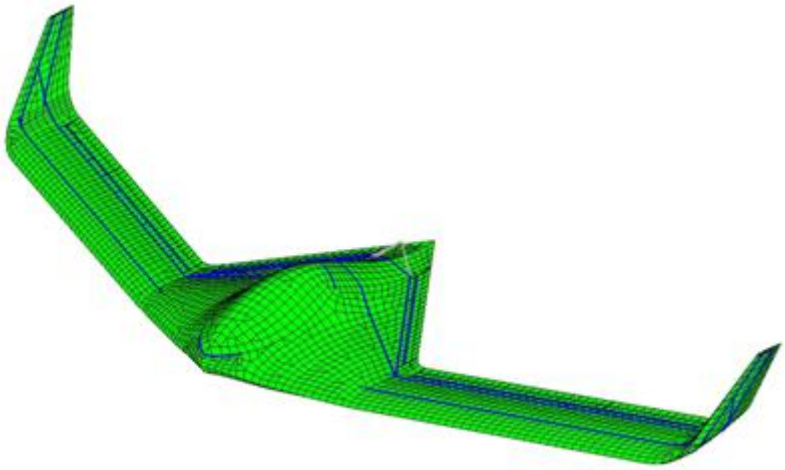
Jotne

Simulation Data Management



EDMopenSimDM™

Usage Guide (R13.0)

EXPRESS Data Manager™

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1 Introduction to this document

This EDMopenSimDM Usage Guide describes the typical use and the benefits of the EDMopenSimDM application. There is also an EDMopenSimDM Reference Manual, which lists and explains the individual user functions of the application. It is recommended to study this usage guide before reading the reference manual.

EDMopenSimDM is currently available in release 13, respectively CRYSTAL Platform, version 1. This document indicates the state of the current implementation.

2 Introduction to EDMopenSimDM

It is the objective of EDMopenSimDM to improve the effectiveness of simulation and analysis programs and the sharing of the information produced. Thus, EDMopenSimDM is an addition to existing engineering analysis tools; it offers special provisions to reuse the data they produced.

EDMopenSimDM is designed for the following use cases, which are described in more detail in section 3 below:

- Management of design and engineering analysis data on an active program
- Use in customer support organizations
- Long term archival of program data.

EDMopenSimDM is different to other simulation data management tools on the market in offering an interoperable solution by supporting the internationally-recognized ISO STEP standardized format - specifically ISO 10303-209 and the emerging edition 2 (AP209e2). The following functionality of EDMopenSimDM supports data interoperability:

- import of AP209e2 files in ISO 10303-21 (P21) format;
- validation of AP209e2 data;
- visualization of the graphical aspects of AP209e2 data;
- text queries into AP209e2 data;
- AP209e2 compliant representation of product structure and management data;
- export of user-defined data to AP209e2 files in P21 format.

This openness enables the support of the following sub-goals and benefits:

- Simulation data are made accessible for the support and upgrade of aircraft, land vehicles, and ships:
    - Allows users such as national Ministries of Defence and Air Logistics Centers to have access to simulation information.
- EDMopenSimDM interfaces with off-the-shelf CAD and CAE engineering applications:
    - Provides the mechanisms for single access to product structure, CAD models, and CAE simulation data for engineering programs.
- Long term data retention issues are resolved:
    - Enables cost-effective life-cycle processes.

3 Use cases

In summary, the following functionality is available from EDMopenSimDM for the different use cases:

i. For managing design and engineering analysis data:

- Multi-user collaborative environment
- Organize your program data in repositories and models
- Manage files on product structure level
- Create multiple product structures, automatically from STEP-files or manually
- Link design and analysis items by drag-and-drop
- Assign properties to product structure items
- Upload and download files
    - Automatic creation of meta data, like timestamp and creator
- Add files to design and analysis items
- Support for various file formats, including AP209e2
- Manage distributed and local files in database
- Assign resources and methods to tasks
- Provide task feedback
- Peer approval and final approval
- Versioning of items in product structures
- Create baselines for all or parts of a structure
- Validate data provided in STEP-format
- Search in meta data

ii. For viewing of design and engineering analysis data:

