More Complex
Not More Complicated
A Joint Project by EADS, IAI, and IBM Research - SE-1310

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IBM Software
Innovate 2011
The Premier Event for Software and Systems Innovation

Software. Everywhere. June 5–9 Orlando, Florida
## Agenda

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Agenda

The Systems Engineering Challenge – Rational Perspective

IBM Research and IAI Project Collaboration: Relationship Hub Results

SPRINT - Software Platform for Integration of Engineering and Things

Summary
Largest industrial company in Israel - 6 groups & 21 divisions

Current workforce: 16,700

Land, Sea, Air & Space Products: Missiles, Satellites, UAVs, RADARS, Avionics, Upgrades, etc.

Activities encompassing: Development, Production, Maintenance and Service of Aerospace And Defence Systems

Global company: Over 30 subsidiaries worldwide, including holding & marketing companies

Sales: 3.6B $ (Over 80% export; Backlog: +8B$)
IAI Environment

- DOORS
- SA
- ICD Messaging
- RPE
- Siemens TC NX
- HP – Quality Center
- Rhapsody
- ClearCase
- PDM - Mantra

- In Use
- To Be

- IBM
- Third parties
- In-house

- Not in the FOAK scope
- E.E tools
- Simulation tools
- ERP
- Maintenance applications
The Relationship Hub Solution

IAI tools/systems with Relationship Hub

- Create a “virtual PLM“ system from cross-discipline tools
  - As opposed to migrating all data to a single all-in-one PLM application
  - Integrate with the customer’s existing PLM toolset in a non-intrusive manner
- Leverage Jazz and infrastructure being developed for Rational tooling
- Provide an OSLC like integration for tools that don’t support OSLC
- Explore the best methodology for capturing and representing cross-discipline relationships
Relationship Hub Architecture

**ALM / PLM**
- **SE**: System Architect, Rhapsody
- **Req**: Doors Testing: HP QC
- **SW**: Rhapsody RSA
- **Mechanical Eng**: Team Center
- **PDM tool**: RH Adapter
- **Manufacturing / ERP**: [out of scope]

**REST APIs**
- **Apps**:
  - Impact analysis
  - Inter Connectivity Rule Checking – By CSP solver
  - Document Generation – By RPE
  - Bi directional Inter Link Creation and mgt

**Jazz Team Server**
- **Data Model A**
- **Data Model B**
- **Data Model C**

**RH Web UI**
- RH UI Extensions in ALM/PLM Tools

**WPS**
- SOA/OSLC bridge
Capabilities of the Relationship Hub

Relationship Hub:
- Support systems engineering method
  - Cross-tool models/artifacts integrated view
- Cross-tool models/artifacts bidirectional relations
- Cross-tool search and query
  - Impact analysis
- Interconnectivity rules checking via constraint satisfaction technology
- Cross-tool reports and documents generation
  - Cross-domain baselining
## Agenda

- The Systems Engineering Challenge – Rational Perspective
- IBM Research and IAI project collaboration: Relationship Hub outcomes
- **SPRINT - Software Platform for Integration of Engineering and Things**
- Summary
SPRINT – Software Platform for Integration of Engineering and Things

- General
  - EU-funded consortium: 7 partners
  - Major industrial partner:
    - Israel Aerospace Industries
    - EADS
    - IBM
  - Launched October 2010
  - Duration 36 months
EADS at a glance
EADS Divisions – The Four Firm Walls on which EADS is Built

**AIRBUS**
- Globally leading aircraft manufacturer
- Since 2000, Airbus commercial deliveries grew by 60%
- Backlog more than doubled in one decade (now equaling 6 years of production)

**ASTRIUM**
- Europe’s leading space provider
- Largest space employer in France, Germany, Spain and the UK
- Having increased its revenues 2x and EBIT 4x since the year 2000

**EUROCOPTER**
- Leading helicopter manufacturer
- Accounting for 1/3 of the global helicopter fleet
- Having delivered about 4,000 helicopters throughout the past decade

**CASSIDIAN**
- Worldwide leader in security systems and Europe's leading UAV provider
- Over 234 Eurofighter aircraft delivered (as of Sept. 2010)
- Having more than doubled its EBIT & Return on Sales over the last 5 years
RH Evolution: From Single Partner Sharing Tools [1/3]

Partner A
RH Evolution: Multiple Partners and Tools Single Project [2/3]
RH Evolution: Multiple Partners and Tools Multiple Projects [3/3]
www.ibm/software/rational
Link Management / Integrated View

- Integrated view of data models
- Stores only indexing data including intra-relationships
- Captures client methodology for enriching the data
- Cross-tool relations among model elements from different tools/disciplines
- Bi-directional relation awareness
- Common web UI for creating inter-relations
- Query and web UI for tracing heterogenous related elements
Impact Analysis

- Identify all related elements that could potentially be impacted by a change in an element.
- Perform smart search across RH elements and relations according to different configurable types:
  - Upstream, downstream, custom
- Use advanced visualization
  - Modify the results, navigation, comments
- Present and aggregate the results according to the customer reference model.
Demo Use cases

- **Use case 1**: Associate Requirements From IAI to Requirements from EADS
- **Use case 2**: Impact Analysis across artifacts from IAI and EADS
Change in Stake Holder requirement

- Stake Holder requirement Adjustable Camera changes

“Camera elevation shall be adjustable from pointing straight down to 15 degrees above the horizon”

“What are the elements impacted as a result of this change?
The System: Search And Rescue Automated Helicopter

- SARAH
- Control Station
- Air Vehicle
- Mission Planning Station
- Portable Video Terminal
- Air Frame
- Avionics
- Payload
  - Payload Control (Software)
  - Payload Equipment (Electronics)
  - Payload Structure (Mechanics)
  - Structural Constraints
The System: Search And Rescue Automated Helicopter [1/2]

IAI

SARAH

Control Station

Air Vehicle

Mission Planning Station

Portable Video Terminal

Air Frame

Avionics

Payload

Payload Control (Software)

Payload Equipment (Electronics)

Payload Structure (Mechanics)

EADS
Demo Architecture

IBM/EADS

- EADS RZ
- DOORS 9.2
- SA 11.3
- EADS web br.

FrH

- EADS YZ

Windows clients

Internet GZ

Windows server

IBM

- IAI YZ
- IAI RZ
- DOORS 9.2
- SA 11.3
- HP QC
- IAI tools
- IAI web br.

Actual

Roles

Windows clients

Windows server