OSLC MBSE INTEGRATION

Successfully Integrating MBSE Data Using OSLC

PROSTEP
integrate the future

Datum, Autor

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

PROSTEP - 100% PLM

Consulting and Solution Portfolio

PROSTEP

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® GLOBALX **PLM Realization and Roll-out** Bill of Material & Change Management Variant & Configuration Management Digital Master / Digital Twin
PLM for Digital Transformation	**PLM for IoT/I 4.0 Solutions** Digital Master / Digital Twin **Model Based Enterprise** 3D Master / Systems-Engineering	**Technical Data Package** 3D PDF Paper-less Processes
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® GLOBALX

- PLM System Selection
- PLM Implementation
- PLM Process Optimization

- Digitalization
- Industry 4.0
- IoT

- Merger & Acquisitions
- Joint Venture
- Project Consortia

PROSTEP Technology Partners

Agenda

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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

Schouten 2016
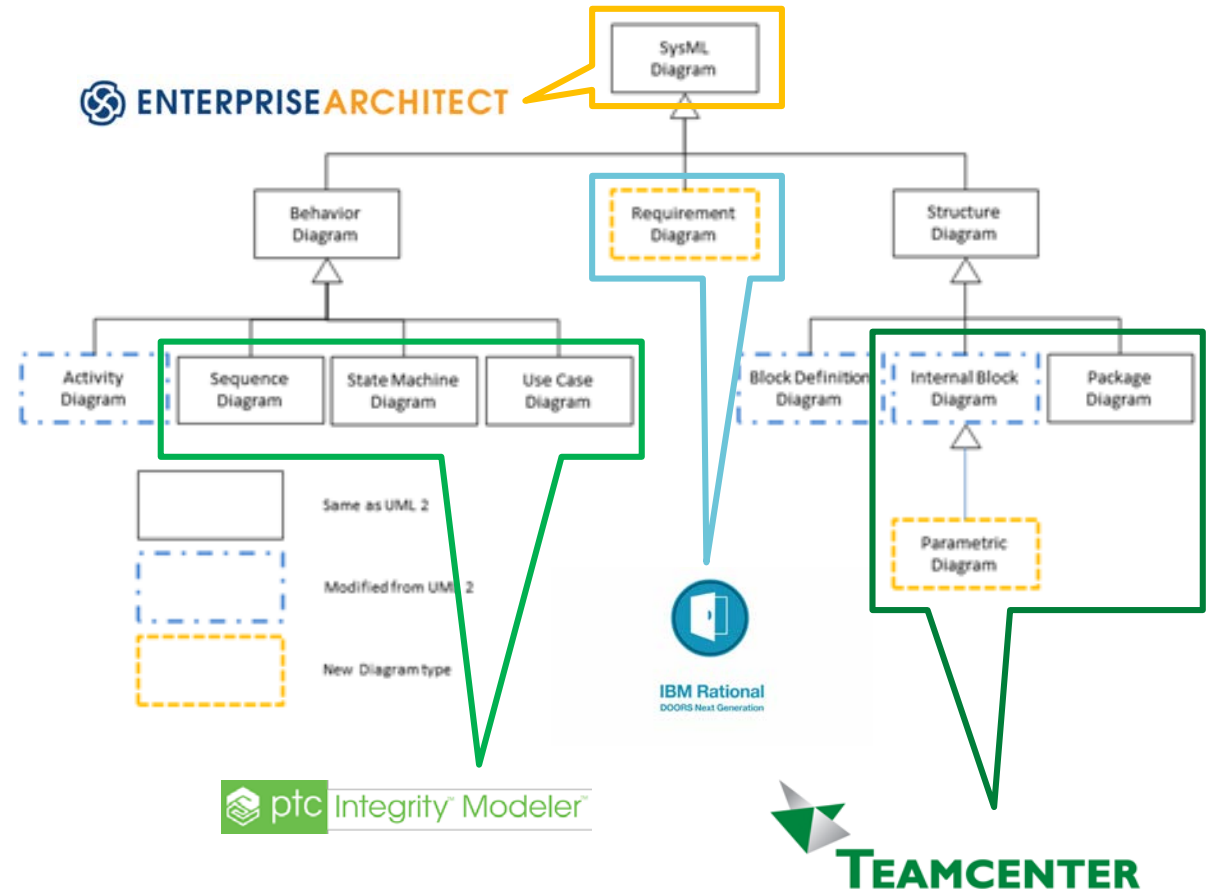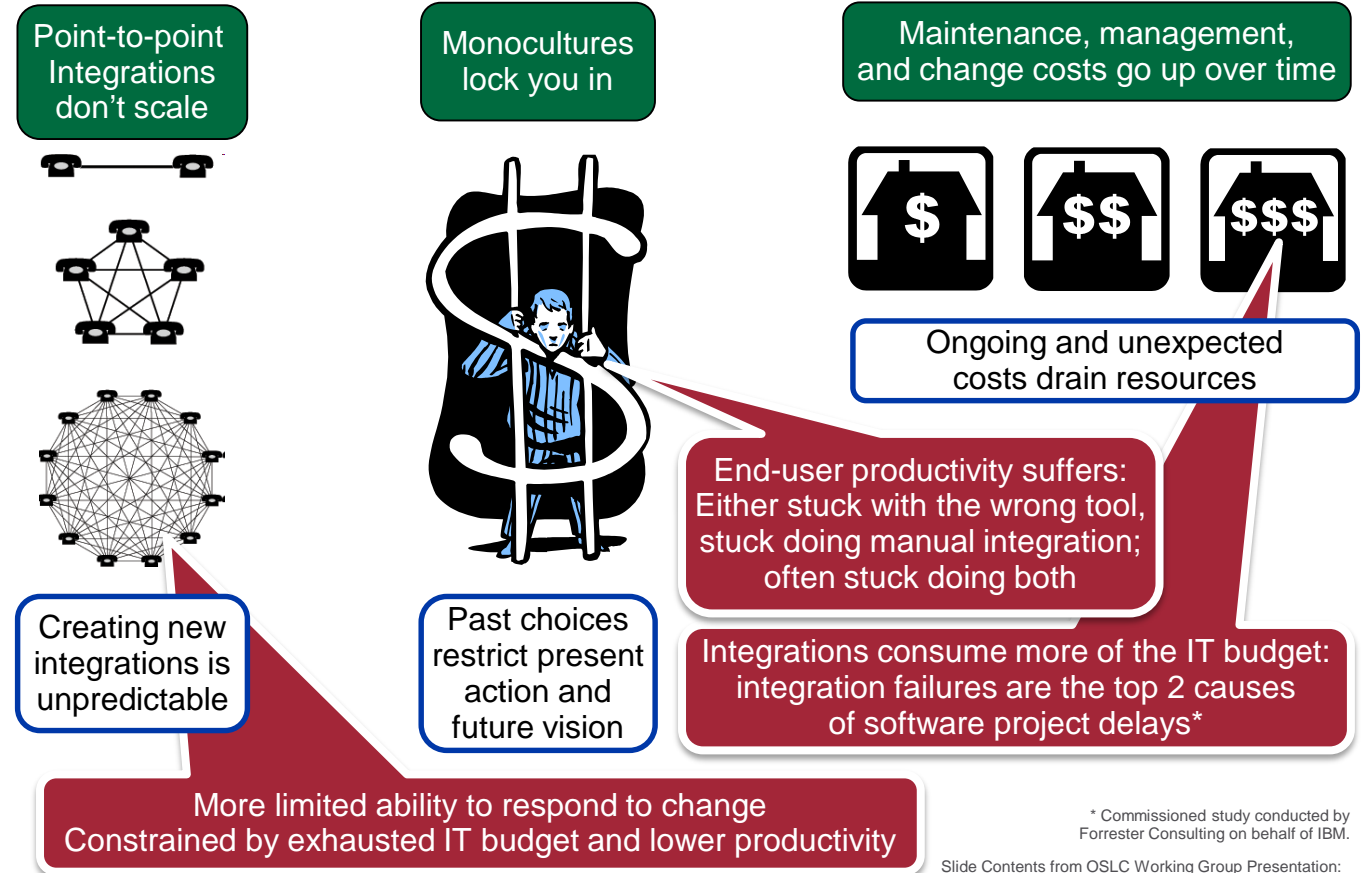
Integration Solves a Lot of Challenges

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!

