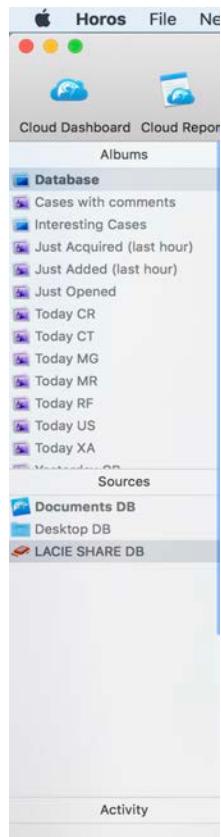


Chapter 5 provides more detail on image manipulation.

The Side Panel



A panel on the left hand side, with subsections labelled ‘Albums’ and ‘Sources’, provides access to collections of studies known as ‘image albums’ (Fig 4.22). These are filtered to allow for ease of access and recognition. External sources of images are also accessed through this panel.

An activity bar is also visible in this panel which displays a list of processing threads running in the background. These processes could include database maintenance or sending threads for example. It is possible to cancel a ‘thread’ if a cross button is displayed to the right.

Figure 4.22 The side panel

The Albums

Studies and images can be organized into different albums within a database. This section provides an overview of albums and smart albums. Albums and Smart Albums can also be created using the ‘File’ menu (see Chapter 3). To start, select the desired database.

Selecting an album

Once you have identified the desired album within the left hand side panel, double-click and the album will appear in the database window.

Creating a new album

Right-click within the ‘Albums’ area of the side panel and select ‘Add Album’ from the contextual drop down menu (Fig 4.23).

You will be prompted to enter an album name, by a ‘drop down’ menu, which will appear in the center of the database window. Once created, the album appears in the ‘Album’ list within the left hand side panel.

Adding studies or images to an album

To add a study or an image to an alternative album, drag and drop the study from the study list into the album icon of the desired album.

Removing a study from an album

Select the desired study from the given album and either select the delete button on your keyboard or click on the ‘Delete’ icon.

A dialogue box will appear allowing you to verify whether you wish to delete the study completely. Alternatively, you can delete the study only from the album, in which case it will remain in the database list.

Deleting an Album

NOTE: Once a study or series has been deleted it will no longer be available for viewing and cannot be recovered

To delete an entire album, select it by placing the cursor over the album name and clicking on the album. Right-click the album and select delete from the contextual menu which appears (Fig 4.24). You will be asked to confirm this procedure in the dialogue box which appears.

This function can also be achieved from the ‘File’ from down menu, and selecting ‘Delete Selected Album’.

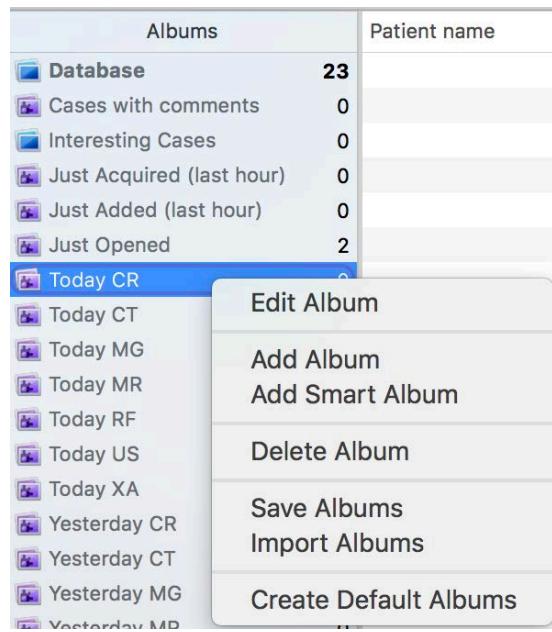


Figure 4.24 Contextual menu used to create and delete albums

Smart Albums

Horos supports smart albums, in a similar way to iTunes®, which allows rules to be set up to automatically store images in selected albums.

To do this, select ‘Add Smart Album’ from the contractual menu by right-clicking within ‘Albums’. These are located within the panel on the left hand side of the database window (Fig 4.25).

