



Memorandum of Understanding (MoU)
between
NAFEMS,
AFNeT, PDES, Inc. and prostep ivip
to support
the LOTAR Engineering Analysis and Simulation
Working Group (EAS WG)
and the CAE Implementor Forum (CAE-IF)

1 Purpose

The parties represented by this MoU are:

- NAFEMS
- AFNeT, PDES, Inc. and prostep ivip; the hosting organizations of the LOTAR EAS WG and CAE-IF.

The purpose of this MoU is to define the desired level of cooperation between the parties in assisting Computer Aided Engineering (CAE) solution providers to accelerate the development and implementation of the Standard for the Exchange of Product model data (ISO 10303), usually referred to as STEP, and to capture engineering analysis and simulation data for long term archiving and retrieval (LOTAR).

Initial efforts are focused on fostering the development of interfaces for the ISO STEP AP209 edition 2 “Multidisciplinary analysis and design” standard.

2 Background

2.1 NAFEMS

NAFEMS is the international non-profit association for the engineering analysis and simulation community which seeks to create awareness of current and evolving techniques in numerical simulation of physical processes, to deliver appropriate education and training for them, and to encourage standards in their use. Its membership is drawn from industry, software suppliers, government, and academia from around the world and continues to grow at an encouraging rate. Much of its technical work is conducted through a number of specialist technical working groups where one of these, the Simulation Data Management Working Group (SDMWG), has been focused on establishing best practices for capturing simulation context and pedigree along with the analysis data - which is essential to LOTAR.



2.2 AFNeT

AFNeT is a non-profit association in operation for more than 30 years. During the past several years, it has promoted a multi-sectoral Think Tank articulated with a Do Tank (i.e., with digital transformation projects or standardization projects in many industries). These activities have led to the emergence of a network of recognized and highly skilled participants from the manufacturing industry, Information Technology (IT), and from business and research companies. Its members represent leading industrial companies, small and medium enterprises, French governmental agencies, software suppliers, universities, and research organizations.

AFNeT promotes the development, testing and usage of a set of coherent international standards for supporting digital standardization activities, especially in the PLM and the Supply Chain Management domains.

2.3 PDES, Inc.

PDES, Inc. is an international non-profit industry/government/academia consortium committed to accelerating the development and implementation of standards that enable enterprise integration and Product Lifecycle Management interoperability. Its participants represent leading manufacturers, US government agencies, software suppliers, universities, and research organizations. PDES, Inc. supports the Digital Enterprise through the development and implementation of information standards to support Model-based Engineering, Model-based Manufacturing, and Model-based Sustainment. Testing of implementations and data exchange using standards is an integral part of PDES, Inc. as well as enabling cross industry collaboration for the Digital Enterprise.

2.4 prostep ivip

Prostep ivip is a leading, globally active, independent, non-profit network of industry, IT and research. This industry-driven association focuses on the digital transformation in product creation and production. By designing the digital transformation in the manufacturing industry, prostep ivip defines and aggregates the requirements of manufacturers and suppliers, with the goal of defining standards and interfaces primarily for the digitalization of the entire product creation process – from idea to implementation.

The headquarters of prostep ivip is in Darmstadt, Germany. The association was founded in October 1993 by 38 industry and a number of IT companies as part of the German STEP initiative. Members of the prostep ivip association currently include almost 180 companies and organizations from 20 nations.

2.5 LOTAR EAS WG

The LOTAR International consortium combines the efforts of Aerospace and Defense manufacturers to create and promote standards for LOTAR of digital product and technical data, based on standardized approaches and solutions, mainly relying on ISO 10303 STEP standards. The LOTAR International Project Group is comprised of a number of domain-specific working groups, supported by the AIA and PDES, Inc. in the US, and by the ASD-STAN and prostep ivip associations in Europe.



During the 4th quarter of 2014, the domain of Engineering Analysis and Simulation (EAS) was added to the scope of its activities and the EAS WG was established.

Although the scope of the LOTAR EAS WG is across all of the technical disciplines associated with engineering analysis and simulation, its initial focus is on **Structural Analysis: quasi-static linear finite element analysis (FEA) for total vehicles** (metallic and composite structures). The LOTAR Parts (documents) to be developed as a result of this effort will be published as parts of the European Norm (EN) 9300–6xx series under ASD–STAN in Europe, and in cooperation with the AIA, under the American National Aerospace Standard (NAS) 9300–6xx, per the current international ASD-STAN and AIA organizational MoU. These documents will be based on the ISO STEP AP209 edition 2 standard “Multidisciplinary analysis and design.”

2.6 CAE-IF

Implementation of the AP209 standard will rely on interfaces to map the EAS data from proprietary analysis formats to the AP209 format and vice versa. To foster collaboration in developing these STEP AP209 interfaces, and to support testing and robust implementations thereof, the existing CAX Implementer Forum (CAX-IF) managed by PDES, Inc., prostep ivip and AFNeT, which has been focused on mechanical CAD, was extended during 2015 to include EAS by creating the CAE-IF as a new forum within the existing infrastructure.

