LOTAR

LONG TERM ARCHIVING AND RETRIEVAL

ProSTEP iViP Symposium
10th of May 2012

Long Term Archiving and Retrieval of PLM Information in the Aerospace and Defence Industries

Presented by JY Delaunay (EADS Airbus)

AIA – ASD Stan LOTAR co-project leader

Objective of the presentation

- To provide the status of the LOTAR project in 2012

- To present the **use of the LOTAR standards in the European Aerospace and Defence industry**
  - **Dassault-Aviation** :3D LTA solution for the certification of the Falcon 7X
  - **Snecma**: LT Archiving solution for new parts based on 3D PMI
  - **Airbus**: project in development for LT Archiving of “full 3D” definition of A350 3D electrical harness installation

- To provide an **overview of LOTAR « phase 2 »**

LOTAR International project
A&D companies members in 2012

Members (Americas)

- BAE Systems
- Boeing
- Bombardier
- Embraer
- General Dynamics
- General Electric
- Goodrich
- Honeywell
- Lockheed Martin
- Sandia National Labs
- Spirit Aero

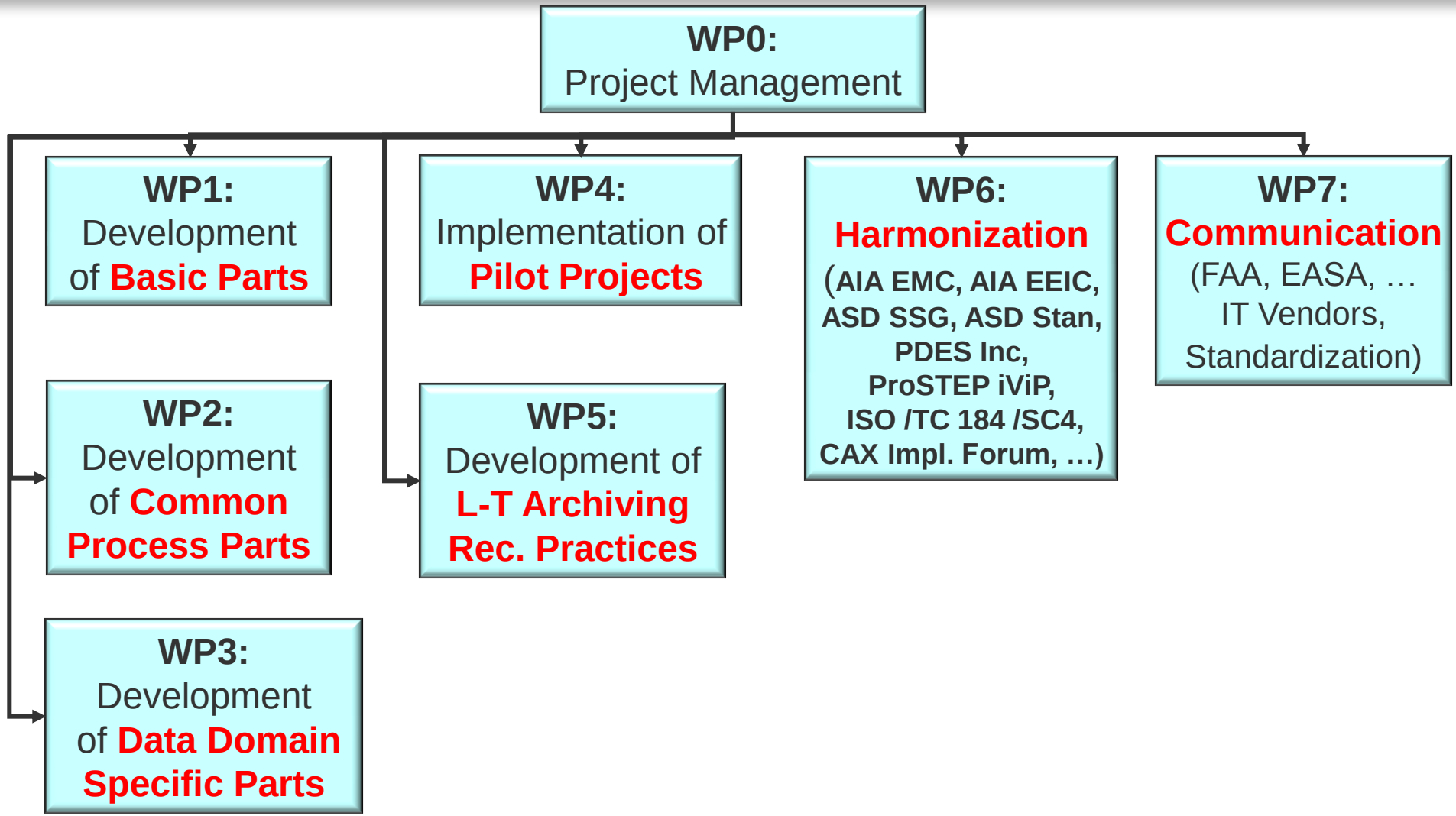
Potential Members (Americas)

- Cessna

Members (Europe)

- *Airbus*
- *CASSIDIAN*
- *Dassault Aviation*
- *Eurocopter*
- *IAI (Israel Aerospace Industries)*
- *SAFRAN Labinal*

LOTAR 2012 WBS



Active participation of A&D manufacturers, and coordination with standardization associations

- **4 international LOTAR workshops of 3 days:**
  - 19th – 21st of March 2012 USA, NIST (parallel to the PDES Offsite)
  - 26th – 28th of June 2012 Europe, Toulouse, Cimpa
  - 17th – 19th of Sept. 2012 USA, PDES Inc (parallel to the PDES Offsite)
  - 4th – 6th of Dec 2012 Europe, Darmstadt, ProSTEP iViP

