Unite Engineering Teams

Open Standards and OSLC

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Smarter products mean that complexity is rising

Aerospace and defense
Today’s F35 has 10 million lines of code on board, twice the amount on the F-22, another stealth fighter.

Energy and utilities
Smart meters for water utilities will lead to $29.9 million in sales by 2017 compared with $10.3 million in 2011.

Automotive
Electronics drives 80 percent of the automotive industry’s functional innovation — software is the key to most of it.

Telecom
Between 2012 - 2016, mobile data traffic will multiply tenfold, with video content acting as the biggest driver.

Electronics
By 2014, 230 million Smart TVs will be installed with 57 million homes watching web-based streams over broadband.

Medical devices
The da Vinci S surgical robotic system:
- 1.4 million lines of code
- Computing power of 7 laptops
- 10,000 individual parts
The value of being right has never been greater...

Apple Inc. Revenue by Quarter by MacRumors.com (in millions)

- Galaxy S - 20 million units
- Galaxy S II - 40 million units
- Galaxy S III - 50 million units
- Samsung Galaxy S IV sales expected to pass 100 million

and the cost of being wrong has never been greater...

BMW Recalling 1.3 Million Cars To Fix Electrical Flaw

The Wall Street Journal, March 26, 2012

Toyota recalls 7.43 million cars

CNN Money, October 10, 2012

First Private Craft Docks With Space Station


Boeing Risks $5 Billion in Revenue on 787 Probe’s Outcome

Bloomberg

"At Apple, we strive to make world-class products that deliver the best experience possible to our customers. With the launch of our new Maps last week, we fell short on this commitment. We are extremely sorry for the frustration this has caused our customers and we are doing everything we can to make Maps better.”

Tim Cook, Apple’s CEO
Workers across the enterprise, including engineering, spend a lot of time (not) finding information

Knowledge workers spend 15% to 35% of their time searching for information

40% of corporate users report that they cannot find the information they need to do their jobs

50% of most intranet searches are abandoned

90% of the time that knowledge workers spend in creating new reports is recreating information that already exists

Sources:
Information Gathering in the Electronic Age: The Hidden Cost of the Hunt, The Ridge Group
Smarter products won’t be developed the same old way

Traditional Product & Systems Development

- Focused on CAD/CAM and BoM
- Slower to react to change
- Silos of engineering disciplines

Next Generation Product & Systems Development

- More focus on software and electronics
- Responsive to change
- Systems engineering methods optimize product designs and engineering collaboration
Need better integration approaches

• Past integration approaches have provided limited choice and coverage.
• Past integration approaches have been disruptive and slow to emerge.

Single repository
“Can I really expect one vendor to provide all the functionality I need? And what about my existing tools?”

Point-to-point integrations
“How can I ever upgrade one tool without breaking everything else?”

Universal metadata standard
“How did I ever think all those vendors would be able to agree?”

Standard implementations
“Did I really believe that every vendor would rewrite their tools on a single framework?”
But what is different this time?
Let’s look at something we all know very well …

- The Internet: distributed and global “data space” of linked documents.
- Enormous content providers
- Simple – adhering to common basic protocols
- Extremely scalable
- Open, Standardized
Linked Data

Four simple principles:
1. Use URIs as names for things
2. Use HTTP URIs so that people can look up those names
3. When someone looks up a URI, provide useful information, using standards (e.g. RDF*, SPARQL**, ***,REST)
4. Include links to other URIs, so that they can discover more things

* RDF, the Resource Description Framework provides a generic graph-based data model for describing things, including their relationships with other things.
** SPARQL is a query language able to retrieve and manipulate data stored in RDF format
*** REST, REpresentational State Transfer (REST) is a style of software architecture for distributed systems where requests and responses are built around the transfer of representations of addressable resources
Domains

- Domain is a formal representation of knowledge as a set of concepts within a specific context, and the relationships among those concepts.
- Domain specifications help in unification and standardization of Linked Data sources that are “semantically close”.
  - Prevent duplications
  - Enhance understanding
Integration services

- Linked Data enables variety of “Integration Services”
  - Traceability
  - Search (through indexing)
  - Query
  - Variety of views and analysis techniques
    - Visualizations
    - Impact analysis
  - Cross domain resource management (e.g. versioning)
  - Many more…
Engineering and the Web?
Engineering environments are highly fragmented

The challenge to connect them is increasing exponentially

• Traditionally, each tool came with its own
  – **UI** – Web and desktop presentations of views and tasks
  – **Logic** – Workflow, process, search, query, scale, security and collaboration
  – **Storage** – individual files on workstation or servers: how to ensure availability and traceability?

