



LOTAR

LONG TERM ARCHIVING AND RETRIEVAL

LOTAR Webinar

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hosted by ProSTEP iViP

Jochen Boy, PROSTEP AG
Europ. Project Coordinator

Agenda



LOTAR

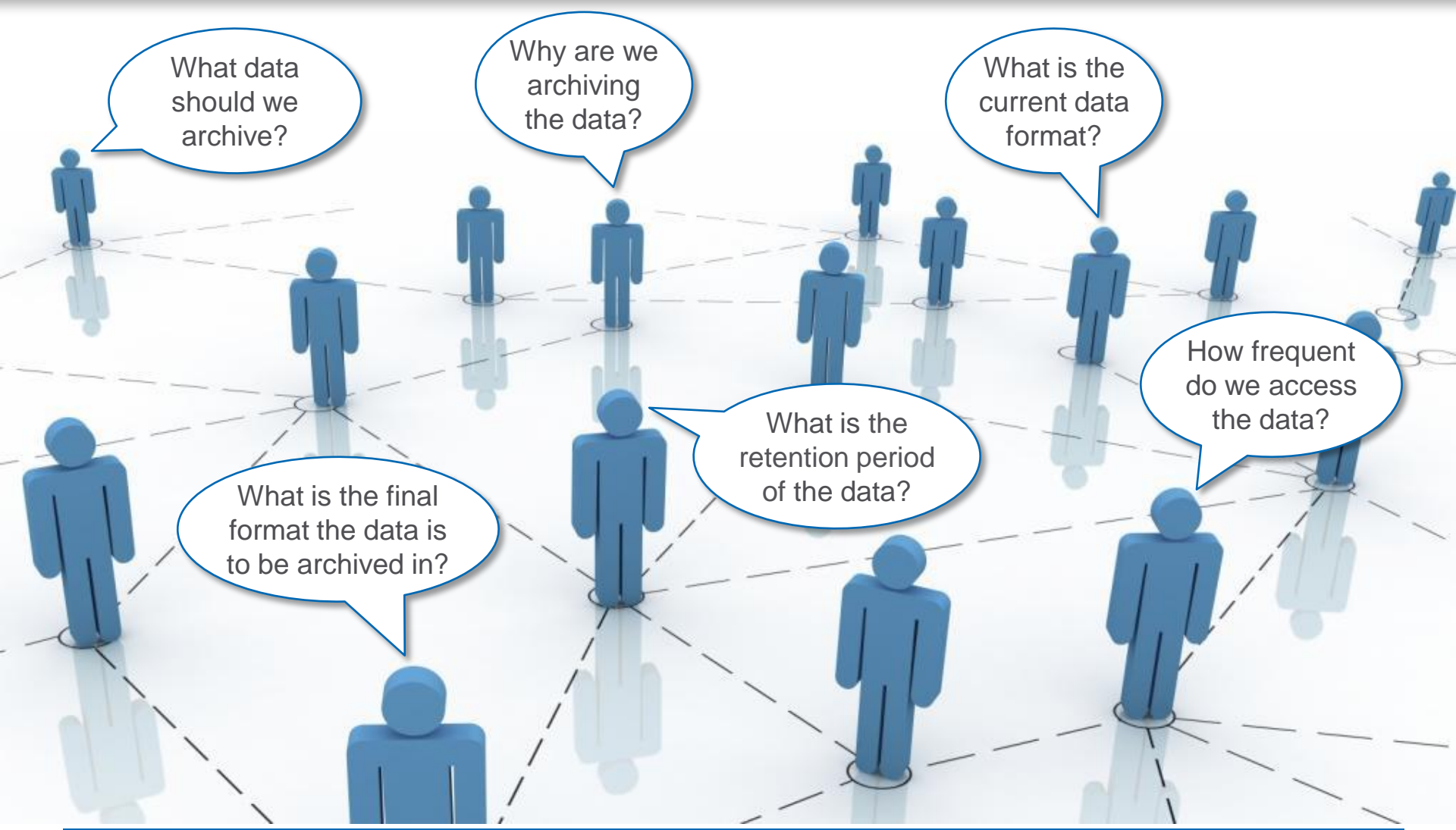
LONG TERM ARCHIVING AND RETRIEVAL

- Project Overview
 - Goals, Motivation, Background
 - Organization, Members, Industry Use
- Workgroups
 - Domains and current Scope
 - Interaction with other Activities
- ASD SSG radar charts and LOTAR recommendations
- Outlook

