Main Page

Contents

ARIS is a laboratory software system for patient management, analysis and laboratory tests. It offers basic functionalities and a simple interface that can be flexibly configured to support the main tasks of a laboratory. ARIS has been designed specifically by Probitas Foundation (https://www.fundacionprobitas.org) and it is available to laboratories free of charge.

These pages contain all the useful information for both final users as well as administrators.

Probitas Foundation

Installation and Upgrades

First of all, the application needs to be installed in a regular computer. It will automatically install some required software platforms. The Installation and Upgrades page contains all the details and step by step instructions to do it. If an Internet connection is at hand, it can also be upgraded when a new version is available, as explained in the same page.

The application has been developed with native support in English and Spanish, however, it supports multilanguage. The Define new language page explains how to extend it to other languages.

Main page of the software

User Guide

The User Guide page contains all the information necessary for both final users as well as administrators. It explains all functionalities provided by the application.

Backup and Restore

As for any other information system, it is important to extract a copy of the database regularly, and move it to another support for safety reasons. The Backup and Restore page explains how such copy can be generated and accessed, as well as used to recover all the data in the unlikely case of database corruption.

Installation and Upgrades

ARIS > Installation and Upgrades

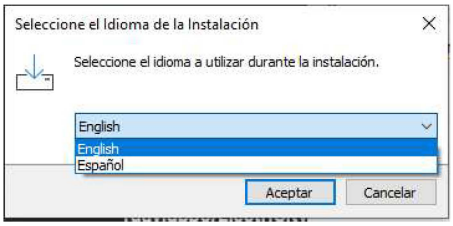
This is a step-by-step guide on how install and run the ARIS application. It contains information about its requirements, installation and upgrades.

Contents

Installing ARIS

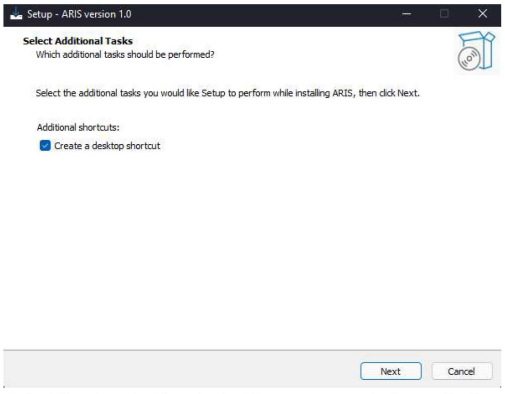
It is possible that when installing or running the application for the first time an administrator permissions window or a firewall windows will pop up. You should not worry much about it, and just accept it since the application will need the permissions to connect to internet to write the necessary files on your hard disk.

To start the installation, you have to execute the *ARIS_Setup* file, which is the installer of the application, available in different languages (notice that this is different from the language of the application itself). This will open a window where you can select the language of the installation instructions. Simply choose the language you are most familiar with.



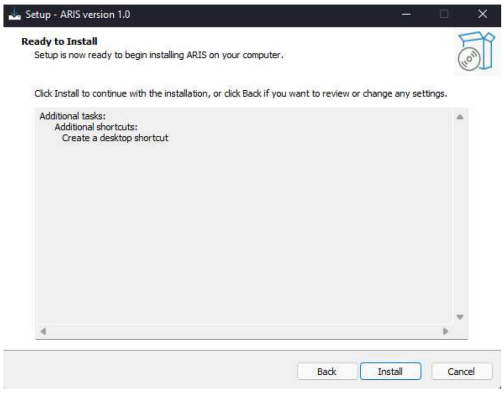
ARIS installer language selector

Once you select the language and click on the accept button, on the following screens you only have to click on the *Next* button. Notice that the *Create a desktop shortcut* is selected by default, we recommend selecting it.



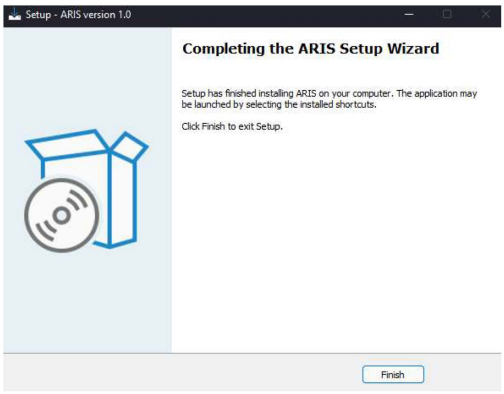
Select *Create a desktop shortcut* for easy access to the application

The next step is to click on the install button in the next window. This will install all the necessary files for the application to function properly.



Click *Install* to start the application installation

If everything went well a final window will show a satisfactory message, as it can be observed in the following image. To finalize the installation press the *Finish* button of the window.



Finish the application installation

Running ARIS

If you created a link in your desktop, just double-click it. Otherwise, go to the folder where you installed it (*C:\Users\Public\ARIS* by default in MSWindows) and double click *ARIS.exe*. The execution will open the ARIS services that will run in the background, you will find a new icon at the *hide icon menu* in the Operating system toolbar (typically on the bottom right of the screen). In addition, it will also open a new browser tab with the application running. Please be patient, this will take a while as the application needs to wait first for the services to start up in the background in order to work properly.

ARIS icon at the hide icon menu

ARIS icon at the expanded hide icon menu

Initial configuration

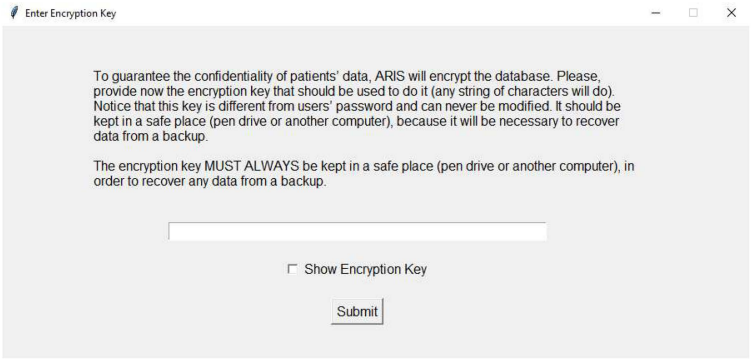
On starting up ARIS for the first time, there are two crucial things that need to be set, namely the encryption key and system administrator password.

Moreover, some initialization setting to the local facility where ARIS is installed, is also necessary (e.g., city and region names).

Optionally, WiFi access to the server can also be enabled.

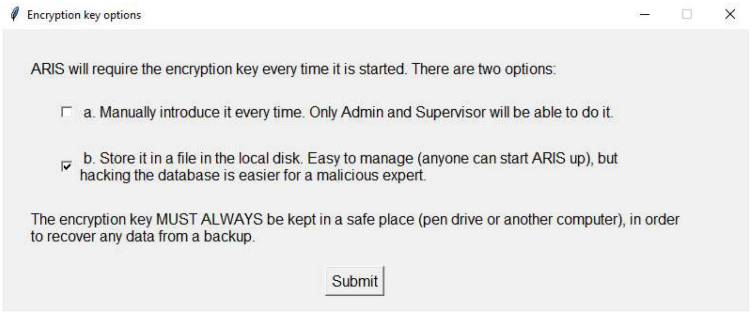
Encryption key

To guarantee the confidentiality of patients' data, ARIS will encrypt the database. Thus, the first time ARIS is started, an encryption key will be asked to the user. Notice that this key cannot be modified and needs to be kept in a safe place outside the laptop (necessary to restore a backup).



Window to enter the database encryption key

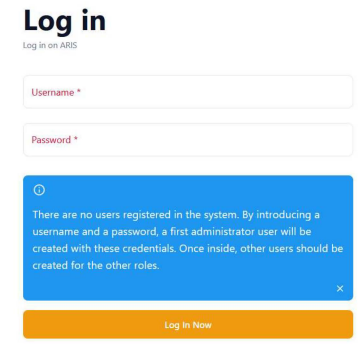
ARIS will require this encryption key every time the program is started. For this reason, the user will decide how to provide it: manually introduce it every time (only Admin and Supervisor will be able to do it) or store it in a file in the local disk (easier to manage, as anyone can start ARIS up, but hacking the database would be easy). Despite the choice, still remember keeping the encryption key in a safe place. Notice that in case of losing the encryption key, all data stored in the database will be lost.