• Resulting in...
  – Brittle/poor integrations
  – Silos everywhere
  – High cost to maintain and administer
  – Low re-use

How do you solve this?

- lack of integration
- lack of management

Lack of integration:
- Quality Management
- HIL Testing
- MIL Testing
- SIL Testing

Lack of management:
- Project Plan
- Work Items
- Portfolio Management
- Requirement Management
- Workflow Management
- FMEA
- E/E Architecture
- AUTOSAR Modeling
- SW Design
- SW Coding
- Verification
- Control Loop Models
- Complier/Debugger
- Emulators
- Change Management
- SW Unit Test
- Process Management
- Software Configuration Mgmt
- Reporting
- AUTOSAR ECU Configurator
Leveraging the Linked Data concepts of Web Technology

- Requirements
- System Architecture
- Electrical Design
- Mechanical Design / PDM
- Embedded Software Design
- Test

http://acme.com/Requirement

http://acme.com/MechanicalPart

HTTP/REST
Linking Lifecycle Data via OSLC

Resources from different domain tools are linked together using OSLC
OSLC community

Wide range of interests, expertise, participation

- Vendors, end users, industry consortia
- 40+ organizations have had employees participate in specification development efforts
- Collaborating on solutions for ALM, DevOps, ISM, PLM

Growing list of implementations from IBM and others

- Implementations from IBM Rational, Oracle, IBM Tivoli and open source
- 3rd party adapters from IBM, Kovair, Tasktop, and open source
- Dozens of end users enabling homegrown tools

Completed and active specifications for many domains

- Change Management, Quality Management, Requirements Management, Asset Management, Architecture Management, Automation
- Product Lifecycle Management, Configuration Management
- Performance Monitoring, Reconciliation
OSLC website at http://open-services.net
Smarter development using an Internet inspired architecture

The Web has proven to be the most **scalable**, **open**, and **flexible** integration technology.
An Example: Rational Engineering Lifecycle Manager

*Extending the Rational solution for systems and software engineering*

- Uses a Linked Data approach that enables
  - ✔️ **Visibility** – across many sources of data
  - ✔️ **Organization** – information in context
  - ✔️ **Analysis** - answer questions using that contextualized information

- Allows stakeholders to:
  - manage growing complexity
  - derive knowledge from the available data
  - make timely and correct engineering and business decisions
Another Example: Mentor Graphics Context™ SDM

Co-ordinating, managing and automating the E/E Design process

- **An OSLC Portal to manage relationships** between tools throughout design disciplines
  - Coordinate changes across dependencies with workflow support
  - Users can see and interact with artifacts from other engineering disciplines from within their familiar tool environments

- **Enable** product centric traceability, **analytics and reporting**
  - Dynamic real-time visibility of design activity available to all
  - Tight linkage with RELM for lifecycle wide analytics and reporting
  - Support standards compliance needs right through the implementation workflows

- With no disruption to current engineering environments
RELM with Mentor Graphics Context SDM
Extend RELM visibility to include the entire E/E design space

Manage, co-ordinate and automate the E/E Design Process and activities with Mentor Graphics Context SDM
Smarter Product Development with RELM and Context SDM

A core set of data sources from IBM Rational
- Rational DOORS
- Rational Team Concert
- Rational DOORS NG
- Rational Quality Manager
- Rational Rhapsody
- Rational Design Manager
- Rational Asset Manager
- Rational Focal Point

A growing ecosystem of 3rd party data sources
- Capital
- Volcano
- DxDesigner
- Expedition
- SystemVision

Extensible via open specifications and toolkits

Open & federated, not proprietary & monolithic
Example Use Case: Aerospace Systems Engineering

**Example Scenario**

- Sam, the Systems engineer models the system functions and behavior at multiple levels of abstraction using Rhapsody.

- Evan, the E/E Engineer creates electrical schematic and harness designs in Mentor Graphics Capital, and links relevant E/E design artifacts to the Rhapsody models using Context SDM.

- Because Context SDM exposes E/E artifacts and relationships to RELM, engineers are able to search, query and perform impact analysis from requirements and standards all the way across the lifecycle to E/E implementation.

**Additional Examples**

- "Are we ready to build our new long range variant?"
- "Which requirements for the safety analysis are related to tests that failed on their last execution run?"
- "Show me everything containing the phrase ‘network’"
- "Which open work items are related to requirements, tests or model elements that contain the words ‘fuel control’?"
Thank You!!

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