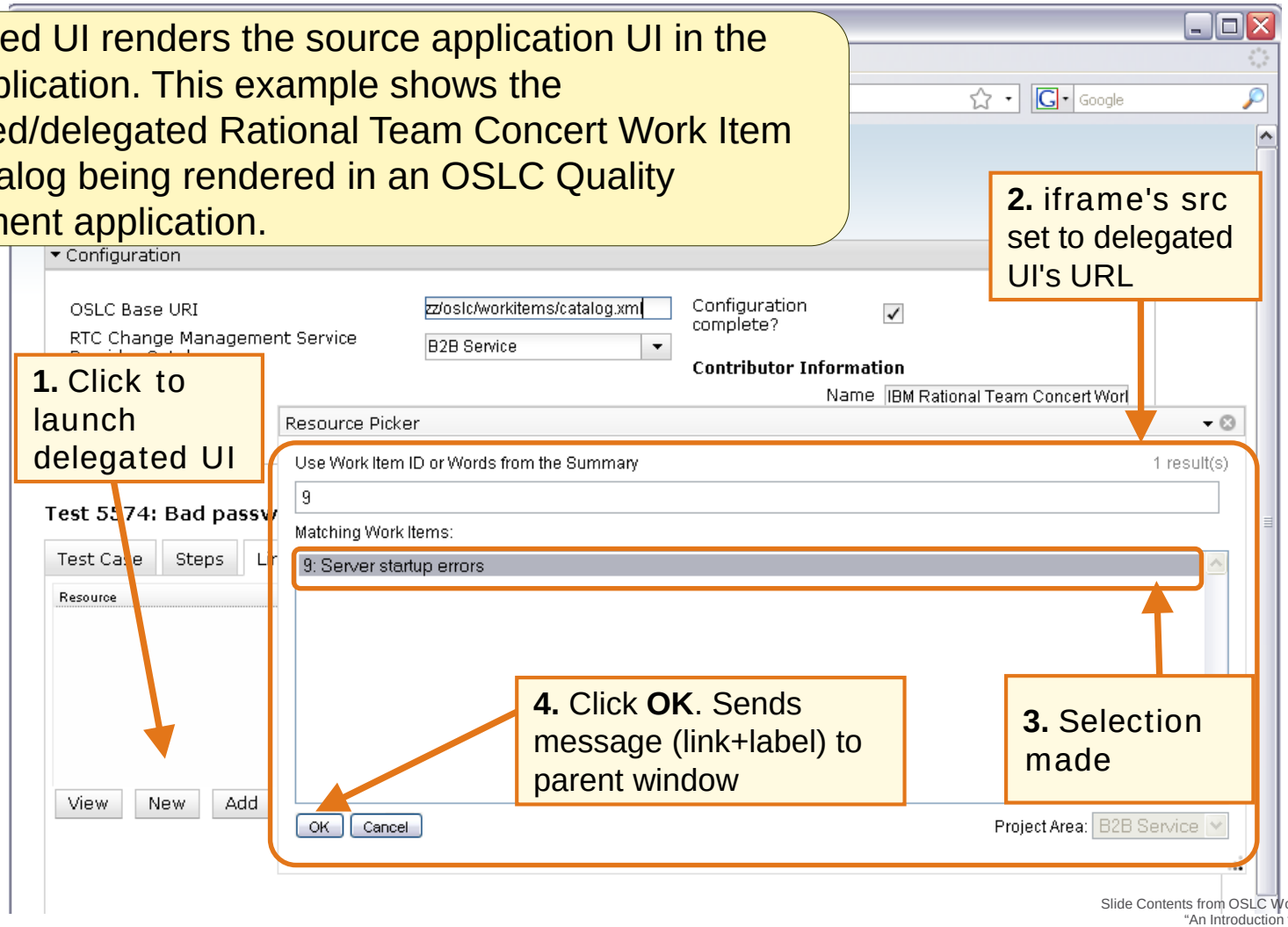
5. Delegated UI for Create or Select

A delegated UI renders the source application UI in the target application. This example shows the contributed/delegated Rational Team Concert Work Item search dialog being rendered in an OSLC Quality Management application.