Options to manage the database encryption key

System administrator password

On logging for the first time, a warning appears highlighting that there are no users in the system. Hence, access is automatically granted and a new *System Administrator* is created with the provided username and password (any values are accepted at this stage and recorded for further use in the system). The username can not, but the password can be modified at any time.



Message on login the empty system

Congratulations! you have successfully installed and executed the new ARIS application.

You should see a browser tab with the application running like this

As a first important note, the system has three different roles with different and complementary functionalities. Consequently, the first necessary thing is to create two more users with the other two roles *Laboratory Technician* and *Laboratory Supervisor*.

Features

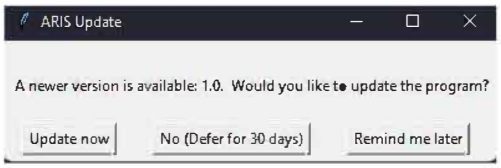
Once the other two users are created, it is important to notice that the initial setting contains some real values for most of the features like laboratory areas or services, but not for other configurable lists of values like regions, locations or health facilities which only contain a fake exemplary instance. This exemplary instances should be replaced by real ones before starting to introduce patients and requests in the system. This should be done through the Configuration functionalities by the *System Administrator* and *Laboratory supervisor*.

WiFi connection

ARIS allows other devices in the same network as the PC/laptop running the application to connect to the system and to work cooperatively. However, ARIS executes by default on “localhost” (i.e., the computer you are currently using, which is a way to access services or resources on your own machine without going over a network), and thus not allowing other devices (even if they are in the same network) to connect to this address. In order to make ARIS available to your network through a WiFi Connection, you need to modify the IP address as in the instructions.

Upgrading ARIS

To upgrade the application you will only need an Internet connection. Once you are connected to the Internet, if there is a new version of ARIS, a pop-up window will appear the next time that you open the application showing three options asking you to update it. The behavior of these options is described below:



Select one of the options

- **Update now:** This option will open a window with a progress bar and a button that you must press to start the update of the software, once this is updated (should take a few minutes), a message window will appear with a successful message, when you click on *Accept* the program will start with the last version.

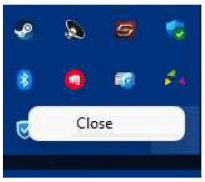
- **No (Defer for 30 days):** If you click this option, the software will not be updated and no update message will appear until 30 days have passed.

- **Remind me later:** Clicking on this option will not update the software, but the next time you launch the system, the update message will appear again.

Closing ARIS

When yo want to close the application you will need to follow two easy steps:

1. The first step is to close the browser tab where the application is running. This will only close the visual part of the application (i.e., opening again the browser and providing the same URL will still take you to the application), so be sure to execute the second step to actually interrupt the services running in the background.
2. In the second step you will need to right click on the ARIS icon located at the "hide icon menu" in the operating system toolbar, then click on close. This will finalize the services that were running on the background, it is important to finalize the services or otherwise you will not be able to reopen the application again (also this is the way to reset ARIS in case of any unstable behaviour).

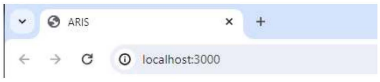


Close option when clicking on the ARIS icon to close services

WiFi Connection

Contents

ARIS allows other devices in the same network as the laptop/PC acting as server (i.e., the one where it was installed, and actually running the application) to connect to the system and work concurrently. However, ARIS executes by default on “localhost” (i.e., the server itself, which is a way to access services or resources on your own machine without going over the network), and thus not allowing other devices to connect (even if they are in the same network). Hence, this should be properly reconfigured to the right URL (or IP address).



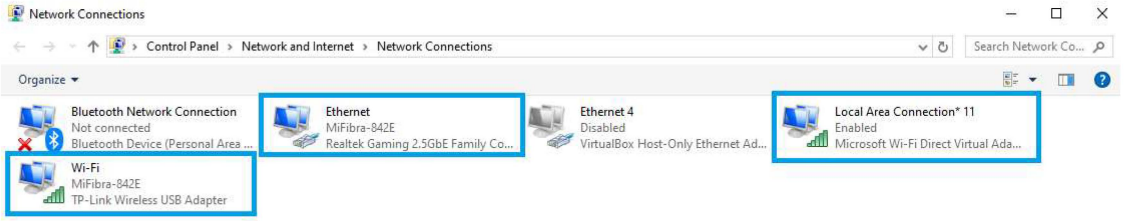
Default ARIS url

To make ARIS available through the WiFi connection, the first thing necessary is actually a WiFi. Just notice that this is different from having Internet connection, which is not really necessary at this point. There are actually two cases here. The first one is when the network already exists, and the second is when the network must be created in the same server in the form of a HotSpot.

Pre-existing network

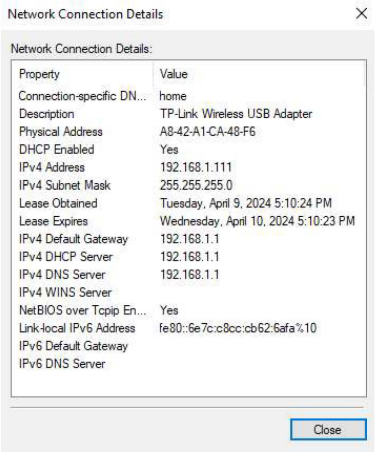
In cases where WiFi or Ethernet connections are already available, there is also the option to run the system in any of these networks. In order to be able to connect multiple devices on the same network to use ARIS concurrently, you will need to set the IP address as follows:

1. Look for the IP address (the unique number that identifies where the device is located in the network) of the server executing ARIS. Note that this IP address must be the one of the active network where both the server and the other devices MUST connect. To find out which is the IP address of the server, you should:
    1. Open Settings: Click on the Start menu (Windows icon) located at the bottom-left corner of your screen. Then click on the gear icon labeled "Settings" to open the Windows Settings menu.
    2. Navigate to Network & Internet Settings: In the Windows Settings menu, click on the "Network & Internet" option. This will take you to settings related to your network connections.
    3. View Network Status: In the Network & Internet settings, you'll see various options on the left side. Click on "Status". This will show you an overview of your network status.
    4. Change Adapter Options: Under the "Status" section, find and click on the "Change adapter options" link. This will open a window displaying all the network adapters available on your computer.
    5. Find Active Network Connection: In the Network Connections window, you'll see a list of network adapters. Identify the available network connection (one from these three in the following example: Ethernet, Wi-Fi or Local Area Connection - a.k.a. HotSpot) where ARIS needs to run. Note that the chosen network MUST be also available for the other devices to connect too (i.e., visible from those devices). Right-click on the active network connection and select "Status" from the context menu (right button in the mause or touch pad).



Network Connections example

    6. Check Connection Status: In the Status window for your network connection, click on the "Details" button. This will open a new window displaying detailed information about your network connection.
    7. Find the IP address: In the Network Connection Details window, look for the "IPv4 Address" field. This field will display your active IP address.



Network Connection details example

    8. Note Down the IP address: Take note of the IP address displayed next to "IPv4 Address." This is the active IP address of your PC in the network.
2. Copy this IP address in the 'ARIS\Frontend\build\server_ip.txt' file:
    1. Navigate to 'C:\Users\Public' folder and find the 'ARIS\Frontend\build\server_ip.txt' file.
    2. Copy the selected IP address to this file, removing the previous content.

Editing server_ip.txt

3. Save the changes and close the file.

Now, the next time ARIS starts, it will run in the desired URL.

Hence, you can type the URL (192.168.1.111:3000 in the example) in a browser of this or any other device connected to the same network and access ARIS concurrently. In this example, the selected network to run ARIS was "MiFibra-842E" (Wi-Fi). So all devices connected to this network, can thus access the application as in the server.

