LOTAR

LONG TERM ARCHIVING AND RETRIEVAL

LOTAR Project Overview

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Lockheed Martin Aeronautics Company

The LOTAR International Project is a working group supported by the AIA and PDES, Inc. in the Americas, and ASD-STAN and the ProSTEP iViP Association in Europe to form a four party consortium.

- The project goal is to *develop, publish and maintain standards* designed to provide the capability *to archive and retrieve* digital product and technical information, including 3D CAD and PDM data, in *a standard neutral form* that can be read and reused throughout the product lifecycle, independent of changes in the IT application environment originally used for creation.

- The standards are published as EN/NAS[*] 9300 series and cover both the information content as well as the processes required to ingest, store, administer, manage and access the information.

(*): EN – European Standard (Norm); NAS – National Aerospace Standard

Objectives & Benefits of LOTAR

- Objectives include:
  - Developing a standard for preserving, managing and retrieving product data throughout its lifecycle.
  - Providing methods, process modules and data model(s), to enable long term archiving of CAD, PDM and additional technical data
  - Developing recommendations for practical introduction of long term archiving of product data, such as 3D CAD and PDM data, in the industry

- Benefits include:
  - Process security achieved through implementation of archival systems compliant to international accepted standards
  - Aerospace and Defense authorities accept workflow due to intense collaboration during standards creation
  - Applicable archiving workflow supported by STEP interfaces & functionalities
  - By solving the challenges of long term data retention, issues of data exchange are addressed

Information Lifecycle Planning
Driving Questions

LOTAR Timeline

LOTAR — LONG TERM ARCHIVING AND RETRIEVAL

2003
- First joint team meeting of the international AIA - ASD-Stan LOTAR effort under the mgt of the IAQG* (MoU: AIA/ASD-Stan)

2012
- First Publication of LOTAR Domain Specific Parts (3D CAD)
- Launch of the Workgroups for Electric Harness, Meta Data for Archive Packages, and 3D Visualization

Late 1990s:
- AIA in the US and ASD-Stan in Europe launched separate initiatives for the Long-term Preservation of Aerospace & Defense Digital ProductDefinition Data.

2004
- Launch of the 3D CAD and PDM Workgroups

2005
- First Publication of LOTAR Basic Parts

2000
- Start of the PDES, Inc. LTDR Project (US) coord w/AIA LTDR

2006
- First Publication of LOTAR Common Process Parts

2014
- Kicked off LOTAR Eng Analysis & Sim Workgroup Sept 2014

2002
- Start of the ASD Stan – ProSTEP iViP LOTAR Project (Europe)
- IAQG* approved charter for AIA/ASD Stan Joint Project
- AIA LTDR Published ARP9034

2009
- Creation of the joint LOTAR International consortium (AIA / ASD-Stan / PDES, Inc. / ProSTEP iViP)
- Launch of the Composites WG

* IAGQ: International Aerospace Quality Group

Motivation for LOTAR

- Meeting the legal and business requirements of the aerospace and defense industry:

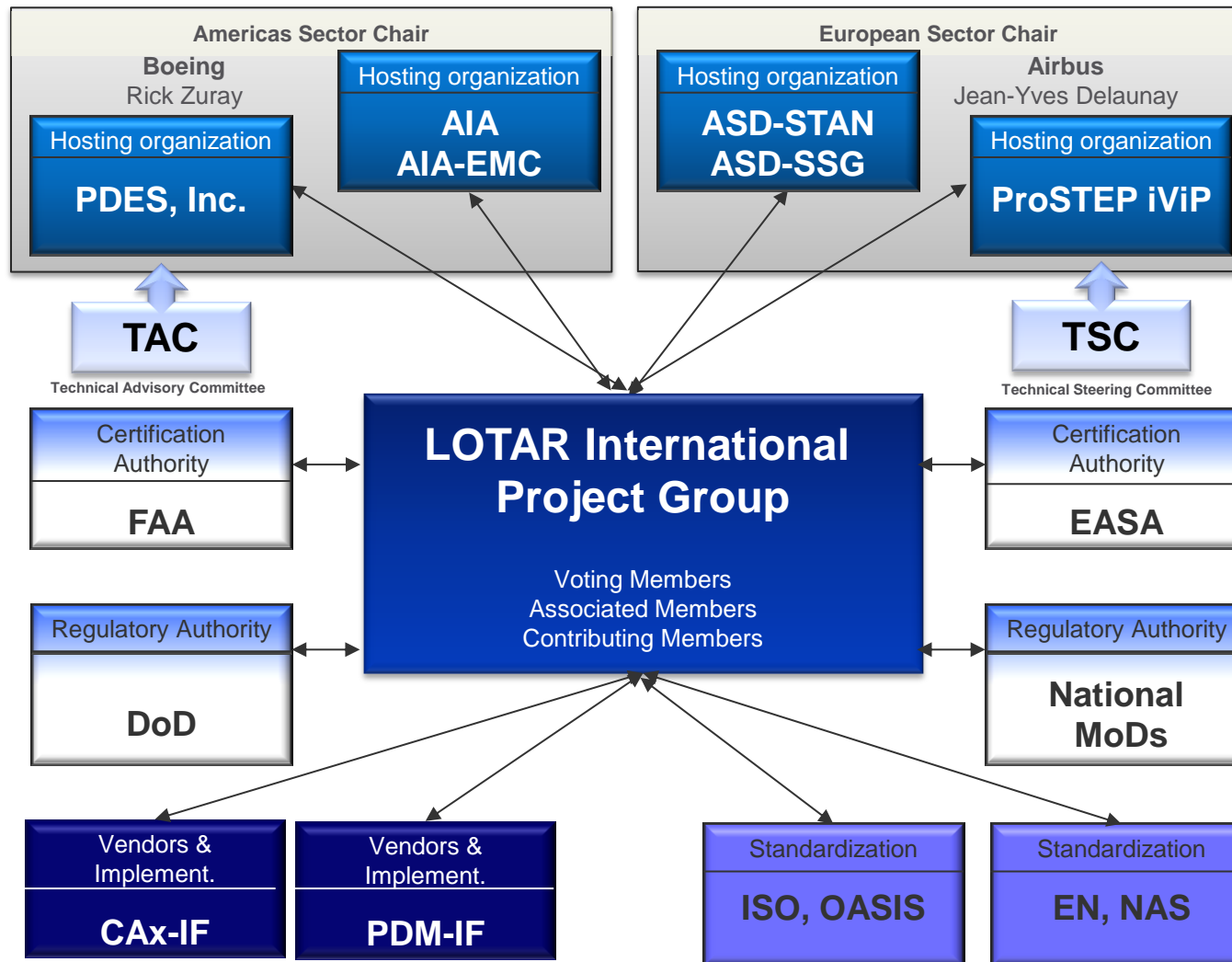- EN/NAS 9300 considers requirements coming from:
    - Legal and certification rules
    - Regulations on long term archiving of technical documentation
    - Reuse
    - Support in operation
- Additional to legal demands, there are industry established standards, company specific rules and recommendations.
- The standard defines architecture, processes and data formats to fulfill these requirements.