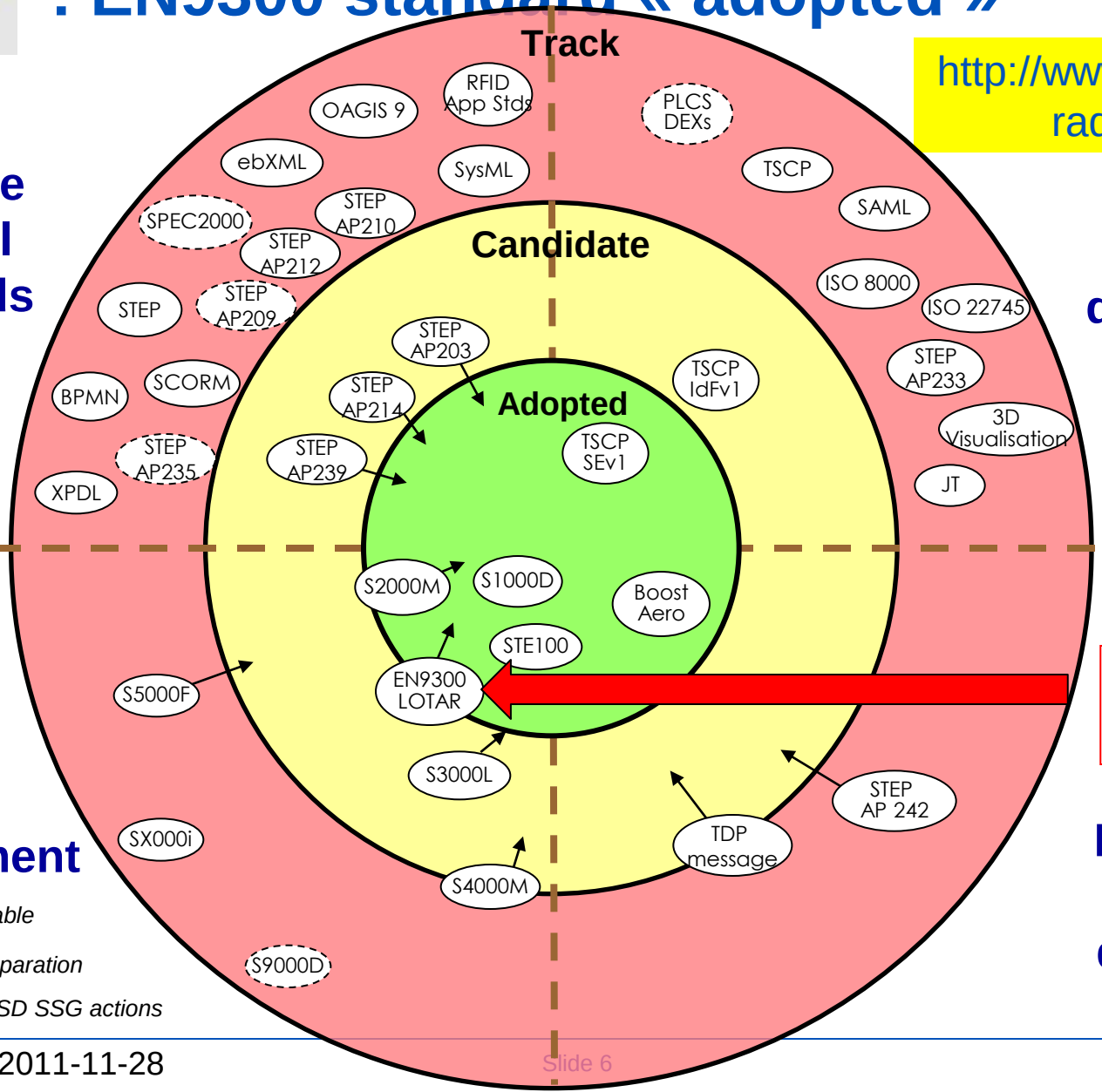
- **Weekly teleconferences of the main Working Groups:**
  - PDM WG, CAD 3D PMI WG, CAD 3D composite WG
  - Coordination team

  Bi weekly teleconferences:
  - Electrical Harness WG, Meta data for Archive Package WG

- **Coordination with A&D and PLM standardization associations**
  - Aerospace and Defence manufacturers associations: AIA and ASD
  - PLM Standardization associations: PDES Inc and ProSTEP iViP

2011 status of the SSG « Radar screen » : EN9300 standard « adopted »

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



Available external standards

Monitor external development

ASD development

Participate in external development

LOTAR “blip”
“Adopted”

yy *Blip available*

yy *Blip in preparation*

Current ASD SSG actions

EN9300 standard summary of the ASD SSG and associated recommendations

AeroSpace and Defence Industries Association of Europe

Technology Radar Element Description

LOng-Term Archiving and Retrieval of 3D digital aerospace product information, such as CAD and PDM (LOTAR)

Abstract

The LOTAR project is designed to provide a capability to preserve digital aerospace and defense product information in a standard neutral form that can be read and reused throughout its lifecycle, independent of changes in the IT application environment originally used to cre
The multi-
processes
The LOTAR
LOTAR, su
AIA, under

ASD adoption statement

ASD recommends the use of EN9300 LOTAR standards by the European aerospace and defense industries for projects for LT Archiving and Retrieval of CAD 3D geometry and CAD assembly structure, with effect from March 2010.

ASD recommendation

The SSG recommends European aerospace and defence OEM to participate in the LOTAR international project, in order to speed up the development of the different parts according to their business priorities.