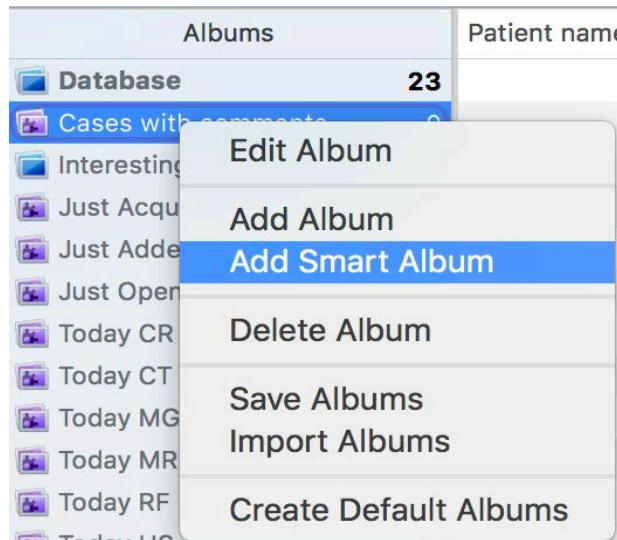


Fig 4.25 Contextual menu for creating a Smart Album

When a dialogue box appears (Fig 4.26), enter the desired album name. A list of criteria can be selected from such as imaging modality, time interval or a key word of your choice, to create rules to enable automatic study selection.

It is possible to select more than one criterion, by selecting the ‘+’ button (Fig 4.26).

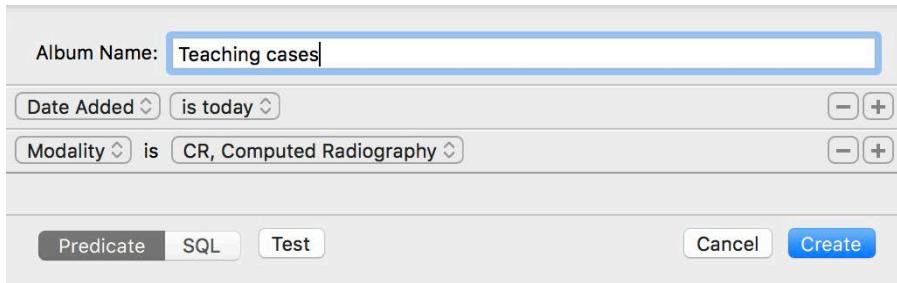


Figure 4.26 Dialogue box for naming and setting criteria for a ‘Smart Album’

Once created, Horos will automatically search and import case studies or series matching the selected criterion into the appropriate Smart Album.

Any new studies imported into the database will automatically be sorted and imported into the appropriate smart album.

It is therefore possible to create dynamic albums with rules for example on time constraints. For example, an album containing Ultrasound studies of the current week. Studies will automatically disappear from the smart album if more than one week old, whilst new studies will automatically be added.

It is possible to edit Smart Album rules at any time. To do this, first double-click on the required smart album. A pop-up window will appear containing the SQL query, this is essentially the set of rules associated with that Smart Album which you selected when the smart album was created. It is possible to edit these rules, also known as a query, according to the fields available (Fig 4.27). It is important to know that these sets of rules apply only at the study level. This is unlike rules set through a SQL filter auto-routing rules, see Chapter 9

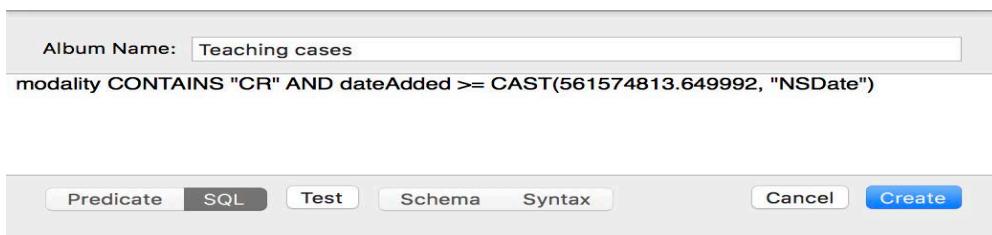


Fig 4.26 SQL Query for a SMART Album

Sources

Within the left hand side panel, a list of remotely accessible external sources is displayed. Four categories are visible:

- Local Default Database*
- Desktop DB (Database)*
- MINIPACS*
- Remote user DB (Database)*

By dragging and dropping image files and studies from the database list to the desired source, it is possible to send or copy images to any of these destinations.