Technical and IT Background

- The life cycle of applications and storage technologies has to be considered by setting up a long term archiving and retrieval standard:
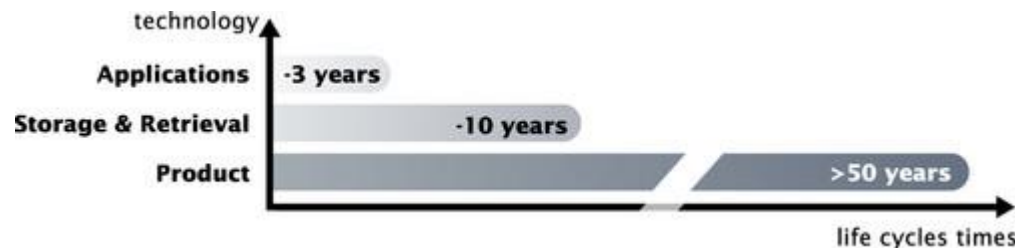
- Continuous development of technical product documentation leads to a change of methods and tools, which are used for design, manufacturing, customer support and archiving.
  - New releases of CAD / CAM / CAE / PDM / … systems offering new functionalities
  - After each migration, the data shall be checked for consistency and completeness.
  - → A conversion of the native product data into a more stable format is essential.

LOTAR Organization – External View

Americas Sector Chair

Boeing
Rick Zuray

Hosting organization
PDES, Inc.

Hosting organization
AIA
AIA-EMC

European Sector Chair

Hosting organization
ASD-STAN
ASD-SSG

Airbus
Jean-Yves Delaunay

Hosting organization
ProSTEP iViP

TAC
Technical Advisory Committee

TSC
Technical Steering Committee

Certification
Authority
FAA

**LOTAR International
Project Group**

Voting Members
Associated Members
Contributing Members

Certification
Authority
EASA

Regulatory Authority
DoD

Regulatory Authority
**National
MoDs**

Vendors &
Implement.
CAx-IF

Vendors &
Implement.
PDM-IF

Standardization
ISO, OASIS

Standardization
EN, NAS

Organizational Structure

Process Steering Council

Hosting Organization	Hosting Organization	Hosting Organization	Hosting Organization
AIA **AIA-EMC**	**PDES Inc.**	**ASD-STAN** **ASD-SSG**	**ProSTEP iViP.**
G. Mills R. Rentsch	J. Harris M. Jahadi	G. Lessmann Yves Baudier	R. Pohl S. Vettermann

Americas Sector | European Sector

Leadership Team

Americas Sector Chair	Americas Sector Project Coord.	Europe Sector Chair	Europe Sector Project Coord.
Rick Zuray	**Jeff Holmlund**	**JY Delaunay**	**Jochen Boy**

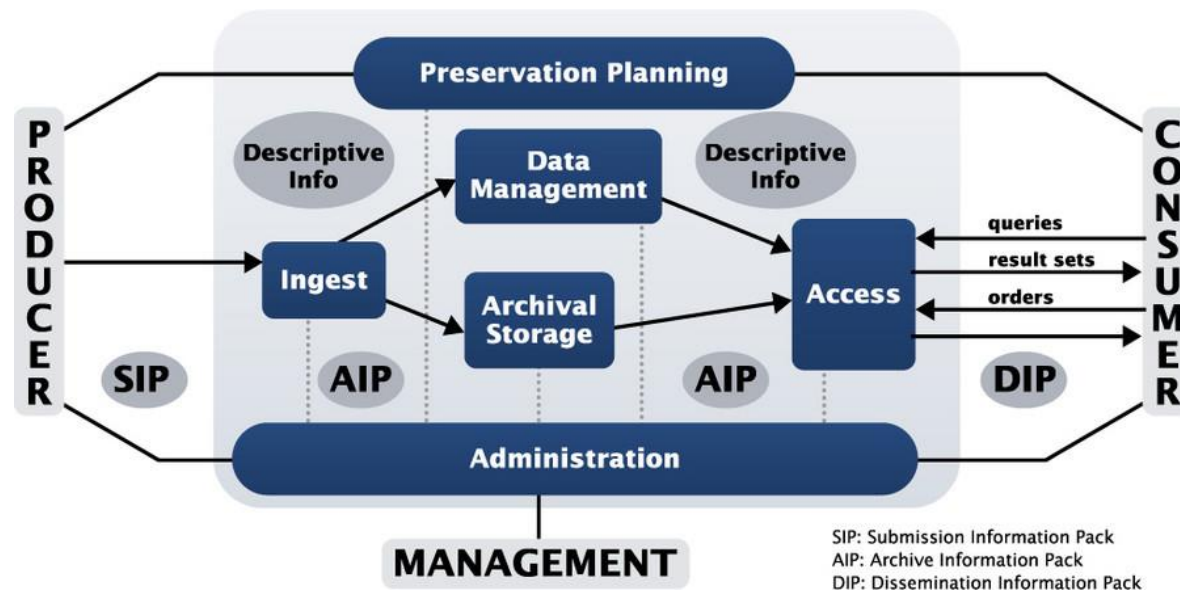| PDES Inc Board Champion	CAx-IF Chair
Mike Jahadi	**Phil Rosche**

