AeroSpace and Defence Industries Association of Europe

E-Business SSG

Table

1. Main industrial needs for PLM interoperability

- **Digital interoperability across the supply chain**

  Examples of Thales, who is OEM, risk sharing partner and suppliers
  Skates for the use of standard product information models
  - Optimization of the relationship with internal and external partners
  - Decrease of the cost of ownership of information systems
  - Protection of the Intellectual Property

  Experiences and Lessons learnt
  Works of Thales on product data standards (STEP AP 239, …)
  - Most of the time, they cover the requested function
  - Real tool for competitiveness
  - But low adoption by the market!

  Need to speed up the easiness to deploy and to ensure their neutrality
  - Recommendation of standard covering a broad domain: STEP AP 242
  - Need of tools (converters, viewer, quality control tool, …)

- **Digital interoperability across the supply chain (Daher)**

  Example of Daher, suppliers for several aircraft manufacturers, presenting the activities of the GIFAS "Digital continuity for production" WG. Illustrations on 2 use cases:
  - Use case 1: Need to ensure the interoperability of 3D mechanical design across the supply chain, with the ability to propagate changes from design to manufacturing with NC programming, and back (from Manufacturing to Design)
    - Relies of the interoperability of the parts definition based on 3D exact geometry with 3D Geometric Dimensioning and Tolerancing "semantic representation" and of the machining form features
  - Use case 2: Need of PDM exchange between the "virtual plateaux" and the internal CAD / PDM systems of the risk sharing partners.

  Summary
  - Need for an efficient exchange of Configured bill of materials and product structures
  - Need for the exchange of 3D definition with mechanical machining form features

- **Aerospace requirements (Airbus Group)**

  Presentation by A. Soubeyran of the business challenges of the Airbus Group Business units:
  - The Aeronautic Extended Enterprise challenge,
    - Reliable and cost effective reuse of CAD-PDM information <u>across multiple stakeholders</u>
  - Full life-cycle domains integration challenge and support of the 3D model based design
    - Reliable & cost effective reuse of CAD-PDM information <u>across multiple domains / multiple tools</u>
  - Obsolescence challenge of PLM systems
    - Reliable and cost effective reuse of CAD-PDM information along multiple timescales

These 3 challenges require the use of international product information interoperability standards.

- **Automotive requirements (Galia)**

Presentation by A. Loire, representing the French Automotive manufacturers associations.

- Innovation and collaboration are key for the efficiency of the automotive products
- New PLM approach: the "3D as master" as the cornerstone; it requires: reusability, sharing, collaboration, LT Archiving of complex CAD 3D information
  - Includes several technological processes: composite, mechatronic …
- Increasing collaborations, between OEMs, between OEM and partners, OEMs and suppliers…
- STEP AP 242 is a key standard:
  - For the exchange and visualization of 3D geometry (exact and tessellated), 3D PMI,
  - For the exchange of machining form feature
  - For the product configuration
  - For long term archiving
- AP 242 is a key standard for the Automotive VALdriv project.

2. STEP AP242 ED1 project:

Presentation by JY Delaunay of the history of the STEP AP 242 project and of its organisation.

- 2009 white paper for a convergent STEP Application Protocol based on AP 203 and AP 214: STEP AP 242 – "Managed Model Based 3D Engineering"
  - Project support by International aerospace (AIA, ASD) and automotive industries.
- External structure of the AP 242 edition 1 project
- Summary of the way of working of the AP 242 edition 1 project

3. The STEP AP 242 ED1 standard

- **Objectives and technical content**

Presentation by J. Brangé, of the Afnet association, of:

- "STEP AP 242 on one page" : scope of the standard
- Landscape of ISO STEP standards before the AP 242: overlap of AP 203 and AP 214.
- Interdependencies between the STEP standards, covering the full product life cycle.
- Business needs covered by the AP 242 standard.
- Overall information flow of the AP 242 standard.
- Scope of product information covered by the AP 242
- Summary of the AP 242 Business Object Model capabilities for XML implementation
- PDM, rules requirements, composite, kinematics, work management / process planning …
- Illustration of the PDM configured product structure with the AP 242 XML
- Summary of main use cases for CAD – PDM interoperability (exchange, sharing, LT archiving)

- **The AP242 public web site**

Presentation by J. Brangé, of the Afnet association, of the AP 242 public web site

- Objectives of the web site: to ensure communication for end users
- Overview of AP 242 web site (standard, project, recommended practices, related standards, …)
- Planning of development of AP 242 edition 1
- The scope of AP 242 edition 1