- 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 and cover both the information content and the processes required to ingest, store, administer, manage and access the information.
- The LOTAR International Project is a working group supported by the AIA and PDES, Inc. in the US, and ASD-STAN and the ProSTEP iViP Association in Europe.

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

Information Lifecycle Planning Driving Questions



What data
should we
archive?

Why are we
archiving
the data?

What is the
current data
format?

How frequent
do we access
the data?

What is the
retention period
of the data?

What is the final
format the data is
to be archived in?

LOTAR Timeline

2003

- First joint team meeting of the international ASD-Stan – AIA LOTAR effort under the roof of the AIQG*

Late 1990s:

- ASD-Stan in Europe and AIA in the US launch different initiatives for the Long-term Preservation of Aerospace & Defense Digital Definition Data.

2004

- Launch of the 3D CAD and PDM Workgroups

2005

- First Publication of LOTAR Basic Parts

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

2000

- Start of the PDES, Inc. LTDR Project (US)

2006

- First Publication of LOTAR Common Process Parts

2002

- Start of the ASD Stan – ProSTEP iViP LOTAR Project (Europe)
- IAQG* approved charter

2007

- First joint LOTAR EU-US Workshop

2009

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

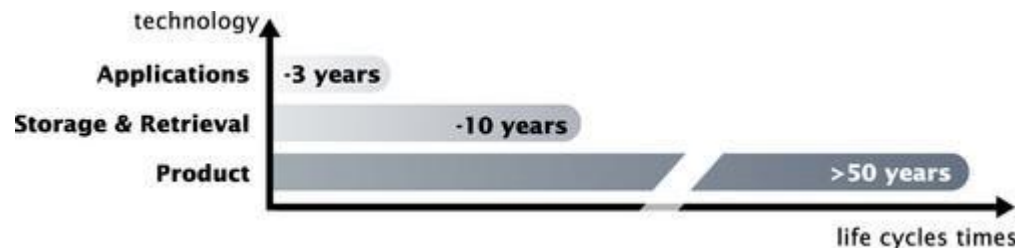
* IAQG: International Aerospace Quality Group

- 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
- In addition to legal demands, there are industry established standards, and company specific rules and recommendations.
- The standard defines architecture, processes and data formats to fulfill these requirements.

