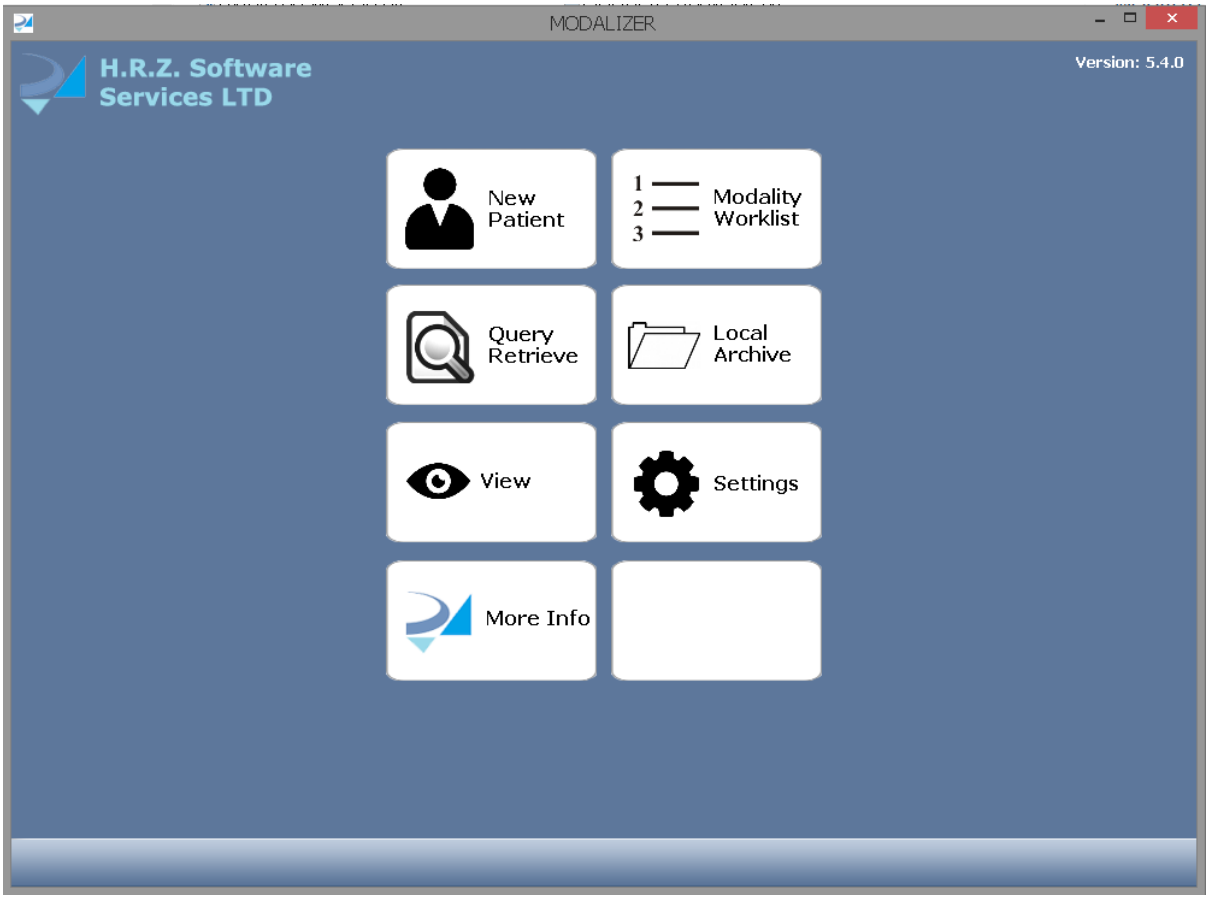
# MODALIZER 5.4.0

*User's Manual*

## Plug and Play

## Imaging Modality

## DICOM Implementation

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## Reference Documents

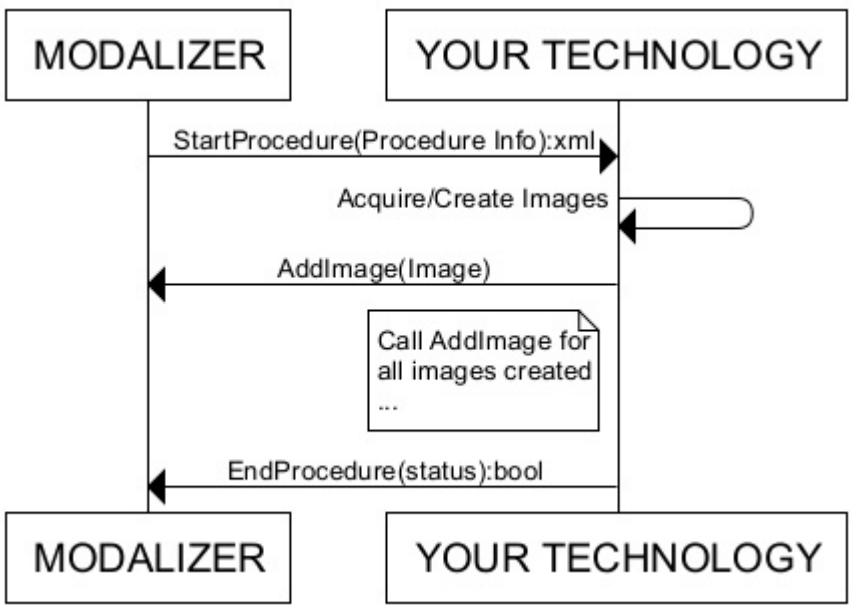
| Title | Link |
|---|---|
| MODALIZER DICOM Conformance Statement | http://downloads.roniza.com/MODALIZER/MODALIZER%20DICOM%20CONFORMANCE%20STATEMENT.pdf |
| MODALIZER White Paper | http://downloads.roniza.com/MODALIZER/MODALIZER%20White%20Paper.pdf |

# Table of Contents

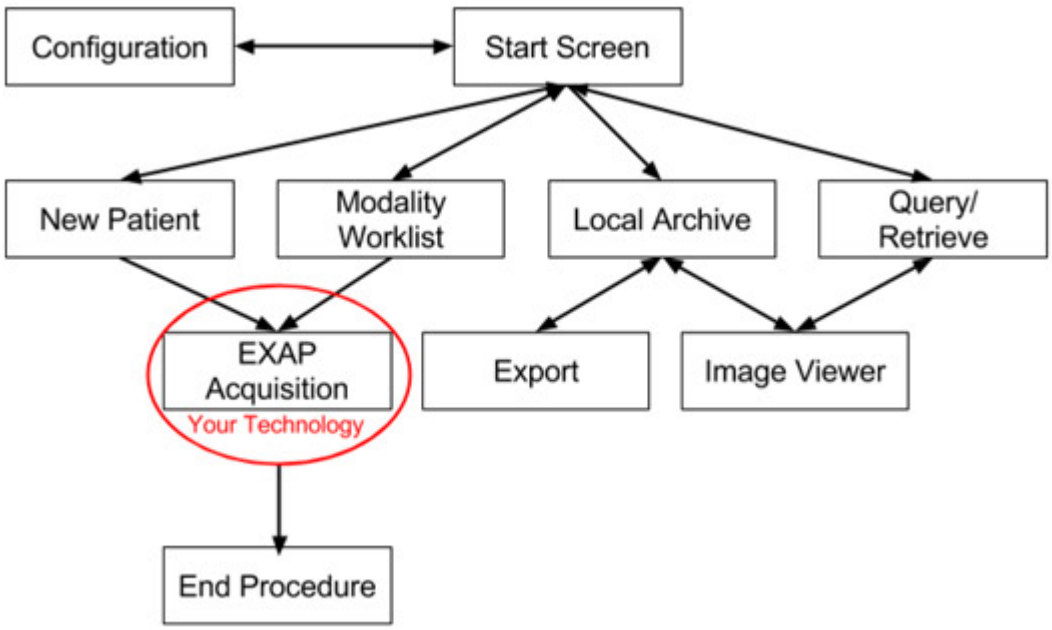
# 1. Introduction

MODALIZER 5.4.0 is a DICOM application with rich feature set, ready to implement. MODALIZER turn the tables on DICOM Software Development. Offering all the capabilities of modern Imaging Modality, with built-in, validated, and documented DICOM Implementation, MODALIZER keeps you focused on your core technology development.

MODALIZER includes Imaging Modality, DICOM viewer and Converter, and many more features expected from Medical Imaging Device Software.
Built on top the successful RZDCX DICOM Toolkit, MODALIZER can be easily customized and extended.




The MODALIZER DICOM Application features a unique interface to integrate with an external process for performing the image acquisition. It implements all the transactions of the Imaging Modality actor within IHE Scheduled Workflow (SWF) Integration Profile, and includes the Workflow, the Configuration, and the Setup functionality.




With MODALIZER, the medical devices manufacturers receive a ready-to-integrate application of Imaging Modality Workstation, so they can focus on developing the image acquisition module. MODALIZER takes care of all the rest.
The intended audience of MODALIZER consists of medical devices manufacturers and medical software developers who seeks an OEM product to operate as an Imaging Modality.

## 1.1. IHE Actors and Transactions

**Image Display**
MODALIZER Implements the transactions of the Image Display Actor within the IHE Scheduled Workflow Integration Profile.
MODALIZER loads all the instances from DICOM Q/R or from Physical Media. It reads DICOMIDIR files or scan Directories for DICOM files and displays their content in the DICOM Viewer.

**Evidence Creator**
MODALIZER includes all the code for creating DICOM Files and exporting them according to the DICOM Standard either through DICOM Networking (C-STORE) or using Physical Media (DICOM CD).
MODALIZER includes features for creating DICOM Structured Reports and for converting images, video's and PDF documents to DICOM.

**Imaging Modality**
Use MODALIZER to transform your Imaging Technology into a standard IHE and DICOM compliant Imaging Modality. The Unique EXAP interface clearly divides the domain of your technology and the DICOM standard and helps you to focus on your technology.

MODALIZER is a complete Imaging Modality implementation just without the image capture device.