ARIS on network URL

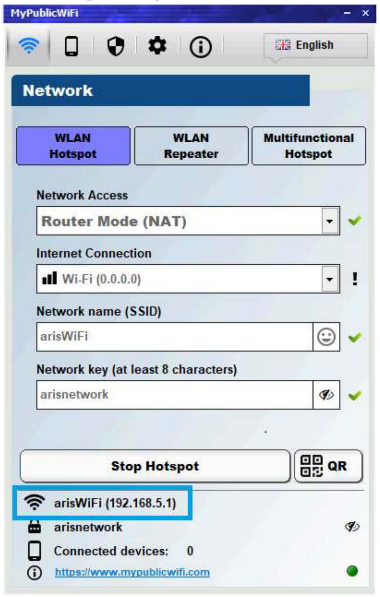
HotSpot network

In cases where neither WiFi nor Ethernet networks are available, the initialization of a Local Area Network (known as HotSpot) from the laptop/PC acting as server allows to create an access point in which other devices can connect and thus work concurrently with ARIS, even without any Internet connection. In order to set up and run ARIS in a HotSpot network, you must do the following:

1. Download and install MyPublicWiFi software (https://mypublicwifi.com/publicwifi/en/index.html), an assistant which will enable the creation of the HotSpot.
2. Once successfully installed, open the application. You will see the main configuration page.
3. In this page, select "WLAN Hotspot" tab and set the following options:

   Network Access: Router Mode (NAT)
   Internet Connection: Wi-Fi (0.0.0.0)
   Network name (SSID): arisWiFi (can be anything else)
   Network key: arisnetwork (can be anything else)

4. When finished, click the "Start Hotspot" button. In case of success, the IP address in which the HotSpot is running will be shown, alongside with the previously configured name of the network. At this point, nearby devices will be capable of connecting to the "arisWiFi" by selecting this network and introducing the key.



Setting the HotSpot configuration.

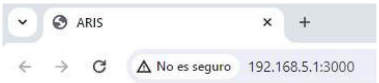
5. Find the 'C:\Users\Public folder and open the ARIS\Frontend\build\server_ip.txt' file.
6. Copy the IP address where the HotSpot is running (192.168.5.1 in the example) into this file, removing the previous content.

Editing server_ip.txt

7. Save the changes and close the file.

The next time ARIS starts, it will run in the HotSpot network URL. Hence, you can type the URL (192.168.5.1:3000 in the example) in a browser of this or any other device connected to the HotSpot and access ARIS concurrently.

Note that for this type of networks there is the option to set a custom server name instead of the numeric IP address, making it easier to access the system in the browser. The steps to set up this feature are explained in detail below.



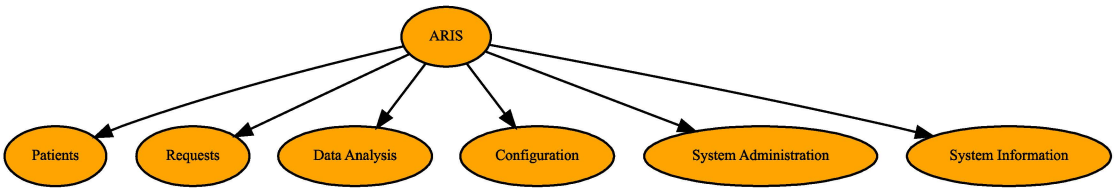
ARIS on HotSpot network URL

User Guide

ARIS > User Guide

This is a step-by-step user guide on the ARIS system. It contains information on what each functionality does and instructions on how to use them.

Contents



Log in page

The first step to work with ARIS, once the software is properly downloaded and installed (see Installation and Upgrades), the users have to create each an identity (username and password). Entering these both credentials will allow the access to the software and the screen will show now the main page of the system. If the username or password is incorrect, a red information box will pop up above the *log in now* button.

It is crucial to remember that the system has three different roles with different and complementary functionalities. Consequently, at least three users need to exist, one with each different role *System Administrator*, *Laboratory Technician* and *Laboratory Supervisor*.

Since the interface is through a browser, we have all of its typical features. Among others saving usernames and passwords (some browsers even do it by default). Notice that in this case, this is not a good practice and should be avoided.

0:00 / 0:20

Sidebar

The sidebar contains information about the user's account and is a tool to navigate between the different functionalities of the system.
At the very top of the orange sidebar, the software's name is displayed in a bold white font.

Just below the title, there is a small box that informs the user of the account currently in use, by means of the user's name and role corresponding to this username.
Underneath, there is a list of the different functionalities listed below.

Functionalities of the system

Functionality	Description
Patients	Create and edit patients, as well as navigate through the patients list.
Requests	Create and edit requests, as well as different types of search.
Data analysis	Basic statistics on the performance of the laboratory.
Configuration	Options offered by the system in the different dropboxes of the forms.
System administration	User administration and edition of software parameters.
System information	Software license, version and credits.

Most of these functionalities have subsets of actions that can be accessed through the small downward arrow to the right of the name. To change between actions, simply click on the desired functionality and the display will change.

General features

Arrow

This downward arrow is present when there is a menu with different options to choose from. The user can filter the options by typing out normally in the box. The options displayed can be manipulated through the Configuration functionality.

Asterisk

The red asterisk represents a mandatory field. In other words, if a box contains an asterisk, it must be filled in order to keep doing the desired task. The current action in progress will not conclude until all the corresponding fields are filled.

Delete

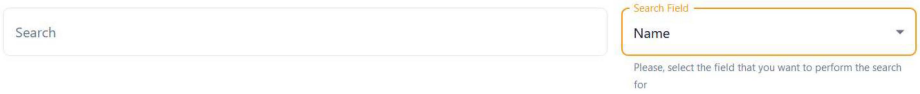
This button is generally found in the Configuration functionality. It allows the user to delete predefined instances of the different concepts, such as the regions or locations available in the creation of patients. There are exceptions to this action, the instances of some concepts are not deletable. For example, it is not possible to delete patients, requests or users.

Editing

In general, there is not any icon associated to the edition of elements. By simply clinking on the corresponding row, its details are displayed. These are then editable, except in the case of patients, that are read-only until a button to enable modifications is pressed.

The exception to this rule is the details of a test. In this case, this icon corresponds to the possibility of showing and potentially changing the results and notes of the test, as well as more information about the corresponding sample. This happens in the *Analytical tests* tab reached through either Introduce results, Validate results or Historical requests.

Search bar



There is a search box at the top of most of the forms that contain tables with lists of elements, like the *search patients* or *create requests* tabs. This search box allows the user to filter by different fields like name, phone, health facility ID, creation date or last modification date. To choose one of these, the user must click on the downwards arrow found to the right of *search field* and pick the desired field (this possibility is not available if the table contains only one column to be searched). Once the field is chosen, the user can type out the information corresponding to the search field in the box on the left.

There is a system parameter that establishes the minimum number of elements required for the search box to be shown (i.e., tables with a small number of elements may not require a search functionality).

Locked item

This icon appears attached to elements of a list that cannot be directly selected or deselected. This happens with groups of tests or profiles. Thus, choosing a group of tests does not allow removing any of its components, as they are an indivisible set.

Navigation bar

Language

The language in use is displayed in the top right corner of the page, the user is able to change it depending on their preference by clicking on the text and choosing the language desired. There are currently two options of language for the system; English and Spanish.

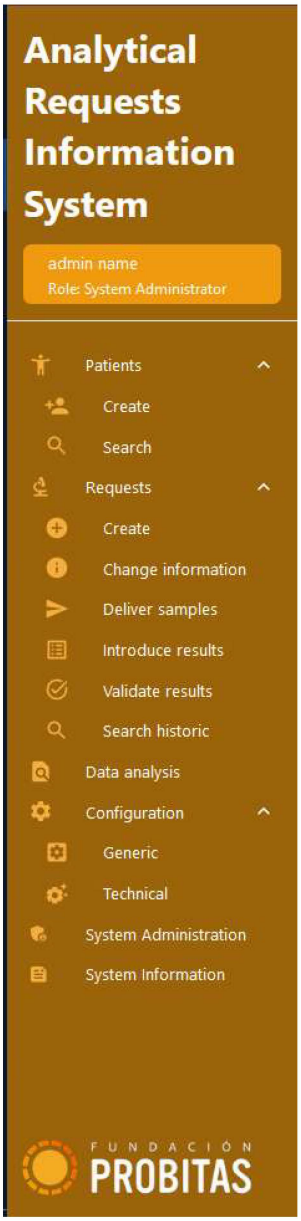
Profile

When clicking on this icon, found in the top right corner of the page, two options will show up. The first, is the log-out option, when pressing on this option, the page will change to the log in page, through which the user will be able to change the account they are using. The second icon, called change password, when clicked will produce a pop-up window where the user might change their password.