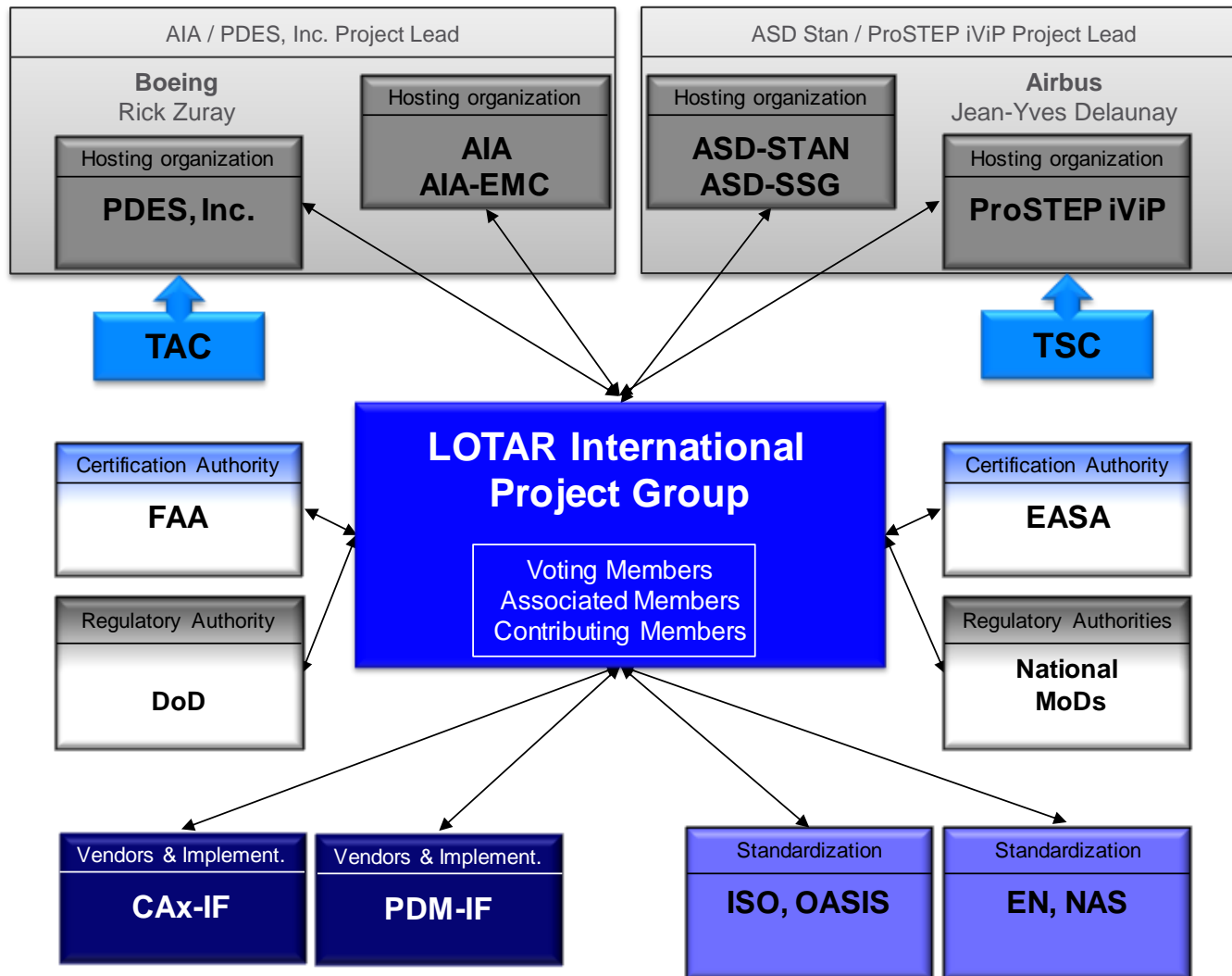
- The life cycle of applications and storage technologies has to be considered by setting up a long term archiving and retrieval standard:



- 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.