## 1.2. DICOM Services implemented by MODALIZER

**Verification SCU/SCP**

The verification service utilize the DIMSE C-ECHO command to confirm network communication at the application level.

MODALIZER provides full encapsulation of the verification service as SCU and as SCP including detailed logging and user controls. It provides “echo” buttons in the settings screen in the right places. Just use them as they are.

**Storage SCU/SCP**

The DICOM Storage service is encapsulated into clearly documented class.

MODALIZER provides SCU (sending) and SCP (receiving) implementations of the the DICOM Storage Service.

**Modality Worklist SCU**

Supporting the DICOM Modality Worklist Service is no longer a bonus. Most hospitals and healthcare organizations wouldn’t accept imaging modalities and even other medical devices that can’t electronically receive patient and procedure parameters without typing.

MODALIZER built in MWL SCU takes care for you for all the aspects of Medical Record integration.

**Query/Retrieve SCU**

We’ve seen too many false implementations of the DICOM Query/Retrieve Service, and decided to encapsulate the whole thing into one simple class. It’s important to understand how it works but also to understand that that’s the way it works. Take the Q/R implementation as it is.

**Modality Performed Procedure Step SCU**

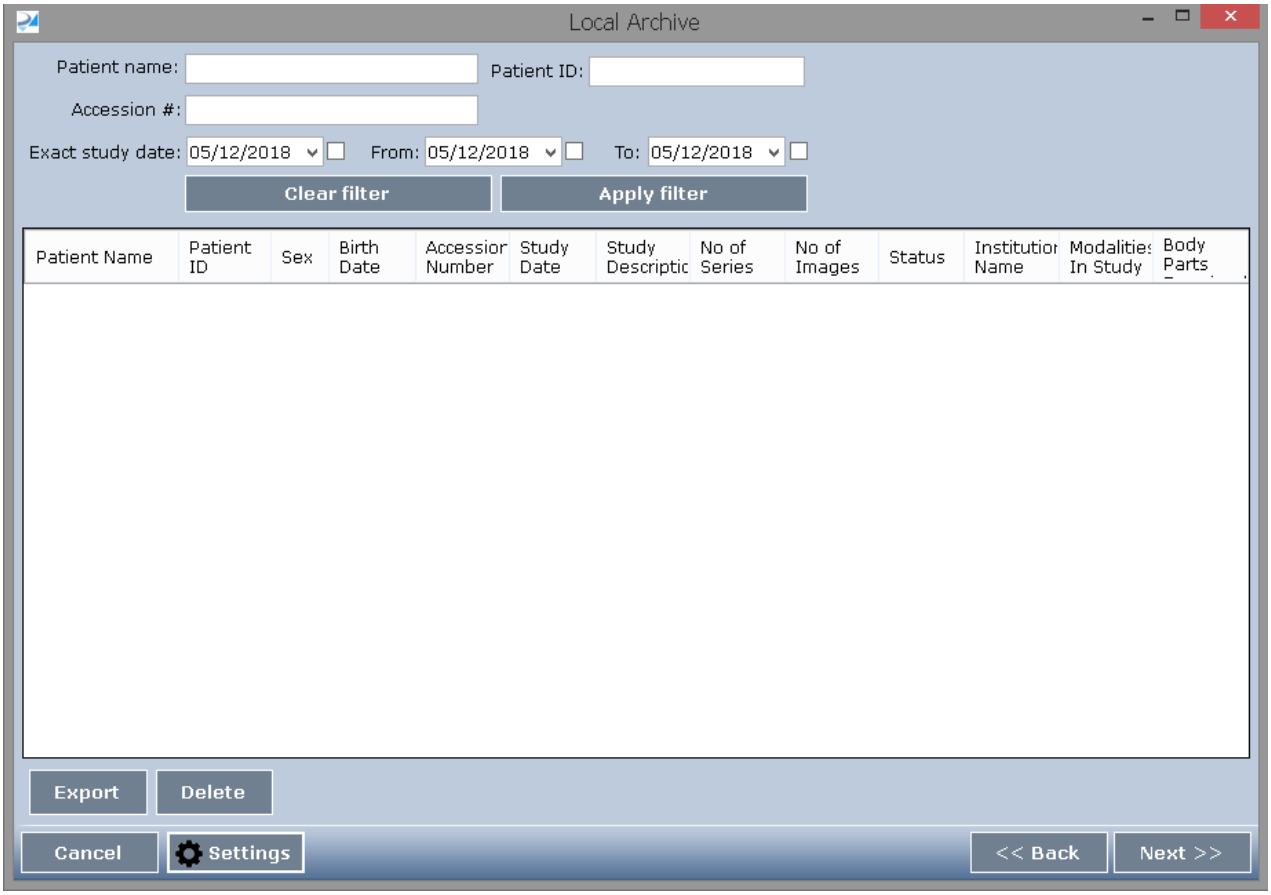
Just like MWL, MPPS gradually earns its deserved recognition. With MPPS your Imaging Modality can report the study acquisition progress and status in a standard way. It’s a feature that can earn your product valuable points.

**Physical Media Creator**

MODALIZER Exports DICOM Studies with DICOMDIR and integrated DICOM CD Viewer and all according to the DICOM standard and IHE guidelines.

## 1.3. The Local Archive

MODALIZER 5.4.0 includes a local DICOM Archive to store all created, converted, and imported studies. All the files in the local archive are stored according to the DICOM Standard using the DICOM file format.



# 2. DICOM Viewer

MODALIZER 5.4.0 has a powerful and friendly Multi-Modality DICOM Viewer.

Detailed description of the viewer functionality see in the our MODALIZER+ user manual which can be loaded there:

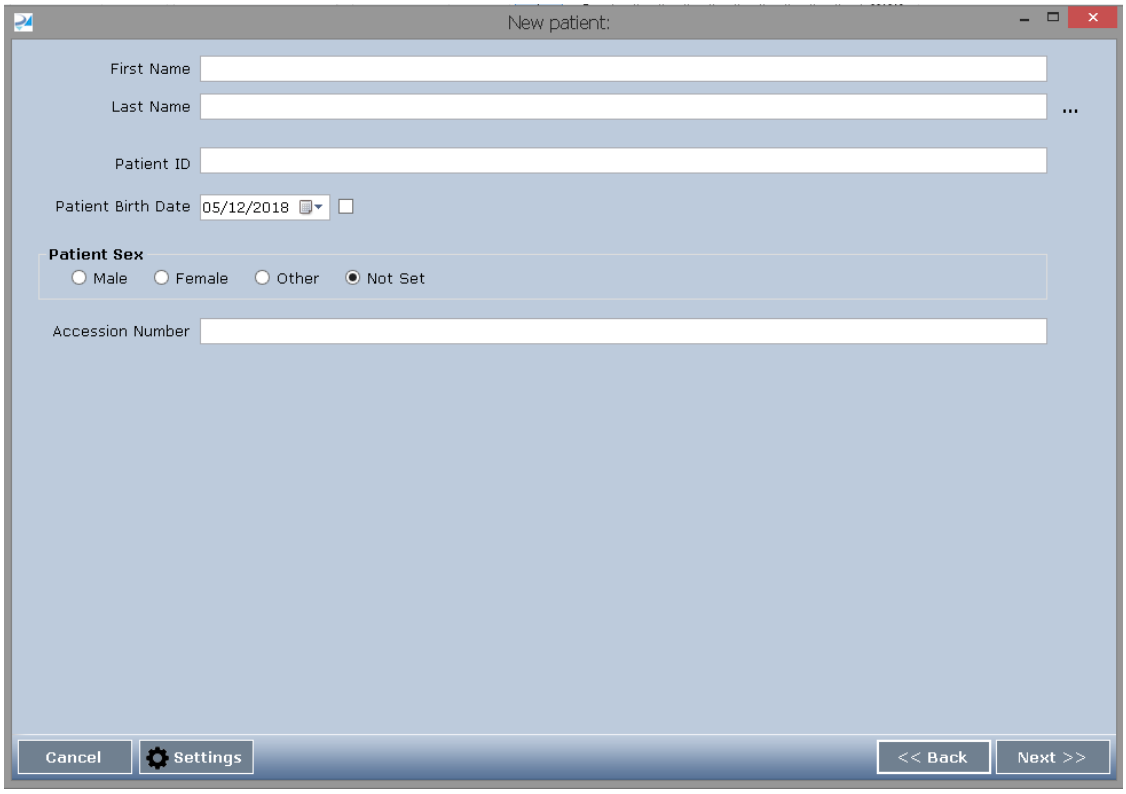
http://downloads.roniza.com/MODALIZERPLUS/MODALIZER+%20User%20Manual.pdf

**NOTE:** Measurement tools (Distance/Optical density/Angle) are not available in the MODALIZER Viewer.

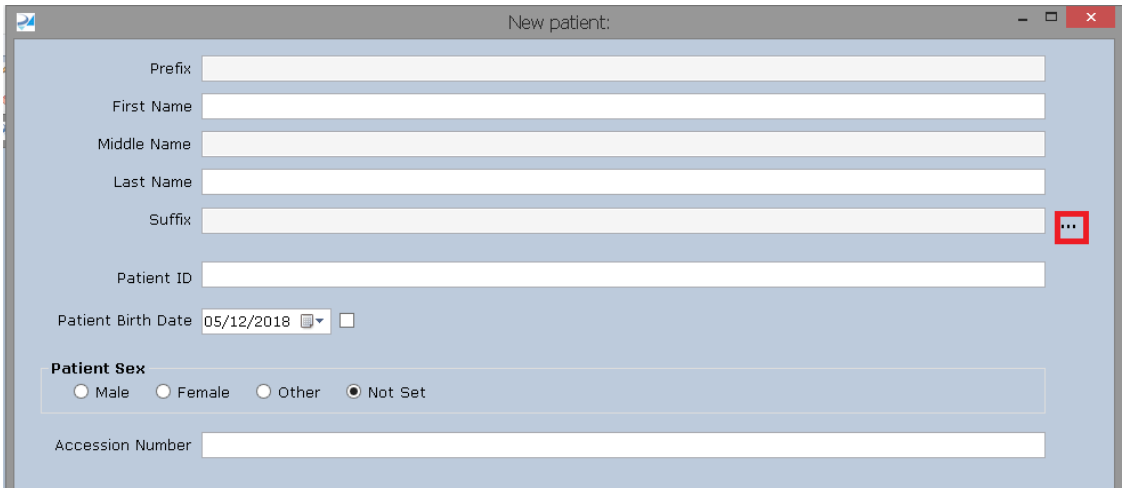
# 3. Working with Studies

## 3.1. New Patient

Select the “New Patient” option from the main menu:




Click "..." button to show/hide Prefix, Middle Name and Suffix fields:




Enter patient's data (not required), then click "Next".
External aquisition application will be started (see Setting to learn how to define it).