Participating Companies and Agencies

- „Open Archive Information System" (OAIS) Reference Model is basis for LOTAR processes

- Developed by Aerospace and Defense Industry

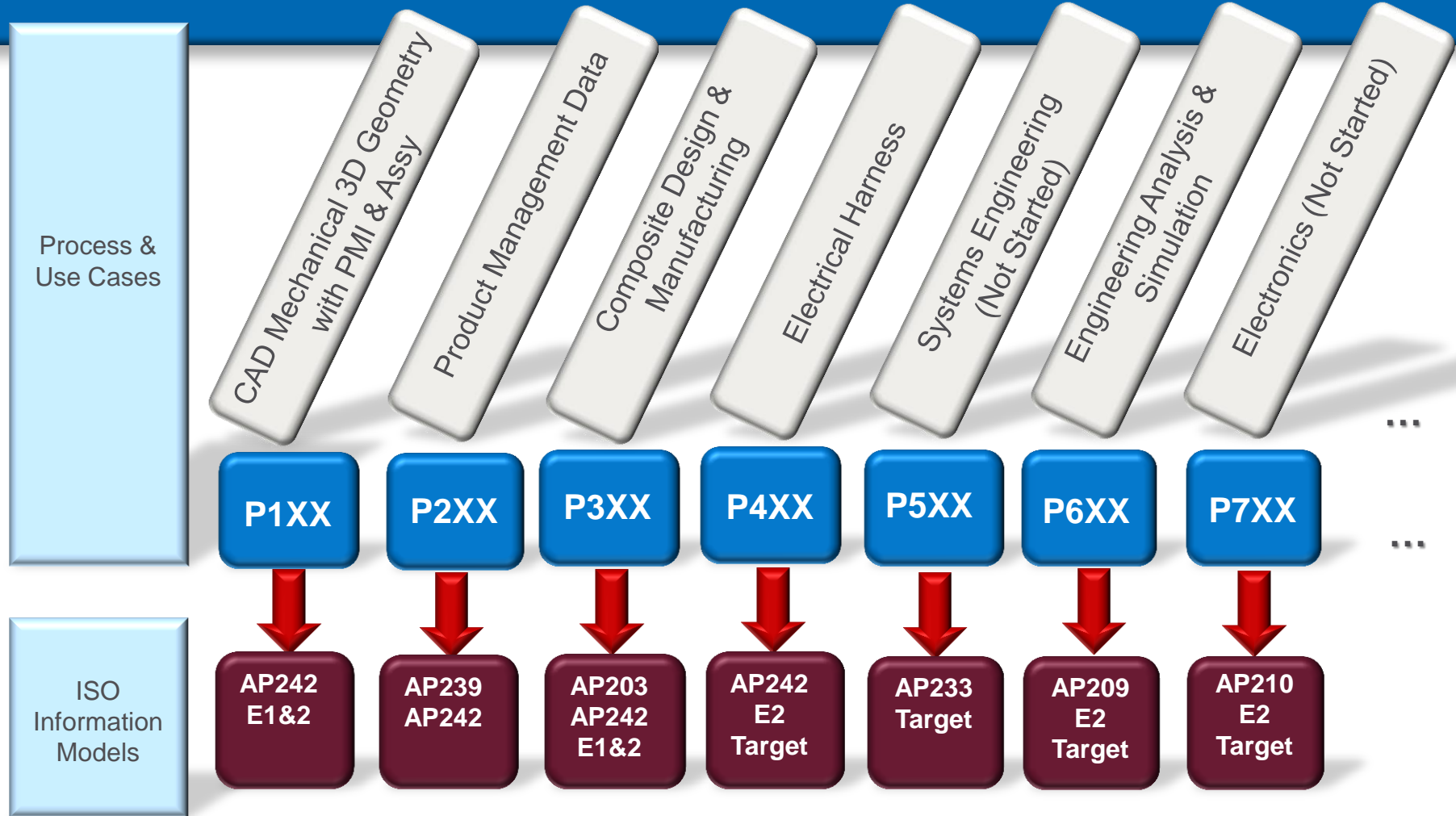- Extended to meet the specific requirements of LOTAR

- As neutral data format for the archives, ISO 10303 (STEP) has been chosen since it is the most advanced open format.

