GIFT-Cloud

A secure data storage and collaboration platform

Technical Manual
Version 1.8

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1 Introduction

GIFT-Cloud is a platform for securely sharing medical imaging data for use in academic research. It was developed as part of the GIFT-Surg project, by the Translational Imaging Group at University College London (UCL) [1].

Data are anonymised and hosted on a dedicated server. Users may view and download data by logging into a secure website, or by using GIFT-Cloud compatible software. Users can upload new data using the GIFT-Cloud Uploader software. This automatically anonymises data before upload, and provide PACS integration making it suitable for use in a hospital environment.

GIFT-Cloud is built using XNAT, a widely-used open source imaging informatics platform developed by the Neuroinformatics Research Group (NRG) at Washington University [2][3].

GIFT-Surg is funded by the Welcome Trust and the Engineering and Physical Sciences Research Council, and is a collaboration between UCL, Katholieke Universiteit Leuven (KU Leuven), University College Hospital (UCLH), Great Ormond Street Hospital (GOSH), and Universitaire Ziekenhuizen Leuven (UZ Leuven).

Disclaimer

GIFT-Cloud is intended for academic research use only. It is not permitted to use GIFT-Cloud for diagnosis, treatment planning, or any other purpose that can impact on patient care.

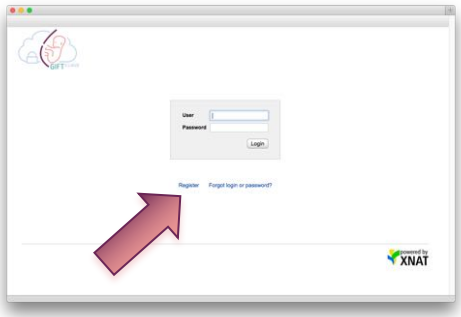
2 How to access GIFT-Cloud

GIFT-Cloud can be accessed from within UCL, KUL and UZ Leuven.

Before using GIFT-Cloud for the first time, you will need to register for a personal account. You will also need to configure the security settings on your computer.

Create a personal account on GIFT-Cloud

1. Go to the GIFT-Cloud website https://gift-cloud.cs.ucl.ac.uk
2. Click **Register**



3. Fill in the form with your personal details and a username and password.
4. You will receive an email asking you to verify your email address.
5. For security reasons, your registration will be reviewed by the GIFT-Cloud administrators. You will receive an email when your account is ready to use.

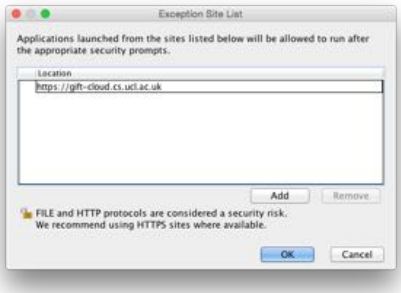
Once your account is activated you can log into the website above and view and download data.

Data are contained within a number of different 'projects' on GIFT-Cloud. If you do not have access to the projects you require, please talk to the GIFT-Cloud administrators.

Configure JAVA

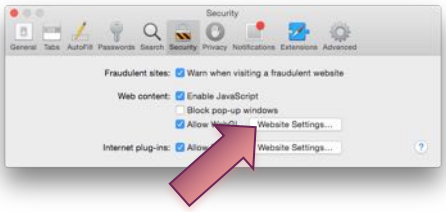
You will need to follow this step to use the download applet to download multiple subjects or studies:

- Install Java if is not already installed.
- Open the **Java Control Panel**
  - *Mac OSX: System Preferences > Java*
  - *Windows XP: Start > Control Panel > Java*
  - *Windows 7: Start > Control Panel, then enter Java Control Panel in the **Control Panel Search***
  - *Windows 8: search for Java Control Panel*
- Go to the **Security** tab.
- Ensure there is a tick next to **Enable Java content in the browser**.
- Set the Security level to **High**.
- Next to the **Exception Site List**, click the Edit Site List button. Then click **Add**. Enter https://gift-cloud.cs.ucl.ac.uk and click **OK**

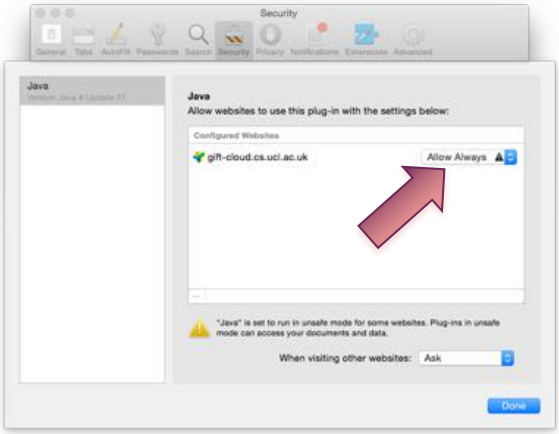


Configure your browser – OSX Safari (Mac)

- Go to **Safari** > **Preferences** > **Security**
- Under **Internet Plugins**, enable **Allow Plug-ins** and then click **Website settings**



- Click on **Java**.
- Next to "gift-cloud.cs.ucl.ac.uk" change the drop-down to **Allow Always**:

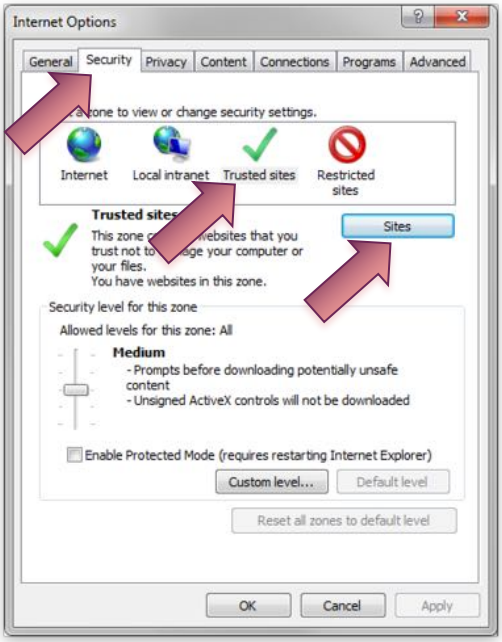


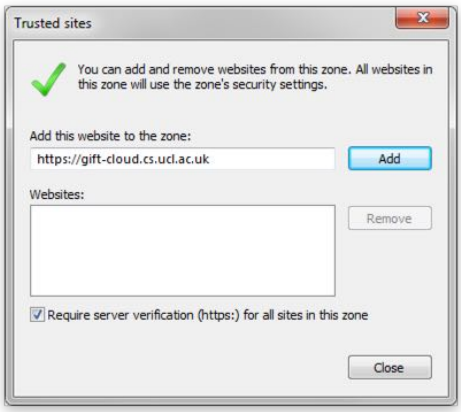
- Now change the same drop-down to **Run in Unsafe Mode** and click **Trust** when prompted *(NB due to a bug in Safari you have to change the drop-down to "Allow Always" before you can successfully change it to "Run in Unsafe Mode").*