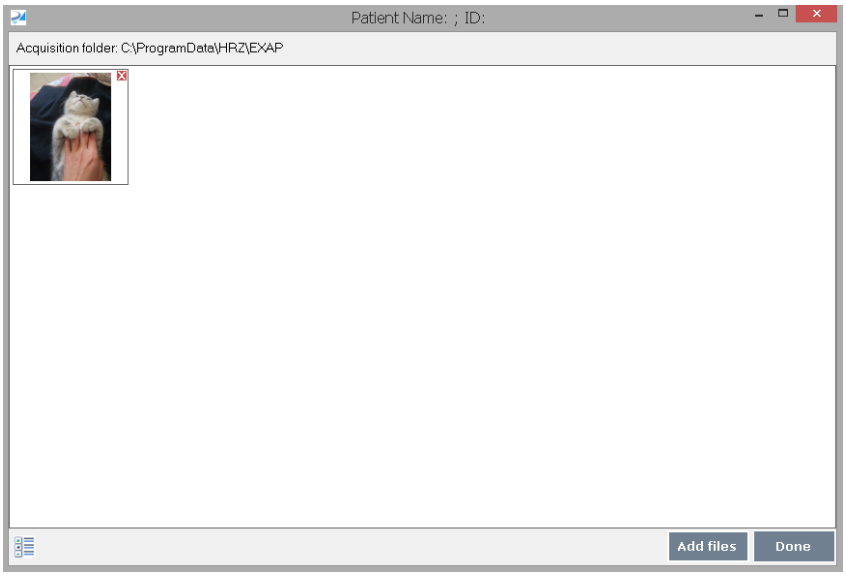
MODALIZER will fill the exchange file with case attributes such as patient identification (e.g. Name, ID, Birth Date and Sex), study information and other attributes.
Template file (defined on Settings screen, built-in oneis located in MODALIZER installation folder and named **PatientDataTemplate.xml**) can be of any text format - XML, txt, json, even RTF. By default it's XML containing ALL available fields:

```
<?xml version="1.0" encoding="utf-8" ?>
<PatientData>
 <PatientName>
        $PatientName$
 </PatientName>
 <PatientId>
        $PatientID$
 </PatientId>
 <PatientSex>
        $PatientSex$
 </PatientSex>
 <PatientBirthdate>
        $PatientBirthdate$
 </PatientBirthdate>
 <AccessionNumber>
        $AccessionNumber$
 </AccessionNumber>
 <StudyInstanceUID>
        $StudyInstanceUID$
 </StudyInstanceUID>
 <StudyId>
```

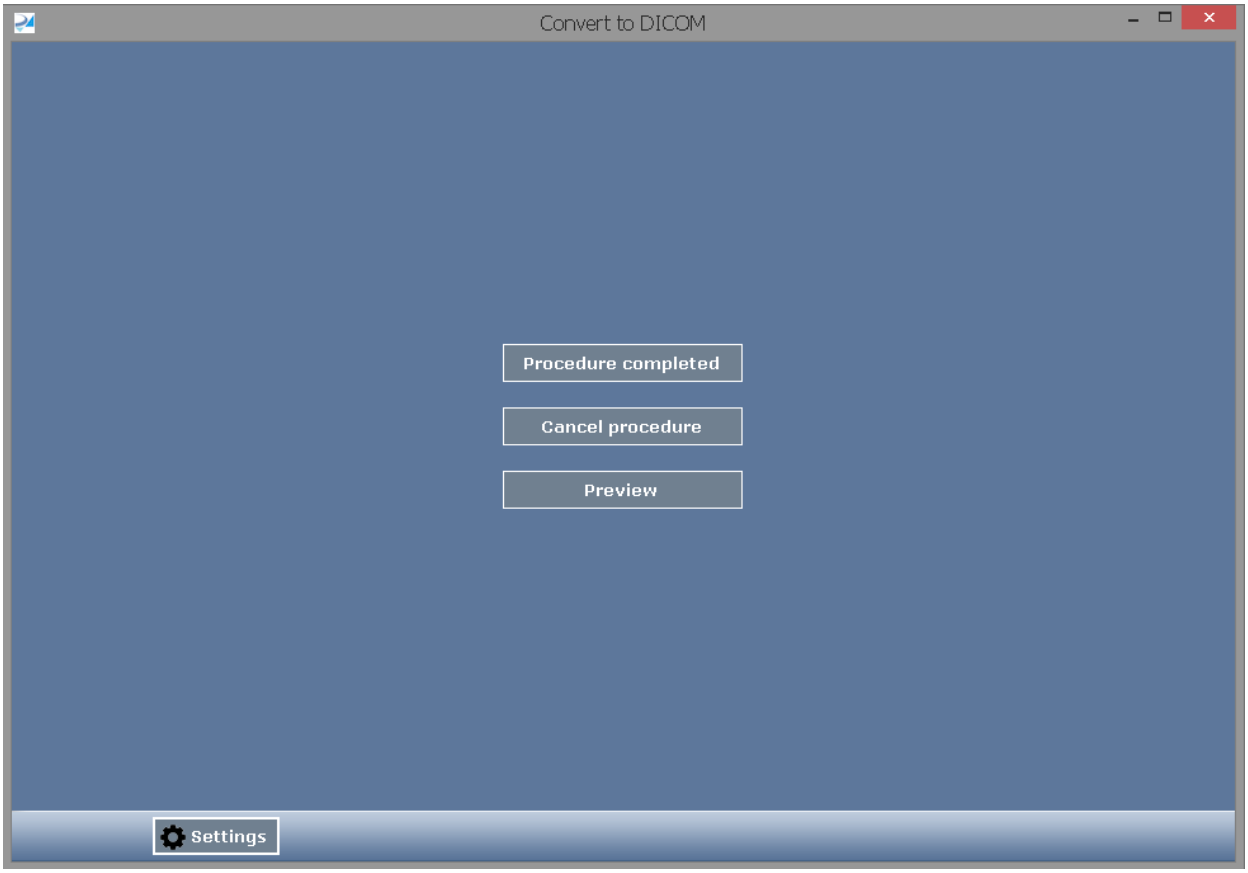
```
        $StudyId$
  </StudyId>
  <StudyDate>
        $StudyDate$
  </StudyDate>
  <StudyTime>
        $StudyTime$
  </StudyTime>
  <Modality>
        $Modality$
  </Modality>
  <RequestedProcedureDescription>
        $RequestedProcedureDescription$
  </RequestedProcedureDescription>
  <ScheduledProcedureStepDescription>
        $ScheduledProcedureStepDescription$
  </ScheduledProcedureStepDescription>
  <StationName>
        $StationName$
  </StationName>
  <ReferringPhysiciansName>
        $ReferringPhysiciansName$
  </ReferringPhysiciansName>
</PatientData>
```

Output file is saved as PatientData.[extension of the template file] in the shared folder so your EXAP application is able to load required data from it. The special '$' surrounded placeholders are automatically replaced by the actual attributes values for every new exchange file.

MODALIZER is installed with built-in EXAP application as example:



After user added files and clicked "Done" (or executed custom actions in external application and closed it) - all acquired images/video will be converted to DICOM accordingly to conversion parameters defined on the Settings screen and "Convert to DICOM" screen will be opened:



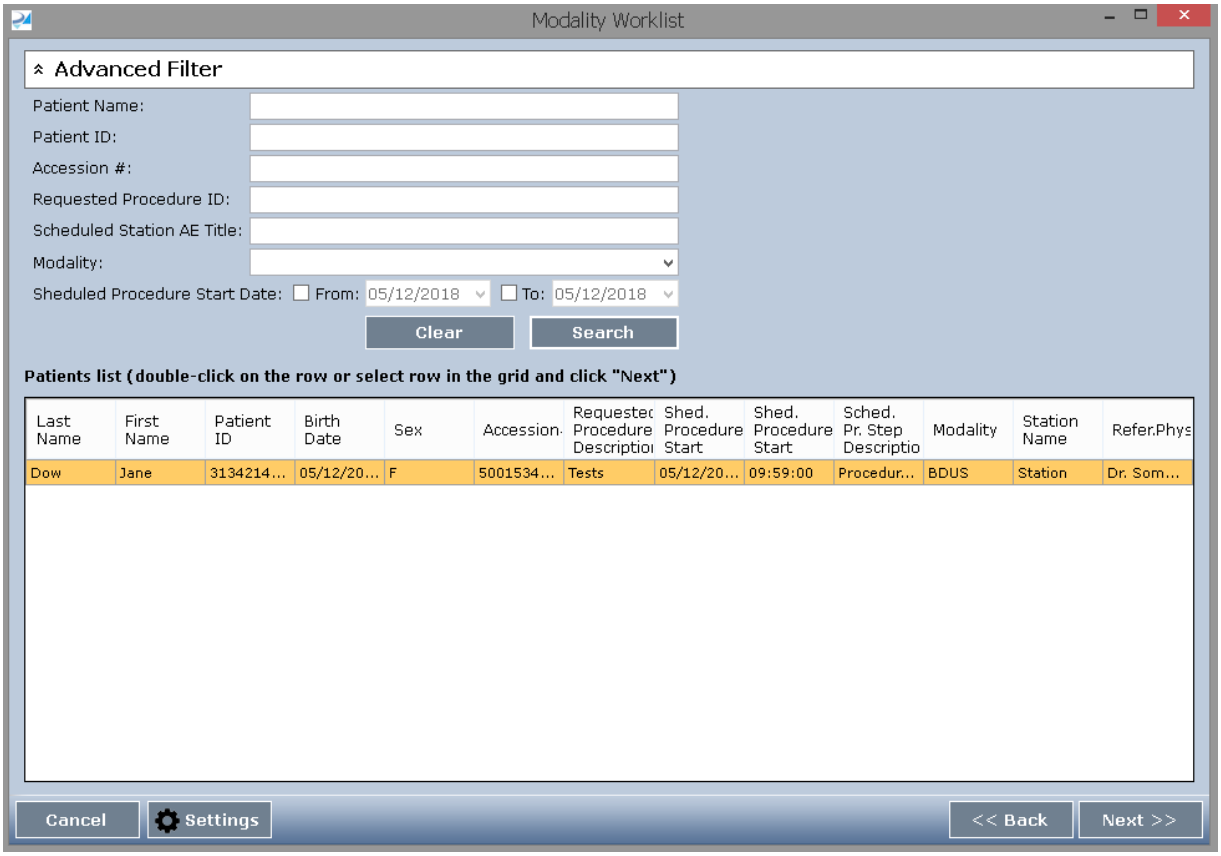

Click "Procedure completed" to store converted DICOM files permanently on the hard disk and in local archive data base, "Cancel procedure" to delete converted DICOM files or "Preview" to open all converted DICOM files in the Viewer.

