

# DICOM Tool

## Features and BIRPacs Migration

### Introduction

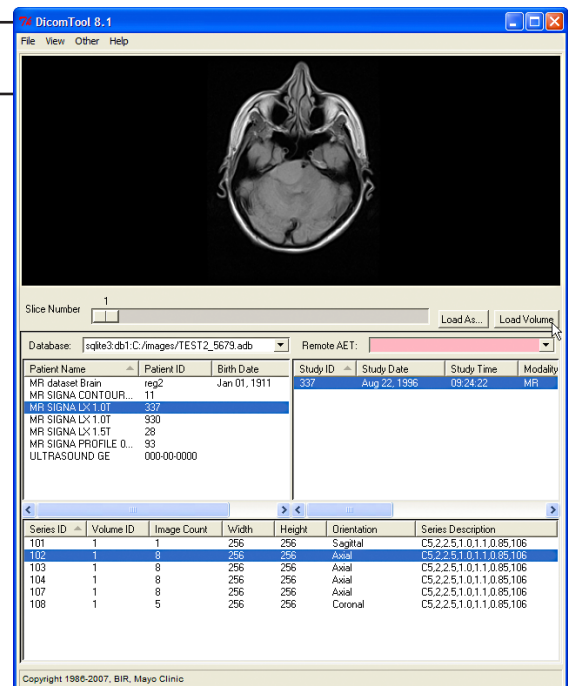
**Analyze** includes functionality for the critical task of DICOM image management, including the import/export of DICOM image files, standard DICOM communications with other DICOM-based systems, and a database to coordinate the use of DICOM images within Analyze. This functionality is embedded in a module called the **DICOM Tool** (under File in the main Analyze menu). The DICOM Tool module includes an intuitive interface to data selection and loading, including an image viewer for examining the images prior to loading. The underlying DICOM Tool database provides cross-platform compatibility, shared data throughout networked Analyze systems, the ability to create project-specific databases, and heuristics for resolving DICOM series into 3-D volume images. The DICOM Tool also provides tools for easy configuration and management of DICOM communications components, including setting up multiple DICOM receivers and full query/retrieve functionality for remote DICOM storage systems.

### DICOM Tool Features

The **Analyze DICOM Tool** module permits easy loading of volume images into the Analyze workspace, manages database files with associated image directories, and optionally allows configuration of DICOM receivers for each of the image databases created. DICOM Tool uses an embedded file-system based database engine (SQLITE). A database server application providing automatic updates and network access may be optionally installed but is not necessary. DICOM network communication, including a receiver (via STORESCP) and remote query/retrieve (via FINDSCU, MOVESCU), is an integral part of the DICOM Tool module.

A DICOM Tool database consists of the database file, a directory with DICOM images, an optionally configured database server, and an optionally configured DICOM receiver which stores its received images in the image storage directory. The database may be populated with images received through the DICOM receiver (via STORESCP) or directly imported from the file system. The database is not updated by the receiver. Rather the receiver stores its images in the directory with the rest of the images. If the database server is installed, it periodically merges newly received images into the database; otherwise when an update is invoked from the DICOM Tool module, any received images are detected and merged into the database. The database may be read by any number of users, but only updated by one user at a time. The database file and associated image directory can be easily copied to media for backup, and the database can be shared by multiple users with network access to the database file and its associated images. For Linux/Unix systems, a .initScript directory is created with initialization scripts that can be copied to the appropriate startup directory to start receivers and database server during system boot.

The DICOM Tool module also provides an interface to query remote DICOM AETs (via FINDSCU) and retrieve selected images to the current local database (via MOVESCU). Selected images may be sent to a configured remote AET (via STORESCU). The 'Administer AETs' dialogue (File > Administer AETs) provides an interface to set the Query/Retrieve AET for the DICOM Tool on the local client system, and to define other remote AETs which may be queried by the DICOM Tool.



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### Creating a DICOM Tool Database

The first time you open the **DICOM Tool** module, it will detect that there is no database present. A dialog box will be returned asking you if you would like to create a new database or browse for an existing database. After selecting **Create a new local database**, the Create New Image Database window will be returned. This window has four parts:

#### 1. Specification of the database name and file system directory [A]:

- i. **Local Database Name:** The default database name is *YourSystemName\_5679*, which is assigned as the default database file name and the AET title for the receiver specific to this database. A directory with the name *YourSystemName\_5679.DICOM* will also be created for the DICOM images. You can set the database file name to be anything you want, but the image directory must be the same name with the *.DICOM* suffix.
- ii. **Local Database Directory:** Enables you to specify the directory in the file system where the database and its images will be stored. Following creation of this directory, DICOM images from this directory are copied to and merged into the newly created database.

#### 2. Specification of a DICOM receiver for the database (optional) [B]:

- i. **Configure DICOM receiver:** Check this box to configure an associated receiver. You can optionally configure an instance of a DICOM receiver (STORESCP). The default AET will be the same name as the database name. This can be changed to a different AET name, but DICOM AETs can be no longer than 16 characters. You may find it convenient to have the database name, DICOM AET, and Windows service or Linux/Unix daemon all share the same name to associate all with the specific database. You must also specify a port number where the receiver will listen. If you have administrative privileges under Windows, a Windows service will be created and started for the receiver. Under Linux/Unix, an attempt is made to install an initialization script (must run as root) so that the receiver will start automatically on boot. A *.initScript* directory will also be created with the boot initialization script that can be modified if necessary for the specific system configuration and installed manually.