Point-to-point Integrations don't scale

Monocultures lock you in

Maintenance, management, and change costs go up over time

Ongoing and unexpected costs drain resources

End-user productivity suffers: Either stuck with the wrong tool, stuck doing manual integration; often stuck doing both

Creating new integrations is unpredictable

Past choices restrict present action and future vision

Integrations consume more of the IT budget: integration failures are the top 2 causes of software project delays*

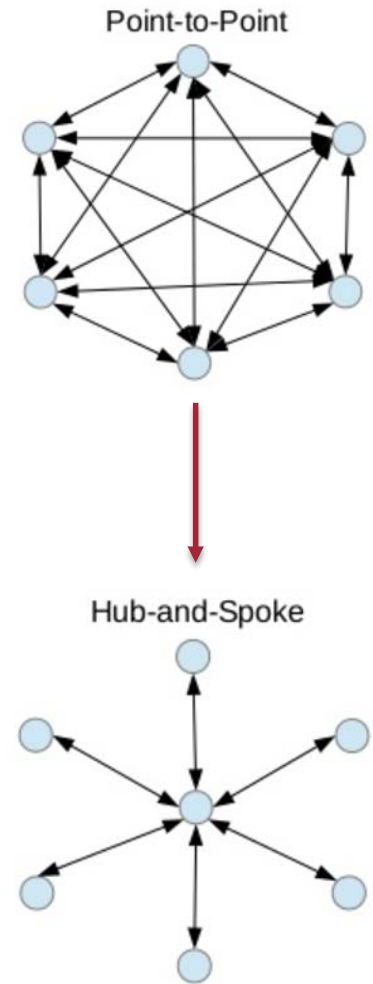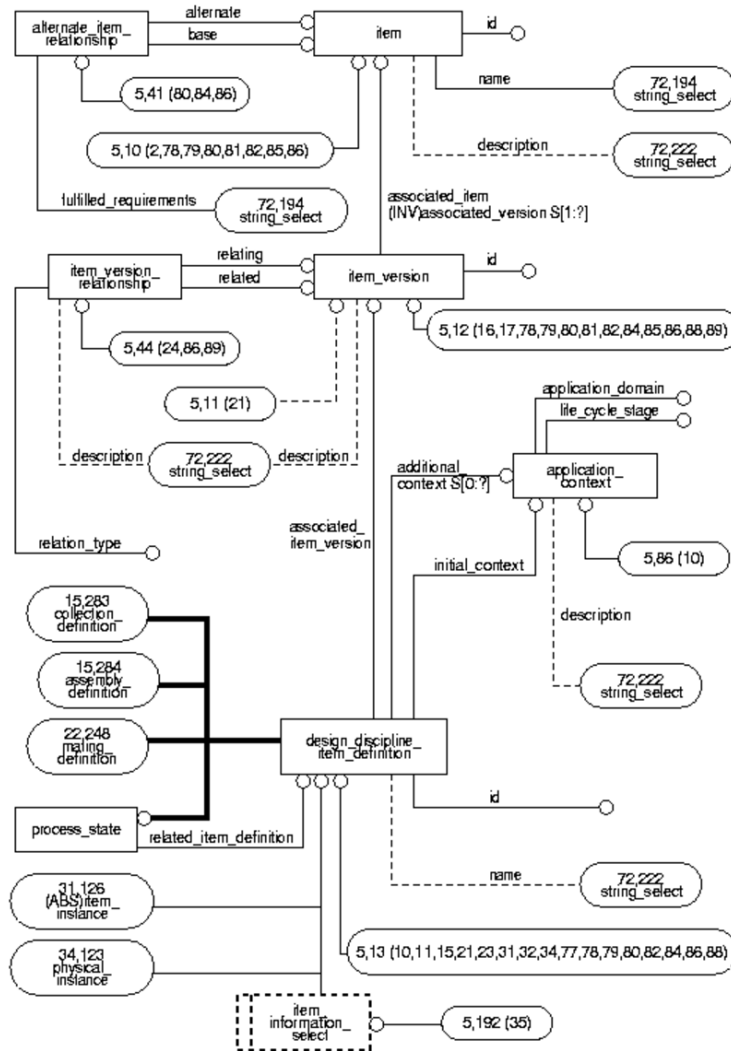More limited ability to respond to change Constrained by exhausted IT budget and lower productivity

* 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)

Agenda

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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
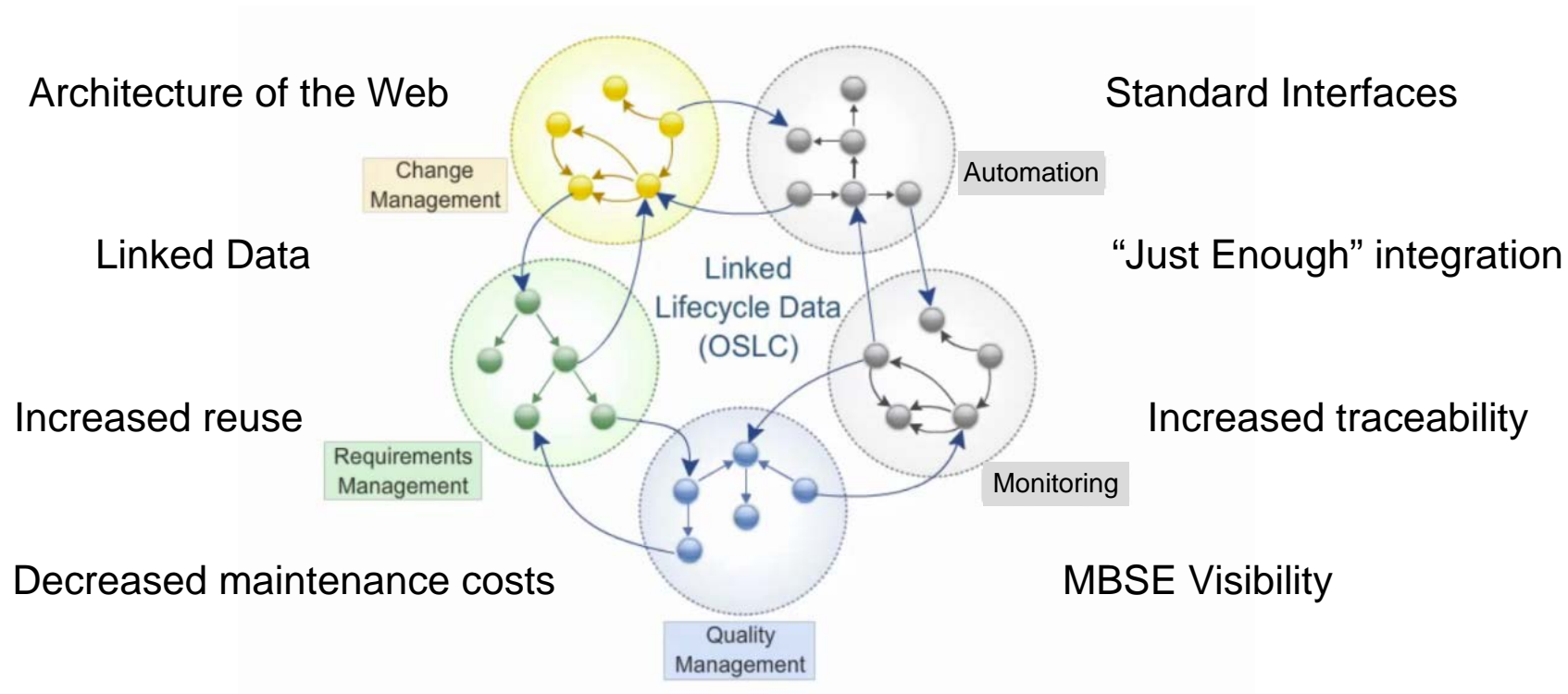- Easy to define your own data types
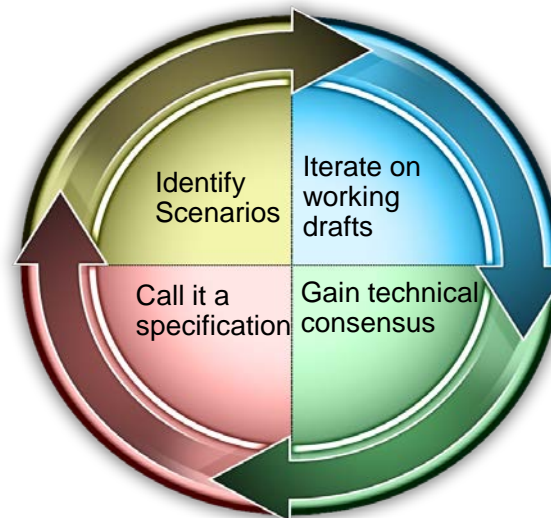
"Just Enough" integration
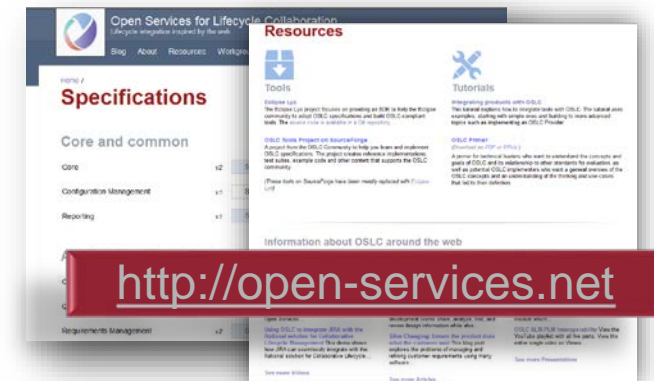
http://open-services.net