On completing procedure DICOM files can be automatically sent to remote PACS is correspondent option was selected on Settings screen

## 3.2. Modality Worklist Query

In order to use the Modality Worklist Service configure a Worklist Server.

Click “Modality Worklist” in the main menu:



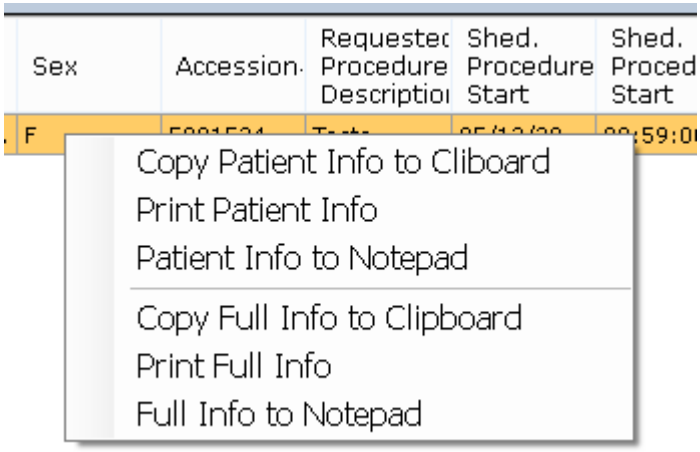

The basic search is done by the patient name or by patient ID. If you are not sure in patient’s name spelling you can use wildcard characters “**?**” and “*****”. “?” is used to represent a single character and “*” represents any number of characters. Click “Advanced Search“ to present additional search options like a range of days when the study has been created or by the accession number. Clicking “Search” with no search parameter set will list all the existing studies. This is not recommended and it may take a very long time.

A default search filter can be set in the settings screen for “today” and for a specific scheduled AE title. To enable this mark the appropriate check-boxes in the “Worklist Server” settings panel.

MODALIZER uses the attributes received from the MWL Query in the EXAP exchange file.

Double click on the row from the list of results or clicking the “Next” button will lead you to acquiring images by EXAP application and converting them to DICOM.

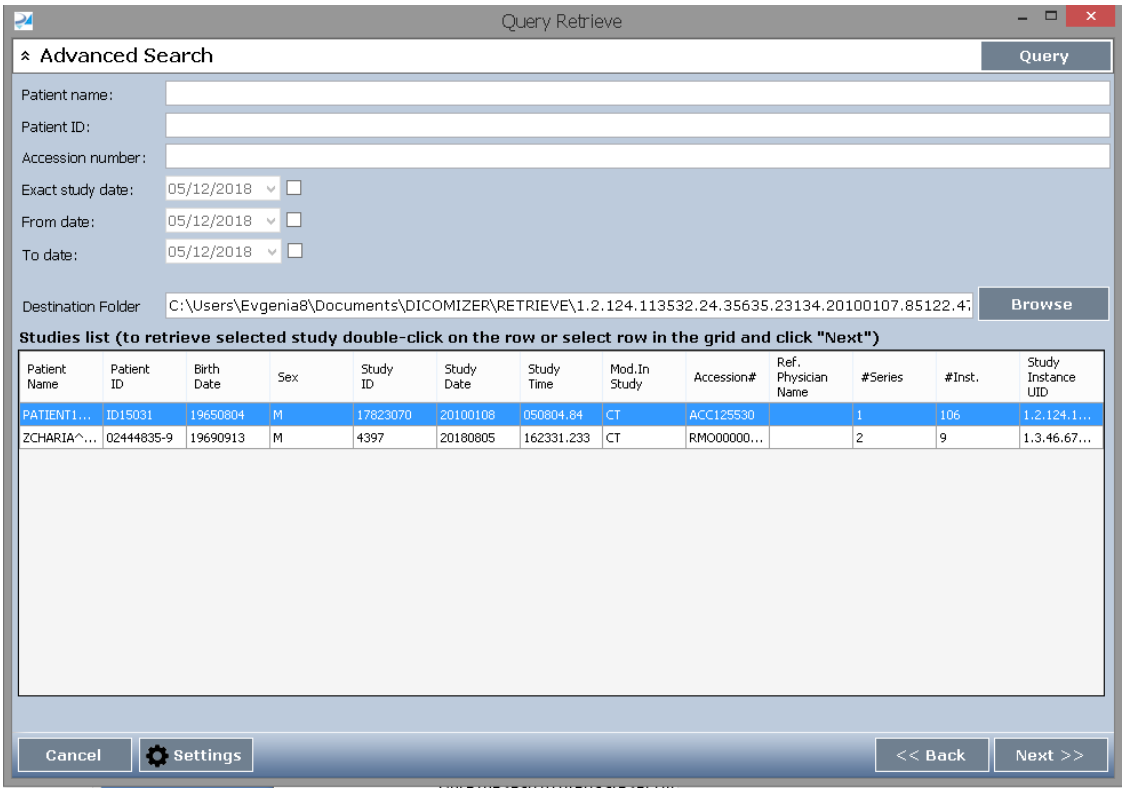
Right click on the row opens menu allowing to copy/print patient and study info:




## 3.3. Query/Retrieve - Searching the PACS

Query/Retrieve (Q/R) is a DICOM Service that allows to search for DICOM objects in a PACS using search criteria (patient name, date of creation of the images, modality etc.) and retrieve them for viewing or other purposes. To use Q/R you configure a Storage Server.

Select “Query Retrieve” from the main screen.



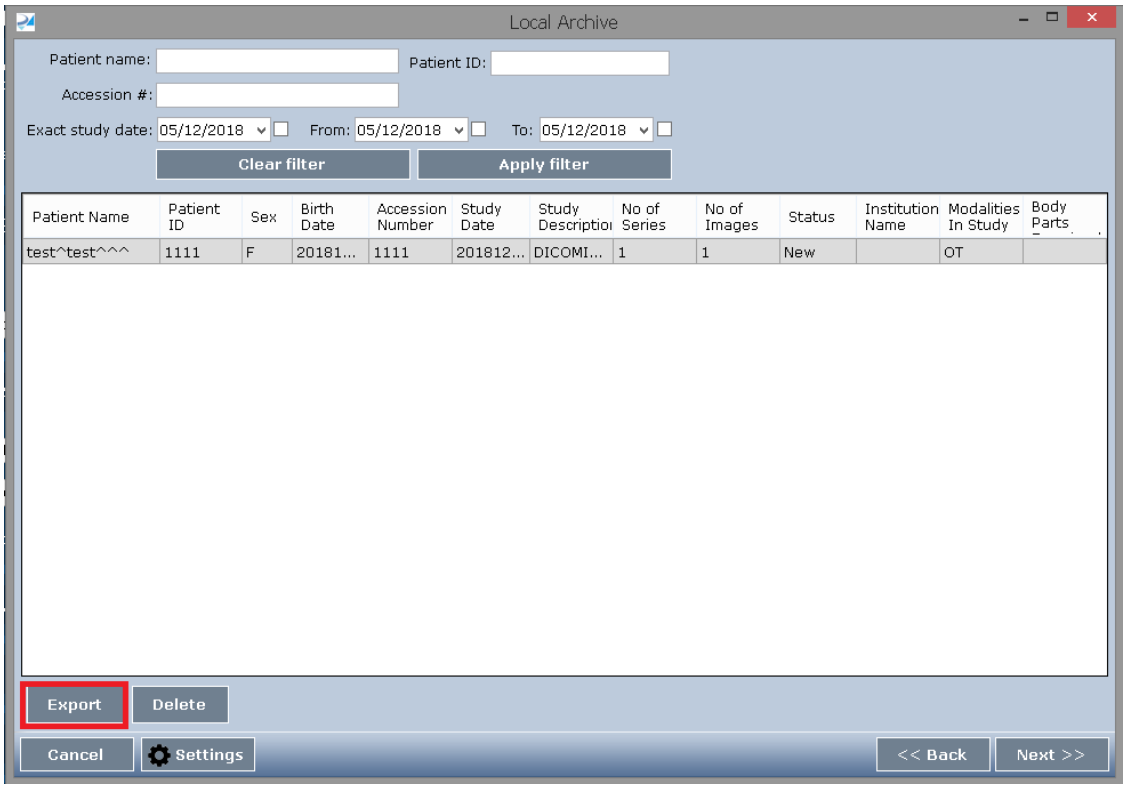
Once the search criteria are set click “Search”. Clicking “Search” with no search parameter set will list all the existing studies. This is not recommended and it may take a very long time.

Double click on the row from the list of results or select the row and click “Next” –the matching DICOM files will be stored in the destination folder and then displayed in the DICOM viewer.