Responsib
Steering Bo

Lead Orga
ASD Stan
ASD SSG
ASD LOTA

Link to a standards host site

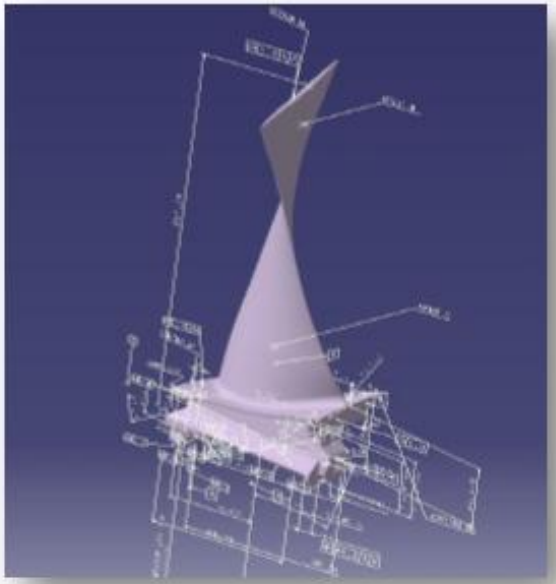
http://www.lotar-international.org/

LOTAR IMPLEMENTATION AT SNECMA

Long term archival of 3D CAD with PMI documents

April 2012

Dominique GALPIN,
Snecma , Safran group
Legal Department / Records and Archives



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Snecma

HISTORICAL RECONSTRUCTION

➔ Initial motivation

- Snecma project to replace 2D drawing by definition based on 3D model with PMI
- Regulation and legal requirements to preserve the part definition

➔ What has been done

- Contribution to LOTAR project, mainly on Part 100, 110 and 120
- Contribution to a Safran working group to update the process of management of the life cycle of electronics documents candidate to be archived, including LOTAR Parts process (UML representation)
- Agreement with regulation to store temporary the first definition without 2D drawing
- Implementation of the electronic archive system called EASY (Electronic Archiving System) at Snecma, interfaced to the system used to manage CAD documents
- First 3D with PMI definition archived at the end of 2011

➔ And now ?

- Deployment of EASY system for all electronics documents listed in our archiving calendars (referential of time retention of our documents in the preservation format)

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TECHNICAL ASPECTS

➔ Some technical details for our archival package archived

- Chose of zip format for all containers (without compression)
- Archival package container include another container with documents and a digital signature for authentication
- Documents archived for CAD 3D with PMI documents after approval workflow :
  - STEP AP 214ed3 file with all validation properties (explicit geometry and PMI)
  - 3D visualization format, used to approve definition and to pronounce the conformity of manufactured parts
  - Quality report with LOTAR verification rules level 1 and 2 defined in Parts 110 and 120
  - Conversion report from the CAD system
  - Status file from the conversion system
  - Summary sheet in xml format (based on the LOTAR development)

➔ Retrieval

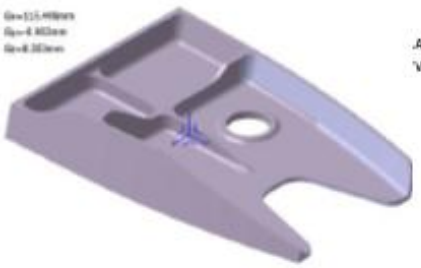
- Summary sheet in html format stored in EASY system with descriptive information's
- Authorized users can retrieve and visualize documents by a known reference our by a request using any character of summary sheets.
- Specific process done to get the container and its documents, with security controls

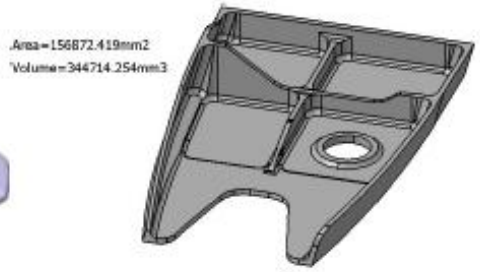
VALIDATION PROPERTIES

➔ Illustration of validation properties for 3D exact shape :

- Validation properties level 1 :

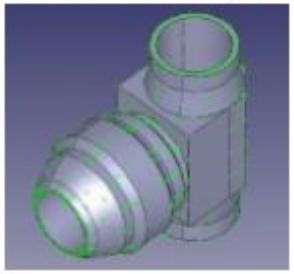
Volume, centroid and area

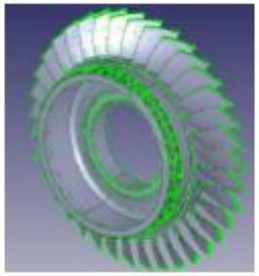


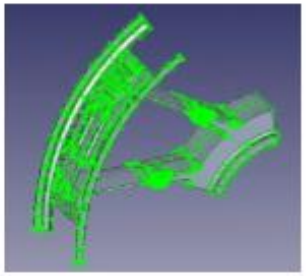


- Validation properties level 2 (optional) :

Cloud of Points







➔ Validation properties for 3D with PMI

- Validation properties level 1 : total number of PMI annotations in the file, “number of views in the file” and “number of annotations per view”
- Validation properties level 2 (optional) : Unicode string version 1

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LOTAR CONTRIBUTION

➔ Mains benefits

- Snecma was an active member during 5 years, and take an great experience with the LOTAR project, and share results with Safran companies
- A common standard in the Aerospace industry is very important to change the archiving processes for the drawing and to show the compliance with regulation requirements

➔ Labinal replace Snecma as LOTAR member

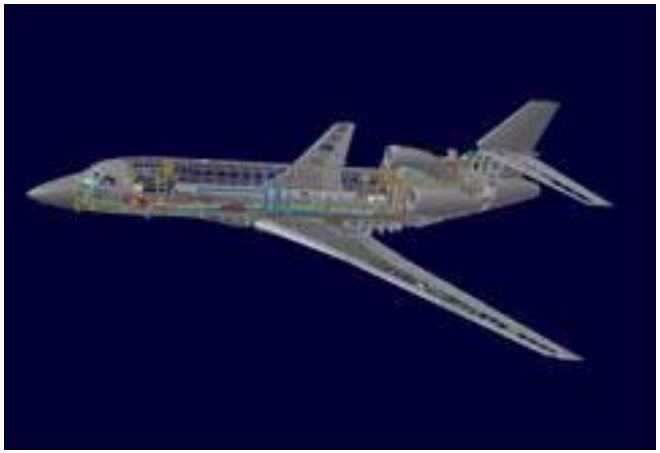
- Motivation is now to archive the CAD model for electrical harness
- Snecma continue to follow the LOTAR standard trough the ASD-SSG team (Strategic Standardisation Group) as Safran group representative