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

OSLC Linked Data Solution

OSLC's Simple Solution
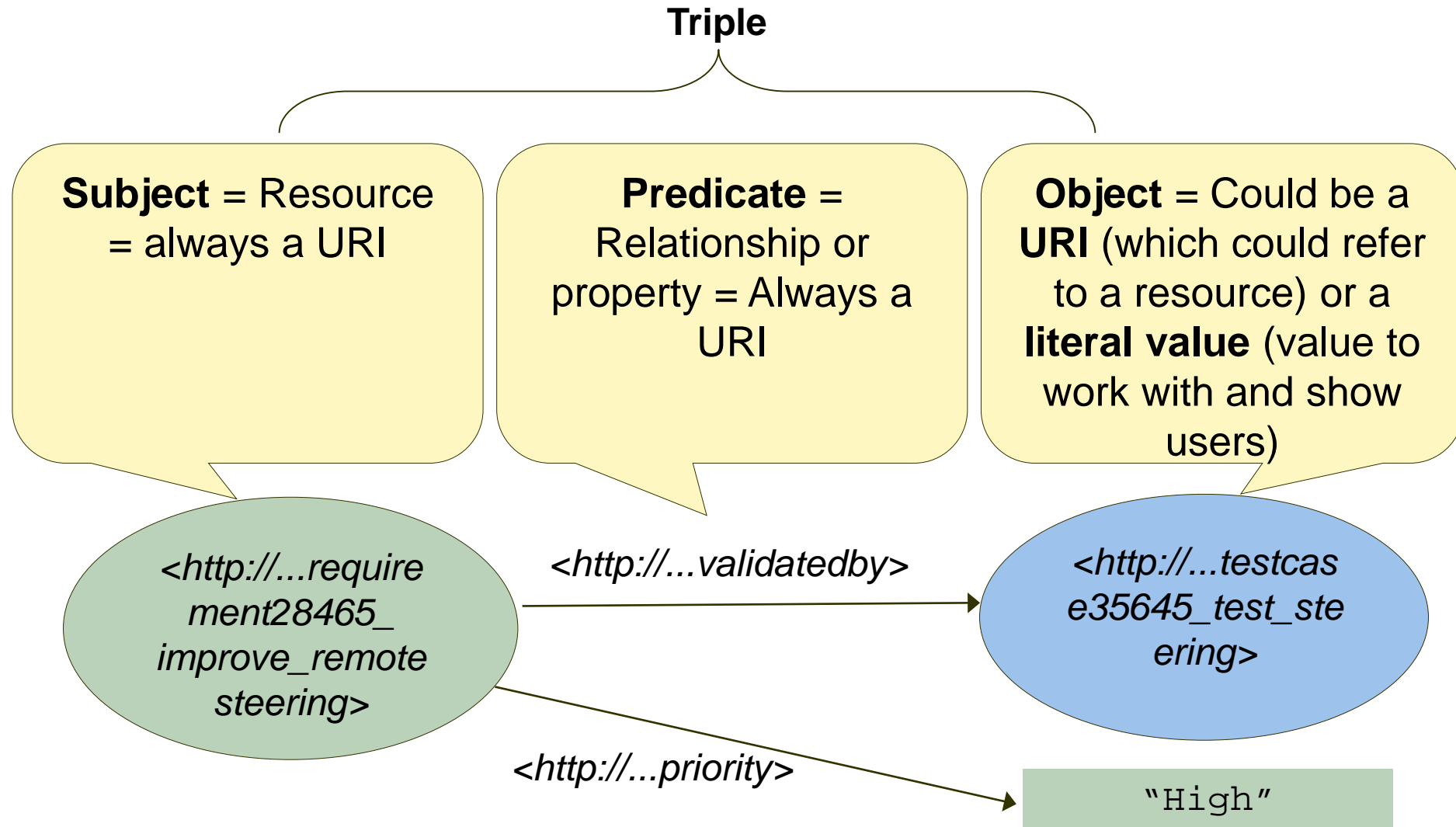

Architecture of the Web

Linked Data

Increased reuse

Decreased maintenance costs

Standard Interfaces

"Just Enough" integration

Increased traceability

MBSE Visibility

Change Management

Automation

Linked Lifecycle Data (OSLC)

Requirements Management

Monitoring

Quality Management

OSLC is an __open__ and __scalable__ approach to lifecycle integration.
It __simplifies__ key integration scenarios across __heterogeneous__ tools