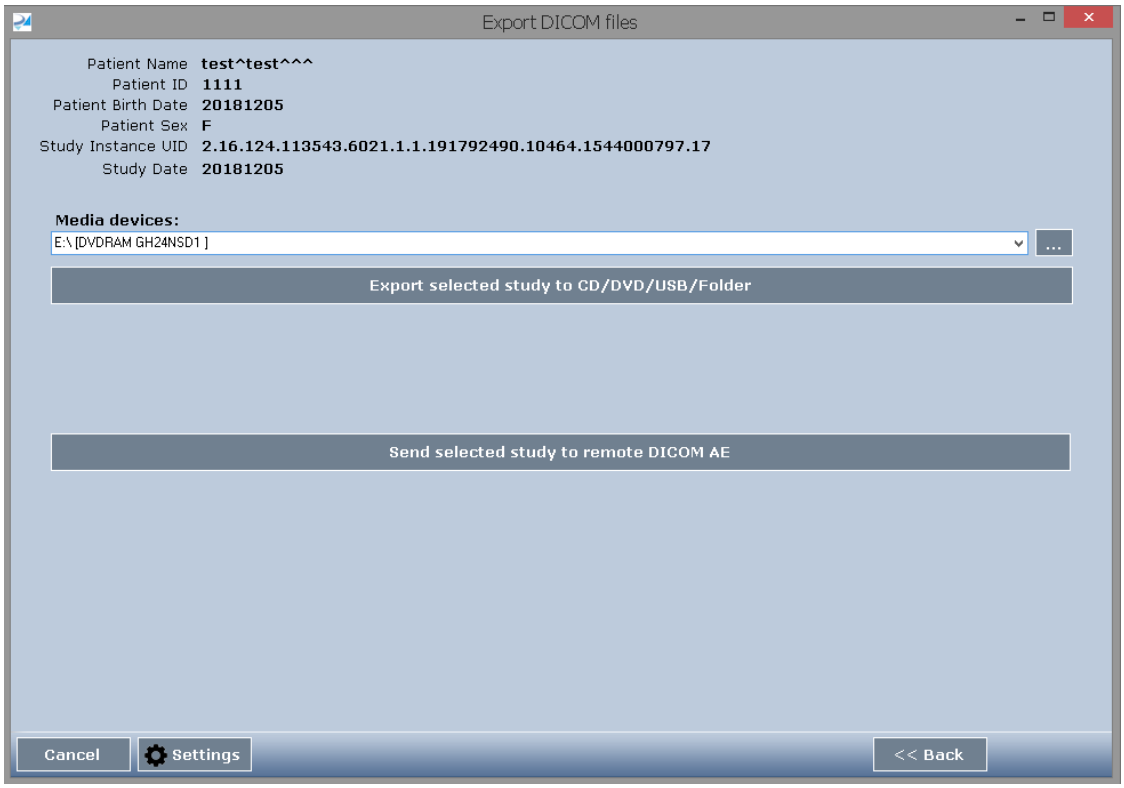
## 3.4. Export study (burn CD/DVD), send study to PACS

MODALIZER allows creating a complete and portable medical record with specific studies and an embedded DICOM Viewer.

Select study and click “Export” on the Local Archive screen:




"Export DICOM files" screen will be opened:




In order to prepare a Standard DICOM Media, MODALIZER prepares the media files using standard filenames in Patient-Study-Series-Image hierarchy and creates a DICOMDIR file.

Select the media device or export folder  for the media to be burn. Click “Export selected study to CD/DVD/USB/Folder” to copy files to selected folder or burn on CD/DVD .

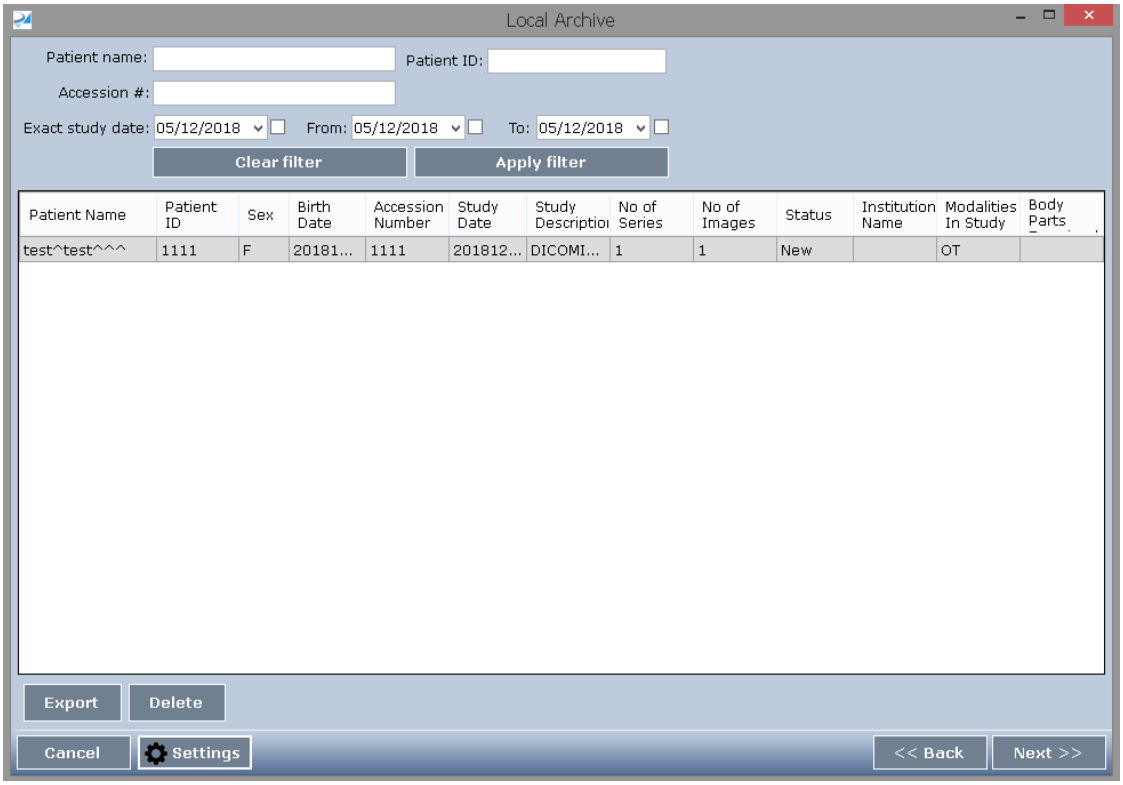
Click " Send selected study to remote DICOM AE " to send study to the remote image archive defined on Settings screen.

# 4. The Local Archive

Local Archive is a built-in Compact SQL data base and hierarchically structured storage place (Root folder/Study folder/Series folder/DICOM files). All converted/retrieved from PACS DICOM files are stored in this storage place. You are able to search, view, export, delete stored files and add new DICOM files to an existing study using "Local Archive" screen.

See in "Settings" how to configure the Local Archive.

Select "Local Archive" from the main screen:




Once the search criteria are set click "Search". Double click on the row from the list of results or clicking the "Next" button will lead you to Viewer screen displaying images of the selected study.

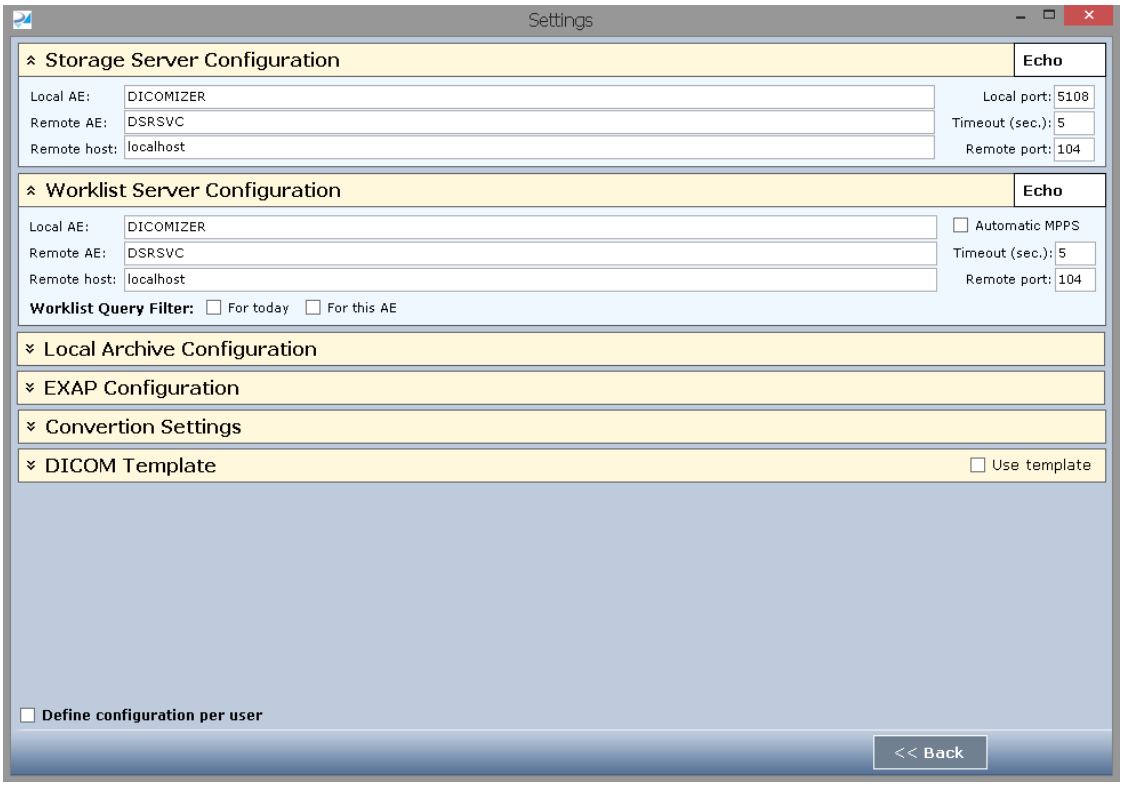
Right click on the row opens menu allowing to export/delete selected study or add a new series to it:

Click on "Delete' to remove selected row from the Data Base and all study files from the hard disk.

