Model Based Enterprise Modeling applied to Dynamic Manufacturing Networks

Towards a PLM interoperability test bed within the Aeronautic, Space and Defense digital business ecosystem

presented by Thomas Vosgien

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Plan of the presentation

Business and Research Context

The problem

The addressed issues

State of the Art

The new proposed approach

Conclusion

cPlatform

cPlatform usage

Standard blueprint template

SIP Testbed
Business
- Product Lifecycle Management approach within Aerospace, Defense and Space community
- Open eBusiness PLM standards identified as strategic
- Some difficulties to deploy standard based solutions within the dynamic manufacturing networks

Research
- Federative Interoperability Framework
- cPlatform for Networked collaborative Product Development
- Open standards elected by a matured (in term of interoperability) community of interest, enterprise modeling, etc.
- Design adopting System Engineering approach
- Building interoperability on top of technical solution implementing open standard, and if possible open source with industrial quality;
- Enterprise modeling: ArchiMate implementation by Archi
- Enterprise collaboration platform: Enterprise portal + Enterprise Workflow System + Enterprise Service Bus based on related open standards
Targeted usage of Archimate and cPlatform

- Dynamic Manufacturing Network blueprint for describing architecture of the DMN with Archimate
- Model Based Approach Archimate Model
  - Generated Business Architecture deployed on cPlatform
- AS IS and TO BE modeling with path between them (governance of change of information systems and collaboration processes)
- Blueprint (templates) of elected standards for guiding architects
- Model Based approach assessing standards and their implementation
- Execution platform for simulating the DMN models
Issues

- Several modeling language to be used in addition to ArchiMate (UML, BPMN, XPDL)
  - Required methodology with modeling artifacts to be managed in configuration

- Enterprise Application required with underlying meta-model different from the used standards
  - How to project Archimate models in the execution platform?
    - Enterprise Portal, Application Server, ESB and Enterprise Workflow system
IWEI 2015

The state of the Art

- **[1] NEFFICS approach**
  - Building a new enterprise platform which is not a product, and not using COTS solutions

- **[2] Specifying Domain-Specific Refactoring for AndroMDA**
  - Too simple target i.e. Enterprise Application Server

- **[3] Sirius rapid development of DSL graphical editor**
  - All the mapping and transformation to be written

- **[4] TOGAF Enterprise Architecture Platform (TEAP) for Model Driven Organisations**
  - Focus on aggregation of multiple enterprise data source, not PDM

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2. Gabriele Taentzer, Dirk Muller, Tom Mens, 2014 Specifying Domain-Specific Refactorings for AndroMDA Based on Graph Transformation. In Applications of Graph Transformations with Industrial Relevance http://dx.doi.org/10.1007/978-3-540-89020-1_9
cPlatform architecture of reference

Associated Archimate blueprint re-usable templates

Standards Archi blueprint to support
- Negotiation between enterprise, business, information system, ICT and Product/Domain architects
- Parameterization of targeted collaborative platform for networked collaborative product development platform

Model-based PLM standards development & testing methodology
Model-based methodology for producing and validating specifications for standards-based PLM collaboration for DMN
Collaboration around a configuration item

Business Collaboration Blueprint template

Hub for PLM collaboration

Applicative architecture

Concrete realizations based on open source reference implementations when possible
Distributed services contract based on relevant PLM services open standards e.g. OMG PLM Services

Cross organizational workflow process orchestrating call to relevant PLM services operations
Archi Model of the standard using properly it in ArchiMate for projection on the cPlatform

Capturing the nature of the standard: business process, information system, ICT, data, service, process, several, etc.
Projection of the standard at the appropriate place for PLM mediation

Transformation

Set of process for which cross organization workflow process representation will be represented (XPDL/BPMN) and deployed on the cPlatform for enactment on the Hub

Instantiation

Private process – collaborative process mapping

Client

Client’s PDM

PLM services

Enterprise Portal

Enterprise Workflow Engine

Cross Organisational Workflow process models

Enterprise Service Bus

OMG PLM services

Provider

Provider’s PDM

PLM services
Simulate the collaboration using standards with simulation of applications
Simulate the collaboration using standards with simulation of applications.
Integration test with all products and applications to be involved in the collaboration re-playing collaboration scenarios.
cPlatform development methodology

1. Define the various goals, drivers, requirements, the platform principles and assessments for each stakeholder.

2. SIP Concepts
   - ISO 15288 V2 Process framework
   - SIP Business Cases Atlas

3. Mapping ISO15288 - Business Cases

4. Detailed Use Cases Overview
   - Detailed Use Cases
   - Technical solutions per use case
   - Virtual Testbeds Overview
   - SIP Platform Technical Architecture
   - Generic OVH Dedicated Cloud

5. List and organisation of SIP platform applicative components
   - List and organisation of SIP platform infrastructure nodes.
Systematization of the approach

Iterative Realization and validation leaded by industrial business use cases

Generalization for a consistent set of complementary standards

Running SIP project going further on this direction in order addressing model based standards and associated implementation assessment

Other example: ISA 95 for PLM – Manufacturing collaboration
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• http://www.irt-systemx.fr/project/sip/