- **Live Demo of exchange of 3D with Geometric Dimensioning & Tolerancing (Core Technologie)**

Demonstration of the exchange from Catia V5 to STEP AP242 and then STEP AP242 to NX of CAD 3D exact geometry with GD&T "semantic representation"

- Allowing to change the GD&T in the receiver system
  - Tolerance: simple frame, multiple frame, projected tolerance zone, modifiers, dimension,
- Foundation for the exchange of mechanical definitions with machining form features

- **Live Demo of a visualization of a 3D digital Mock-up (Dassault Systèmes)**

Presentation with several demonstrations:
  - Visualization of a car in STEP AP 242 3D tessellated geometry
  - Visualization on a tablet
  - Capability of collaboration processes with 3D design in context based on AP 242 3D tesselleted models
    - Capability of precise positioning and measures based on canonic shapes (cylinders, circular holes, ...)
    - Associativity of 3D tessellated annotations with 3D tessellated geometry.

- **Live Demo of 3D CAD model conversion from AP242 to PDF 3D (Datakit)**

Presentation of the conversion on the flight of STEP AP 242 geometry (exact / tessellated) with 3D PMI in PDF 3D, then visualization in PDF 3D viewer

- **Live Demo of configured product structure exchange in AP242 (T-Systems)**

Illustration of the scope of the AP 242 PDM XML data model and format.
Overview of STEP interfaces developed by TSystems
PDM Link, Enovia, SAP
Interoperability with TeamCentre (interface developed by Siemens PLM)

4. STEP AP242 recommended practices: an help for the deployment

Presentation by P. Duchier of the needs for AP 242 recommended practices and associated CAD and PDM Implementer forums
  - Business requirements and benefits to support standards Implementer Forums
    - Quicker common implementation by PLM vendors without issues of “interpretation”
  - Presentation of the STEP CAx Implementer Forum
    - Created since 1999, led by PDES Inc (USA) and ProSTEP iViP (Europe)
    - Example of resulting recommended practices
    - Test rounds (2 per year) and associated new test cases
    - Test results for STEP AP 242
      - 3D tessellated geometry
      - 3D geometry with 3D PMI tessellated presentation
      - 3D exact geometry with Geometric Dimension & Torerances (semantic representation)
  - Setting up of the STEP AP 242 PDM Implementer Forum
    - Preparation of an international white paper (target: end of April / May 2014)
    - French SystemX R&D project: the SIP project

Summary: the involvement of the industry in the CAx and PDM Implementers Forums are essential to steer the roadmap of PLM vendors and to ensure the pre-qualification of STEP interfaces

5. STEP AP 242: link with other standards

- **The European Aerospace & Defence industry vision**

Presentation by Y. Baudier, chairman of the ASD SSG:
  - Mission of the ASD SSG: the European A&D PLM and ILS Standards governance
  - ASD SSG members and links with other organizations (standardizations, trade associations)
  - The ASD SSG web site: http://www.asd-ssg.org
  - Interoperability framework: organizing the tools to master business requirements and consistency
  - The radar screen and the monitoring of "components standards"
  - A landscape of PLM and ILS standards for aerospace and defence
  - The backbone for standard interoperability, illustrated for STEP standards
  - The core suite of STEP standards for PLM interoperability
  - Example of ASD SSG results Statement on ISO 14306 JT Ed1 and Ed2 - 11 January 2012

- **ISO JT Edition 2 - J. Brangé (AFNeT)**

Presentation by J. Brangé, of the Afnet association, of the links between ISO JT edition 2 and STEP
Context: New Work Item for ISO 14306 JT edition 2

- Validation of ISO 14306 JT ed.1 with the condition to prepare ISO 14306 JT ed.2, where XT BREP (informative) will be replaced by STEP 3D exact BREP (normative)
- Benefits for the industry
- Technical principal of ISO JT ED2

6. PLM vendors roadmap for STEP AP242 interfaces

Presentation by each vendor of their STEP AP 242 roadmaps.
The figure hereafter sums up the availability of STEP AP 242 functionalities per vendor (focused on CAD).