> *Note: If you do not see gift-cloud.cs.ucl.ac.uk listed under Java, try restarting Safari and registering and logging into GIFT-Cloud as described below, and then come back and configure this screen later.*

Configure your browser – Internet Explorer 11 (Windows)

- Click the cog at the top right of the screen and select **Internet Options**
- Click the **Security** tab
- Select the **Trusted Sites** zone
- Click the **Sites** button
- Under **Add this website to the zone:** enter https://gift-cloud.cs.ucl.ac.uk
- Click **Add**





Configure your browser – Firefox

1. Select the **Tools** menu and click **Add-ons**
2. Select Plugins from the left-hand side of the Add-ons Manager window
3. Click **Java (TM) Platform plugin** (Windows/Linux) or **Java Applet Plug-in** (Mac)
4. Change the selected option to **Always Activate.** *NB. on older Firefox versions, click the **Enable** button*

Browsing the GIFT-Cloud website

GIFT-Cloud uses a customised version of the standard XNAT web interface. Detailed user documentation can be found on the XNAT website:

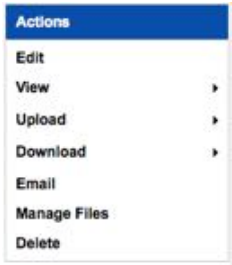
https://wiki.xnat.org/display/XNAT16/Home

Data is grouped into a number of projects, some of which contain clinical data, while others contain testing data. The projects to which you have access are listed on the Home tab. Click on a project to view its contents.

Within each project are the imaging subjects. When data is uploaded, it is anonymised and subjects are assigned an auto-generated name such as UCH-GIFTSURG-00042. Click on a subject to view the data for that subject.

For each subject, images are grouped into ‘experiments’ (each corresponding to Dicom ‘studies’), and these are further grouped into ‘scans’ (each corresponding to a Dicom ‘series’). Within each scan (series) are the individual files. By clicking on a scan you can see a preview image and examine the Dicom headers for the files in that scan.

When examining scans, the action menu on the right side of the screen gives you options to download and examine files:



3 Downloading data

You can download data directly from the website, or using suitable software. This manual will discuss downloading data from the website.

Download data from one study

You can download one or more scans from the same study using the **Manage Files** action. Studies are also known as *sessions* or *experiments*.

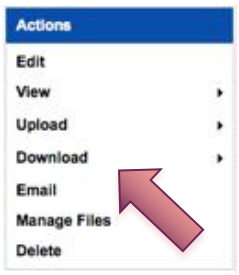
- Log into GIFT-Cloud, or select **Home** to go to the main page
- Select a project
- Select a subject
- In the **Subject Details** window, click on the Study you wish to download
- Under the Actions menu on the right, click **Manage Files**
- Tick all the series you wish to download, and click **Download**
- The images will be saved to your Downloads folder

Note: the Manage Files action operate from a study, not from a subject

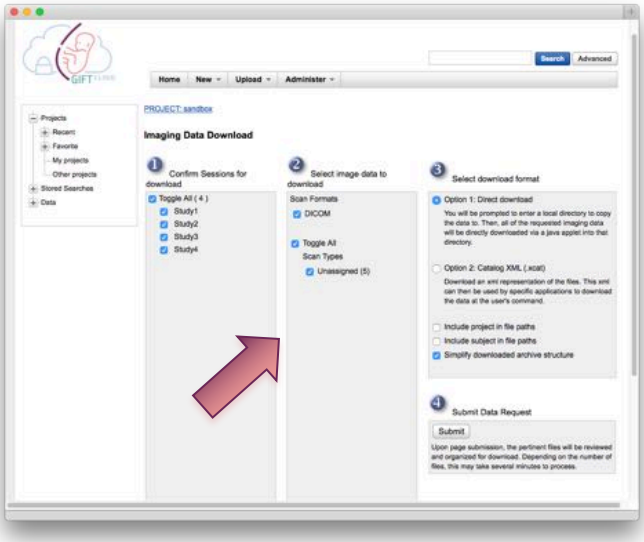
Download data from multiple subjects

You can follow this procedure to download data from more than one study or more than one subject.

- Make sure you have configured your web browser as described in section 2 above. Otherwise the download applet may not run correctly.
- Log into GIFT-Cloud, or select Home
- Select a project
- From the actions menu on the right, select **Download** Images, or select **Download** and then select **Download Images**. This is also available from search results via a drop-down menu.



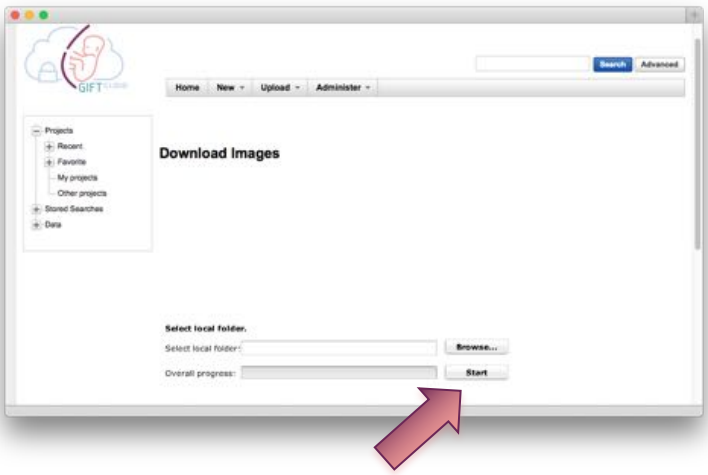
- The **Imaging Data Download** screen will appear. If it does not, please check your browser settings as described in section 2 above.



- Ensure you tick all the sessions (studies) you wish to download in the first column. Make sure you tick **all** the scan formats in the second column, including **Unassigned** (see image above), unless you wish to exclude particular scan types.
- Click **Include project in file paths** and **Include subject in file paths** if you want the folder names created for the downloaded data folders to include the GIFT-Cloud project and subject names.
- Click **Submit**.

If you get the following security warning, click **I accept this risk** and click **Run**.

When the Download Images page appears, click **Browse** to select a folder where the downloaded images will be saved.



When you browse for a path, if you do not see your local paths appearing in the dialog, it may be because you have not configured your Java and your browser as described in section 2 above.

- Click **Start** to start download.

More details about using the XNAT downloading interfaces are found in the XNAT documentation on the XNAT website:
https://wiki.xnat.org/display/XNAT16/XNAT+Data+Management#XNATDataManagement-HTTPDownload

4 Uploading data

You can send data to the GIFT-Cloud server using the **GIFT-Cloud Uploader**. Anonymisation and encryption will be performed automatically before uploading. GIFT-Cloud Uploader supports the following methods for uploading:

- Select files and directories from your local machine, network drive, USB stick, DVD etc.
- Drag-and-drop files and directories from your local machine, network drive, USB stick, DVD etc.
- Act as a Dicom listening node, and automatically anonymise and upload data pushed to your machine
- Manually query multiple datasets from a PACS or other Dicom-compatible service, then retrieve, anonymise and upload the data.

