



WEBINAR - OSLC CASE STUDY

AND POC RESULTS

- 1 PROSTEP Background
- 2 Needs and Concerns for Digital Thread Integration
- 3 OSLC History, Concepts, and Goals
- 4 OSLC Technology Explanation
- 5 Leveraging OSLC with OpenPDM - Bombardier Transport, ZF
- 6 OSLC POC – Needs, Implementation, and Results
- 7 Wrap Up

Company Overview



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



Over 25 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

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® <small>GLOBAL X</small>	<ul style="list-style-type: none"> – PLM System Selection – PLM Implementation – PLM Process Optimization
	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	
PLM for Digital Transformation	Model Based Enterprise 3D Master / Systems-Engineering	Technical Data Package Paper-less Processes 3D PDF	<ul style="list-style-type: none"> – Digitalization – Industry 4.0 – IoT
	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® <small>GLOBAL X</small>	<ul style="list-style-type: none"> – Merger & Acquisitions – Joint Venture – Project Consortia

PROSTEP Technology Partners

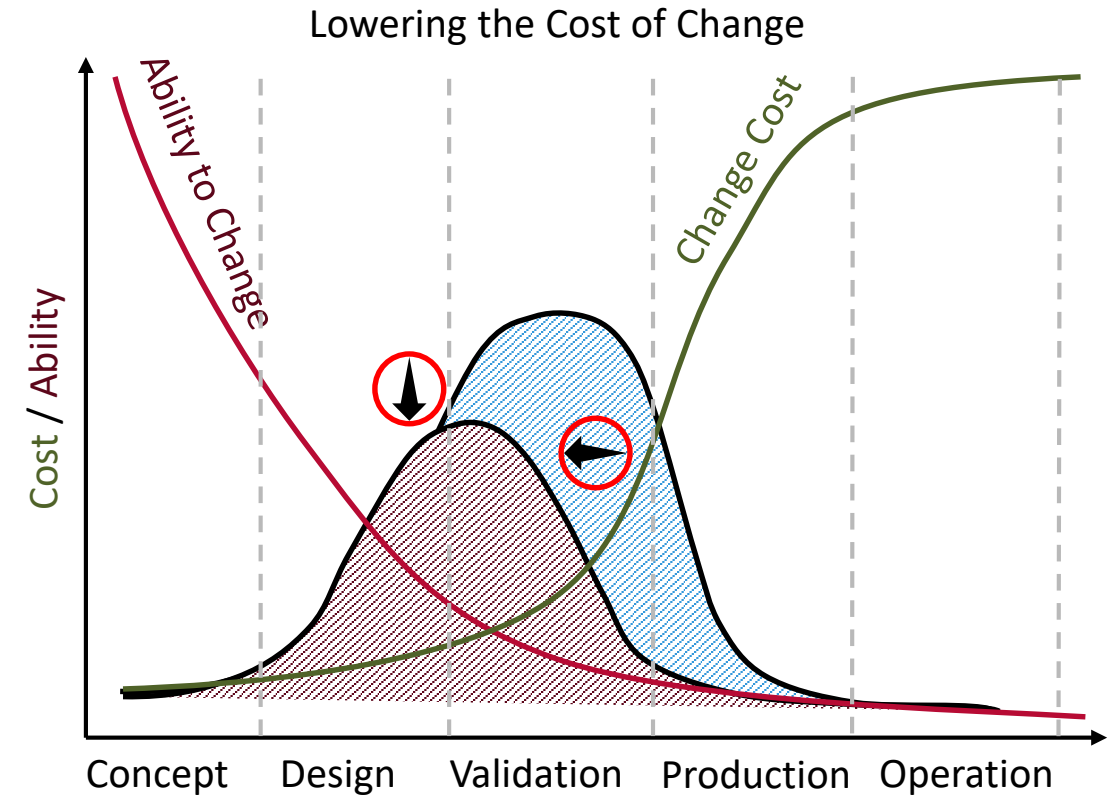


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The Need for a Digital Thread

Added Costs of Complexity

- Longer Time to market with a larger development effort and cost
- Wider distribution of product developers in suppliers
- Increasing use of Software
- Larger volume of components
- More Computer Aided Analysis for More Purposes
- More domain and organizational complexity
- More technical delivery packages
- More “Cumulative” Risk from inputs
- Expense of re-authoring
- Time and information loss of manual processes
- Data preservation for Sustainability
- Knowledge Retainment and Acquisition

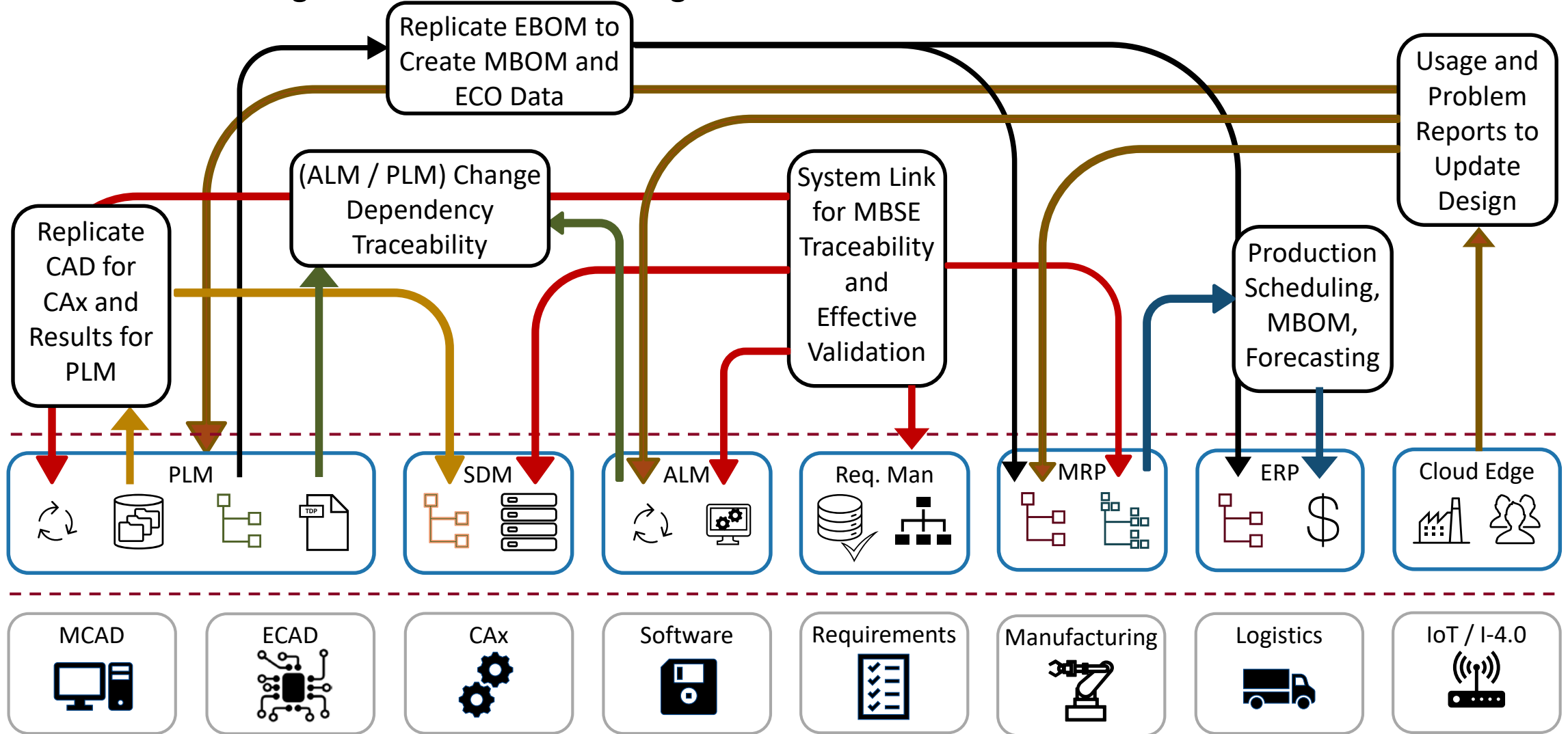


← Timely, Accurate, Complete, Up-to Date information and Inter-domain System Validation expose problems earlier in the cycle

↓ Lower the duration, frequency, and quantity of changes with the better up front information, traceability and readily available information