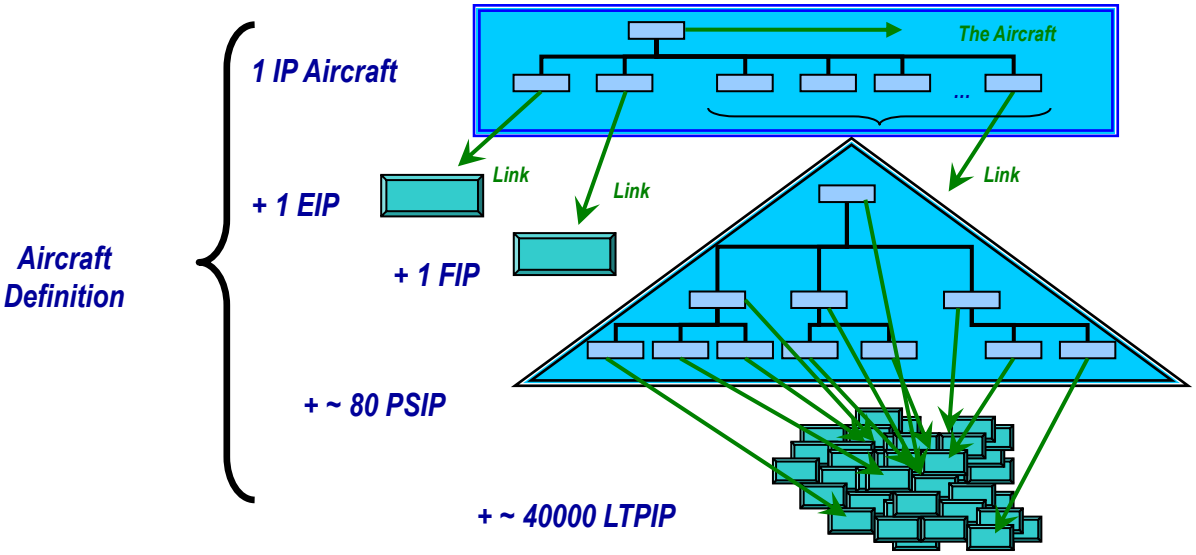
SAFRAN
Snecma

Long term archiving of Dassault Aviation Falcon 7X 3D digital mockup

- E ASA and FAA certification require that access and exploitation of the digital data will be maintained through the entire life of the Falcon 7X fleet + 3 years (estimation 70 years)
- Project began in 2007 after one year of preliminary study and ended in 2011 (Type Certificate archived)
- Every delivered A/C is archived, native data are managed by
  - Catia V4 and V5 for geometry accessed with VPM
  - Fixation (DA software) for fasteners
  - ESTEL (DA software) for electrical definition
- Dassault Aviation's solution is agreed by EASA and FAA
- Based on the following standards and EN9300 parts
  - OAIS and parts 10 to 17
  - STEP AP 214 ed3, ISO 8859-15, TIFF and parts 100, 110, 115 and 120
- Data conversions are checked using GVPs and methodologies that has been developed and validated using CADIQ tools

Content of the archive of an aircraft



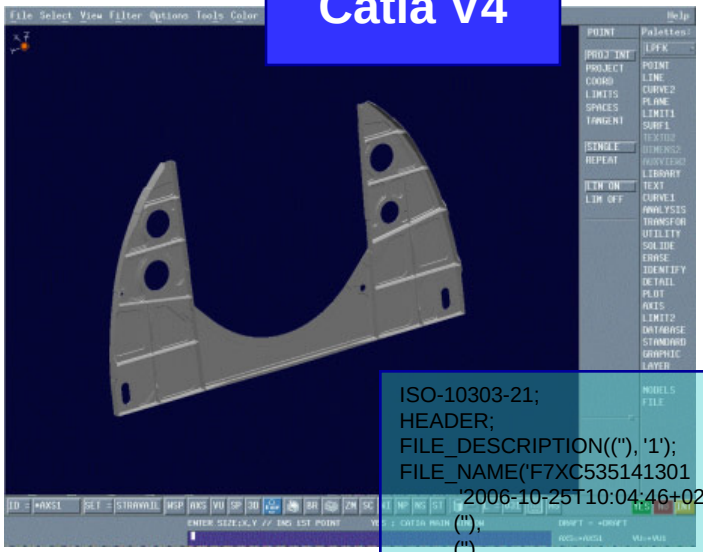


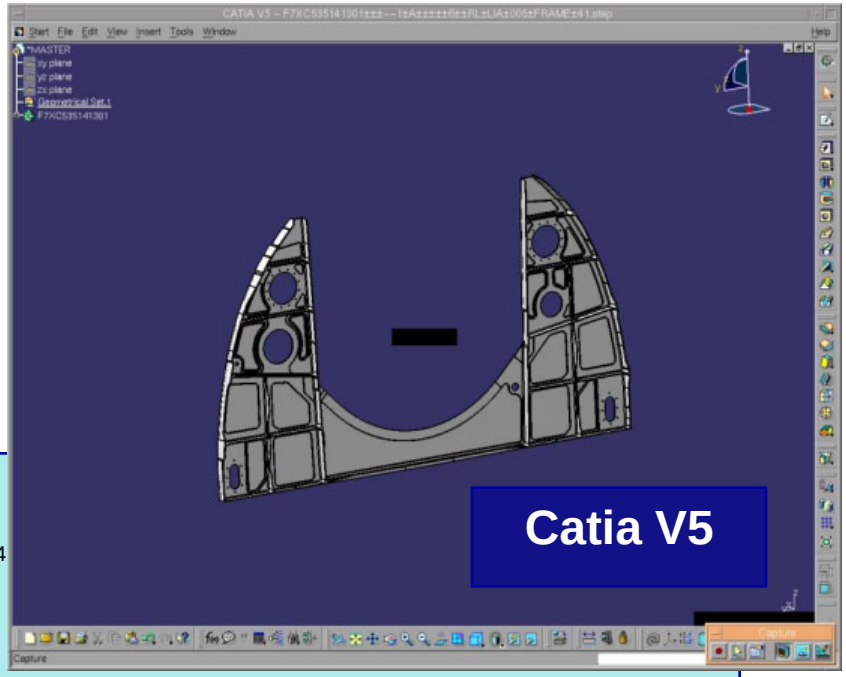
An archive (part or A/C) contents :