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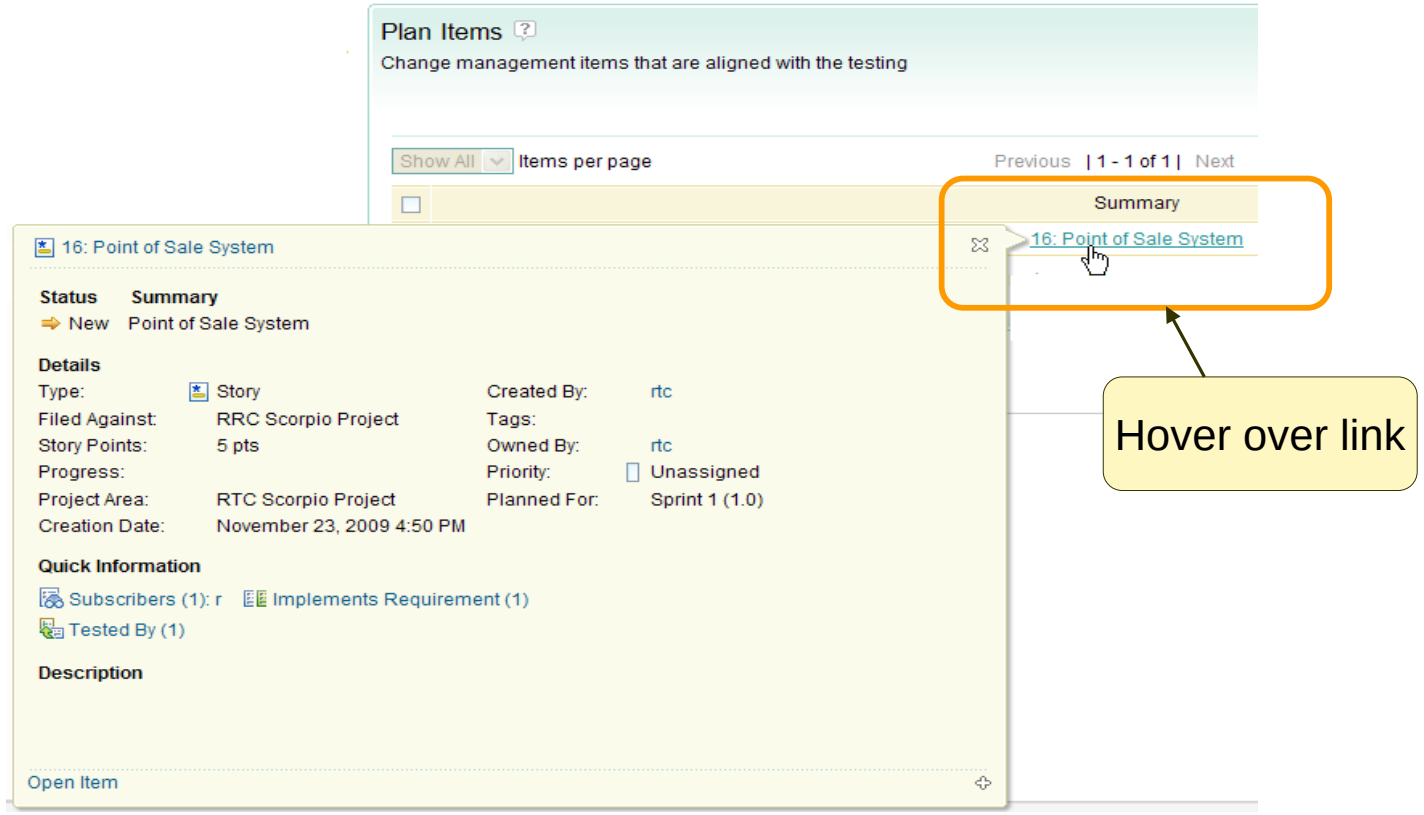
6. UI Previews for Resource Links