The CAE-IF activities include:

- Capturing user requirements to define the functional scope of the software test rounds
- Managing interoperability test rounds
- Providing feedback to ISO and LOTAR standardization communities
- Promoting CAE-IF results.

3 Functional Roles for all parties

3.1 NAFEMS

In the frame of this MoU, NAFEMS:

- Enables communication with representatives of the CAE solution providers who are members of NAFEMS (the person, position and CAE solution provider they represent) – the goal is to contact appropriate personnel who can aid in making decisions to engage in developing the software interfaces
- Facilitates LOTAR EAS WG communication with NAFEMS members via conferences, publications and technical working groups

3.2 LOTAR EAS WG

In the frame of this MoU, the LOTAR EAS WG:

- Acts as the point of contact for technical questions from CAE solution providers that might arise



- Guides the overall collaboration efforts; schedules and governs the policies for the collaboration efforts with CAE solution providers
- Engages in collaboration with the CAE solution providers under the auspices of the CAE-IF and Pilot Study facilitators
- Communicates the status of LOTAR EAS WG activities in developing standards, Pilot Studies (e.g., proof-of-concept implementations) and in supporting the CAE-IF via:
 - Authoring content for presentations/papers at NAFEMS conferences and articles to be published in the NAFEMS Benchmark magazine
 - Engaging with technical working groups in NAFEMS, such as the Simulation Data Management Working Group (SDMWG)
 - Authoring content for other relevant means of communication

3.3 LOTAR EAS WG and NAFEMS Collaboration

LOTAR has been keeping the working groups within NAFEMS apprised of its activities. Several members of the NAFEMS SDMWG are also members of the LOTAR EAS WG.

The LOTAR EAS WG approached NAFEMS with a request for its support in reaching out to the international CAE solution providers via a memorandum of understanding signed in 2016. The scope of work outlined in that previous MoU has been completed. This new extended MoU is intended for continued collaboration in performing the following basic tasks:

- Continue the outreach to CAE solution providers for collaboration with the EAS WG in developing LOTAR standards by their involvement in the following:
 - Pilot Studies related to developing additional features for the STEP AP209 interfaces that are underway and further defining recommended practices for their use
 - Validate the STEP AP209 interfaces via the CAE-IF as they mature
- Promote the LOTAR standards for simulation and analysis to include more technical domains and extensions of STEP or other industry standards for data exchange
- Extend the industry outreach beyond aerospace and defense regarding LOTAR of EAS data via regional conferences, websites and the NAFEMS Benchmark magazine
- Provide a means of communicating with representatives of CAE solution providers that are members of NAFEMS
- Engage with technical working groups within NAFEMS, such as the SDMWG
- Confirm the desire to collaborate in educating users and suppliers of best practices and methods of capturing engineering analysis and simulation data for long term archiving and retrieval, including joint publications on using the STEP AP209 standard.

3.4 CAE-IF and NAFEMS

Several CAD software suppliers also produce CAE products (FEA pre-/postprocessors, FEA solvers, process automation, workflow management, etc.), but there are also companies that currently produce only CAE products. Many of these companies are members of NAFEMS as well.



By engaging NAFEMS, the CAE solution providers will be introduced to the CAE-IF, especially for developing and validating interfaces which support data exchange with STEP standards. NAFEMS members and the industries they represent are engaged in performing simulation and analysis and have a vested interest in LOTAR of the data produced (input, analysis processes and subsequent results).

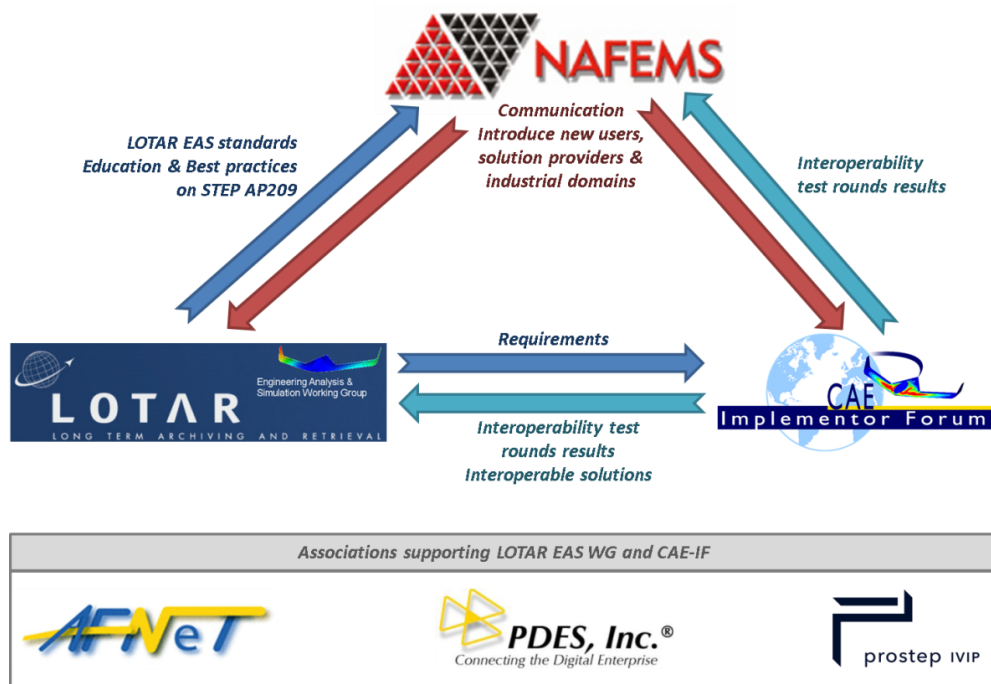
In the frame of this MoU, CAE-IF expects NAFEMS, together with the other identified parties, to disseminate the results of the test rounds.