Change password

There are two ways of changing the password associated with the username:

1. The password can be changed by the user. All they have to do is press on the profile icon, click on change password, and a screen will come up with the title **Change password**. Next, the user must just fill in the required boxes with their current password, their desired password and, finally, confirm their new password.



Sidebar found on the left side of the interface

2. Another method to change the password would involve accessing the system administration functionality and going to the users tab. Once in this tab, the administrator can choose any other user, and click on edit user. Then, at the bottom of the page, the administrator can find two non-obligatory fields named *password* and *repeat password*. These must be filled in order to change the password.

Bluetooth (not visible by default)

By default, this icon is hidden, because most laboratories are not going to use this functionality (only those participating in the IMAGING project (http://dl-prod.essi.upc.edu/IMAGINGwiki/index.php/Main_Page)).

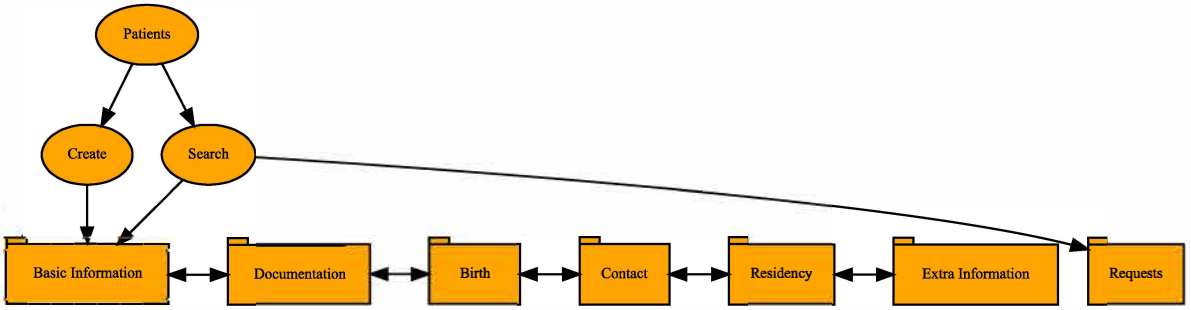
To make it visible, the value of the corresponding system parameter needs to be modified. For this, a *System Administrator* needs to log in and go to Parameters. There, they need to set 'bluetooth_enabler' to *Enable*. This will make the icon visible to all 'Laboratory Technicians'.

When a *Laboratory Technician* clicks this icon, the system will enable the Bluetooth connection of the system, and the users will be able to connect their mobile device to ARIS. This capability is used to transfer images from the Mobile App (http://dl-prod.essi.upc.edu/IMAGINGwiki/index.php/MobileApp:Main) in case of automatic tests. When Bluetooth is active, the icon will turn orange. From the moment the icon is orange, all the behaviour is managed from the Mobile App (http://dl-prod.essi.upc.edu/IMAGINGwiki/index.php/MobileApp:Main) (i.e., from ARIS interface, you can only enable or disable the Bluetooth and everything happens in the background). On clicking again, the feature will be disabled and the icon will be grey.

Patients

The basic information unit is the patient. Before creating any analytical request, the corresponding patient record must exist. This will survive the livespan of the request, and will contain all their history.

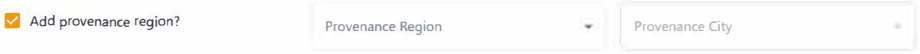
Contents



Create

This page is divided in a form with the basic information of the patient, involving the obligatory (*) entry of the *name*, *last name*, *gender*, *birth date* and *phone*, as well as multiple tabs with additional non-mandatory information.

1. Documentation information → Information such as the *number of clinical history* or the *type* and *number of an identifier card*.
2. Birth information → Complementary information such as the *birth region* and *locality*. Added to the previously introduced *birth date* and the automatically calculated *age* of the patient.
3. Contact information → Additional contact information.
4. Residency information → Apart from the basic residency information, it contains a checkbox at the bottom, *Add provenance region?*. This option is for when a patient, although local, has come from outside the country. When the box is ticked, two more boxes appear on the forms, *Provenance region* and *Provenance city*.



5. Extra information → Other data such as parent's names. The *Reserved 1, 2 and 3* are boxes whose names can be modified through the System administration if the laboratory requires any specific information from the patients.
6. Requests → This actually not a step in the creation or update of the patient, but just a read-only tab containing all the requests of the patient.

Once the mandatory information is entered, the *Save values* button at the bottom right of the page will be available.

Search and Edition

Table found in the Search function of the system

Name	Phone	Identification	Creation Date	Last Modification Date
The first column shows the patient's name	The patient's contact number is listed in this column	Here, the internal, automatically generated identification number can be found	This column informs about when the patient's information was first inputted into the system	The last time the patient's information was altered in the system is shown here

Arrows appear next to each heading in the table when the mouse is hovered over them to manipulate the order the information is showed in for each heading.

On clicking on any row, a new form will appear with the age, gender, phone and internal identifier of the patient as well as tabs with the information on the patient's documentation information, birth information, contact information, residency information, extra information and requests. From this page, the patient manager or laboratory technician can also edit the patient through the edit patient button at the bottom right of the page. To return to the search patients page, there is a Return button at the bottom left of the screen.

Notice that to avoid inconsistences in the system, patients once created cannot be deleted.

Duplicate Detection

The e-mail address as well as the Identifier document number are optional. Nevertheless, if provided, they identify a patient (i.e., they do not allow repetitions). Besides this, to guarantee the existence of an identifier for each patient, a consecutive number is always automatically generated and internally assigned by the system.

Moreover, patients of similar name, parent names, age and telephone number are detected as potential duplicates at creation time. On happening this, a warning is displayed, and the patient manager or laboratory technician can either modify the corresponding data or move ahead with the creation.

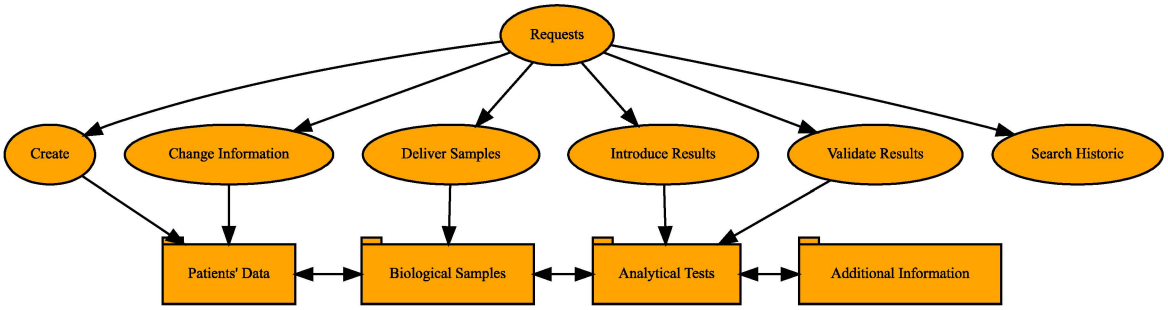
Notice that two patients are not considered similar (i.e., they are considered different) if either:

- Their age difference is greater than ten years, or
- Their name is different enough (more than 50% characters), or
- Their parent names are provided and at least one of them is different enough (more than 30% characters differ considering the three names together), or
- Their telephone numbers are different enough (more than 50% of the digits).