Local Default Database

Upon setup Horos will, by default, create a folder called Horos data to store and organize images. This is located in the Documents folder of your home directory. It is possible to change the location of this folder using the ‘System Preferences’ described in Chapter 2.

Database Folders

The list of folders in this subsection correspond to any database folders located either on the computer’s hard drive or within an external device, including an iPod. This list can be amended, by removing or adding items. Details on how to do this can be found in Chapter 2.

Shared Horos Database

These are identified by a ‘Bonjour’ icon. A shared Horos database is one which corresponds to a database located on a shared workstation which has been set up to allow access to other users. Once these databases have been discovered, through the Bonjour protocol (see Chapter 2), Horos will automatically display them in this section of the Sources panel.

If a shared database is available to view, double click on the named database to open the list of images in the database window. These images can be displayed and manipulated in the same way as a local database. Studies and series can be added or deleted from the shared database. This is done by editing the list within *Location Preferences*. More details on this can be found in Chapter 2.

Your own local database can also be shared with other users by activating the database sharing function. More detail can be found in Chapter 2.

DICOM nodes

These are identified by a ‘network sphere’ icon.

Databases located at a distant DICOM node can be added to, or items removed. This can be done by editing the list using the *Locations Preferences*. See Chapter 2 for more details. It is not possible however, to browse images stored at these remote locations.

It is also possible to share images, series or studies with databases at distant Dicom nodes. To do this, first select the desired images, studies or series using your mouse. Then drag the selected cases to the desired location.

Consecutive cases can be selected by highlighting the first case, then holding down the ‘Shift’ button on your computer or laptop and highlighting the remaining cases by scrolling the cursor. Holding down the ‘Command’ button whilst moving the cursor, to select the required cases, can highlight non-consecutive cases.

Activity bar

An activity bar is also visible in this panel which displays a list of processing threads running in the background. These processes could include database maintenance or sending threads for example. It is possible to cancel a ‘thread’ if a cross button is displayed to the right.

Horos is able to perform multiple simultaneous operations and is described as a multi-threaded software. Some of these operations, such as sending images, compressing images and database auto-cleaning, can be performed in the background. These background operations are displayed in the activity panel. It may be possible to cancel an operation. If this is the case a small ‘x’ will be visible adjacent to the operation, and can be clicked to cancel.

File Management

Images are stored as files within a specific database folder either on a local directory or a remote device. The default folder name is Horos data, and is located in the home directory within the ‘Documents’ folder. It is possible to change the location of this folder by selecting *Preferences* from the Horos menu.

DICOM Files

The default file type supported by Horos are DICOM files, with the extension dcm. A DICOM file contains not only the image, but also fields describing the image and other related information. The descriptors include for example resolution, matrix size and orientation and the related information includes for example the physicians name. Currently, thousands of fields are described by the current DICOM format [10].