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

PROSTEP

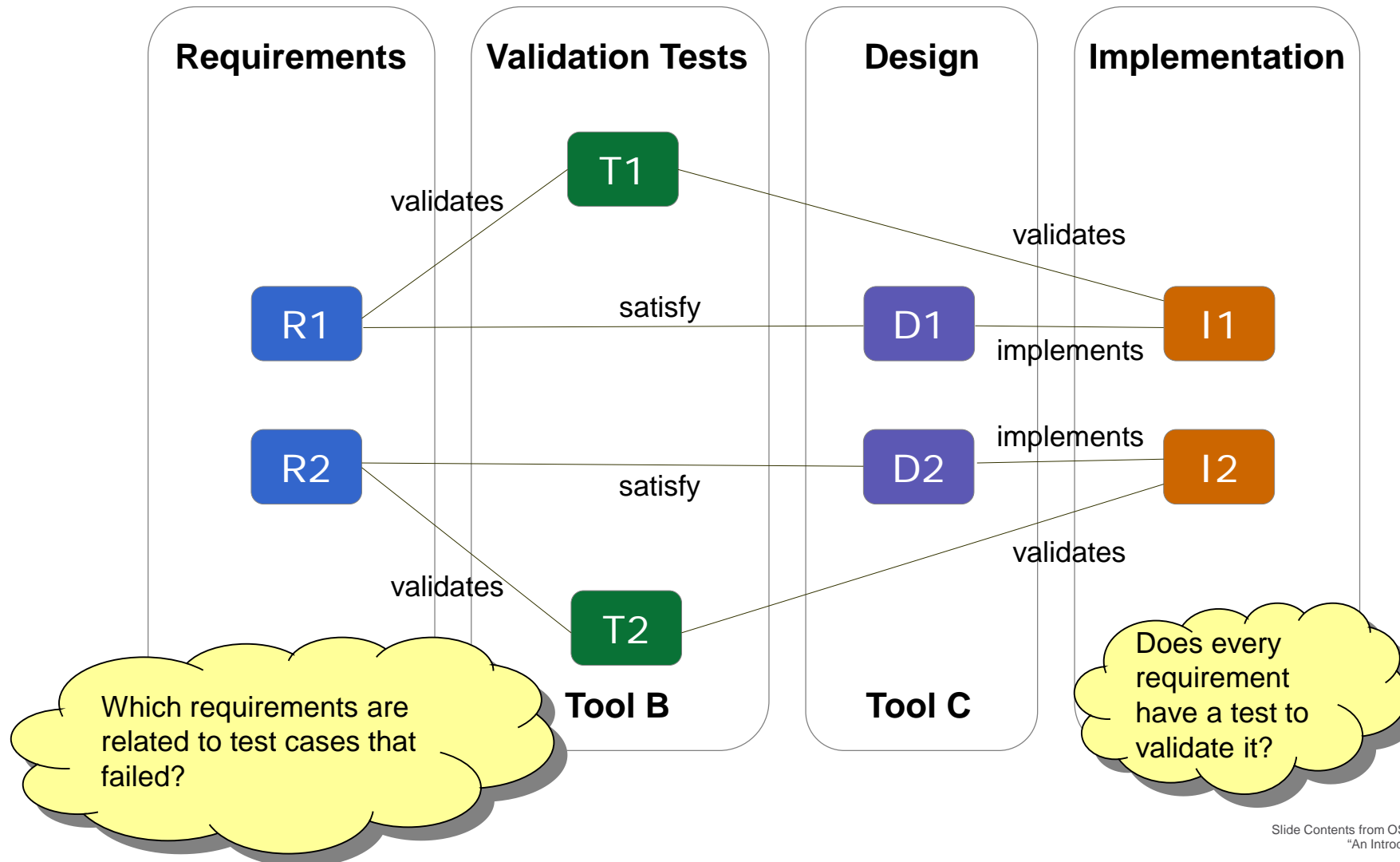Schouten 2016

# Everything is Represented as an RDF Triple

Subject – Predicate - Object

Triple

Subject = Resource = always a URI

Predicate = Relationship or property = Always a URI

Object = Could be a **URI** (which could refer to a resource) or a **literal value** (value to work with and show users)

<http://...requirement28465_improve_remote steering>

<http://...validatedby>

<http://...testcase35645_test_steering>

<http://...priority>

"High"

Use Actual Data for MBSE, Not Just Words

Integrating Data in Different Silos

Schouten 2016

How Does OSLC Work?

1. Discovery of capabilities

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

6. UI Previews for Resource Links

3. Standard resource representations

5. Delegated UI for Create and Select

4. Querying for resources

Slide Contents from OSLC Working Group Presentation:
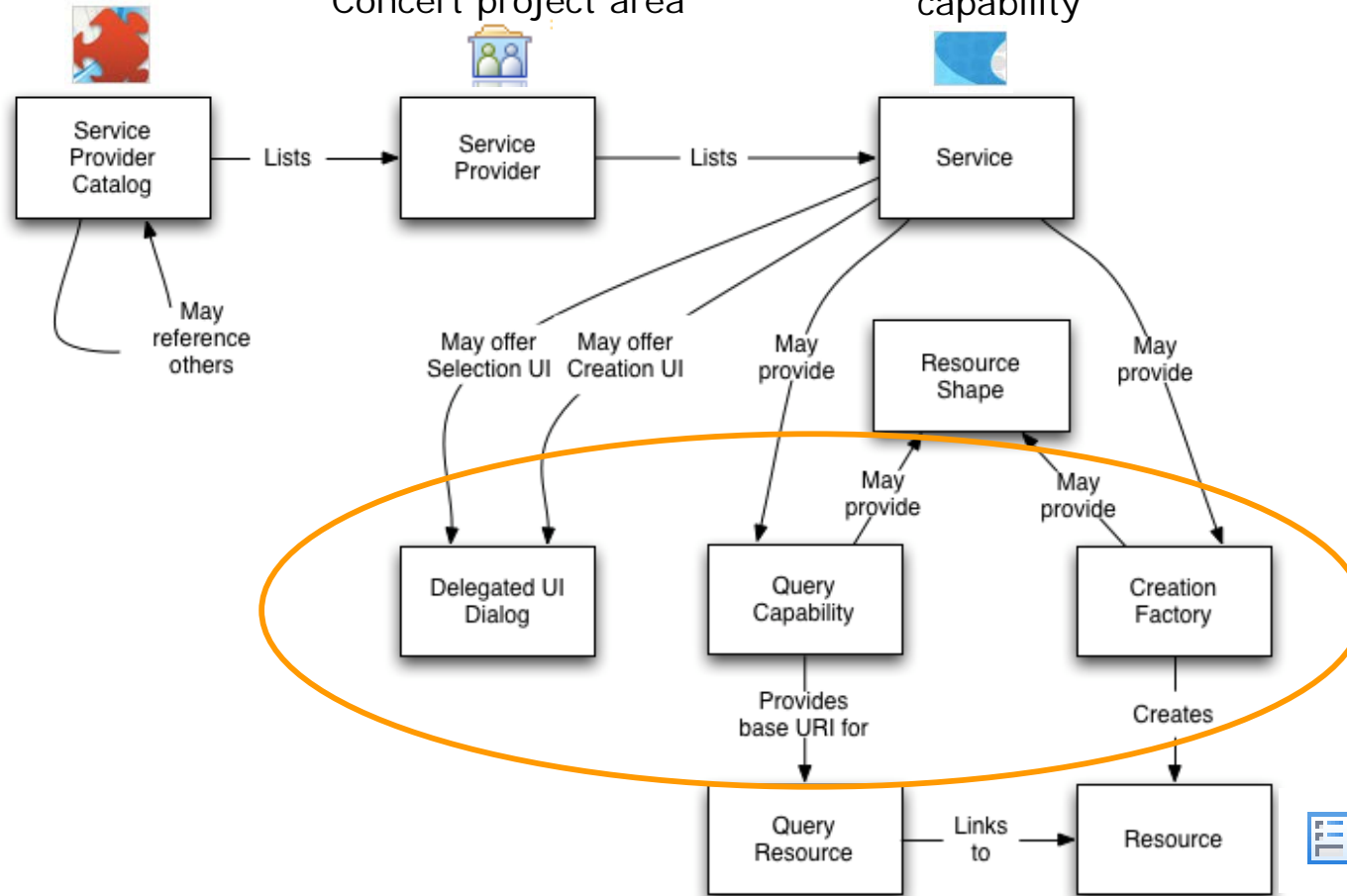"An Introduction to OSLC and Linked Data"
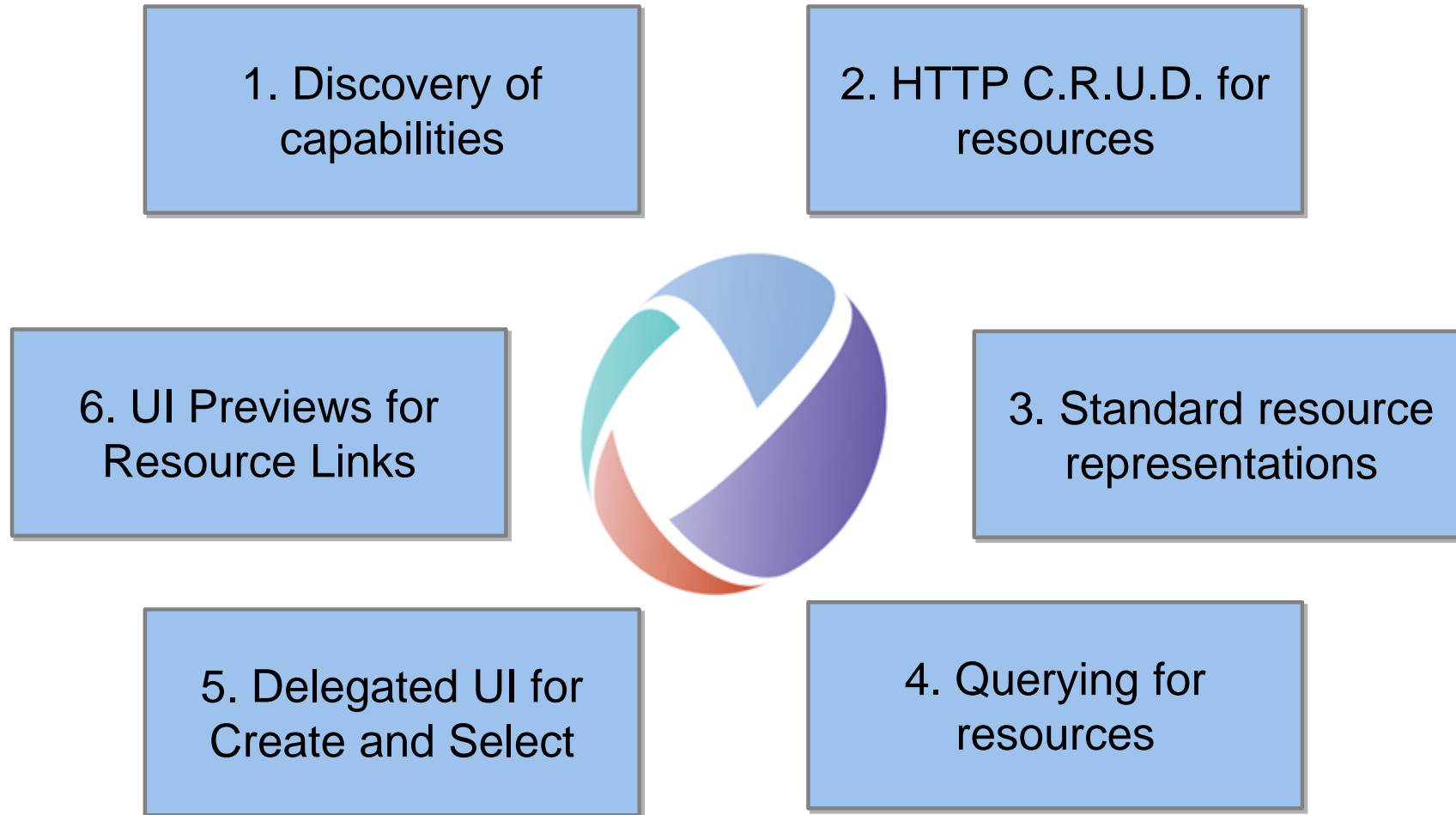
1. Discovery of Capabilities

