PLEIADES

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PLEIADES procedures & guidelines

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Summary

The main objective of work package 2 is to develop, test and deploy a software suite that will be used to perform the integrated decommissioning process using the BIM approach. Tasks 2.1 and 2.2 provided the basis of this work package by defining the architecture of the platform and ensuring that all requirements notified by WP1 are taken into account by the PLEIADES software. The key objectives of this deliverable are to provide procedures and guidelines for the creation of PLEIADES projects and for their use. These procedures and best practices should allow a good use of the developments made in WP2 during the realization of the use cases of WP3. The procedures described in this deliverable have been realized on the basis of the validation tests realized in task 2.4 and following the creation of the BIM data realized in task 3.1. Therefore, these procedures will be updated during the realization of use cases in WP3. This document is divided into several sections: The first section describes the methodology to create a new project, i.e. to configure the server and define the roles of the entities involved. The second section describes the best practices to fill the database and the file server (formats, upload method, limitation...). Finally, the last part will address the recommendations for a collaborative use of the data by each software.

Approval

Date	By
2023-07-07 09:15:57	Mr. Vincent PERROT (CEA)
2023-07-07 15:52:30	Mrs. Marie-benedicte JACQUES (CEA)

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Abbreviations and acronyms

Acronym	Description
Workflow	A workflow consists of an orchestrated and repeatable pattern of activity, enabled by the systematic organization of resources into processes that transform materials, provide services, or process information. **PLEIADES** workflows automate ordinary tasks and can help you streamline processes
WP	Work Package
API	Application Programming Interface
REST API	A REST API (also known as RESTful API) is an application programming interface (API or web API) that conforms to the constraints of REST architectural style and allows for interaction with RESTful web services.

Table 1: Abbreviations and acronyms

Executive Summary

The main objective of work package 2 is to develop, test and deploy a software suite that will be used to perform the integrated decommissioning process using the BIM approach. Task 2.1 and 2.2 provided the basis of this work package by defining the architecture of the platform and ensuring that all requirements notified by WP1 are taken into account by the PLEIADES software.

The key objectives of this deliverable are to provide procedures and guidelines for the creation of PLEIADES projects and for their use. These procedures and best practices should allow a good use of the developments made in WP2 during the realization of the use cases of WP3.

The procedures described in this deliverable have been realized on the basis of the validation tests realized in task 2.4 and following the creation of the BIM data realized in task 3.1. Therefore, these procedures will be updated during the realization of use cases in WP3.

This document is divided into several sections:

The first section describes the methodology to create a new project, i.e. to configure the server and define the roles of the entities involved. The second section describes the best practices to fill the database and the file server (formats, upload method, limitation…). Finally, the last part will address the recommendations for a collaborative use of the data by each software.

Keywords

Guidelines, workflows, Nuclear, Decommissioning, Digitalisation, 3D modelling, 3D simulation, XR, holistic approach, software ecosystem, nuclear ontology, BIM, IFC, integrated software, modular platform

1. Introduction

1.1. Purpose and target group

In WP2, task 2.4 had for objective to test the developments made on the server side and the connectors of each software. Then, this task had to validate that the whole ecosystem would be ready to run the use cases planned in WP3.

All of these tests and their results have been compiled in deliverable D2.3.

On the basis of the developments made and the experience acquired during the tests of task 2.4, this deliverable intends to provide guidelines in order to coordinate the actors of a dismantling project around the PLEIADES ecosystem.

With guideline and workflow, teams can quickly identify and resolve problems, increase efficiency, improve quality, and reduce risk. This guide introduces the PLEIADES suggested workflows and gives context to the different capabilities built into the ecosystem, including description of each actor's roles and step-by-step starter guides. This guide has evolved during the project, particularly during the WP3 user stories, in order to converge with the most efficient procedures and guidelines possible.

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1.2. Relation to other activities in the project

1.2.1. Architecture and software connector

These guidelines and workflows are the result of the thoughts on the architecture of PLEIADES made in WP1 and WP2, as well as on the technology choices made in task 2.2.

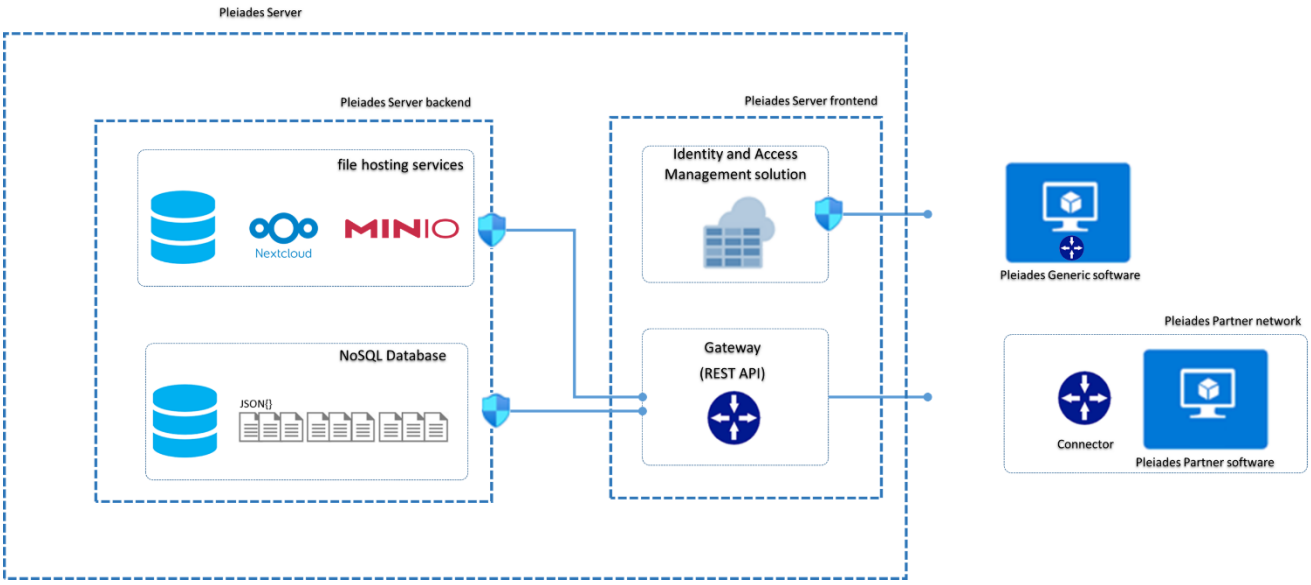


Figure 1 - PLEIADES Architecture as defined in the task 2.1.

1.2.2. Guidelines and procedure required for user stories

The PLEIADES concept will be tested and validated using input data/information from three different nuclear sites provided by IFE, EDF and ENRESA. The input data from these sites will include 3D CAD models, physical and radiological data, BIM based database data, and other input like scenario description, project scheduling, cost factors, etc.

Within the deliverable D1.2, six user stories were developed focusing on comparison of alternatives for radiological characterization, dismantling and decontamination of building surfaces as well as management of risks, regulatory requirements and waste management.

In order to carry out these user stories, a framework has to be defined based on clear guidelines and procedures announced in this document.

Based on the most common workflows, these procedures and guidelines should allow to automate some tasks, especially to guarantee the integrity of data throughout a project. The realization of users story must allow to validate these workflows, even to consolidate them according to the acquired experience.

2. PLEIADES suggested workflows

2.1. PLEIADES Project: definition of roles

Before defining the main workflows required to use PLEIADES, we need to define the main actors involved in these workflows. One or more people can occupy each role listed below or a single person can take on several roles at once.

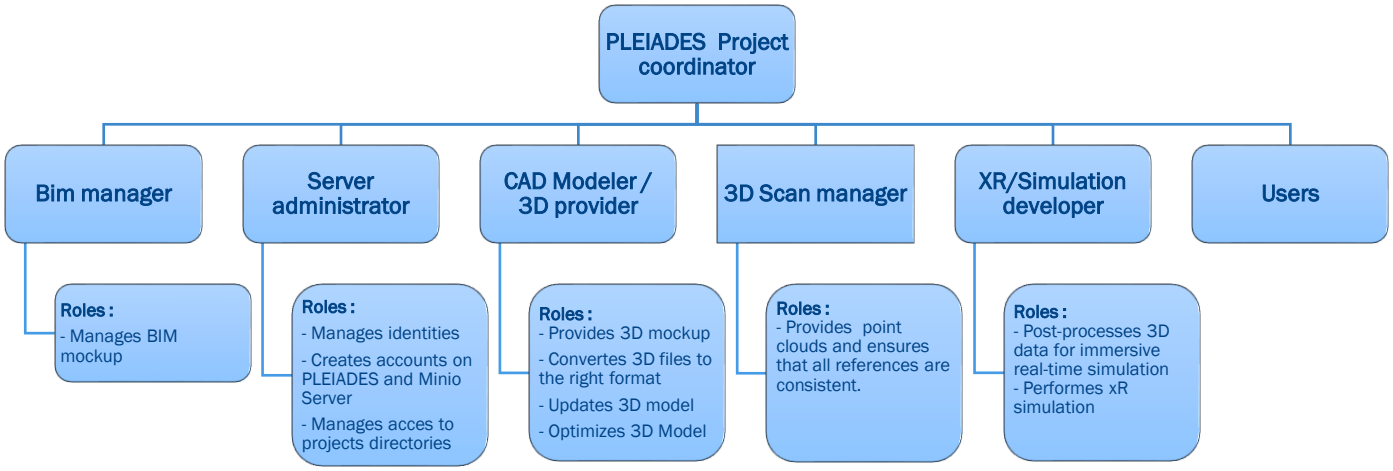
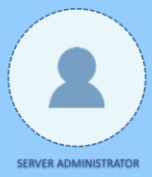


Figure 2 - List of PLEIAIDES Roles

2.2. Guidelines and common workflows

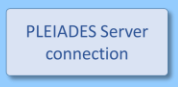
The following sections show workflows using a common graphical representation. Below, the graphical meaning of the elements used.



Role

Embedded in software connector

User Action



Workflow

Link between Actions

Optional Action

Visual Result

2.2.1. Account Administration workflows

Objective: Ensure best practices in account creation by controlling access of each user. The graphic below outlines the suggested account creation workflow using PLEIADES Server. Each connector has to have a unique ID (provide by the server administrator) and user must have valid login and password.

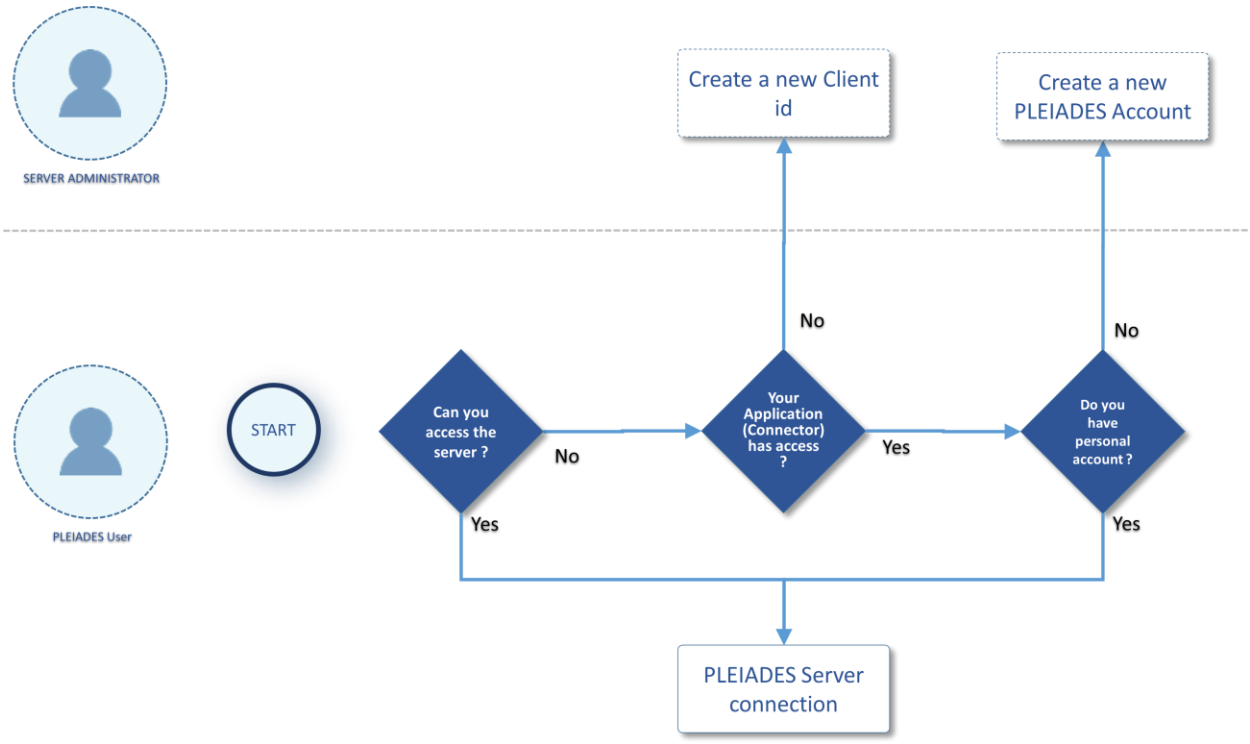


Figure 3 - PLEIADES server connection workflow

Why follow this workflow?

- Manage each profile (software and user)

PLEIADES capabilities used

- Flexibility and security of profile management with a OpenID solution (keycloak)

2.2.2. Project creation workflow

Objective: Create a new PLEIADES Project, manage identity and define the people responsible for key roles. The graphic below outlines the suggested PLEIADES project creation workflow.

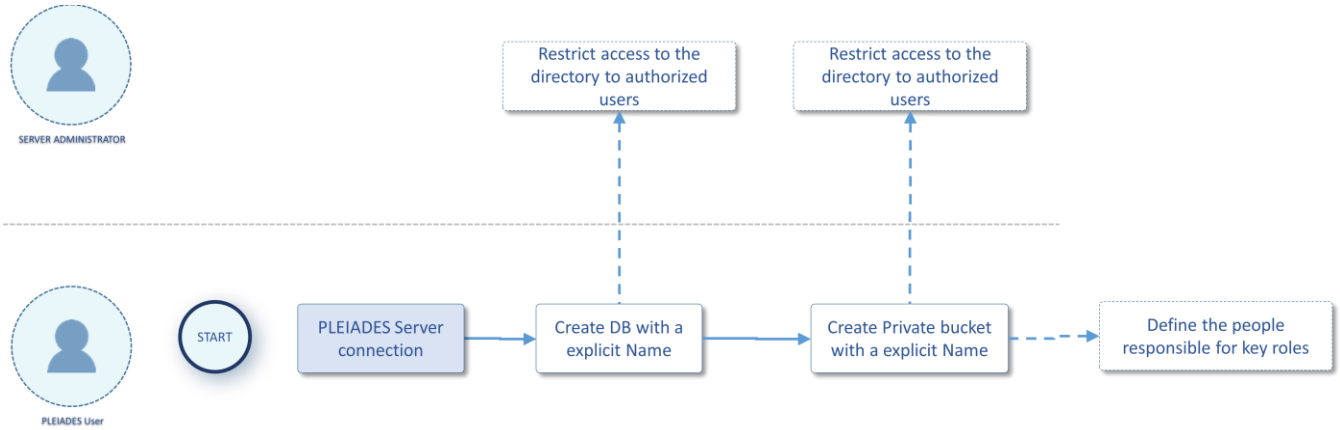


Figure 4 - PLEIADES project creation workflow

Why follow this workflow?

- To be sure that each project respects the naming criteria
- Ensure naming consistency between the database and the server
- Optimize future processes by defining key roles

2.2.3. 3D/BIM Models management workflow

Objective: The workflows presented below have in common that they present suggested procedures for exporting or importing data from the PLEIADES server.

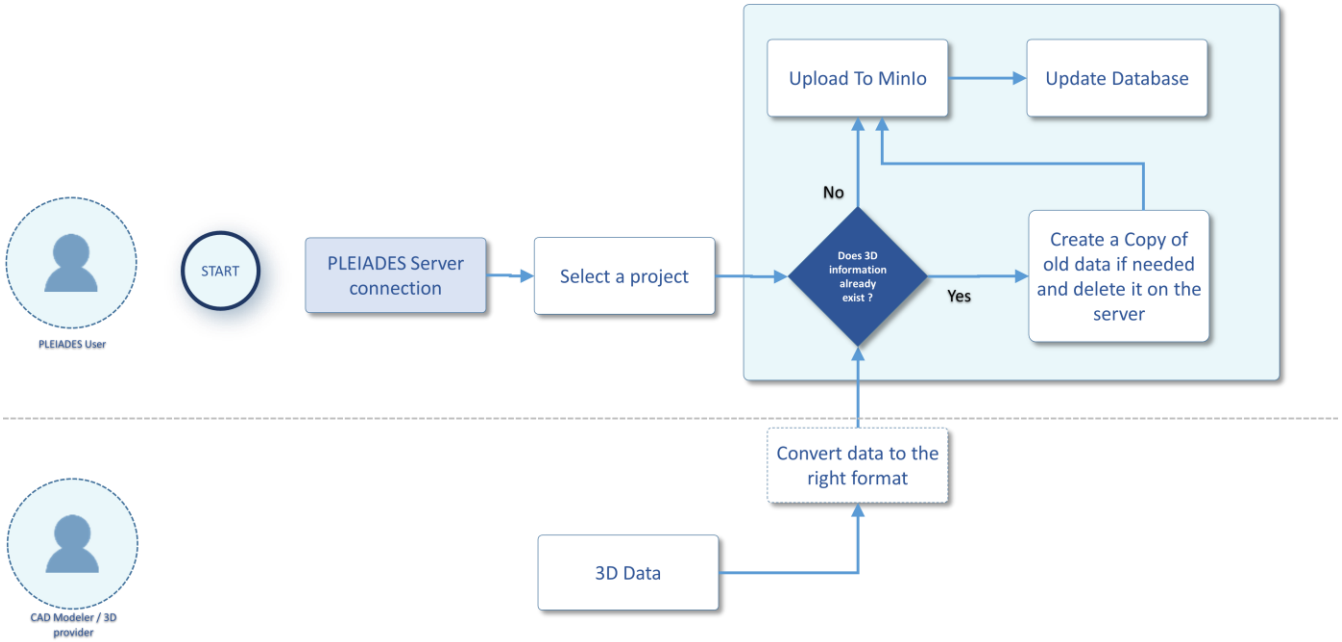


Figure 5 - Export 3D information from local software to PLEIADES Server

Why follow this workflow?

- Be sure that the users or connectors manage data updates correctly
- View and share models across multiple disciplines with a unique format data.

PLEIADES capabilities used

- Unique spatial reference
- Automatic link between 3D data and metadata through connectors

Objective: This workflow presented below suggest procedures for importing data from the PLEIADES server. This workflow can result in the import of raw data (i.e. Raw 3D model, pdf document, etc.) or import enhanced data through software connector.

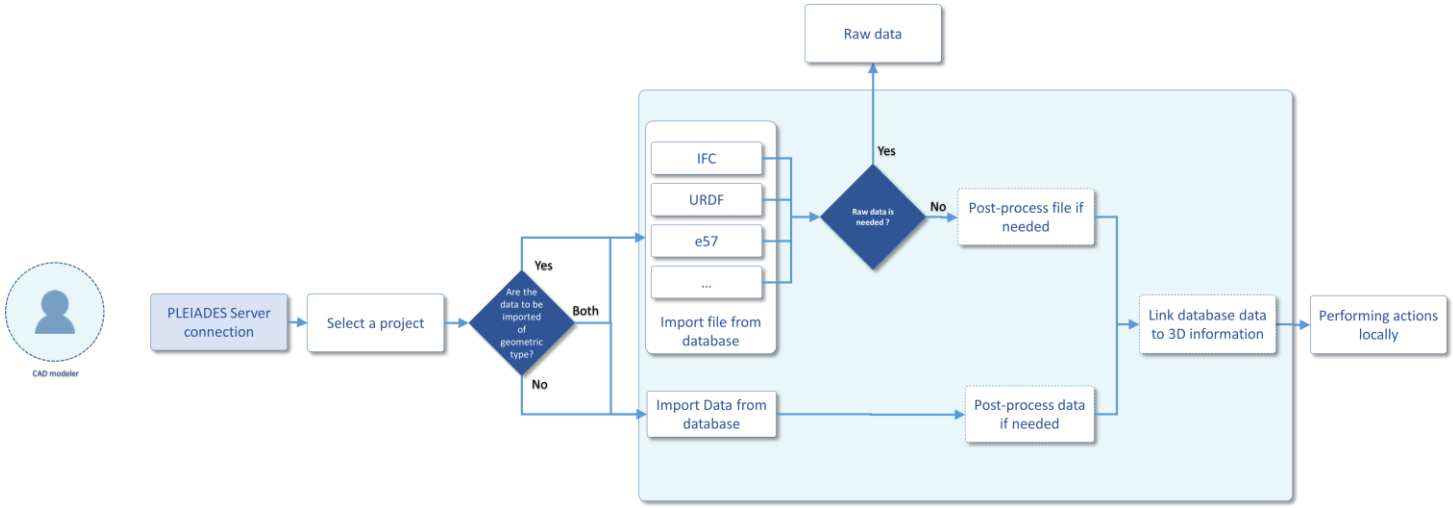


Figure 6 - Import data from PLEIADES Server

Why follow this workflow?

- Automate data fusion between 3D models and the database

PLEIADES capabilities used

- Unique spatial reference
- View heterogeneous data across multiple disciplines working environments

Figure 7 - Import documents from the PLEIADES server through the web portal

Why follow this workflow?

- Allow simple and flexible data extraction trough PLEAIDES web portal

PLEIADES capabilities used

- Flexibility to access a single trusted data source

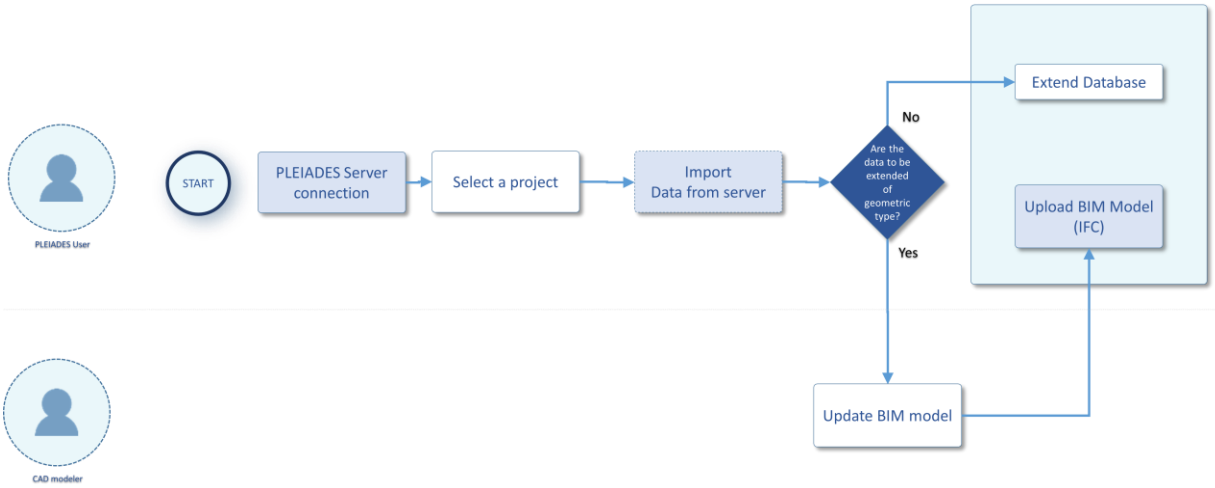


Figure 8 - Extend 3D model with available physical data, radiological data or waste acceptance criteria

Why follow this workflow?

- Have a clear separation of tasks between the PLEIADES user and the 3D model provider

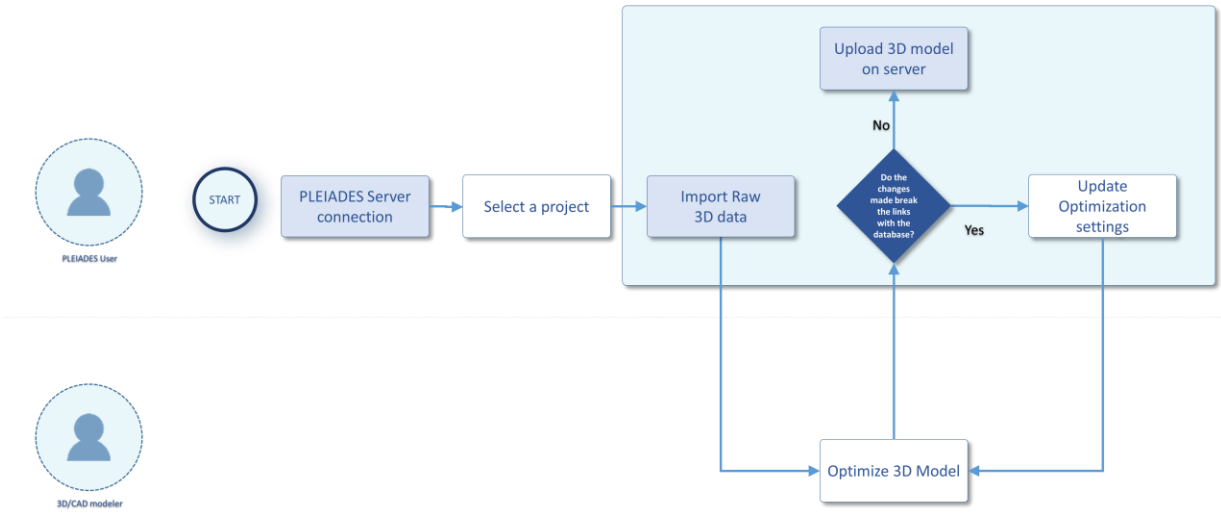


Figure 9 - Increase LOD of the component in the 3D model and export to PLEAIDES Server

Why follow this workflow?

- Do not overload the 3D model versions in the database until the optimal level of detail is reached

PLEIADES capabilities used

- Work locally to find the optimal state

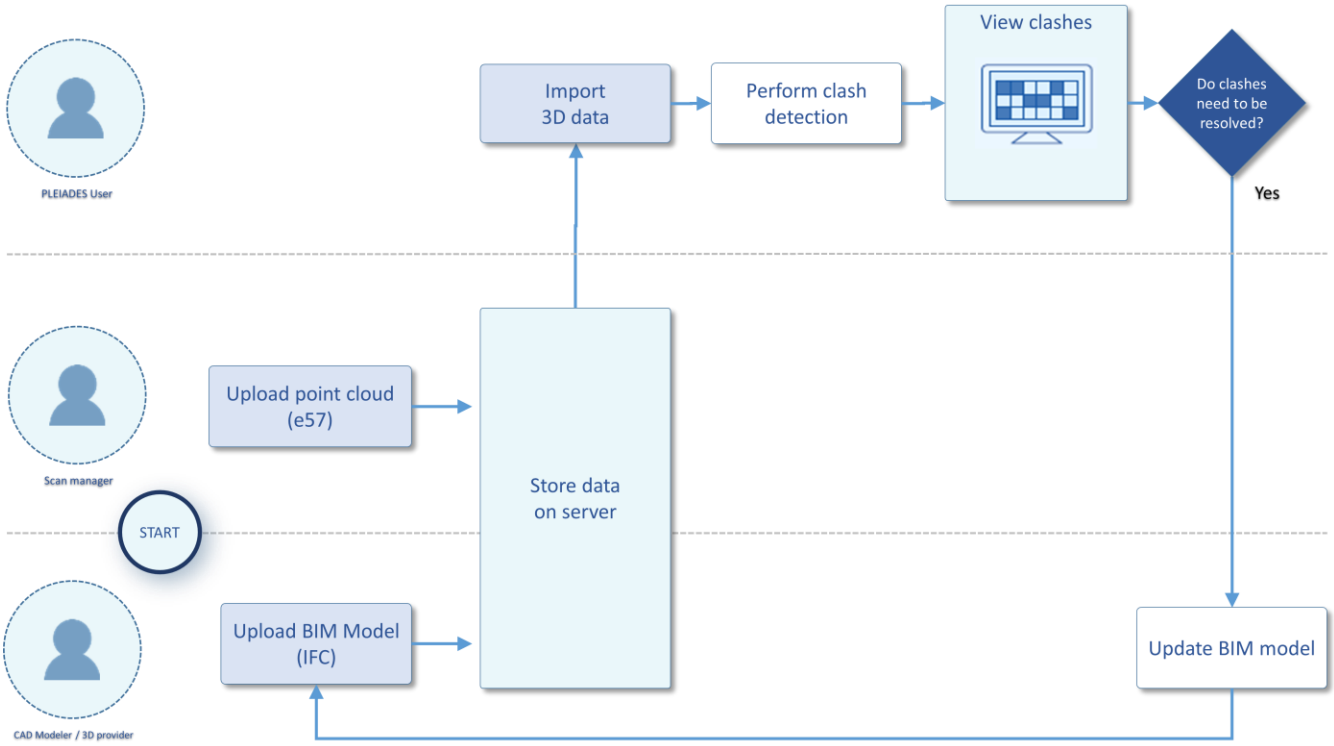


Figure 10 - Verify the 3D model with point cloud model

Why follow this workflow?

- Automate clash detections
- Easily detect and fixe clashes

PLEIADES capabilities used

- Unique spatial reference
- Visual clash detection

2.2.1. Workflow related to tasks sequences and associated data (costs, schedule…)

Objective: The workflows presented below are based on tasks and task sequences. Task sequences are key elements used by all the software in the ecosystem to calculate costs, optimize schedules, manage cumulative doses, etc.

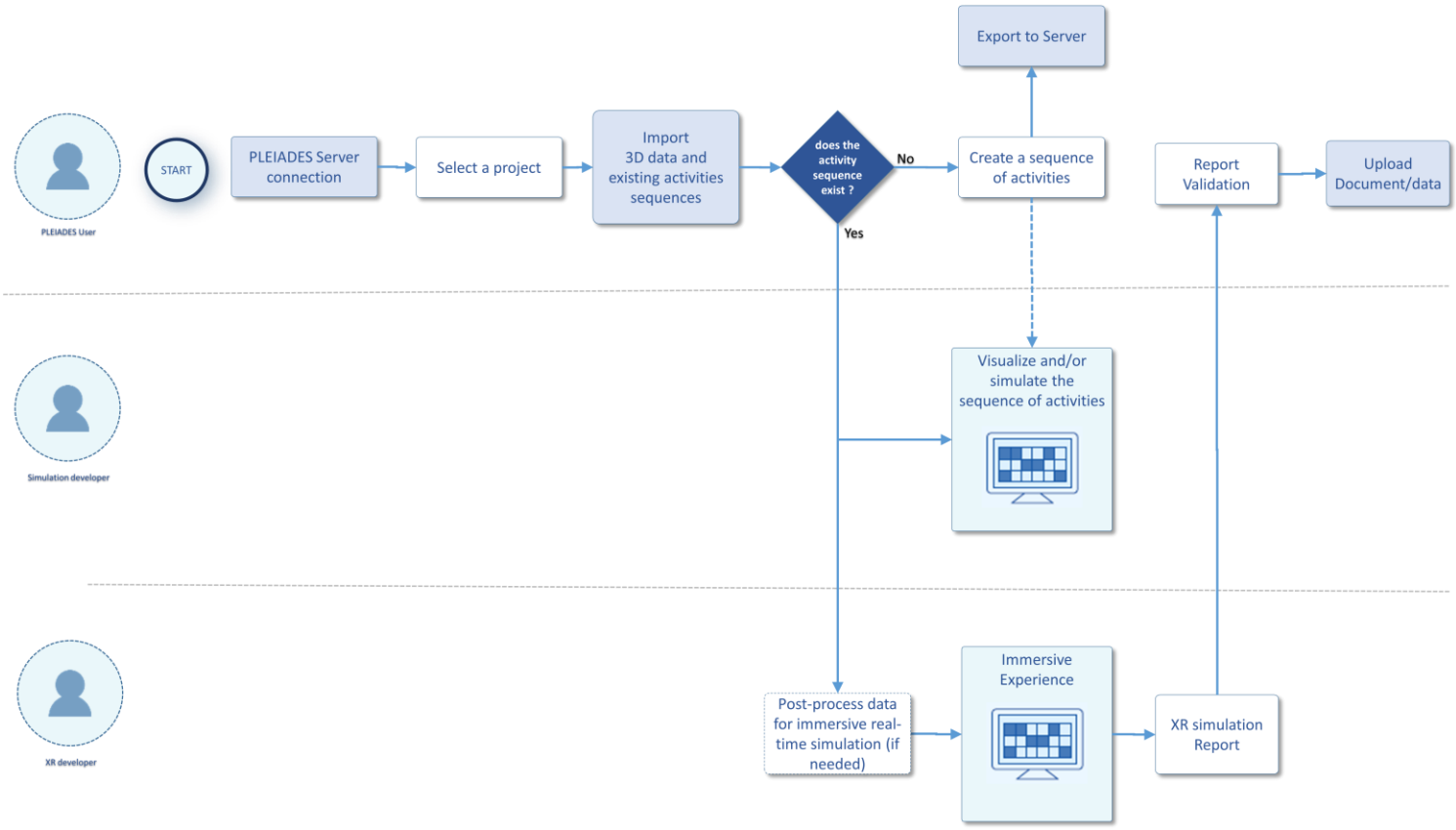


Figure 11 - Deal with sequence of activities and 3D model

Why follow this workflow?

- Easily share new sequence of activities to collaborator to : Make new simulations, optimize costs, estimate waste etc.
- Experts from multiple disciplines can create, update and share activity sequences

PLEIADES capabilities used

- A single trusted source for multiple software capabilities

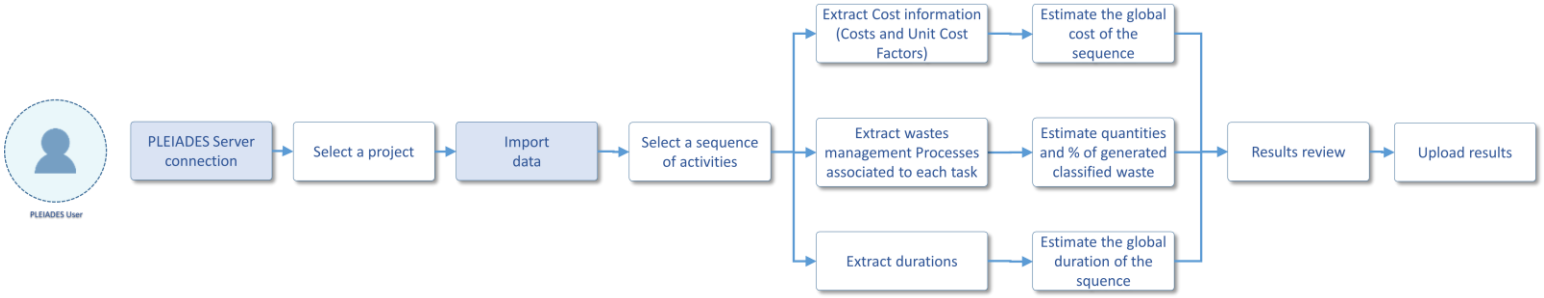


Figure 12 – Extract costs, wastes and schedule information from sequence of activities

Why follow this workflow?

- Use sequence of activities like a unique source of data

2.2.2. Workflow related to radiological data

Objective: The workflows presented below are related to radiological data and ensure best practices to extract or update radiological data from and to the database.

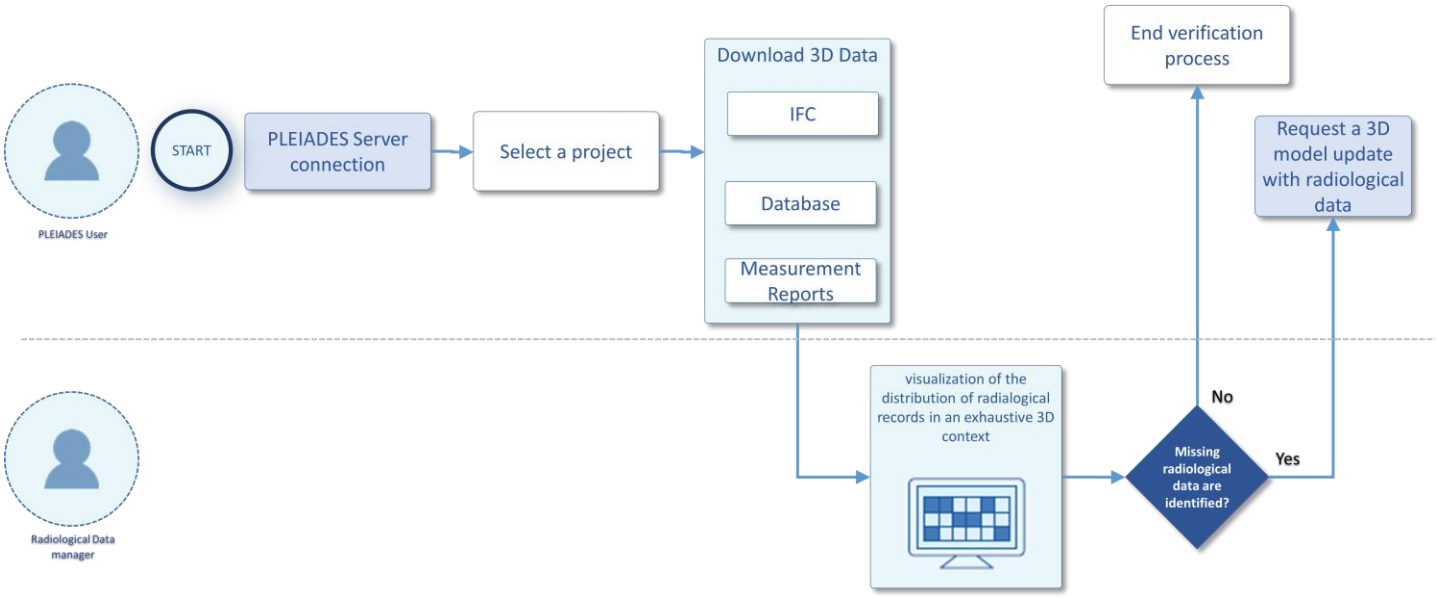


Figure 13 – Verify dose measurement sampling in a rich 3D environment

Why follow this workflow?

- Improve decision making by aggregating all data

PLEIADES capabilities used

- Visualization of radiological data in a 3D BIM environment

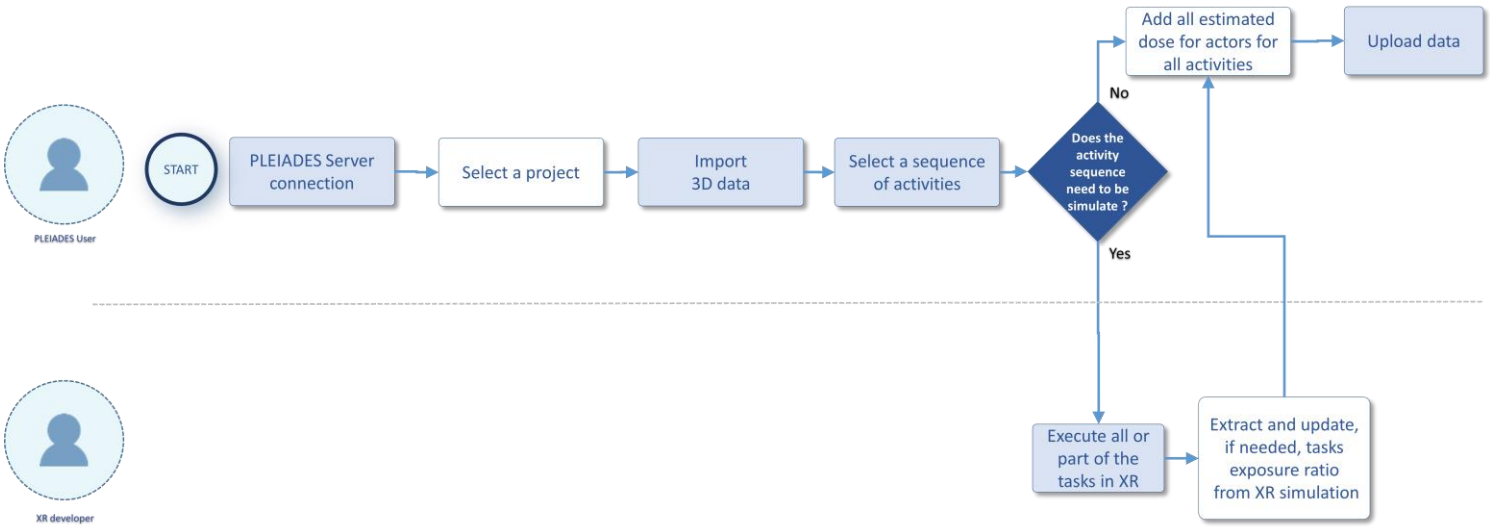


Figure 14 - Estimate dose exposures to workers from tasks ratio or from xR simulations

Why follow this workflow?

- Easily identified the source of dose exposures (From empirical ratio or from simulation)

PLEIADES capabilities used

- Estimate dose exposures from a list of task
- Estimate dose exposure from xr simulation using up-to-date 3D mockup

2.2.1. Safety data workflow

Objective: Ensure good practices in data management related to safety.

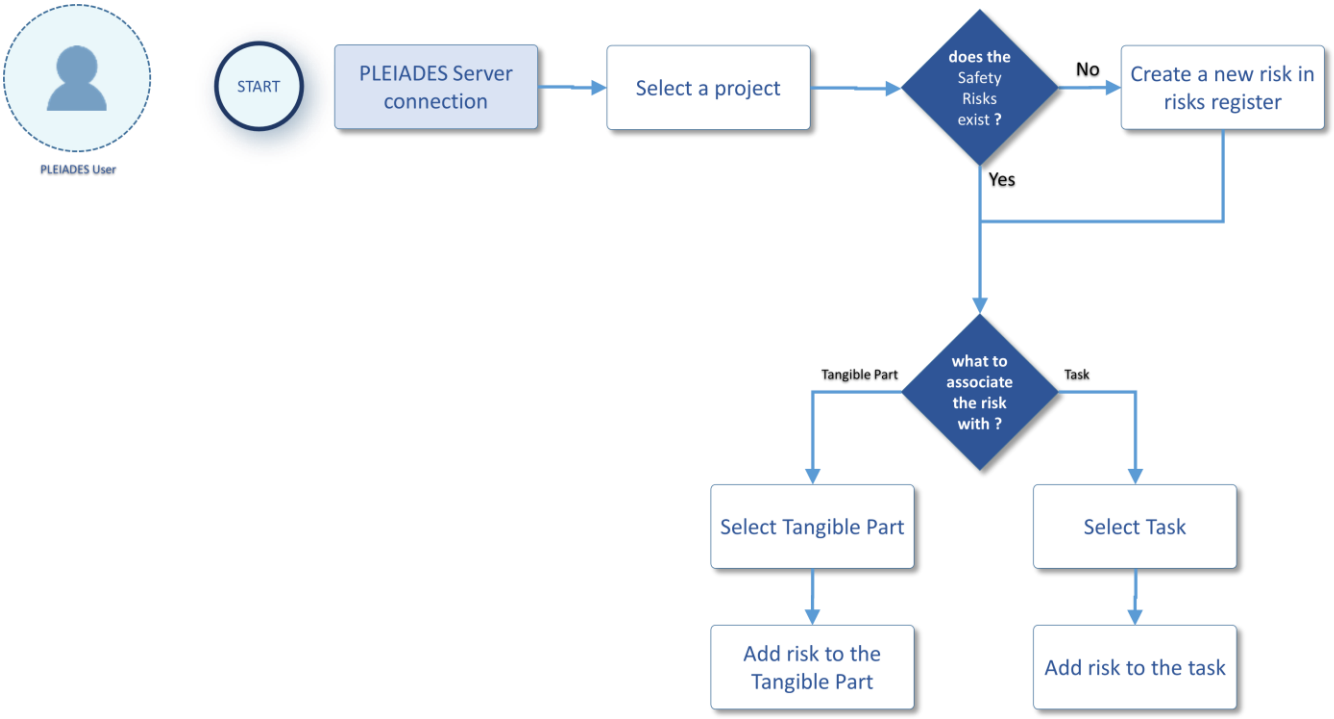


Figure 15 – Add or update a risk in the risk register. Add a risk according to its associated to a specific scenario or to a tangible part in the BIM model

Why follow this workflow?

- Identify the best practice according to risksassociated to a specific scenario or to a tangible part in the BIM model

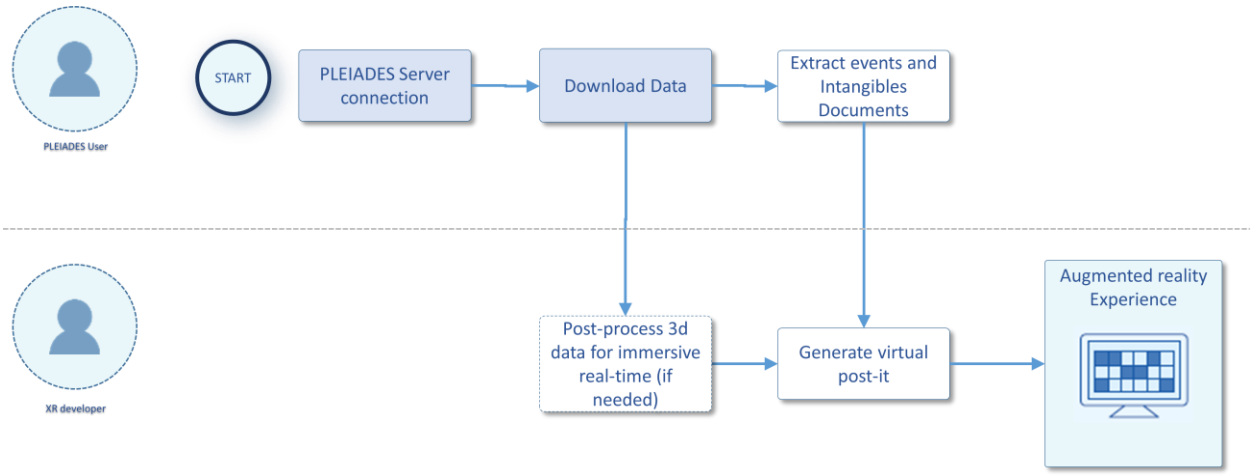


Figure 16 - Identify safety outcomes in immersive environment

Why follow this workflow?

- Optimize the processing of safety-related data by visualizing them in xR

PLEIADES capabilities used

- The link between the BIM model and the specific metadata (here related to safety)

3. Collaborative guideline and best practices

3.1. Suggested sequence for using Pleiades software

The main objective of the PLEIADES project is to streamline data exchange between the consortium's software ecosystems, and to guarantee digital continuity between them.

In addition, the relevance and speed of the responses provided by the PLEIADES ecosystem to the concrete problems of A&D worksites will depend on the correct routing of data between software packages.

In contrast to the workflows presented in the previous paragraphs, which describe the communications between the connectors and the PELAIDES server, with the aim of maintaining data consistency between the local connector and the PELAIDES server. The workflows below suggest sequences for using ecosystem software to meet specific A&D site requirements. The sequences suggested below are not exhaustive, but reflect the sequences implemented in the user stories defined in WP1 and implemented in WP3.

3.1.1. Estimate dose exposures to workers

The aim of this workflow is to use the PLEIADES software suite to estimate dose exposures to workers in a D&D project. This objective requires intermediate steps to produce data on the Pleiades server, such as :

- Sequence of activities
- Dose rate mapping
- Time schedule

This sequence can be adapted to compare different types of scenario (e.g. manual vs. remote operations, etc.).

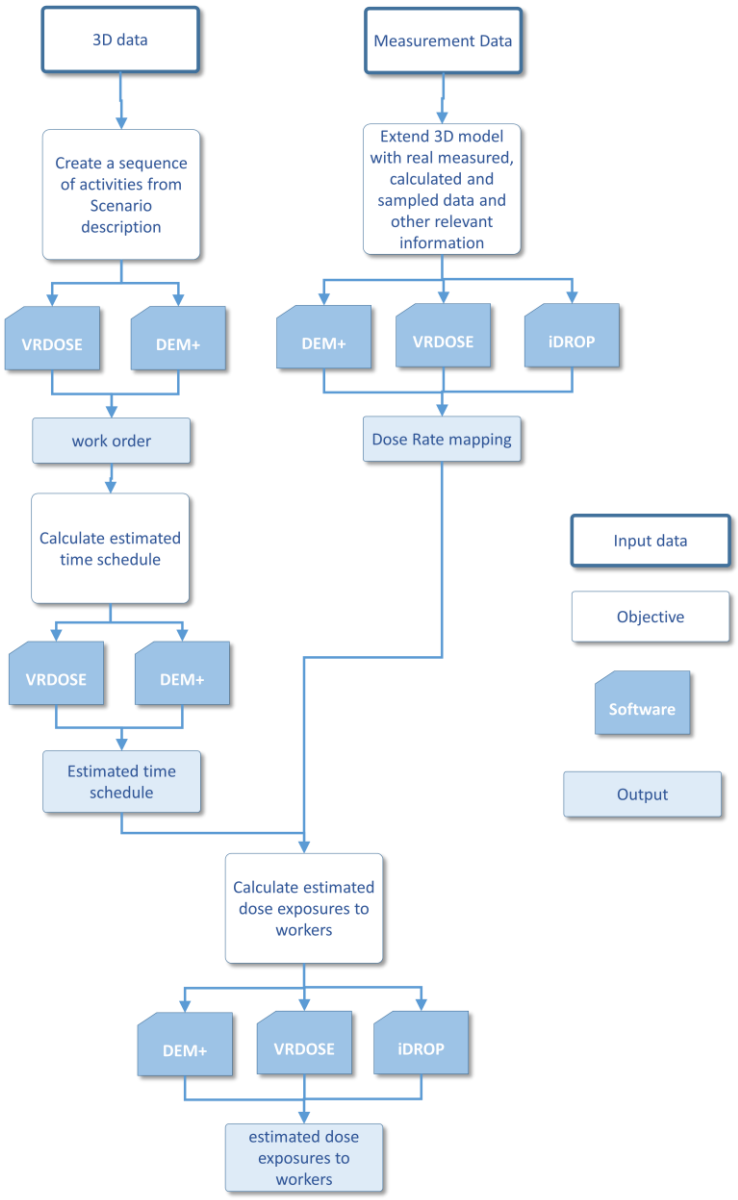


Figure 17 – Sequential workflow to estimate dose exposures to workers

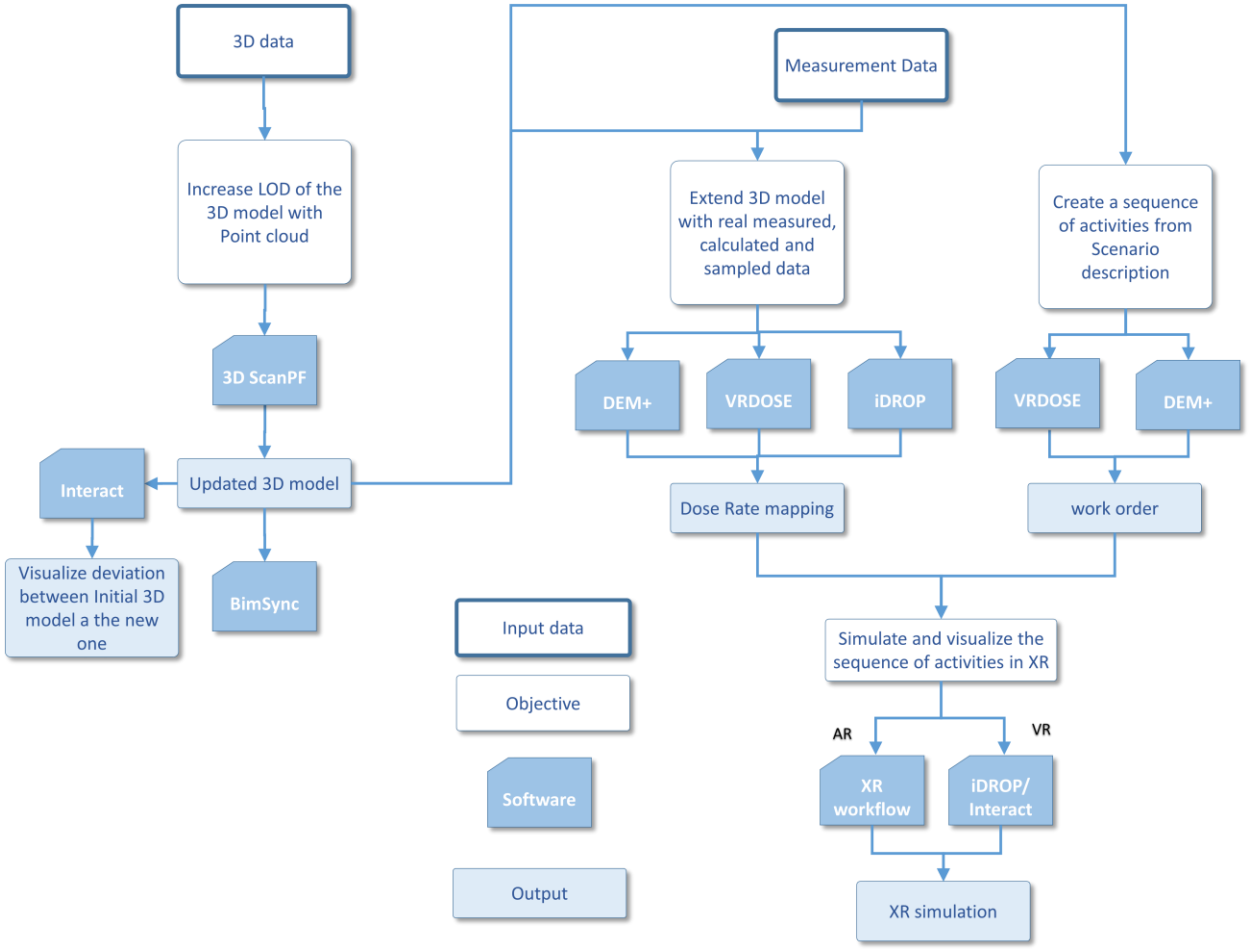


Figure 18 -Sequential workflow to update 3D model and to simulate and visualize the sequence of activities in XR

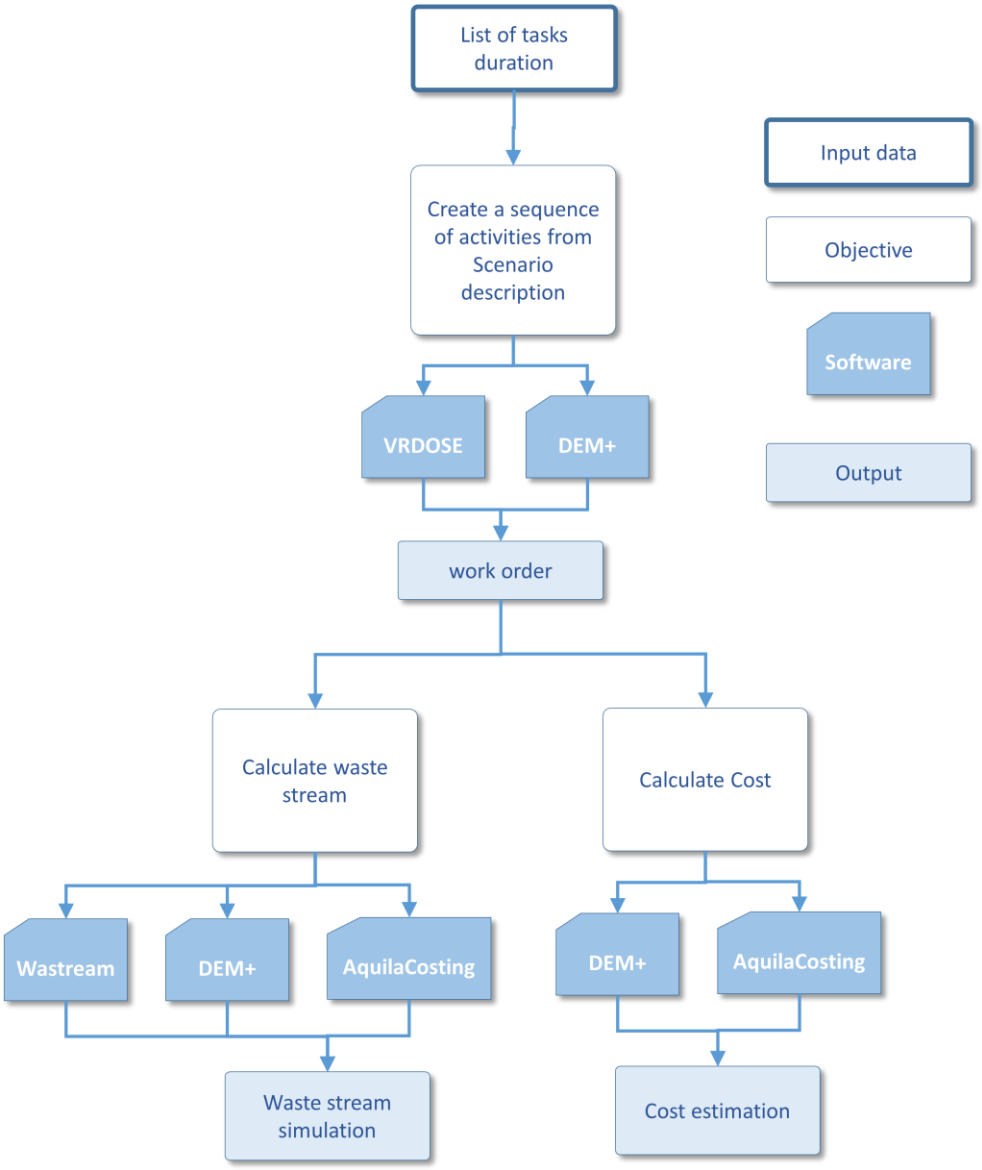


Figure 19 - Sequential workflow to estimate waste quantities and costs

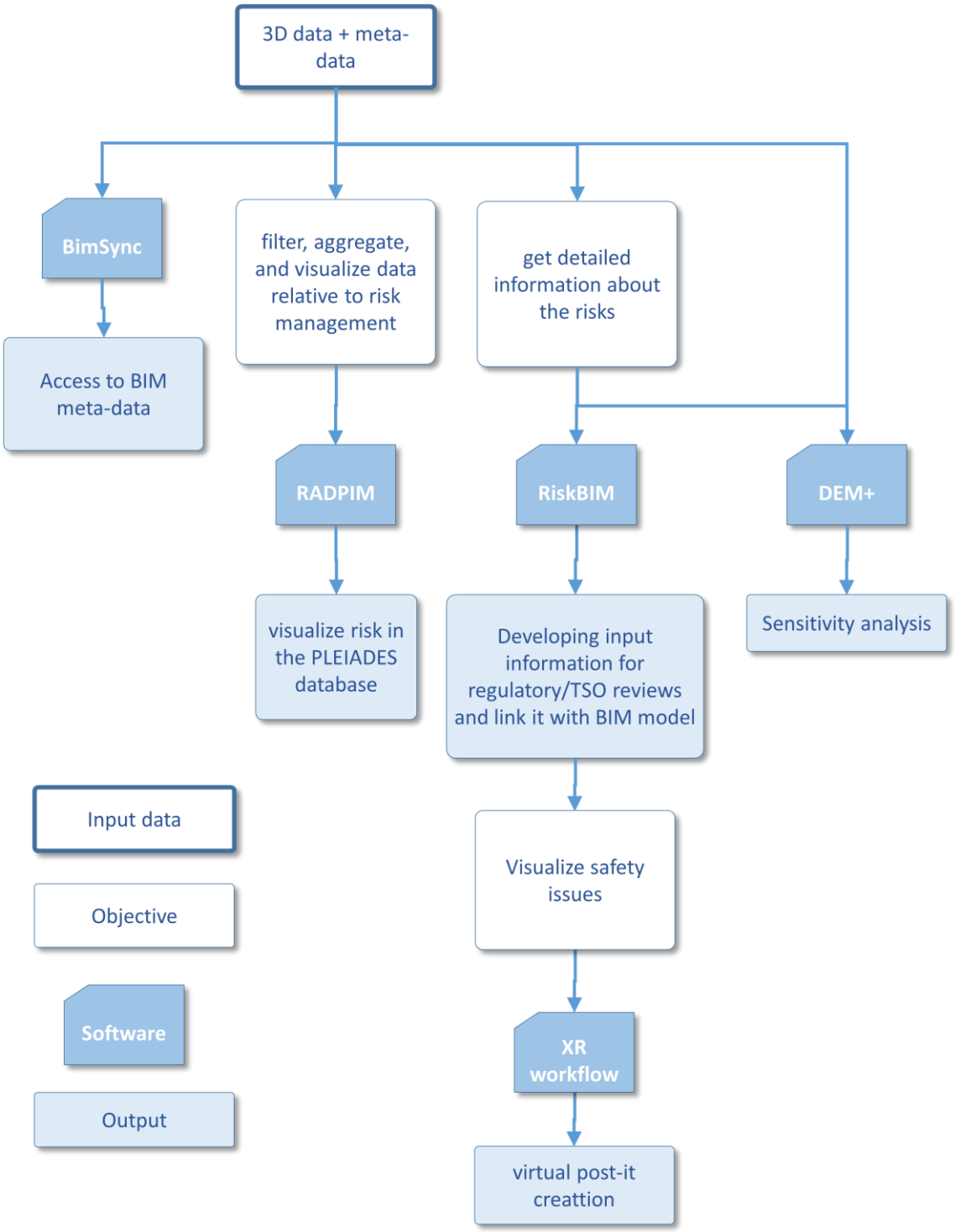


Figure 20 - Sequential workflow for generating and processing risk management data

3.2. Best practices to manage the link between the BIM model and the database

One of the key features of the single source of truth is to banish multiple versions of the data stored in it. This approach must be maintained for the database but also for documents and 3D models.

During a project, if the need to store archives appears, they must be clearly identified and stored in a directory of the MinIO bucket with an explicit name ("3Dmockup_ Archive02/28/2025).

Thus, a new version of a document or 3D file will have to be uploaded to the server with the same name as the file it replaces in order to maintain the validity of the links in the valid database. If this is not possible, an update of the database should be done to ensure that the links are also updated.

The information contained in the IFC files can be specifically pointed to by entries in the database. In the case of an update of IFC files, it will be up to the users to maintain the ifcguid of the files and to update the database if necessary.

Figure 21 - Firstly, an explicit link in the database to an IFC file. Below, a structural element pointing to a specific 3D object in an IFC

3.3. Access and roles

The PLEIADES server does not manage concurrent access to a resource (3D model, documents, etc.), it is therefore essential to define the roles of each of the participants on the resources as well as the managers of these resources. These resource managers will be the guarantors of the successful collaboration around a shared resource, and will have to define a single user with the ability to edit this resource.

A good distribution of roles will have to allow, to define well the accesses (in writing) to the input and output data in order to limit the bottlenecks and to tend towards the seamless.

3.4. Request of information:

Requests for Information (RFI) are technical requests that are characteristic of a BIM approach. Typically, a party sends a request for information to the provider of the input data, or to any other entity involved in the project.

Without an effective RFI process, it's all too likely that change requests will also suffer from unnecessary delays and errors.

RFIs can be classified in several categories:

- Design clarifications (conflicts, incomplete plans, specifications).
- Requests for a design change (sequencing problems, error in decommissing equipment design…).
- Requests for new characterization (New dose measurement needed, new 3D scan).
- Request for link correction (update link in the database)

The best way to define the receiver of the RFI is to refer to the type of data concerned and the roles that have been assigned to its data. Another possibility is to consult the "CreatedBy" (or "ModifiedBy") field of the resource in the database and assign the RFI to it

4. Conclusion

In WP2, the aim of the deliverable 2.4 was to suggest guideline and innovative workflows for the new PLEIADES approach.

With guidelines and workflows, teams can quickly deploy PLEAIDES Ecosystem with methodologies to create a new project, update data, download 3D model and so on.

Guidelines and workflows development in this deliverable allows future D&D project to identify and resolve problems, increase efficiency, improve quality, and reduce risk.

This guide has introduced the PLEIADES suggested workflows and gives context to the different capabilities built into the ecosystem.

This guide has evolved during the project, particularly during the WP3 user stories, in order to converge with the most efficient procedures and guidelines possible.

5. References

Internal PLEAIDES reference:

- D1.2 Specifications for the pleiades system prototype and validation tests
- D2.1 Platform software architecture
- D2.3 Platform validation tests
- D3.3 Final report including all test cases simulations results (DRAFT)

Literature and reference on BIM workflow

- https://construction.autodesk.com/resources/
- https://www.designingbuildings.co.uk/wiki/Request_for_information_RFI

Literature and reference on Glossary

- https://en.wikipedia.org/wiki/Workflow