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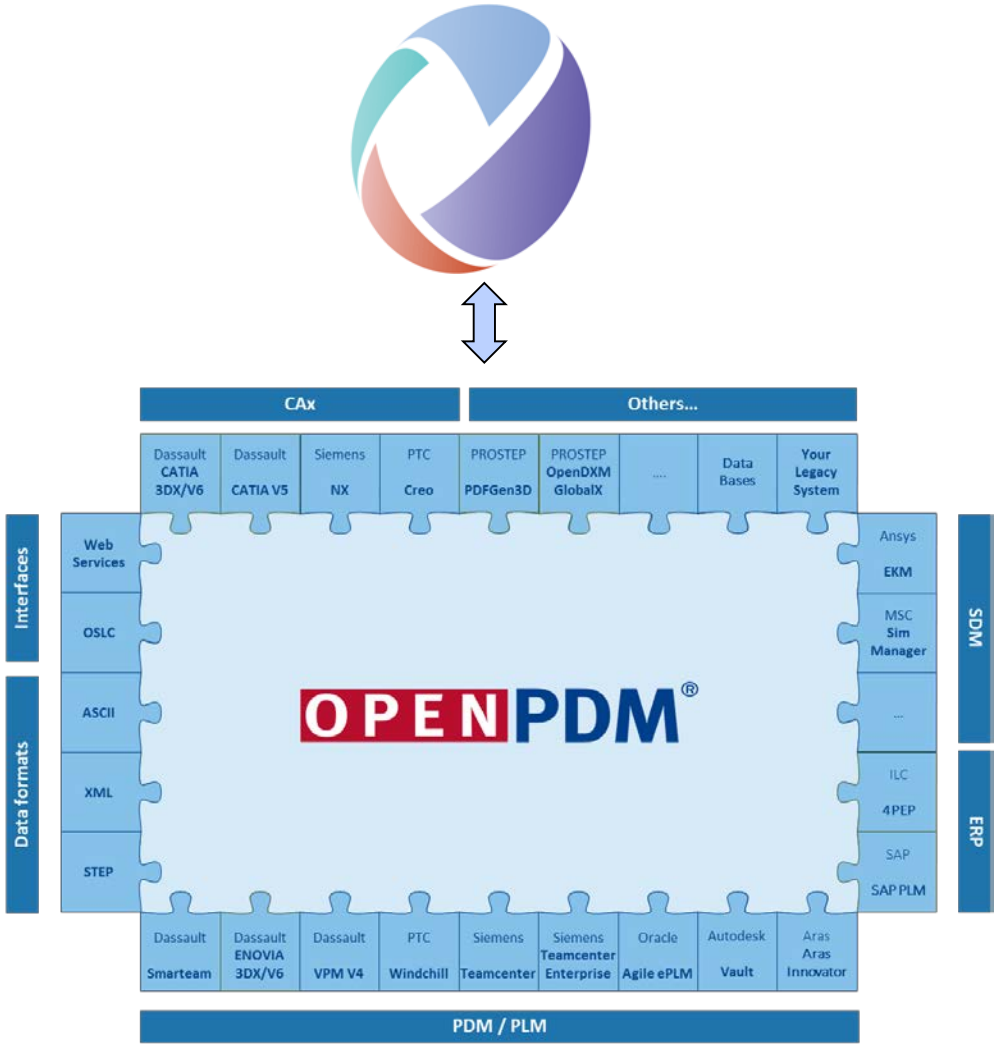