The screenshot shows the 'Create New Image Database - DicomTool' dialog box. It is titled 'Image Database [A]'. The 'Local Database Name' is 'TEST2\_5679' and the 'Local Database Directory' is 'C:/images'. Under the 'Dicom Receiver' section, 'Configure DICOM Receiver' is checked [B], 'Dicom Receiver AET' is 'TEST2\_5679', 'Dicom Receiver Port' is '5679', and 'DCMTK path' is 'C:/BIR/DCMTK-3.5/PC\_NT/bin'. Under the 'Database Server' section, 'Configure Database Server' is checked [C], 'Service Name' is 'TEST2\_5670', 'Host System' is 'AD02', 'Port Number' is '5680', 'Update Frequency' is '5', and 'Server Logging' is checked. At the bottom, 'Source of Initial images' [D] is 'C:/BIR/images/TutorialData/ImportExpo'. There are 'Done' and 'Create Database Server' buttons at the bottom.

#### 3. Specification of a database server (optional) [C]:

The DICOM Tool provides an optional database server to manage automatic updates and multiple client access to the database over a network. The database server is a dedicated process attached to one database and accessible by system name and port number. It responds to connection requests, SQL statements, and requests for images, and polls the image storage area for newly received images to register.

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Configuring and installing a database server is very similar to configuring the DICOM receiver. A database path, port number, service name, and polling interval are used to configure an instance of the database server, which can be installed as a Windows service for Windows-based systems and a Unix daemon for Linux/Unix/Mac OS X systems. Under Unix a daemon start up script is created which can be used to start the server from a client (running from the same host). Additionally the script may be installed by a system administrator to automatically run when the system starts.

A database server can be configured at the time the database is created by specifying the required items for the database server in the same way the properties of the DICOM receiver are configured. The Service name and port number should be different from the parameters given for the DICOM receiver. (For example, if port 5679 was used for the DICOM receiver, use 5680 for the database server.) This will make it easier to remember and avoid conflicts with port numbers.

- i. Check the box **Configure a Database Server**.
- ii. Enter a **Service Name** for the database server i.e. SystemName\_PortNumber.
- iii. Specify a **Port Number**.
- iv. Specify an **Update Frequency** in minutes. This determines how frequently the server checks for newly arrived images to register.

If a DICOM Tool database has already been configured using Analyze without a database server, a database server can be assigned to that database using the DICOM Tool.

- i. Start **DICOM Tool**.
- ii. If the program does not start connected to the desired database, use **File > Open Database** to connect to the desired database.
- iii. Use the **File > Administer Database** tool to configure a Database server.
- iv. Set a **Service Name**, **Database Port**, and **Update Frequency**.
- v. Click the **Status** button to see if another such server is already configured.
- vi. If there is no configured service by that name. Select the **Install** button.
- vii. After its indicator turns green, select the **Start** button to start the server.
- viii. After it is started, the database will be connected through the server.
- ix. Once a database has a configured server and that server is running, attempts to connect directly to the database file are automatically rerouted to the server. In the database directory a new link file is created with a .rdb extension. This file has the information required to connect to the server. This file can be copied anywhere else in the filesystem. This “link file” can be used by the File > Open Database file selection dialog to connect to the database server. You may also connect to this server by pressing <Ctrl><S> in the program and entering the system name and port number for the server.

Image Database **A**

Local Database Name: TEST2\_5679

Local Database Directory: C:/images

Dicom Receiver

Configure DICOM Receiver  **B**

Dicom Receiver AET: TEST2\_5679

Dicom Receiver Port: 5679

DCMTK path: C:/BIR/DCMTK-3.5/PC\_NT/bin

Database Server

Configure Database Server  **C**

Service Name: TEST2\_5670

Host System: AD02

Port Number: 5680

Update Frequency: 5

Server Logging

**D** Source of Initial images: C:/BIR/images/TutorialData/ImportExpo

Done Create Database Server

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4. **Specification of a directory of images to initially populate the database (optional) [D]:**
  - i. **Source of Initial Images:** This directory (if specified) will be recursively searched for DICOM images. Any DICOM images found will be copied to the database directory and merged into the database.

### Migrating from BIRPacs to DICOM Tool

The DICOM Tool in Analyze uses a different database system from BIRPacs and therefore is not directly compatible with any prior BIRPacs installations. Analyze does not contain a BIRPacs client program, therefore in order to continue using BIRPacs you will need to keep your earlier installation of Analyze.

To migrate your BIRPacs-stored images into a DICOM Tool database, you should first create a DICOM Tool database to hold the BIRPacs images, as described in the previous section. This could be the default database, or a new DICOM Tool database specific for your current BIRPacs images. In the Create New Image Database window, set the **Source of Initial Images** field to the directory containing the BIRPacs images. With previous versions of Analyze, the default location for BIRPacs-stored images would be **C:\BIR\BIRPACS-6.X\dicom** for a Windows system, or a similar directory at the installed location of Analyze on a Linux/Unix system. When the DICOM Tool database is created, these images are copied from this BIRPACS-6.X\dicom directory and placed into the new DICOM Tool database directory (make sure you have sufficient disk space for 2 copies of all the images).

If you wish to continue using the same port and AET for the new DICOM Tool receiver that you are currently using for the BIRPacs receiver, you will need shutdown and uninstall the BIRPacs receiver. To do this:

**For Windows:** from a **dos** shell use the SC (Service Control) command to execute  
**SC stop BIRPacsReceiver**  
**SC delete BIRPacsReceiver**

**For Linux/Unix:** (as root)  
Find the initialization script - probably **/etc/init.d/BIRPacs\_s**  
**./BIRPacs\_s stop**  
Remove the '**BIRPacs\_s**' startup script

Once you are confident that the new DICOM Tool database was created successfully and all of the images are accessible, you can delete the BIRPacs image directory.