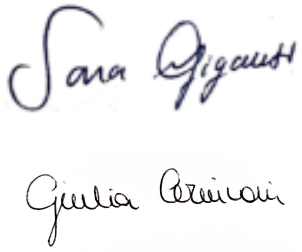
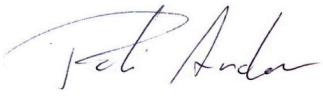
ZEEROmed Store

User Manual

Manufacturer	O3 Enterprise s.r.l.
Mark	CE 1370 CE Mark under the Medical Device Regulaton EU 2017/745
Protocol	DPR-252
System version	3.0
Minor version	2
Language	EN

	NAME	DATE	SIGNATURE
Written/modified by:	Sara Giganti Giulia Cernivani	27/12/2024	
Checked by:	Sara Giganti	13/01/2025	
Approved by:	Andrea Poli	13/01/2025	

Modifications from previous system version	
Modifications	**Chapter**
Chapter revision with addition of the "password formulation criteria" paragraph	Login

Index

1 Introduction

O3IMS.Store is a PACS system (Picture Archiving and Communication System) that manages all the types of data and signals that can be handled through the DICOM standard. The product is intended for the storage and management of biomedical images, especially those relate to radiological specialties. Hereafter, it is referred to as the "product" or "system".

1.1 Manufacturer Essential Data

NAME: O3 Enterprise srl

HEAD OFFICE: AREA Science Park, Padriciano 99, 34149, Trieste, ITALY

OPERATIONAL CENTRE: AREA Science Park, Padriciano 99, 34149, Trieste, ITALY

LOCAL UNIT: Via Caprin 18, 34170, Gorizia, ITALY

VAT NUMBER: 01137150320

1.2 Medical Device description and specifications

Device name	**ZEEROmed Store**
Intended purpose	Software application which aims to provide support for archiving and distributing images and clinical data. The product is intended for storing, managing and transmitting images and clinical data.

General description of the device	ZEEROmed Store is a Medical Device Software (MDSW) that provides a web interface easy to use. It's a PACS (picture archiving and communication system) without the possibility to visualize the image, which can be achieve in combination with another third party software. The system does not apply any filter to the images, if configured it can perform a lossless compression. The eventual alteration of the images is eventually delegated to other connected systems. The system does not show any warnings or alarms originating from other medical equipment and does not mean to control or influence usage of medical devices, nor change their normal use. The device is not intended for supporting vital functions, nor for influencing devices which support vital functions.
Intended patient population	There is not a specific intended population designated to be treated with this MDSW because of its intended purpose (archiving patients images and clinical data). All patient populations can indirectly benefit from this MDSW if needed.
Intended user	Administrator systems and technicians
Medical condition	There is no clinical condition that is to be diagnosed, prevented, monitored, treated, alleviated, compensated for, replaced, modified or controlled by this medical device because ZEEROmed Store is used for archiving and distributing images and clinical data. It is not used directly to diagnose a medical condition, but it's used in combination with other software and devices to do so.
Indication for use	Usage of the device and changes to its configuration are to be allowed just to qualified personnel trained on the system, through the use of suitable protection means, such as usage of appropriate usernames and passwords. Users lacking the appropriate training could not be able to correctly understand the information provided by the system, to change its parameters and/or enforce appropriate security measures.
Contraindication	There are NO contraindications
Warning	There are NO warnings
Side effects	There are NO side effects
Lifetime	ZEEROmed Store is considered obsolete if it hasn't received any system updates for three years

Table 1: Medical Device description and specifications

1.3 Information on incidents

The user shall inform the competent authorities of any incidents referred to:

- Any malfunction or deterioration in the characteristics and/or performance of a device, as well as any labelling or instructions for use which might lead to or might have led to the death of a patient or user or to a serious deterioration in his state of health;
- Any technical or medical reason in relation to the characteristics or performance of a device leading to systematic recall of devices of the same type by the manufacturer.

The user shall also take the necessary steps to ensure that the manufacturer (O3 Enterprise) of the device concerned, or his authorized representative, is informed of the incident.

1.4 Minimal and recommended technical requirements

1.4.1 Server requirements

CPU	4 cores
RAM	8 GB
Storage size	1 TB

Table 2: Server requirements

A UPS must be used for the server machine.

1.4.2 Web interface requirements

Desktop:

- HTML-5 compatible browser installed;
- Operating system: Windows, Mac OS, Linux OS;

- Broadband connection.

1.4.3 Supported browser

Web browser	*Version*
Google Chrome	112+
Microsoft Edge	112+
Mozilla Firefox	112+
Safari	16+

Table 3: Supported browsers

⚠**Warning**: the use of Mozilla Firefox and Safari browsers does not ensure the software's optimal utilization; it is recommended to use Google Chrome or Microsoft Edge browsers.

1.5 The device

The product is a software application that enables doctors, professionals and technicians to store and distribute clinical images and data.

The system communicates through standard protocols such as DICOM, HL7, and WADO, and it is also compliant with the Integrating the Healthcare Enterprise (IHE) initiative.

It consists of modules that can be configured by system administrators in order to achieve an effective and efficient integration with other Hospital Information Systems, to which the device can be connected.

2 Login

Steps to log in:

1. Go to the following address: *https://pacs.<customer_name>.zeeromed.cloud/o3-ipm-web*;
2. Enter *Username* and *Password*;
3. Click on the "*Login*" button.

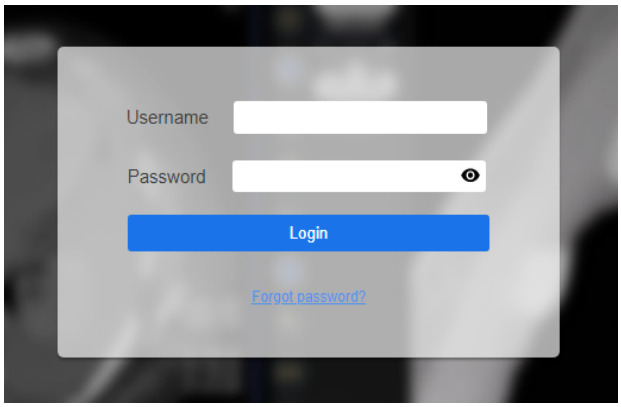


Image 4: Username and password

2.1 Password recovery

Steps to recovery the password:

1. Click on the "*Forget password*" button;
2. Insert the email address in the pop-up window:

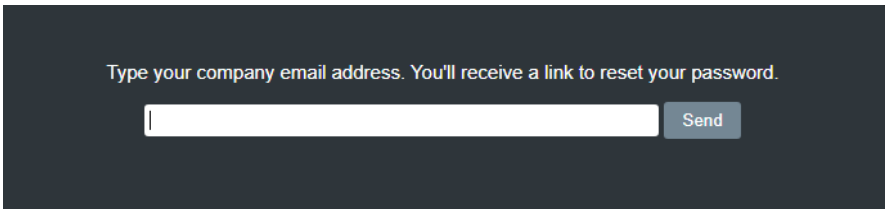


Image 5: Forgot password pop-up

3. Check the email and follow the steps provided to reset the password. The new password must comply with the criteria define in paragraph **2.3 Password formulation criteria**.

2.2 Edit password

After the first login, change the temporary password provided by O3 Enterprise by clicking the "Edit" icon in the User Management section.

The new password must comply with the criteria defined in paragraph **2.3 Password formulation criteria**.

2.3 Password formulation criteria

For password creation, it is recommended to consider the following criteria:

- Minimum length of 6 characters;
- Maximum length of 100 characters;
- At least 1 uppercase letter;
- At least 1 lowercase letter;
- At least 1 numeric character;
- At least 1 non-alphanumeric character (such as ^ $ * . [ ] { } ? " ! @ # % & / \ , > < ' : ; | _ ~ `).

Note: Password formulation criteria are configurable, so they can be different according to the type of project.

3 Dashboard

Once logged in, the following "*Image Management*" screen is displayed:

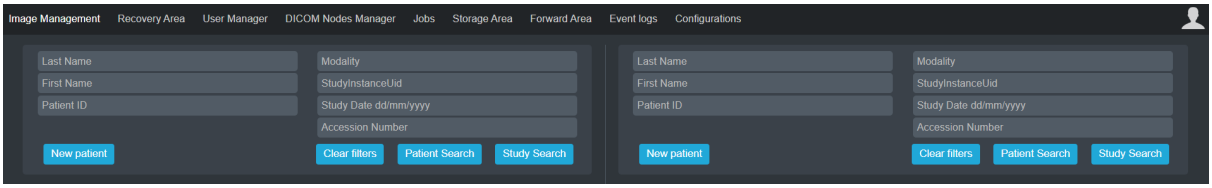


Image 6: "Image management" screen

In the top left corner, there is a menu that contains various clickable sections that can be configured by the user:

1. Image management;
2. Recovery Area;
3. User management;
4. DICOM Nodes;
5. Jobs;
6. Storage Area;
7. Forward Area;
8. Event logs;
9. Configurations.

The following chapters will delve into each section in more details.

4 Image Management

In the Image management section it is possible to:

- Search for a patient using the filters: Last name, First name, Patient ID; modality, StudyInstanceUid, Study date, Accession Number;
- Add a new patient;
- Reset the filters;
- Search for a patient;
- Search for a study.

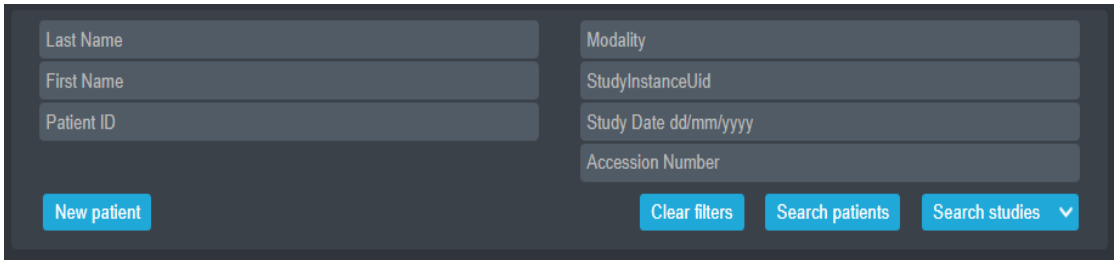


Image 7: Image management panel

The "*Study Date*" filter allows the user to manually insert the date (dd/mm/yyyy) or navigate through the displayed calendar pop-up.

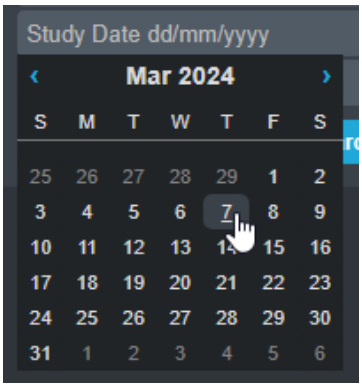


Image 8: Pop-upof the "Study Date" filter

4.1 New patient

For adding a new patient, user has to click on the "*New patient*" bottom and to fill out the provided form.

Finally, user has to click on the "*Save*" button.