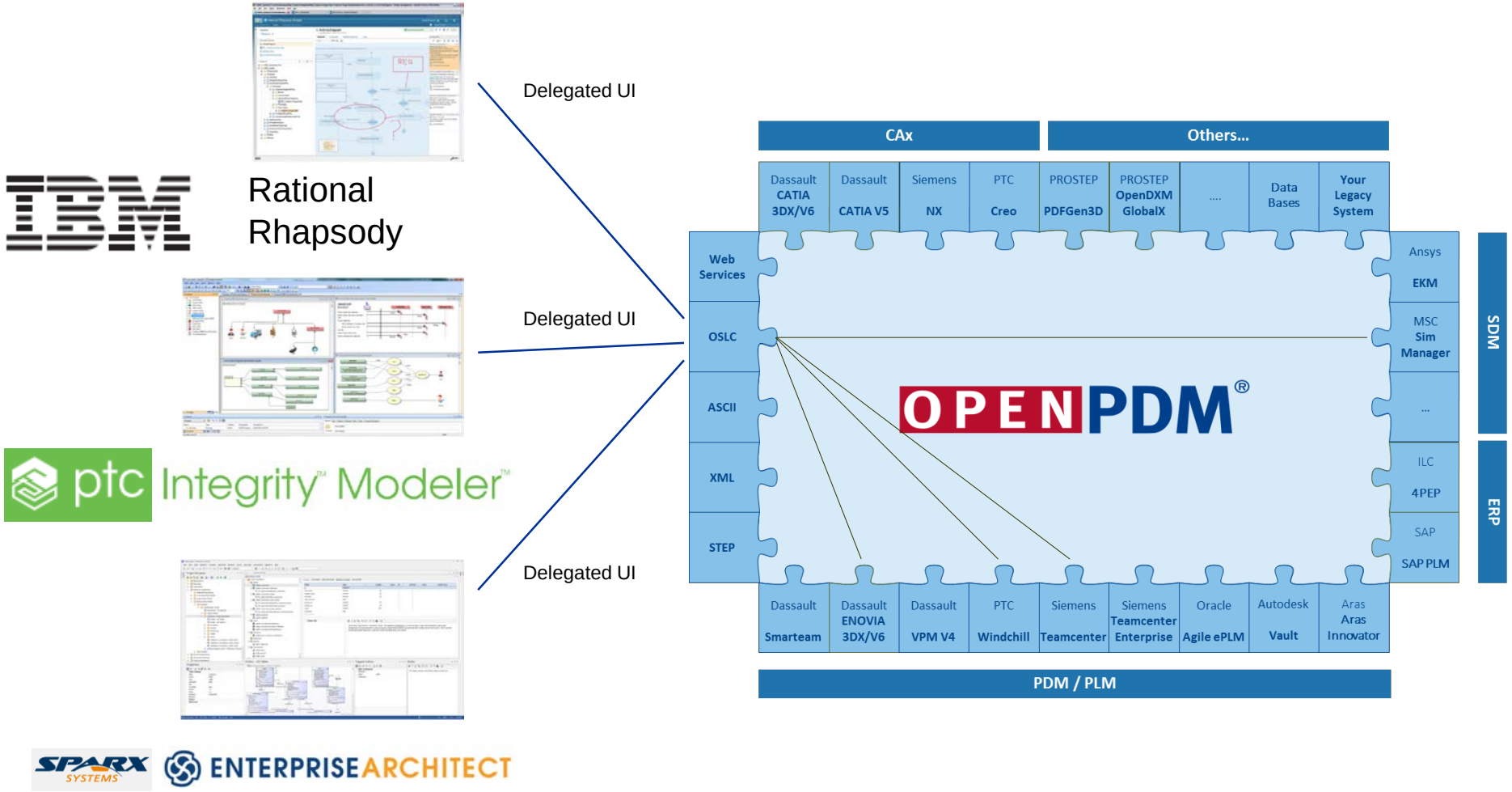
How Can I Leverage OSLC for MBSE?