- The list of the corresponding files with their footprint
- The data in neutral format
- The log of conversion process (native to neutral)
- The name and version of software et standards that have been used for converion (CATIA, VPM, SFA, STEP, XML, …)
- Reference of documents and standards that has been used (they are archived too)

Illustration of the Preservation of digital 3D definition of the 7X

Catia V4





Catia V5

```
ISO-10303-21;
HEADER;
FILE_DESCRIPTION((''),'1');
FILE_NAME('F7XC535141301    --1 A     6  RL LIA 005 FRAME 4
          '2006-10-25T10:04:46+02:00',
          (''),
          (''),
          'CATIA.STEP INTERFACE',
          'CATIA SOLUTIONS V4   RELEASE 2.4 FR 4.2.4',
          '');
FILE_SCHEMA(('AUTOMOTIVE_DESIGN { 1 2 10303 214 0 1 1 1 }'));
ENDSEC;

DATA;
#1=APPLICATION_CONTEXT('automotive_design');
#2=APPLICATION_PROTOCOL_DEFINITION('Draft International Standard','automotive_design',1997,#1);
#3=PRODUCT_DEFINITION_CONTEXT(' ',#1,'part_definition');
#4=PRODUCT_CONTEXT(' ',#1,'mechanical');
#5=DIMENSIONAL_EXPONENTS(0.00000000000,0.00000000000,0.00000000000,0.00000000000,0.00000000000,0.00000000000,0.000
00000000);
#6=(LENGTH_UNIT()NAMED_UNIT(*)SI_UNIT(.MILLI.,.METRE.));
#7=(NAMED_UNIT(*)PLANE_ANGLE_UNIT()SI_UNIT($,.RADIAN.));
#8=PLANE_ANGLE_MEASURE_WITH_UNIT(PLANE_ANGLE_MEASURE(0.0174532925199),#7);
#9=(CONVERSION_BASED_UNIT('DEGREE',#8)NAMED_UNIT(#5)PLANE_ANGLE_UNIT());
#10=(NAMED_UNIT(*)SI_UNIT($,.STERADIAN.)SOLID_ANGLE_UNIT());
```

STEP File

EZMB/EZMI

LTA3D @ Airbus

Project overview

Prepared by:
Tobias Mueller
Jean-Yves Delaunay

AIRBUS

Overview of Airbus A350 “LTA3D” project

Goal of the project is to provide a 3D archiving solution for the Definition Dossier

Scope & Key Objectives of the phase 1

- *CAD 3D LT archiving for A350 XWB 3D harness installation only*
- *The solution shall be EN9300 LOTAR compliant*
- *The solution shall be fully integrated into the existing release process, and LT archiving shall be done in the existing Airbus corporate archive*
- *ISO 10303 STEP format shall become the used neutral format for LT archiving of CAD 3D PMI and PDM*
- *An external audit shall be performed on the solution implementation*
- *The solution shall be deployed before A350XWB type certification*

Essential information to be archived

- CAD Assembly structure,
- CAD 3D exact geometry,
- CAD 3D annotation,
- CAD 3D tessellated geometry

EN9300 LOTAR standards applied

Basic parts:

- EN9300 part 1, 2, 3, 4, 5, 7

Process parts

- EN9300 parts 10, 11, 12,13,14,15

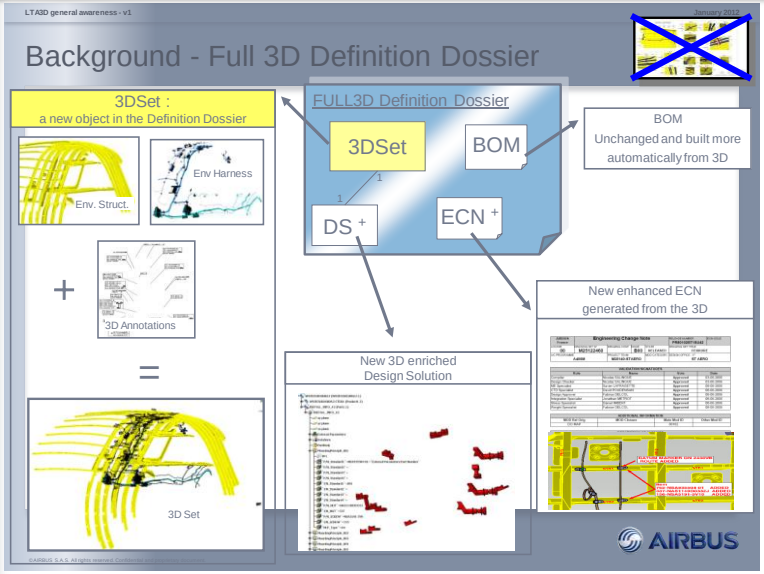
CAD 3D geometry domain parts

- EN9300 part 100, 110, 115, 120

LTA = Long Term Archiving

Background & Process of the Airbus A350 “LTA3D” project

Full 3D definition dossier



➔Usage of the “Full 3D” approach requires an implementation of a CAD 3D LT archiving solution to stay compliant with Airworthiness regulation

➔agreement with EASA has been reached on this subject for the A350 3D electrical harness installation scope

LTA3D “high level” process

Ingest

- **Fully integrated in release process:**
  - Conversion from native into to neutral format
  - Quality control of converted data using V&V
- **Transfer to archive**

Archive

- **Fully integrated in corporate LT archiving solution:**
  - Archival checks
  - Archival storage