- A distinctive feature of the combined use of LOTAR and STEP is the use of Validation Properties
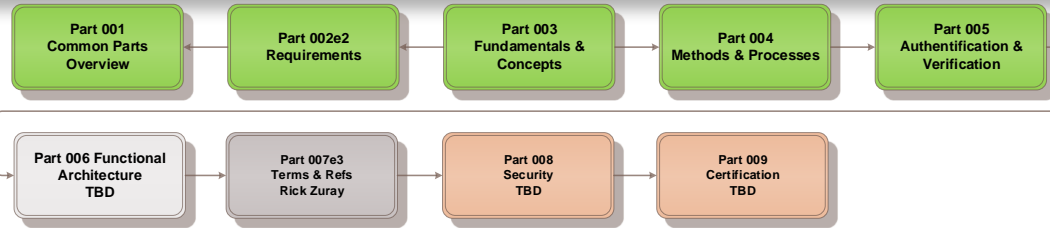- Validation Properties are key characteristics of a model that help to ensure consistency of the data
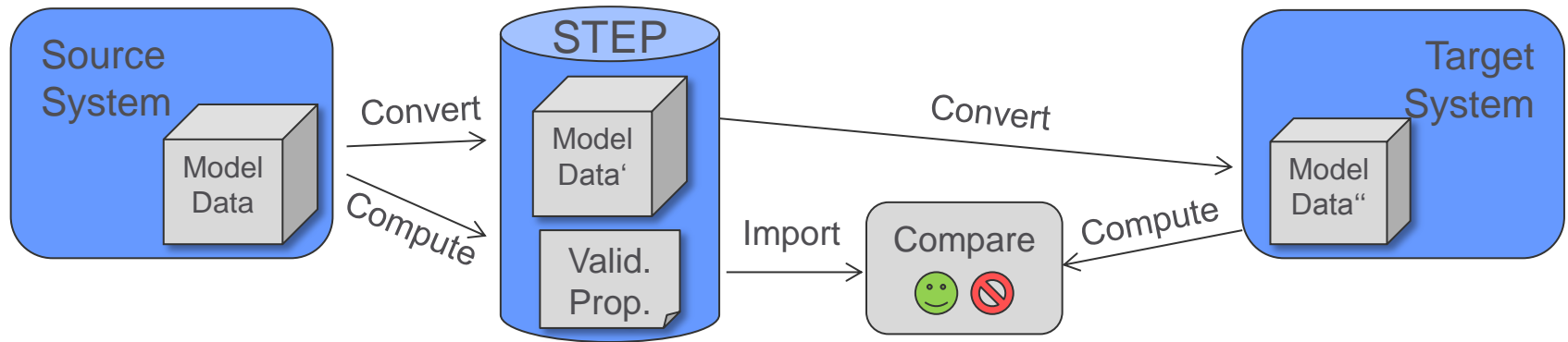
- They are computed by the exporting system and included as key-value pairs in the STEP file
- Any importing system will compare its import results with these properties and thus determine success of the data transfer.

Standards (5) year vision

Process & Use Cases

| CAD Mechanical 3D Geometry with PMI & Assy | Product Management Data | Composite Design & Manufacturing | Electrical Harness | Systems Engineering (Not Started) | Engineering Analysis & Simulation | Electronics (Not Started) | ... |

| P1XX | P2XX | P3XX | P4XX | P5XX | P6XX | P7XX | ... |

ISO Information Models

| AP242 E1&2 | AP239 AP242 | AP203 AP242 E1&2 | AP242 E2 Target | AP233 Target | AP209 E2 Target | AP210 E2 Target |

Governance: LOTAR Document Structure

Basic Parts 001 – 009
Overview, Reqs, Methods...

Part 001 Common Parts Overview	Part 002e2 Requirements	Part 003 Fundamentals & Concepts	Part 004 Methods & Processes	Part 005 Authentification & Verification

Part 006 Functional Architecture TBD	Part 007e3 Terms & Refs Rick Zuray	Part 008 Security TBD	Part 009 Certification TBD

Common Process Parts 010 – 099
Common Processes, Data Prep, Ingest, Archive Storage, Retrieval...

Part 010 Common Processes Overview	Part 011 Data Preparation	Part 012 Ingest Process	Part 013 Archive Storage	Part 014 Retrieval

Part 015 Removal	Part 016 Test Suites	Part 017 Audits	Part 018 Verification	Part 019 Validation

Part 020 Governance & Planning Sean Barker	Part 02x Meta-Data F. Darre/J. Klein	3D Visualization Guide/Recommended Practice T. Hedberg/P. Duchier

Domain Specific Parts
100 – series
200 – series
300 – series etc.

100 Series PMI R. Zuray/P. Duchier	200 Series PDM C. New/H. Byzio	300 Series Composites R. Murrish/S. Herail	400 Series Electrical WH D. Ganser/S. Herail	500 Series System Engineering TBD	600 Series PDM A. Levy/J. Draper

AP242e1 3D PMI

Support

AP242e2 3DPMI Extensions

Part 120e1 Geometry/PMI Polyline

Part 120e2 Geometry/PMI Tessellated

Part 121e1 Geometry/PMI Semantic

Part 122e1 Machining Form Features

Part 125e1 Assembly Geometry/PMI

Part 100 Fund & Processes Complete

Part 110 Explicit Geometry Complete

Part 115 Assy Geometry Complete

Part 110e2 Explicit Geometry Tessellated

Part 200 Fund & Processes

Part 210 "As-Designed"

Part 220 "As-Built"

Part 300 Fund & Processes

Part 310 "As-Designed"

Part 400 Fund & Processes

Part 410 "TBD"

Part 500 Fund & Processes

Part 600 Fund & Processes

Part 610 TBD

Part 620 "TBD"

Legend:

- Development
- On-Hold
- Ballot Phase
- Published Standard
- Not Started

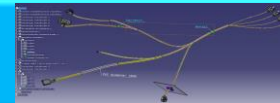# LOTAR Involvement in the development of ISO 10303-242

PDM

Part Identification. Physical Part Characteristics, Document Management General management information Activity and work management Effectivity, Specification, Breakdown and Configuration

Process Plans

Requirements

Design Rules

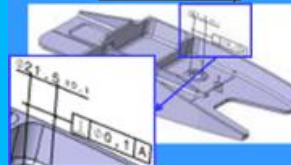**Electrical Wire Harness**

AP242 Domain Support

Presentation

3D Shape Data Quality

3D Machining Form Features

3D PMI (**Product & Manufacturing Information**)

3D Assembly Constraints

3D Kinematics
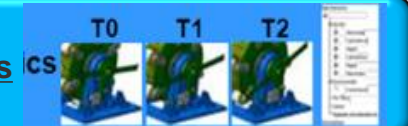
2D Draughting
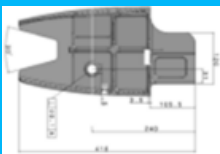
3D Shape (Explicit and Parametric

3D Exact/Explicit Geometry

3D Tessellated Geometry
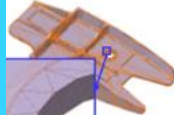
3D Parametric & contr. history