- OSLC UI integration is OOTB for many ALM and MBSE solutions
  - Enterprise Architect Pro Cloud Server
  - IBM Rational Rhapsody (and all of RTC)
  - PTC Integrity Modeler
  - PROSTEP OpenCLM (The Future!)
- OpenPDM offers OOTB Connectors for all types of systems
- Low complexity Standards Based COTS solution
  - Install connectors
  - Generate the mappings
  - Data is federated to your MBSE system



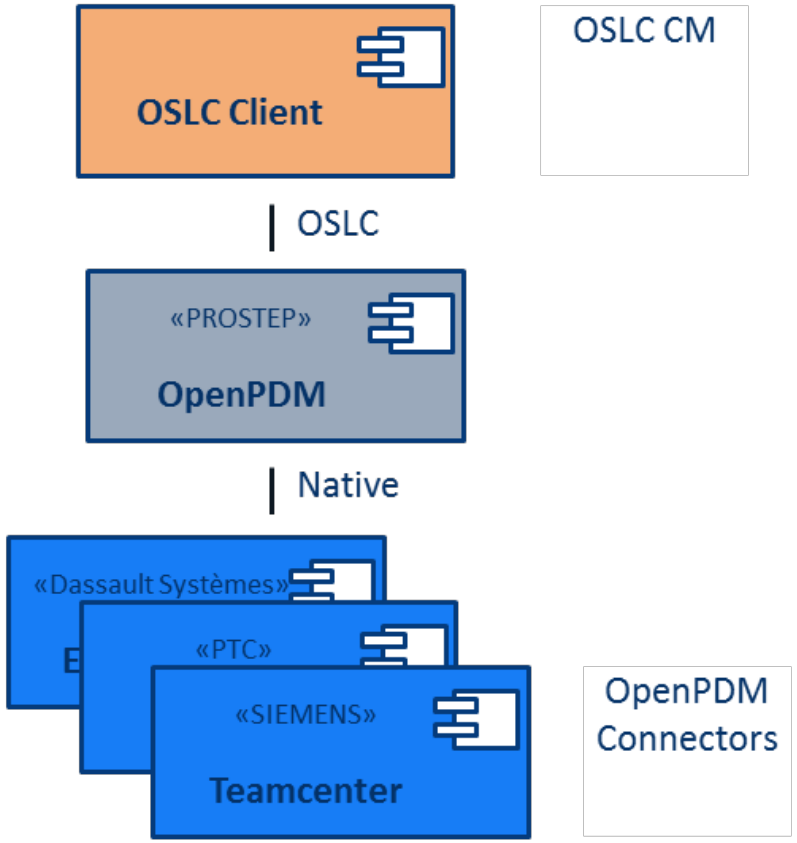
MBSE Integration Utilizing OSLC with OpenPDM