example: IBM Rational Team Concert

example: IBM Rational Team Concert project area

example: Change Management capability

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

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

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

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

Schouten 2016

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

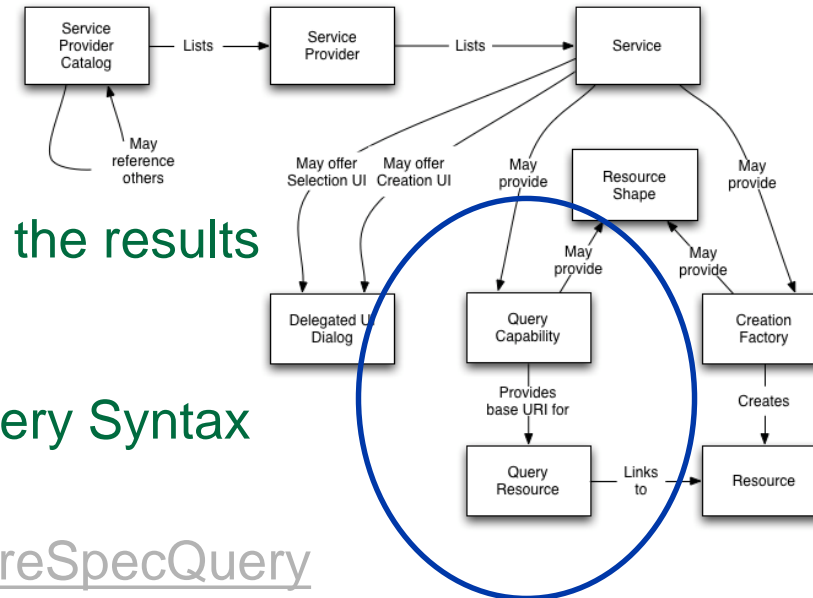Slide Contents from OSLC Working Group Presentation:
"An Introduction to OSLC and Linked Data"

4. Query for Representations

- Query capability has base URI

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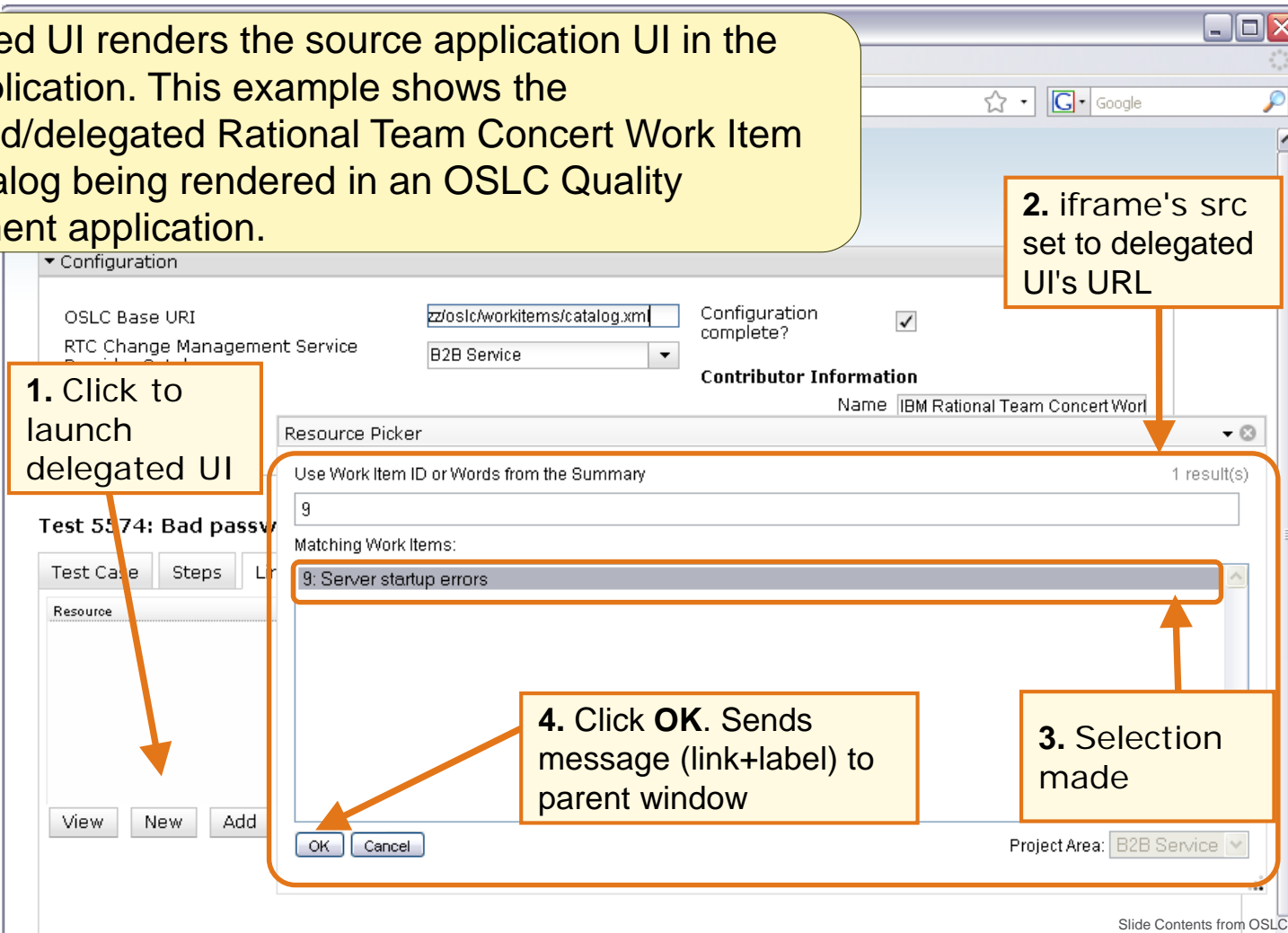
- OSLC services MAY support OSLC Query Syntax
  » http://open-services.net/bin/view/Main/OSLCCoreSpecQuery


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

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

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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.