If you want to push data from a PACS system, medical scanner, OsiriX or other DICOM-compatible software, then you can configure GIFT-Cloud Uploader as a DICOM listening node that will receive and upload DICOM data. You may wish to install this on a dedicated **Gateway** server – see section 5 below.

Requirements

GIFT-Cloud Uploader runs on most versions of Windows, macOS, and Linux. You need to have the following software:

- Oracle Java 6 or later *(NB. Java 6, 7, 8 are also known as Java 1.6, 1.7, 1.8 respectively)*
- Java Advanced Imaging libraries *(only required if you will be performing pixel data anonymisation)*
- *Linux only:* If you are using a non-Oracle version of Java, you may need to separately install Java Webstart or compatible software such as IcedTea for Linux.

macOS users

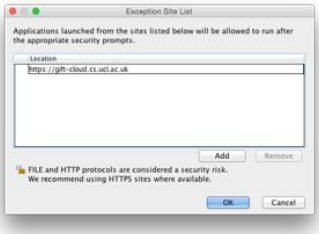
macOS users may need to configure their operating system to permit running of all applications:

- Select **System Preference**s from the Apple menu
- Select **Security and Privacy**
- Select the **General** tab and click the padlock to make changes
- Choose **Allow apps downloaded from Anywhere**.

  *Note: If you do not wish to enable the option for software from anywhere to run, you can instead give an explicit permission for GIFT-Cloud Uploader to run. To do this, you will need to attempt run the application first. Depending on your macOS version, you may be prompted to allow GIFT-Cloud Uploader to run, If you receive an error "Not permitted to run by your security preferences" then you will need to return to the **Systen and** Security menu where you will be given an option to allow GIFT-Cloud Uploader to run.*

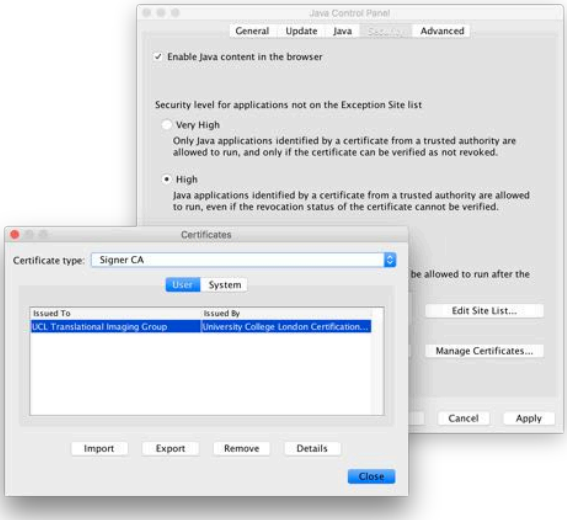
Configuring Java

- Open the **Java Control Panel**
  - *Mac OSX: System Preferences > Java*
  - *Windows XP: Start > Control Panel > Java*
  - *Windows 7: Start > Control Panel, then enter Java Control Panel in the **Control Panel Search***
  - *Windows 8: search for Java Control Panel*
- Go to the **Security** tab.
- Ensure there is a tick next to **Enable Java content in the browser**.
- Edit the **Java Exception Site List** and add https://gift-cloud.cs.ucl.ac.uk



If you have been provided with public CA signing certificates from the UCL Translational Imaging Group, you can add these now:

- Click **Manage Certificates**
- Next to Certificate Type, select **Signer CA**.
- Click **Import**
- Under File Format, select **All Files**
- Navigate to the certificate file, select and click **Open**
- Click Close to close the Certificates dialog box



Installing GIFT-Cloud Uploader

To install GIFT-Cloud Uploader:

- Install and configure Java as described above.
- In a web browser, go to the GIFT-Cloud website https://gift-cloud.cs.ucl.ac.uk and log in using the credentials provided. *Note: you can only access this website once your institution's IP ranges have been permitted by the administrators of the GIFT-Cloud Server – see **Before you start** above.*
- Click **Upload** from the top bar of the webpage.
- If GIFT-Cloud Uploader does not download automatically, click the direct download link as instructed.
- If GIFT-Cloud Uploader does not start automatically, check your **Downloads** folder and launch the **GiftCloudUploader.jnlp** or **webstart.jnlp** file.

The first time GIFT-Cloud Uploader runs, you may receive a message asking you to confirm that you wish to run the software. Click **Run** to continue. The Uploader will then run and add shortcuts to the Start menu (Windows) and the desktop. Also, the first time you run, the settings dialog will be displayed for you to configure the Uploader (see below).

Running GIFT-Cloud Uploader

GIFT-Cloud Uploader can be launched it from the start menu, the desktop shortcut or the **jnlp** file you downloaded. The main window looks like this:

While running, an icon also appears in the system tray which provides additional menu options (right-click the icon in Windows; left-click on macOS). If you hide the main window using the **Hide uploading window button**, then you can make it visible again using the system tray menu.

To close GIFT-Cloud Uploader, click the normal Close button or choose Quit from the menu.

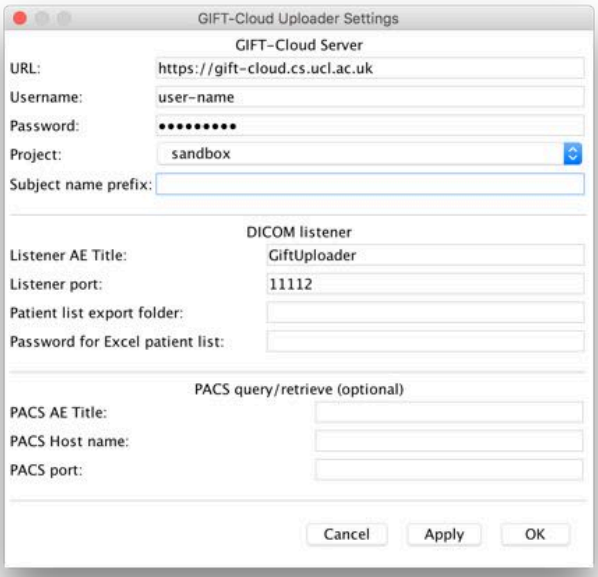
Troubleshooting: if GIFT-Cloud Uploader does not run

See **Troubleshooting** at the end of this section. Some common causes are:

- The UCL security certificates are not installed
- Java is configured to prevent running of jnlp files (Web Start)
- The OS is configured to prevent running of applications downloaded from the internet
- Java is not installed, Java is an old version (must be 1.6 or later) or is not Oracle Java and does not support Java Web Start
- Java is badly configured (this can happen if you have multiple Java versions installed)

Configure the GIFT-Cloud Uploader

If it is not already open, click **Settings** to open the configuration dialog:



- Enter the GIFT-Cloud username and password you were provided for uploading.
- Click **Apply** – this will log into the server.
- Select the project from the GIFT-Cloud Project list where you want the uploaded data to be stored.