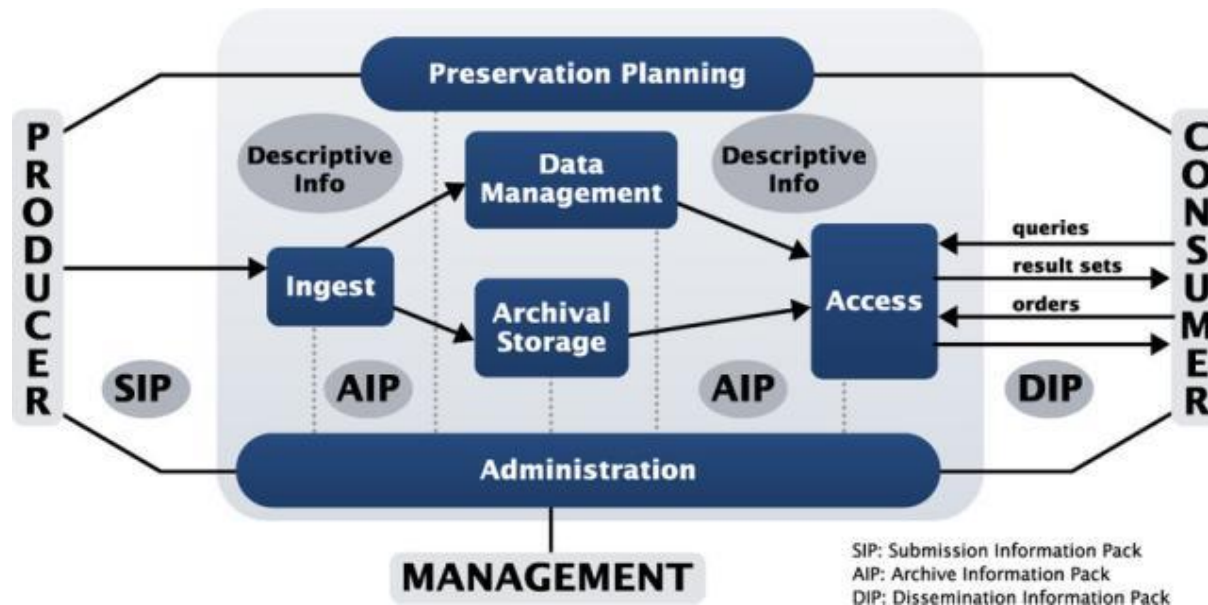
- Objectives include:
 - Developing a standard for the archiving and retrieval of product data
 - Providing methods, process modules and data model(s), to enable long term archiving of CAD, PDM and additional technical data
 - Developing recommendations for practical introduction of long term archiving 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

LOTAR Organization – External View



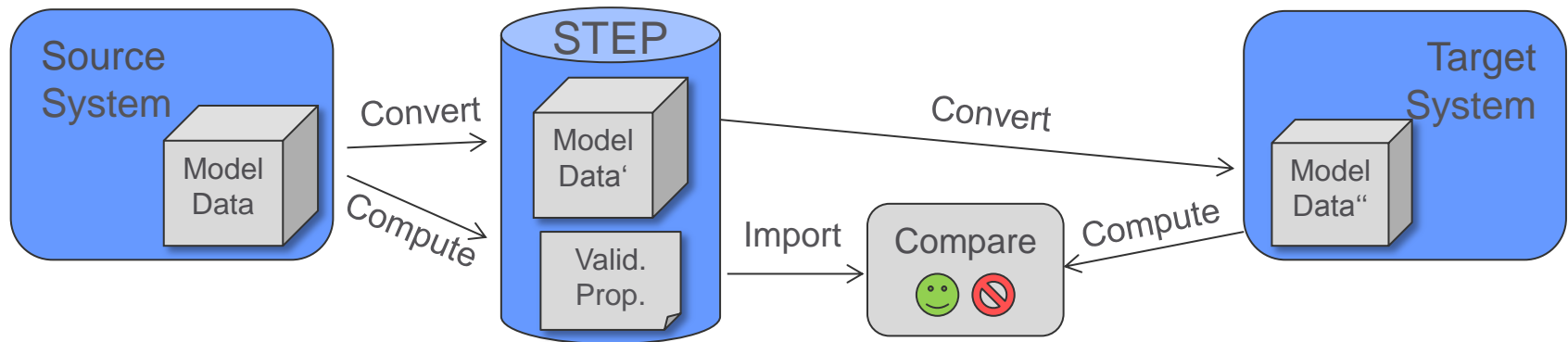
LOTAR Standard Foundation ISO 14721:2003 (OAIS)

- „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 a 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 defined for the 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 the success of the data transfer.

EN/NAS 9300 High-Level Document Structure

Basic Parts

(Overview, Requirements, Fundamentals, Methods, ...)

Published:

001 – Structure
002 – Requirements
003 – Fundamentals & Concepts
004 – Description Methods
005 – Authentication & Verification
007 – Terms & References

Common Process Parts

(Common Process, Data Preparation, Ingest, Archival Storage, Retrieval, ...)