System Boss
EdgeFillet.Boss =4mm

3D Composite Design

LOTAR Member Companies 2015
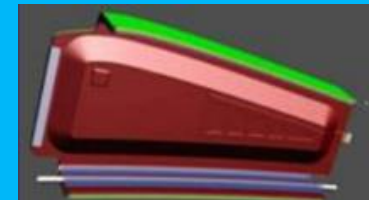
(Americas)

- BAE Systems
- Boeing
- Embraer
- General Dynamics
- General Electric
- Goodrich
- Honeywell
- Lockheed Martin
- Rockwell Collins
- Sandia National Labs

(Europe)

- Airbus Commercial
- Airbus Defense & Space
- AFNET
- IAI (Israel Aerospace Industries)
- SAFRAN
- Airbus Helicopter TBC

Status of use of NAS/EN 9300 by LOTAR members

A&D company	Area of application	Scope	NAS / EN 9300 LOTAR parts (CAD)				ISO formats	Project status
			CAD 3D exact geometry	CAD 3D tessellated geometry	CAD 3D PMI	CAD Assembly structure		
			Part 110	Part 100	Part 120	Part P115	ISO 10303 "STEP"	
Airbus	A350	3D electrical harness installation	Yes	Yes	Yes	Yes	AP 214 ed3 (*) + AP 242 ed1	PROD
EADS		"Full 3D" model based	Yes	Yes	Yes	Yes	AP 242 ed1	PROD
Dassault-Aviation	Falcon 7X	complete definition of the aircraft (airframe, brackets, pipes, harness)	Yes	No	Yes	Yes	AP 214 ed3 (*)	PROD
Snecma	New parts of engines	3D definition with PMI of new mechanical part	Yes	No	Yes	No	AP 214 ed3 (*)	PROD
Boeing	787	3D definition with PMI with assemblies	Yes	Yes	Yes	Yes	AP 203 ed2 (*) + U3D PDF	DEV
Gulfstream	G650	3D mBD mechanical, electrical and composite	Yes	No	Yes		AP 203 ed2 (*)	PROD
Lockheed-Martin	F35	3D mBD mechanical, electrical and composite	Yes	No	Yes	Yes	AP 203 ed2 + AP242 ed1	DEV
EMBRAER	Legacy 450 & Legacy 500	complete definition of the aircraft	Yes	No	Yes	Yes	AP 242 ed1	PROD

PLANNED : project planned
DEV : project in development
PROD : project on production
(*): Plan to migrate to STEP AP 242 ed1 when possible

LOTAR International

7 Technical Working Groups

- **3D Mechanical / PMI**
- **PDM / PLM**
- **Adv. Mfg & Composite**
- **Electrical**
- **3D Visualization**
- **Meta data for archive packages**
- **Engineering Analysis & Simulation**

Description of a LOTAR WG web page

- Goals and Objectives
- Associated LOTAR use cases
- LOTAR Family of Standards
- Associated ISO 10303 Information Models
- Meetings & teleconferences
- Accomplishments
- Related standardization projects
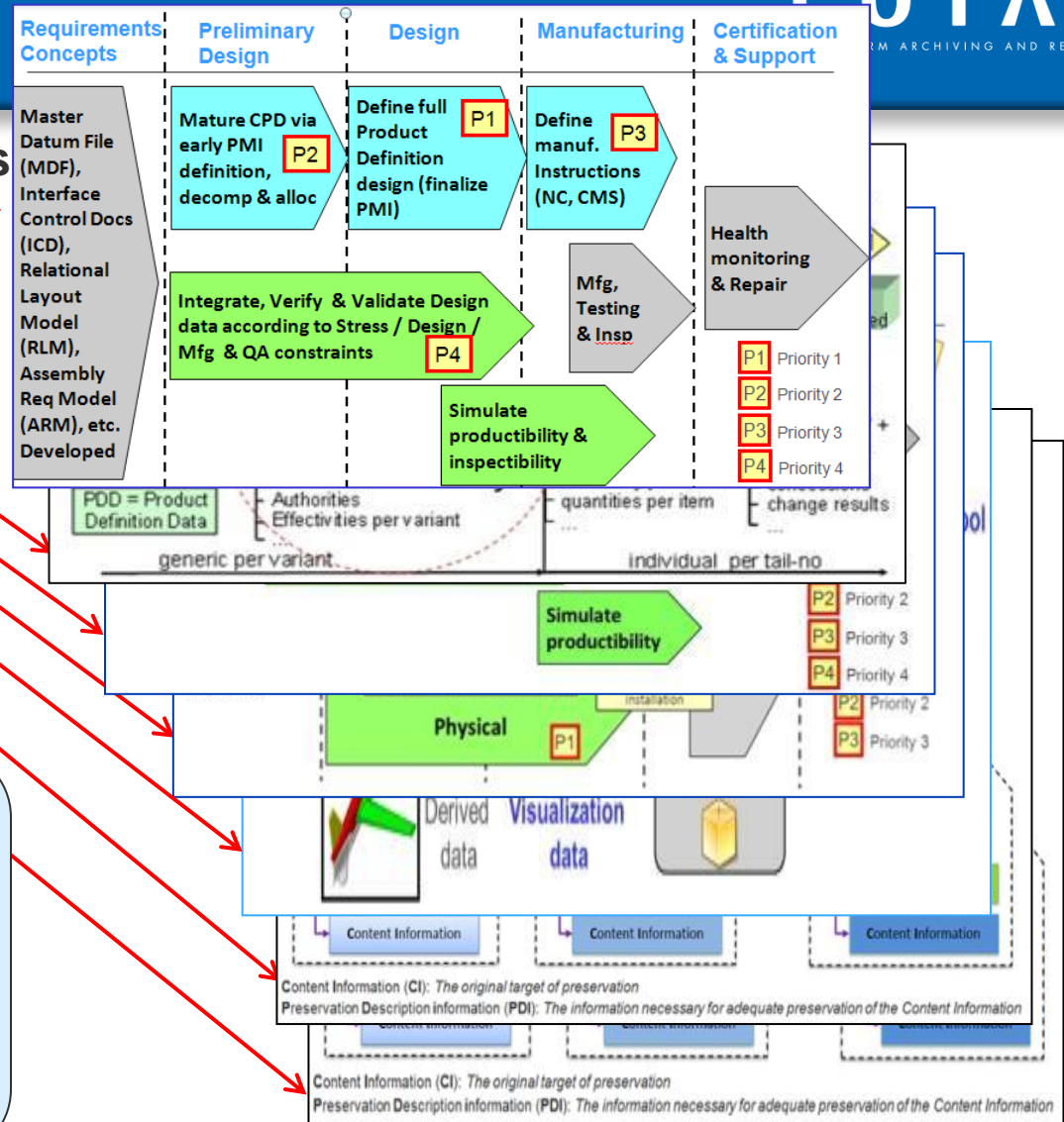
LOTAR WG: 3D Mechanical CAD with PMI (EN/NAS 9300-1xx)