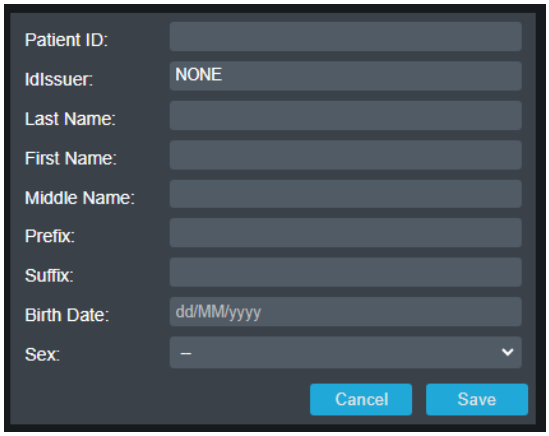


Image 9: "New patient" panel

4.2 Patient search

By clicking the "*Patient Search*" button, a list of patients (in alphabetical order), who have undergone the examination, is displayed:

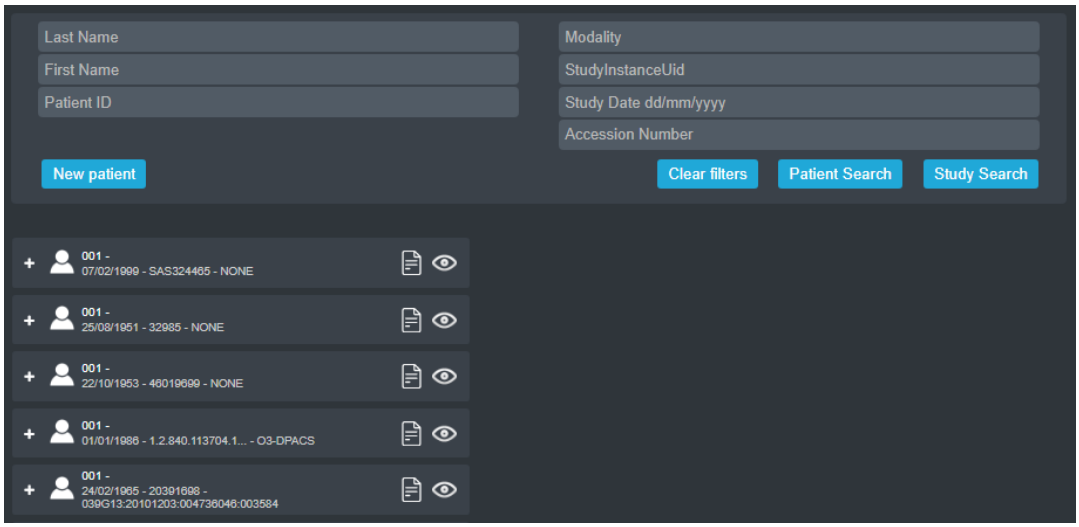


Image 10: "Patient Search" panel

The following table describes the functionalities of each icon in the patient list.

Icon	Name	Functionality
	Edit	Allows the user to modify patient data
	Open examination	Allows the user to display the examination associated with that specific patient through the integration with a viewing software
	Expand patient	Allows the user to expand the patient tree, showing all the associated studies

4.3 Study search

By clicking the "*Study Search*" button, a list of studies stores is displayed.

The drop-down menu of the button allows the user to filter the results by "*Orders only*" and "*Off worklist only*", as described in the paragraph **4.3.1 "Search studies" filter**.

In the list of archived studies, locally available studies are identified by the folder icon while those available on the *Google Cloud Bucket* with a cloud-shaped icon.

Image 11: Search study panel

The search can be conducted simultaneously on both panels, as the scrolling of each results tree is independent.

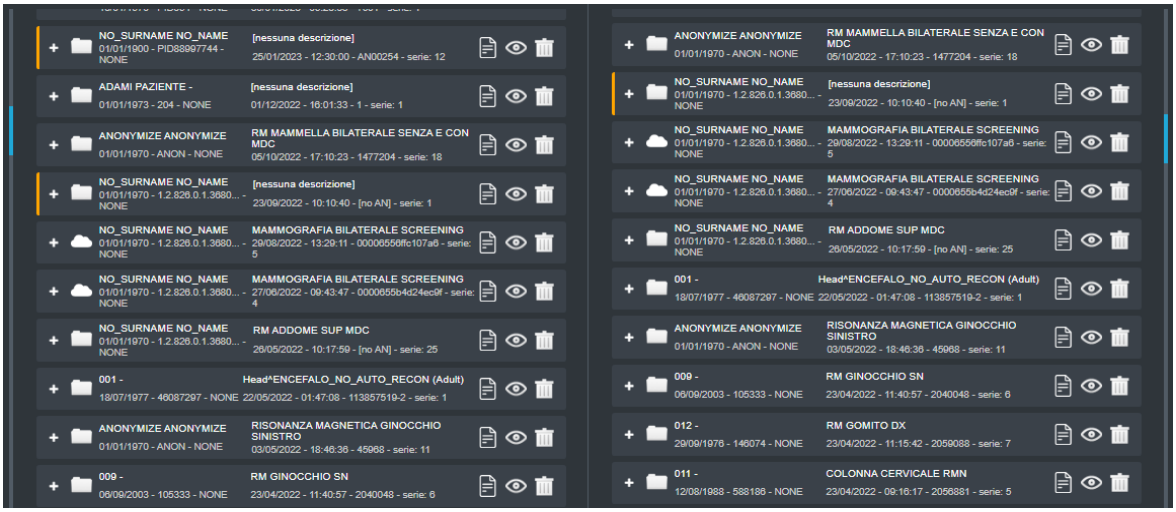


Image 12: Searching for the study using both panels

The following table describes the functionalities of each icon in the study list.

Icon	Name	Functionality
	Edit	Allows the user to edit the study data
	Open examination	Enables the user to display the examination through the integration with a viewing software.
	Delete	Deprecates the selected examination. Clicking on this button opens a pop-up for entering the deprecation description

Icon	Name	Functionality
	Multiple deselection	This button is available only when multiple series belonging to the same study are selected simultaneously. By clicking the button, the series are deselected. The same behavior can be achieved by pressing the ESC key on the keyboard.
	Expand study	Clicking on this button opens the study tree, displaying all associated series. In turn, series can also be expanded or deprecated.

4.3.1 "Search studies" filter

The "*Search studies*" button in the "*Image management*" panel features a dropdown menu to automatically filter the "Orders only" and the "Off worklist only".

"**Orders only**" comprises all orders that have not received images yet.

"**Off worklist only**" refers to studies without a corresponding order and therefore need reconciliation.

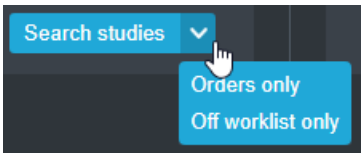


Image 13: "Search studies" and dropdown menu

Having two independent search panels can facilitate order reconciliation, allowing the user to filter for "Orders only" in one panel and "Off worklist only" in the other.

4.4 Editing a study

By clicking on the "*Edit study*" button  , the following pop-up becomes available.

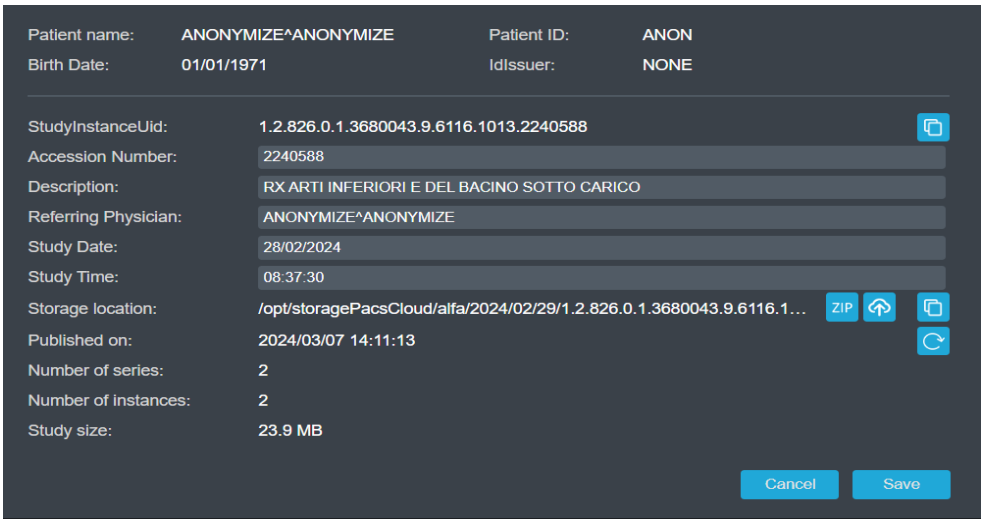


Image 14: Edit study pop-up

In the popup user can check some patient general information, update key details such as the *Accession Number*, *Study Description* and *Study Data*, download the compressed study archive in *.zip* format ZIP or upload it into one of the available *Google Cloud Bucket* .

The "*Republish study*" icon allows the user to republish the study.

4.5 Editing a series

A similar popup is displayed when choosing to edit the series' information, by clicking on the "*Edit*" icon next to the series row.

The popup displays series information related to: StudyInstanceUid, UID Serie, modality, station name, body part, number of instances, series description, AE title, series size and storage location.

However, in this popup it is possible to only edit the *Description* of the selected series.

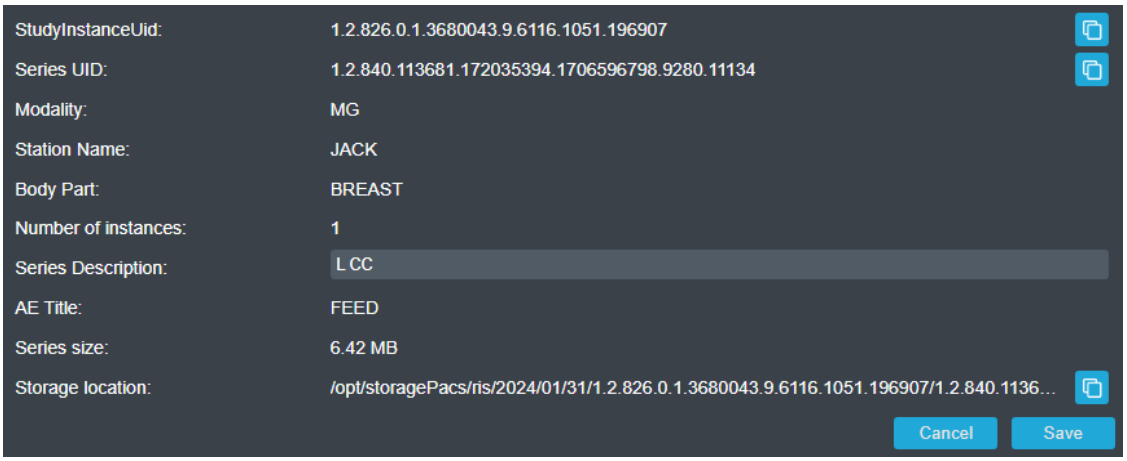


Image 15: Edit series pop-up

4.6 Instances pop-up

To display the popup with the series information, open the instance using the "Expand study" icon and click on the "Edit" icon in the instance row.

