Shanoir NG – Study

Software Design Description

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# Microservice context

## Microservice presentation

This microservice is a part of the Shanoir-NG application and is responsible for study management.

## Main functionalities

Shanoir NG main functionalities are:

* Managing centers (list, create, delete, update)
* Managing investigators (list, create, delete, update)
* Managing acquisition equipment (list, create, delete, update)
* Managing coils (list, create, delete, update)
* Managing studies (list, create, delete, update)
* Manage requests to join study
* Download report
* Export study

## Application users

Target population is:

* Shanoir administrators
* Shanoir users of any level

# Functional architecture

## Center

### Parameters

#### Name

May contain letters, numbers, whitespaces, special characters, accents. Minimum 2. Maximum: 200. Input. Mandatory

#### Street

Text area. Facultative.

#### Postal code

Input. Facultative.

#### City

Input. Facultative.

#### Country

Input. Facultative.

#### Phone number

Input. Facultative.

#### Website

Input. Facultative.

### Functionalities

#### List centers (GET /center/all)

After clicking on the Center menu in Shanoir, the table with the list of centers appears with the following columns:

* Name
* City
* Country
* Edit (with icon) – for admins and experts
* Delete (with icon) - for admins and experts
* Details (with icon)
* Add acquisition equipment (with icon) – for admins and experts

It is possible to filter and sort the table.

In the header there is a link to **new center**.

#### View details of one center (GET /center/{id})

From the table it is possible to see the details of one center only.

On this page it is possible to see (only one request-response is sent):

* The details about the center (name, street etc.)
* List of investigators linked to this center
* List of acquisition equipment linked to this center

On the bottom of the page there are buttons:

* Back
* Edit (if admins or expert)
* Delete (if admin or expert)
* Add acquisition equipment (if admin or expert)

#### Add new center (POST /center)

Only for admins and experts.

Add new center after filling in the fields relative to center (see 2.1. Center)

#### Edit center (PUT /center/{id})

Only for admins and experts.

Possible to edit the fields from 2.1 Center

#### Delete center (DELETE /center/{id})

Only for admins and experts. Delete center permanently. Cannot be deleted if a center is linked to a study.

NOT IMPLEMENTED YET!

#### Add acquisition equipment

Redirected to POST /equipment with the select-center already chosen.

## Investigator

Person involved in study. Linked to center and study. Investigator **is linked** to a specific user.

1. **Investigator**: If in the moment of migration, the user (found by his first and last name) does not exist in the database of users, it is created automatically with role User and has a role in the studies “Can see and download datasets”. Function by default: researcher. Has access to study by default.
2. **Principal investigator:**  User is created if it doesn’t exist and has role User with role in the study “Is responsible for the research study”. Function by default: researcher. Has access to study by default.

### Parameters

#### Username

Username of the investigator (from the userlist)

#### Affiliation center(s)

List of centers affiliated to the investigator. Select none or more.

#### Functions

Select at least one. Possible selections:

* Psychologist
* Medical doctor
* Researcher

### Functionalities

#### List Investigators

After clicking on the Investigator menu in Shanoir, the table with the list of investigator appears with the following columns:

* First Name (from user)
* Last Name (from user)
* Functions: list of functions (array)
* Center: list of centers (array)
* Delete (with icon) – for admins and experts
* Edit (with icon) – for admins and experts
* Details (with icon)

It is possible to filter and sort the table.

In the header there is a link to **new investigator**.

#### View details of one investigator

From the table it is possible to see the details of one investigator only.

On the bottom of the page, there are buttons:

* Back
* Edit – for admins and experts
* Delete – for admins and experts

#### Add new investigator

Only for admins and experts.

Add new investigator after choosing username and filling in the fields relative to investigator (see 2.2).

#### Edit investigator

Only for admins and experts.

Possible to edit the fields all but user id (username)

#### Delete investigator (new)

Only for admins and experts. Delete investigator permanently. Cannot be deleted if an investigator is linked to an examination. In that case link to study (if there is any) and to center (must be at least one) are deleted automatically.

Only experts and admin can delete an investigator.

Deleting an investigator does not delete the user linked to it.

#### Add investigator to study

Study must have at least one investigator.

For multi-center studies, there is at least one investigator per center plus one principal investigator.

## Acquisition equipment

Model with a serial number that is linked to specific center.

### Parameters

#### Name

Name that appears on UI is the concatenation of the rest of fields and center’s name:

{Manufacturer} - {Model name} {Model’s magnetic field} T ({Model’s modality}) {Serial number} - {Center name}

#### Manufacturer name

Object Model (see point 2.4)

#### Manufacturer model name

Object Model (see point 2.4)

#### Center

Object Center (see point 2.2)

#### Serial number

Input (text or numbers)

### Functionalities

#### List Equipment (GET /equipment/all)

After clicking on the Acquisition equipment menu in Shanoir, the table appears with the following columns:

* Name
* Manufacturer (link to manufacturer’s details -> see GET /manufacturer/{id})
* Model (link to model’s details -> see GET /model/{id})
* Serial number
* Center (link to center’s details -> see GET /center/{id})
* Delete (with icon) – only for admins and experts
* Edit (with icon) – only for admins and experts
* Details (with icon) – only for admins and experts

It is possible to filter and sort the table.