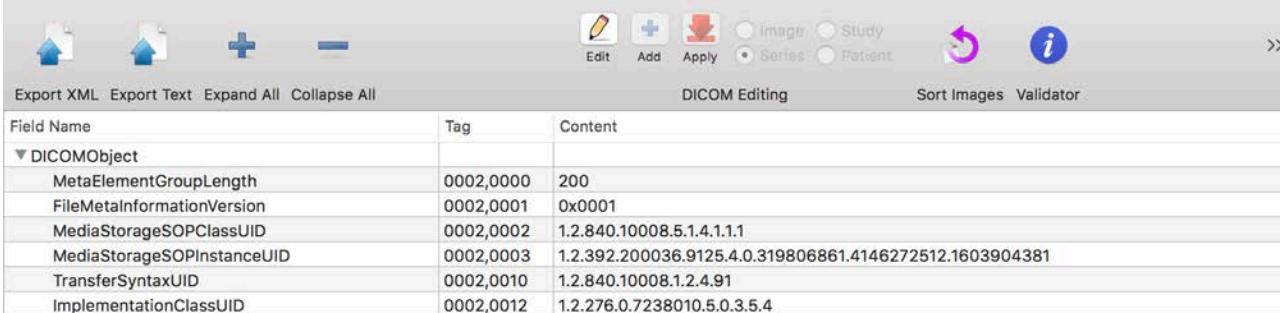
A single DICOM file classically stores one image, however in a multi-frame protocol multiple images are stored in a single file. Multi-frame protocols would typically be used for ultrasounds or angiograms for example.

DICOM files may contain a simple matrix of pixels, or could be another encapsulated format such as JPEG or JPEG2000. Files, such as reports (Structured Reporting objects) are also covered by the DICOM protocol and would be stored in a DICOM file. Horos can load and import any of the described DICOM files whether single images, multi-frame protocols or reports.

It is possible for Horos to support other types of image formats, including JPEG and TIFF. For further information on this see Chapter 2.

Meta-Data Window

Meta-Data describes the associated data which is stored with the DICOM image, study or series. This includes image acquisition time, physician name and study center, for example, as well as other data around image quality. A screen shot example is displayed below Fig 4.28.



The screenshot shows the Horos Meta-Data window interface. At the top, there is a toolbar with icons for Export XML, Export Text, Expand All, Collapse All, Edit, Add, Apply, and buttons for Image, Study, Series, and Patient. Below the toolbar is a table with three columns: Field Name, Tag, and Content. The table shows several DICOM object fields:

Field Name	Tag	Content
MetaElementGroupLength	0002,0000	200
FileMetaInformationVersion	0002,0001	0x0001
MediaStorageSOPClassUID	0002,0002	1.2.840.10008.5.1.4.1.1.1
MediaStorageSOPInstanceUID	0002,0003	1.2.392.200036.9125.4.0.319806861.4146272512.1603904381
TransferSyntaxUID	0002,0010	1.2.840.10008.1.2.4.91
ImplementationClassUID	0002,0012	1.2.276.0.7238010.5.0.3.5.4

Figure 4.28 Snapshot example of Meta-Data associated with a DICOM file

It is possible to modify the content of the displayed fields. This can be achieved by altering the parameter settings within General Preferences, see Chapter 2

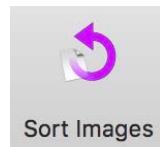
To search the Meta-Data window, use the search field which can be found within the toolbar of the pop up window.

Modifications to the fields within the Meta-Data can be done at an image level, ensuring only the current image is modified, at a Series, Study or Patient level.

To make a modification, double click on the desired field value, input the new value and then press return to validate the change.

To enable the DICOM header edition, click on the ‘edit’ button. To disable the DICOM header edition, click on the ‘disable’ button, see Chapter 2.

Sorting Images



This additional feature is available if the Meta-Data tool is loaded whilst viewing images using the 2D viewer tool. By selecting this tool from the Meta-Data toolbar it is possible to change the order of images within a case series (4.29).

The default order of image display is determined by the *Instance Number* field within the Meta-Data. If you choose to alter the *Instance Number* to change the order in which images are displayed, the images will only be temporarily re-ordered. Neither the DICOM files themselves, nor the structure of the Horos database is affected by this change. Consequently, the next time you open the series, you can choose to restore the default order in which the images are displayed.