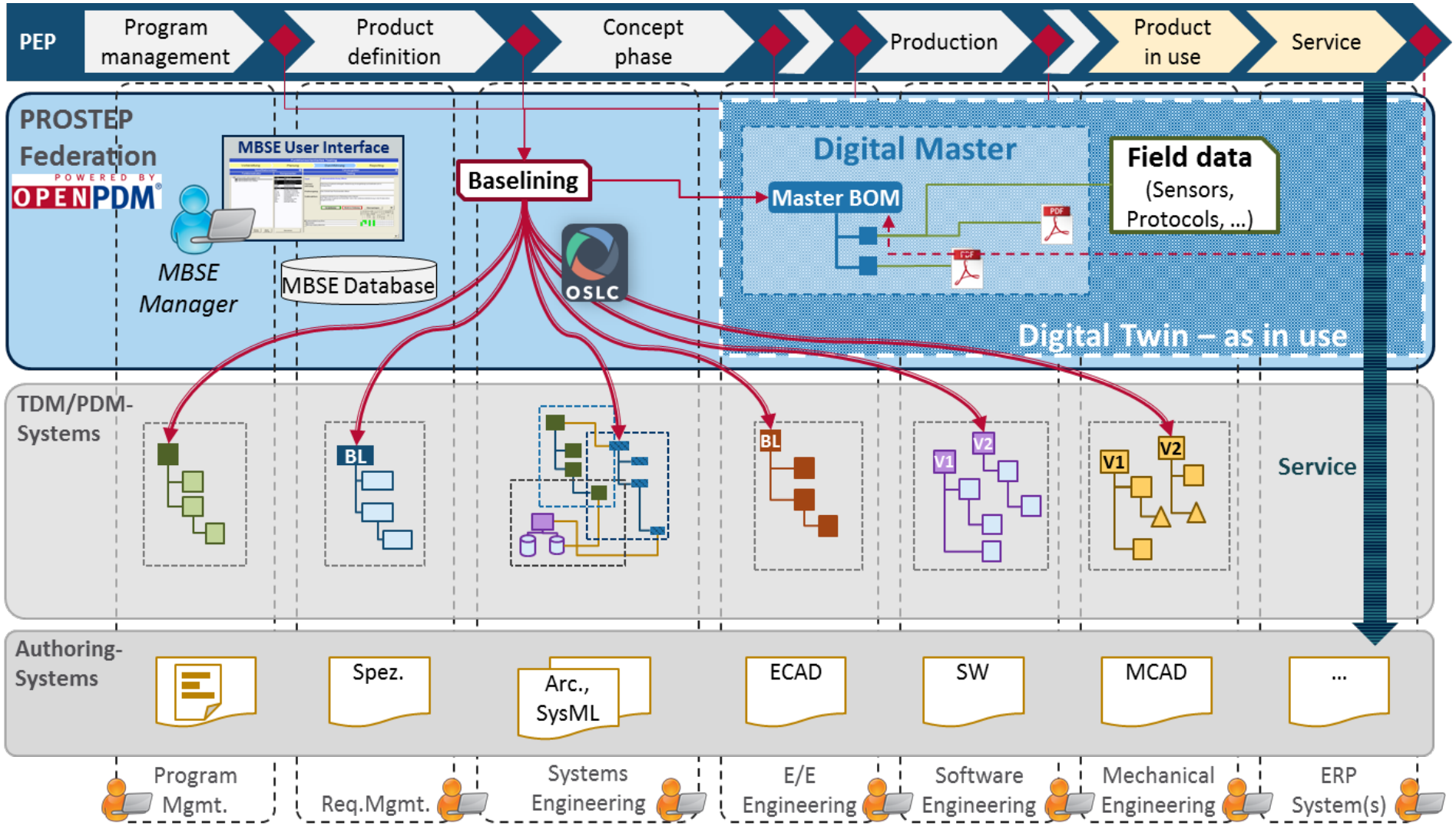
OpenPDM OSLC Adapter

- The OpenPDM OSLC Adapter enables OSLC access for none-OSLC systems
  - » Authentication against backend
  - » Query UI / Properties Display UI
  - » REST Resources and resource links
  - » Local Document Download from the backend system via OpenPDM