Published:

010 – Overview Data Flow
011 – Data Preparation
012 – Ingest
013 – Archival Storage
014 – Retrieval
015 – Removal

Planned 2014:

020 – Governance & Planning

Data Domain Specific Parts

CAD Mechanical 3D
Geometry & Assembly
with PMI

Product Management
Data

Composite Design

Electrical Harness

Systems Engineering
(not yet started)

Engineering Analysis
(not yet started)

...

P1xx

P2xx

P3xx

P4xx

P5xx

P6xx

P7xx

Published:

100 – 3D Mechanical CAD
Fundamentals & Concepts
110 – Explicit Geometry
115 – Explicit Assembly Structure
Planned 2014:

120 – PMI as Polyline Presentation
200 – PDM Fundamentals & Concepts

Applicable Data Models (ISO 10303 STEP)

AP203e2
AP214e3
AP242e1

AP239
AP242e1

AP203e2
AP242e1

AP242e2
(target)

AP233
(target)

AP209e2
(target)

AP2xx

LOTAR Member Companies 2014



Europe

- Airbus
- Airbus Defence & Space
- Airbus Helicopter
- Dassault Aviation
- IAI Israel Aerospace Industries
- SAFRAN

Americas

- BAE Systems
- Boeing
- Embraer
- GE
- Goodrich
- Gulfstream
- Honeywell
- Lockheed Martin
- Rockwell Collins
- Sandia National Labs

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	DEV
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	PLANNED
EMBRAER	Legacy 450 & Legacy 500	complete definition of the aircraft	Yes	No	Yes	Yes	AP 242 ed1	DEV

PLANNED : project planned

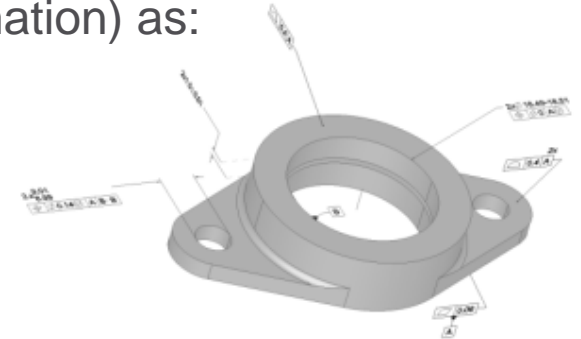
DEV : project in development

PROD : project on production

(*): Plan to migrate to STEP AP 242 ed1 when possible

LOTAR WG: 3D 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-readable, 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

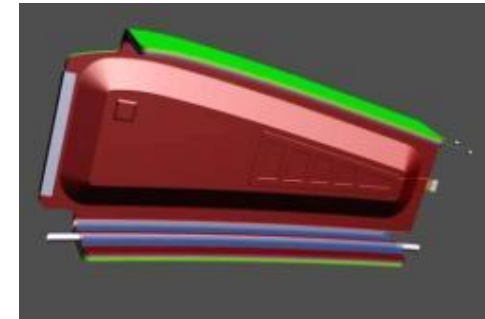
- Scope:
 - Archive and retrieve Product Data Management information in a standard neutral form that can be read and reused throughout the product lifecycle
 - Preservation of digital PDM information along the product lifecycle: in development, as designed, as planned, as delivered and as maintained.



- 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 DEX
 - Facilitation of pilot projects

()*: Accomplished or in work; more planned

- Scope:
 - Preservation of the CAD 3D composite structures information such as Sequences, Plies, Cores, Material properties, Rosette, Orientation...
 - Preservation of CAD 3D tessellated solids
- 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 composite structure 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 Homepage: www.lotar-international.org