The instance popup provides information related to StudyUID, SeriesUID, InstanceUID, SOP class, Transfer syntax, file dimension and storage location.

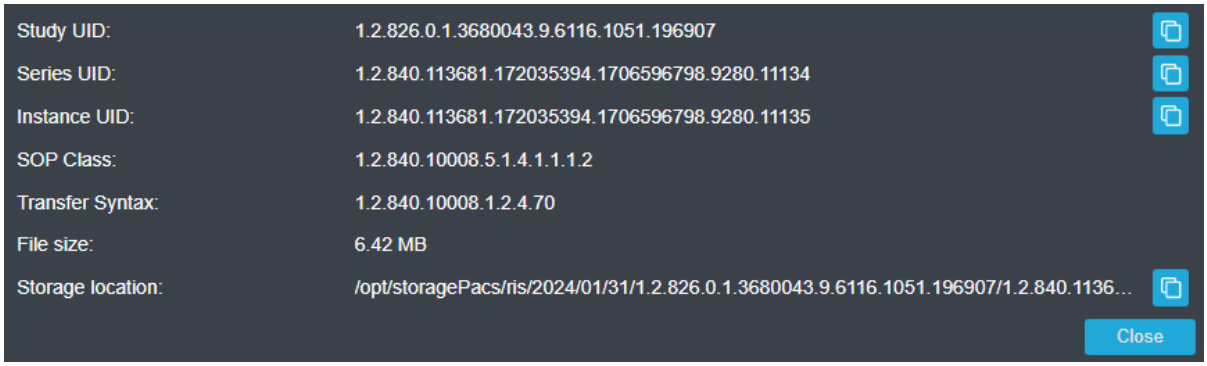


Image 16: Pop-up with the series information

4.7 Objects interaction

The PACS Cloud allows a wide range of operation between studies, series or instances.
All actions involve the **physical dragging of the selected element by using the mouse**.

These operations can be briefly summarized in the following list:

1. A study can be moved under another patient. In this case the patient's metadata is updated so that the study belongs to the chosen patient;
2. A study can be dragged over another study; in this case an operational choice pop-up becomes available, asking the user if he wants to perform:
    - ***Swap*** of the series (= moving all the series from the original study to the destination study and, vice versa, all the series of the destination study under the original one);
    - ***Move all series*** (= assigning all the series from the original study to the destination study).
3. A study **can not** be moved under a series or an instances;
4. One or multiple series can be moved under a patient or a study, updating all its metadata;
5. One or multiple series **can not** be moved under another series or instance;
6. An instance can be moved under a patient, study or series;
7. An instance **can not** be moved under another instance.

In case it is necessary to create new elements (e.g. when moving an instance under a study, some information regarding the belonging series in the destination study may lacking), information from the original study are used.

4.7.1 Reconciliation

The reconciliation procedure allows 4 different actions:

1. Exchange of a study with another;
2. Association of a study with a different patient;
3. Association of a series with a different study or patient;
4. Association of a instance with a different series, study or patient;
5. Reconciliation of a study by moving all the series to another study.

In order to perform the reconciliation, simply drag on the screen the chosen element to the selected destination element:

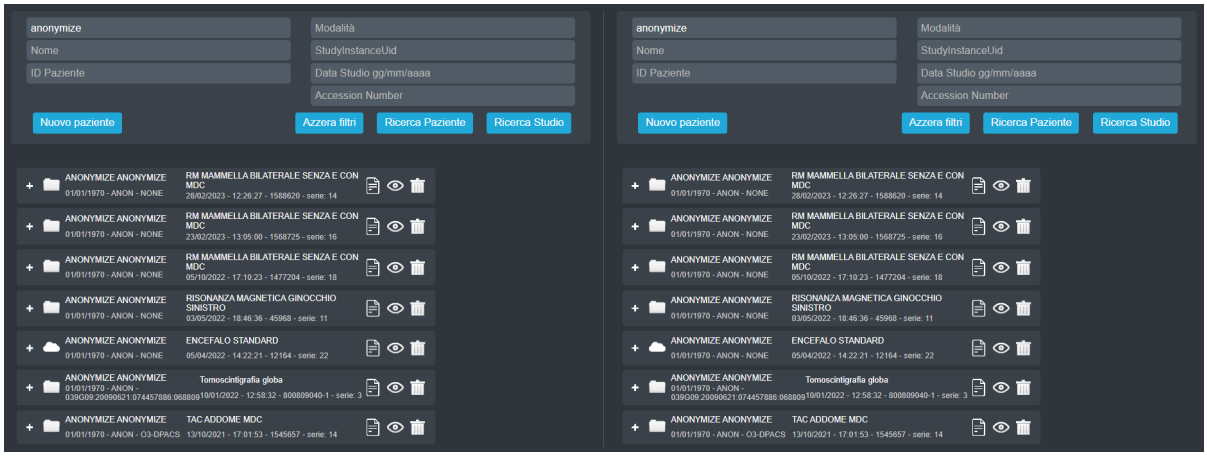


Image 17: Reconciliation screen

Step to perform reconciliation:

- Hold down the left button of the mouse, drag the selected element and release the button once the destination element is reached;

  If the operation is not allowed, the destination will turn red:

  If it is allowed, the destination will turn green:

- Confirm the operation by clicking "*Ok*" in the pop-up:

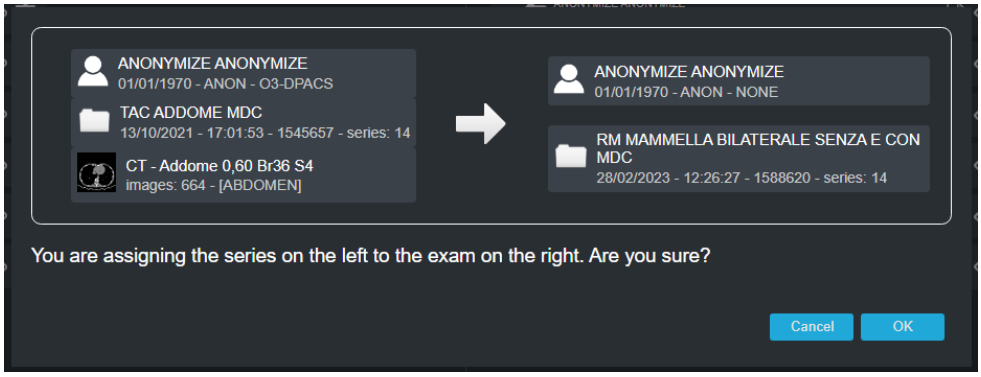


Image 18: Pop-up to confirm the reconciliation

If a study is dragged over another study, the following pop-up becomes available:

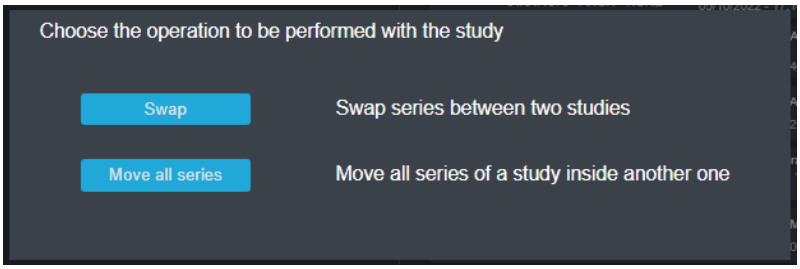


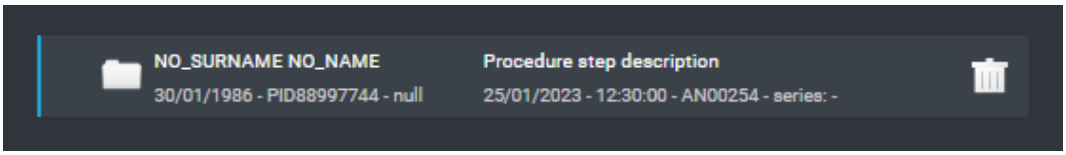
Image 19: Study reconciliation screen

At this point, it is necessary to select the desired operation; then, the confirmation pop-up will appear.

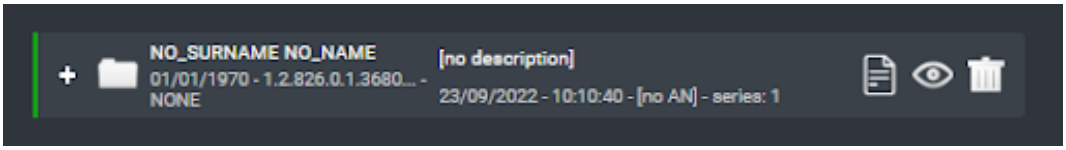
4.7.2 Reconciliation with orders

In the image management section, some colors can be associated to the studies:

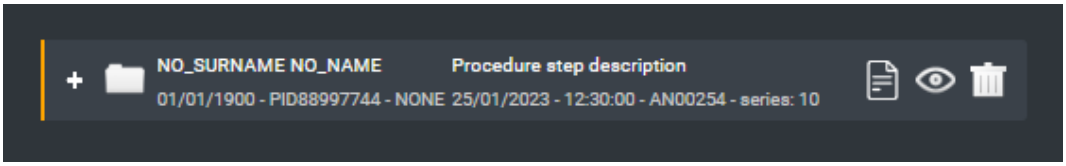
1. Blue: indicates that the element is an order and the images are not yet available on the PACS.
   It is possible to manually reconcile an order with an existing study by dragging it over the study; if the data matches, the color will turn green, otherwise it will be yellow.



2. Green: indicates that the exam is associated with an order and their data matches.



3. Yellow: indicates that the exam is associated with an order but their data does not matches.



If there is no color associated with the exam, the exam is not yet associated to an order.

4.8 Patient Merge

The ZEEROmed Store interface allows users to merge patients directly by dragging and dropping patient items. The recap widget will inform the user that all studies from patient A will be associated with patient B and will request confirmation.

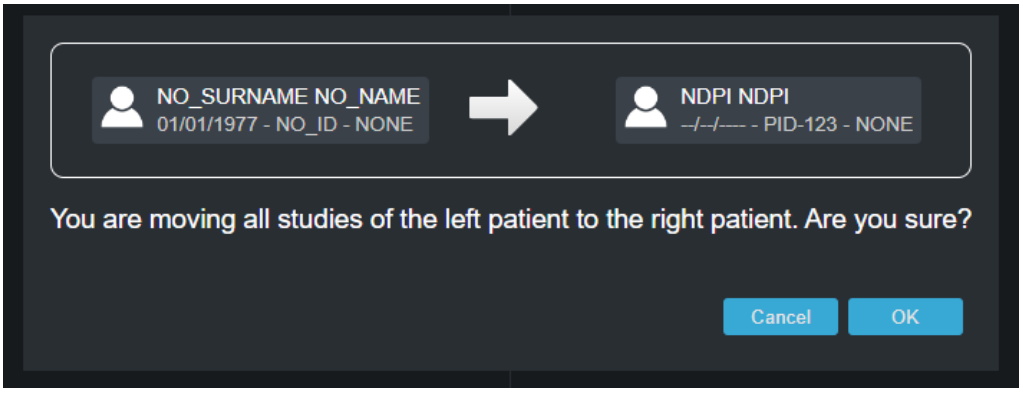


Image 20: Patient merging widget preview

To prevent modifications to incomplete studies, a warning in the widget preview will alert the user about the study's status, requiring confirmation.