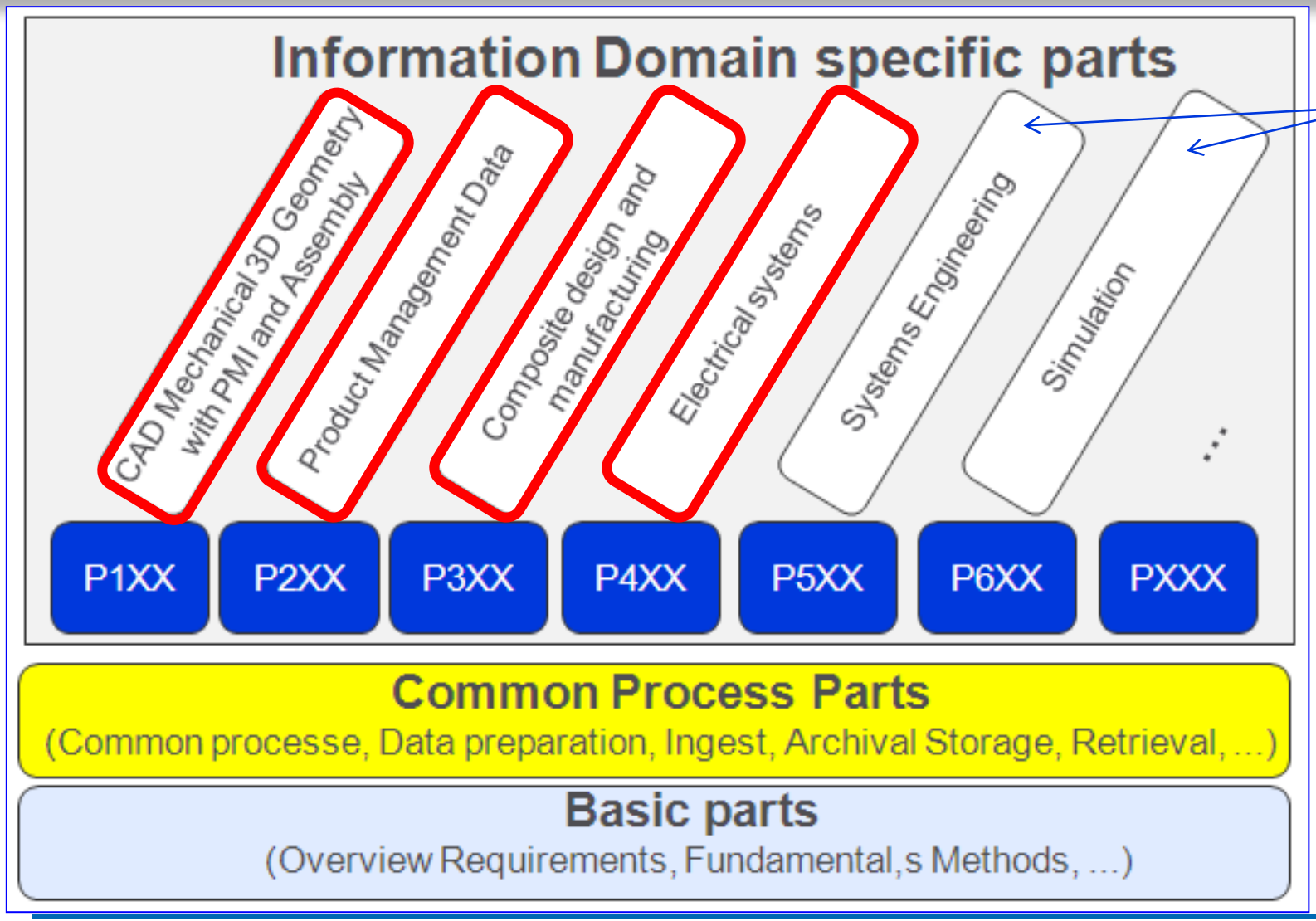
Retrieve

- **Launched from corporate LT archiving solution:**
  - Retrieval of neutral archived format
  - Retrieval into native CAD format
  - viewing