- Scope:
  - Exchange and archiving of 3D Geometry via STEP
  - Provision of Validation Properties and User Defined Attributes
  - Transfer of PMI (Product & Manufacturing Information) as:
    - Representation (machine-consumable, reusable)
   - Graphic Presentation (human-readable)
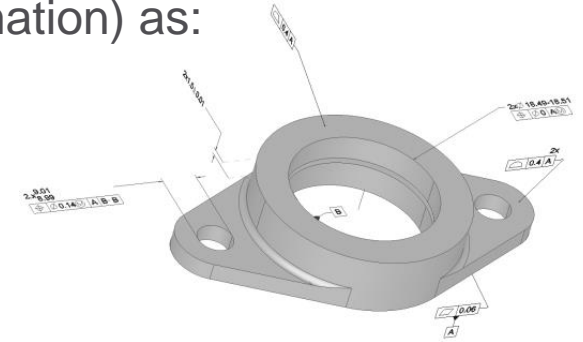
- Deliverables[*]:

- Parts:
  - 100 (Common Concepts)
  - 110 (Explicit 3D Geometry),
  - 115 (CAD Assembly Structure),
  - 120 (PMI Graphic Presentation),
  - 121 (PMI Semantic Representation),
  - 122 (Machining Features),
  - 125 (Assembly PMI Graphic Pres.)

- Comprehensive suite of test models
- Numerous pilot projects in cooperation with the CAx-IF
- Support of STEP AP242 development and associated Recommended Practices

(*): Accomplished or in work; more planned

LOTAR WG: PDM (EN/NAS 9300-2xx)

- Scope:
  - Archive and retrieve Product Data Management information in a standard neutral form that can be read and reused throughout the product lifecycle
  - Preservation of digital PDM information along the product lifecycle: in development, as designed, as planned, as delivered and as maintained.
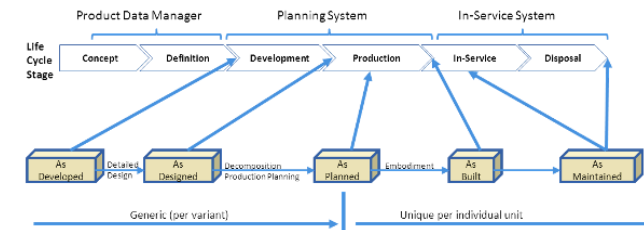
- Deliverables(*):
  - Parts 200 (Common Concepts), 210 (PDM "as designed"), 220 (PDM "as built"), 230 (PDM "as maintained").
  - Recommendations for the Validation of Product Structures
  - Preparation of a STEP AP239 / PLCS DEX
  - Facilitation of pilot projects

(*): Accomplished or in work; more planned

- Scope:
 - Preservation of New information required in STEP data model for Additive manufacturing:

- **Organic Shapes and Surface Models**

  - **Design Tools –**

  - **Representation Formats**

  - **Preservation of CAD 3D tessellated solids**

  - **3D composite structures information such as Sequences, Plies, Cores, Material properties, Rosette, Orientation…**

  - **Preservation of CAD 3D tessellated solids**

Full shape freedom

→ Cost independent from shape
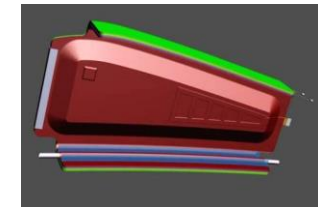
- Deliverables[*]:
  - Parts 300 (Common Concepts), 310 Ed.1 ("exact implicit" – Ply Definition), 310 Ed.2 ("approximate explicit" – 3D Tess. Solid)
  - Support of STEP AP242 Development and associated Recommended Practices
  - Prototype part developed to anticipate future structures in order to demonstrate concepts
  - Independent tests of CAD tools for the purpose of interoperability

(*): Accomplished or in work; more planned

- ## Scope:
  - Preservation of digital electrical harness models for
    - Design
    - Certification
    - Manufacturing
    - Support
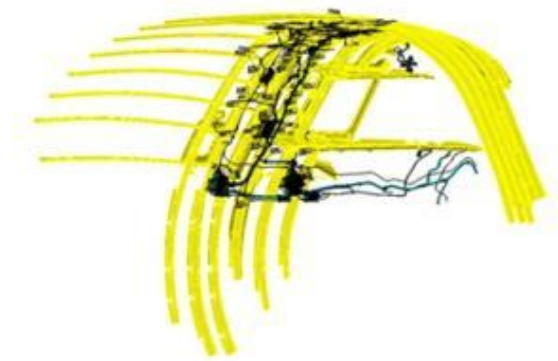
- ## Deliverables[*]:
  - Parts 400 (Common Concepts), 410 (Physical harness definition for design & construction)
  - Preparation of test cases for physical electrical harness definition
  - Coordination with other standardization projects related to electrical harness (STEP AP 210, AP239, VDA VEC specification, ...)
  - Preparation of business requirements and use cases for extension of STEP AP 242 ED2 to include Electrical Harness Data