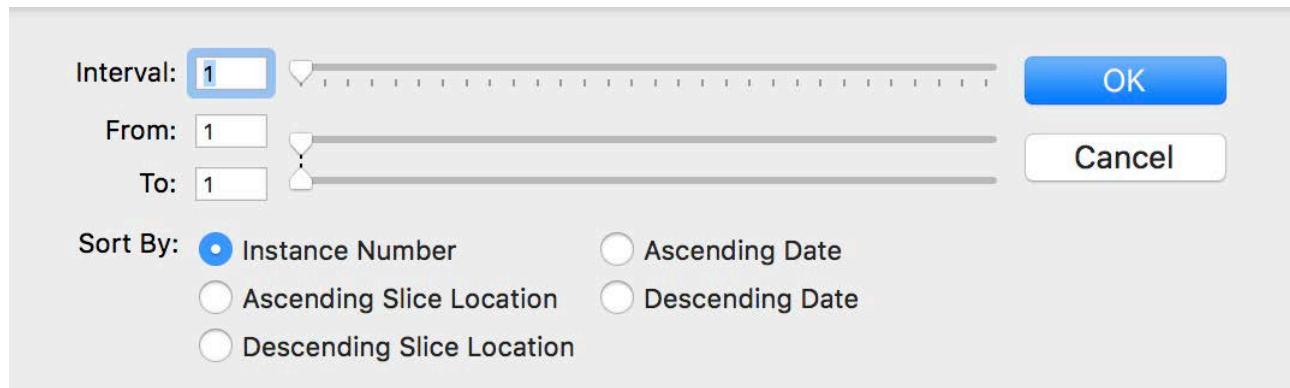


Figure 4.29 Dialogue window for sorting images

DICOM Validator Tool

In order to verify whether an image is DICOM standard [10] and consequently correctly formed, a validator tool is available within the Meta-Data window. Once the validator tool is selected, a text output window, displaying the validation, is displayed. The validator tool within Horos is based upon the DICOM validator, *dciodyfy* [3].

Importing images

DICOM files can be imported into Horos. In order to reduce compatibility issues, three DICOM reader toolkits are incorporated into the Horos software to import and read DICOM files. This is because DICOM files themselves are based upon a complex protocol.

The available toolkits for importing and reading DICOM files within Horos are:

DCM Framework
DCMTK from Offis
Papyrus

These toolkits can be modified within the ‘settings’ feature in General preferences. See Chapter 2 for more information.

DICOM files can be imported into Horos in one of several ways:

Using the File Menu. Select ‘import’ from the drop down menu.

Using the ‘Finder’ function on the study list. Files can be dragged and dropped to or from this location.

CD/DVD. Insert a CD or DVD containing DICOM images into your computer to browse its content. Files can be copied into your database by selecting the ‘copy’ option from the pop-up window.

DICOM Communications. It is possible to receive DICOM images through network sharing protocols. More information can be found on this in Chapter 9.

Database Sharing. Images can be downloaded from a distant Horos workstation, see Chapter 9

ZIP Files. If a ZIP file is received either via email or through an external storage device, Horos will automatically decompress and import the content.

INCOMING Folder. Horos regular checks the content of the INCOMING Folder, and will automatically index and archive files found, including sub-directories. The interval for content checking can be specified. See Chapter 2 for more details.

Chapter 5

Displaying Images

Occasionally, users will want to change the layout of the 2D views on the screen. For example, you may prefer to display brain CT series differently than those for abdominal or 4D series. Fortunately, Horos allows you to set the 2D views in ways that correspond with your study modality. You can define a set of multiple layouts for one Study Description (database field `studyName`, DICOM field `StudyDescription` (0008, 1030), and a different one for another Study Description. Once you have set the layout for a given modality, when you open it again Horos will display it according to the layout you specified.

To create a specific layout for a modality (brain CT studies, for example), open the Horos Preferences and click on Protocols icon (Figure 5.1). This opens a window like that shown in Figure 5.2. You can specify the modality using the drop-down list at the top and set the layout using the Window Tiling and Image Tiling options. If you want to apply a layout to all studies of a given modality, use Default as the study description. Otherwise, you must set the `StudyDescription` for the study to the exact string you plan to use in the Protocols Preferences. The layout refers to the number of rows and columns for the Viewers (Series Rows, Series Columns) and for image tiling (Image Rows, Image Columns)



Figure 5.1. The Protocols icon from the Horos Preferences panel.