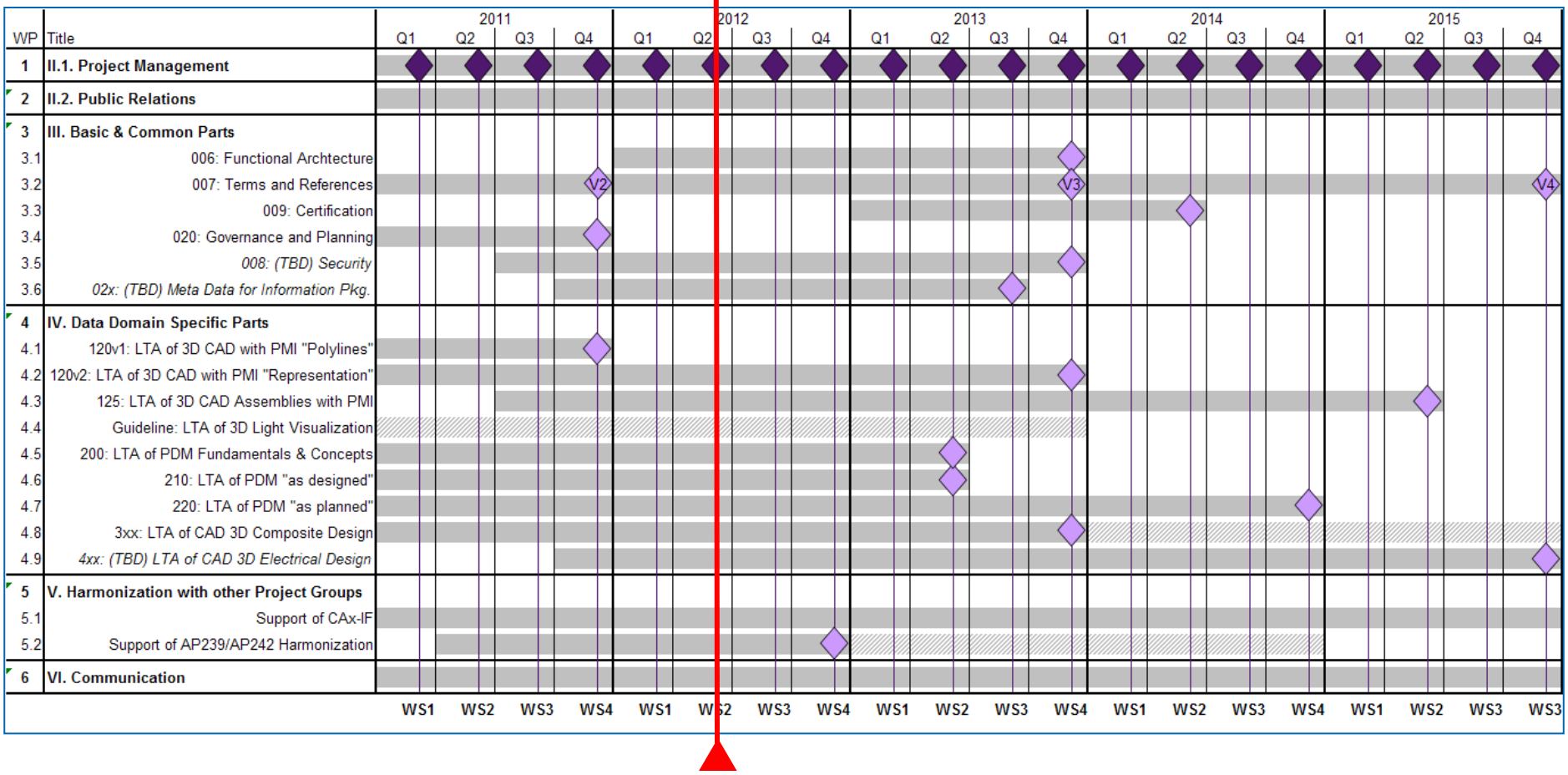
Preparation of LOTAR « phase 2 »

- The LOTAR project has delivered NAS / EN9300 standards for LT archiving and retrieving of CAD 3D PMI « graphic » allowing to support 3D type design definition (without 2D drawing)
- The LOTAR project is developing new standards for new functionalities for the following CAD and PDM domain:
  - CAD 3D PMI
    - 3D PMI « representation »
    - 3D PMI assembly « graphic »
  - PDM information
    - As design » product structure (based on STEP AP 239)
  - CAD 3D Composite design
    - 3D exact Implicit representation (based on STEP AP 203 / 242 ed1)
    - CAD 3D tessellated representation (based on AP 242 ed1)
  - CAD 3D electrical harness design
    - 3D exact implicit representation (based on AP 242 ed2)

Overview of NAS / EN 9300 LOTAR standards
An architecture for extensions according to business needs



LOTAR Five Year Plan



Next AIA – ASD Stan LOTAR workshop
26th – 28th of June 2012 (Toulouse – Cimpa)

LOTAR project and the coordination with other PLM standardization projects

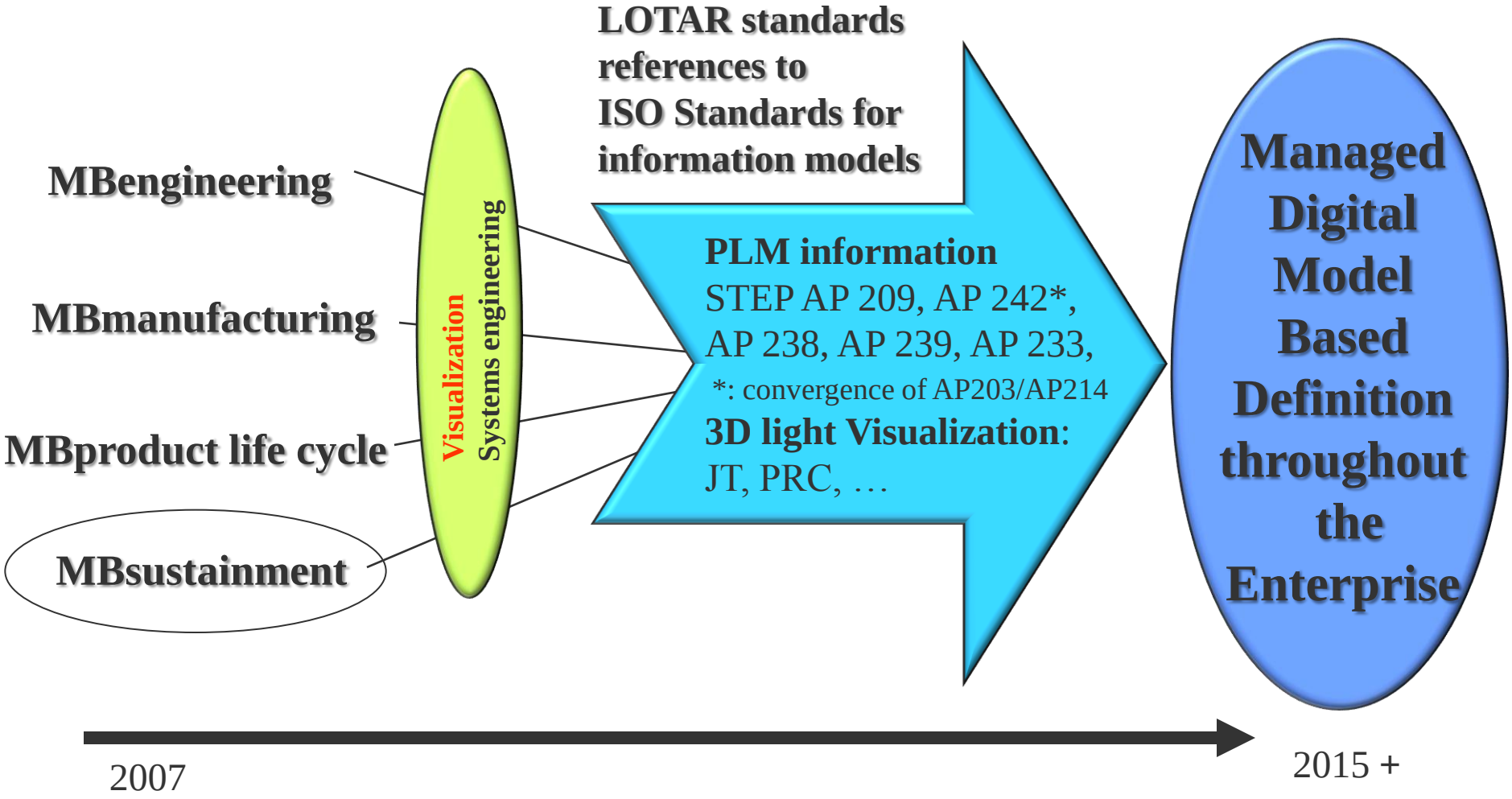
- The LOTAR standards define the processes, use cases, quality control rules, for the preservation of the PLM information