(*): Accomplished or in work; more planned

LOTAR WG: Engineering Analysis and Simulation (EN/NAS 9300-6xx)

- Scope:
  - Preservation of Engineering Analysis and Simulation information
    - Simulation
      - Structural (p1)
      - CFD (p2)
    - Analysis Methods
      - Deterministic (p1)
      - Finite Element (p1)
    - Material Types
      - Composites (p1)
      - Metallic (p1)
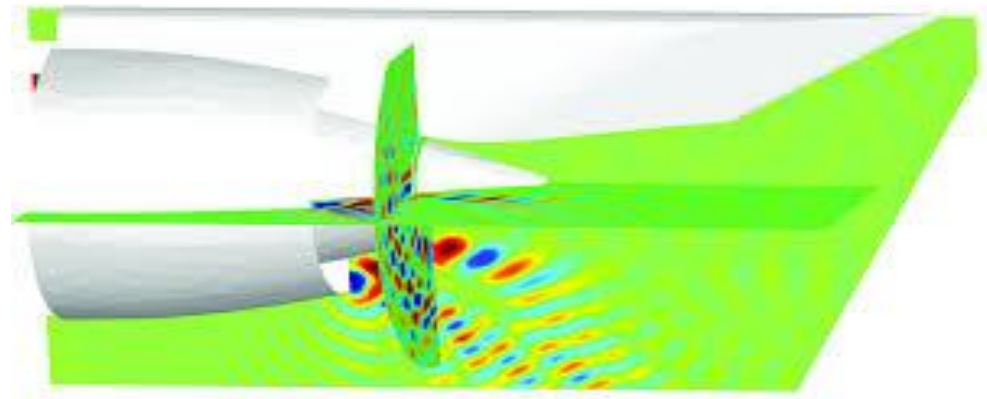
- Deliverables[*]:
  - Parts 600 (Fund. & Concepts), 6xx (TBD)
  - Preparation of WG Scope and Use Cases
  - Coordination with other standardization projects related to EAS (AP209, AP242, MoSSEC, ProSTEP iViP)
  - Preparation of business requirements and use cases for extension of STEP AP 242 ED2 to include Simulation & Analysis Data

(*): Accomplished or in work; more planned

LOTAR WG: 3D Visualization (Technical Specification/Rec Practice)

- Scope:
  - To define common recommendations for LT Archiving and Retrieval of 3D Visualization information being consistent with LT Archiving and Retrieval of information concerning CAD models and related information, throughout the full product life cycle.

- Deliverables[*]:
  - To define the characteristics of the Visualization information to be archived.
  - To prepare recommended practices for implementing available 3D Visualization standards by the LOTAR community.

  - To describe to the recommended processes to ensure the consistency between the archived CAD 3D (authoring) data and the archived 3D Visualization (derived) data

(*): Accomplished or in work; more planned

- Scope:
  - Define processes, UCs and standard information model to manage meta-data for:
    - Submission Information Package
    - Archival Information Package
    - Dissemination Information Package
    - Define processes, UCs and standard information model to manage meta-data for:
  - Define the information model and the corresponding STEP AP 239 PLCS subset
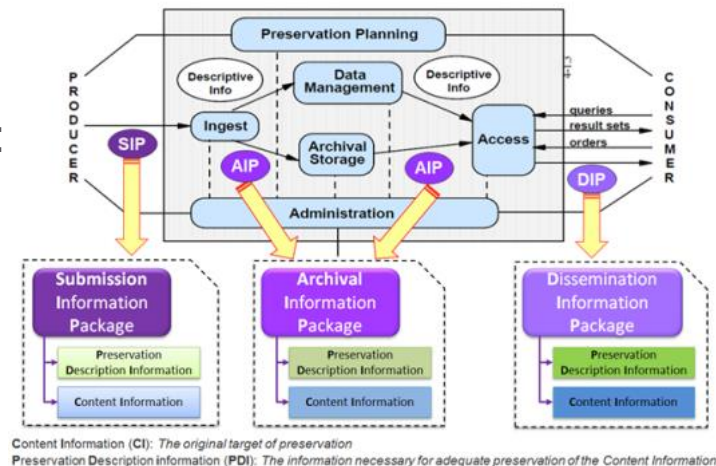
Content Information (CI): *The original target of preservation*
Preservation Description information (PDI): *The information necessary for adequate preservation of the Content Information*

- Deliverables(*):
  - Parts 021 (Meta-data for Archiving),
  - Processes, use cases and test cases
  - STEP AP 239 information model subset
  - STEP AP 239 LOTAR DEX / Rec. Practices for meta data for AP
  - Test round reports and prototypes of PLM vendors

(*): Accomplished or in work; more planned

LOTAR Homepage:
www.lotar-international.org

LOTAR
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Why LOTAR?
- Mission, Objectives & Scope
- Legal & Business Motivation
- Technical & IT Background
- Goals & Benefits

LOTAR Organization
- External View
- Internal View
- Working Together
- Fundamentals & Processes
- Member Companies

LOTAR Workgroups
- 3D CAD with PMI
- PDM
- Composites
- Electrical Harness
- 3D Visualization
- Meta-Data for Archival
- Engineering Analysis & Simulation

Communication
- Public Presentation
- Progress Reports

LOTAR Standard
- Overview on Parts
- Industry Use

News

Links

Contact

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http://www.lotar-international.org/home.html — LOTAR: Home