NOTE: the check is performed only for the studies of the left-side patient.

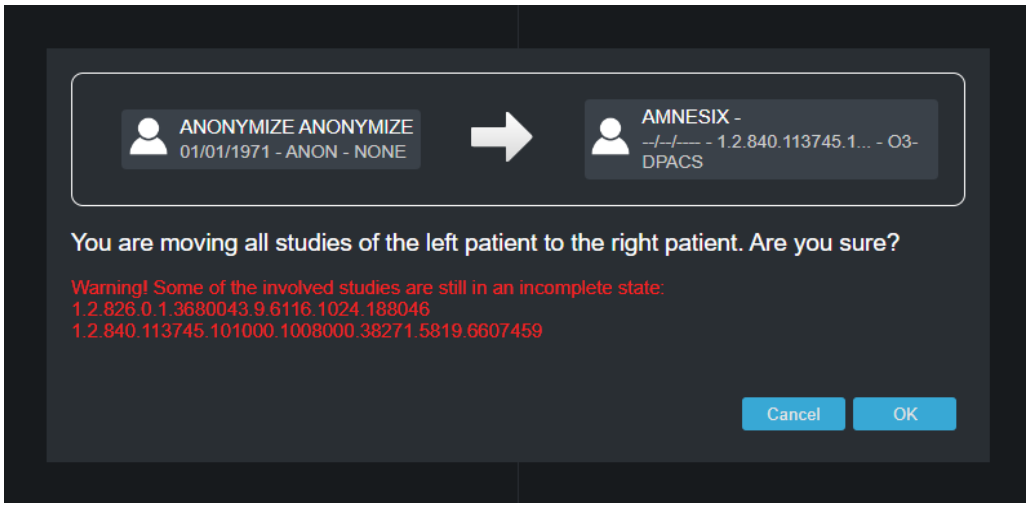


Image 21: Warning in the widget preview for a modification of an incomplete study

5 Recovery area

5.1 Deprecations list

In the "*Recovery area*" the user can view all the information regarding deprecations that have occured on the current PACS. The "*Deprecations list*" table displays the subject of the deprecation ("*STUDY*" o "*SERIES*"), some general information related to the deprecation (the reason, the author, the data of deprecation, and whether it has been recovered or not), and other information related to the subject of the deprecation (study date, patient name, mode and number of deprecated instances).

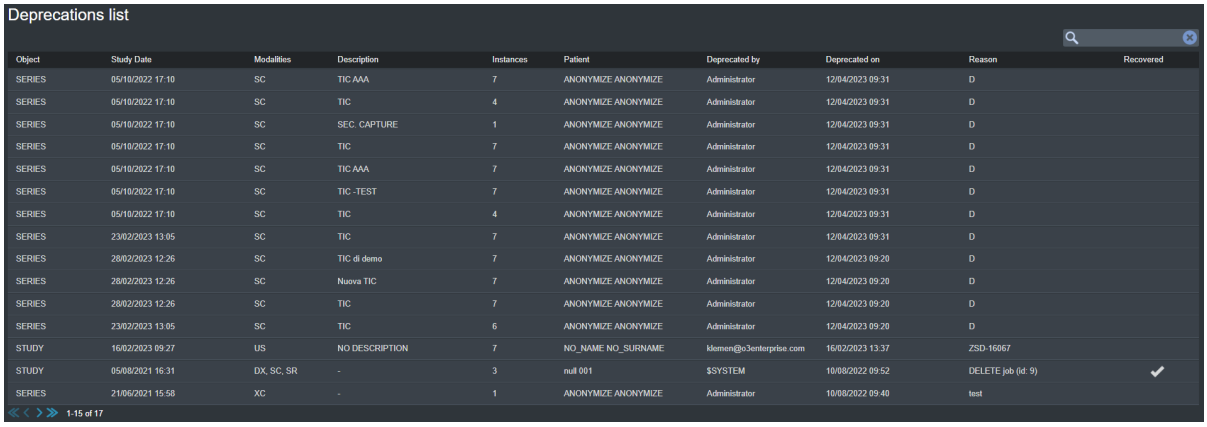


Image 22: Deprecation list

5.2 Deprecation overview

The user can display additional information related to the study/series and to the deprecation, by clicking on the row of the selected subject. Furthermore, it is possible to restore the study or the series by clicking on the "*Recovery*" button at the bottom left. In case the recovery is successful, the recovery icon is activated at the end of the deprecation row.

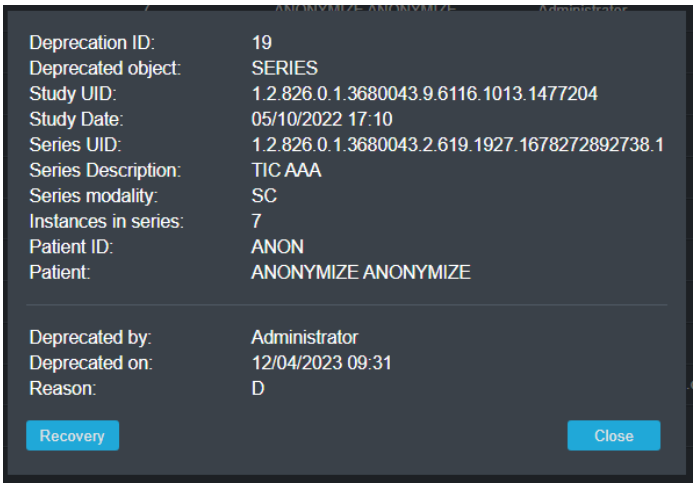


Image 23: Deprecation overview

6 User management

In this section the currently logged-in user can control the list of users configured in the PACS Cloud, add new users, edit and create new roles, or update the existing ones through the permissions overview.

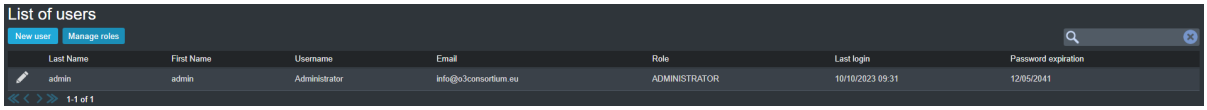


Image 24: List of configured users

6.1 Users

In the screen, the list of users is presented; some minimal information are present for each user, such as name and surname, username, email, role, timestamp of the last login and date when the password will expire. Furthermore, it is possible to filter the results using the search box at the top left.

6.1.1 New user

By clicking on the "*New user*" button, it is possible to add a new user.

The "*Role*" combo box is pre-filled with the roles currently available; therefore, for a better user experience, it is recommended to firstly create the desired role and then connect it to the selected user.

All the input fields present in the following picture are mandatory.

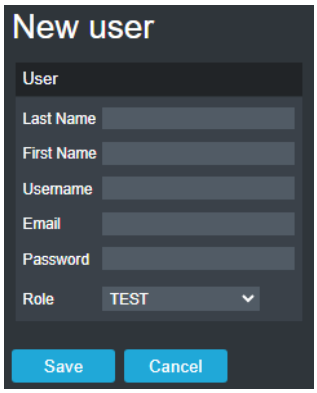


Image 25: "New user" configuration panel

Alternatively, by using the "*Edit*" button at the beginning of the row and marked with the pencil icon  , it is possible to update the information of the selected user.

6.2 Roles

The role overview is available by clicking on the "*Manage roles*" button, located next to the "*New user*" button previously seen. Each role must have a unique name and a list of associated permissions. Permissions are divided into "*Viewable Areas*", which contains the list of pages that a user with a particular role can view, and "*Allowed actions*", which is a collection of actions that can be performed on the enabled pages.

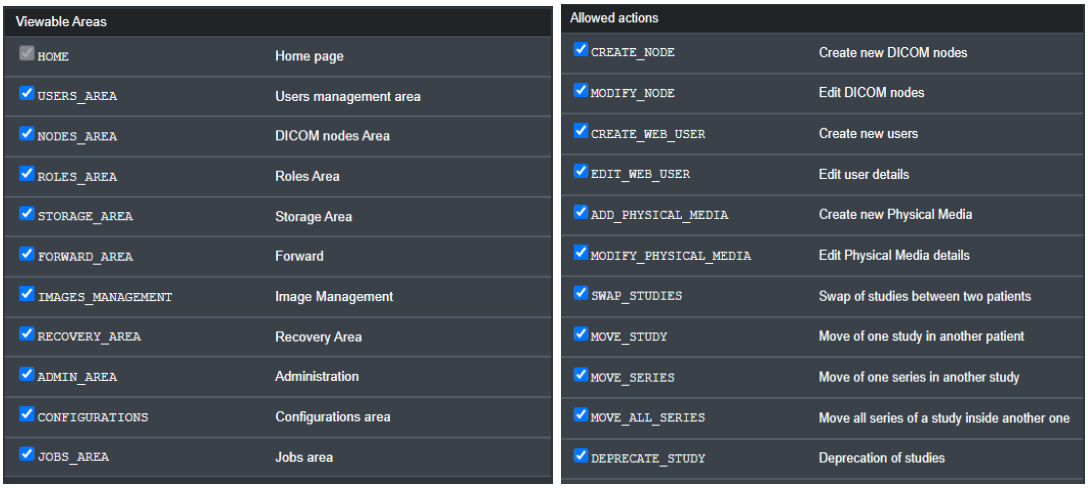


Image 26: "Viewable ares" and "Allowed actions" panel

To save the current configuration it is necessary to click the “*Save*” button at the bottom of the page; to the contrary, in order to cancel the operation, the “*Cancel*” button, next to the previous one, must be clicked.

In the case the user wants to edit another currently available roles, he has to select it from the combo box at the top of the page and click the "*Load*" button.

6.3 Considerations on roles and users

As the user may have noticed, on the role configuration page, there is a check-box labeled “*Privileged roles*” that makes the current role *privileged* and the user a *super-user*. This check-box can only be checked by other super-users.

It is important to remember that, during the users creation, there must be at least one privileged role and a user associated with it. In any case, the PACS Cloud automatically prevents the modification of this check-box if the aforementioned requirements are not met.

6.4 User panel

In the top right corner of all the pages, by clicking on the button marked with the profile icon  , the “*User panel*” is available. In the "User panel" it is possible to check the date and time of the last profile access, change the password, display the label with the information about the PACS Cloud license and log out.
If the user is configured as a *super-user*, the “*Go to Admin tenant*” button is available for global system configurations.