2. iframe's src set to delegated UI's URL

1. Click to launch delegated UI

Configuration

OSLC Base URI   zz/oslc/workitems/catalog.xml   Configuration complete? ☑

RTC Change Management Service   B2B Service

Contributor Information

Name   IBM Rational Team Concert Worl

Resource Picker

Use Work Item ID or Words from the Summary   1 result(s)

9

Test 55.74: Bad passw

Matching Work Items:

9: Server startup errors

Test Case   Steps

Resource

4. Click **OK**. Sends message (link+label) to parent window

3. Selection made

View   New   Add

OK   Cancel   Project Area: B2B Service

6. UI Previews for Resource Links

Plan Items ?
Change management items that are aligned with the testing

Show All | Items per page   Previous | 1 - 1 of 1 | Next

Summary
16: Point of Sale System

16: Point of Sale System

Status   Summary
⇒ New   Point of Sale System

Details
Type: Story   Created By: rtc
Filed Against: RRC Scorpio Project   Tags:
Story Points: 5 pts   Owned By: rtc
Progress: Priority: Unassigned
Project Area: RTC Scorpio Project   Planned For: Sprint 1 (1.0)
Creation Date: November 23, 2009 4:50 PM

Quick Information
Subscribers (1): r   Implements Requirement (1)
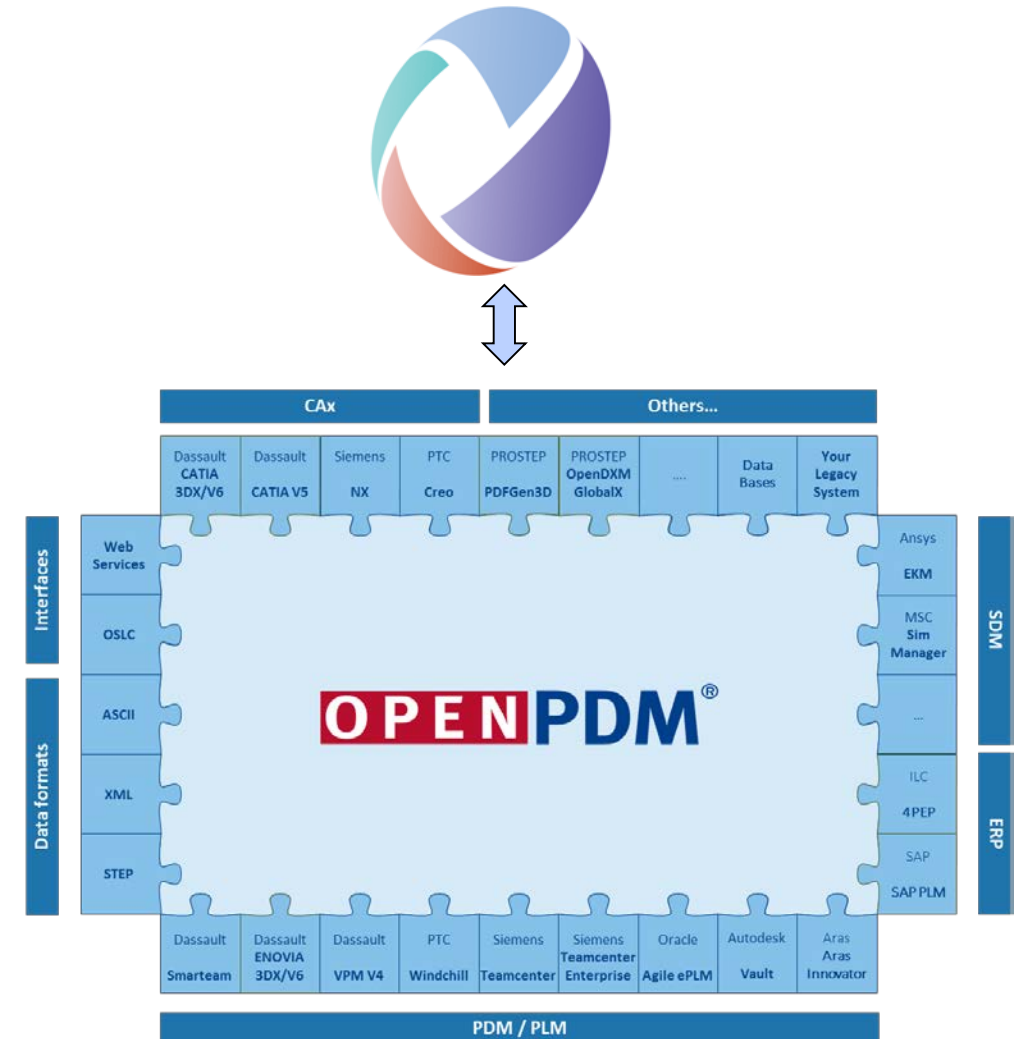Tested By (1)

Description

Open Item
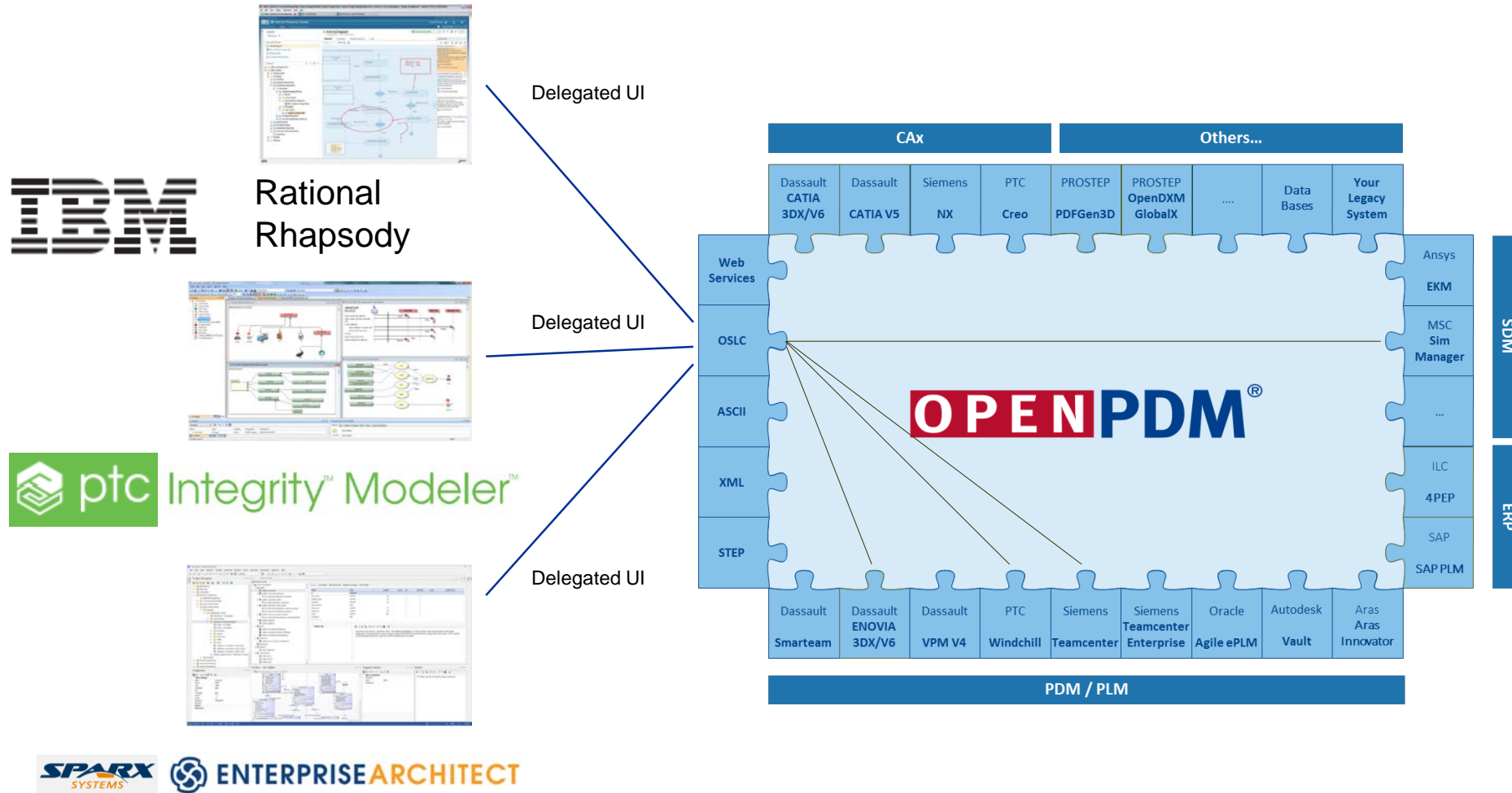
Hover over link

Agenda

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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
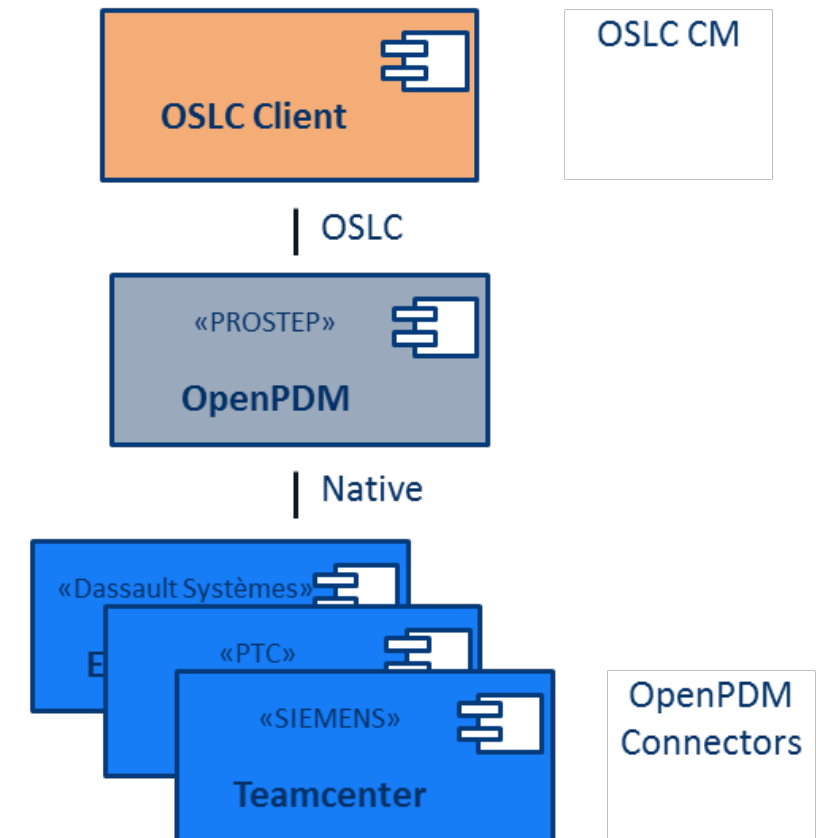 - Generate the mappings
  - Data is federated to your MBSE system
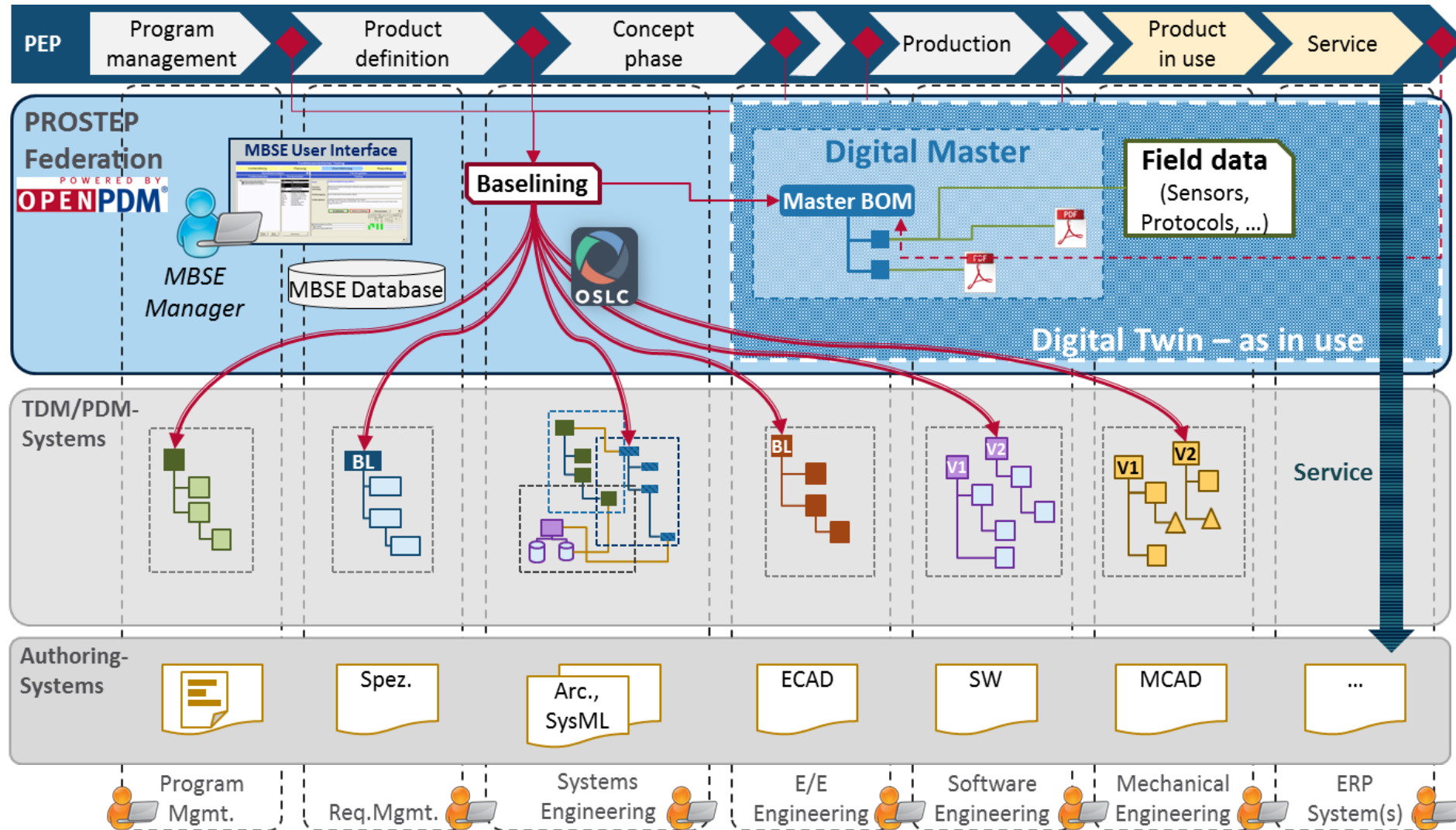
MBSE Integration Utilizing OSLC with OpenPDM

IBM

Rational Rhapsody

ptc Integrity™ Modeler™

SPARX SYSTEMS ENTERPRISE ARCHITECT

Delegated UI

Delegated UI

Delegated UI

CAx					Others...			
Dassault **CATIA 3DX/V6**	Dassault **CATIA V5**	Siemens **NX**	PTC **Creo**	PROSTEP **PDFGen3D**	PROSTEP **OpenDXM GlobalX**	....	**Data Bases**	**Your Legacy System**

Web Services			Ansys **EKM**
OSLC	OPENPDM®		MSC **Sim Manager**
ASCII			
XML			ILC **4PEP**
STEP			SAP **SAP PLM**

SDM

ERP

Dassault **Smarteam**	Dassault **ENOVIA 3DX/V6**	Dassault **VPM V4**	PTC **Windchill**	Siemens **Teamcenter**	Siemens **Teamcenter Enterprise**	Oracle **Agile ePLM**	Autodesk **Vault**	Aras **Aras Innovator**

PDM / PLM

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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
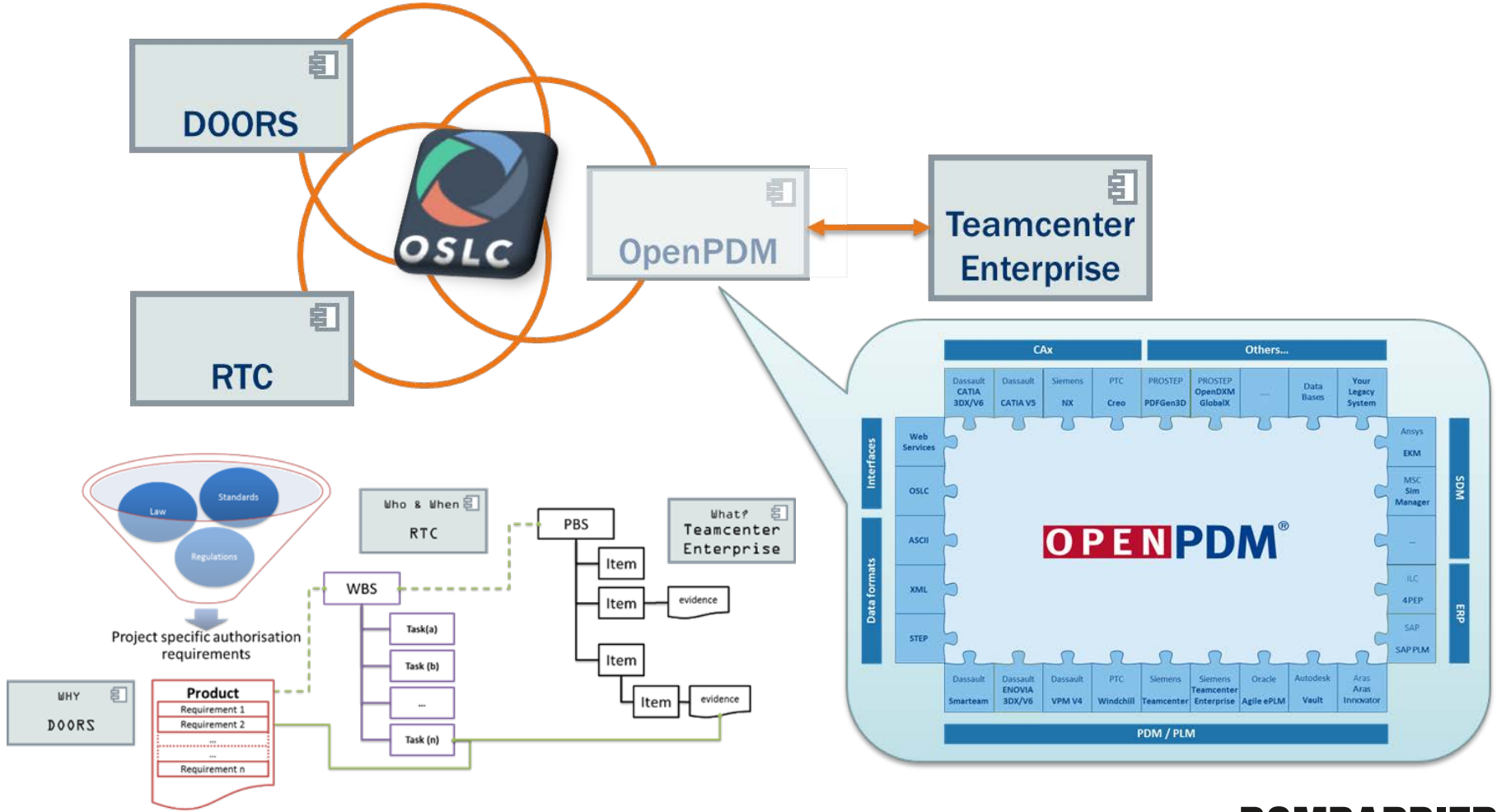- Support for modern schema (new 2017)

OSLC CM

OSLC Client

OSLC

«PROSTEP»
OpenPDM

Native

«Dassault Systèmes»
«PTC»
«SIEMENS»
Teamcenter

OpenPDM
Connectors

Schouten 2016

More Than MBSE – Digital Master | Thread | Twin

Agenda

Compliance Tracability at Bombardier Transport

Systems Engineering Impact Analysis as ZF
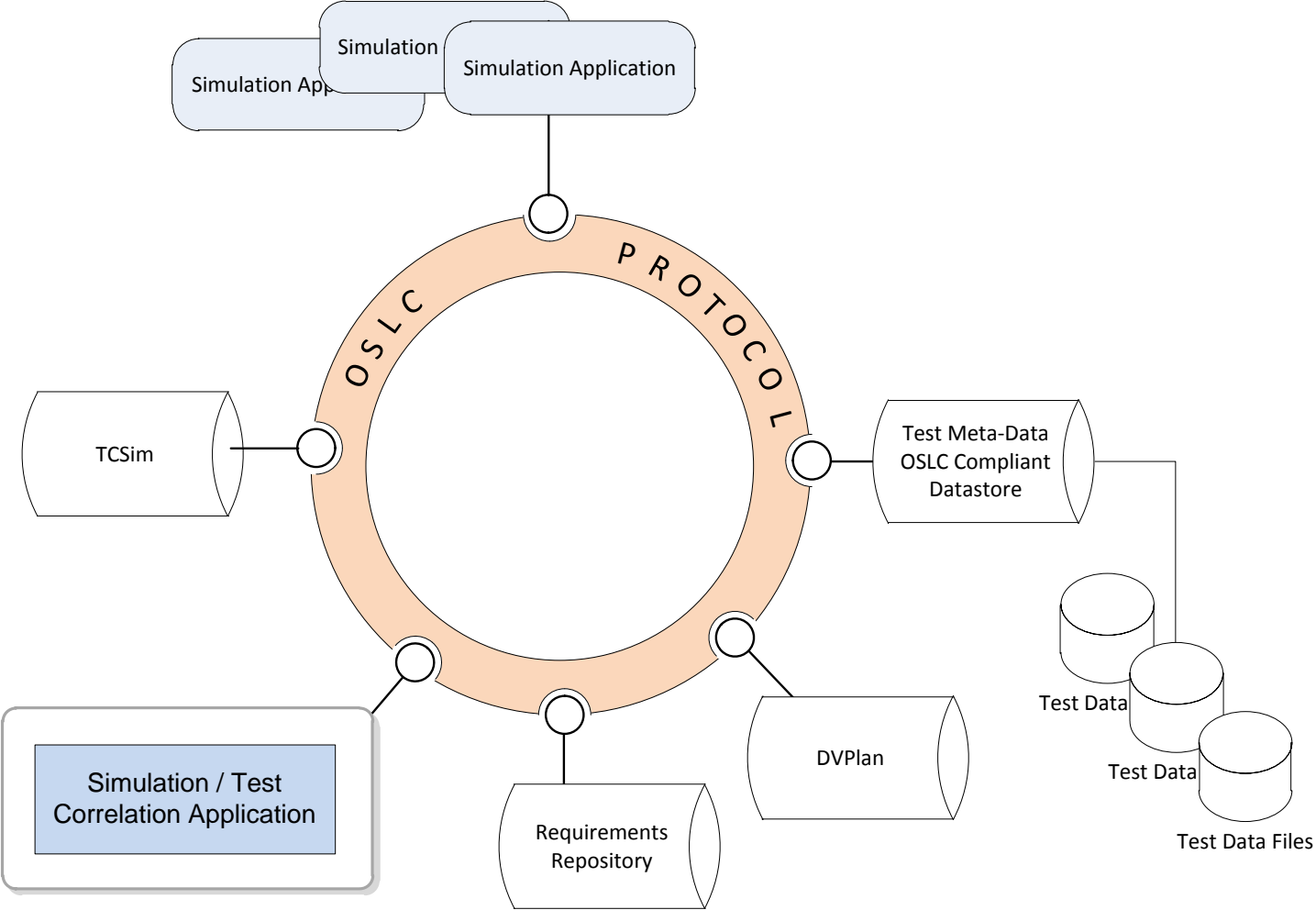
OpenPDM Use Cases

- 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
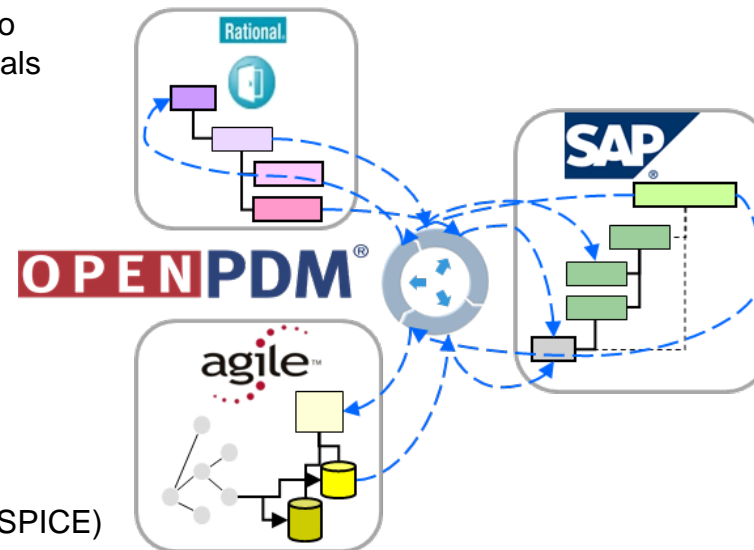
OpenPDM Customers

Questions?

THANK YOU!

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