- Browse product structures like folders
- Execute textual queries into AP209e2 data
- Run survey queries to find critical spots in analyses
- View files with your favorite tools
- Browse analysis data, native and AP209e2, graphically with built-in 3D Viewer

iii. For archiving:

- Export an entire product structure or parts of it as “Data package”
- Export baselines
- Archive for the long term according to LOTAR standards (EN 9300-11)
- Import product structures from STEP files
- Import archived programs and baselines
- Validation and verification of ingest/retrieval processes

iv. For access control:

- Login access control
- Separation of responsibilities into manager, editor and reader

- Locking of product structures
- Open Standard API and Web services
- Customized access control for
  - product structures and their elements
  - low level assignment of roles

3.1 Management of data on an active program

Management of data is a process that continues as long as a program is active, as long as new Computer Aided Design (CAD) models or new versions of existing CAD models are created and as long as Computer Aided Engineering (CAE) models are created and analyses are executed. The task is to take care of all analysis data in a database and relate them to CAD models and Product Structures (PS). Therefore, the resulting database shall be a database where it is easy to find and display all the different types of simulation data.

Figure 1 shows a diagram of a product development process with focus on design and analysis. The EDMopenSimDM product can be used in all these steps.

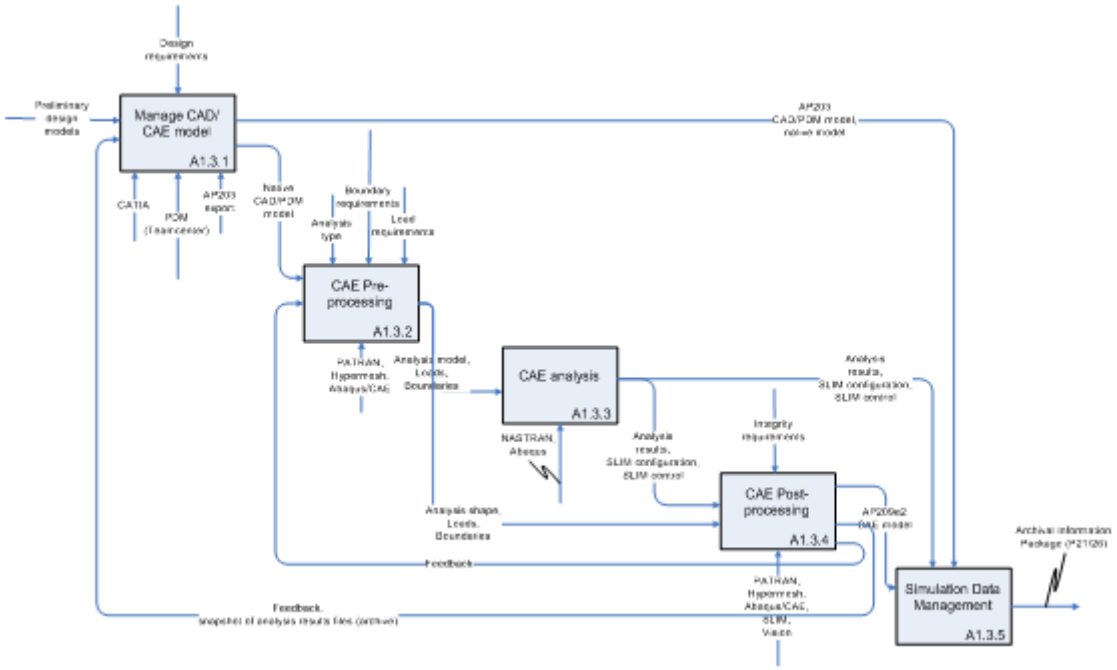

Figure 1: Process diagram - Management of data on an active program

3.1.1 Access control

EDMopenSimDM users are assigned types of access to the system. Users may play two types of roles:

- UserManager[1] – can create/update/delete users.
- SystemManager – can create new product structures and has the rights of a SystemUser.
- SystemUser – can play roles in product structures as Admin, Editor or Reader.