Click "Export" to save selected study on external drive or send it to PACS (see 4.4).

# 5. MODALIZER Settings

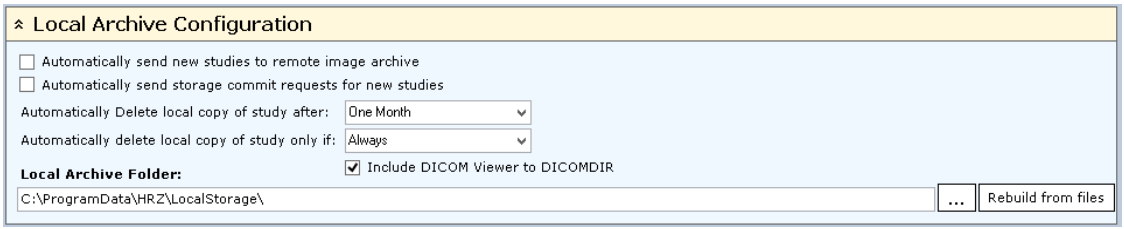
You can enter the “Settings” screen by clicking the “Settings” button in the main menu or by clicking the “Settings” button in the bottom left corner of any screen. Here you can set the Listener, Storage and Worklist servers, configure Local Archive, change the conversion process configuration and define EXAP application parameters.




The DICOM nodes (workstations, PACS systems) can communicate if they know each other. That means, each system must know the AE Title, the IP address or hostname and the IP port of the other system. After setting these parameters you will be able to use Storage, Modality Worklist and Query/Retrieve.

## 5.1. Local Archive configuration

All converted/retrieved from PACS DICOM files are stored in hierarchically structured storage place (Root folder/Study folder/Series folder/DICOM files); info about these files is stored in built-in Compact SQL data base.




To change root folder where archived studies are stored - click "..." button.

Set required clearing mode by selecting options from "Automatically delete local copy of study after" and "Automatically delete local copy of study only if" lists.

You may need to re-fill DB by info about DICOM files stored in root folder, for example if you want to switch to another storage folder. You can do it by selecting required path and clicking "Rebuild from files" button. Current archive folder will be scanned and found studies inserted into DB.
This operation is executed in separate task with displaying its progress while running. You can stop this operation by clicking "Cancel" button.
Log file RebuildFromFiles.log will be created containing follow data:

- The name of every folder that is scanned
- The name of every file that is opened (full path)
- Whenever new study is added with Study Instance UID.

Select "Automatically send new studies to remote image archive" if you want send DICOM files to PACS after conversion ends.

Select "Include DICOM Viewer to DICOMDIR" if you want to copy DICOM Viewer Standalone Application so the DICOM files can be viewed automatically by clicking DICOMViewer.exe

## 5.2. Storage Servers configuration


- Local AE - The DICOM AE Title of this installation of MODALIZER. This must match to the MODALIZER AE Title configured in the PACS.
- Local port - define the port number that MODALIZER listens on for incoming connections (The default port is 5108)
- Timeout - the purpose of a server timeout is to prevent from endlessly waiting for a server to respond. The recommendation is to keep the default, if there are known connection problems increase the value.
- Remote AE - your Storage Server title.
- Remote host - your Storage Server host name or IP address.
- Remote port - your Storage Server port.

Click the “Echo” button to verify that the settings are correct. If red X icon is displayed, verify that the settings are correct and the server is running. Check the log file lastEcho.log in MODALIZER installation folder (C:\MODALIZER).

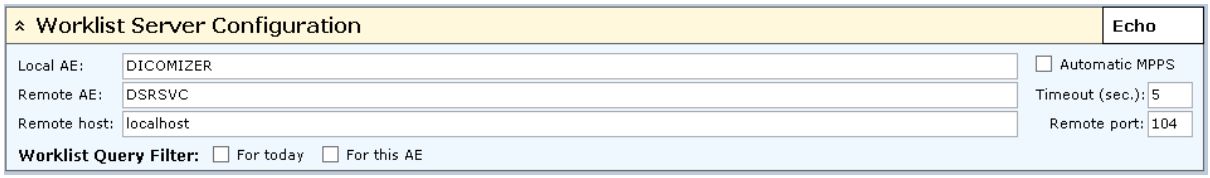
**Important:** To complete this settings you must also configure your Storage Server (PACS) with Your MODALIZER AE Title (the value you set for “Local AE”), the hostname (or IP address) of your computer and the IP port (the value you set for “Local port”).

Note #1: Ask your System/PACS Administrator for the Storage Server parameters.

Note #2: MODALIZER is compatible with most DICOM PACS providers. Please advise your PACS software help file about AE configuration of your PACS server or ask your System Administrator.

## 5.3. Worklist Servers configuration

The Worklist Server must be configured in order to use Modality Worklist query.




Configure the parameters for your Worklist Server. Click the “Echo” button to verify that the settings are correct. If red X icon is presented verify that the settings are correct and the server is running.

Automatic MPPS - check this option to use MPPS.

Note: Don’t check this option if the Worklist Server you work with doesn’t support MPPS.

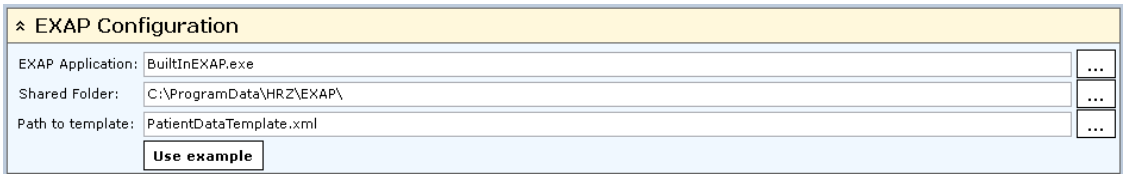
Timeout - The recommendation is to keep the default, if there is known connection problem increase the value.

Two more options in the Worklist Server panel refer to Worklist Query filter. You can define that the search results will present only the studies that scheduled for today and/or for a specific Scheduled AE Title. To do this mark the appropriate check-boxes in the “Worklist Server” panel.

Note: Ask your System Administrator for the Worklist Server parameters.

## 5.4. External Acquisition Application configuration

MODALIZER uses some external application to acquire images for converting to DICOM. For example - some application receiving images from medical device as CT etc.
External application will be started when user clicks "Next" button on "New patient"/ "Modality Worklist" screen or on adding new series to existing study from "Local Archive'/"Query Retrieve" screen.
This application must receive as input parameter path to some "exchange data" file containing patient and study data (patient name and ID and so on) and save acquired file in the parent folder of this file.
Follow parameters have to be defined in Settings screen:

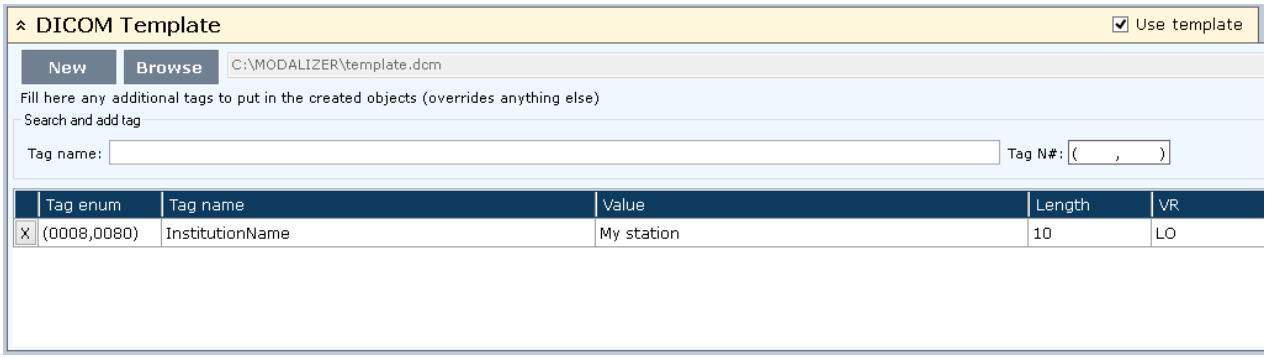



1. **EXAP Application**: full path to EXE file starting external application (by default it is built-in example working exactly as Acquisition screen). To select EXE - click "Browse" button in the same line. To return to built-in example - click "Use example" button
2. **Shared folder:** full path to a folder in which exchange file (XML, txt, json etc.) will be stored. To select folder - click "Browse" button in the same line.
3. **Path to template:** full path to exchange file template. Built-in template is XML file by name PatientDataTemplate.xml containing all available fields.

## 5.5. DICOM template (override DICOM Attributes)

DICOM attributes are stored in a file that you can edit or replace. In order to use the attributes as they're defined in the template mark "V" in the check-box "Use Template".

Important! The override attributes are applied after all other conversion steps were made. Make sure not to override any image attributes (group 0028).




To create your own DICOM attributes template click "New", in the opened window select the file location and give it a name. Click "Save". The created file will be automatically loaded in MODALIZER and you can edit the attributes. You can find the attribute by its name - start typing to get a drop-list of the appropriate attributes or search by the attribute's tag enumeration. Click "Add" to present the value in the table. Enter the new value in the attribute's row in the "Value" column. Clicking "X" in the left column will remove the attribute from the template.

If you want to use another DICOM attributes template click "Browse" and select.

## 5.6. Conversion Settings


The files will be converted to DICOM the way they are. JPEG Images will be converted as JPEG and other as uncompressed.

- Create one Multi-Frame File – use this option when you have a series of related images. All images must be the same format and the same size.

## 5.7. General configuration

At the bottom of the configuration screen there are one additional option:


When per-user configuration is checked, every user (from the windows operating system) has its own configuration file.

# 6. Completing tasks with MODALIZER

## 6.1. Viewing DICOM Images

MODALIZER is a powerful DICOM Workstation that lets you display DICOM Files from your local computer, from CD/DVD/USB and from any PACS.