- They rely on other ISO TC 184 SC4 STEP standards defining the PLM information models

=> Setting up of a **coordination of the LOTAR project with other PLM standardization projects**, for example:

  - Funding of STEP AP 242 and STEP AP 239 “Product Life Cycle Support” harmonization for PDM information model
  - Funding of the STEP CAX Implementor Forum
  - Funding of the developement of specific functionalities of STEP AP 242,
  - Liaison to be set up with ISO TC 171 “Technical documentation” for PDF A3 / PRC

Fundamentals and concepts : Use of the suite of ISO STEP standards and related 3D light visualization standards

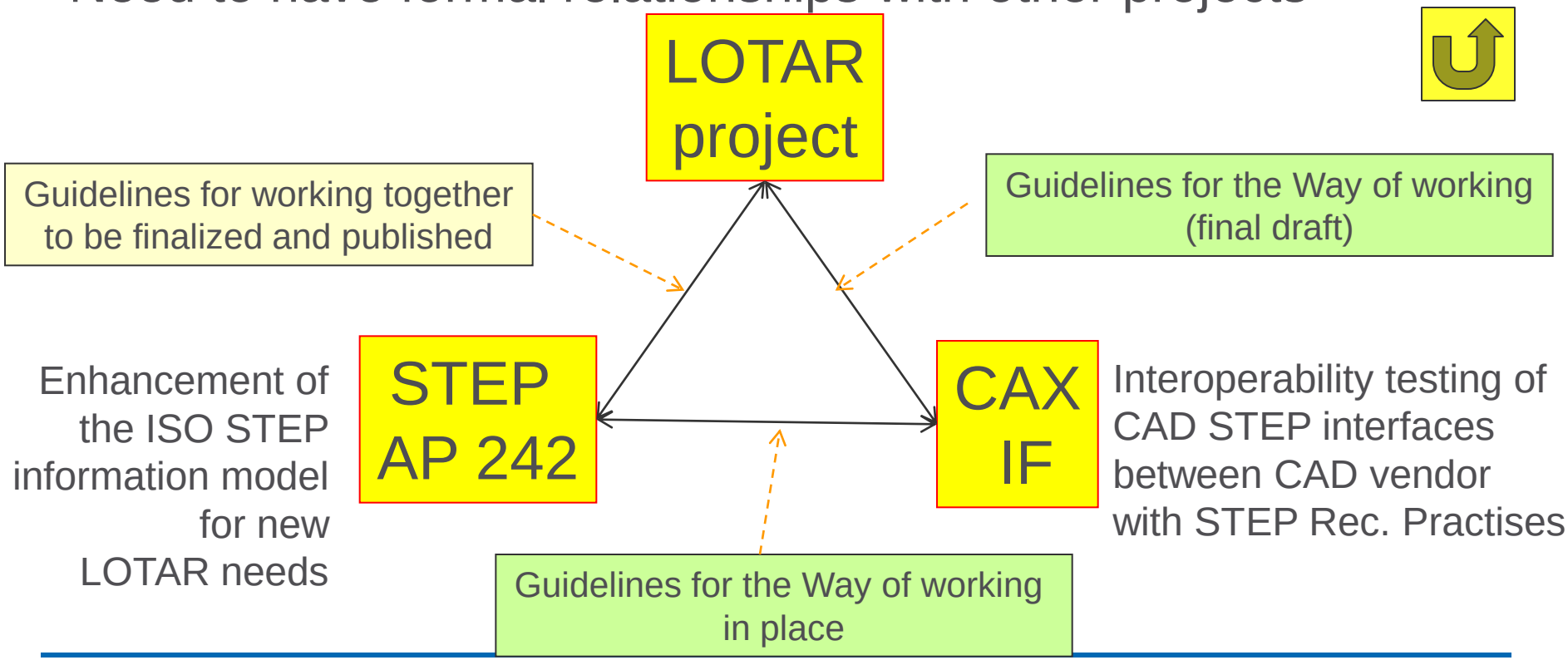


Summary

- The LOTAR project has delivered standards now used by US and European Aerospace and Defences manufacturers
  - Europe: Dassault-Aviation , Snecma, EADS Airbus
- The LOTAR project prepares new LOTAR standards in order to extend the current capabilities :
  - PDM « As design », CAD 3D composite design, CAD electrical harness
  - recommandation for LT Archiving of 3D light visualization
- It relies on a close cooperation with other PLM standardization projects and their associated Implementor Forums
  - Governance of interdepandancies with other projects
- Access to the LOTAR International public web site

Close interdependencies between the LOTAR project, the STEP AP 242 project and the CAX IF

- The goal of the LOTAR project is to develop standards, in order to have successful operational solutions approved by the regulatory authorities (FAA, EASA)
- Need to have formal relationships with other projects



LOTAR International public web site

http://www.lotar-international.org/