Overview of Open Services for Lifecycle Collaboration (OSLC)

INCOSE IW MBSE Workshop

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Koneksys
Axel Reichwein

- Developer of multiple data integration solutions based on Open Services for Lifecycle Collaboration (OSLC)
- Background in aerospace engineering
- Since PhD, focus on data integration
- Since Koneksys, focus on OSLC
- Previously involved in standardization efforts related to SysML (Systems Modeling Language)

- Presented OSLC at multiple conferences: INCOSE, OMG, SAE International Automotive, North American Modelica Users Group, IBM InterConnect, IBM Innovate, NoMagic World Conference, CIMdata Systems Engineering Workshop
Koneksys helps organizations create data integration solutions using

- Linked Data
- Open Services for Lifecycle Collaboration (OSLC)
- Big Data frameworks
- Graph Databases

Located in San Francisco. In business since 2012.
Status Quo of Collaboration

According to David Meza, Head of Knowledge Management at NASA

“Most engineers have to look at 13 different sources to find the information they are looking for”

“46% of workers can’t find the information about half the time”

“30% of total R&D funds are spent to redo what we’ve already done once before”

“54% of our decisions are made with inconsistent, or incomplete, or inadequate information”

https://www.youtube.com/watch?v=QEBVoultYJg
Consequences of Bad Collaboration

Cost vs Time

Failure
Distributed Engineering Information

One technical system described from different perspectives

One technical system, but a lot of distributed information

Distributed information is challenging for collaboration
Overlaps and Relationships in Engineering Information

Overlaps due to data duplication (e.g. same parameter used in different models or reports)

Logical relationships such as a requirement verified by a test case

The more complex a system is, the more relationships exist between engineering information
Problem: Rollover Risk of SUVs

Higher center of gravity -> higher risk of rollover
More than a third of all fatal crashes in the US are rollovers!

Static Stability Factor Test

System Engineer defines SSF Test Case

Mechanical Engineer computes center of gravity height of new vehicle through geometric model
Fishhook Maneuver Simulation

System Engineer defines simulation test case

Mechanical Engineer performs simulation with dynamic system model

http://www.mathworks.com/tagteam/49380_2008-01-0579_Cherian_Final_1.10.08.pdf
Link between COG Parameter of different models

Center of Gravity
+ Moments of Inertia

Center of gravity in geometric model

Center of gravity in simulation model
Relationships between Engineering Data

Test Cases

Simulation Model

Geometric Model
Reality: Many Relationships between Engineering Data
Collaboration Challenges in Designing Systems

- Increasing system complexity
- Increasing number of partners
- Increasing number of versions of data

Questions:

- How can I assess the impact of a change?
- How can I establish traceability?
- How do I know what is related to what?
- How can I manage changes/updates?

Challenges:

- Increasing number of meetings
- Increasing costs
- Increasing frustration
Data Integration Benefits

Understanding the context of information

Understanding the origin of product failures

Performing consolidated reporting

Performing data analysis

Performing better decisions

Change here

Predict ripple effects!
Key Data Integration Concepts and Standards

1. Standard machine-readable data format = RDF
2. Standard to identify data = URL
3. Standard to access data = HTTP

- No license costs
- No vendor lock-in
- Mature and widely adopted infrastructure
- Abundance of Web specialists/developers
Hypertext + Internet = Web

BEFORE THE WEB

Hypertext System 1

Hypertext System 2

Problem: No Compatibility between hypertext systems + different protocols to access and connect documents on the internet (Gopher, WAIS, etc...)

WITH THE WEB

One global hypertext system = Web
One protocol to access and connect documents
Extending Web of documents to a Web of Data

Web of Documents
- Documents spread across multiple machines

Web of Data
- Data spread across multiple databases
- Note: a lot of information accessible through the Web is private!
URLs = Common Global Information Identifiers

Web of Documents
- wikipedia.org
- facebook.com
- myblog.com

Web of Data
- https://private.myorg.com/req123
- https://private.supplier.com/part123

Data Repository 1  Data Repository 2  Data Repository 3

Data Repository 1  Data Repository 2  Data Repository 3
HTTP = Common Protocol to Access Information

Web of Documents

Client

HTTP Request

HTTP Response

Server 1

Server 2

Web of Data

Client

HTTP Request

HTTP Response

Server 1

Server 2

OSLC specifies how to perform CRUD operations on data using HTTP
HTML + RDF = Common Web Data Formats

Web of Documents

Client

HTTP Request

HTTP Response

HTML

Server 1

Server 2

Web of Data

Client

HTTP Request

HTTP Response

RDF

Server 1

Server 2

OSLC
Schemas for Data Interoperability

Web of Documents

Web of Data

OSLC domain-specific standards (e.g. for Requirements)
OSLC Domain-specific Standards
Links for Data Integration

Web of Documents

URL1
HTML
Link
Facebook Server

URL2
HTML
Link
Wikipedia Server

URL3
HTML
Link
Blog Server

Web of Data

URL1
RDF
Link
Requirements

URL2
RDF
Link
PLM

URL3
RDF
Link
ERP

OSLC
Mashup Applications

Web of Documents
- **Search** (e.g. Google, Bing)
- **Visualize** (e.g. Chrome, Firefox)

Web of Data
- **Search**
- **Visualize** (e.g. IBM Lifecycle Query Engine and Mentor Graphics Context)

Equal access to information - more competition amongst data management solutions

Facebook Server  Wikipedia Server  Blog Server

Requirements  PLM  ERP
Mashup Application Example

Google-like Search

Private/public Data Web

Distributed Data Silos

Search

Filters
Type:
- Assembly
- ItemPart
- DesignPart
- TraceLink

Origin:
- Supplier1-PLM1
- Supplier2-PLM2
- OEM-PLM1
- OEM-PLM2

Results

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Mashup Application Example

Link Editor

Private/public Data Web

Distributed Data Silos

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Mashup Application Example

Tree (BOM-like) Viewers

Private/public Data Web

Distributed Data Silos

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Open Services for Lifecycle Collaboration (OSLC)

Standards for servers hosting data (Hypermedia REST API + Linked Data REST API)

Standards for web-based data interoperability

Adopted so far mainly for Application Lifecycle Management (ALM), systems and requirements engineering

Open Community
OSLC to achieve the Digital Thread
We need you to help promote OSLC!

New OSLC Web site: [http://oslc.co/](http://oslc.co/)

Adding your company logo to the list of supporters on the web site helps the OSLC community grow.

If end user organizations show support for OSLC, then vendors, consultants, and developers will offer more support for OSLC.
Thanks and get in touch!

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