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

Communication

- Public Presentation
- Progress Reports
- Dates

LOTAR Standard

- Overview on Parts
- Industry Use
- Next Steps

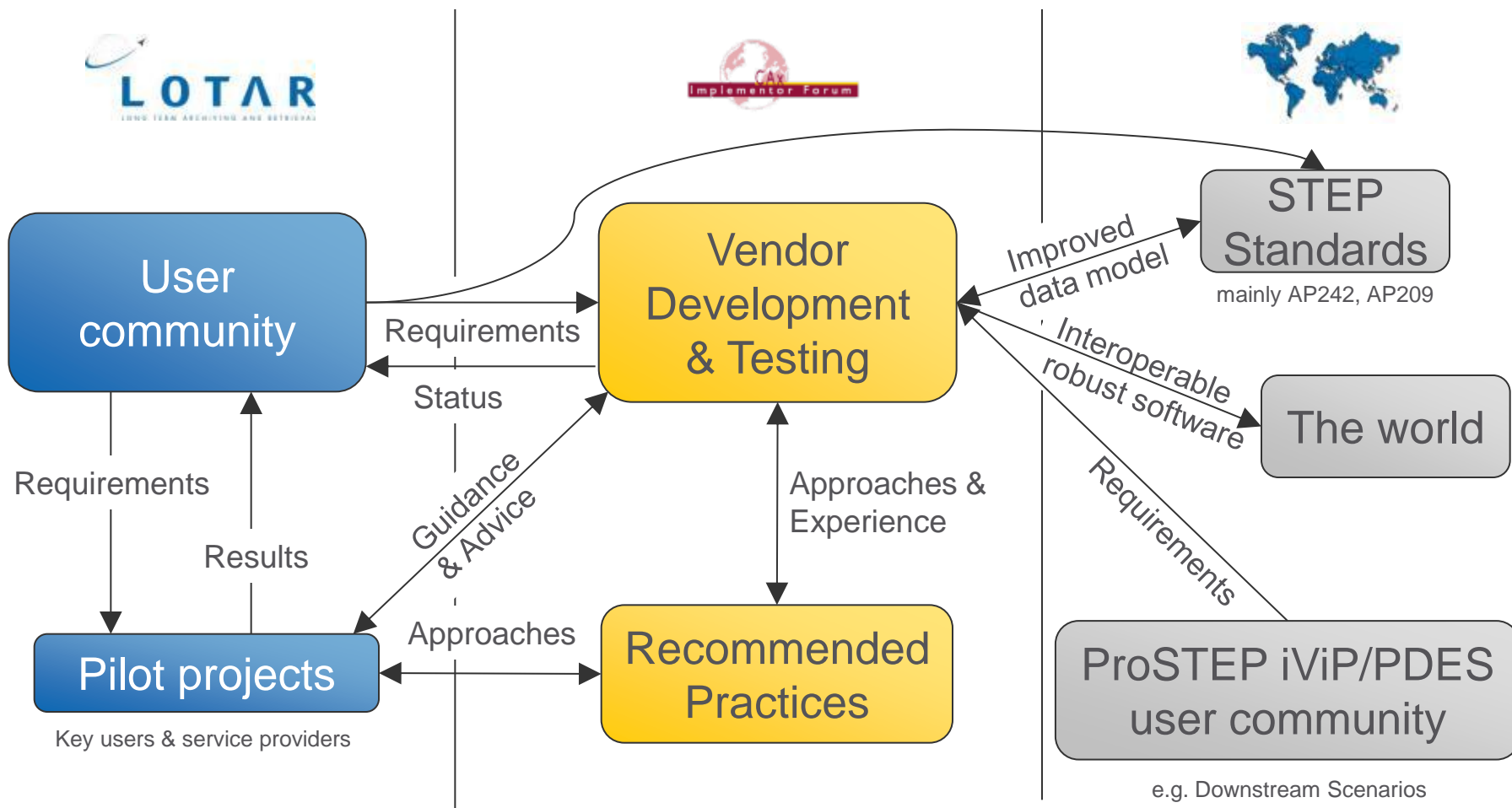
News

Links

Contact



LOTAR / CAx Implementor Forum Coordination



- Preparation of a „New Work Item“ to start a new LOTAR WG in 2015:
 - Title: **“Product Simulation and Analysis”**
 - Scope: LOTAR of CAE (Computer Aided Engineering) and SDM (Simulation Data Management) data
 - The NWI will define the WG scope, initial use cases, and ensure the support from LOTAR member companies
 - Goal is to launch this workgroup in spring of 2015
- **PMI WG**: conduct a survey to evaluate the most commonly used PMI elements; finish the use cases for Assembly PMI. Finalize LOTAR Part 121 for Semantic PMI.
- **PDM WG**: Launch ballot for part 200: “Fundamental and concepts”. Finalize part 210 “As Designed product structure”. Continue work on Recommended Practices
- **Composites WG**: broaden scope of test cases and pilot projects; internally distribute first version of Part 300 “Fundamentals and concepts”
- **Electrical Harness WG**: Complete list of essential data; update test models; continue analysis of domain information as input for the preparation of AP242e2 (see prev. slide)
- **Visualization WG**: Complete “certification data” use case; continue requirements identification; start process and best practice definitions
- **Meta Data for AIP WG**: Prepare use cases; collect retrieval expectations and review linkages between AIPs; analyze PLCS DEX and map further metadata