[1] Only “superuser” is defined with UserManager role.

There are following roles within product structure.

- Admin – user has administrator (manager) access rights. User can create new persons, assign access rights for them, approve actions and so on.
- Editor – user is an editor. User can create new folders, upload files and make some updates.
- Reader – user can not update the product structure, but can add comments to objects.

3.1.2 Define Product Structures

The person responsible for data management will in A1.3.1 (Figure 1) either import a CAD Product Structure (PS), or create a PS suitable for managing the data files in the simulation process, providing a structure to organize the associated CAD and CAE files. These Product Structures may be quite cursory and just enough to organize the simulation models.

In case of importing AP209e2 files, these files might contain analyses of the same CAD model along with the CAD model itself. If so, the user will have the option not to store the CAD model a second time. It may also happen that the two CAD models to be imported are different revisions. Then both are stored and given different revision numbers.

The following is a typical sequence of commands to establish a product structure:

- Login (manager)
- Create repository
- Create product structure (PS) folder (new model) in this repository
- Create meta data for the PS (persons, approvals, organization, …)
- Introduce properties for model
- Define methods
- Browse through the meta data (property view)
- Add children to the new product structure (for example, one for design and one for analysis)
  - select different types of folders (design, analysis, part, document, ...)
- Apply copy, paste and remove functions to folders
- Change default access of administrators, editors and readers to folders
- Add task descriptions to some folders
- Assign property values to some folders

3.1.3 Manage files

In process steps A1.3.1 through A1.3.4 (Figure 1) the user will import models into the EDMopenSimDM database and will manage the CAD and CAE files within it. These functions treat the files as separate independent units. As a part of the import process the CAD models and CAE simulations will be linked to Product Structures (PS).

Import of AP242 or AP209e2 data into a EDMopenSimDM database may involve a validation according to the AP-schemas. The validation process will output a list of non-conforming data

instances used to debug and cleanse the models as necessary. This output will be linked to the original file in the database.

The following is a typical sequence of commands to manage files:

- Login as one of the editors
- Create document folders
- Add document extensions that are missing from your EDMopenSimDM installation
- Upload files (pdf, op2, AP203, AP209e2) to folders of type Document and to other folders
- Establish links to external files (both .stp and non .stp files)
- Validate a STEP-file
- Run queries against an AP209e2 file
- Remove files
- Browse through the automatically created meta data
- Add meta data to files
- Open and browse through uploaded files, among others, using Vcollab (NASTRAN and AP209e2 files)
- Add replies to task descriptions

3.1.4 Baselines

In Product Data Management (PDM) systems product structures have baselines and versions. EDMopenSimDM offers functionality for both. For example, if EDMopenSimDM shall deliver all CAD/CAE data in the database of one specific version of an aircraft to a customer, EDMopenSimDM must have exact information about which parts and versions of the parts that are used in that specific version of the aircraft. This information is typically stored in a PDM system as the product matures.

The following is a typical sequence of commands to establish a baseline:

- Login and select a model that you are administrator for
- Apply final approval to some of the folders
- Create baseline 1 with folders that all are finally approved
- Create baseline 2 and include some folders that are not approved
- Review the resulting baseline

3.1.5 Folder versions

Further editing on a frozen Product Structure is the same as building the next revision of the Product Structure. The following is a typical sequence of functions to deal with folder versions:

- Login and select a model that you are administrator for
- Create folder versions
- Create folder versions of folders belonging to a baseline

- Copy a folder version to another parent
- Review new folder versions
- Assign editors and readers to folder versions
- Remove a folder version
- Login and select a model that you are editor for
- Change folders of an underlying branch that effect corresponding folders of the previous version of the high-level folder

3.1.6 Links among folders

Links between different Product Structure folders may be established manually. For example, the following may be linked to a PS folder:

- CAD-model
- Simplified CAD shape for analysis
- Mesh model
- Loads
- Boundary conditions
- Analysis results.