File Edit View Favorites Tools Help

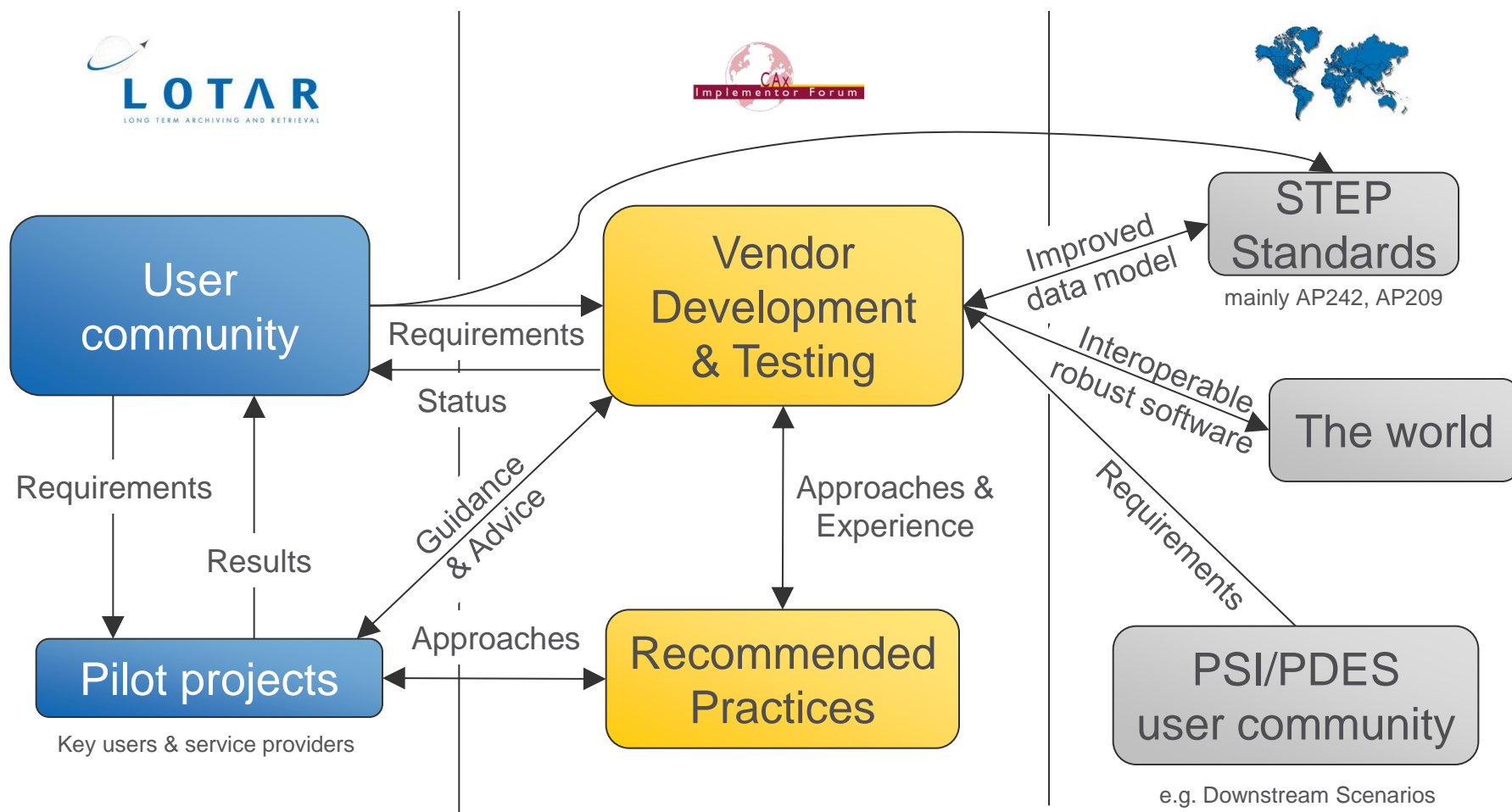Sitemap | Search | Imprint

LOTAR
LONG TERM ARCHIVING AND RETRIEVAL

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NEWS

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Search
Enter search word...

::: **LOng Term Archiving and Retrieval – LOTAR**

Activities

The objective of LOTAR International is to develop, test, publish and maintain standards for long-term archiving (LTA) of digital data, such as 3D CAD and PDM data. These standards will define auditable archiving and retrieval processes. Use of the standard series by other branches of industry such as the automotive or shipbuilding industry is possible. The results are harmonized with e.g. the Recommendation 4958 for long-term archiving of the German Association of the Automotive Industry (VDA) and are based on the ISO 14721, Open Archival Information System (OAIS) Reference Model. The documents for the standard are published as the EN9300 series and, in cooperation with the AIA, also as the National Aerospace Standard (NAS).

LOTAR International is a project being conducted by leading OEMs and suppliers in the aerospace and defense industry under the joint auspices of ASD-STAN, AIA, PDES Inc. and the ProSTEP iViP Association.

Close cooperation with the PDES, Inc. / ProSTEP iViP CAx Implementor Forum ensures implementation reliability.

The LOTAR project consortium consists of user companies from around the world. Member companies include Airbus, BAE Systems, Boeing, Dassault Aviation, EADS, Eurocopter, General Dynamics, Goodrich, IAI, Lockheed Martin, SAFRAN, Sandia, and Spirit.

Goals of the project include:

- Developing, publishing and maintaining a standard series for archiving and retrieval of product data

LOTAR Spring Offsite & Affiliated Meetings
2015-02-20

The upcoming 1st Qtr. LOTAR Offsite will be held March 2nd – 4th, 2015 in conjunction with the...

more ➔

New „Engineering Analysis and Simulation" workgroup launched
2015-01-15

After a preparation phase in 2014 and a successful LOTAR membership ballot with four member...

more ➔

LOTAR Meeting in Darmstadt, Germany
2014-12-01

The upcoming 4th QTR LOTAR Workshop will be held December 8th – 12th, 2014, in Darmstadt, Germany,...

more ➔

100%

AIA ASD-STAN ProSTEP iViP PDES, Inc.

LOTAR / CAx Implementor Forum Coordination

Any questions?

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