Requests

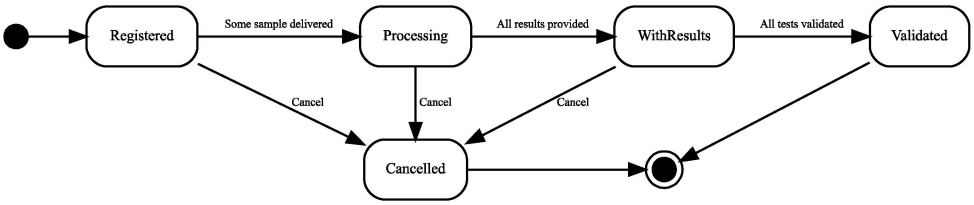
Requests are the most important entities in ARIS, whose main purpose is to manage them. They are always associated to a given patient, who must have been created before hand.

Contents



Request Lifespan

During their lifespan, requests go through some different states that determine the functionalities offered for them in the system. These states are depicted in the diagram, and their labels are modifaiable and configurable at State of the request.



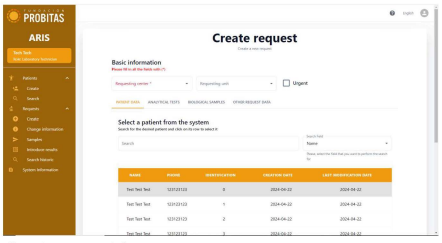
On creation, the state of the request is *Registered*, and allows to provide the basic information, as well as associate different tests to it. After indicating that some of the samples have been delivered, the state changes to *Processing* and the data of the request cannot be modified anymore. Other samples can be delivered later, but at this point, results can be provided for the tests whose sample was already delivered. Once all non-cancelled tests have a result, the state of the request changes to *WithResults*. At this state, results can still be modified, but they are expected to be eventually validated. A request with all its non-cancelled tests being validated is considered *Validated*.

At any time, a request, its samples or its tests can be cancelled. A sample with all its tests cancelled is considered cancelled, and a request with all samples cancelled is considered cancelled, too.

During the lifespan of a request, it is available to all the laboratory technicians, except for the validation, which can only be done by a laboratory supervisor or a specially authorized laboratory technician.

Create

This form is divided into tabs. The tab the laboratory technician is on is indicated by the label of the tab turning orange. Above, it can be found the *Requesting centre* mandatory field, alongside with the additional *Requesting unit* field and the *Urgent* checkbox. To create a request, the following steps must be executed:



Create request form

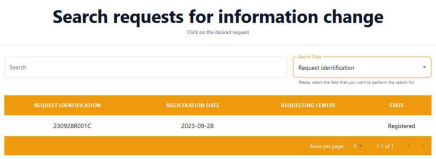
1. Select a patient → The first tab involves searching and selecting a patient. The search grid can be narrowed down with the search field. Once a patient is selected, the main and important information about this patient will be displayed at the bottom of the form in a table. Until the patient has been selected, the laboratory technician cannot save the new request.
2. Analytical tests → In this tab, the laboratory technician must choose which tests are requested and required for the patient. Groups and profiles will appear in case the proper parameter is enabled. More than one element from each list may be chosen, but at least one test must be requested one way or another. Tests selected as part of a group or profile (highlighted in purple) cannot be deselected individually.
3. Biological samples → This tab informs the laboratory technician of the type of sample that must be taken, depending on the tests chosen in the previous tab. There are no required fields in this tab, but if the laboratory technician wants to add a comment, there is a comment box for each sample.

4. Basic information → In this tab, other optional fields are provided like physician, the room or bed of the patient. Additional information like a diagnostic orientation or the pregnancy status can also be indicated.

At any moment, the *Save values* button cannot be used if any of the required fields is not filled in.

Change information

This form is for editing requests whose samples were not yet delivered. Clicking on any part of the row will bring the laboratory technician to a form similar to the create one, with all of its tabs and similar format and behavior.



Change information form

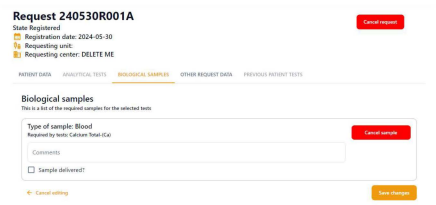
Deliver samples

Similarly to the previous form, this also displays a list of either *Registered* or *Processing* requests, for the laboratory technician to choose one of them.

Once a request is chosen, five tabs are shown. The patient's data, potentially analytical tests already done in this request, its list of biological samples, the request data, and tests in previous requests. Just the biological samples allows some interaction. The other ones are read-only (if enabled at all).

Each of the samples shown contains a field to provide comments, and it can be either checked as delivered or cancelled by click the corresponding red button. On the delivering of a sample, its origin or incident can be optionally provided. On cancelling, a pop-up dialogue allows, providing some justification for this.

It is important to notice that the tests associated to the request cannot be changed once the first sample as been delivered.

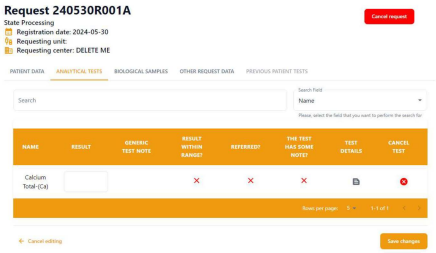


Deliver samples form

Introduce results

As in the previous cases, a list of requests is shown. In this case, this list contains all requests in *Processing* state. Clicking the corresponding button at the bottom, it is possible to download a worklist with all pending tests in these requests, to work on them off-line.

Once the laboratory technician has chosen a request, five tabs are shown with the patient's data, its list of analytical tests, its list of biological samples, other request data, and potentially previous tests of the same patient. Just the analytical tests allows some interaction. The other ones are read-only. Besides the same search box present in all the tables in the system, there is also the possibility of filtering the tests by group of tests (if any was chosen for this request). A red button in the top right corner allows cancelling the request.



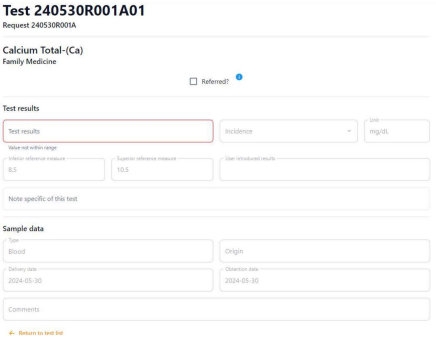
Form to Introduce Results

The table of tests contains the following columns:

1. Name → Shows the name and the code of the kind of test. It is coloured red if either the test or its sample was cancelled.
2. Result → Allows to introduce the result of the test.
3. Generic test note → Shows the informative note associated to the kind of test, if any.
4. Result within range → Indicates whether the result of the test is in the expected range of values for the kind of test (green check) or not (red cross).
5. Referred → Indicates whether the test is done or expected to be done in another laboratory (green check) or not (red cross).
6. Automatic (not visible by default) → Indicates whether the test is done or expected to be done automatically (green check) or not (red cross). Automatic tests are done by means of the Robotized microscope (http://dl-prod.essi.upc.edu/IMAGINGwiki/index.php/Microscope:Main) and the Mobile App (http://dl-prod.essi.upc.edu/IMAGINGwiki/index.php/MobileApp:Main). Their results should not be typed manually, but uploaded through Bluetooth. This feature is enabled through the corresponding system parameter. If enabled, the field is editable here to allow overwriting the automatic results.
7. The test has some note → Indicates whether the test has some associated note (green check) or not (red cross).
8. Test details → This should show an icon to navigate to further details of the test. However, if the test or its corresponding sample was cancelled, the corresponding message in red will be shown.
9. Cancel test → Icon to cancel the test. If the test is cancelled. A red *cancelled* label appears.

On the laboratory technician accessing the details of the test, we gain access to visualize many other things (i.e., units of the result, inferior reference measure, superior reference measure, the user who introduced the results, as well as details provided for the corresponding sample on delivering it). Moreover, this also allows changing if the test is automatic or deferred, indicate some incidence on the sample, or provide some note (notice that the content of this note will be visible to the patient in the report of the request). It is important to notice that any of the information provided in this form will not be persisted in the disk until back in the list and saved from there.

If the result of the test was provided automatically (which is not enabled by default and only available in the context of the IMAGING project (http://dl-prod.essi.upc.edu/IMAGINGwiki/index.php/Main_Page)), the corresponding image and its associated note will be shown at the bottom of the details of the test.