	Assembly		3D exact	3D tessel.	User Def. Attribute	3D PMI , e.g. Geometric Dim. & Tol.		Composite		Kinematics		Machining Form Feature	Para-metric / Constr History	
	P21 AIM	P28 XML				graphic pre-sentation	semantic repre-sentation	P21 AIM	P28 XML	P21 AIM	P28 XML			
Dassault Systèmes	Avail.	Dev.	Avail.	Avail.	Avail.	Avail.	In dev.	Avail.	Planned				No plan	Planned
PTC			Creo 4 + - When AP 242 is "IS" - High priority					-	-	-	-	-	-	
Siemens PLM	Avail.	Avail.	Avail.	Avail.	Avail.	Avail.	In dev.	In review		In review		No plan	No plan	
Datakit	Avail.	Dev.	Avail.	Avail.	Avail.	Avail.	In dev.	Future		Future		In dev.		
Eurostep	Avail.	Dev.	Not planned - main priority for PDM											Available / in development
ITI	Avail.	Dev.	Avail.	Avail.	Avail.	Avail.	Avail. 2014							
Coretechnologie	Avail.		Avail.	Avail.	In dev.	Avail.	Avail. 2014	In dev.	-					
TechSoft3D	Avail.	No	Avail.	Avail.	Avail.	Avail.	In progress	In progress		No plan		No plan	Avail.	
T-Systems		Avail.	Not planned											Available / in development

For more information, see related presentations.

7. Estimated plan for the AP242 interoperability functions

Presentation by P. Duchier and J. Brangé (Afnet)
Estimated roadmap of PLM applications, per capabilities

- For CAD:
  - CAD assembly structure (one file) : available (similar to AP 214)
  - CAD assembly structure (Nested assemblies) : available (similar to AP 214)
  - 3D exact geometry : available (similar to AP 214)
  - 3D tessellated geometry : start of availability (new in AP 242)
  - 3D PMI graphic presentation : start of availability (new in AP 242)
  - 3D PMI semantic representation : tested, planned operation in 2016
  - Composite design : start of availability (similar to AP 203)
  - Kinematic : tested, planned operation in 2016
  - Machining form feature : start of test in 2015, operational in 2017
  - 3D parametric model : preliminary tests
  - Construction History

- For PDM BO Model XML:
  - Legacy STEP PDM technology (similar to AP 214) already used since > 15 years
  - New STEP AP 242 XML interface less mature
    - Need to secure the setting up of AP 242 XML PDM Implementer Forum
      - Involvement of Airbus Group and of the GIFAS association
      - Distribution of the PDM IF white paper for end of April
      - Need for the trade associations to prioritize the use cases of PDM interoperability
    - Requirement management
      - Compatible with STEP AP 233 and AP 239 PLCS

8. STEP AP242 edition 2 project: an extension of the scope of functionalities

Presentation by JY Delaunay

- Overview of the STEP AP 242 edition 2 white paper
- Summary of the business needs for STEP AP 242 ed2
- New functionalities planned in AP 242 ed2
- Resulting functional perimeter of the future AP 242 ed2.
- Illustration of electrical harness design information to be included
- Illustration of other types of enhancements (3D geometry, 3D PMI, composite, PDM)
- Need for an integrated model covering PDM, geometry, GD&T, composite, electrical harness
- Target budget plan and target planning of the AP 242 ed2 project
- Next actions to launch the AP 242 ed2 project

9. Feedback on the industries and PLM vendors expectations

A questionnaire was distributed at the beginning of the day to provide feed backs on the topics of interests and to gather the expectations of the participants: here is the summary of the results:

- Expectations in term of training: P1: CAD mechanical exchange, PDM exchange,
- Expectations for users guide / AP 242 ed1 recommended practices
- Organization of a conference about the setting up of a PLM Implementer Forum
- Interests for the contributions to the requirements for the AP 242 ed2, to the participation of the workshops to prepare the AAP 242 ed2

10. Synthesis and next actions

P. Faure (Dassault Aviation, chaiman of Boostaerospace) sums up and concludes the conference:

- The efficient use of methods and processes based on digital product information is essential for the competiveness of the manufacturing industries.
- Product International standards are strategic for the interoperability in the extended entreprise,
- AP 242 ed1 documentation now sent to ISO for publication; availability planned for June 2014.
- Key role of the STEP implementer forums, to speed up the availability of operational solutions through the development of international recommended practices and interoperability test rounds
- The main PLM vendors and integrators have started to implement STEP AP 242 interfaces
- The AP 242 standard is the more powerful and the more efficient to support the collaborative processes and the long term archiving of configured digital mock ups
  - PDM, 3D explicit / tessellated geometry, 3D PMI, composite, kinematics
- Importance to set up a governance organization to ensure the complementarity, usability and durability of the standards
- Overview of the AP 242 ed2 project, focused on the extension to electrical harness design.