> *The project list will not appear until the login has been successful. If you enter the wrong username/password, correct it and click **Apply** again.*

- The **Subject name prefix** specifies what a new subject will be called when it is uploaded to the GIFT-Cloud Server. Real subject names are replaced with a pseudonymous identifier, which consists of this prefix plus a 5-digit number. For example, the prefix **GOSH-** will lead to patient names **GOSH-00001, GOSH-00002** etc. Note this only applies when uploading new subjects, since existing subjects will keep their existing pseudoname.

Optional: Configuring a Dicom listener

If you want the Uploader on your machine to act as a Dicom node, so that you can push data to it from another Dicom program or PACS, and that data will be automatically anonymised and uploaded, then set the **Listener AE Title** and **Listener port**. This is particularly useful when installing a Gateway – see section 5 below.

> *If you use the Dicom listener, configure your machine's firewall to open the port you specify. The standard Dicom port is 11112. This port is not normally open by default. If you are pushing data from a different network, you will also need to ensure your network firewall allows this.*

Optional: Configuring a patient list

You can configure GIFT-Cloud Uploader to automatically maintain an Excel patient list on your local machine or local network drive. This list remains on the local network and does not get uploaded to the GIFT-Cloud server. The patient list contains the patient names, PACS IDs and GIFT-Cloud anonymisation identifiers for patients uploaded on this machine.

To automatically save a patient list as an Excel file, fill in a folder under **Patient list export folder**. To turn off patient list saving, leave this blank.

If you wish the Excel file to be password-protected, enter the password under **Password for Excel patient list**. To turn off the password, leave this blank.

Optional: Configuring PACS query/retrieve

The **PACS query/retrieve** section should be configured if you wish to fetch data from PACS, OsiriX or other systems using Dicom Query/Retrieve. Specify the AE title, host name and port of your remote Dicom device. See below for how to use query/retrieve.

Updating GIFT-Cloud Uploader

When you start GIFT-Cloud Uploader, it will automatically update to a new version if available.

Uploading data from your computer, a DVD, USB stick or the local file system

If you want to upload data from your computer, DVD, USB stick, local network etc. you can run the GIFT-Cloud Uploader from your computer. You require an internet connection and a GIFT-Cloud user account.

If GIFT-Cloud Upload is not running, then start it up from the Start menu, desktop shortcut or by clicking on the **jnlp** file you downloaded earlier. When started, you will see the main window:

You can use one of the following methods:

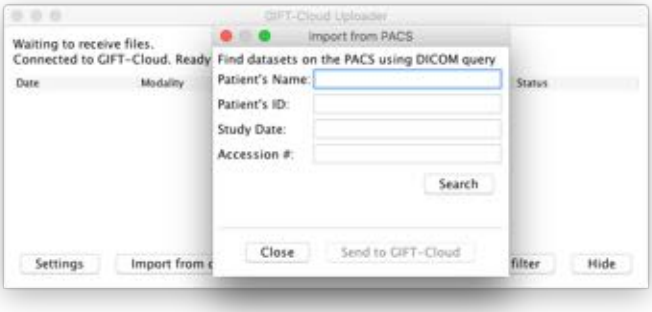
- Drag-and-drop files and folders onto the GIFT-Clod Uploader window;
- Click **Import from disk** and select one or more files and folders to upload.

If you select or drag-and-drop any folders, each folder will be searched recursively and all images in the folder and its subfolders will be uploaded. Files that cannot be uploaded will be ignored.

Uploading data from PACS, OsiriX or other systems using Query/Retrieve

You can connect to a DICOM query/retrieve system and retrieve and upload data. Firstly, configure the **PACS configuration** settings as described above. If you are using OsiriX, you need to configure a Listener in the OsiriX preferences with AE title, port number and host matching the GIFT-Cloud Uploader PACS configuration settings.

Click the **Import from PACS** button. This will open the **Import from PACS** window:



Enter search terms and click **Search**. You can leave all the fields blank to show all data, but note that this could take a very long time on a large PACS database.

A tree browser will open showing datasets matching your search criteria. Select any patients, series and images you wish to import. You can select multiple images/series/patients using standard shortcuts such as CMD+click (Mac) or Ctrl+click (Windows)

Click **Send to GIFT-Cloud** to retrieve and upload the selected files.

Pushing data from PACS or OsiriX

To push DICOM data from a scanner, PACS, OsiriX or other DICOM compatible hardware or software, you need to set the DICOM Listener settings as described above.

Configure your DICOM device to add a destination matching these settings. For example, in OsiriX preferences, go to Locations and add a new Location node with the IP address of the computer running GIFT-Cloud Uploader, and enter the AE title and port of the **Uploader DICOM node configuration** specified in the GIFT-Cloud Uploader settings.

Once configured, you can send data to the GIFT-Cloud Uploader node for immediate anonymisation and upload. For example, in the OsiriX database, click on the data you wish to upload, click the **Send** button, and select the node you have configured.

- If you are running OsiriX and GIFT-Cloud Uploader on the same machine, you will need to assign them different port numbers.
- If you want to keep the node running permanently, you need to ensure the computer running the GIFT-Cloud Uploader DICOM node has a fixed IP address, otherwise the IP will change over time and you will have to modify the Location node settings each time.
- You must ensure your firewalls on the DICOM device and the computer running GIFT-Cloud Uploader are configured to permit data traffic through the ports you have specified.

Configuring pixel data anonymisation

If you wish to perform automated pixel data anonymisation, this needs to be configured as described in section 7 below.

Troubleshooting

If you have problems using GIFT-Cloud Uploader, please check the following:

- Your machine's IP address (or your site's IP netblock) must be added to the GIFT-Cloud whitelist by the GIFT-Cloud administrators;
- Your firewall must be configured to allow https internet communication with the GIFT-Cloud server;
- Your firewall must be configured to allow communication on the port you have specified, if you are using the Dicom listening service;
- The local machine must have Java installed, minimum version 1.6 (later versions preferable);
- You may need to add the GIFT-Cloud server URL to the Java Exception Site List;
- Your machine must be configured to permit the running of the Java webstart application;
- In some cases, restarting the GIFT-Cloud Uploader webstart application may fix server communication issues.

5 Installing a GIFT-Cloud Gateway

You can install a GIFT-Cloud Gateway within your clinical site or academic institution. The Gateway provides automated anonymisation, encryption and uploading of data to the GIFT-Cloud server. This allows you to upload data to GIFT-Cloud from any hardware or software that supports DICOM Send, including PACS systems, scanners and software such as OsiriX. The Gateway acts a listening node, receiving data sent from hardware or software within the local network. Using a gateway means you can upload data from devices even if they are not connected to the internet, and no manual anonymisation is required.

Requirements

A GIFT-Cloud Gateway can be run on most versions of Windows, macOS, and linux. We recommend you use a dedicated computer or virtual machine, with a fixed IP address. The computer must be configured to allow https access to the GIFT-Cloud server, and local DICOM Push connections from any devices that will be sending data. The port used to receive data is configurable.

The following software should be installed:

- Oracle Java 1.6 or later *(NB. Java 6, 7, 8 are also known as Java 1.6, 1.7, 1.8 respectively)*
- Java Advanced Imaging libraries *(required for pixel data anonymisation)*
- *Linux only:* If a non-Oracle version of Java is used, you may need to separately install Java Webstart or compatible software such as IcedTea for Linux

Before you start

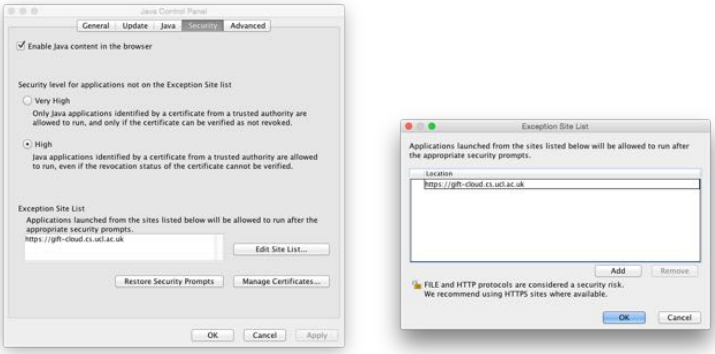
- If this is the first time GIFT-Cloud is used in your institution, you should send details of your institutional IP address ranges to the GIFT-Cloud Server administrators. This will allow them to configure the GIFT-Cloud Server to permit access from your institution. We recommend you provide **all** IP ranges, as this will allow users in your institution to access the GIFT-Cloud web interface from anywhere in your institution.
- You should obtain the following information from the GIFT-Cloud Server administrators:
    - URL and IP address of the GIFT-Cloud Server
    - Username and password for your uploading account
    - Name of the GIFT-Cloud project to which your data will be uploaded
    - CA signing certificates from the UCL Translational Imaging Group,

Configuring Gateway network access

- The firewalls on your Gateway server and institution should allow outgoing connections from your Gateway to the GIFT-Cloud Server on port **443**.
- Configure your Gateway's firewall to locally accept incoming connections from any devices on your institutional network from which you wish to receive data.

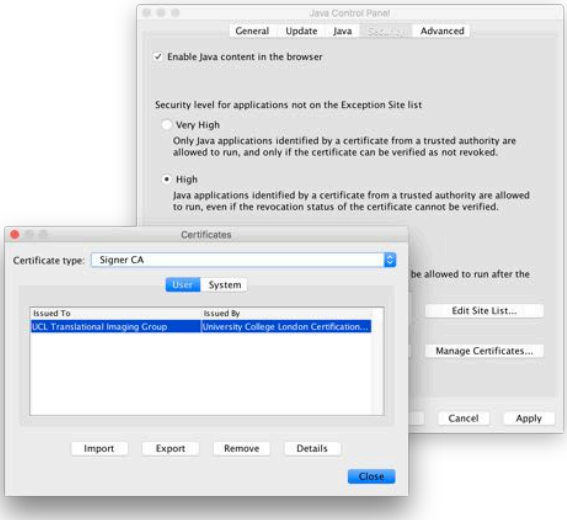
Configuring Java

- Open the **Java Control Panel**
  - *Mac OSX: System Preferences > Java*
  - *Windows XP: Start > Control Panel > Java*
  - *Windows 7: Start > Control Panel, then enter Java Control Panel in the **Control Panel Search***
  - *Windows 8: search for Java Control Panel*
- Go to the **Security** tab.
- Ensure there is a tick next to **Enable Java content in the browser**.
- Edit the **Java Exception Site List** and add https://gift-cloud.cs.ucl.ac.uk



If you have been provided with public CA signing certificates from the UCL Translational Imaging Group, you can add these now:

- Click **Manage Certificates**
- Next to Certificate Type, select **Signer CA**.
- Click **Import**
- Under File Format, select **All Files**
- Navigate to the certificate file, select and click **Open**
- Click Close to close the Certificates dialog box



macOS users

macOS users may need to configure their operating system to permit running of all applications:

- Select **System Preference**s from the Apple menu
- Select **Security and Privacy**
- Select the **General** tab and click the padlock to make changes
- Choose **Allow apps downloadad from Anywhere**.

*Note: If you do not wish to enable the option for software from anywhere to run, you can instead give an explicit permission for GIFT-Cloud Uploader to run. To do this, you will need to attempt run the application first. Depending on your macOS version, you may be prompted to allow GIFT-Cloud Uploader to run, If you receive an error "Not permitted to run by your security preferences" then you will need to return to the **Systen and** Security menu where you will be given an option to allow GIFT-Cloud Uploader to run.*

Installing GIFT-Cloud Uploader

The Gateway uses GIFT-Cloud Uploader, the same software used for uploading data directly by users. GIFT-Cloud Uploader is a cross-platform Java Web Start application that will run under Windows, macOS and linux.

To install GIFT-Cloud Uploader:

- Install and configure Java as described above.
- In a web browser, go to the GIFT-Cloud website https://gift-cloud.cs.ucl.ac.uk and log in using the credentials provided. *Note: you can only access this website once your institution's IP ranges have been permitted by the administrators of the GIFT-Cloud Server – see **Before you start** above.*
- Click **Upload** from the top bar of the webpage.
- If GIFT-Cloud Uploader does not download automatically, click the direct download link as instructed.
- If GIFT-Cloud Uploader does not start automatically, check your **Downloads** folder and launch the **GiftCloudUploader.jnlp** or **webstart.jnlp** file.

The first time GIFT-Cloud Uploader runs, you may receive a message asking you to confirm that you wish to run the software. Click **Run** to continue. The Uploader will then run and add shortcuts to the Start menu (Windows) and the desktop.

When the Uploader first launches it will launch the settings dialog for you to configure the application. This is covered in the next section.

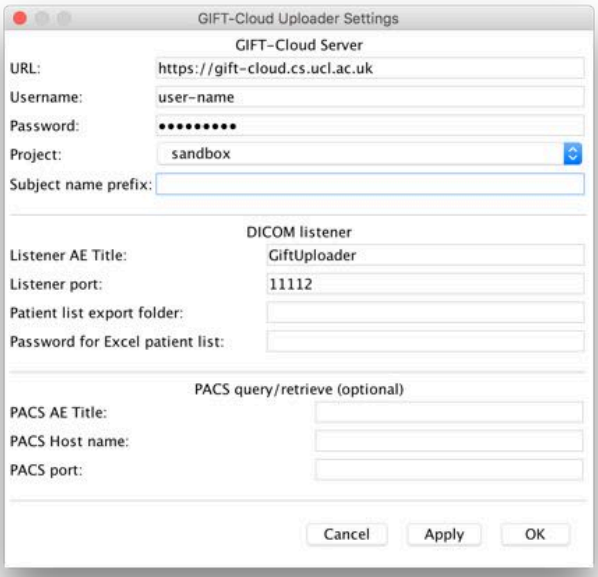
Troubleshooting: if GIFT-Cloud Uploader does not run

Common causes:

- The UCL security certificates are not installed
- Java is configured to prevent running of jnlp files (Web Start)
- The OS is configured to prevent running of applications downloaded from the internet
- Java is not installed, Java is an old version (must be 1.6 or later) or is not Oracle Java and does not support Java Web Start

Configure the GIFT-Cloud Uploader

If it is not already open, click **Settings** to open the configuration dialog:



- Enter the GIFT-Cloud username and password you were provided for uploading.
- Click **Apply** – this will log into the server.
- Select the project from the GIFT-Cloud Project list where you want the uploaded data to be stored.

> *The project list will not appear until the login has been successful. If you enter the wrong username/password, correct it and click **Apply** again.*

- If you want the Uploader on your machine to act as a Dicom node, so that you can push data to it from another Dicom program or PACS, and that data will be automatically anonymised and uploaded, then set the **Listener AE Title** and **Listener port**.

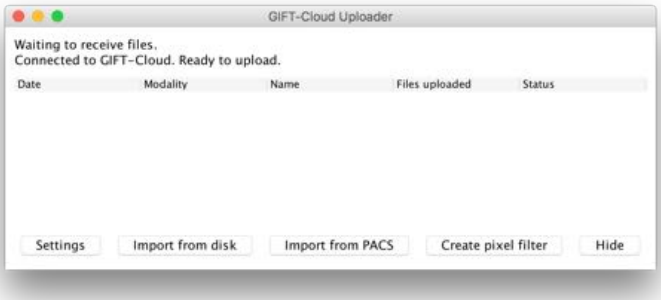
> *If you use the Dicom listener, configure your machine's firewall to open the port you specify. The standard Dicom port is 11112. This port is not normally open by default. If you are pushing data from a different network, you will also need to ensure your network firewall allows this.*

- The **Subject name prefix** specifies what a new subject will be called when it is uploaded to the GIFT-Cloud Server. Real subject names are replaced with a pseudonymous identifier, which consists of this prefix plus a 5-digit number. For example, the prefix **GOSH-** will lead to patient names **GOSH-00001, GOSH-00002** etc. Note this only applies when uploading new subjects, since existing subjects will keep their existing pseudoname.
- The **Patient list export folder** should be specified if you wish to store a patient list on your local network – see **Saving a Patient List** for more details. If you do not wish to store a patient list, this should be blank.
- The **Password for the Excel patient list** is used if you are saving a patient list. If specified, the patient list will be saved with the specified password.
- The **PACS query/retrieve** section is only required if you want to be able to query/retrieve form the uploading server. This is described in section 4 above.

Running GIFT-Cloud Uploader

If GIFT-Cloud Uploader is not running, you can launch it from the start menu, the desktop shortcut or the jnlp file you downloaded.

You should normally leave GIFT-Cloud Uploader running on your gateway machine in order to allow data to be received. **Data are only received and uploaded when the Uploader is running**. While running the Uploader displays a main status window and also creates an icon in the system tray which provides additional options. The main GIFT-Cloud Uploader window looks like this:



You can hide the main window using the **Hide uploading window button**. Use the system tray menu to show the window if hidden (right click on the icon in Windows; left-click on macOS).

To close GIFT-Cloud Uploader, click the normal Close button or choose Quit from the menu.

Updating GIFT-Cloud Uploader

To update GIFT-Cloud Uploader to a new version, close the application and then restart it. The new version will be downloaded and installed automatically.

Saving a patient list

You can configure GIFT-Cloud Uploader to automatically maintain an Excel patient list on your local machine or local network drive. This list remains on the local network and does not get uploaded to the GIFT-Cloud server. The patient list contains the patient names, PACS IDs and GIFT-Cloud anonymisation identifiers for patients uploaded on this machine.

To automatically save a patient list as an Excel file, fill in a folder under **Patient list export folder** in the **Settings**. To turn off patient list saving, leave this blank.

If you wish the Excel file to be password-protected, enter the password under **Password for Excel patient list**. To turn off the password, leave this blank.

Configuring pixel data anonymisation

See section 7 below for more details.

Configuring a scanner to work with a GIFT-Cloud Gateway

If your scanner supports DICOM Send then you can configure it to work with a GIFT-Cloud Gateway, using the **Listener AE Title** and **Listener port** specified above.

Example: GE Voluson E10

These instructions show how to configure a GE Voluson E10 ultrasound scanner to send data to any computer running GIFT-Cloud Uploader, such as a GIFT-Cloud Gateway server.

To create a new DICOM device:

- Press the **Util** button to open the Utility menu
- Select **Setup** on the touch screen to open System Setup
- Select **Connectivity** on the touch screen
- On the upper screen, select the **Device Setup** tab
- Click the **Dicom Configuration** button
- Click the **Add** button to add a new DICOM device

Use the following settings:

- IP Address: IP of the GIFT-Cloud Gateway (the computer running GIFT-Cloud Uploader)
- AE Title: the Listener AE Title you set on the GIFT-Cloud Gateway
- Port: the Listener port you set on the GIFT-Cloud Gateway
- Alias: a name to help the scanner user identify the destination of the data. For the following instructions we will use the alias **GIFT-Cloud**.

The following settings are recommended but you may modify for your own requirements:

  - Color: Color
  - 2D Compression: None
  - Cine Compression: None
  - Volume Compression: None
  - Send Image as: Image
  - Send 3D Volume as: DICOM Volume
  - DICOM Image Type: default
  - Send Measurements as: ---
  - Image Size: Original
  - Send 2D Cine as: Image
  - Send 4D Cine as: DICOM Volume
  - Multiframe: FPS Limit: Unlimited
  - Include Scan Assistant Data: no
- Once you have completed the settings, click **Save&Exit**
- Click **Test Connection** to verify the settings. If you receive a **Ping: Failed** message, the scanner is not communicating with the Gateway.
  - Check the AE title, IP address and port
  - Ensure your scanner is connected and is accepted by the network
  - Ensure the GIFT-Cloud Uploader is running, has the correct AE Title and post, and is allowed by the firewall

Put a tick mark to the left of the new GIFT-Cloud service you have created. When you perform a DICOM Send you will then be able to choose GIFT-Cloud as a destination. If only one alias is ticked, the DICOM Send will send data only to this destination without being presented with a choice.

If you want to restore the previous behaviour where DICOM Send goes to a single destination without presenting the user with a menu, untick every service except for the one you wish data to be sent to.

Sending data from a GE Voluson E10 to GIFT-Cloud

Once the scanner has been configured as described above, you can send data to GIFT-Cloud as follows:

- Pres the **Archive** button
- Select the datasets to transfer
- Click the **DICOM Send** button on the right of the upper screen (under **Data Transfer**)
- Select **GIFT-Cloud** (or your chosen alias) from the **Destination** menu. *NOTE: if only one destination is ticked in the DICOM Configuration menu, then the Destination menu will not appear, and data will be sent straight to the ticked service*

This will then give you the option , then when you perform a **DICOM Send** you will be given

Uninstalling GIFT-Cloud Uploader

You can uninstall GIFT-Cloud Uploader using the Java Cache Viewer:

- Open the **Java Control Panel**
  - *Mac OSX: System Preferences > Java*
  - *Windows XP: Start > Control Panel > Java*
  - *Windows 7: Start > Control Panel, then enter Java Control Panel in the **Control Panel Search***
  - *Windows 8: search for Java Control Panel*
- Open the Java Cache Viewer by clicking General > Temporary Internet Files > View.
- Click GIFT-Cloud Uploader
- Click the Remove button (the red cross).

Technical information

The following is for information only. You should not normally modify the following files and directories:

The main configuration is provided from the Settings menu. The settings are stored in a file in your home directory called GiftCloudProperties.properties.

Additional program files are stored in a folder in your home directory called GiftCloudUploader. These include:

- Log files are stored in GiftCloudUploader/logs
- Data to be uploaded are stored in GiftCloudUploader/WaitingForUpload
- Templates for pixel data redaction are stored in GiftCloudUploader/RedactionTemplates

6 Installing a GIFT-Cloud server

This section is for administrators of the GIFT-Cloud data server, or for users who wish to set up their own GIFT-Cloud system.

Installation

GIFT-Cloud uses a custom fork of the xnat_builder codebase. This can be obtained from https://github.com/gift-surg/GiftCloudServerBuilder. In addition, you may wish to install the custom module https://github.com/gift-surg/GiftCloudServerModule.

Please follow the instructions provided with the codebase to build and configure the server. These closely follow the XNAT 1.6 instructions (https://wiki.xnat.org/display/XNAT16/Home), but using this custom fork. In addition we recommend customisations of the XNAT codebase such as making the GIFT-Cloud Uploader available as a download from the secure site.

Firewall

The GIFT-Cloud server firewall must be configured with the netblock (IP address range) for any machines that wish to connect, including:

- any machines that will be used to browse and download data;
- any machines that will be used to upload data using the web-based uploader;
- any machines running the uploader service.

Communication with the GIFT-Cloud server uses HTTPS. If non-standard ports are required, these may require special configuration of the GIFT-Cloud server the firewalls of the institution hosting the GIFT-Cloud Server.

Adding new sites

To add a new site to your GIFT-Cloud system, and allow one or more gateway systems to be installed we recommend the following procedure:

- Obtain the IP address ranges of the new institution and configure the GIFT-Cloud Server firewall to permit incoming connections from these;
- Create a new project for the new institution and add an anonymisation script (the uploading will fail without an anonymisation script);
- Create a dedicated uploading user for that site;
- Supply the uploading account credentials, project name and CA certificates to the new site administrators, along with this manual.

7 Anonymisation of pixel data

This section is for users uploading data from their own machine or configuring a GIFT-Cloud Gateway for automated data upload, and who wish to anonymise burnt-in annotations in pixel data, such as 2D ultrasound images and ultrasound loops. GIFT-Cloud Uploader can automatically anonymise these images, provided suitable templates are available which describe how to anonymise the data. You may have to configure your own templates for this purpose if the built-in templates do not match the scanner type, pixel encoding or resolution of your images.

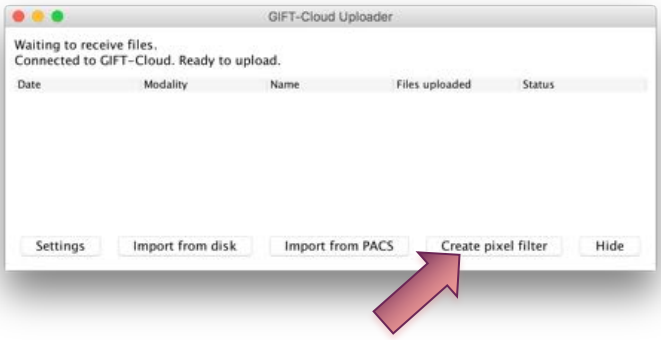
Configuring pixel data anonymisation templates

Pixel data anonymisation is configured using templates, which are tailored to specific scanners and image resolutions. Once the required templates are defined, pixel data anonymisation is fully automated and requires no interaction with the user. A number of standard templates are provided with GIFT-Cloud Uploader, and you may also define your own templates.

Before creating your own templates, you may wish to check whether the existing templates are sufficient by uploading test data that represents the data you will be uploading. If the test upload reports a “no suitable template found” error then you will need to create a template.

To create your own image templates, you may need to have Java Advanced Imaging libraries installed. If necessary, install Java Advanced Imaging libraries and restart the GIFT-Cloud Uploader.

To create a new template, launch the GIFT-Cloud Uploader and click the **Create pixel filter** button:



Select a Dicom file representing the type of image you wish to anonymise. A new window will open (this may take some time if your selected image is large or a video).

Use the left mouse to draw green rectangles. These regions will be blacked out in the anonymised image for all images or videos that match this template. If you want to remove a rectangle, left click it (it will become red) and click delete. You can use the right mouse button to adjust the window and level of the displayed image.

Click **Save template** to save the template and choose a filename. If you want to abandon your template, close the window without saving. To define another template, click **Select new image** and repeat the process.

Templates are defined based on the following DICOM header tags, which are derived from the test image you provide when creating the template:

- PhotometricInterpretation
- SopClassUID
- Modality
- Manufacturer
- ManufacturerModelName
- Rows
- Columns

If you upload an image which matches all of the parameters in the template, that template will be applied. For cine loops, the template is applied to each image in the loop.

Your custom templates are store in your home directory, under `GiftCloudUploader/RedactionTemplates`. If you want to remove a template you can simply delete it and restart the GIFT-Cloud Uploader.

8 Confidentiality of clinical data

XNAT is used to securely host clinical research data at many institutions worldwide [3]. In addition to GIFT-Cloud, UCL has a well-established XNAT installation on the CMIC-XNAT server [4] which is used by a number of research projects involving clinical data [5][6].

GIFT-Cloud at UCL is based on the established security model used by the CMIC-XNAT server. This includes the following security features:

a. The server is accessible only through the well-established HTTPS protocol [7], which makes it mandatory that the data traffic between the client and the server be encrypted.
b. A firewall on the server blocks access except from trusted clients (the UCL and KUL domains, and research partners outside UCL), via IP whitelisting.
c. XNAT implements a security model that allows user access control on a per project basis. This allows us to restrict access for certain data to specific groups of users, if required [8].