Test details

Validate results

0:00 / 0:17

This functionality, available only to the laboratory supervisor or a laboratory technician authorized to validate, uses exactly the same interface as introducing results, but the table shows one more column, *Validated*, with a checkbox for each test. These can be checked one by one, or all at once, by choosing a concrete group of tests in the dropbox at the top. On doing the latter, a button to check all the tests of the group will appear.

Besides doing it in the list, the results can be overwritten and the test validated from the details of the test. Together with displaying all the information related to the test in read-only mode, the corresponding form also offers the possibility of adding a note to the test, as well as changing whether the test is automatic/referred or not, cancelling the test or the whole request.

It is important to notice that the tests will not be really validated until the bottom right button is pressed to save the changes.

Search historic

0:00 / 0:54

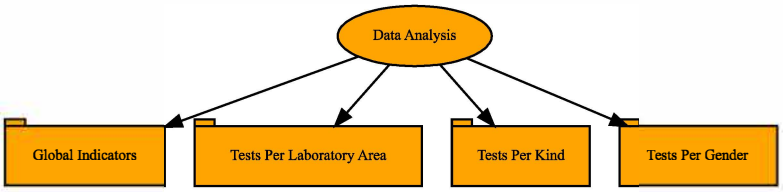
This functionality, available to both laboratory technician and supervisor allows to see any request in the history of the laboratory. They can be filtered out by the state and the date of the request. By clicking on the corresponding row, all the details of the request can be visualized.

At the bottom left of this form, there are two download buttons. Clicking any of them will generate and download the corresponding file (i.e., CSV or ZIP). The checkboxes in the Downloaded fields tab indicate which fields will be included in each of these files. Moreover, the ZIP file is password protected. The password used is indicated by the system parameter *zip_password*, whose value can be seen and modified from Parameters tab.

Data analysis

This provides a very basic analytical functionality based on counters. It basically allows the laboratory supervisor to keep track of the number of tests performed (potentially grouped) and some basic elements related to the requests.

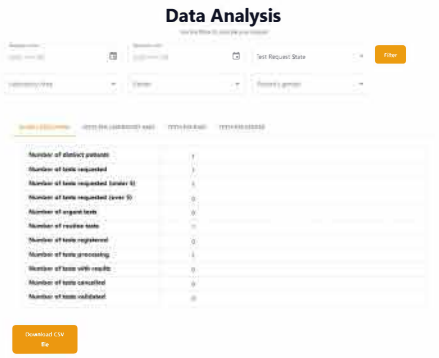
Contents



Database queries

This form contains a filter at the top of the screen, which allows the laboratory supervisor to choose the parameter for the database search. There are nine filter fields available, at most (only those being used in the existing requests are shown).

1. From (request's creation date): the data taken will only contain requests created after this date.
2. Until (request's creation date): the data taken will only contain requests created before this date.
3. Test request state
4. Laboratory area
5. Requesting centre
6. Requesting unit
7. Patient's gender
8. Patient's provenance region
9. Patient's provenance location



Data analysis form

Not all filters are always visible. If the ARIS database does not contain values for a specific element, the filter for this element will not be shown to the laboratory supervisor.

Global indicators

This tab contains a table with counters, which shows the laboratory supervisor the number of certain elements that are in the ARIS database.

Tests per laboratory area

This tab groups together all the tests that belong to each laboratory area and shows the laboratory supervisor the number of each one.
At the bottom left of this tab, there is a download button. When clicked, this button will download every piece of information found in the screen into the laboratory supervisor's computer.

Tests per kind

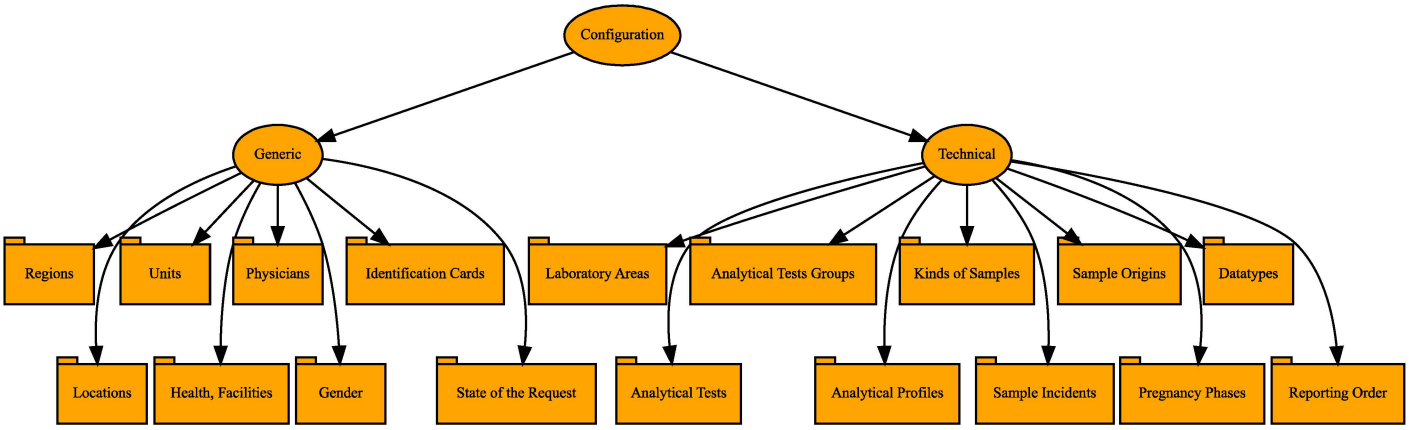
This tab groups together all the kinds of tests and shows the laboratory supervisor the number of each one. It also informs the laboratory supervisor as to which laboratory area each kind of test belongs to.
At the bottom left of this tab, there is a download button. When clicked, this button will download every piece of information found in the screen into the laboratory supervisor's computer.

Tests per gender

This tab groups together all the tests that belong to each gender and shows the laboratory supervisor the number of each one.
At the bottom left of this tab, there is a download button. When clicked, this button will download every piece of information found in the screen into the laboratory supervisor's computer.

Configuration

The configuration functionality allows the user to manipulate ARIS, adding or changing some of its aspects for a better customization. These have been divided into two groups, depending on the knowledge needed to use them. The first group is absolutely generic and both laboratory supervisor and system administrator should be able to provide the required information. However, for the second group, more specific biomedical knowledge will be needed, and consequently only the laboratory supervisor is allowed to do it.



Contents

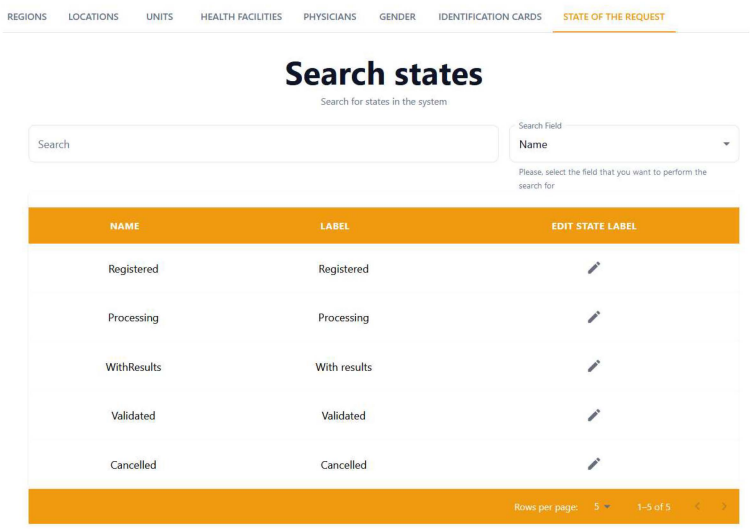
Generic configuration

This form controls the values of all non-free text fields (i.e., those that appear when clicking on an arrow) within the system. Through each tab, the user is able to create, edit and delete the values of one of these fields. If the laboratory is not interested in one of the values, but the user does not wish to delete the information from the system, it can be simply disabled, so it will not be shown in the corresponding drop-down menu. This is done by unticking the *Active* checkbox. This is a very important feature, since deleting some configuration value will produce a cascade effect that will delete all other configuration records pointing to the deleted one (e.g., deleting a region will delete all its locations). Patients or requests will not be deleted, but the corresponding information will not be displayed any more (e.g., after deleting a region, this information in the patient will become empty).

☑ Active ⇔ ☐ Active

List of tabs:

- Regions (initially empty)
- Locations (initially empty)
- Units
- Health Facilities (initially empty)
- Physicians (initially empty)
- Gender
- Identification cards
- State of the request



Editing the labels used for the states

Some of them also include hierarchical information. Thus, physicians point to health facilities, health facilities point to locations and these to regions. This information is used in the forms to show the right available values depending on the parent choice in the hierarchy.

State of the request

From the *state of the request* tab, only the *label* field can be edited. Notice that this indicates the different phases a request goes through in the application during its lifecycle, and not only a passive value to be stored.

Technical configuration

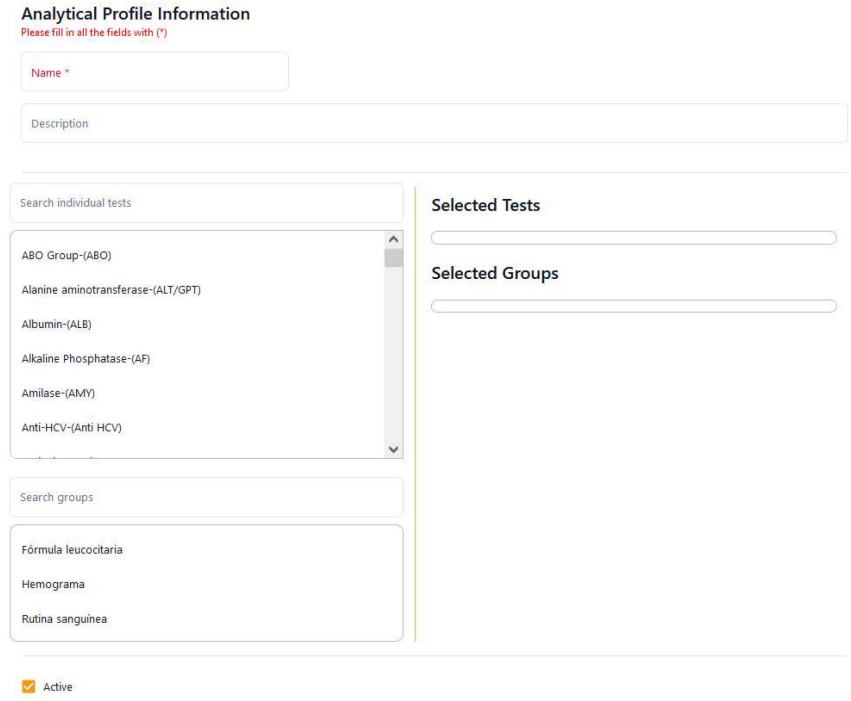
The *Laboratory areas*, *Kinds of sample*, *Sample incidents*, *Sample origins* and *Pregnancy phases* tabs, have exactly the same effect as the ones under the generic configuration (i.e., they simply provide the available values in drop boxes). However, the following tabs have further effects in the behaviour of the forms.

Analytical tests

This is without doubt the most crucial concept in the configuration, since it defines the available kinds of tests in the laboratory. They are identified by a name, but also contain a code that will always be shown next to the name. To facilitate the management of the laboratory, kinds of tests are assigned to a laboratory area, which will be used both in the generation of reports for the patients, and in the analysis of data regarding the performance of the laboratory itself.

Each kind of test is then related to a kind of sample. Only after that kind of sample is provided by the patient, the corresponding test will be allowed to have an associated result.

Each test must have a datatype, which indicates the kind of result it will accept, this being either numerical (integer or real) or enumerate. For numerical test results, units of the test can be indicated for informative purposes, together with upper and lower bounds of the result can be defined. These will be automatically checked. Only results within the declared boundaries will get a green tick next to them. Those outside the boundaries will be detected and automatically marked with a red cross. Validating the value will rely anyway on the laboratory supervisor. However, a note can be provided here to indicate exceptions to the boundaries or any information that is considered relevant to either the technician or the supervisor.



Editing analytical profiles

Finally, there are two specific boolean fields:

- Referred → Indicates that an action or test is performed in another hospital. The option marked in the configuration only determines the default of this field for each test. It does not impede the laboratory supervisor from choosing differently in the Requests forms.
- Automatic → Enables the kind of test to be partially automated. The result of the test is not manually obtained by a person, but by an AI. If this option is disabled in the configuration, the laboratory supervisor will not be able to mark it otherwise in the Requests forms. However, if it is enabled, the laboratory supervisor will be able to choose if they desire for the test to be done automatically or not in the Requests forms.

Analytical tests groups

In this tab, groups of tests can be formed for a quicker selection when choosing which tests to perform on a patient. When creating or editing a new group, a *Group Of Tests Information* form must be filled in or modified. In this form, the group must be given a name and the laboratory supervisor must choose the tests included in the group from the box provided. In the left-hand side list, the groups are in alphabetical order and if the laboratory supervisor wishes for a quicker option, there is a search bar on top of the box to write down and filter the tests. Simply clicking on the name of a test adds it to the group, hence appearing in the right-hand side list.

The analytical tests groups are also used to sort the tests in the generated report of a request.

Analytical profiles

In this tab, profiles of tests can be formed for a quicker selection when choosing which groups of tests or individual tests to perform on a patient. When creating or editing a new profile, an *Analytical Profile Information* form must be filled in or modified. In this form, the profile must be given a name and the laboratory supervisor must choose the tests and the groups included in the profile from the lists provided. The groups and tests are in alphabetical order and if the laboratory supervisor wishes for a quicker option, there is a search bar on top of the box to write down and filter the tests and groups.

Choosing a group selects in the corresponding list all the tests belonging to it. Then, these cannot be individually removed from the profile, but only by removing the group. Moreover, a test added later to the group will automatically appear as part of any profile containing that group, which is indicated by a lock icon next to the test name.

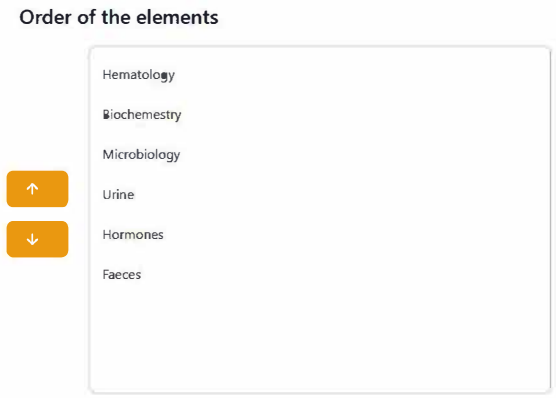
Analytical profiles do not have any effect in the report generated for a request.

Datatypes

Enumerate datatypes can be defined here (integer and real numbers are always available). These are simply lists of potential results that can be used in any kind of test.

Reporting order

This tab allows ordering the elements in the PDF worklist and in the report of a request. The tests appearing in them will be firstly sorted by laboratory area, then groups of tests, and finally individual tests. This is done by choosing one of the three elements, which will lead to another form with a list and two vertical arrows on the left side of the image. Any number of elements can be simultaneously selected by simply clicking on them. Then, the arrows will allow moving them up or down in the list, and hence in the generated PDF documents.

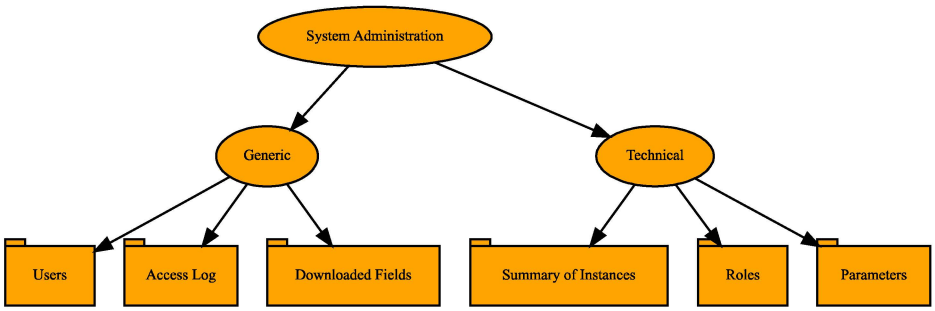


Editing the laboratory areas order from the reporting areas tab

System administration

This groups all knobs that allow to manage and adapt the behavior of ARIS to the needs of the laboratory and user preferences. They are grouped in two to facilitate their access. The first one is more generic and allows both laboratory supervisor and system administration to access some basic stuff. The second one is only available to the system administrator, since it is considered to require more advance technological skills.