There are a few ways to present the files - you can Drag-and-drop the items or to click “Open Files” to browse for a folder and select the files to view. In order to present all folder’s content use “Open Folder” button.

## 6.2. Using CD/DVD DICOM Viewer

MODALIZER automatically adds a DICOM CD Viewer to every burned CD/DVD so patients and physicians can view their studies and reports anywhere. Double click the DICOM Viewer application in the CD/DVD root folder to view the CD/DVD content.

## 6.3. Viewing PDF file in DICOM format

To extract a PDF from a DICOM Encapsulated PDF file, click PDF icon in the Viewer – the file will be converted to PDF and displayed using your system default PDF viewer.

## 6.4. MPPS (Modality Performed Procedure Step)

Modality Performed Procedure Step is a complementary service to Modality Worklist.

Once the procedure was started via Modality Worklist Query the modality creates a new MPPS that references the Study.

MPPS has 3 statuses:

- IN PROGRESS – this means that the procedure has been started
- COMPLETED – this means that the procedure is finished.
- DISCONTINUED – if the procedure was stopped in the middle

# 7. Troubleshooting

## 7.1. Log Files

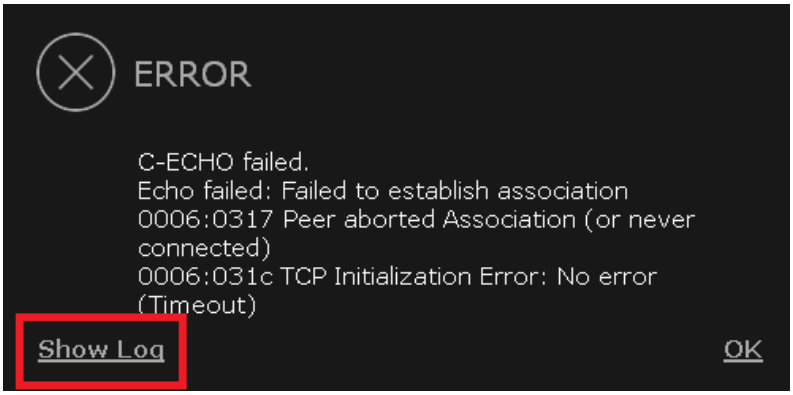
MODALIZER Log files are stored in the directory:
C:\Users\<User>\Documents\MODALIZER\LOGS.

MODALIZER keeps the last log for every DICOM operation:

- LastEchoToStorageServer - the log on Echo to PACS action

- LastEchoToWorklistServer - the log on Echo to Worklist Server action
- LastMove - the log on copying a study to PACS
- LastMPPSCreate - the log on MPPS creation
- LastMPPSSet - the log on setting MMPS
- LastQuery - the log on Query Retrieve operation
- LastSend - the log on the send to PAXS operation
- LastWorklistQuery1 - the log on Worklist Server search operation

When operation fails, message will be displayed with an option to open correspondent Log file:



# Appendix A. Customization Instructions

There are five files in the installation folder you can use to customize your MODALIZER layout and links:

1. Company_Logo.png - logo on the main screen, image size 254x60, built-in image is

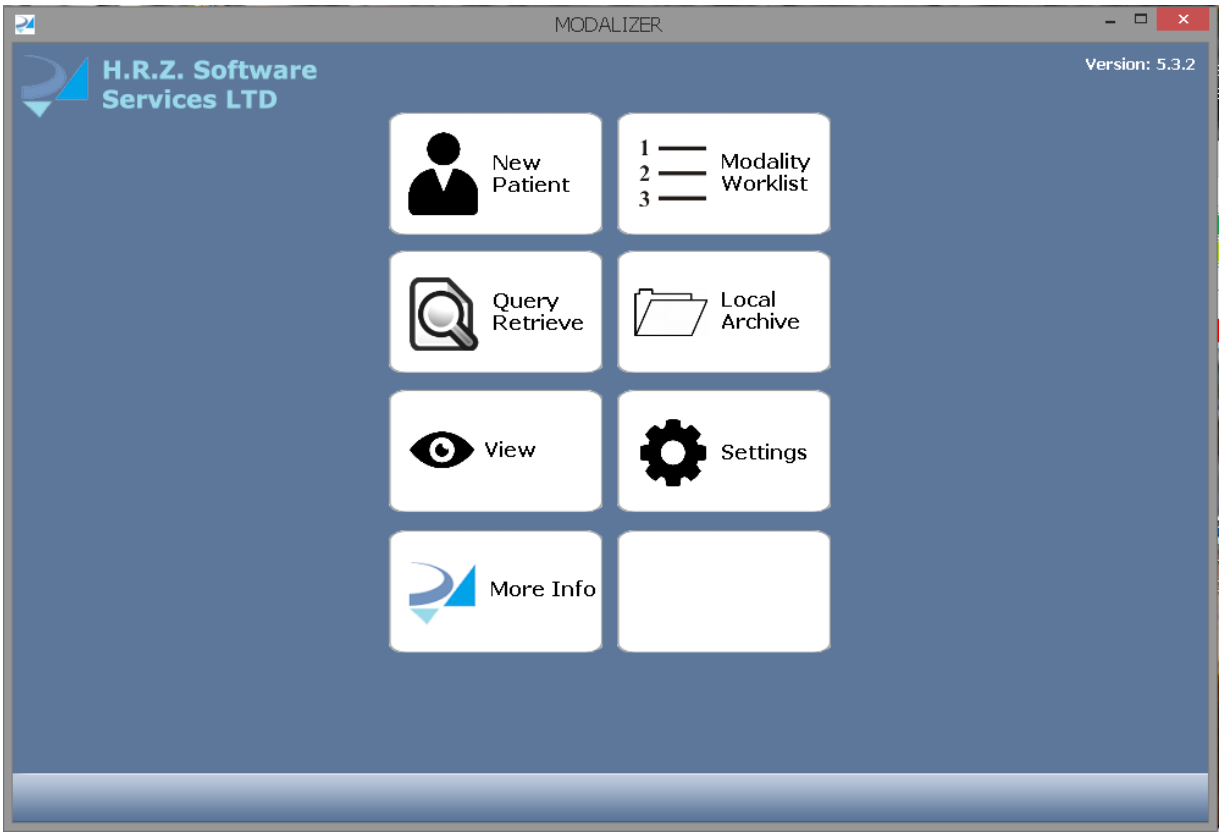

2. CompanyIcon.ico - icon file for main screen title and desktop shortcut, built-in icon contains 16x16, 32x32, 48x48, 64x64, 96x96, 128x128 and 256x256 24 bit images which looks like

3. More_Info.png - image for "More info" button, image size 60x60, built-in image is

4. MODALIZERMoreInfoLink.txt - text file containing link for "More info" button, built-in value is
   https://www.roniza.com/products/modalizer/
5. MODALIZERBuyLink.txt- text file containing link for "Buy now" button, built-in value is http://www.roniza.com/modalizer-contact-for-pricing/

After clean installation desktop shortcut looks like:

and main screen of the MODALIZER like:




**NOTE:** You can edit all these files but you need to save it with EXACTLY THE SAME NAMES!
PNG file MUST have the same width and height.

Edit MODALIZERMoreInfoLink.txt and MODALIZERBuyLink.txt in the Notepad if you need another links.

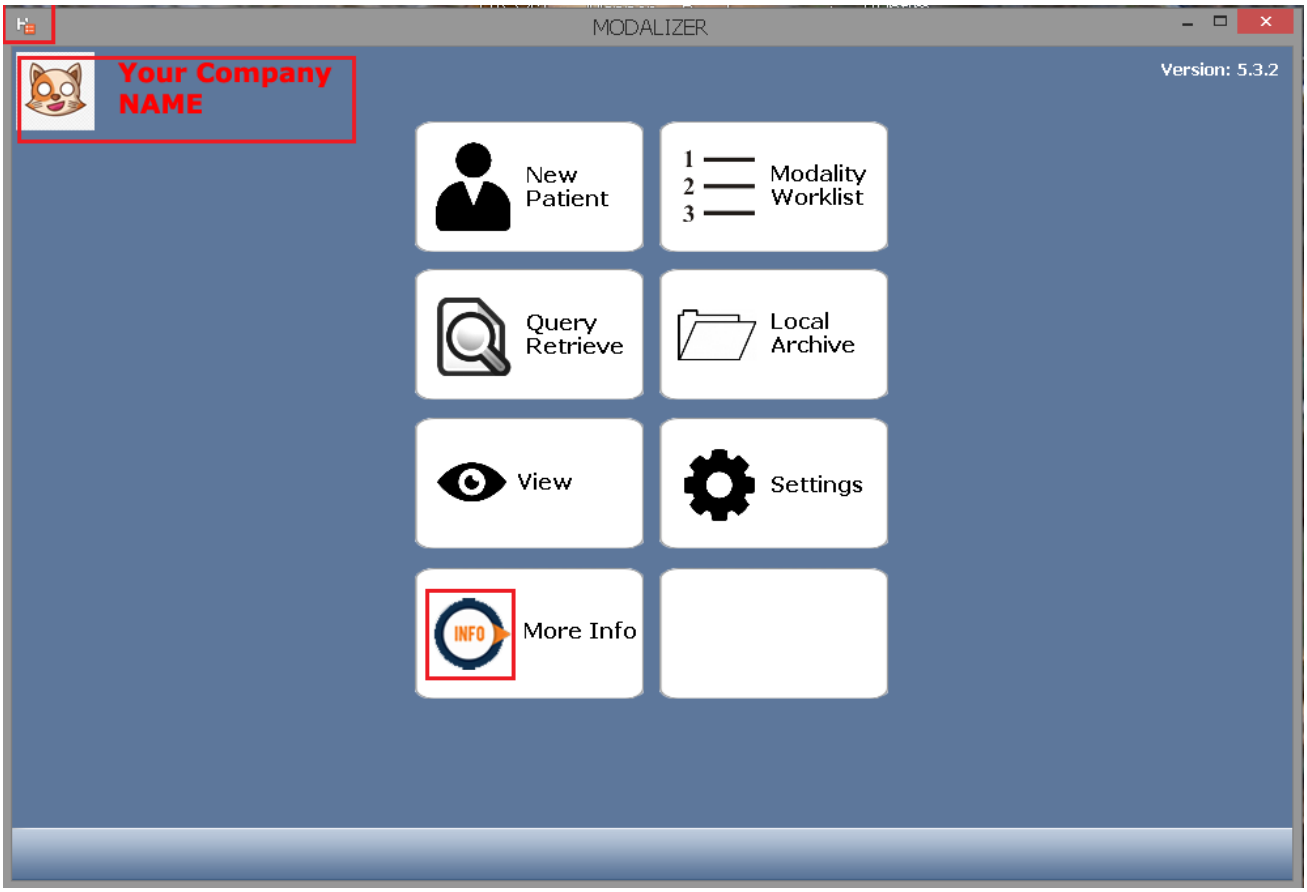
Icon file CompanyIcon.ico can be edited for example in Visual Studio or any graphic redactor supporting ico format. Let's suppose CompanyIcon.ico file has been changed to something like:

PNG files can be edited in Photoshop, Windows Paint etc.