The confidentiality of personal identifiable data (PID) is protected in GIFT-Cloud through pseudonymisation. Pseudonymisation in general comprises:

a. Deleting a large portion of PID (including pixel data that could potentially be used for identifying a patient), which is not relevant to the research objectives,
b. Replacing relevant PID with uniquely generated identifiers (e.g. enumerated values, hash codes), allowing for later re-identification by authorised personnel (e.g. the radiologist who keeps the map of real identifiers versus generated identifiers).

We aim to provide an intuitive mechanism for fully automated, on-site pseudonymisation (i.e. such that no PID is transmitted over the network). Existing well-established policies (see [9][10][11][12]) and laws (UK, EU, USA where applicable) are the basis of the pseudonymisation procedure.

Data upload and download procedures

The following figures illustrate how data confidentiality is ensured by the procedures.

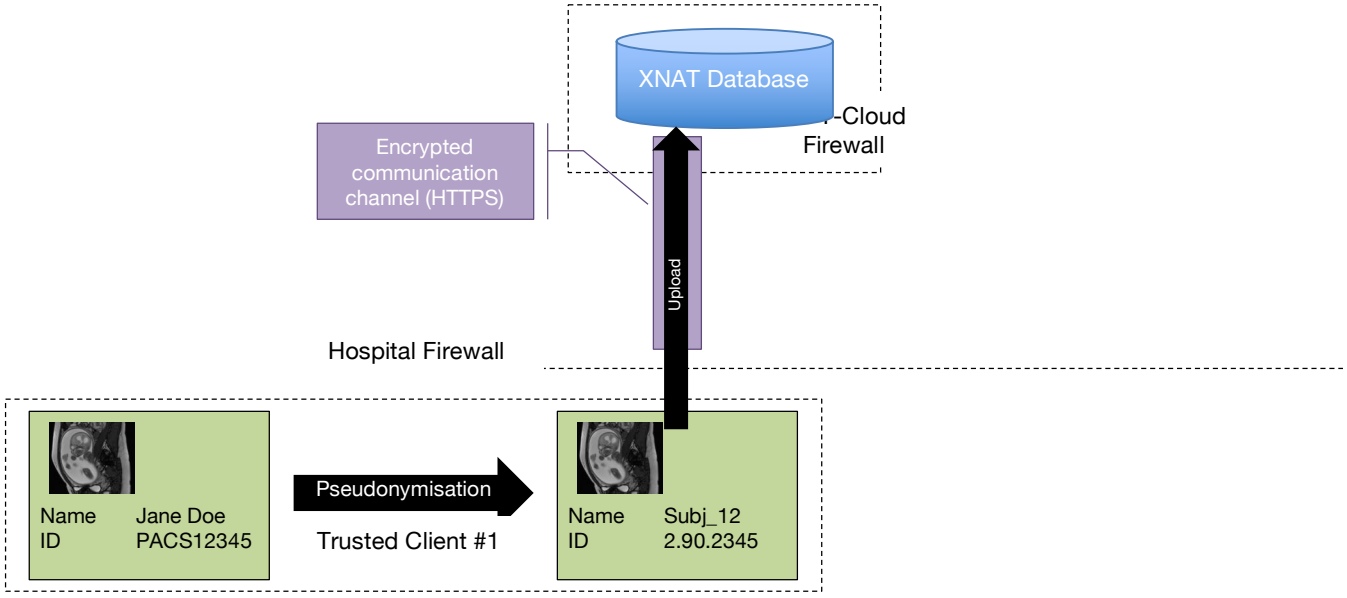


Figure 1: Data upload. Every PID is anonymised **on the client, prior to upload**. This ensures that the server does not store any sensitive information that could lead to patient identification.

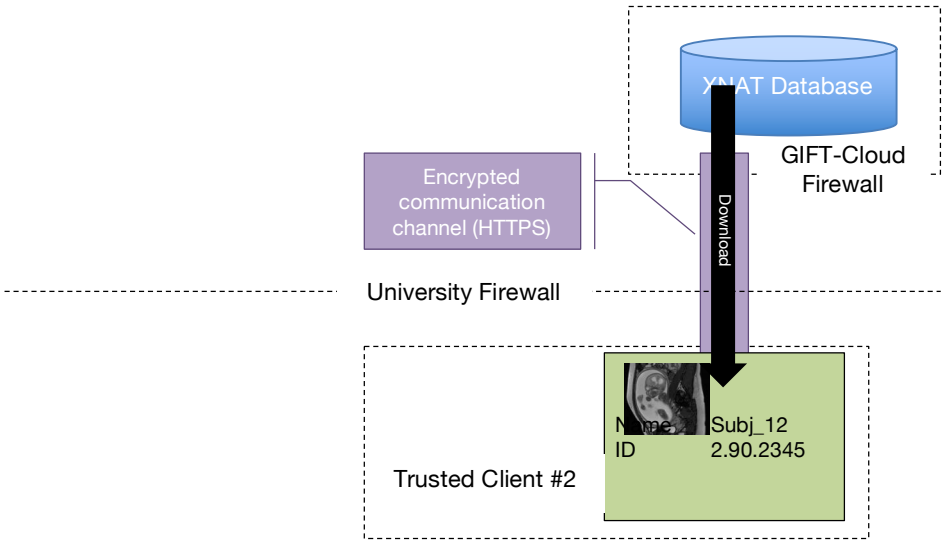


Figure 2: Data downloaded by researcher in a collaborating academic institution. The researcher **has no access to PID**, but rather only to **pseudonymised identifiers.**

9 References

[1] Translational Imaging Group http://cmictig.cs.ucl.ac.uk
[2] XNAT Open Source Imaging Informatics Platform, Neuroinformatics Research Group at Washington University, USA http://xnat.org
[3] XNAT implementations around the world, http://xnat.org/about/xnat-implementations.php
[4] CMIC-XNAT Server. https://cmic-xnat.cs.ucl.ac.uk
[5] Patient Information Combined for the Assessment of Specific Surgical Outcomes in Breast cancer (PICTURE), http://cordis.europa.eu/project/rcn/106628_en.html
[6] EPICure – Population based studies of survival and later health status in extremely premature infants, http://www.epicure.ac.uk/epicure-1995/epicure19/
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[8] Understanding Data Sharing in XNAT's Security Structure, https://wiki.xnat.org/display/XNAT16/Understanding+Data+Sharing+in+XNAT's+Security+Structure
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[10] Standards for patient confidentiality and RIS and PACS, Royal College of Radiologists, UK http://www.rcr.ac.uk/docs/radiology/pdf/BFCR(12)19_Standards_patient_confidentiality.pdf
[11] Clinical Research and the HIPAA Privacy Rule, NIH, USA (not necessary, but compatibility with this would allow for smooth inclusion of potential collaborators from USA) http://privacyruleandresearch.nih.gov/pdf/clin_research.pdf
[12] Supplement 142: Clinical Trial De-identification Profiles, DICOM Standards Committee, USA ftp://medical.nema.org/medical/dicom/final/sup142_ft.pdf

10 Contact details

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