Contents



Generic

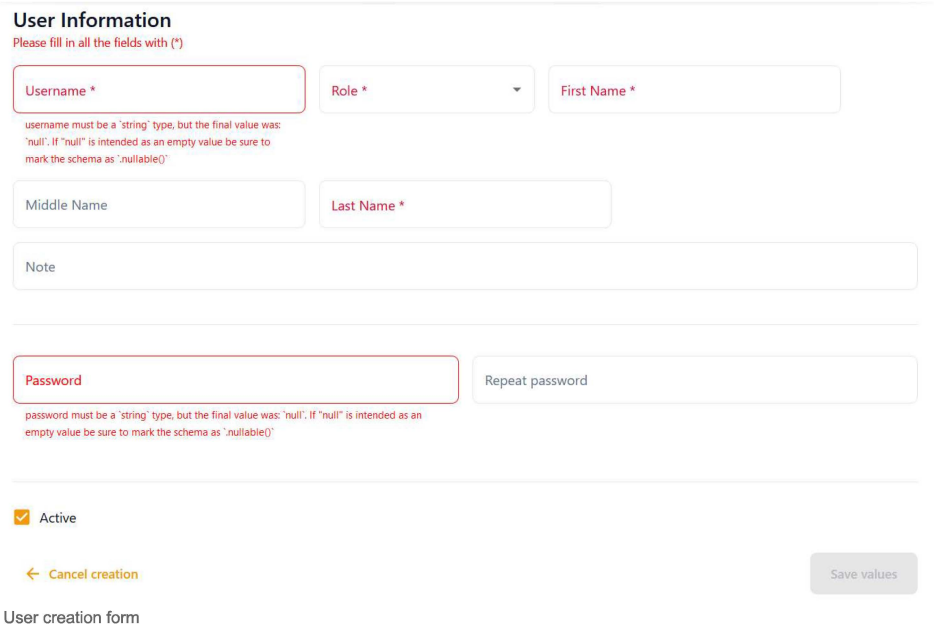
This groups all the basic administration functionalities. They are available for both the system administration and the laboratory supervisor.

Users

When clicking on the edit or *New user* buttons, a form pops up on the screen. The information necessary to create a user consists of a *Username*, *Name*, *Middle name*, *password* and the person's Role within the system. This Role will determine the functionalities available to the user. A note, without any effect in the behaviour of the application, can be added to indicate any relevant information to the system administrator.

This same form allows the system administrator to modify the password of any other user. For security reasons, this password must contain some number, some capital letter, some small letter, and at least eight characters.

Since they are used for auditing changes in patients and requests, the users cannot be deleted from the system. However, they can be declared not to be active, which would prevent them from logging in, but still keep track in the database of all their past actions.



User creation form

Access log

The *access log* shows the user which user has done an action within the system and exactly when. The timestamp is in the format **Year-Month-Day Hour:Minute:Second**

There are three actions recorded by the access log, *successful log in*, *wrong user* and *failed log in*. This last action refers to the wrong password being used.

TIMESTAMP	USER	ACTION
2023-03-07 19:19:59	admin	Successful log in
2023-03-09 22:51:28	admin	Successful log in

Example of access log

Downloaded fields

ARIS allows the laboratory supervisor to download all the information in the database into a single file in their computer. There are two possible download options, depending on the format of the generated file being plain CSV or compressed and password-protected ZIP. These documents will contain information on the requests, and by extension, on the corresponding patients. Thus, due to patient confidentiality, not all the personal data should be in the downloaded file. The checkboxes in this form allow the laboratory supervisor as well as the system administrator to decide which fields will be downloaded in each one of the formats.

Technical

This groups all the more advanced administration functionalities. They are available only for the system administration.

Summary of instances

This tab displays information about the different existing instances in the application. Some examples are: the number of patients, users, requests or genders. This information comes directly from the database and is automatically updated after every modification in the system. It can be useful to investigate potential performance problems in case of extremely large numbers. To facilitate the reading and identification of the different kinds of instances, the information is divided into three sections: *Data*, *Administration* and *Configuration*.

Summary of instances

Roles

This tab is displayed and works, in the same way as the State of the request tab in the Configuration functionality. The roles are unchangeable, but their labels (not the corresponding functionality) can be customized.

Each role has different actions allowed within the application, chosen due to the tasks the people are expected to carry out. Thus, there are five roles within the system, which indicate the functionalities that a user can perform, as can be seen in the following table.

Allowed functionalities per role

Functionalities		Patient Manager	Laboratory Technician	Laboratory Technician with Validation	Laboratory Supervisor	System administrator
Patient	Create	✓	✓	✓	✗	✗
	Search	✓	✓	✓	✗	✗
Request	Create	✗	✓	✓	✗	✗
	Change information	✗	✓	✓	✗	✗
	Deliver samples	✗	✓	✓	✗	✗
	Introduce results	✗	✓	✓	✗	✗
	Validate results	✗	✗	✓	✓	✗
	Search historic	✗	✓	✓	✓	✗
Data analysis		✗	✗	✗	✓	✗
Configuration	Generic	✗	✗	✗	✓	✓
	Technical	✗	✗	✗	✓	✗
Administration	Generic	✗	✗	✗	✓	✓
	Technical	✗	✗	✗	✗	✓

Parameters

Parameters determine the behaviour of some functionalities. Thus, they cannot be created or deleted. However, their values can be updated to customize the system. At this point it is important to highlight the on updating them, the data type must be respected. Providing a value of the wrong data type (e.g., a string instead of an integer) can provoke the malfunction of the whole application.

The following table contains the list of existing parameters together with the corresponding data type and a brief description.

System parameters

Name	Data type	Description
attribute_reserved1	String	Label of the first field of free use in the requests (write 'DoNotShow' to hide it)
attribute_reserved2	String	Label of the second field of free use in the requests (write 'DoNotShow' to hide it)
attribute_reserved3	String	Label of the third field of free use in the requests (write 'DoNotShow' to hide it)
backup_frequency	Integer	Minimum amount of hours that need to pass for the system to generate a new copy of the database
backup_history	Integer	Maximum number of copies of the database kept (once reached, the oldest copy in the folder is deleted)
bluetooth_enabler	String	Indicates the availability of automatic tests through Bluetooth connection (accepted values are 'Enabled' and 'Disabled'), which is only used in the IMAGING project (http://dl-prod.essi.upc.edu/IMAGINGwiki/index.php/Main_Page)
default_language	String	Language set by default on logging in (the same for all users)
filename_background	String	File containing the image displayed in the background
filename_favicon	String	Icon of the system used in the browser tab
filename_sidebarlogo	String	File containing the logo displayed at the bottom of the sidebar
filename_worklistlogo	String	Logo used in the worklist reports
groups_profiles	String	Shows groups and profiles for analytical tests (accepted values are 'Enabled' and 'Disabled')
log_history	Integer	Maximum number of days to keep registries in the access log (those older than this will be automatically deleted)
max_image_volume	Integer	Maximum number of megabytes used to store images (once reached, the oldest ones in the folder are deleted)
name	String	Caption to appear at the top of the screen (in the navigation bar), as well as in the worklist and reports
report_subtitle	String	Subtitle to be used in the worklist and reports
table_default_paging	Integer	This indicates the initial paging of all the tables (accepted values are 5, 10 or 25)
table_min_rows_for_search	Integer	This is the minimum number of rows a table must have to show the corresponding search field
timeout	Integer	Time (in minutes) after which the connection to the backend requires a new log in
version	String	Version of the system
zip_password	String	This is the password that will be used to generate the downloaded zip file

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