For example Company_Logo.png is now like:


and More_Info.png like:

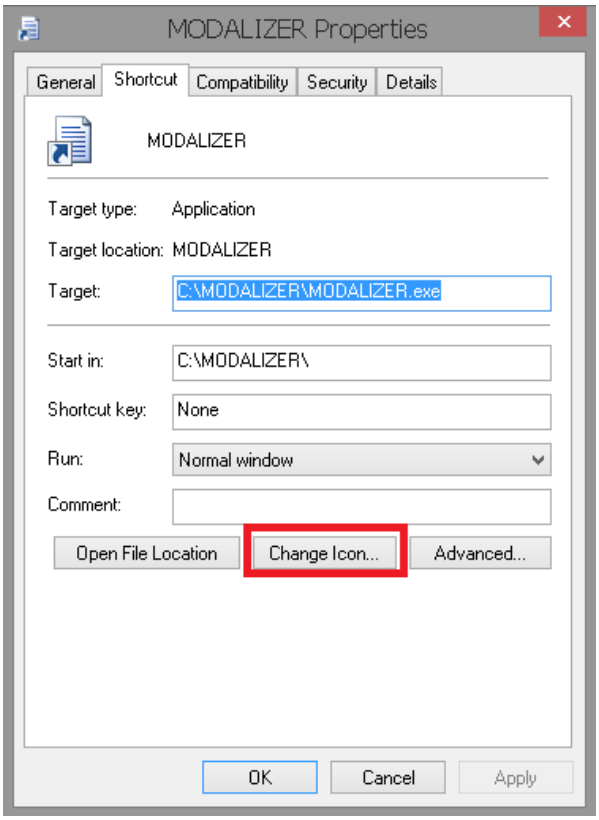

MODALIZER main screen now will look like:



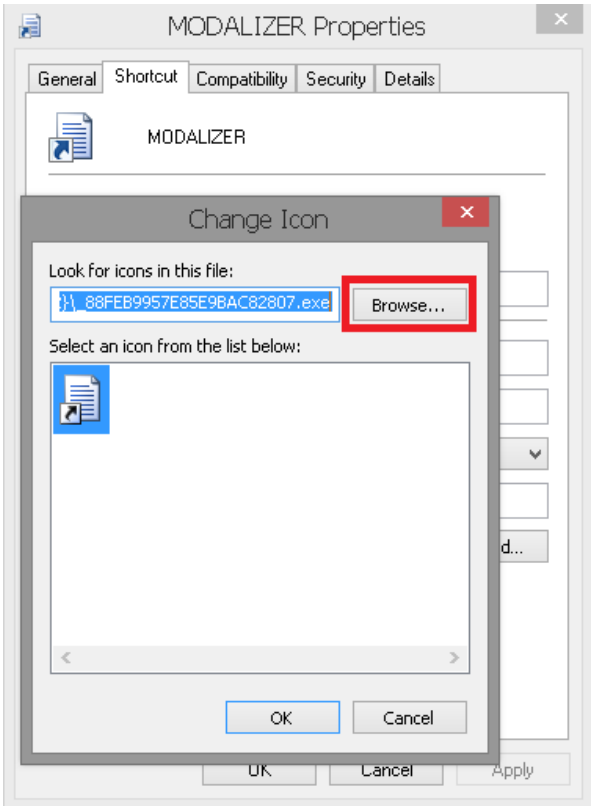

Also you can change desktop shortcut layout by selecting another icon:

1. Right-click on MODALIZER shortcut and select "Properties"

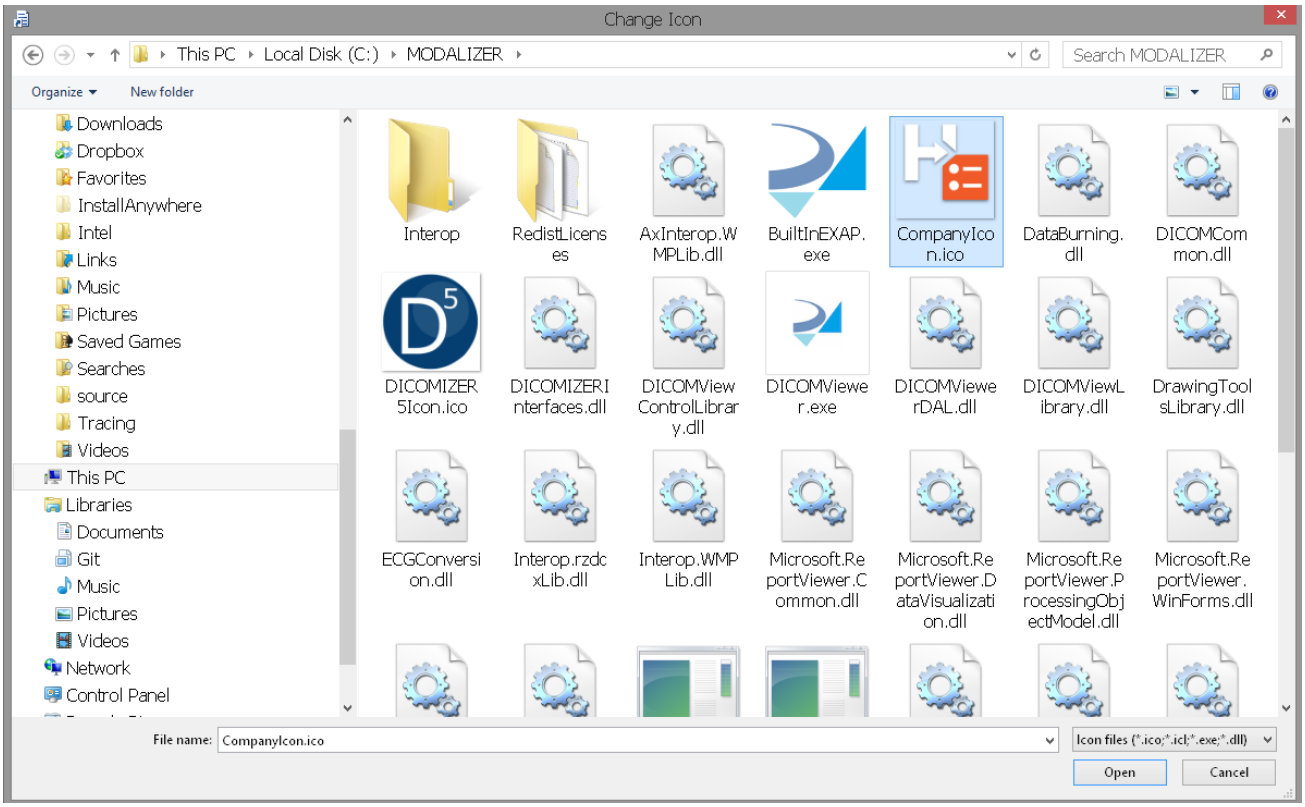
2. Click "Change icon":




3. Click "Browse"

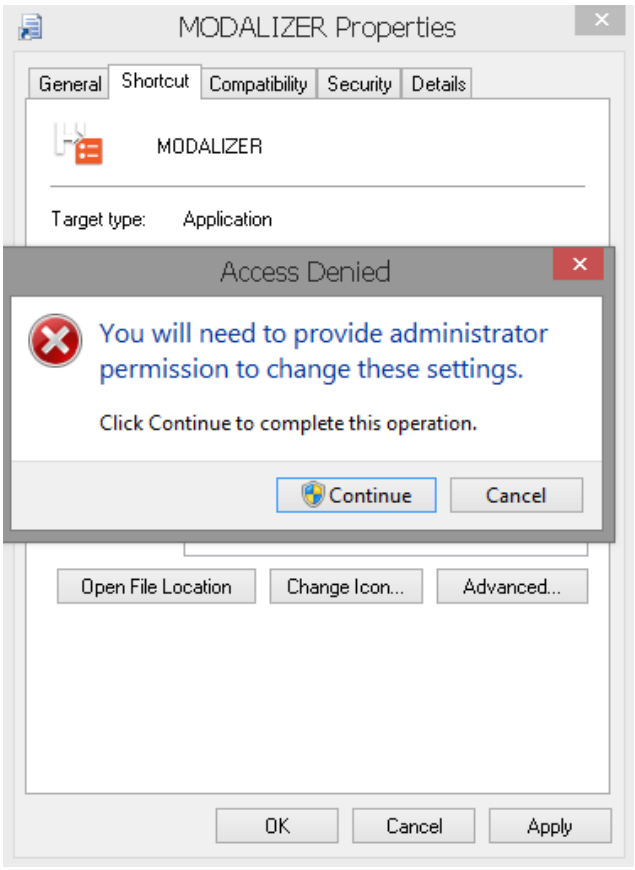


4. Navigate to MODALIZER installation folder and select CompanyIcon.ico file:




5. Click "OK" in "Change icon" screen and "Apply" on Properties screen.

**NOTE:** You must have Administrator permissions to complete operation:




If icon has been changed successfully, you desktop shortcut will look like: