Requirements Management and PLM

Sept 9, 2013

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Northrop Grumman
Northrop Grumman Today

Northrop Grumman Corporation is a leading global security company providing innovative systems, products and solutions in aerospace, electronics, information systems, and technical services to government and commercial customers worldwide.

- $26 billion sales in 2012
- $39.5 billion total backlog
- 75,000 people, 50 states, 25 countries

Leading capabilities in:

- C4ISR and battle management
- Cyber security
- Defense electronics
- Homeland Security
- Information technology and networks
- Logistics
- Space and missile defense
- Systems Integration
- Unmanned Systems
## Four Operating Sectors at a Glance

### Aerospace Systems

- Airborne Ground Surveillance / C2
- C4ISR
- Directed Energy Systems
- Electronic Combat Operations
- Environmental & Space Science Satellite Systems
- Global / Theater Strike Systems
- ISR Satellite Systems
- Large Scale Systems Integration
- MILSATCOM Systems
- Missile Defense Satellite Systems
- Naval BMC2
- Strategic Space Systems
- Unmanned Systems

### Electronic Systems

- Air Defense Systems
- C4ISR Networked Systems
- EO/IR Targeting & Surveillance
- Marine & Undersea Systems
- Navigation & Positioning Systems
- Propulsion & Power Generation
- Radar Sensors & Systems
- RF/IR Countermeasures
- Space Sensors

### Information Systems

- Command & Control Systems
- Communications
- Cybersecurity
- Enterprise Systems and Security
- Federal, State/Local & Commercial
- Homeland Security
- Intelligence
- Intelligence, Surveillance & Reconnaissance Systems
- IT/Network Outsourcing

### Technical Services

- Aircraft Subsystem/ Component Sustainment & Modernization
- Aircraft System/Platform Sustainment & Modernization
- Defense and Government Services
- Ground Vehicle Reconstitution
- Integrated Logistics and Modernization
- Irregular Warfare/Quick Reaction Capability
- Live, Virtual and Constructive Domains
- Nuclear Security Services
- Technical and Operational Training Support
- Training Solutions
Northrop Grumman Corporate Vision

Global Product Data Interoperability Summit | 2013

Be the most trusted provider of systems and technologies that ensure the security of our nation and its allies
Northrop Grumman Products
Typical RM Challenges

Challenges Through the Product Lifecycle

• Requirements Definition
  – Can everyone see the definition?
    – Engineers, Designers, Contracts, Mgt, Customers, etc..

• Requirements Traceability
  – Are the requirements managed with the products?
  – Are the requirements included in the deliverable BoM? (if req’d)
  – Impact of a Req’t CN to the deliverable?

• Change Management
  – Are the requirements visible in the CM processes?

• Workflow and Product Development Review
  – Are the requirements visible/verifiable in the review processes?
Choices?

Partial List RM Software Applications
(http://www.incose.org)

- Acclaro DFSS
- Accept 360
- Blueprint Reqs Cntr 2010
- Case Complete
- Concerto
- CORE
- DOORS
- GatherSpace
- HP Requirements Management
- Leap SE
- Mac A&D and Win A&D
- objectiF
- Open Source RM
- PixRef Pro
- Projectricity
- RaQuest
- Requisite Pro
- ScopeTracker
- SpiraTest

- Accompa
- AnalystPro
- Caliber-RM
- CASE Spec
- Cognition Cockpit
- Cradle
- Enterprise Architect
- GMARC
- inteGREAT
- Lighthouse RM
- MKS Requirements
- OneDesk
- PACE
- Polarion Reqs
- Rally
- Requirement Tracing System
- RMTrak
- SoftREQ
- Teamcenter
RM Options For NGC

- IBM-DOORS is prevalent and the ‘standard’
  - Many users across multiple business sectors and multiple programs
  - Used for proposal development support and contract deliverables
  - Some individual instances
  - Some Citrix-based with shared licenses

- PLM Direction
  - Thousands of users across multiple business sectors and multiple programs
  - TC UA
  - TC SE
  - Windchill for contract partners
  - Others...

- Reqt’s Mgt and Traceability is Essential to Accurate Deliverable

- Siemens System Integrator
  - DOORS
  - TC UA
  - TC SE
  - Others on horizon
  - Conforms to RIF 1.1a
RIF 1.1a: Requirements Interchange Format

- The Format for the Standardized Exchange of Requirement Information

- Neutral Format for Structure Requirements & Attributes, Types, Access permissions and Relationships (links)
  - Similar to IGES for CAD and STeP for data

- Ensures Accurate Exchange of Requirement Information

- Defined/Delivered via a deliverable XML schema
  - Can be shared between systems

- Tool independent
  - Major RM vendors are committed to supporting the RIF standard

[XML code snippet]

\[\text{Example XML code}\]

\[
\text{Example XML code for RIF}\]

\[
\text{Example XML code for RIF}\]
DOORS: Requirements Mgt

DOORS Reqt’s Management

System Requirements

System Test Plan
DOORS: Proposal Support

Program Proposal Work

Proposal Design
Systems Integration: Features: Map Attributes

Integration Interface

Teamcenter Items

Teamcenter Attributes
Systems Integration: Schedule Synchronize

System Synchronization

Assign dates and times for Automated Synchronization
### Requirement Objects

- 000025/A1: Control car (Design)
- 000026/A1: Switch on car (Design)
- 000027/A1: Control speed (Design)
- 000028/A1: Brake car (Design)
- 0000014/A1: REQ
- 0000015/A1: REQ
- 0000016/A1: REQ
- 0000017/A1: REQ
- 000025/A1: Control direction (Design)
- 000018/A1: Specific items (Design)
- 000019/A1: Power car (Design)
- 000020/A1: Control car (Design)
- 000023/A1: Protect passengers (Design)
- 000024/A1: Protect passively (Design)
- 000025/A1: Protect actively (Design)
- 000036/A1: Accommodate (Design)
- 000023/A1: A new structure for the parking sensors
- 000024/A1: Accelerate car
- 000025/A1: Control direction
- 000032/A1: Directional
- 000039/A1: Accommodate steering system
- 000015/A1: Accommodate accessories

### Assy Structure Relationships

- **MS-2013/-j1-FURY (Design)**
  - Latest Working - Date: "Now"
  - **DOMLines**
  - **Item Type**

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<th>DOMLines</th>
<th>Item Type</th>
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<td>Hardware</td>
</tr>
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<td>Paragraph</td>
</tr>
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<td>Paragraph</td>
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Traceability/Review Process

Teamcenter Product Impact

Follows part through review process

Referenced to part for impact analysis

Review/Workflow for CM
On The Right Path?

Address The Challenges Through the Product Lifecycle

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