Also files may be linked to different folders. Try the following functions:

- Login and select model that you are editor for
- Link an analysis node to a design node
- Delete a link
- Click on both the created link objects

3.2 Use in customer support organizations

With receiving digital engineering analysis models, intended changes to the system-in-support may be analyzed locally, that is, without or at least with less involvement of the manufacturer.

EDMopenSimDM makes this easier and cheaper by delivering system data in a standard format. This will enable the end user to select among several engineering analysis tools for local treatment of the data. In addition, the EDMopenSimDM end user will receive an application to browse the engineering analysis system data. Those who do not need to manipulate the data will, thus, not need to purchase any additional application to display the data.

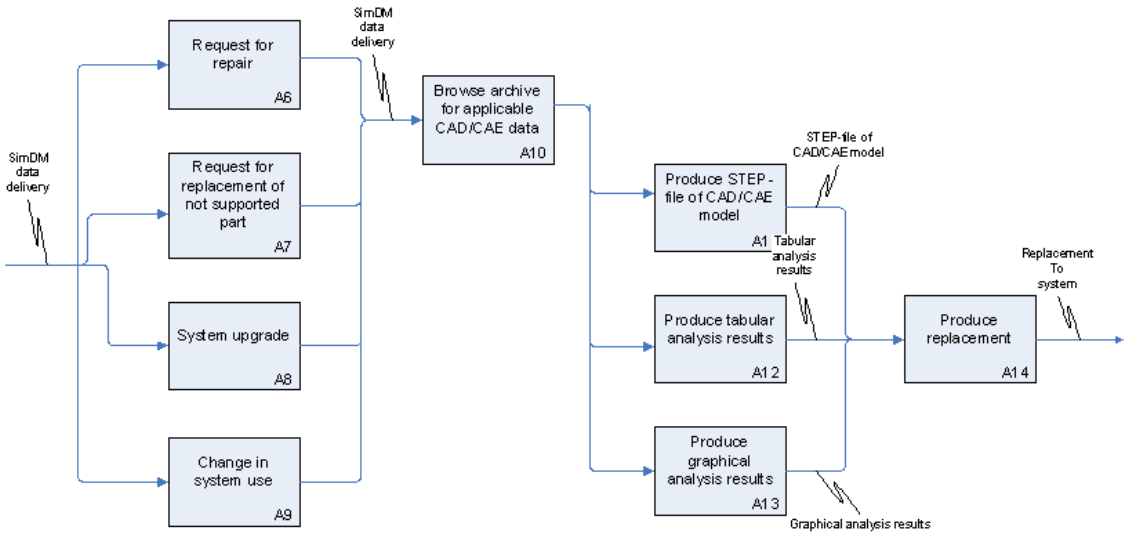

Figure 2: Process diagram - Use in customer support organizations

3.2.1 Browse in EDMopenSimDM client

The capability of the software is reduced compared to the tool for management of active program data to only reading of data, not manipulating them. The user can browse, search and extract data.

The following is a typical sequence of functions to deal with browsing of data:

- Login and select model that you are reader for
- Select in panel for repositories and models the function ”Import from archive”
- Browse through the imported Product Structure
- Browse through meta data of the product structure folder, other folders and files
- Open various types of files
- Download a file
- Select a folder other than the product structure folder, create, then download a data package
- Query the contents of an AP209e2 file
- Search in product structure meta data

Organizations that want to restrict access to the EDMopenSimDM server data or need clients without installation may use the web-client. It offers the following functionality, which is not yet identical with the typical sequence of functions in the list above:

- Login: Login to Web Client
- Browse Model: Browse a model
- Download File: Download a file
- Export Structure: Export a structure
- Meta-data: Explore the meta-data of a folder
- File upload: Upload a file
- Add Remark: Add a remark to a folder
- Add Approval: Add an approval to a folder
- Import Folder: Import a folder to folder structure

- Delete Folder: Delete a folder

3.2.2 Browse in CAE tool

The following is a typical sequence of functions to deal with browsing in a viewing tool:

- Login and select model that you are reader for
- Select a suitable CAE-file and open it in Vcollab Presenter
- Browse and manipulate the opened model
- Add another CAD/CAE model to the same display
- Try out the callback functionality by selecting (double-click) the two models and observe the product structure panel

3.3 Long term archival of program data

The process diagram in Figure 3 shows the main activities involved in this use case. The three activities on the left trigger an archival process:

1. A system is ready for delivery to a customer. The engineering analysis data related to this system shall accompany the delivery and shall also be archived at the source organization, that is, usually the production facility.
2. A back-up of the production system is required, as part of a back-up routine or extraordinarily.
3. An on-going study shall be branched, that is, several options shall be investigated. A current branch shall be copied and re-used.

In all cases, the activity can be documented by a copy of the archived data set itself.

The two first of the triggers, A5.1 and A5.2, require a full archival process to be executed; the third one only needs a copy of the active data set.

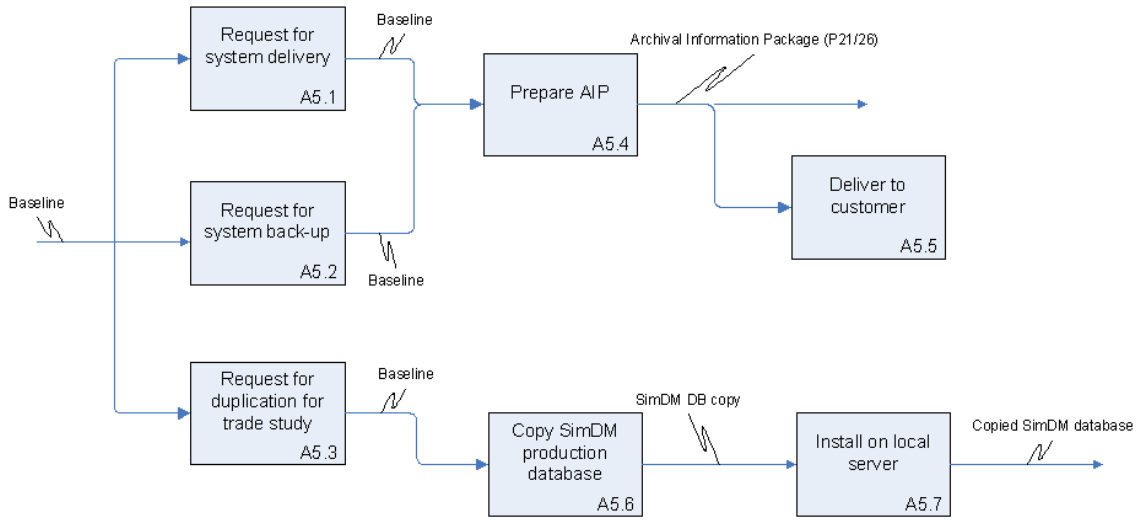

Figure 3: Process diagram - Long Term Archival and Retrieval of Simulation Data

3.3.1 Archival

An archival task is started at any time upon command from a user.

Especially for delivery to customers the archived items will need to fulfill certain quality standards and approval procedures. A result report will be included in the archival package.

Any node in EDMopenSimDM can be the root node for an archival package. CAD/CAE models can be archived individually.

To create the delivery package the user executes a function to select the correct configuration of the product. This function will check that all necessary information about the selected product version is available in the database. For example, archival items will not be included in the package unless they are approved. If that is not the case, the function is interrupted and the user must provide the missing approval.

Each archival operation results in a complete archival package. There is no functionality to relate new archival packages to already existing ones. Outdated packages may be removed.

The following is a typical sequence of functions to deal with archiving:

- Login and select model that you are editor for
- Select a folder and create an archive package; include validated and not validated STEP-files
- Select a baseline and create an archive package; include only validated STEP-files
- Select entire PS and create an archive package
- Unpack the created zip-file into a local folder in the operating system

3.3.2 Retrieval

The following is a typical sequence of functions to deal with retrieval:

- Login and select model that you are editor for
- Select a repository and import an archived package into a new model / product structure

Select a folder in the product structure of your choice and add the retrieved package from the new model as new branch.