NAFEMS has been active in supporting the development and implementation of ISO 10303 STEP since its inception, including collaborating with PDES, Inc. Furthermore, prostep ivip and AFNeT have also been active in developing STEP and collaborating with NAFEMS.

4 Interactions between all the parties

4.1 Information exchange

The major interactions between all the parties are depicted in the figure below:





4.2 Responsibilities and Intellectual Property Rights

4.2.1 Personal data

Each organization shall comply with all privacy laws and regulations applicable to it, as they relate to any personal information (e.g., names, email addresses, etc.) shared with any of the other organizations. To the extent that any individual representative participates in the activities of another organization, they will comply with all privacy rules of that organization.

4.2.2 Copyrights

Except with respect to standards, which are dealt with separately below, and unless otherwise agreed in writing in advance between the parties, the following rule shall apply with respect to copyrights: whenever a member of one organization participates in the activities of any of the other organizations and wishes to make a contribution of material, the contributor agrees that the rules of the receiving organization shall apply to the material contributed.

In the event that the parties wish to develop and/or co-own collaboratively any copyrightable materials, they shall agree in advance in writing how such materials shall be developed and/or co-owned.

4.2.3 Patents

The parties will avoid including any patented work in the LOTAR Standards or ISO Standards.

5 Duration

This MoU will be an ongoing collaboration agreement in effect from the date of signing. During execution of this agreement, any one of the parties can choose to end the collaboration described in this MoU at any time or for any reason by giving notice via email, fax to/from the approver of one party to the approver of the other parties.

6 Review

The parties of this agreement will review and align the efforts established under this agreement on a regular basis, as required to identify mutual benefits of the ongoing collaboration efforts and to refresh it accordingly for future plans. This MoU is not a contractual obligation between the parties, and in no way shall conflict with, modify, or negate clauses of any contracts which have been or are to be negotiated between the parties.

Approve Rodney P. Dreisbach
on behalf of 9/25/2018
 Date:
 Joseph G. Draper
 Co-leader LOTAR EAS
 WG - Americas
 The Boeing Company

Approve Rodney P. Dreisbach
on behalf of 9/25/2018
 Date:
 Tim Morris
 Chief Executive
 NAFEMS

Approve Jelly 26/9/2018
ON BEHALF OF
A. LEVY
 Date:
 Albert Lévy
 Co-leader LOTAR EAS WG - Europe
 CIMPA on behalf of Airbus

Approve Mike Jahadi
 Date:
 Mike Jahadi, PhD
 Chairman
 PDES, Inc.

Approve Rick Zuray 9/25/18
ON BEHALF OF
 Date:
 Rick Zuray
 Co-leader LOTAR International -
 Americas
 The Boeing Company

Approve Armin Hottacker 16.10.18
 Date:
 Armin Hottacker
 Chairman

Approve Jean-Yves Delaunay 25/9/18
 Date:
 Jean-Yves Delaunay
 Co-leader LOTAR International -
 Europe
 Airbus

Approve Pierre Faure 25 sept 2018
 Date:
 Pierre Faure
 Chairman
 AFNeT Jean Branzé



Useful links- Internet websites

LOTAR International	http://www.lotar-international.org
LOTAR EAS WG	http://www.lotar-international.org/lotar-workgroups/engineering-analysis-simulation.html
NAFEMS	http://www.nafems.org
AFNeT	http://www.afnet.fr
PDES, Inc.	https://www.pdesinc.org
prostep ivip	http://www.prostep.org/en.html
AIA	http://www.aia-aerospace.org
ASD-STAN	http://www.asd-stan.org
ISO STEP AP209 ed2	http://www.ap209.org
CAX-IF	https://www.cax-if.org
CAE-IF	http://afnet.fr/dotank/sps/cae-if