There is one more Select in the header that allows to see in the able manufacturers and models.

In the header there is a link to **new acquisition equipment**, **new manufacturer**, **new model**.

#### View details of one equipment (GET /equipment/{id})

From the table it is possible to see the details of one equipment only.

On the bottom of the page there are buttons:

* Back
* Edit (for admins and experts)
* Delete (for admins and experts)

#### Add new equipment (POST /equipment)

Only for admins and experts.

Add new investigator after filling in the fields relative to equipment.

#### Edit equipment (PUT / equipment /{id})

Only for admins and experts.

Possible to edit the fields

#### Delete equipment (DELETE / equipment /{id})

Only for admins and experts.

Delete equipment permanently. An equipment can be deleted only if it is not linked to any study card or dataset acquisition or coil.

NOT IMPLEMENTED YET!

#### View manufacturers (GET /manufacturer/all)

List all manufacturers.

Columns:

* Name
* Edit (for admins and experts)
* Delete (for admins and experts)

#### Add new manufacturer (POST /manufacturer)

Only for admins and experts.

Possible to add new Manufacturer. Only Name is required.

#### Edit manufacturer (PUT /manufacturer/{id})

Only for admins and experts.

Possible to edit the name (can get there by clicking on the model or choosing Manufacturer from the Select in the header of the table)

#### Delete manufacturer (DELETE /manufacturer/{id})

Only for admins and experts.

Delete -> only it is not used by any equipment.

#### View model (GET /model/all)

List all models.

Columns:

* Manufacturer (link to detail of the manufacturer GET /manufacturer/{id})
* Name
* Magnetic field
* Edit (for admins/experts)
* Delete (for admins/experts)

#### Add new model (POST /model)

Only for admins and experts.

Possible to add new model. Name, modality (Mr or Pet), manufacturer and magnetic field. See 2.4

#### Edit model (PUT /model)

Only for admins and experts.

To edit. Get here from the table of models

#### Delete model (DELETE /model)

Only for admins and experts.

Delete -> only it is not used by any equipment.

## Model

Equipment models used for acquisition

### Parameters

#### Manufacturer

Object Manufacturer (see point 2.5). Mandatory

#### Model name

Input (text) (from 2 to 200 characters). Mandatory

#### Modality

MR or PET. Mandatory

#### Magnetic field

Input (number). Mandatory

## Manufacturer

### Parameters

#### Name

Input (min. 2, max. 200 characters). Mandatory

## Coil

### Parameters

#### Name

Input. Min 2, max 200 characters. Mandatory

#### Center

Select from the list of centers. Mandatory

#### Acquisition equipment

Select – from the list of available equipment for selected centers. Mandatory

#### Serial number

Input. Min 2, max 200 characters. Facultative

#### Coil type

Obligatory. One of the following:

* BODY
* EXTREMITY
* HEAD
* MULTICOIL
* SURFACE

#### Number of channels

Input. Min 2, max 200 characters. Facultative

## Study

### Parameters

#### Name

Mandatory

#### Status

In progress or finished. Mandatory.

Once study is finished it is no longer possible to add any new datasets

#### Start date

Facultative

#### End date

Facultative

#### Is clinical

#### Is with examinations

#### Visible by default

#### Data downloadable by default

#### List of subjects associated

#### List of centers

Study must have at least one center

#### List of members (new)

Move the members’ management part directly to Edit page

#### Principal investigator

In case there is only one center with one investigator he automatically becomes the principal investigator.

#### Protocol

### Role

Possible roles for users in study:

1. Is responsible for the research study
2. Can see and download datasets
3. Can see, download and import datasets
4. Can see, download, import datasets and modify the study parameters
5. Cannot see or download datasets

### Functionalities

#### List available studies

Administrators can see all studies but other users (users, experts and guests) can only see study they are allowed to.

The list of studies contains:

* Name
* Status
* Start date
* End date
* Subjects
* Examinations
* Buttons:
  + delete, edit (visible for administrators and person responsible for the study)
  + details, report, protocol

On the top of the list is it possible to create a new study.

#### Create research study

Administrators and experts can create new research studies. All obligatory fields must be set.

#### See details

Everyone linked to study can see details but only Administrator and Experts can edit it.

#### Edit study

Allows to modify all the fields, add/remove subjects, members, centers.

#### Delete study

Can be deleted if it doesn’t have any examinations.  
The relations between members and study and between investigators/centers and study are automatically deleted as well.

Study card is deleted or must be deleted before the study.