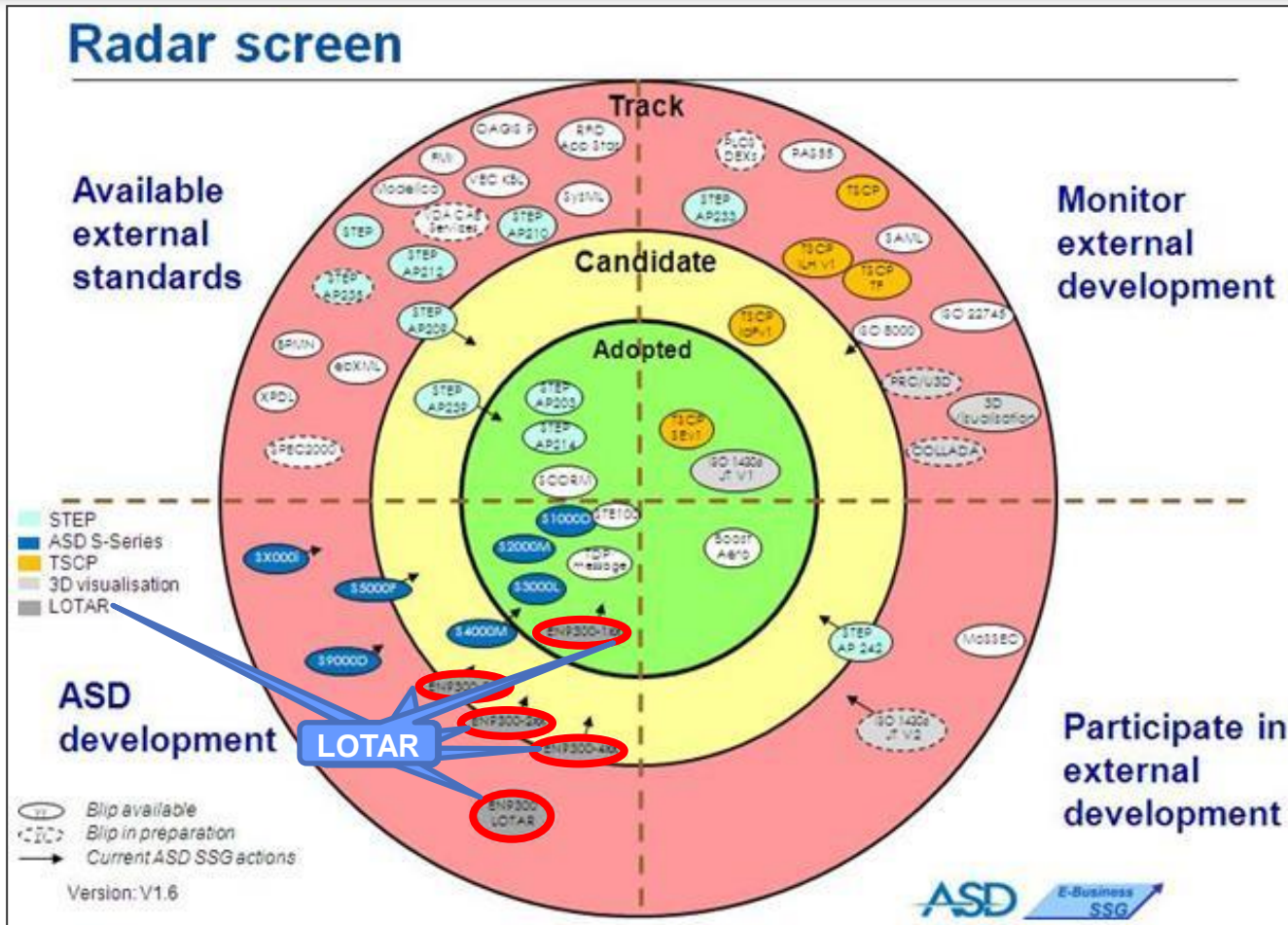
LOTAR Support of Interoperability

Projects planned by the A&D Industry



- The Aerospace & Defense industry is currently planning a number of interoperability projects.
 - A White Paper is being written for each, outlining the use cases, supported business scenarios, and draft project plan.
 - LOTAR supports these activities in accordance with each workgroup's scope and planning
- Supported activities:
 - STEP AP242 2nd Edition
 - Scope extension to support LOTAR of Electric Harness data
 - Extensions and enhancements of existing capabilities
 - PDM Implementor Forum
 - Creation of PDM Recommended Practices for AP242 BO Model XML
 - PDM Interoperability Testing
 - STEP AP239 3rd Edition
 - Enhancement of through-lifecycle support
 - Further harmonization with AP242 for PDM

ASD SSG “Radar Chart” – Recommendations to use LOTAR standards



ASD SSG =
Strategic
Standardization
Group

*A similar “Radar Chart”
is maintained by the
American Aerospace
Industry Association
(AIA)*

Access to ASD recommendations for the
use of EN9300 LOTAR standards:

<http://www.asd-ssg.org/radar-chart>

ASD SSG “Radar Chart” – Statement for LTA of CAD 3D with PMI

Name	Status	Action	Type
EN9300 LOTAR (Long-Term Archiving and Retrieval of 3D digital aerospace product information, such as CAD and PDM)	OK	Track	ASD development
EN9300-1xx (Long-Term Archiving and Retrieval of 3D Geometry, CAD structure and Product Manufacturing Information)	OK	Adopted	ASD development
EN9300-2xx (Long-Term Archiving and Retrieval of Product Management Data & Configured Mechanical Product Structure)	OK	Track-Candidate	ASD development
EN9300-3xx (Long-Term Archiving and Retrieval of Composite information)	OK	Track-Candidate	ASD development
EN9300-4xx (Long-Term Archiving and Retrieval of Electrical Harness information)	OK	Track-Candidate	ASD development





AeroSpace and Defence
Industries Association of Europe



Technology Radar Element Description

EN9300-1XX – Long-Term Archiving and Retrieval of 3D Geometry, CAD structure and Product Manufacturing Information (LOTAR 3D CAD)



ASD adoption statement

ASD recommends the use of EN9300 LOTAR standards parts 100, 110, 115 and 120 by the European aerospace and defense industries for long-term archiving and retrieval of CAD 3D explicit geometry, 3D Product Manufacturing Information and CAD assembly structure, with effect from July 2012.

Next LOTAR International Europe Communication Actions

- ProSTEP iViP Symposium; May 13, 2014; Berlin
 - **“Industry use and cross domain extension of the LOTAR standard”**
 - Presented by Jean-Yves Delaunay, Airbus
 - LOTAR International Europe project leader
 - Airbus Group Strategic Standardization Committee co-chair

- NAFEMS DACH* Konferenz, May 20, 2014; Bamberg
 - **„Langzeitarchivierung in der Luftfahrt – Herausforderung Simulationsdaten“ ***
 - Presented by Jochen Boy, PROSTEP
 - LOTAR Europe project coordinator
 - NAFEMS SDMWG member
 - * *German-language Conference; title of the presentation : „Long-term archiving in the A&D industry – challenge simulation data“*

Any questions?

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