  - » Query Service maps OSLC queries onto backend

- Supports Change Management 2.0 + custom attributes
- Support for modern schema (new 2017)



More Than MBSE – Digital Master | Thread | Twin



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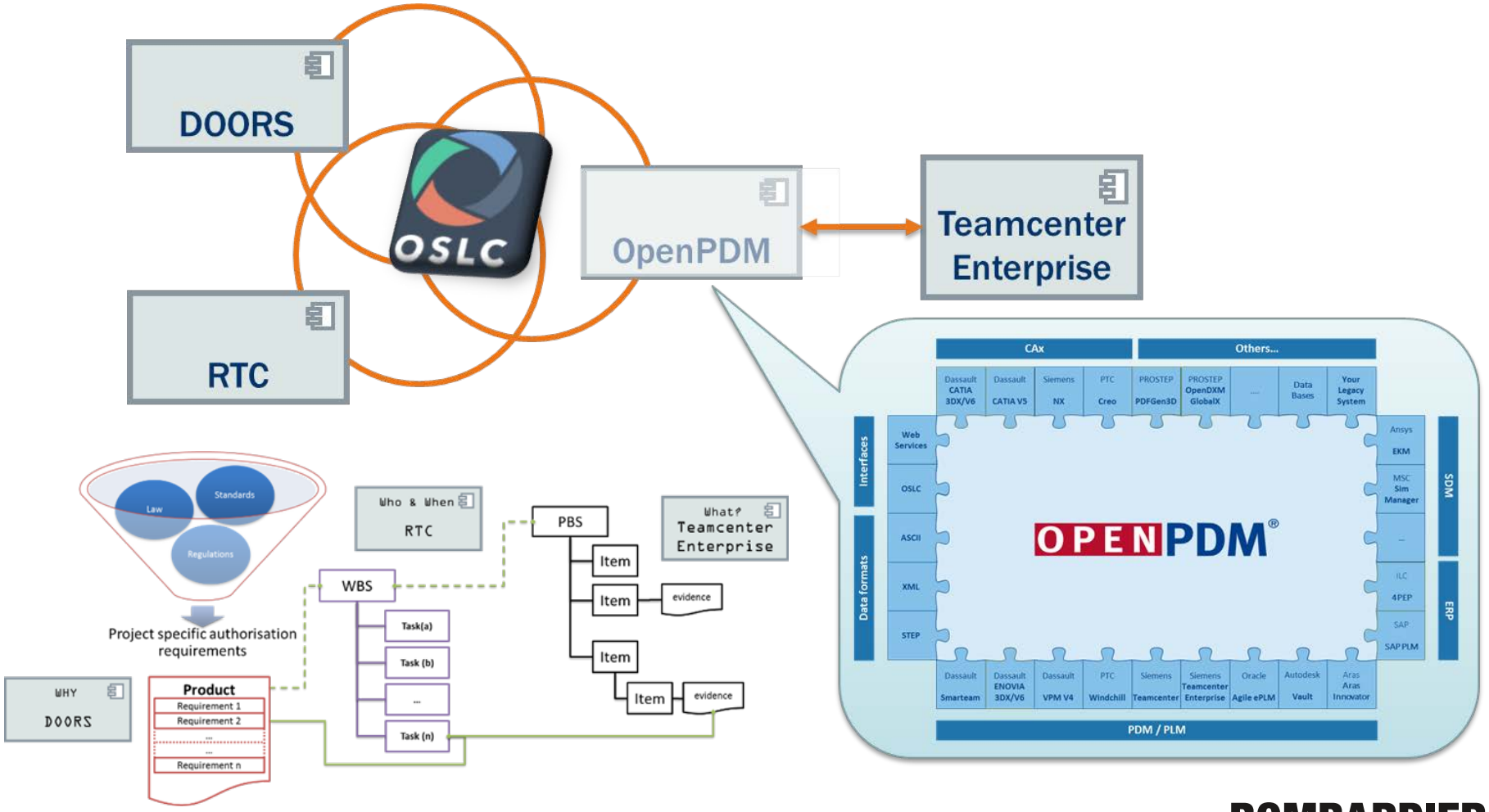
Compliance Tracability at Bombardier Transport