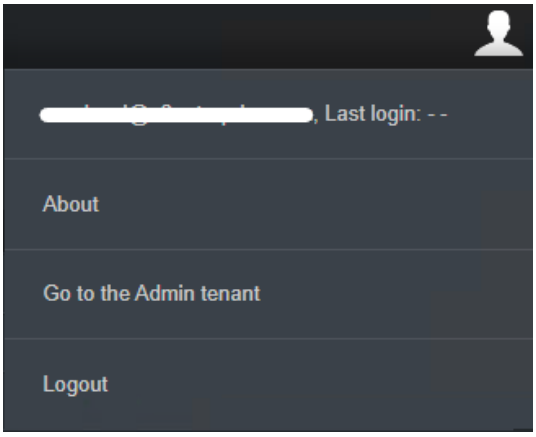


Image 27: User panel (super-user)

7 DICOM Nodes Manager

7.1 DICOM nodes list

On the "*DICOM Nodes Manager*" page the user can access a complete list of all the DICOM nodes currently configured in the system. The "*Dicom nodes list*" table shows for each node its *AE Title*, the possible *Station Name*, the type of the node (*FEED* o *OTHER*), the file system folder where the files will be saved and whether the compression and the anonymization are enabled or not.
Furthermore, it is possible to filter the results in the table using the search box in the top right corner.

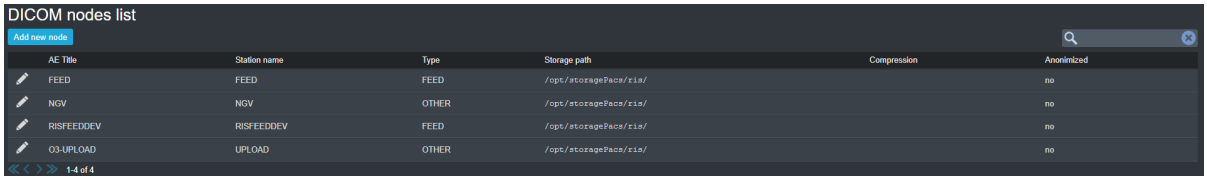


Image 28: DICOM nodes list

7.2 Adding or editing a DICOM node

User can add a new node by clicking on the "*Add new node*" button at the top left; this action will open a node configuration pop-up.

All fields marked with an asterisk (*) are mandatory (*AE Title*, *Host*, *Porta* e *Station name*). The "*Storage path*" combo box is automatically populated using the current configured Storage Areas: it is advisable to firstly create a *physical support* and, subsequently, the node associated with it. For more information on how to create a physical support, user should refer to chapter **7 DICOM Nodes Manager**.

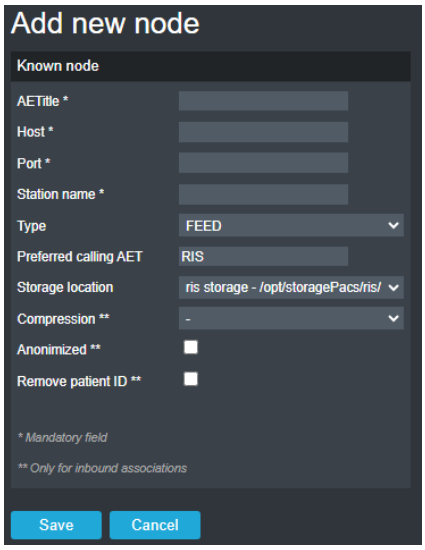


Image 29: Add new DICOM node

Using the "*Edit*" button, marked with a pencil icon and located next to the AE Title  , user can modify the current configurations of the selected node; the same node configuration pop-up is displayed but pre-populated with the configurations that should be modified.

7.3 Add unknow DICOM nodes

ZEEROmed Store is configured to reject requests from unknown nodes but to save their references in the "DICOM node List" with the "*Disabled*" flag. To enable the node, refer to paragraph **7.3.1 Enabling a disabled unknown node**

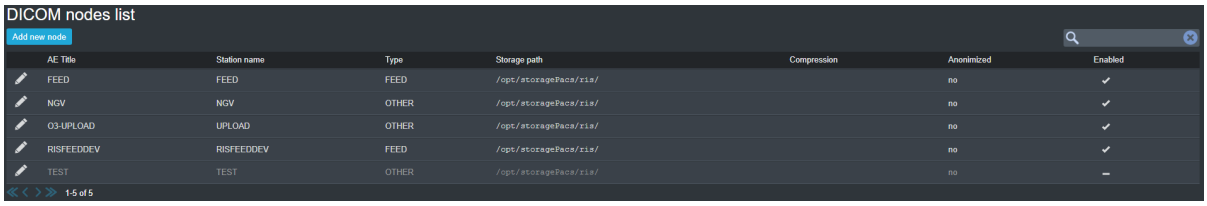


Image 30: Adding an unknown node to the "DICOM node list"

Requests can be:

- DICOM C-Store request;
- DICOM C-Find request;

- DICOM C-Move request;
- DICOM C-Echo request.

7.3.1 Enabling a disabled unknown node

To activate a disabled unknown node, the user needs to open the "*Modify node*" panel through the "Edit" icon and check the "*Enabled*" field.

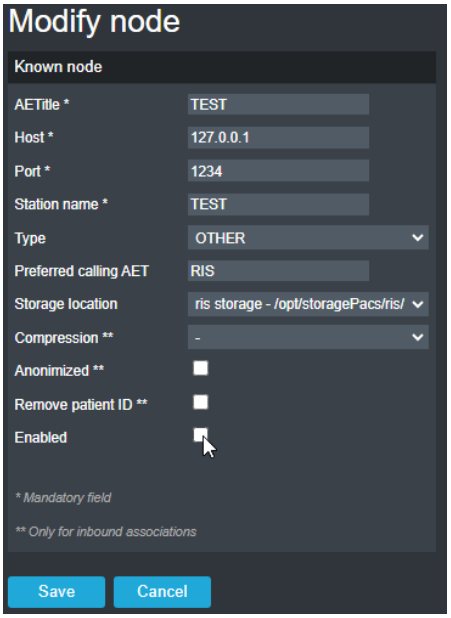


Image 31: Enabling a disabled unknown node

8 Jobs

On the "*Jobs*" page, user can define the queue of tasks that has to be executed at a specific time point in the future. Currently, the following seven jobs are available:

- Delete
- Deprecate
- Image availability
- Relocate
- Export
- Forward series
- Delete empty

Furthermore, the user can define the time at which these tasks can be executed by using *trigger*, a set of configurations present on the same screen. The type of triggers can be: "*Daily*", "*Manual*", "*Scheduled*" and "*Periodic*".

8.1 Queueing rules

The production and management of the queue follow specific rules to avoid conflicts during task execution. The most important rules include:

- If a job has already been added to the execution queue or if it has been executed at least once (for recurring job), it cannot be modified;
- The system strives to execute jobs at the time define by the user, taking into account the current system resources and the compatibility with other concurrently running jobs.

8.2 Types of jobs

As previously mentioned, there are six types of jobs: "*Delete*", "*Deprecate*", "*Image availability*", "*Relocate*", "*Export*" and "*Forward series*".

8.2.1 *Delete*

This task is used to **permanently** delete studies or series previously marked as "*deprecated*", both from the file system and the database.

> ⚠ **Warning**: once the object has been successfully processed by the task, it can not be recover in any way

Configuration options for this job are:

- **Deprecation age**: number of days that have been passed since the element was deprecated;
- **Deprecated by**: name of user who performed the deprecation. This is particularly useful when combined with the *Deprecation job*, which deprecates all the elements using the alias "$SYSTEM".

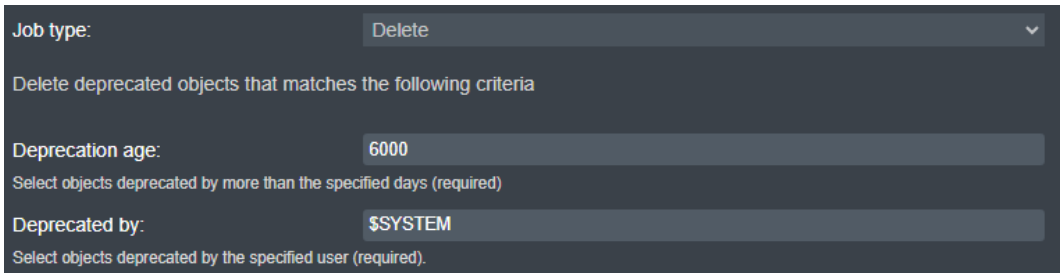


Image 32: "Delete" panel

8.2.2 Deprecate

The "*Deprecate*" job is used to automatically deprecate all elements that match the filters specified in its configuration. User can specify:

- **Study age**: number of days during which the study should not have been modified;
- **AE Title**: filter to select studies only from a specific AE;
- **Modality**: filter to select studies that contain specific modalities;
- **Station name**: filter to select studies only from a specific station.

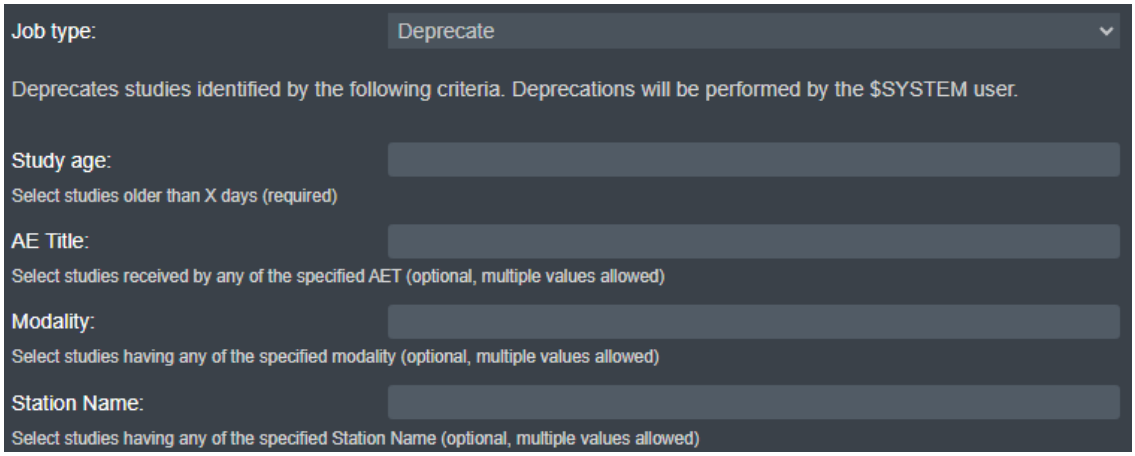


Image 33: "Deprecate" panel

8.2.3 Image Availability

This task is used for publishing image availability to the configured endpoint; additionally, it is possible to specify the "*Machine learning endopoint*" used for *AI* services. The configurations are:

- **Source Id**: name by which the PACS presents itself to the third-party service during publication;
- **Endpoint**: url to notify the image availability;
- **Machine learning endpoint**: url of the artificial intelligence services to notify the image availability
- **Authentication header**: optional authentication header for the previously specified endpoint;
- **Study cooldown seconds**: time, in seconds, after which a study can be considered

publishable. It can be simply calculated as `current time - study's last modification time > seconds for the study's cooldown`.