Only for Administrators and Experts.

#### Manage members

For administrators and experts.

On the **Edit page** it is possible to add/delete user to study.

Only active users can be added to study.

#### Manage requests to join study (new)

User can ask for rights to see study / download datasets etc.

The request is visible to the persons responsible for the research study and administrators.

#### View examinations and datasets

From the subject details page, it is possible to check the list of datasets and examinations that belong to this study.

#### Download report

## Subject

### Parameters

#### Category

One of the following values:

* Anatomical piece
* Animal (Neuroinfo, Small Animals)
* Human cadaver
* Living human being
* Phantom
* Simulated human being (Neuroinfo)

#### Is the subject already anonymized?

This option is available only for Neuroinfo platform. Subject in OFSEP must be already anonymized.

Possible options: Yes/ No.

If yes, Fields First name and Last name do not appear. Else, they are optional

#### First Name

Appears only if Category is Human cadaver or Living human being.

Required for Living human being. Optional for Human cadaver.

First name is not editable and is not stored in the database but is part of the hash key generated (visible only during creation)

#### Last Name

Appears only if Category is Human cadaver or Living human being.

Required for Living human being. Optional for Human cadaver.

Last name is not editable and is not stored in the database but is part of the hash key generated. (visible only during creation)

#### Birth name

Appears only if Category is Human cadaver or Living human being.

Required on OFSEP platform does not appear in Neuroinfo.

Last name is not editable and is not stored in the database but is part of the hash key generated. (visible only during creation or import)

#### Birth Date

Appears only if Category is Human cadaver or Living human being.

Required for Living human being. Optional for Human cadaver.

Birth date is partially anonymized – only the year is kept with day and month equal to 1st January.

#### Hash key

Generated automatically, visible only during import in Shanoir Uploader.

For OFSEP:

*PHK = SHA256(hashP1(first\_name)|| hashP1(birth\_name)|| hashP1(birth\_date)),*

*«SHA256 »: SHA\_256 bits,*

*«hashP1 » : Pseudonymus hash with soundex « 0 »,*

For Neuroinfo:

*PHK = SHA(first\_name || last\_name || birth\_date)«SHA»: SHA\_algorithm 160 bits \*,*

*« || »:  concatenation symbol.*

#### Date of creation

Appears if category is Anatomical piece, Animal, Phantom, Simulated human being and is optional.

#### Common Name

Appears for all the categories. Obligatory.

#### Sex

Appears only if Category is Human cadaver or Living human being. Optional. Possible values: F or M.

#### Language Hemispheric Dominance

Appears only if Category is Human cadaver or Living human being. Optional. Possible values: Left or Right

#### Manual Hemispheric Dominance

Appears only if Category is Human cadaver or Living human being. Optional. Possible values: Left or Right

#### Personal Comments

Optional.

### List of studies the subject is attached to.

One subject can participate in many studies hence it is always possible to add the subject to more studies.

During import from Shanoir Uploader subject can be automatically attached to a new study.

### Functionalities

#### Add subject

Subject can be created using UI or Shanoir Uploader.

Fields First name, Last name and Birth date are obligatory. For OFSEP Birth name is obligatory as well.

#### Edit subject

Subject can be modified via UI. Names cannot be modified.

#### View subject

Details on subject. Names are not visible.

#### Delete subject

Subject can be deleted only if he doesn’t have any datasets and/or examination. Link with study is deleted as well.

#### Add subject to study

Subject can always be attached to new study.

Relation between study and subject is described as:

* A subject can have an identifier in the study other than his common name (if this field is empty then subject appears on the list of subjects with his common name)
* Can be physically involved or not
* Is one of the following types:
  + Healthy volunteer
  + Patient
  + Phantom

#### View studies for subject

List studies the subject is attached to.

#### Remove subject from study

Subject can be removed from study.

# Software/technical Architecture

## Interfaces

### Communication with other microservices

Study management microservice uses web services and message queues.

#### MS Users

MS Study sends messages to MS Users to:

* Get details of user already in study (GET /users/{userId})
* Get list of users (all) – to add one to study (GET /users/all)

The ID of the users in the study are kept in MS Study along with their role.

#### MS Center

MS Study sends a message to MS Center to get list of the centers, equipment and investigators.

* Get details of one specific item
* Get list centers/inv etc. that are linked to study
* Get list of all the items that can be added to study

#### MS Subject

To get the list of subjects.

* Get details on one subject
* Get list of all subjects in the study
* Get list of all subject (to choose one to add to study)

#### MS Study cards

Get study cards

* Get details on one study card
* Get list of study cards in the study
* Get list of all study cards (to choose one)

#### MS Examinations/dataset

Get datasets

* Get details on one exam/dataset
* Get list of exam/datasets in the study

### Communication with Shanoir

Every time a request is sent from Shanoir, it arrives via MQ to Shanoir-NG.