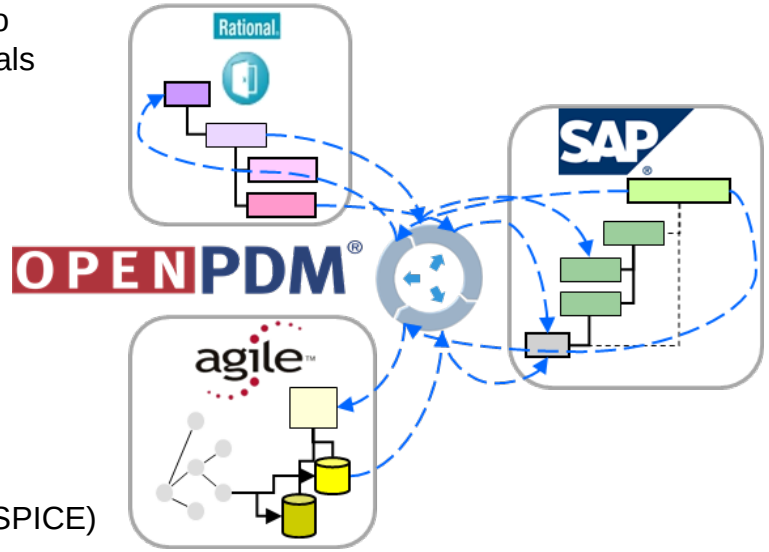


BOMBARDIER
the evolution of mobility

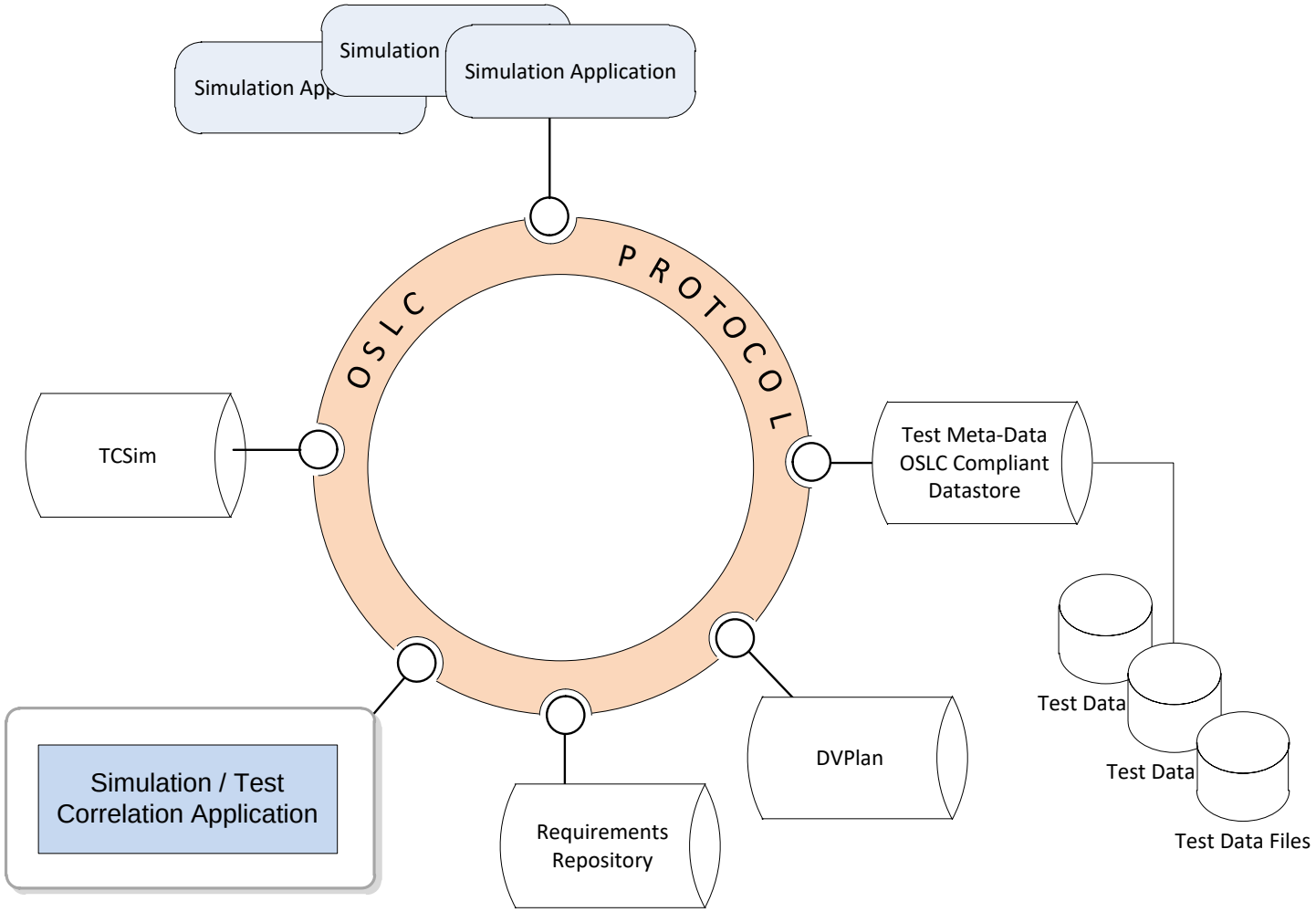
Systems Engineering Impact Analysis as ZF

OpenPDM Use Cases

- DOORS – Agile e6 – SAP Integration
  - Linking requirements to documents and materials
- Process Improvement
  - Traceability
  - Impact Analysis (RFQ Assessment)
  - Integrated change management
  - Integrated release management
  - reuse
  - Improved auditability (SPICE)
  - quality management



SDM -Test & Requirements Integration at Auto OEM



OpenPDM Customers

PROSTEP

3M
ABB
AEROLIA
PREMIUM AEROTEC
Alenia Aermacchi
ANSYS
AUTODESK
Bell Helicopter
BENTELER
BMW
BOMBARDIER
BOSCH
CLAAS
Continental
DELPHI
EATON
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EMBRAER
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PSA PEUGEOT CITROËN
RENAULT
RHEINMETALL
SIEMENS
Snecma
sonaca
TATA
TESLA MOTORS
thyssenkrupp
TREMEC
TRICO PRODUCTS
TRW Automotive
TVS
valmet automotive
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ZF
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Questions?

THANK YOU!

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