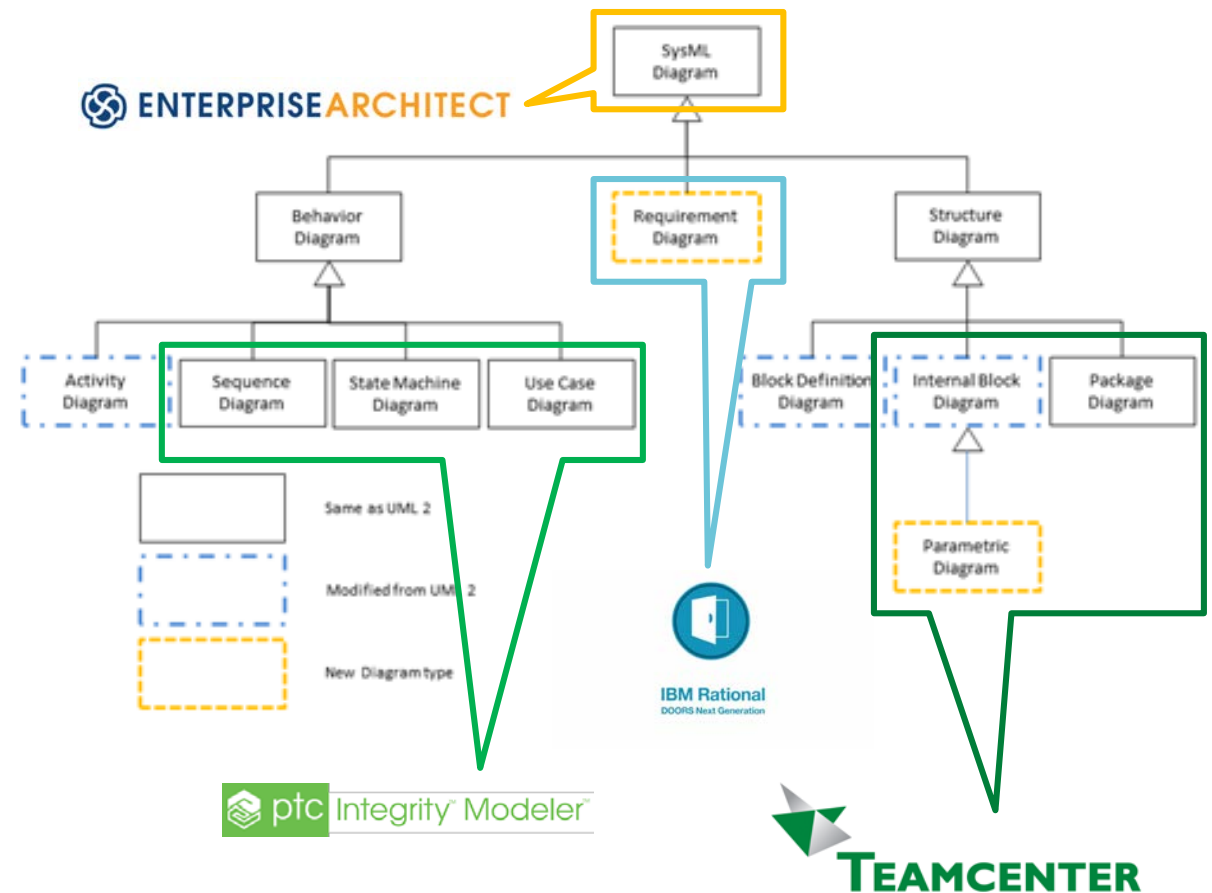
Digital Thread Roadmap

A Path to Eliminating Re-work and Automating the Future



Federation for Systems Engineering Integration

- 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



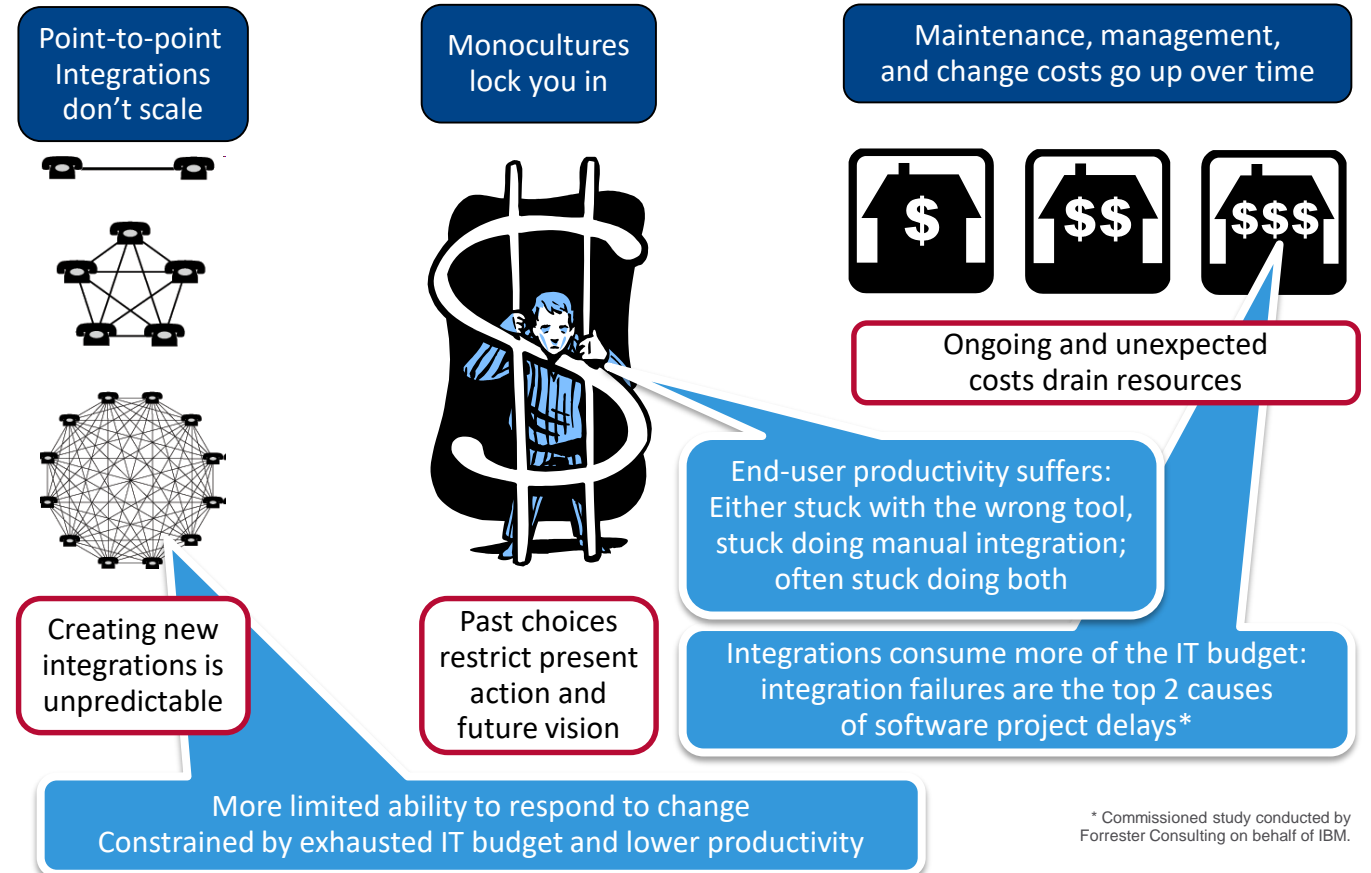
Integration Solves Lots of Problems

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

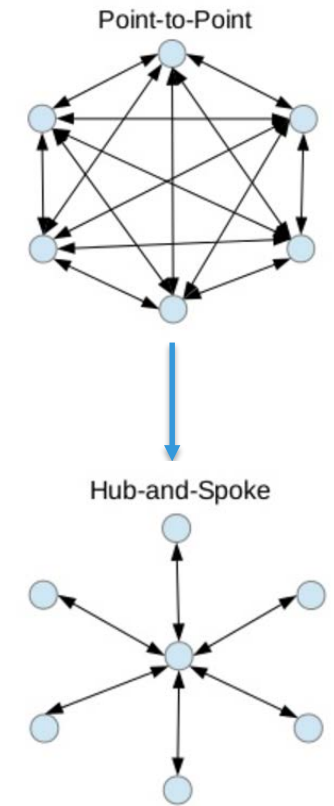
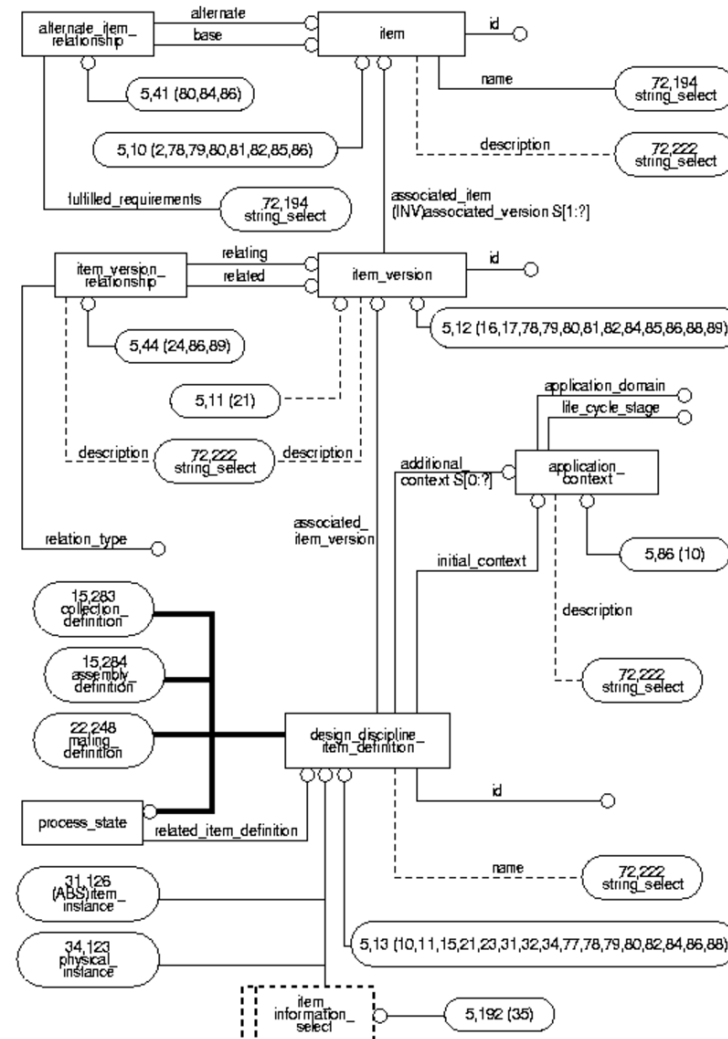
- Point-to-point solutions do not scale and typically become unmanageable
- Full centralization is neither feasible nor desirable
- Data Duplication comes with data model compatibility issues, data mastery issues and synchronization processing time.
- Remastering data means duplication.
- MBSE only requires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



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

Standards Enable hub-and-spoke Integration at a Cost

- 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)



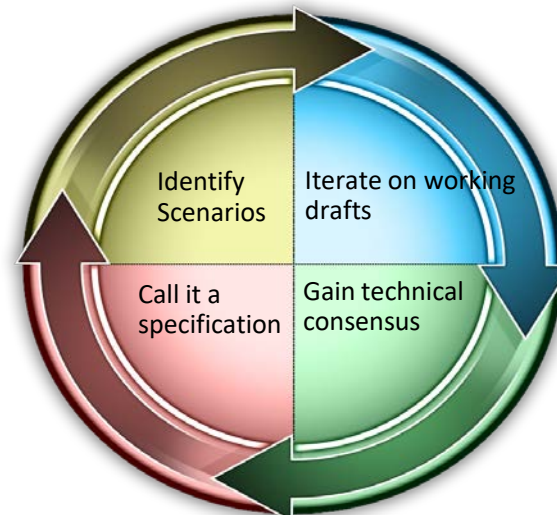
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Model the Internet for “Just Enough” Integration (OSLC)

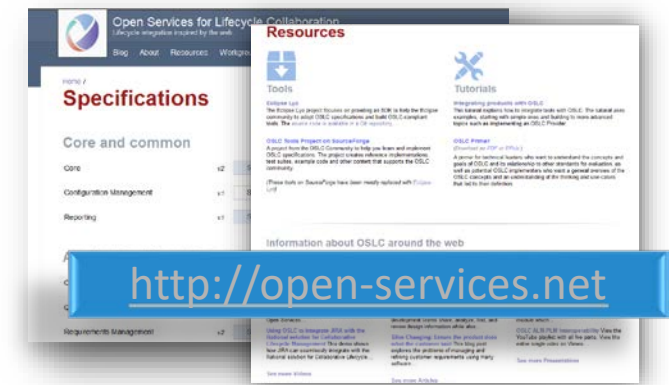
- Open Services for Lifecycle Collaboration
- Open Standard, Open Community
- Proposed by IBM et. al. in 2008
- Motivated by Rational Team Concert (RTC)
- Data is stored at single location and simply **linked**. No replication!
- Emerging standard for Tool integrations in ALM domain
- Loosely Coupled
- 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

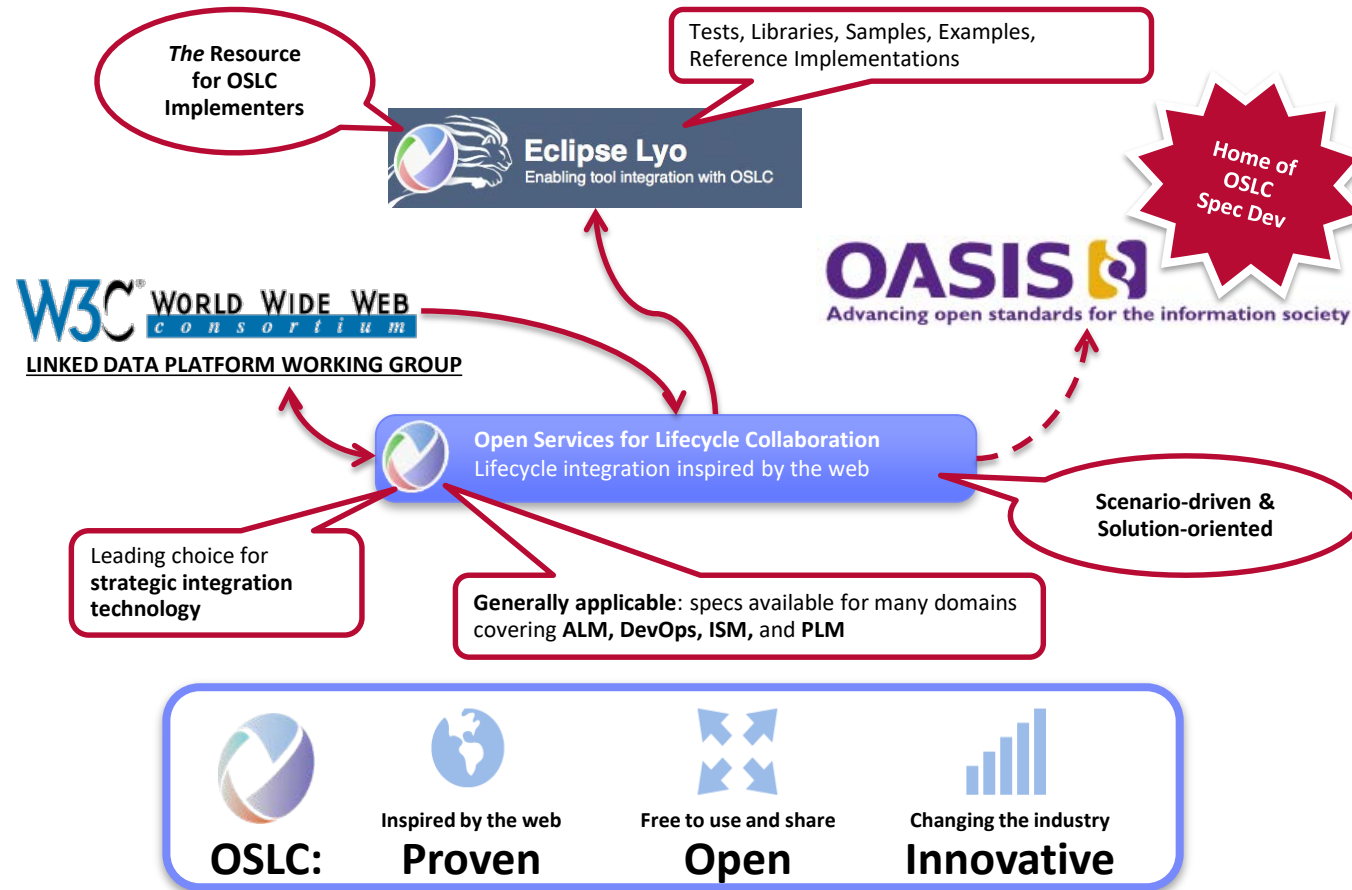
- Slim Data model
 - Granular to one attribute at a time
- Enhanced Data models available for Change- and Document Management
- Easy to define your own data types



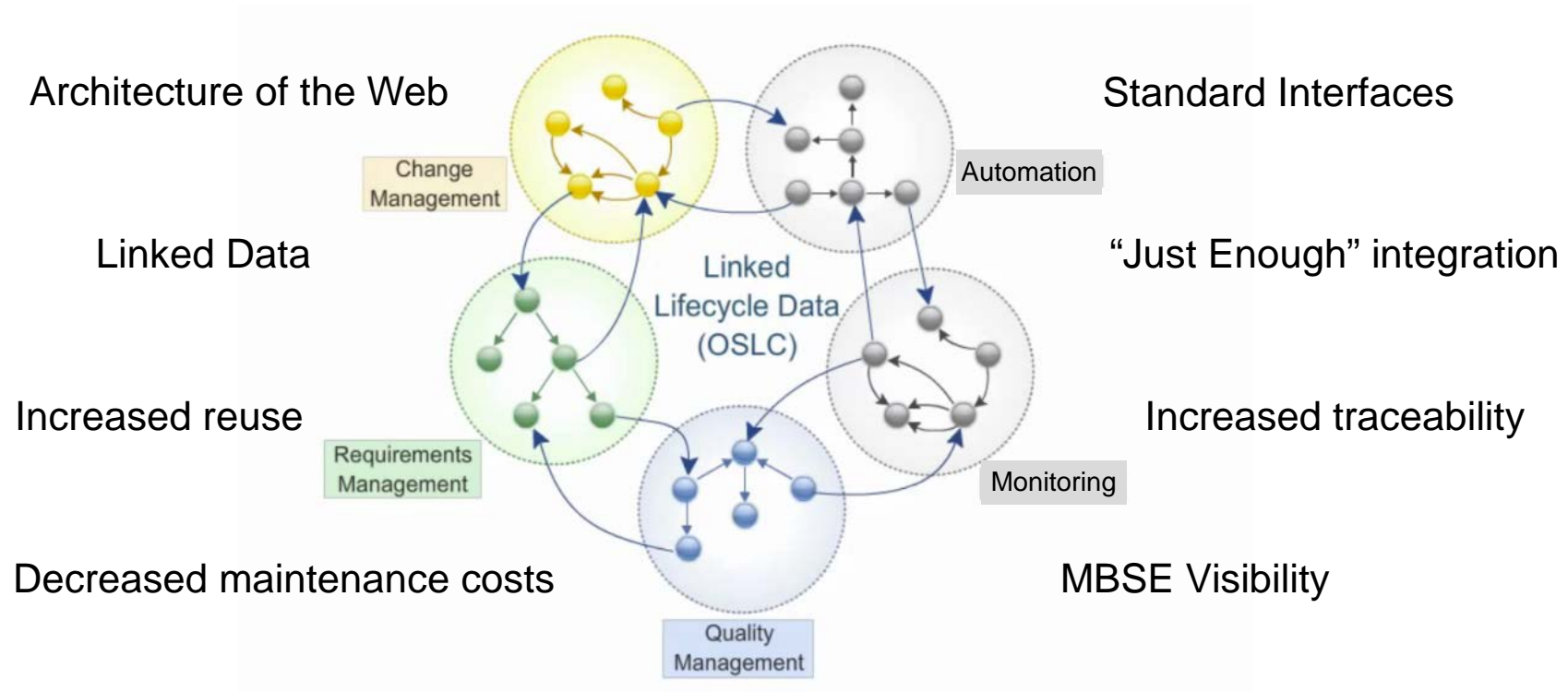
“Just Enough” integration



Open Standards & Open Resources

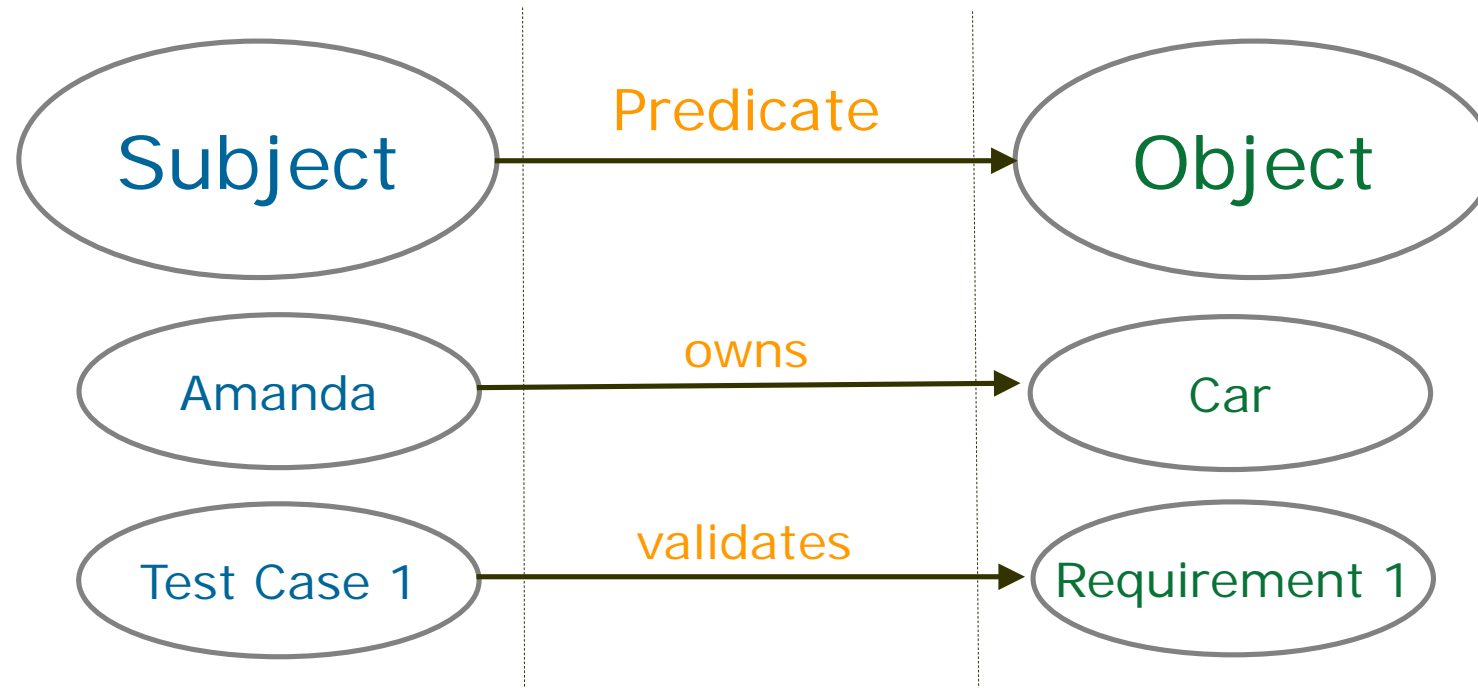


OSLC's Simple Solution



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

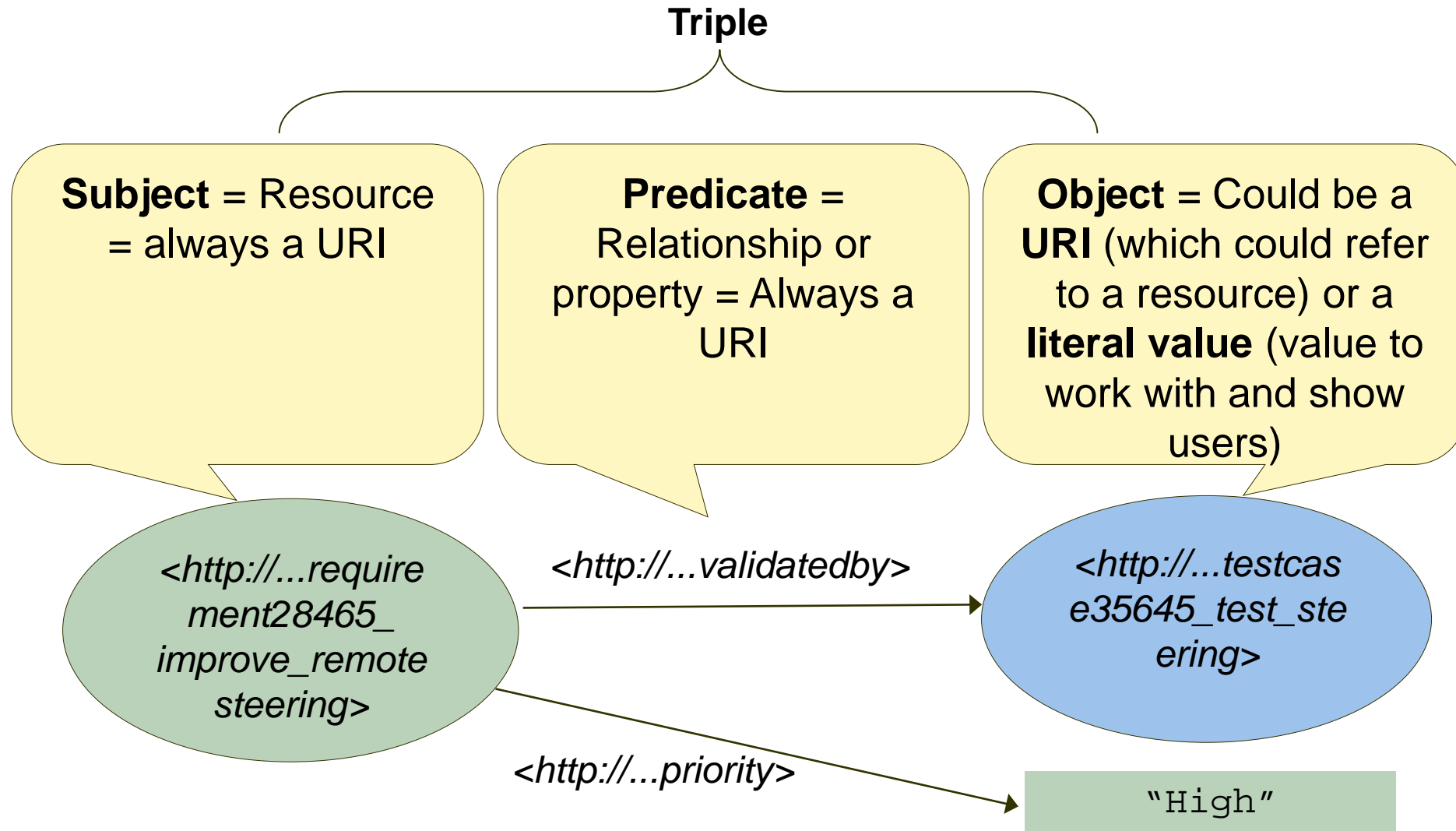
OSLC Uses an RDF Graph Data Model



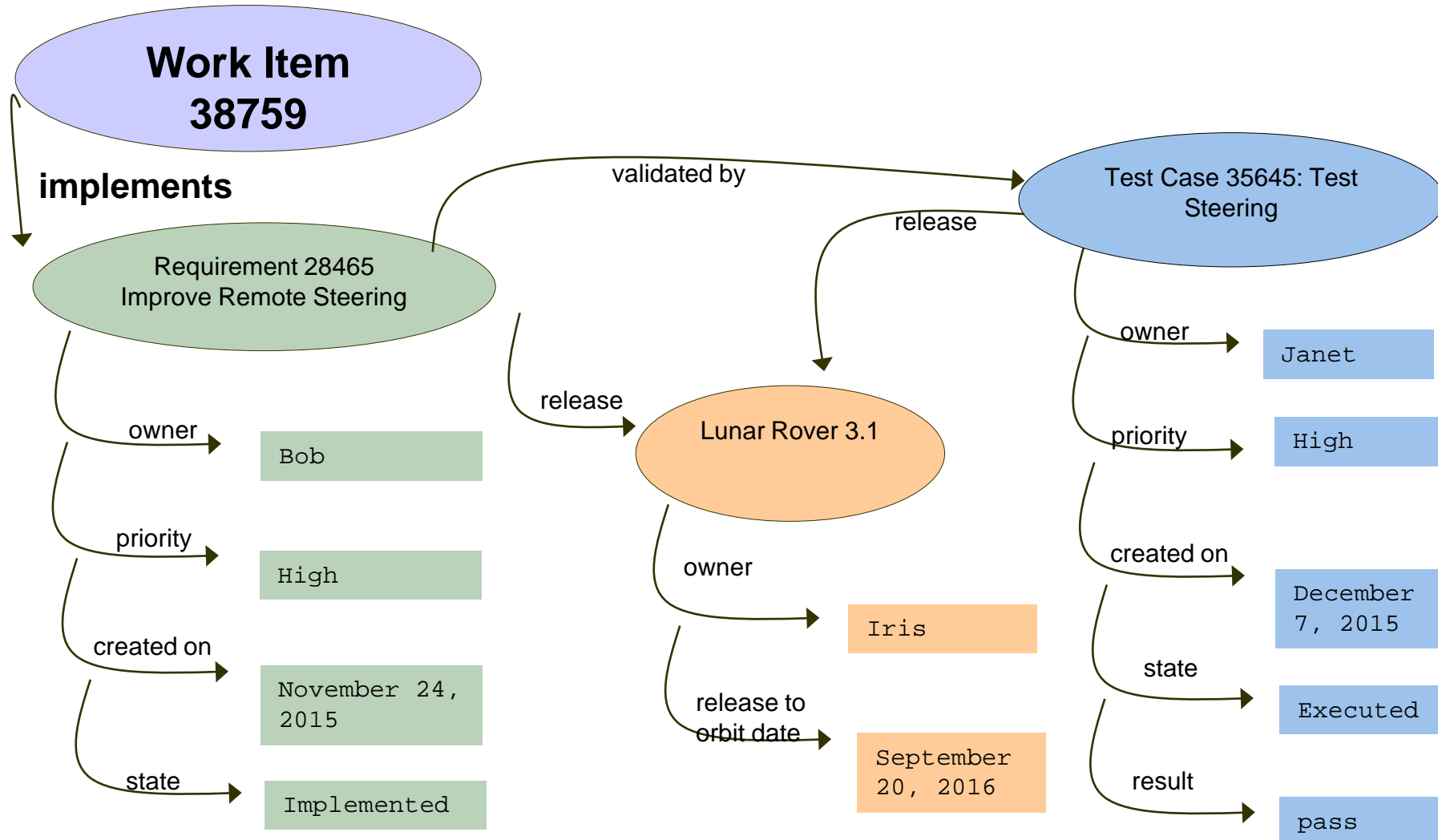
Adapted from:

<http://www.w3.org/TR/2004/REC-rdf-concepts-20040210/#section-data-model>

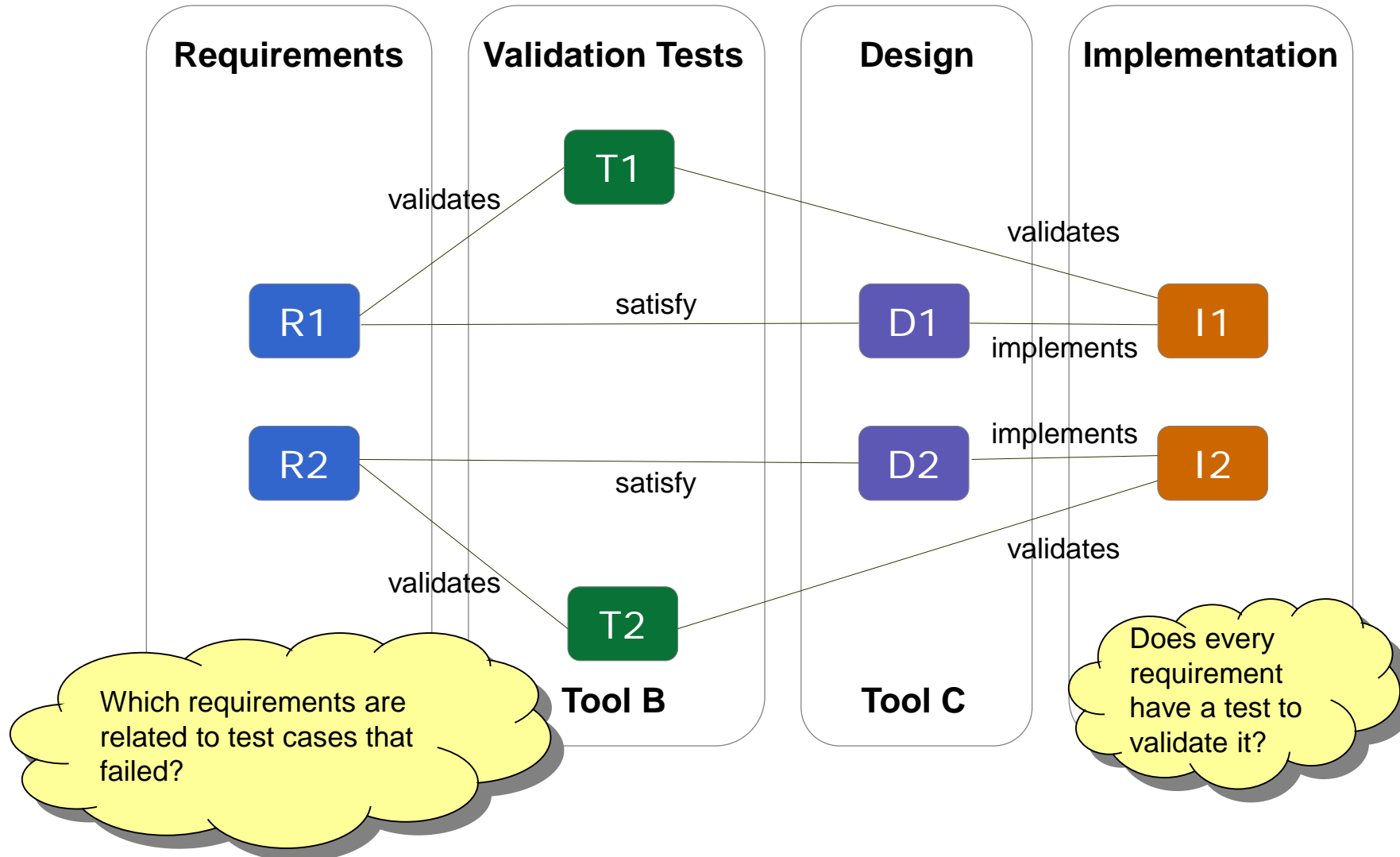
RDF triple (subject-predicate-object)



Example Relationship Graph

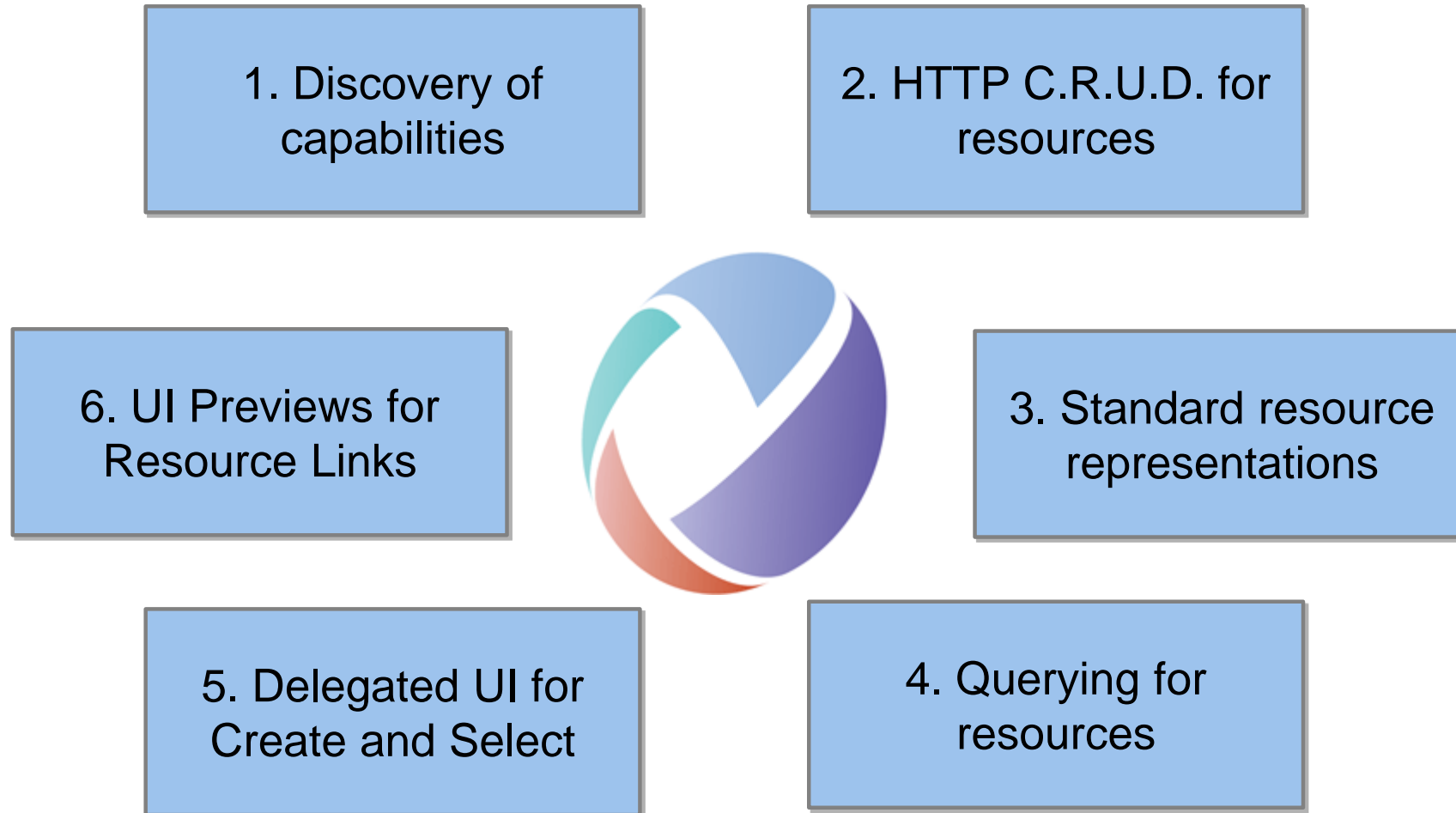


Integrating Data in Different Silos



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How does OSLC Work?

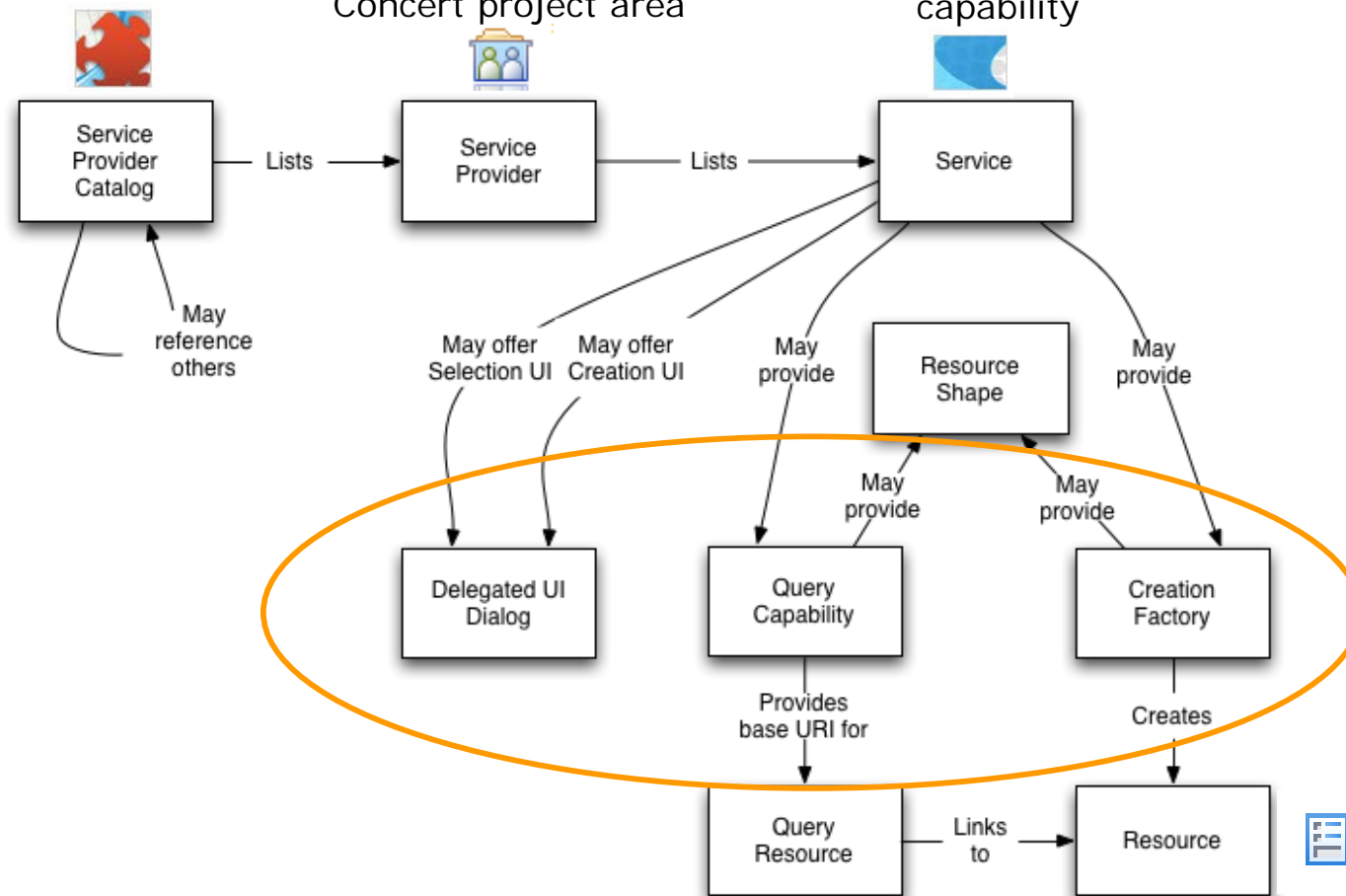


1. Discovery of Capabilities

example: IBM Rational Team Concert

example: IBM Rational Team Concert project area

example: Change Management capability



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

2. HTTP CRUD for Resources

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

	<u>HTTP</u>	<u>SQL</u>
Create	= POST	= INSERT
Request	= GET	= SELECT
Update	= PUT	= UPDATE
Delete	= DELETE	= DELETE

3. Standard Resource Representations



```
<http://example.com/TestCases/1> a oscs_qm:TestCase ;
    oscs_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"
  } ],
  "oscs_qm:validatesRequirement": {
    "rdf:resource": "http://example.com/Requirements/1"
  }
}
```

JSON

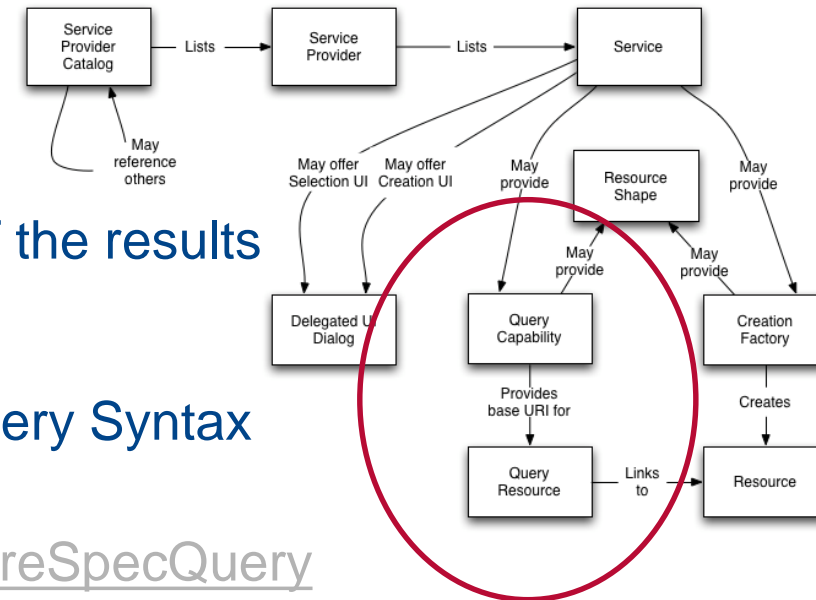
```
<oscs_qm:TestCase rdf:about="http://example.com/TestCases/1">
  <oscs_qm:validatesRequirement rdf:resource="http://example.com/Requirements/1"/>
</oscs_qm:TestCase>
```

RDF/XML

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>



- Example: Find high severity bugs created after April fools day

```

http://example.com/bugs?oslc.where=
cm:severity="high" and dcterms:created>"2018-04-01"
  
```

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.

1. Click to launch delegated UI

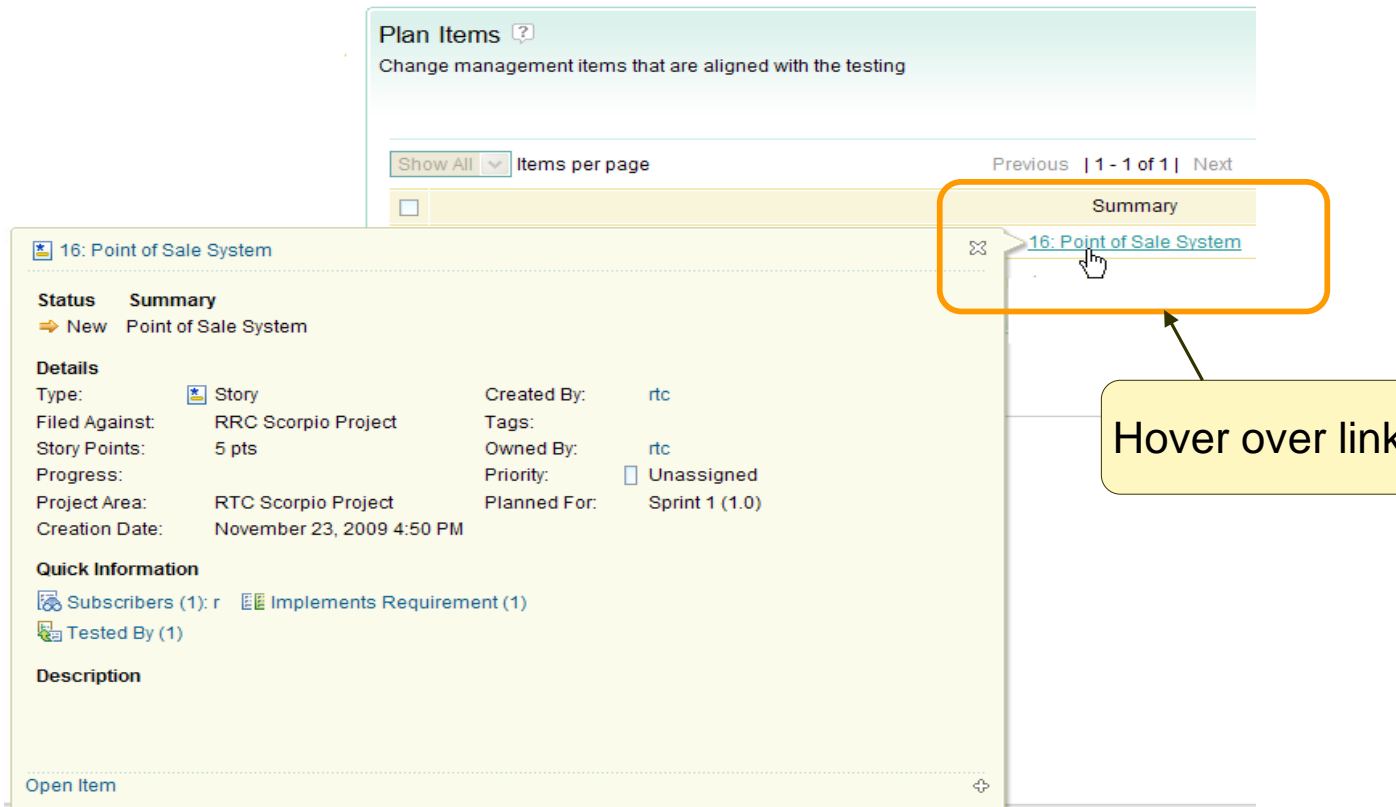
2. iframe's src set to delegated UI's URL

3. Selection made

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

6. UI Previews for Resource Links

- Scenario supported: hover over link to get in context preview of resource
- Simple resource format defined and retrieved using HTTP content negotiation

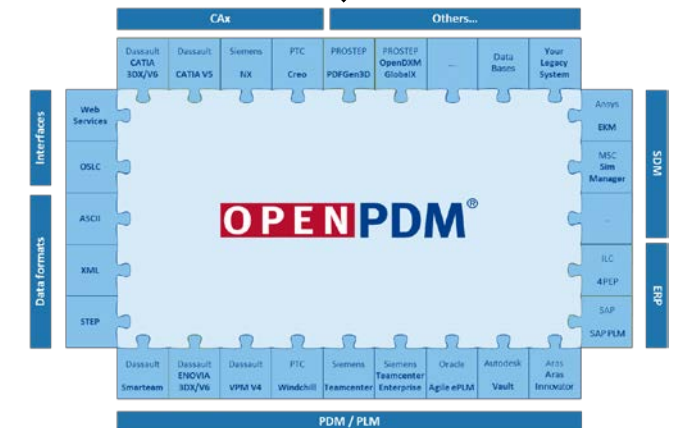
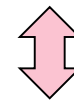


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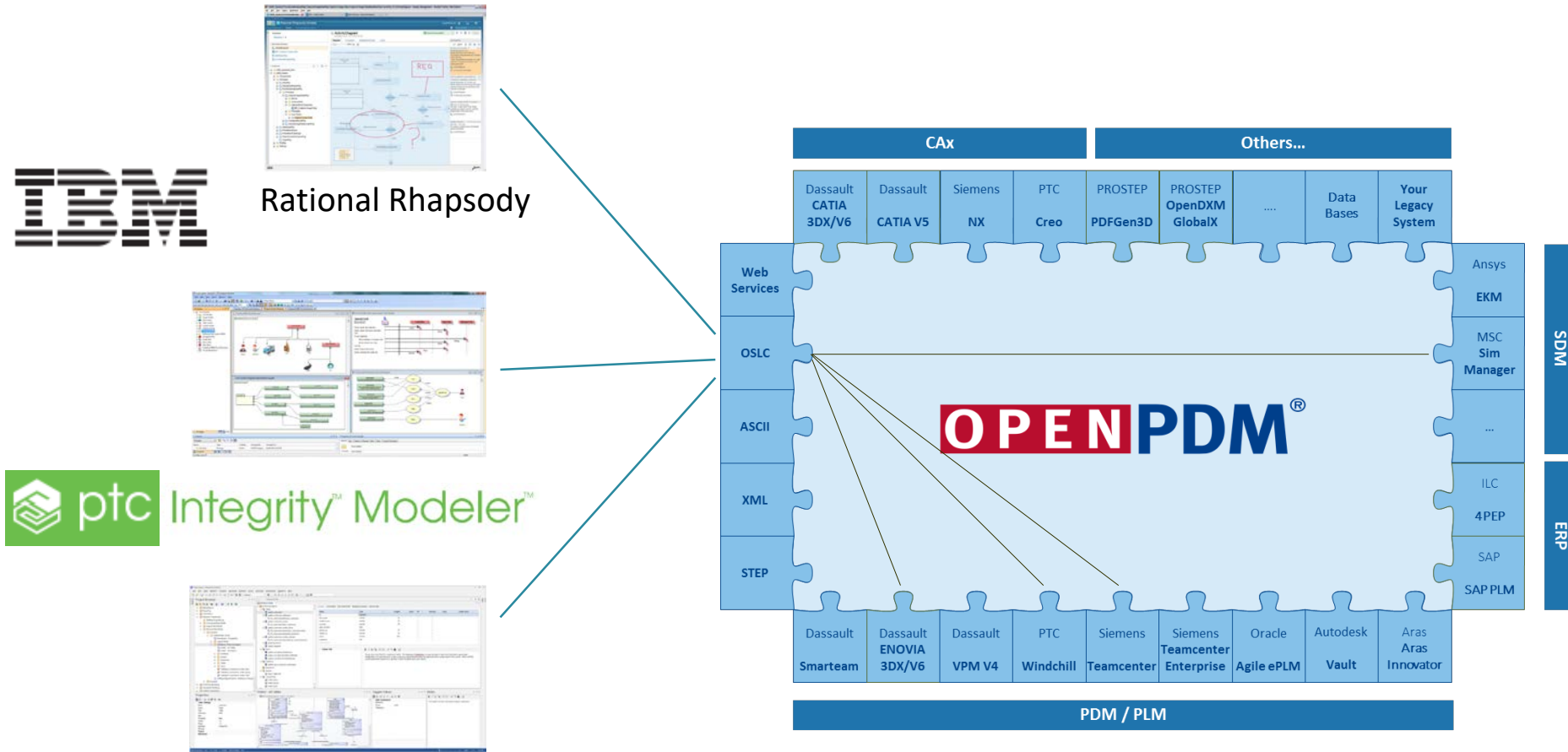
How can I leverage OSLC?

- 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
 - More!
- OpenPDM offers OOTB Connectors for all types of systems
 - Install connectors
 - Generate the mappings
 - Data is federated to your OSLC enabled system

PROSTEP

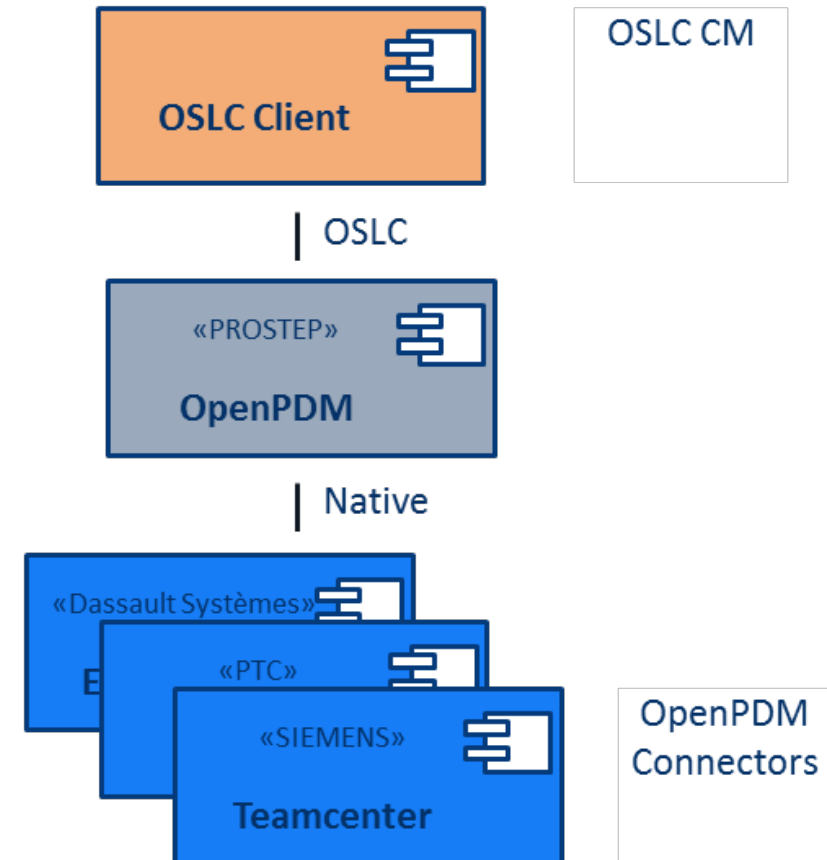


Utilizing OpenPDM OSLC Adapter



OpenPDM OSLC Adapter

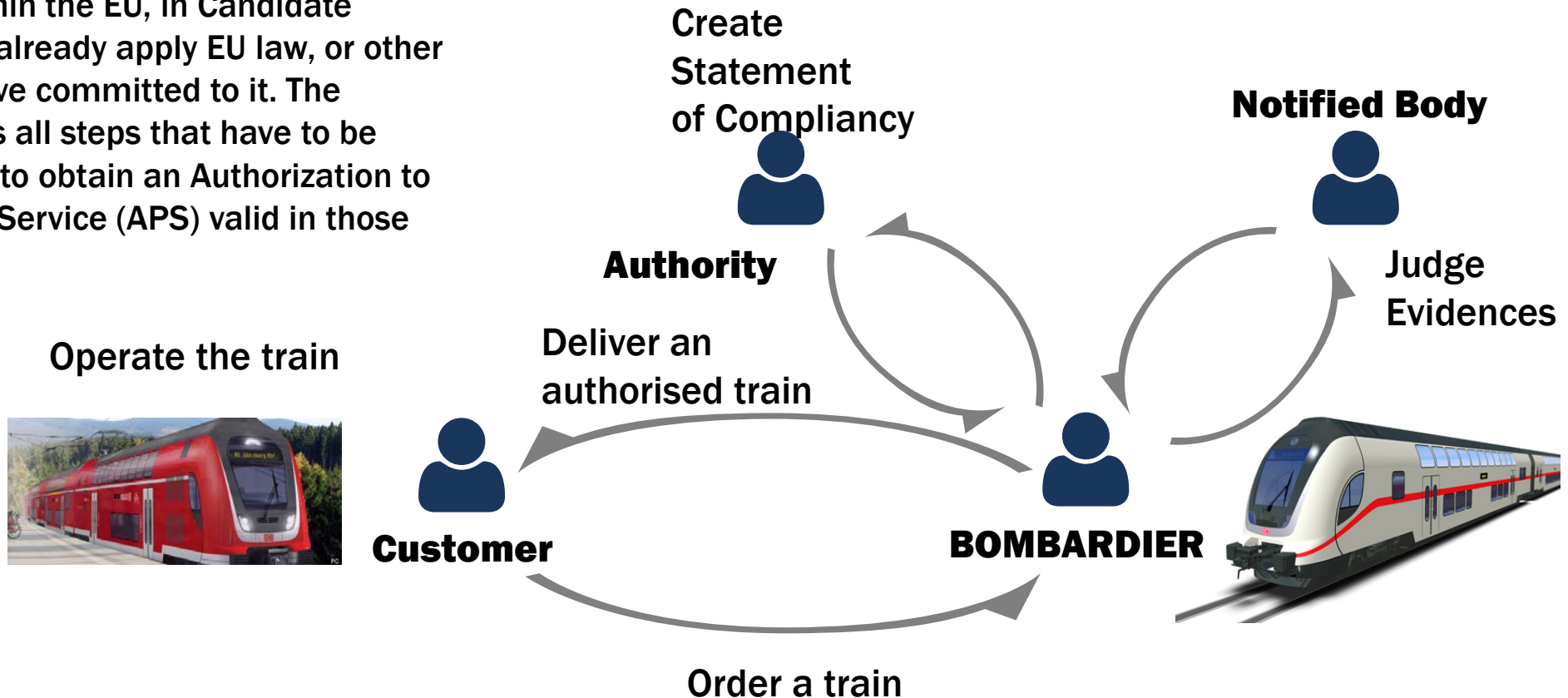
- The OpenPDM OSLC Adapter enables OSLC access for none-OSLC systems
 - » Authentication against backend
 - » Query UI / Properties Display UI
 - » REST Resources and resource links
 - » Local Document Download from the backend system via OpenPDM
 - » Query Service maps OSLC queries onto backend
- Supports Change Management 2.0 + custom attributes
- Support for modern schema (new 2017)



Bombardier Transport

Selling Trains with More Than Two Parties Involved

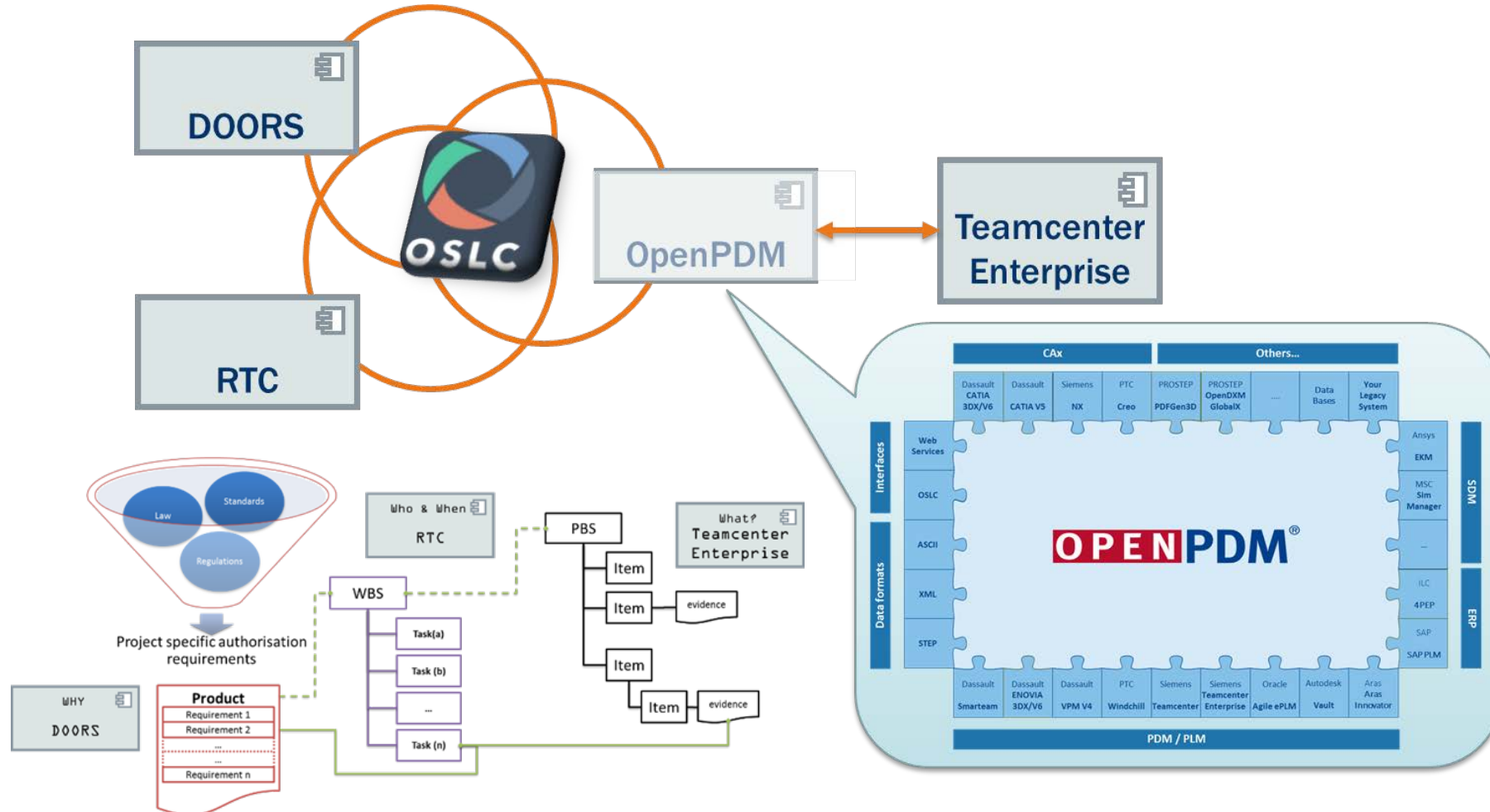
The authorization process reflects the legal framework of the European Union (EU) it has to be consulted for projects applying for authorization within the EU, in Candidate Countries, which already apply EU law, or other countries that have committed to it. The process describes all steps that have to be carried out by BT to obtain an Authorization to Place vehicles in Service (APS) valid in those countries.



Operate the train

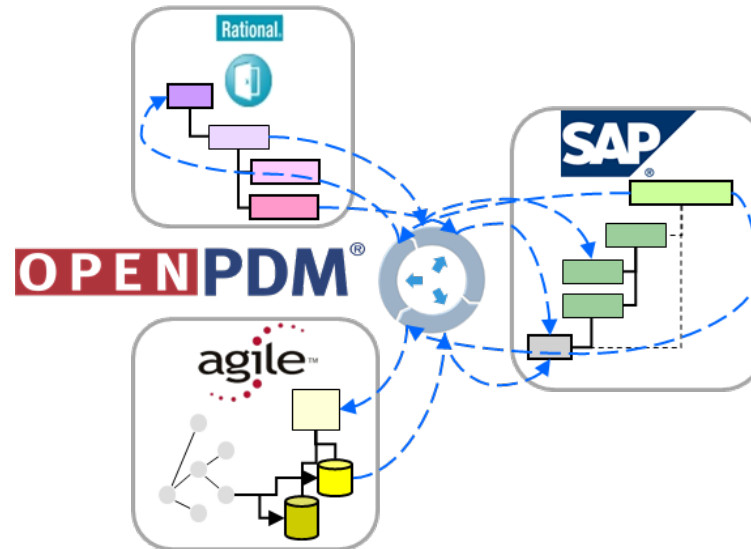


Compliance Tracability at Bombardier Transport



Systems Engineering Integration at ZF

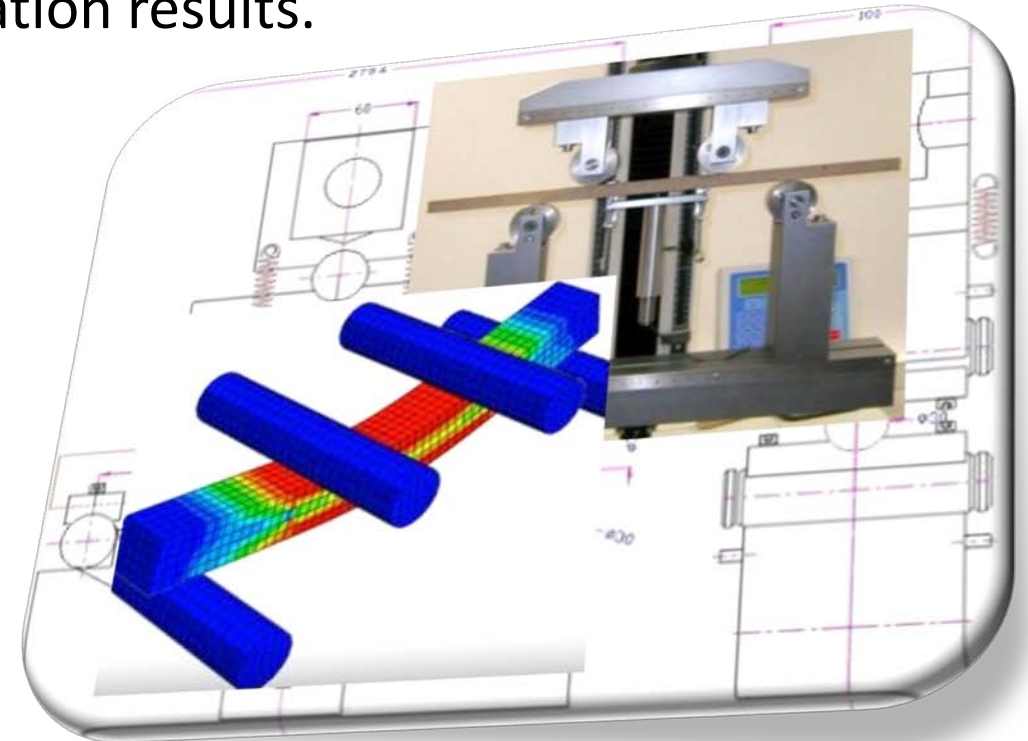
- DOORS – Agile e6 – SAP Integration
 - Linking requirements to documents and materials
- Process Improvement
 - Traceability
 - Impact Analysis (RFQ Assessment)
 - Integrated change management
 - Integrated release management
 - reuse
 - Improved auditability (SPICE)
 - quality management



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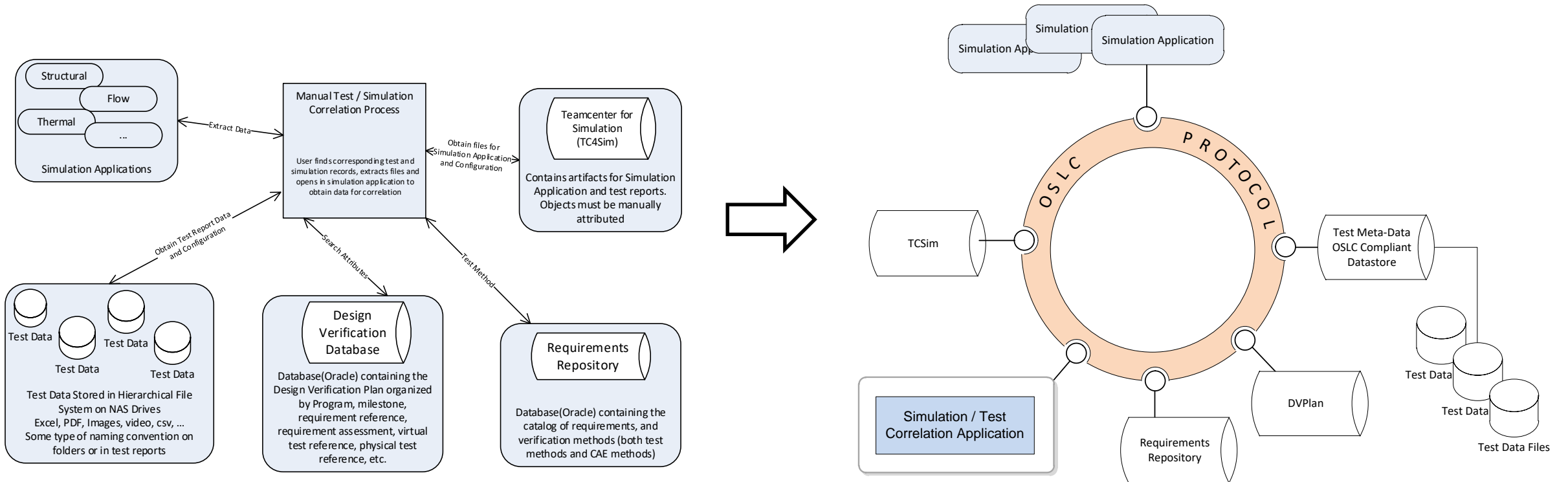
SDM Proof of Concept

- Ran PoC to evaluate OSLC in the Customer IT environment.
- Domain: Physical test/CAE correlation
 - Business driver: replace physical tests with computer simulations.
 - Need to evaluate the quality of the simulation results.
 - Simple data management.
 - Semantics of meta-data.
- “Partnered with PROSTEP because of their system integration expertise in the product development domain.”

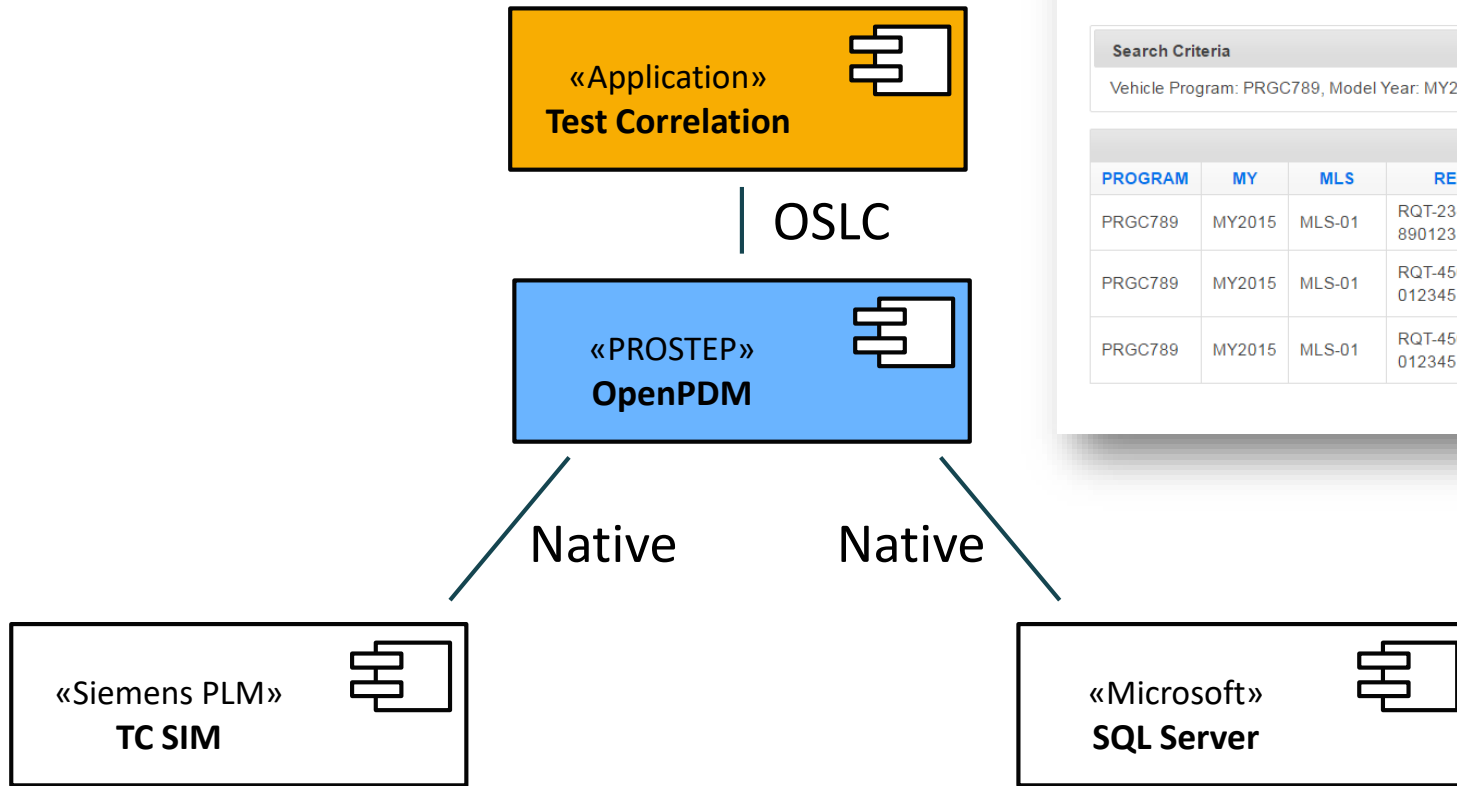


Problem Statement -> Solution Architecture

Huge volumes of data across diverse applications, multiple search tools, manual linkage of datasets



POC Setup & Results



Simulation Test Correlator Application
/ Results Page /

Search Criteria
Vehicle Program: PRGC789, Model Year: MY2015, Milestone: MLS-01

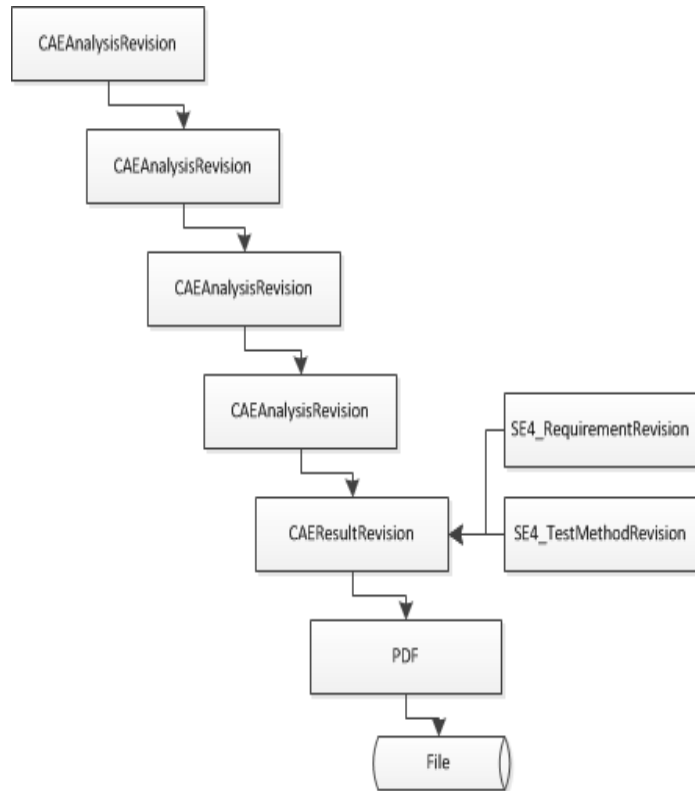
Search Results

PROGRAM	MY	MLS	REQ ID	REQ NAME	TM ID	TM NAME	RESULTS
PRGC789	MY2015	MLS-01	RQT-234567-890123	reqmt02	TM-02.08-C-579	MD-C579	CAE Report
PRGC789	MY2015	MLS-01	RQT-456789-012345	reqmt03	TM-03.14-C-879	MD-C879	CAE Report Test Report
PRGC789	MY2015	MLS-01	RQT-456789-012345	reqmt03	TM-03.14-C-871	MD-C871	CAE Report Test Report

< [Back to Search](#)

POS Characteristics

Tc4Sim Data Model and SDM Repositories



CAE Result Revision

Overview | Attachments | History | Trace Links | Change History | Audit Logs

Defining Objects

Object	Type
TM TM-02.08-C-579/1-MD-C579	Test Method Revision / Evaluation Method Revision
RQ RQT-234567-890123/2-reqmt02	Requirement Revision

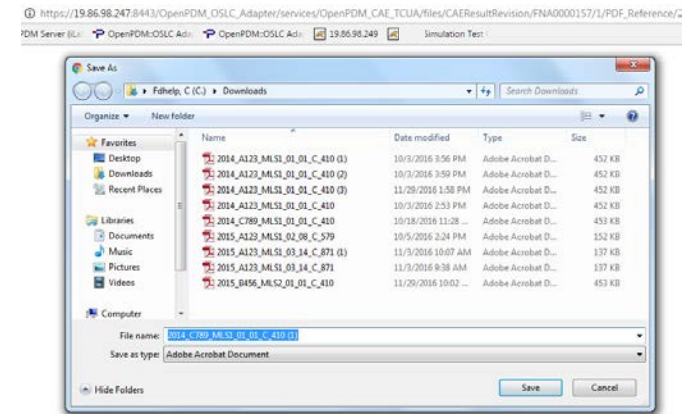
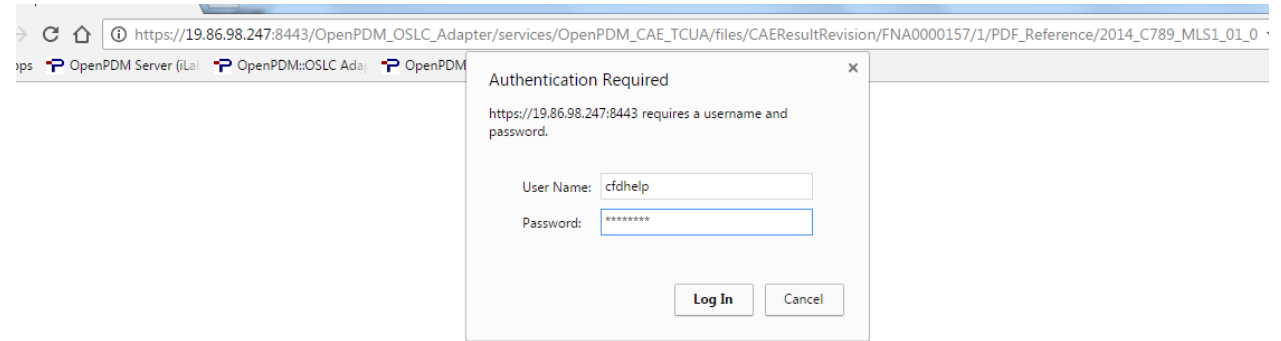
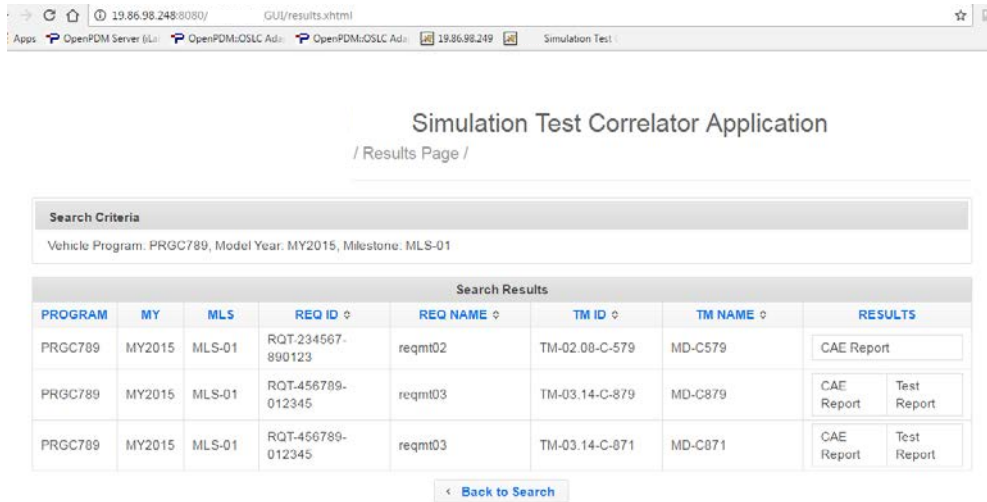
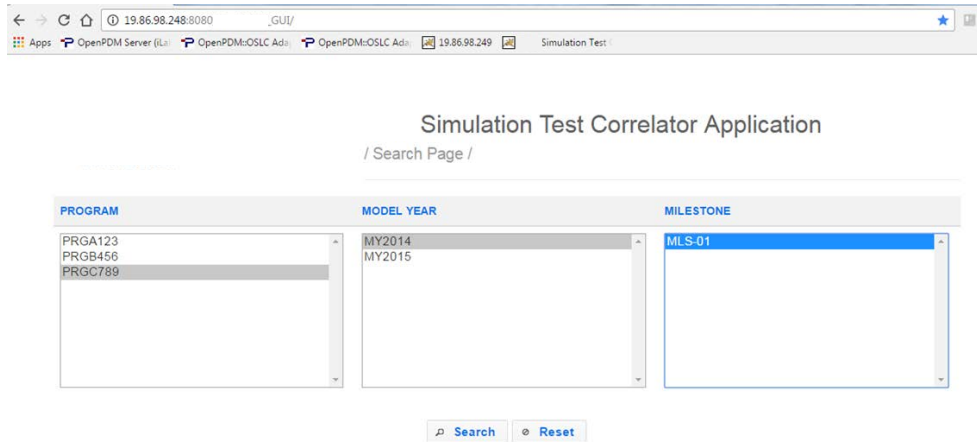
Complying Objects

Object | Type | Release Status | Date Released | Owner

OSLC21_Meth...	OSLC01_Progr...	OSLC02_Model...	OSLC03_Milest...	OSLC04_Requir...	OSLC05_Meth...	OSLC21_Result...
1	PRGA123	MY2014	MLS-01	RQT-012345-67...	TM-01.01-C-410	C:\ProgramDat...
2	PRGA123	MY2015	MLS-01	RQT-234567-89...	TM-02.08-C-579	C:\ProgramDat...
3	PRGA123	MY2015	MLS-01	RQT-456789-01...	TM-03.14-C-871	C:\ProgramDat...
4	PRGA123	MY2015	MLS-02	RQT-234567-89...	TM-02.08-C-579	C:\ProgramDat...
5	PRGB456	MY2015	MLS-01	RQT-012345-67...	TM-01.01-C-410	C:\ProgramDat...
6	PRGB456	MY2015	MLS-02	RQT-012345-67...	TM-01.01-C-410	C:\ProgramDat...
7	PRGC789	MY2014	MLS-01	RQT-012345-67...	TM-01.01-C-410	C:\ProgramDat...
8	PRGC789	MY2015	MLS-01	RQT-234567-89...	TM-02.08-C-579	N/A
9	PRGC789	MY2015	MLS-01	RQT-456789-01...	TM-03.14-C-871	C:\ProgramDat...
10	PRGC789	MY2015	MLS-01	RQT-456789-01...	TM-03.14-C-879	C:\ProgramDat...
**	NULL	NULL	NULL	NULL	NULL	NULL

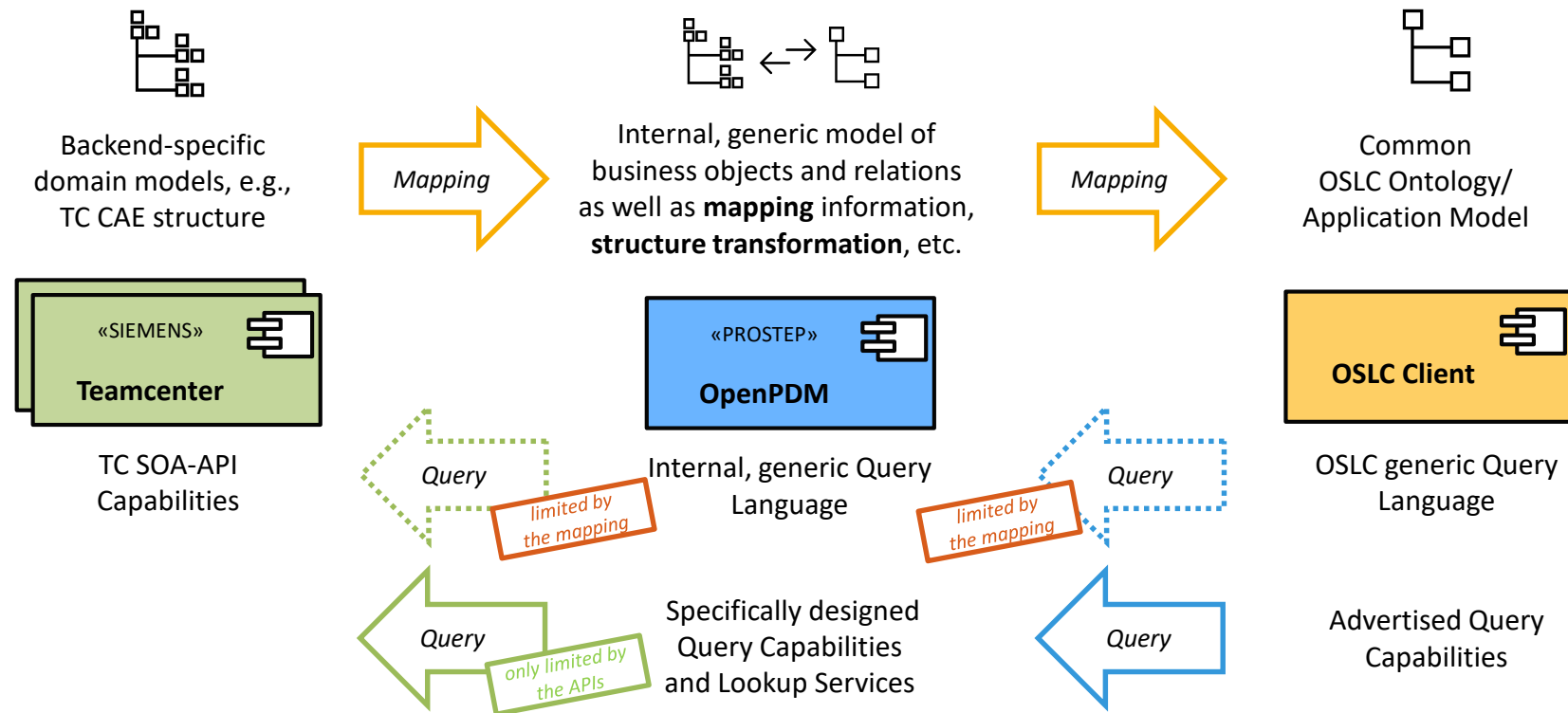
Correlation Application

Finding Correlations and Deriving Results



Understanding Data Models, Mapping, and Lookup

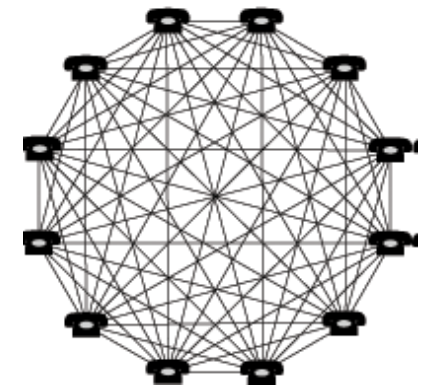
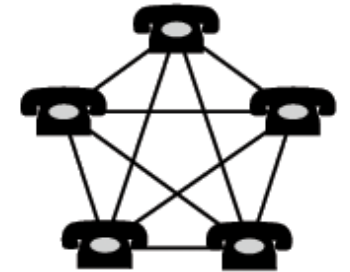
OpenPDM enables mapping between various backend models and the chosen OSLC application model



- OSLC Application Ontology may not support your use case.
 - This is expanding today! Join the group and be heard!
- Having a fully generic query language sounds good, but...
 - needs **non-automatic reverse-mapping** to backend and is hard when structure transformation is involved
 - is **limited by backend capabilities** (API, pre-defined queries, access rights)
 - may put **unwanted load** on backend systems, if not used carefully
- use **designed query capabilities** where possible
- combine with **Data Warehouse** approach when „unlimited“ generic search and analysis capabilities are needed

Is OSLC always the right choice?

- Is there a real need for a common application model and a neutral resource description?
 - or could you work with the backend model directly?
 - how many applications need to be integrated (providers vs. consumers)?
 - what lookup query and analysis capabilities are needed?
 - Do you need to transform or merge data before publishing to OSLC?
- Can you live with linked data or is it necessary to duplicate data?
 - this is a paradigm shift
 - is there a need for synchronization?
- How does this fit-in with other strategies?
 - Enterprise Architecture & ALM
 - Master Data Management
 - Business Intel / Analytics



What do I have to do to make it work?

- Choose an existing or invent your own OSLC application model / ontology
 - tailor model to your needs, e.g., in the CAE / PLM / MBSE domain
 - involve more of your backend systems, as useful / needed
 - launch new workgroup, develop use-cases, draft common requirements
- Choose business and/or research use cases to collect feedback from key users
 - in the business to learn about needs, practical applicability, expectations, and acceptance
 - in IT regarding technical complexity / elegance of the solution
- Evaluate OSLC-technology in more detail
 - Investigate vendor support for OSLC for other tools in use
 - Close gaps by using integration technologies like OpenPDM
 - Iterate and develop more OSLC services!
- Formalize an OSLC vision
 - Investigate pain points for integration, Domains to cover, Start with simple scenario based use-cases

Finally (TLDR)

- OSLC is a light weight mechanism to integrate enterprise data
- It enables access to underlying system without exporting/ importing, i.e., duplicating data
- Caveat: there are only a few detailed published application models
 - These are growing!
- OSLC makes loose integrations very simple
- Need adapters if backend natively doesn't support OSLC
 - Tools like OpenPDM OSLC-Adapter enables publishing existing data from all kinds of systems as OSLC
- Focus on and High Potential for ALM-PLM integration
- Simplified development. No new tools/protocols needed
 - HTTP, XML/JSON, RESTful WebServices
- Tools like OpenPDM also shines when it comes to data transformation and filtering; could even merge data from more than one backend system before publishing as OSLC resource

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API For Digital Thread

A Complete Platform for Transforming an Enterprise Utilizing the Existing Systems

Replicate

- Share required data - CAD data is required for CAE, BOM for manufacturing
- Automatic synchronization of shared data between systems

OPENPDM®

Federate

- Provide intelligent traceable links between systems
- Real time system access of data managed in another system

OPENPDM®

Collaborate

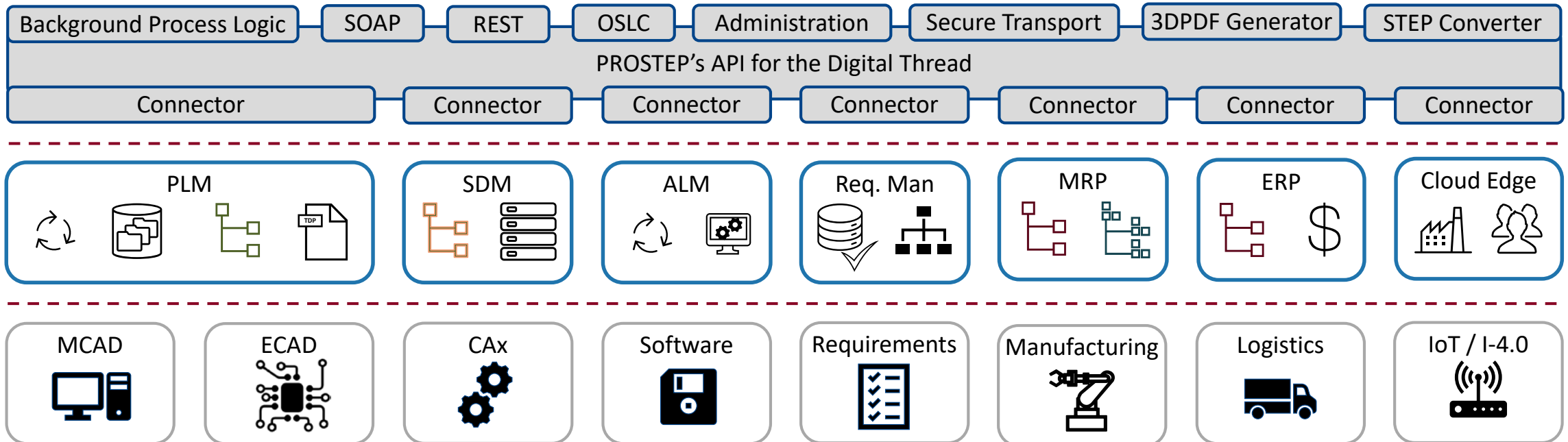
- Automatically share with suppliers and customers
- Secure IP with encrypted transport and DRM

OPENDXM®
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Any Questions?



The text "THANK YOU!" is positioned on the left side of the slide. "THANK" is written in a large, white, sans-serif font, and "YOU!" is written in a large, blue, sans-serif font.

Brian Schouten

Director of Technical Presales

brian.schouten@prostep.com

PROSTEP Inc.

300 Park Street Suite 410

Birmingham, MI 48009

US Toll Free Company Voice: 8-PROSTEP-01 (877-678-3701)

US Toll Free Company Fax: 8-PROSTEP-02 (877-678-3702)