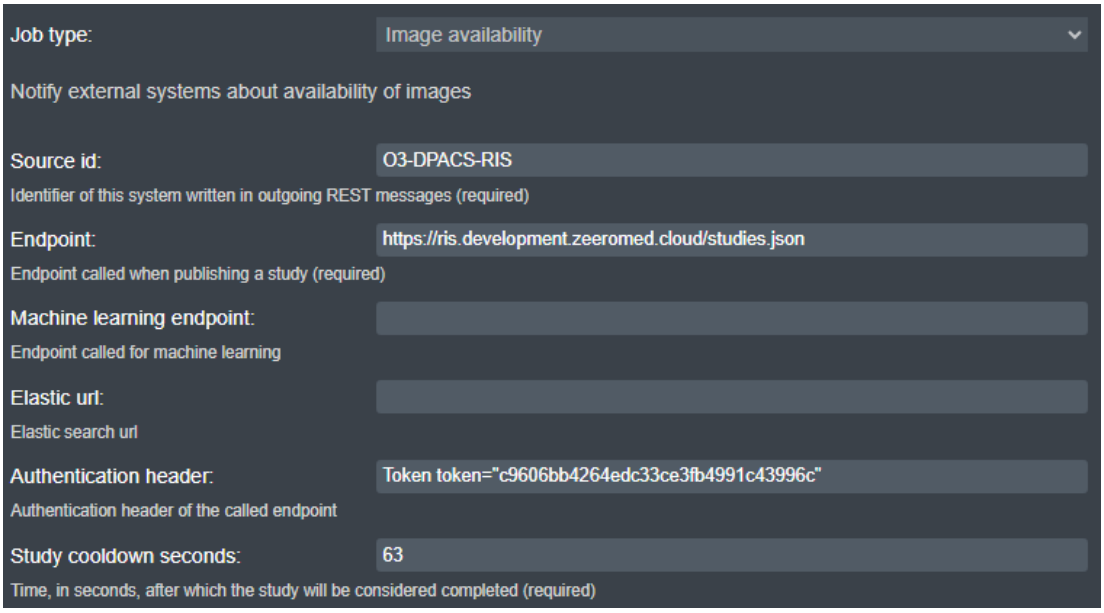


Image 34: "Image availability" panel

8.2.4 Relocate

This job is used to automatically move studies from their source storage to another (even if its type is different). Due to the fact that the PACS Cloud supports *Google Clouds Buckets*, it is possible to move a study from a bucket to a local storage, from a local storage to a bucket and from a local storage to another file system folder. The available configurations are:

- **Storage type**: type of destination storage; it can be "*Disk*" or "*Bucket*". Depending on its value, a different text box becomes available ("*New storage location*" for Disk, "*Destination bucket*" for Bucket);
- **New storage location**: absolute path in the file system in which studies should be moved;
- **Destination bucket**: name of the bucket in which studies should be moved. Only current configured buckets are present;
- **Study age**: number of days during which the study should not have been modified.

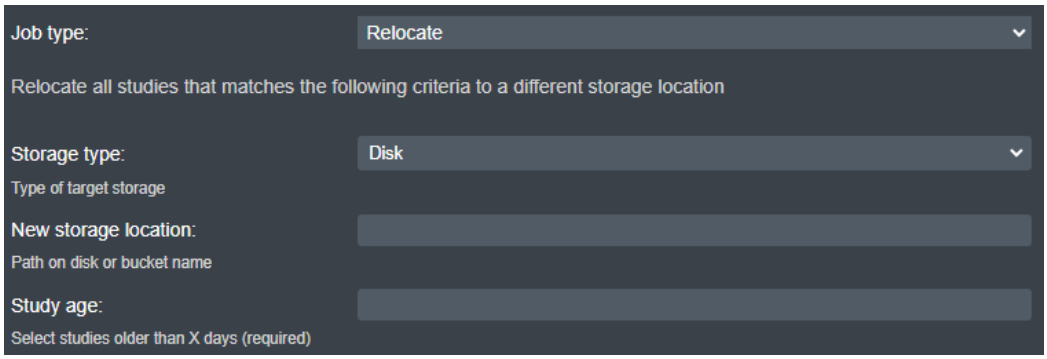


Image 35: "Relocate" panel

8.2.5 Export

This job exports all the studies that meet the specified filters, updating all metadata to ensure that they are completely synchronized. This task can be very useful in the case of a *transfer back*. Its configurations include:

- **Storage type**: type of destination storage; it can be "*Disk*" or "*Bucket*". Depending on its value, a different text box becomes available ("*Disk folder*" for Disk, "*Bucket name*" and "*Bucket folder*" for Bucket);
- **Disk folder**: absolute file system path where the selected elements should be exported;
- **Bucket name**: name of the destination bucket. Only the currently configured buckets are present;
- **Bucket folder**: name of the folder within the selected bucket where the studies should be exported;
- **Studies older than**: filter used to select all studies not modified since the specified date;
- **AE Title**: filter used to select studies only from a specific AE title;
- **Modality**: filter used to select studies containing images with the specified modalities;
- **Station Name**: filter used to select studies only from a specific *station*.

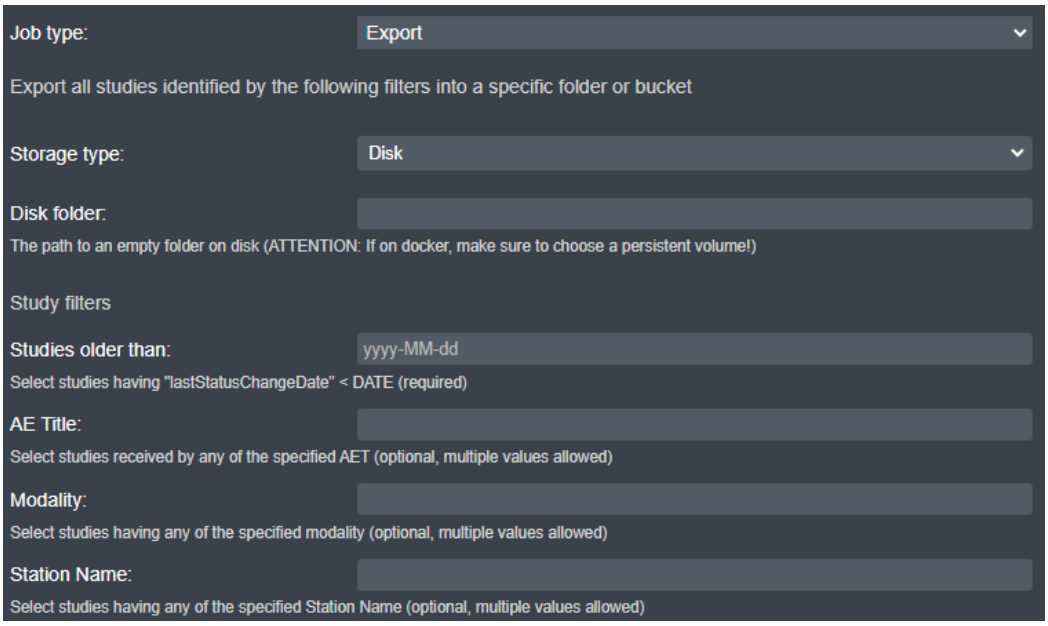


Image 36: "Export" panel

8.2.6 Forward series

The "*Forward series*" job can be used to automatically forward all the series that meet specific criteria to other nodes previously configured in the system. In this task it is possible to define the forwarding rules to filter the relevant series effectively. Due to the need of supporting a high level of complexity in the rule definition, unlike other job types, it is not possible to define more than one task of this type. In addition, user can not associate a "*Manual*" or "*Scheduled*" trigger, as they are not relevant to this specific case. The configurations include:

- **Max attempts**: integer number indicating how many times PACS Cloud should retry the forwarding of specific serie (in case of a previous failure). The next attempt occures in the next queue processing round;
- **Rule**: by clicking the "*New Rule*" button, a box containing the forwarding rules becomes available; it is possible to add an undefined number of rules. User can remove a rule by clicking on the "*Delete rule*" button, located at the bottom right of the box. Each rule consists of:
    - **Source node**: indicates the source node of the series. If the user does not want to specify the source node, he can use the "*any source*" entry;

- **Studies received after***: date and time, in the `dd/MM/yyyy HH:mm` format, after which studies should be considered for forwarding;
- **Cooldown (seconds)***: time, in seconds, after which the series can be considered completed (and therefore eligible for forwarding);
- **Destination node***: node, previously configured in the PACS Cloud, to which the filtered series should be forwarded;
- **Modalities**: modality that a series should have to be forwarded; this field is optional.

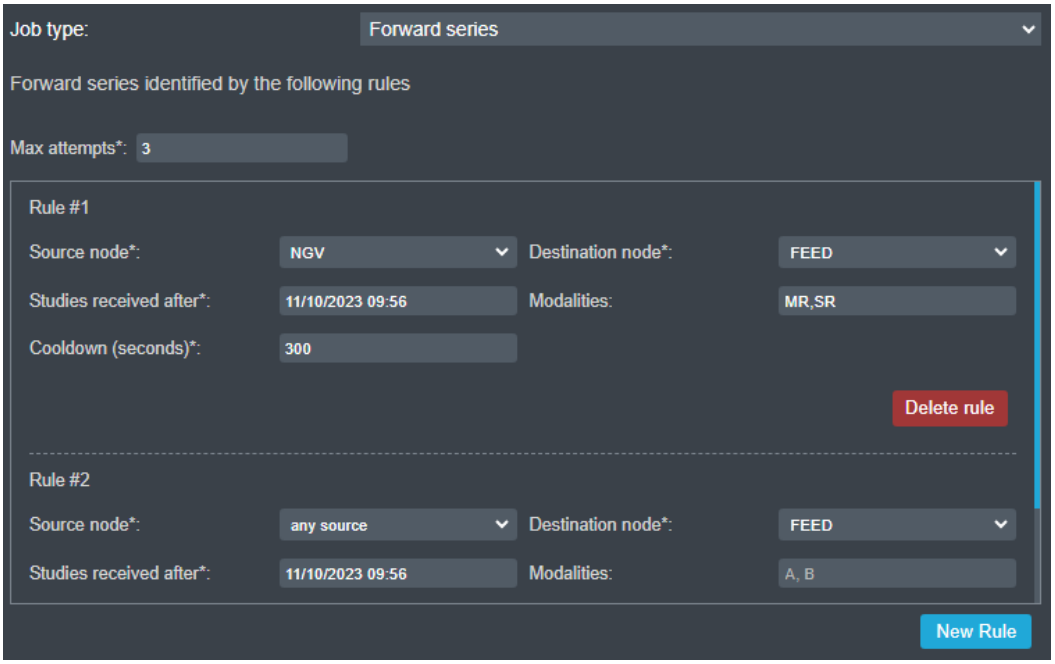


Image 37: "Forwars series" panel

8.2.7 Delete empty

The "*Delete empty*" job removes all studies and patients that do not have any child attached and therefore are considered "*empty*" by the system.

A study is "empty" if it does not contain any series.

A patient is "empty" if does not have associated study.

The "*Study Age*" field enables the filtering of studies, removing only those older than the specified time (dd) by the user.

In the event of exceptions or issues during the job execution, operations are canceled to prevent the loss of information.

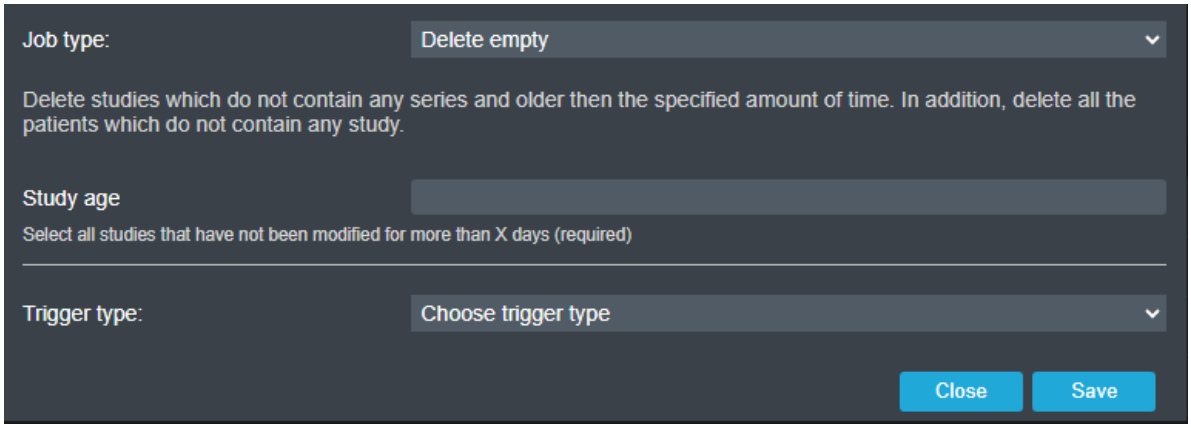


Image 38: "Delete empty" panel

Warning: the system only deletes entries in the database, without performing any operations on the file system. Therefore, some empty folders may not be deleted.

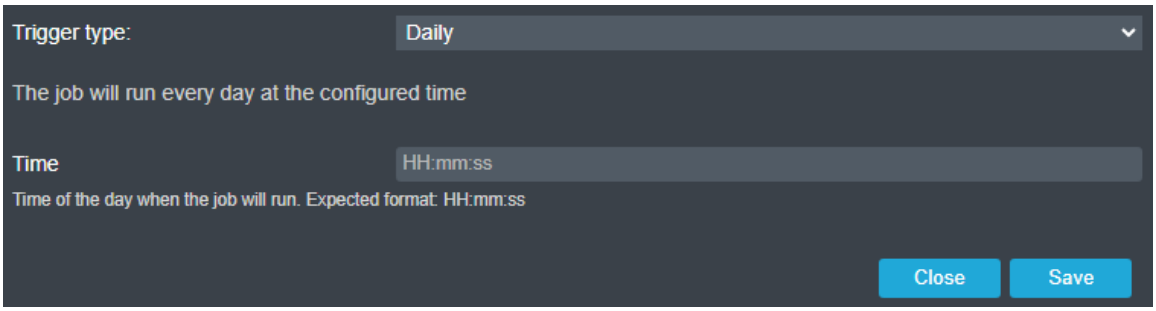
8.3 Triggers types

As mentioned earlier, there are four types of triggers: "*Daily*", "*Manual*", "*Scheduled*" and "*Periodic*".

8.3.1 Daily

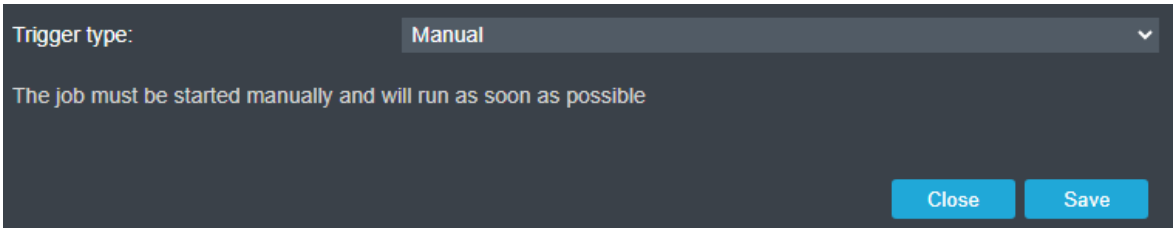
This trigger allows the user to queue the associated job at a specific time of the day. It is important to note that the specified time will be the moment in which the task is **queued** (with a error margin of approximately 10 seconds) and not when it is executed. The job, considering the queueing rule discussed in **8.1 Queueing rules**, will be executed as soon as the queueing conditions allow it. Its configuretions include:

- **Time**: time, expressed in `HH:mm:ss` format, when the associated task is queued.



8.3.2 Manual

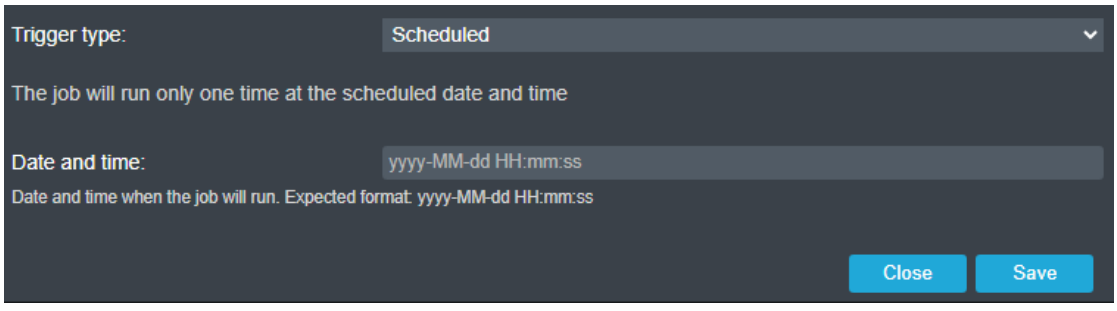
This trigger allows the user to manually queue a job, executing it as soon as possible, based on the current queue conditions. If a task has this type of trigger, the "*Play*" action appears on its row. This trigger does not have any specific configuration.



8.3.3 Scheduled

This trigger can be used to execute a job only once, at the specified date and time. Similar to the "*Daily trigger*" the timestamp represents the moment when the job is queued, not when it is executed. Its configurations include:

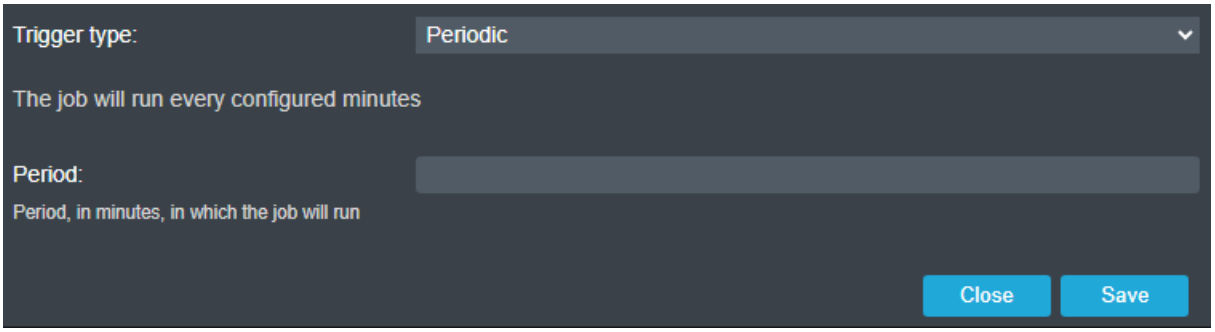
- **Date and time**: timestamp, expressed in `yyyy-MM-dd HH:mm:ss` format, when the associated job is queued.



8.3.4 Periodic

This trigger is used to queue the associated job at regular intervals, allowing the user to specify the time range. Its configurations are:

- **Period**: time, expressed in minutes, that has to elapse between each executions.



8.4 Jobs page

8.4.1 Summary Table for "Jobs"

On the "*Jobs*" page, user can add new jobs (of any types and with any triggers), check the current configuration of each existing job, modify, enable or disable, manual queuing (only if the type of the associated trigger is "*Manual*") and delete jobs.

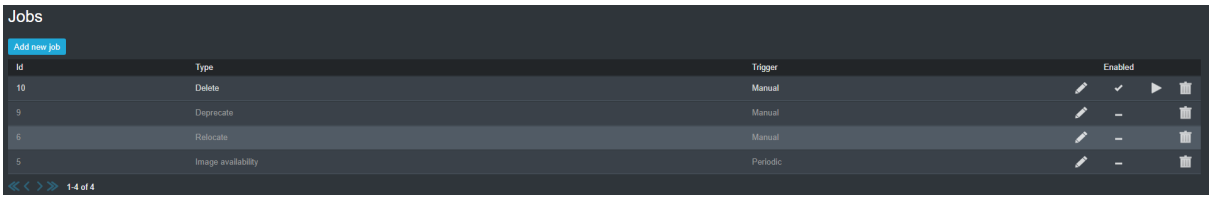


Image 39: Jobs

8.4.2 Job queue

The "*Job queue*" table, located below the "*Job*" table, allows the user to monitor the current status of the queue. Each row contains the Job id, the type, the execution timestamp ("*Started at*") and the status (which can be either "*ENQUEUED*", if it is simply queued, or "*PROCESSING*", if it is running).

If the status is "*ENQUEUED*", it is possible to remove it from the queue by using the "*Remove from queue*" button marked with the "X" and located at the end of the row .

The table is automatically updated every 10 seconds, but the user can manually refresh the status by clicking on the "*Refresh job queue*" button, next to the section title .

Image 40: Job queue

8.4.3 Job history

The last section of the Job page is the "*Job history*" table. This table displays the status of the completed jobs along with the additional data related to the execution time. User can filter the results present in the table using the searching box located at the top right. Similar to the "*Job queue*" table, this table is automatically updated every 10 seconds.

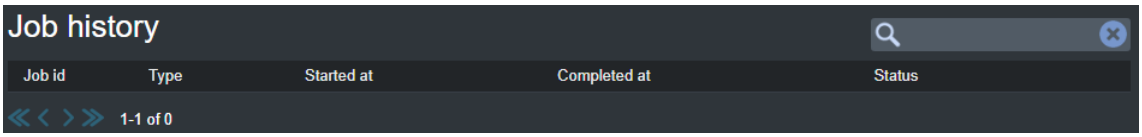


Image 41: Job history

At the end of each row, the "*Show logs*" button will open a pop-up containing some logs related to the current execution. If the execution ends with at least one error, the button will display a warning icon and all the error logs will be highlighted in red.

For practical purposes, all executions and logs older than three days are deleted and no longer accessible in any way.

9 Storage Area

9.1 Physical Media List

On the "*Storage Area*" page, user can check the presence of any storage areas, add new ones and modify the existing ones. It is also possible to filter the list of *physical supports* using the search box on the top right corner. The summary table of storage area provides to the user the name of the storage area, its file system path, its availability and an optional description.

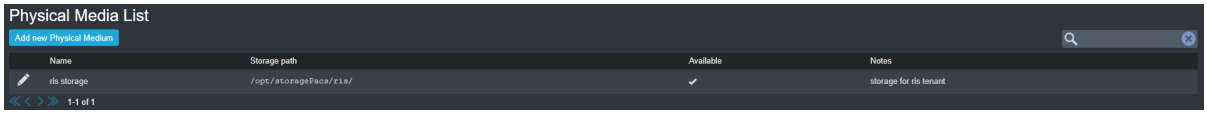


Image 42: Physical media lists

9.2 Adding and modifying a storage area

By clicking the "*Add new Physical Medium*" button, a pop-up for creating the storage area becomes available; in this pop-up the user can configure its setting. In case of changes to an existing storage area, the same pop-up is shown but pre-filled with the previous setting.

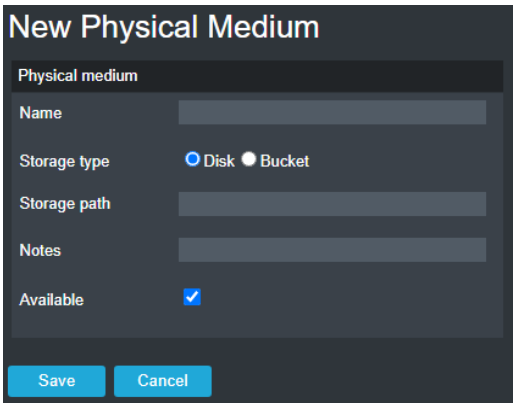


Image 43: New physical medium pop-up

10 Forward area

The "*Forward area*", if configured in the user dashboard, allows the user to check the current status of the series forwarding queue, previously configured through a "*Forward series*" job (**10 Forward area**).

In the summary table all series that are yet to be forwarded, currently in the process of being sent or already completed (either successfully or not) are listed. It provides information regarding the series itself (study instance UID and series instance UID), the name of the destination node, the queuing timestamp, the date and time of the last update of the forwarding and the forwarding status with the corresponding number of images forwarded and the (possible) attempts made.

The "status" column is update with the current forwarding status of the series. This can be:

- **ENQUEUED**: series has been added to the forwarding queue;
- **SENDING**: series is in the sending process;
- **ERROR**: one or more series instances can not be forwarded;
- **PAUSED**: one or more series instances can not be forwarded and the previously configured maximum number of attempts in the tasks has been reached;
- **DONE**: the forwarding process of the entire series has been completed without errors.

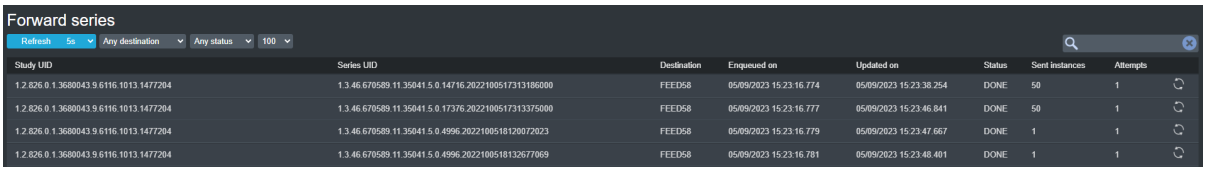


Image 44: Series forwarding

To better consult the table, some filters have been made available to the user for a more specific research: it is possible to filter by the destination node and by the current

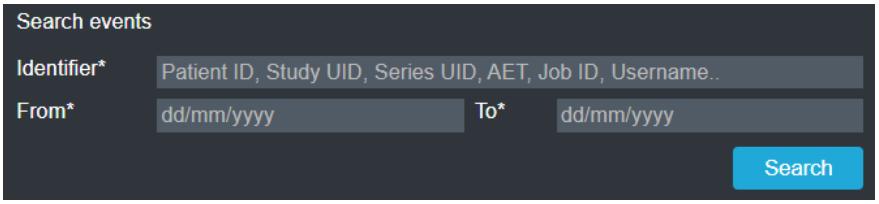
forwarding status or to choose how many rows should be displayed in the table. It is also possible to filter by the text contained in any of the rows.

In addition by clicking the “*Refresh*” button, available in the top position of the page, the table's content is immediately update; it is also possible to configure the automatic table updates using the dropdown menu next to the “*Refresh*” button.

11 Event Logs

In the Event logs section user can analyze all operations performed on items stored on the ZEEROmed Store.

Upon selected the "*Event logs*" icon from the dashboard, the following panel is displayed, allowing user to filter by "Identifier" (which can be *Patient ID*, *Study UID*, *Series UID*, *AET*, *Job ID*, *Username*) and date range.



In particular, ZEEROmed Store stores the following operations or events performed on items:

- Patient: creation, update;
- Study: creation, reconciliation, update, movement, deprecation, recovery, deletion, relocation;
- Series: creation, reassignment, update, deprecation, recovery, deletion;
- Instance: movement;
- Node: creation, update;
- Job: creation, update, deletion;
- Webapp login events.

Results are limited to 1000 rows and each event contains the event type, the timestamp and all the partecipants.

The following examples pertain to patient's creation and node's operations research:

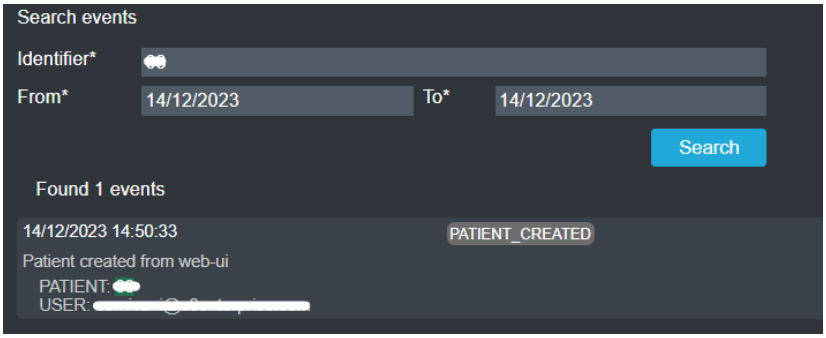


Image 45: Patient creation

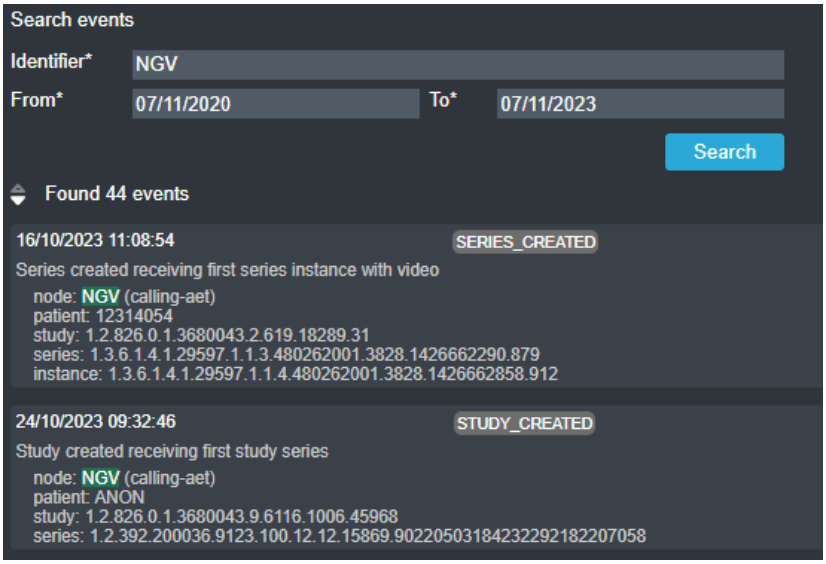


Image 46: Operations related to a node

12 Configurations

In the configuration page, user can check and update some PACS Cloud operation settings. This section is only accessible to system administrators.

The page has two main sections: "*Buckets*" and "*Tenant*".

12.1 Buckets table

Through the *Buckets* table the user can view, edit or delete the currently configured *Google Cloud Buckets*.

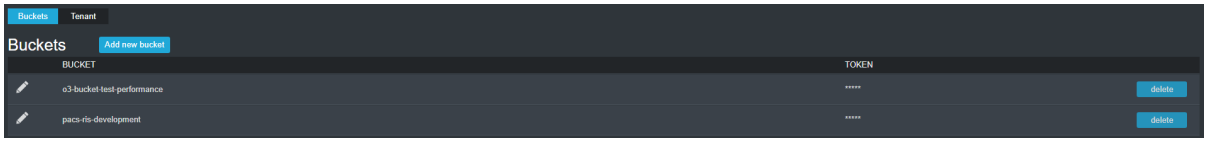


Image 47: Buckets panel

In order to add new buckets, the user has to click on the "*Add new bucket*" button; subsequently the bucket configuration pop-up is displayed. It is necessary to enter the exact name of the bucket and its token, issued concurrently with its creation. From this point forward, for security reason, the token can no longer be viewed but it can only be updated by the user by clicking on the "*Edit*" button, marked with a pencil icon  .

Image 48: Bucket configuration pop-up

By clicking on the "*Cancel*" button, the user can permanently delete the selected bucket, along with all its configurations. In this situation no files will be deleted because just the reference to the selected Bucket will be removed.

12.2 Tenant table

In the *Tenant* table the user can check and update the PACS Cloud operational configuration. The tables consists of two columns, *Key* and *Value*, and only the latter is editable.

When updating a configuration, the user has to click on the "*Save*" button, located next to the title, in order to save the changes. If some mistakes have occurred and the user wants to revert to the last saved configuration, he has to click con the"*Reset*" button.

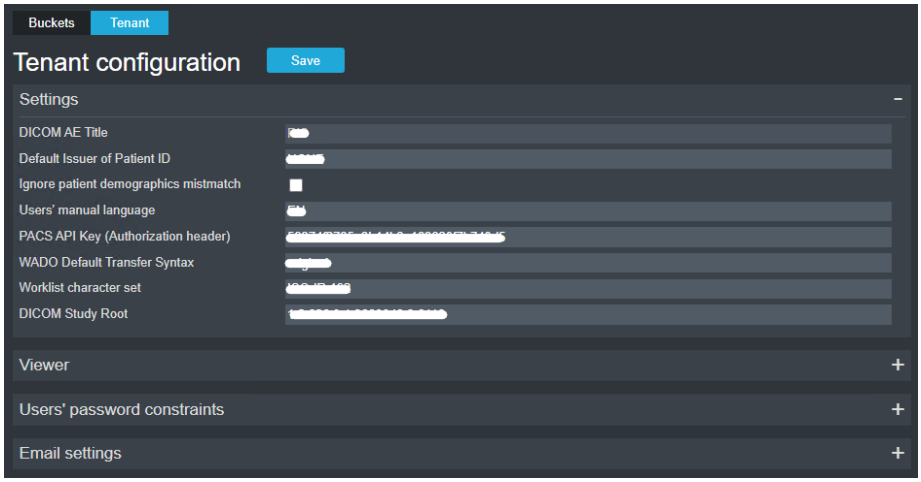


Image 49: Tenant panel